

Food Insecurity Atlas of Rural India

M S Swaminathan Research Foundation

World Food Programme

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ISBN No. 81-88355-00-3

First Edition April 2001
Third Impression, June 2003

Printed by
TTK Healthcare Limited – Printing Division
328 GST Road, Chormepet
Chennai – 600 044.

Cover Design:
The Frontline
Chennai – 600 002.

ACKNOWLEDGEMENTS

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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

The inter-state boundaries among Arunachal Pradesh, Assam and Meghalaya shown on this map are as interpreted from the North-Eastern Areas (Reorganisation) Act 1971, but have yet to be verified.

The external boundaries and coastlines of India agree with the Record/Master Copy certified by Survey of India.

The State boundaries between Uttarakhand & Uttar Pradesh, Bihar & Jharkhand and Chhattisgarh & Madhya Pradesh have not been verified by the governments concerned.

The spellings of names in this map have been taken from various sources.

MSSRF/BK /01/01

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The boundaries and names shown and the designations used on the maps in this book do not imply official endorsement or acceptance by the UN.

PREFACE

The Food Insecurity Atlas of Rural India is a joint initiative of the M S Swaminathan Research Foundation (MSSRF) and the United Nations World Food Programme (WFP). The goals of this exercise are to identify the food insecure States in India both in the short and long term time dimensions and to suggest an action plan which can help the country to become substantially food secure by the year 2007, which marks the 60th anniversary of India's independence.

Drawing sustenance from the goals of the World Food Summit which met in Rome in 1996, this atlas attempts to understand the multifaceted character of food insecurity in India and identify the hot spots of food insecurity. Overall, India is a food surplus country, maintaining a sufficient buffer stock and exporting food commodities. Yet, India has the largest absolute numbers of undernourished people in the world. This is the so-called 'Paradox of South Asia' where huge levels of child and maternal malnutrition, as well as micronutrient deficiencies co-exist with high levels of food supply. The incidence of low birth weight children as a result of maternal and foetal under nutrition is also unacceptably high, and today micronutrient deficiencies affect more than a third of India's population, predominantly women and children.

The issue India is facing is no longer simply food security - based on food availability - it is also food and nutrition security based on the access to a diet of high nutritional quality.

The process of developing this atlas has been as important as the atlas itself. A Steering Committee was formed to arrive at a sound methodology. This committee consisted of senior government officials, senior academicians, officials from international organizations, NGOs and donor agencies. The many debates of the Steering Committee have been a voyage into discovery and have enriched the analysis. We wish to thank members of the committee as well as independent reviewers for their interest and commitment and hope the joint learning that has occurred will continue into the future.

The atlas is only the first step; moving from analysis to action is the critical leap. This process has started in several states and soon we hope that every State will draw up a hunger elimination strategy and include it as an integral part of the Tenth Five Year Plan. The onus is on us to develop and re-orient the existing programmes so that they fully serve the needs of the food insecure; particularly pregnant and nursing women, children and the old and infirm.

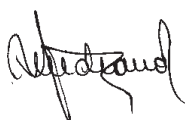
In the longer term, the atlas will be successful to the extent to which it contributes to targeting those people and areas suffering the most from hunger and malnutrition and contributes to the taking of remedial action to improve their situation. Both of us firmly believe that hunger is the worst form of discrimination and targeting our resources at the most discriminated is an absolute imperative. This is also the recipe for equitable and sustainable development proposed by Mahatma Gandhi, when he advocated an **antyodaya** (attention to the poorest) approach to development. Conditions which lead to the incidence of low birth weight children, who are predestined to suffer from several health handicaps and impaired brain development constitute the cruelest form of inequity. We will be able to partly judge the atlas's long term achievement in terms of the number of Indians who remain undernourished in 2007, which is the last year of the Tenth Plan Period.

Effective implementation of the **Gram Sabha** led 7 point action plan recommended by us should make a substantial contribution to achieving the goal of providing every child, woman and man an opportunity for a


productive and healthy life. The Prime Minister and the Government of India and our respective organizations, have pledged ourselves to work towards this goal. We are convinced that “the hunger of one is the shame of all” and are committed to taking action which results in poverty induced hunger becoming a problem of the past.

We are indebted to Shri K C Pant, Deputy Chairman, Dr N.C. Saxena, Member-Secretary, Shri M D Asthana, Senior Advisor, Union Planning Commission for the advice, guidance and support they have extended throughout this exercise. Much of the credit for bringing out this publication in this action-oriented manner goes to Dr Swarna S Vepa, Project Leader, Ms R V Bhavani and their colleagues in MSSRF and to Mr. Gerald Daly, Regional VAM Advisor, Mr Wolfgang Herbinger, and other staff of WFP.

We are deeply conscious of the limitations of this study, which arise from the limitations of the available data. For example, we could not get authentic data on the situation relating to safe drinking water, which is an important factor in influencing the biological absorption of food in the body. Complete data were also not available for a few States. We plan to update and revise the atlas and analysis on the basis of new data as well as the advice, comments and suggestions received from those using this publication. We plan to bring out periodically an updated version so as to serve as a road map to the years 2007 and 2015, by which time we hope the concept of “food for all” will become a reality.



Pedro Medrano
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CHAPTER 1

Introduction

Food is the most basic need of a person. The inability of a person to eat enough, stay active and lead a healthy life comes under the purview of food insecurity. The causes of persistent food insecurity are deep-rooted. Availability of sufficient food, either through production or through import, is only a part of the story. The full story of food insecurity is related to poverty, illiteracy, discrimination and neglect. It is also related to unhygienic living, lack of basic amenities and health care. Ultimately it is a story of failed governance — global, national and local.

The Food Insecurity Atlas of Rural India seeks to unfold the story at the level of Indian states. The story unfolds through the data to begin with. It is finally narrated with the help of the chosen indicators, indices and maps. Maps are used to enhance the awareness of the problem.

The Government of India paid considerable attention to the problem of food availability at the national level. Due to the price and non-price incentives given to farmers, staple food production reached a peak of 209 million tonnes by the year 2000, starting from a modest level of 50 million tonnes in 1950-51.¹ The government ensured the overall availability of major food items such as cereals, sugar, oil seeds, milk etc., mostly through production and at times through imports. Food producers receive price and non-price incentives from the government in some states.

All the same, often, some concern has been expressed about the ability of the country to feed itself in the future.² The fears arose out of the decelerating rates of growth in food grain production and a fall in per capita availability of staple foods.³ Land degradation and declining moisture availability have increased these concerns. Therefore, environmental sustainability and its long-term impact on

food production is one of the main issues in this book. Availability can be reduced by disasters such as droughts, floods, cyclones and earthquakes that disrupt normal life. They can wipe out the food security in an instant. It takes days, months or even years to restore normalcy. Hence, the book looks into the impact of disasters in different parts of the country.

Even after fifty years of independence, it has not been possible for the country to ensure access to productive livelihoods and food for all. Those dependent upon low wage incomes and casual employment do not hope to eat enough throughout the year. Things get worse when droughts and other transitory problems occur. There are problems of discrimination by caste and gender which are ingrained in society and which have a bearing upon livelihood access and food access. Denial of food and health care due to discrimination is difficult to isolate from other factors at the macro level, though some of these facts are clear to many Indians in their daily lives. The plight of Scheduled Tribes and Scheduled Castes deserves special attention. The book has attempted to cover some of these important issues.

Further, problems of absorption of food into the body occur due to diet imbalances and diseases. Lack of health care facilities, clean drinking water and sanitation worsen the situation. They in turn have an impact on human outcomes such as life expectancy, maternal mortality, child mortality and infant mortality rates. Studies in this area reveal that there are still many parts of India, where high infant and child mortality rates prevail notwithstanding successes achieved by immunization elsewhere in the country. Maternal mortality rates are also high in some states

¹ GOI, Economic Survey (2000-2001)

² Bhalla, *et. al.* (2000) and Bansil, P. C. (2000)

³ The per capita cereal availability has declined from a peak of 468.5 gm/day in 1991 to a level of 434.8 gm/day in 2000.

2 FOOD INSECURITY ATLAS OF RURAL INDIA

due to the lack of primary health care facilities. Life expectancy is low in some parts. For adult Body Mass Index a majority of the population is below the norm, according to international standards.⁴

Micronutrient deficiencies are widespread in India and the most critically affected are the women and children.⁵ Micronutrient malnutrition is preventable and cost effective solutions are available.⁶ However, the key constraints in implementing them are often a lack of awareness and sustained commitment on the part of policy makers and consumers.

The planning process has evolved policies and programmes to enhance the affordability of food. Prominent among them has been the procurement of food grains and public distribution at affordable prices. Other food-based programmes are also implemented. Remarkable progress has been achieved in some parts of the country in reaching people effectively. Tamil Nadu's Universal Nutritious Noon Meal Programme, the Integrated Child Development Services (ICDS) projects and Kerala's universal public distribution system are outstanding examples of meaningful governmental initiatives in improving access to food. However, for the country as a whole, most of these programmes have achieved limited success. Both central and state governments have carried out programmes to enhance livelihoods. The Maharashtra Employment Guarantee Scheme is relatively more successful than other programmes. Yet, access to productive livelihoods is a far cry in many areas.

Despite years of development efforts and various programmes targeted at eliminating hunger and deprivation, millions of people are still consuming diets deficient in calories. As per the National Sample Survey data (NSS 1993-94 fiftieth round Quinquennial survey),

the percentage of population consuming less than 1890 Kcal per day per consumer unit,⁷ stood at 13.4 percent of the rural population and 16.4 percent of the urban population. The percentage of population consuming less than 2160 Kcal constituted 26.4 percent of the rural population and 31.9 percent of the urban population. Those consuming less than 2400 Kcal constitute 42 percent of the rural population and 48.8 percent of the urban population.

Can it be said that these people eat less because they cannot afford to eat more? Is it that they do not eat more since they are not healthy enough to do so? Why do they remain hungry and what are the consequences of their remaining hungry? Finally, what can be done for them? How can we rid India of Hunger? These are some of the questions that need to be answered.

We do not claim to have answered all these questions satisfactorily in this book. We have made an attempt to highlight the interacting factors that lead to hunger and malnourishment. The Atlas maps all the factors that might cause hunger and malnourishment and hopes to increase public awareness of these issues and initiate appropriate public policies and actions to end hunger.

There are three stages to make India Hunger-free. The first stage is to collate data at the state level and to examine where the situation is bad and why. The second stage is the district level analysis to identify the specific areas of action. The third stage is the programme design and implementation. All the three steps are important. The state level aggregation can hide the facts and may not reflect the needs felt at the district level. Ultimately, we have to work at the village level and block level. Such an approach enables us to take up speedy and location-specific action. This book concentrates on the first stage.

⁴ NNMB (1996) and GOI, India Nutritional Profile (1998)

⁵ NFHS-2 (1998-99)

⁶ WFP, India Mix (booklet)

⁷ 1890 Kcal constitutes 70 percent of the norm of 2,700 kilocalories per consumer unit per day. 2160 Kcal constitutes 80 percent of the above norm and 2400 kcal constitutes 90 percent of the norm. NSSO, Sarvekshna, 73rd Issue, (1997).

Eradicating persistent food insecurity from India is a challenging task. It means getting food to all the corners of the country at affordable prices. It amounts to providing viable livelihoods to millions of illiterates and semi-literates. It requires educating people on nutrition and providing health care. We must think of ways of making food and health care accessible to all women and to all oppressed sections of the population. Sanitation, hygiene and medical facilities will have to be made available in thousands of villages. It is important to view the problem from the macro perspective before attacking the problem at the micro level.

To design and implement an effective programme one needs to first understand the region and culture specific problems at the grassroot level of a village, a community and a household. The planning process in India is largely centralized. Many programmes continue to be designed with a national and state-level perspective. It is probably time to change this approach and consider community level programmes with active participation by the people. Such alternative policies and programmes are considered at length in this book, building on recent experiences in participatory planning and governance.

1.1 Dimensions of Food Insecurity

To start a systematic study, we first need to define food insecurity. Food insecurity exists when all people, at all times, do not have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life⁸. Hunger is just one aspect of food insecurity. Hunger is difficult to measure, since perceptions of hunger differ from one person to another. Hence, in this study, the word hunger is used only sparingly in the limited context of deficient calorie intake. Silent hunger refers to micro nutrient deficiency.

Importantly, food insecurity may be present or potential. A state producing sufficient food at present may not be able to produce the same amount in future, due to environmental factors such as land degradation or ground

water depletion or due to economic factors, e.g., lack of price incentives. A region with inadequate food production would face food insecurity at present. If it overuses its natural resources and fails in making provision for preventing environmental degradation, it would become potentially food insecure.

Potential food insecurity is related not only to existing malnutrition of the people in a region but also to the lack of access to safe drinking water and poor sanitation and health conditions. The likelihood of a person falling ill or consuming a diet, which is unbalanced, constitutes potential food insecurity. Thus, potential food insecurity can occur either due to a potential lack of availability of food or due to a potential lack of livelihood or a potential threat of disease and lack of absorption.

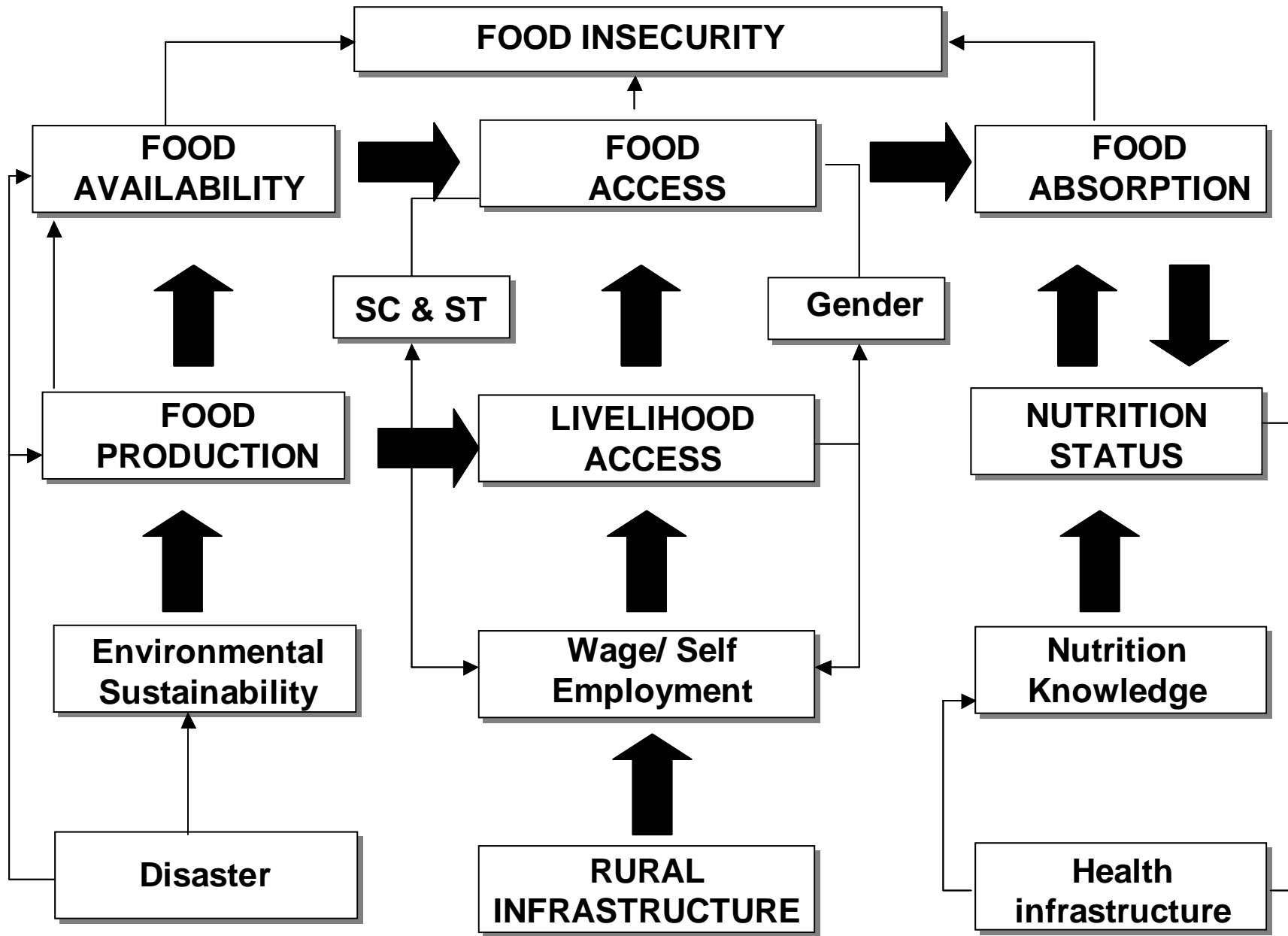
Food insecurity may be chronic or transitory. Chronic food insecurity refers to a situation in which people consistently consume diets inadequate in calories and essential nutrients. This often happens due to the inability to 'access' food by production, purchase, gift or aid. Transitory food insecurity is a temporary shortfall in food availability and consumption. Factors like fall in income, increase in food prices, shortage of production, temporary shortfall due to floods, droughts, and other natural calamities etc., lead to temporary food insecurity.

We can capture all the essential dimensions of food insecurity in the three aspects of food availability, food access and food absorption. The concept diagram shows the basic links (see Fig. 1.1). Food insecurity is a complex phenomenon. The interaction of these three aspects results in a situation of food insecurity.

Food availability may be hampered by low levels of production or inadequate inflow of food into the area. Low levels of production may be due to limitations such as markets, credit, technology and the natural resource base. It may also be due to lack of price incentives to production.

⁸ FAO (1996)

Figure 1.1: Concept Diagram



Environmental sustainability is equally important for long-term assured production. Both private trade in food grains and government supported food grain distribution systems normally ensure adequate inflow of food into a region. In some areas, infrastructure bottlenecks and lack of purchasing power necessitate government-supported measures to ensure adequate supply. Food availability by itself does not ensure adequate access to food, though adequate food availability is necessary for food access. If people have access to livelihood, they would in general have access to food and nutrition. Those who are unemployed, employed on a casual basis or under-employed, would have limited economic and physical access to food. Persons with a low asset base and those engaged in non-viable enterprises tend to remain poor. The poor spend a large percentage of their income on food and yet get very little to eat — let alone a balanced diet. Eighty to ninety percent of the energy requirements of the lowest expenditure groups in various states come from cereals.⁹

Food prices also play an important part in the ability of the household to purchase an adequate diet. Rural infrastructure and agricultural and non-agricultural employment enhance livelihood opportunities and food access. Further, social and gender related factors might prevent access to livelihood as well as an individual's access to a balanced diet. Poor physical access to food leads to poor consumption and poor nutrition. Levels of food consumption depend mainly upon food availability and food access. In poor societies, food insecurity and livelihood insecurity go together.

Food absorption relates to food assimilation. Absorption in turn depends upon the state of health of the individual. Food consumption depends upon habits, preferences, perceptions and knowledge of basic nutrition. The intake of carbohydrates, proteins, fats and other basic nutrients is guided by the above considerations. Low levels of nutrient intake may occur if people do not consume

balanced diets. This may happen due to a lack of knowledge of nutrition. Female literacy is known to enhance nutrition knowledge and child health.¹⁰ There are certain preconditions for the adequate absorption of each type of essential nutrients. For example, for protein adequacy, calorie adequacy is a necessity. Otherwise, protein does not serve its purpose as a protective food. Similarly, for the absorption of iron, small amounts of vitamin C are important. Iron deficiency, vitamin deficiency, iodine deficiency and calcium deficiency are widespread due to the lack of knowledge and lack of access to natural foods rich in these nutrients. The lack of fortified foods to compensate for the lack of natural foods adds to the problem of micronutrient deficiency.

A person who is not healthy cannot assimilate food even if she or he consumes a balanced diet. One's state of health depends upon sanitation, hygiene and the surroundings. It also depends upon the timely availability of medical facilities to recover from disease. These in turn depend upon the health infrastructure. The outcome of problems connected with absorption is an unhealthy population with growth disorders, high levels of morbidity, high levels of mortality of infants, children, mothers, women and men. Shorter life spans may also be a result of these insecurities and a lack of basic amenities.

Food availability, food access and food absorption are not separate phenomena — they overlap. Food production is linked to livelihood access, food access and food consumption. Livelihood access in turn influences the demand for food and better prices and incentives for production. Better livelihood access also leads to better education, better living standards, better sanitation, better knowledge of nutrition, better absorption and better health.

External agencies such as the Government, local authorities, international organizations and non-governmental organizations help the population to overcome food insecurity. Providing food grains at

⁹ NSSO, Sarvekshana, 73rd Issue, (1997)

¹⁰ Dreze, Jean and Sen, Amartya (1999)

6 FOOD INSECURITY ATLAS OF RURAL INDIA

subsidized prices, providing micro-credit for self-employment, credit for consumption in times of crop failure, crop insurance facility, providing employment in off-peak seasons, fixing minimum wages, providing supplementary food to children through the Integrated Child Development Services, supplementary school feeding, and supplemental nutrition packets etc., come under this category. When safety nets are successfully cast, food insecurity is minimal. Further, the effectiveness of the safety nets depends upon the need, the suitability of the programme, the awareness and participation of the community, and the competence of the implementing agency.

1.2 Mapping Food Insecurity

The overall approach consists of selecting the indicators which best describe the situation of food availability, food access and food absorption. We start with an analysis of the situation and choose the relevant indicators. The indicators give greater emphasis to deprivation¹¹ and vulnerability¹². Some of the indicators are composite in nature. They are indices. There are five such indices in all. Three are selected as food insecurity parameters and two are used only to explain the nutritional status of adults and children. The indices contain three or four variables. The method of computation of each index is simple and measures the distance covered by a state as a proportion of the total distance that exists between the best state and the worst state in respect of that parameter. Detailed explanations are provided in the relevant appendices.

We start with a discussion on food availability and choose the relevant indicators for the final map. Similarly, the study of the problems of livelihood access and food access and discrimination, lead to the identification of the appropriate indicators. While looking into protein calorie malnutrition and the nutritional status of adults and children, we select the appropriate indicators of food

absorption. During the analysis, we bring out the relevance of the chosen indicator to the food insecurity situation to justify their inclusion in the study.

The chosen indicators have been mapped separately. We have looked into the interdependencies to understand better their combined impact on food insecurity. Indicators are aggregated together to get the four composite maps of food availability, food access and food absorption and the final food insecurity map of India.

The detailed discussion of the indicators and their relationships across the states gives us insights into the strengths and weaknesses of the states. Thus, the study covers not only the indicators included in the Map but a number of others that explain the existing situation in the state. Maps are used to enhance the visual impact of the findings. The three core chapters on food availability, food access and food absorption present detailed profiles of the states.

A mapping index has been developed for the four composite maps that represent more than one indicator on the map. First, the indicators are ranked such that the first rank shows the worst possible situation and the sixteenth rank shows the best possible position. The aggregative rank score of each state is calculated by adding up the ranks of all the indicators. If the composite mapping index has 19 indicators and 16 states, a state that has the worst situation with respect to all indicators, will have a value of 19. If a state is good in every single respect, it will have a value of 304. With 19 indicators and 16 states, these are the limits. Thus the lower the value, the worse off the state and the higher the value, the better off the situation of the state in respect of the composite maps. For the sake of uniformity, the aggregative rank score is divided by the number of indicators used, to get the final mapping index. This is our final mapping index. The mapping index is calculated only for the composite maps. For individual

¹¹ Deprivation refers to non-existence or denial of an opportunity.

¹² Vulnerability refers to exposure to risk and the ability to cope with it. The poor are more vulnerable than the rich are, as they face more risks and their coping mechanisms are limited.

indicators the actual data are converted into class intervals.

The states are divided into five classes representing five typologies. The class intervals are unequal, because most of the data are skewed. This means that if equal intervals are taken, many states would fall into the middle classes and the extreme classes will have very few states. Hence, the ideal approach is to use the natural breaks that follow the pattern of the data to decide the class intervals.

'Arc-view' Geographical Information System software has been used to detect the natural breaks in the series, so that the error in detecting natural breaks is minimized. Where necessary, the class limits have been adjusted slightly to suit the distribution of states more evenly between the two classes. Each class represents a typology, which is named as per the level of food insecurity. Class limits are rounded off to the nearest digit or two decimal points. This has been done to capture the typologies better. In the case of the Sustainability Index, the standard deviation method has been used. The ranges are one standard deviation and two standard deviations from the mean.

The mapping index of the composite maps gives the combined intensity of various factors. The state with severe problems in one aspect may be relatively problem-free in other aspects. Hence, the mapping index gives the relative position of a state vis-à-vis others as per the combined intensity of the problem of food insecurity. Unlike the Human Development Index, where the position of a state is measured against the total distance between the best and the worst, or a price index that measures the price position vis-à-vis the base year's position, the Mapping Index indicates the average position of the state with respect to others.

The inclusion or exclusion of certain indicators might change the final mapping index. Exclusion or inclusion of any one of the nineteen indicators changes the position of two to four states out of the total sixteen states just by one position.

The methodology as such does not give a special weight to any indicator. All indicators carry equal weight.

The weighting is implicit in the number of parameters in each group. Out of the 19 indicators, five indicators represent food availability, eight represent food access and six represent food absorption. Thus, food availability gets an implicit weight of 26 per cent. Food access in terms of calories and livelihood access gets a weight of 42 per cent and the factors representing absorption get a weight of 32 per cent. The description of the indicators, the method of computation and the sources of information are given in the relevant chapters.

A mapping index does not explain the cause and effect relationship between the parameters chosen. Parameters that show association are also included, if conceptually one parameter is not a substitute for the other. Child mortality may be associated with female literacy, but other factors such as immunization play an important role in reducing child mortality. Female literacy is important not only for nutrition knowledge, but also to avail of the existing facilities and safety nets. The selection was guided by the conceptual link between food insecurity and the chosen indicator rather than the degree of association of one parameter with another. Where there is perfect correlation, the indicators represent the same aspect and so there is no necessity to include both.

Sometimes it is felt that as few indicators as possible should be used, as in the case of the Human Development Index which uses only three indicators, namely, per capita income, literacy and life expectancy. Its aim is only to highlight the relative position of the states. In contrast, the analysis and the maps of food insecurity are meant to give us a deeper understanding of the food insecurity situation. We have opted for a larger number of indicators, meaningfully arranged and studied, which would capture all the dimensions of food insecurity in the different parts of the country. The major emphasis is more on the analysis of the individual indicators and maps rather than on the composite maps. Ultimately they are the targets of public action and policy and understanding them is more important than the relative position of the state in the composite map. However the composite maps are useful

8 FOOD INSECURITY ATLAS OF RURAL INDIA

in giving us the average situation and do contain a reference to the individual maps.

1.3 Data Limitations

The data are derived from secondary sources.¹³ Comparable data are not available for some states and some periods; therefore, data from another source for the same year or a year close to it have been taken. Sometimes data for the same state for a previous period have been used. There are only a few cases of gaps being filled in such a manner and they have been indicated. Sometimes the reference periods used are different for different indicators in the same index, since data from more than one source have been pooled.

All data relate to the decade between 1990 and 2000. Where only provisional figures are available for some indicators for recent years, we have chosen an earlier year of finalized data. Sometimes the data used are a decade old, such as the 1991 census. Hence composite maps have to be interpreted with care. Indicators for female literacy, juvenile sex ratio¹⁴ and Scheduled Caste and Scheduled Tribe population, rely on the 1991 census. Both the Rural Infrastructure Index and Rural Health Infrastructure Index use some indicators on safe drinking water and village electrification based on the 1991 census data.

Jammu and Kashmir and the North Eastern States except Assam have not been included due to paucity of comparable information. We have not referred to the more recent data from the National Sample Survey (55th round) for the year 1999-2000, because the state level data are not available for all aspects.

The main sources of data are the publications of the

Ministry of Agriculture, the published reports of the National Sample Surveys, Nutritional Surveys of the National Nutritional Monitoring Bureau, India Nutritional Profile of the Department of Women and Child Development, and the Census of India Reports. Two reports, India Human Development Report published by the National Council of Applied Economic Research (NCAER) and Rural Development Report, published by the National Institute of Rural Development, have been used extensively.

The survey data of National Nutritional Monitoring Bureau (NNMB) on eight states are pooled with data from India Nutritional Profiles for six states, and National Council of Applied Economic Research (NCAER) data for two states, to get the data for all the sixteen states in respect of stunting and underweight in children and chronic energy deficiency in adults. Rural data are not available separately for all the states from the same survey. National Family Health Survey (NFHS-2) data are available uniformly for all 16 states on some aspects, but these data have not been used for two reasons. The sample size of NFHS is very small, though not as small as that of NCAER. Second, NFHS-2 combines rural and urban data, which gives erroneous conclusions when used for rural India. Thus, we have preferred to depend on three different data sources rather than on one single source.

The data used are not always strictly comparable; reliability also varies. Given the innumerable limitations of data, the findings are indicative of the approximate position of a state. If the data are updated, and more reliable and more recent information is made use of, then the food insecurity map of rural India would change.



¹³ See appendix 5.1 for the sources of data and reference years for the 19 indicators used.

¹⁴ Though some results on the Juvenile sex ratio are available for 2001, data are not available for all the sixteen states. Hence, we have used only the 1991 data.

CHAPTER 2

Food Availability

Food has to be available in abundance, if everybody has to eat enough. Food availability is a function of domestic production and imports. At the outset, we need to highlight the importance of food availability in economic development, lest the role of agriculture be downplayed in the new economy of globalization. Availability of adequate food is a prerequisite to economic development.

Domestic production is the main source of food availability. With globalization comes the theoretical possibility of food imports and industrial exports. Imports can be used to ensure that prices of wage goods such as food do not escalate, even if domestic food production falls short of the requirements. However, Indian industrial exports are far too limited to allow any dependence on food imports and any let up in the domestic production of adequate food.

As the country develops, a structural change occurs and the importance of agriculture in the overall economy comes down, not only in terms of its contribution to the national income but also in terms of the population dependent upon it. In the Indian case, the so called 'structural change' - of decline in the number of those dependent upon agriculture and an increase in the number of those dependent upon industry - may have started, but we still have a long way to go to complete the process.¹ Such a change has to be accompanied by higher productivity per worker in both agriculture and industry. Until there is a perceptible shift to higher-paid jobs in the non-agricultural sector, agriculture has to continue to provide livelihoods. Given the limited possibilities of a shift to high-paid jobs in industry, it is clear that even in an era of globalisation, the role of agriculture in food production and employment remains crucial for India.

This chapter examines various aspects of food availability, bearing in mind both current and future food availability. Current levels of production, year-to-year fluctuations in production, environmental degradation that might harm long-term production and disasters that would disrupt food availability temporarily are the major factors considered.

A study of food availability is not complete without a reference to the procurement and existing food stocks with the Food Corporation of India. The total food stocks and production are influenced by the price policy. Hence, we have referred to the problem of food stocks and falling farm prices, which might affect future food production. Some policy suggestions are given in the sixth chapter.

We have examined all the above aspects in this chapter and retained five key indicators of food availability for use in the food insecurity map. Of these, two indicators refer to the present situation, and three indicators attempt to capture future problems. Based on these indicators, the food availability situation has been mapped. The map of food availability situation of India shows the relative position of the states.

2.1 Net Production of Food at the State Level

By food, we mean all items of food which are essential for healthy living, including cereals, pulses, tubers, sugar, edible oils, fruits, vegetables, milk, eggs, and fish. Certain foods such as meat and poultry meat have not been included due to paucity of data. Cereals consist of wheat, rice and coarse cereals. Tubers consist of potato, sweet potato and tapioca. Pulses include bengal gram, red gram, green gram, black gram, lentils and others. Sugar produced

¹ The recent census seems to suggest that there is a slight decline in the number of workers in agriculture.

See Sundaram, K (2001)

10 FOOD INSECURITY ATLAS OF RURAL INDIA

in the sugar mills is considered, instead of sugarcane. Reliable data on production of '*gur*' from sugarcane are not available. The availability of food grains at the national level is computed as the sum of net production (net of seed, feed and wastage), net imports and net changes in government stocks of food grains. A similar computation is not possible at the state level.

At the state level, we have only taken the data on production. Availability depends not only upon local production but also on inflows and outflows. There are outflows of food from the states because of government procurement operations and private trade. There are inflows of food into the states due to the existence of the public distribution system and private trade. The net availability at the state level is the result of all these movements. State-level assessment of availability is hampered by the lack of data on private trade in food grains. Net production (production less seed, feed and wastage) is considered as a proxy for net availability at the state level. Per capita production helps us to judge the adequacy of production at the state level.

The average production of three years or two years is considered, instead of one year's production, to compute the per capita production of various food items. The latest available reliable data are used in respect of each food item.² The estimated total state population in the year 2000 is used to derive the per capita production. To obtain the net production, 13 per cent of the total output of cereals, pulses, tubers and vegetables is deducted for seed, feed and wastage. To represent the edible portion of the total crop, we have deducted 70 per cent in respect of oilseeds (conversion factor when oil is extracted) and 50 per cent in the case of fruits. The production of sugar is taken as it is, without any deduction for wastage.

Net production per capita is more meaningful than the aggregate production. States have shown wide variations in per capita production of various foods. Production seems to be concentrated in some states. Cereal production

per capita is high in the states of Punjab and Haryana followed by Uttar Pradesh, Himachal Pradesh and Rajasthan. On an average, Punjab produces more than 2 kilograms per capita per day and Haryana produces more than 1.2 kilograms per capita per day. Uttar Pradesh produces more than half a kilogram per capita per day and Rajasthan produces close to half a kilogram per capita per day. Kerala produces as little as 66 grams of cereals per capita per day. The per capita cereal production of Gujarat is the next lowest at 221 grams per capita per day. Tamil Nadu and Maharashtra produce around 270 grams per capita per day. These are the four states with the lowest per capita availability. Tuber production per capita is highest in West Bengal, followed by Kerala, Tamil Nadu and Uttar Pradesh. ([Table 2.1](#))

Per capita availability of pulses is high in Madhya Pradesh and Rajasthan. Similarly per capita per day sugar production is high in Maharashtra at 140 grams. Rajasthan, Madhya Pradesh and Gujarat produce more oilseeds per capita than other states. Thus, the production per capita of almost all foods except fruits and vegetables shows a high coefficient of variation, exceeding 90 to 100 per cent. It can be seen that the crop production across the states is characterised by specialisation in a few crops, rather than the production of a large variety of crops. The gaps between the highest producing state and the lowest producing state are very large. The yield gaps also appear to be high. ([Table 2.1](#))

The three food items from animal sources for which data are available are milk, eggs and fish. Production per capita per day for all these three items varies between a low of just 48 grams of milk in Orissa, to a high of 777 grams in Punjab. Haryana produces 570 grams and Himachal Pradesh produces 281 grams. Orissa, Bihar and Assam produce less than 100 grams of milk per capita per day. Some states such as Punjab, Haryana, Himachal Pradesh, Rajasthan and Gujarat produce far larger quantities of milk than other states. The highest per capita production

² See [Appendix 2.1](#) for the computation of per capita net production.

Table 2.1**Per capita net Production of Vegetative Food Items (gms/day)**

S.No.	States	1 Cereals	2 Tubers	3 Pulses	4 Sugar	5 Edible oil	6 Fruits	7 Vegetables
	ICMR norms	420	75	40	30	22	50	125
1	Andhra Pradesh	363.35	6.87	22.68	30.67	27.78	106.33	66.41
2	Assam	16.10	58.01	5.84	0.67	4.84	49.83	196.33
3	Bihar	318.40	42.48	15.90	10.67	0.98	45.17	199.52
4	Gujarat	221.90	30.46	28.96	54.67	44.01	58.83	109.04
5	Haryana	1291.46	22.84	45.98	60.00	37.10	11.50	162.98
6	Himachal Pradesh	487.03	50.88	4.17	0.00	1.03	70.17	211.70
7	Karnataka	371.11	20.91	29.49	59.00	26.26	141.00	230.26
8	Kerala	65.92	197.09	1.42	0.67	0.32	78.67	209.09
9	Madhya Pradesh	454.43	22.21	100.22	3.33	46.62	20.17	85.55
10	Maharashtra	274.13	3.95	43.00	140.67	18.45	97.67	100.63
11	Orissa	389.27	28.20	21.20	5.33	4.55	55.33	354.33
12	Punjab	2132.58	85.37	7.67	61.67	10.38	48.00	166.75
13	Rajasthan	458.77	1.02	89.27	1.33	48.19	7.00	15.95
14	Tamil Nadu	270.31	123.47	9.26	68.00	24.11	84.83	158.05
15	Uttar Pradesh	545.68	116.76	33.62	65.67	7.16	38.17	160.95
16	West Bengal	413.24	210.85	4.73	0.33	4.32	21.17	438.77
	All India	430.33	65.73	31.94	41.00	18.10	58.33	179.22
	C.V.	0.958	1.033	1.010	1.135	0.911	0.631	0.583

Net Production = Production less Seed, Feed and Wastage @ 13% for cereals, tubers, pulses, vegetables; @70% for edible oils; @ 50% for fruits and no wastage for sugar.

Source : Col.1-7 Ministry of Agriculture, Area and Production of Principal Crops in India, (Various Issues)
Ministry of Agriculture, Bulletin on Food Statistics, (1999-2000)
Ministry of Agriculture, Agriculture in Brief, (2000)

of eggs is seen in Punjab, followed by Andhra Pradesh and Kerala. Tamil Nadu, West Bengal, Karnataka and Haryana also produce more eggs per capita compared to other states.

Kerala, Gujarat and West Bengal produce larger quantities of fish. Per capita daily availability of fish is about 52 grams in Kerala, 40 grams in Gujarat, 31 grams in West Bengal and around 20 grams in Orissa and Tamil Nadu. Even though Andhra Pradesh has a long coastline, the production of fish per capita is not high. Karnataka, Maharashtra and Assam produce fish at around 15 grams per capita per day. ([See Table 2.2](#))

The per capita figures do not show the contribution of the state to all India food production. Uttar Pradesh, having a larger area under crops, contributes about 21 per cent of the entire food grain production of the country. Madhya Pradesh contributes about 10 per cent of the total food grain production. Punjab contributes about 11 per cent of the total production. Bihar contributes about 7 per cent, the same as Andhra Pradesh. Ultimately, the levels of food production of the various states are to be judged in the light of the capacity of the state to provide better livelihoods and higher levels of consumption. Percentage levels of food production should also be judged

12 FOOD INSECURITY ATLAS OF RURAL INDIA

Table 2.2
Per capita Production of Animal Food Items (gms/day)

Sl.No.	States	1	2	3
		Milk	Eggs	Fish
	ICMR norms	150	45	25
1	Andhra Pradesh	158.05	26.74	13.01
2	Assam	81.05	26.74	16.35
3	Bihar	92.34	4.87	6.35
4	Gujarat	265.22	3.63	40.32
5	Haryana	570.60	10.72	3.83
6	Himachal Pradesh	281.32	3.62	2.41
7	Karnataka	171.47	10.35	15.52
8	Kerala	139.00	21.46	51.94
9	Madhya Pradesh	178.47	5.21	3.27
10	Maharashtra	151.72	9.90	15.26
11	Orissa	48.00	5.78	20.47
12	Punjab	776.91	37.48	3.23
13	Rajasthan	270.61	37.48	0.70
14	Tamil Nadu	170.17	17.54	20.18
15	Uttar Pradesh	193.69	1.36	2.37
16	West Bengal	116.39	11.28	31.06
	All India	184.33	9.38	14.01
	C.V.	0.827	0.886	0.967

Source: Col.1-3, Ministry of Agriculture, Bulletin on Food Statistics, (1999-2000)

against the hidden dangers of fertility depletion, land degradation and overall environmental damage. The future capacity of the state to produce more has a bearing on these factors.

2.2 Deficit of Production over Requirement

The study of adequacy of food production requires reference to norms based on average requirements. The Indian Council of Medical Research provides us with such norms.³ The recommended daily allowance for a person in respect of various foods is indicative of the average requirement. Deficit or surplus in production per capita per day over the recommended daily allowance per capita only shows whether a state is producing enough food to meet its requirements or not. Self-sufficiency in food may

be important as a national goal. Self-sufficiency at the regional level has very little relevance.

The per capita net production⁴ index is computed for all the states and all India, with ICMR recommended daily allowance as the base. The ICMR recommended quantity is taken as one and the per capita net production of the states is computed as a proportion of it. Where the production per capita is more than the ICMR recommended quantity, the index is above one. Where the per capita net production of the state is below the ICMR recommended quantity, the index is below one. This indicates whether a state is a surplus state or a deficit state with reference to a particular food item from the point of view of average requirement (see Table 2.3).

If per capita net production is compared with the recommended daily allowance given by ICMR, the country does not produce all foods in adequate quantities. India seems to be producing surplus vegetables, just enough of cereals, sugar, fruits and milk, but is deficient in the production of all other food items such as pulses, oilseeds, tubers, eggs and fish (see Appendix 2.1 for the method of computing the index of net production per capita with the ICMR base).

At the all India level, the surplus of production over requirement for a few commodities noted above is so low that any fluctuation in the production of any of these food items would lead to a deficit situation. For example, cereal availability has been estimated by us to be 430 grams per capita per day, compared to the ICMR norm of 420 grams per capita per day for the country as a whole. The country is therefore producing just about enough to meet the requirements.

Compared to the dietary requirements per capita per day given by the ICMR, many states are deficient even in the production of cereals. Only the states of Punjab and Haryana produce much above their requirements. Punjab produces five times its requirement, while Haryana produces

³ ICMR (1989)

⁴ The calculations are based either on triennium average production or two year average production.

Table: 2.3**Per capita net Production Index of Food with ICMR Norm as the Base***

		1	2	3	4	5	6	7	8	9	10
Sl.No	States	Cereals	Tubers	Pulses	Sugar	Edible oil	Fruits	Vegetables	Eggs	Fish	Milk
1	Andhra Pradesh	0.87	0.09	0.57	1.02	1.26	2.13	0.53	0.59	0.52	1.05
2	Assam	0.77	0.77	0.15	0.02	1.26	1.00	1.57	0.15	0.65	0.54
3	Bihar	0.76	0.57	0.40	0.36	0.04	0.90	1.60	0.11	0.25	0.62
4	Gujarat	0.53	0.41	0.72	1.82	2.00	1.18	0.87	0.08	1.61	1.77
4	Haryana	3.07	0.30	1.15	2.00	1.69	0.23	1.30	0.24	0.15	3.80
6	Himachal Pradesh	1.16	0.68	0.10	0.00	0.05	1.40	1.69	0.08	0.10	1.88
7	Karnataka	0.88	0.28	0.74	1.97	1.19	2.82	1.84	0.23	0.62	1.14
8	Kerala	0.16	2.63	0.04	0.02	0.01	1.57	1.67	0.48	2.08	0.93
9	Madhya Pradesh	1.08	0.30	2.51	0.11	2.12	0.40	0.68	0.12	0.13	1.19
10	Maharashtra	0.65	0.05	1.08	4.69	0.84	1.95	0.81	0.22	0.61	1.01
11	Orissa	0.93	0.38	0.53	0.18	0.21	1.11	4.96	0.13	0.82	0.32
12	Punjab	5.08	1.14	0.19	2.06	0.47	0.96	1.33	0.83	0.13	5.18
13	Rajasthan	1.09	0.01	2.23	0.04	2.19	0.14	0.13	0.06	0.03	1.80
14	Tamil Nadu	0.64	1.65	0.23	2.27	1.10	1.70	1.26	0.39	0.81	1.13
15	Uttar Pradesh	1.30	1.56	0.84	2.19	0.33	0.76	1.29	0.03	0.09	1.29
16	West Bengal	0.98	2.81	0.12	0.01	0.20	0.42	3.51	0.25	1.24	0.78
	All India	1.02	0.88	0.80	1.37	0.82	1.17	1.43	0.21	0.56	1.23

* See Appendix 2.1 for the calculation of Index with ICMR norm as the base

Source: Col.1-10, Ministry of Agriculture, Area and Production of Principal Crops in India (Various Issues) and Ministry of Agriculture, Bulletin of Food Statistics, (1999-2000)

three times its requirement. All the other states are either deficient in production or produce small surpluses. Uttar Pradesh, Rajasthan, Madhya Pradesh and Himachal Pradesh produce cereals above their requirements (see Table 2.3).

None of the states is self sufficient in the production of all the food items. The states producing a surplus in some food items may be noted. Madhya Pradesh and Rajasthan produce twice their requirement of pulses and Kerala and West Bengal produce twice their requirement of tubers. Maharashtra produces four and a half times its requirement of sugar. Punjab, Haryana, Tamil Nadu and Uttar Pradesh produce twice their requirement of sugar. Karnataka and Gujarat are close behind. Rajasthan, Madhya Pradesh and Gujarat produce twice their requirement of edible oils. Karnataka and Andhra Pradesh produce twice their requirement of fruits. Orissa seems to produce almost

five times its requirement of vegetables. West Bengal produces three times its requirement of vegetables.

As far as animal products are concerned, Punjab produces five times its requirement of milk. Haryana produces three times its requirement. Rajasthan and Himachal Pradesh produce close to double their requirement. All the other states are deficient in the production of eggs. Kerala produces double the requirement of fish, while West Bengal and Gujarat produce small surpluses.

Those states producing three times their requirement of a product are definitely specialising in its production. It need not mean that the concentration of production is a consequence of soil suitability or sustainability. Favourable price, markets, infrastructure and past commercial success, all play important roles.

2.3 Deficit in Production over Consumption of Cereals

A state need not be self-sufficient in cereal production, since there are possibilities of specializing in one product and getting supplies of other items from other states. Yet, a food deficit state has the additional task of making more food available. Normally, private demand attracts desired foods into the state without any special public effort. Good infrastructure and a well-established private trade infrastructure normally ensure this, as in the case of Punjab. Alternately, a well-established public distribution system as in Kerala helps many more people, who cannot otherwise afford food items that are not locally produced. Whatever the arrangement, production and consumption gaps reveal the availability as well as the affordability situation in the state.

Here we shall consider the production and consumption of cereals alone, to see the deficit of production over consumption. Since the per capita consumption data are available from the National Sample Survey⁵ for the year 1993-94, we have used net per capita cereal production for the year ending 1993-94 to compute the deficit as a ratio. A deficit by itself does not mean overall food insecurity. It only indicates potential food insecurity for some sections of the population. Even if the state is not producing enough, if the people can afford the foods, the consumption will be high. Deficit of production over consumption only highlights the additional effort taken by the state to get the food grains from outside the state. It may not have any impact on the average per capita consumption. However, the low-income groups may be affected.

The rural poor in India derive approximately eighty per cent of their daily energy and protein requirement from cereals. In the food deficit areas, particularly when the staple food is not produced locally, low-income deciles may face food insecurity. Three-year average cereal

production of 1991-92, 1992-93 and 1993-94, has been divided by the 1994 projected population to get the per capita cereal production at the state level. Information on the per capita consumption of cereals has been taken from the National Sample Survey. Deficit is computed as a ratio of per capita consumption to per capita production. Hence, the observations are restricted to this particular year. 1991 to 1994 were good agricultural years. Hence, the production levels were good in many states. The deficit shown may be higher in some states in the years of drought. It is more so in the drought prone states of Rajasthan, Gujarat and parts of Madhya Pradesh, Karnataka and Tamil Nadu. The analysis is restricted to the particular year to which the data pertains.

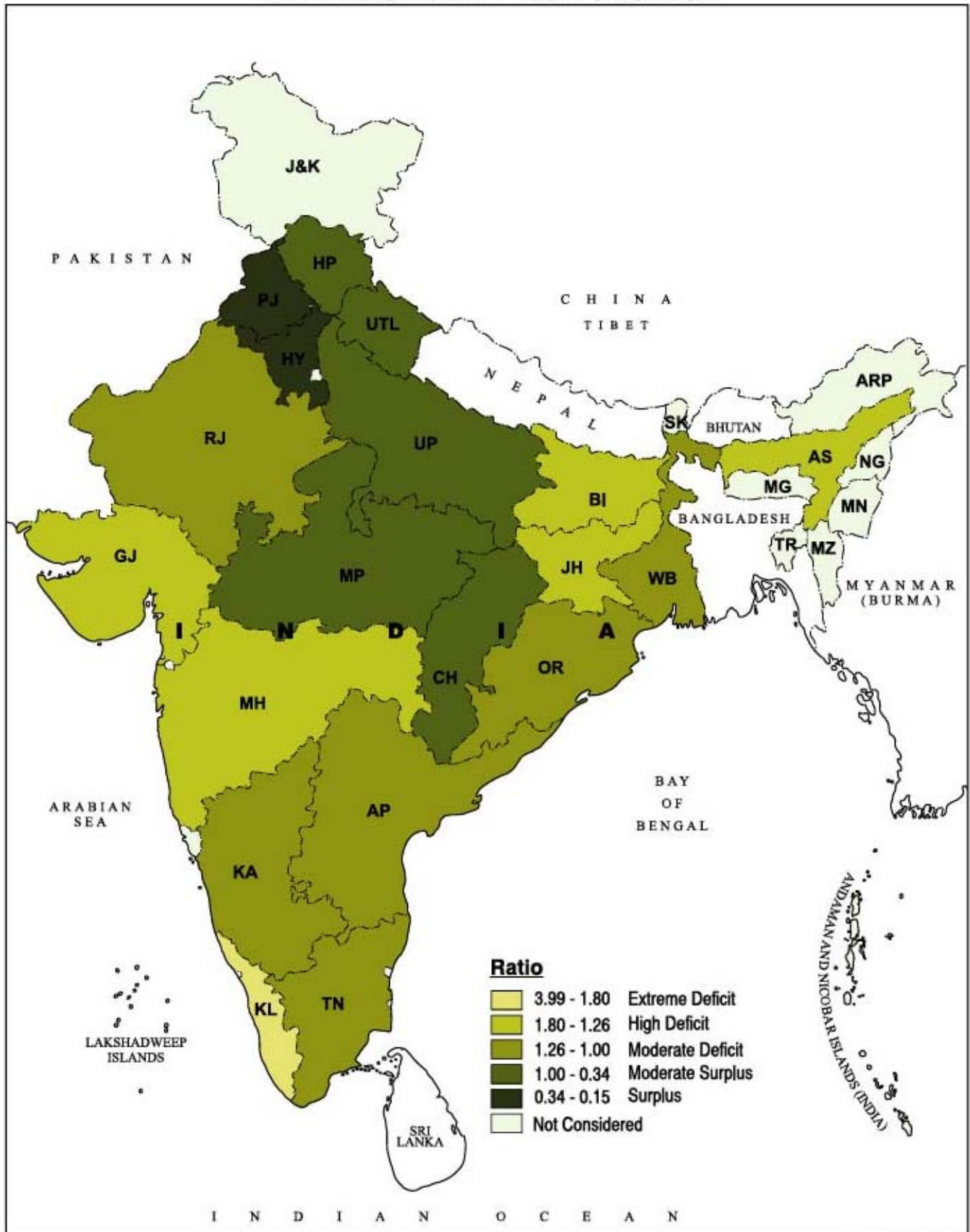
The deficit is the largest in the state of Kerala, where consumption is almost four times the production. In the states of Bihar and Gujarat also, the deficit is about 75 per cent. Maharashtra, Rajasthan and Assam show a deficit ranging from 25 to 30 per cent (1994). A marginal deficit of 10 to 18 per cent is seen in the states of Tamil Nadu, West Bengal, Andhra Pradesh, Orissa and Karnataka. It is interesting to find that only five out of the sixteen states produce surpluses. The others get food from other states. ([Table 2.4](#) and [Map 2.1](#))

The extent of the deficit by itself does not show how much the population is consuming but points to the vulnerability of low-income groups. In a bad agricultural year, the surplus available in some states will be lower, leading to higher prices in deficit states. Movement through competitive private trade or the public distribution system may help to reduce the prices to the consumers and help to boost consumption. There is a significant positive correlation between the deficit in production over the consumption and the percentage of population consuming less than 1890 Kcal. The deficit also has a significant negative correlation with the calorie consumption of the lowest income deciles across the states.⁶ Thus there is an indication

⁵ NSSO, 50th round, Quantity of consumption of all Food Items, (1993-94).

⁶ See [Appendix 5.3](#)

DEFICIT OF CEREAL PRODUCTION OVER CONSUMPTION IN INDIA



Map No. 2.1

Table 2.4
Deficit of Cereal Production over Consumption

Sl.No.	States	1 Tri. Avg in 1000 tonnes (1991-92 to 1993-94)	2 Population (1994) (in 1000)	3 Net Production* of cereals per capita gms / day	4 Consumption of cereals per capita gms/day	5 production over consumption (C/P ratio)
1	Andhra Pradesh	11136.53	70471.74	381.90	442.33	1.158
2	Assam	3399.97	24067.19	341.40	439.00	1.286
3	Bihar	10072.67	91407.08	266.31	477.00	1.791
4	Gujarat	3667.27	43514.83	203.67	355.33	1.745
5	Haryana	9509.67	17548.97	1309.58	430.67	0.329
6	Himachal Pradesh	1312.47	5442.52	582.78	445.67	0.765
7	Karnataka	7742.03	47370.90	394.97	438.33	1.110
8	Kerala	1055.87	30205.72	84.48	337.00	3.989
9	Madhya Pradesh	14189.90	70471.37	486.61	473.33	0.973
10	Maharashtra	10342.07	83882.93	297.95	379.67	1.274
11	Orissa	6492.37	33273.23	471.55	531.00	1.126
12	Punjab	20327.73	21348.04	2301.17	359.33	0.156
13	Rajasthan	7689.80	46994.43	395.44	495.00	1.252
14	Tamil Nadu	7970.03	58124.15	331.38	390.67	1.179
15	Uttar Pradesh	33797.53	147760.64	552.77	463.67	0.839
16	West Bengal	12600.43	72207.97	421.71	498.67	1.182

* Net production includes 13% deduction for seed, feed and wastage.

Source : Col.1, Ministry of Agriculture, Area and Production of Principal Crops in India (1995-96)

Col.2, Estimates are based on the growth rate of the previous decade

Col.3, Derived from Col.1 and Col.2

Col.4, NSSO, 50th Round, Report No. 402, (1993-94)

that deficit of production over consumption may have an adverse impact on the lowest deciles of the population. This has been included as an important indicator of food availability.

2.4 Instability in Cereal Production

Year to year fluctuations in production are referred to as instability. Instability in cereal production and prices influences farm incomes, particularly that of marginal farmers in drought prone areas. Instability of cereal production may also influence the local economy to some extent. The level of instability is related to weather factors. When production falls, the local prices are likely to go up,

thus compensating to some extent for a reduction in farm income. However, for the small and marginal farmers and agricultural labourers who are net consumers, the hardships are greater when prices go up. Their food insecurity increases.

Fluctuations in yield occur not only due to deficient rainfall, but also due to excess rainfall, high humidity, pests and diseases. Instability in production can also occur due to a lack of price incentives and shift of area to other crops. Thus, the production instability takes into consideration all the factors that cause yield instability as well as area instability.

Table 2.5
Instability in Cereal Production (1987-88 to 1997-98)

Sl. No.	States	1 Growth rate of yield (percent)	2 Growth rate of production (percent)	3 Instability in production (percent)
1	Andhra Pradesh	3.500	1.300	12.910
2	Assam	2.300	3.000	7.340
3	Bihar	3.200	2.900	15.820
4	Gujarat	6.000	5.700	57.790
5	Haryana	3.000	4.300	13.680
6	Himachal Pradesh	2.500	2.300	15.280
7	Karnataka	3.600	2.700	12.430
8	Kerala	1.600	2.200	5.390
9	Madhya Pradesh	2.900	2.700	10.800
10	Maharashtra	3.200	2.200	29.290
11	Orissa	1.700	1.300	25.080
12	Punjab	1.600	2.500	5.650
13	Rajasthan	5.100	5.400	38.920
14	Tamil Nadu	1.700	0.400	38.920
15	Uttar Pradesh	3.000	3.200	7.350
16	West Bengal	2.500	3.200	6.040
	All India	3.000	2.800	6.960

Source: Col.1-3, Ministry of Agriculture, Area and Production of Principal Crops (Various issues) and Ministry of Agriculture, Agriculture in Brief, (2000)

In the post green revolution period, production instability has increased for food grain crops. Traditional technology of mixed cropping reduced the instability in production. With the advent of new technology and its extension to rain-fed areas and rain-fed states, mono cropping has become more common. Hence, the fluctuations in production have also become more prominent.⁷

Instability in cereal production has been calculated for a period of ten years, from 1987-88 to 1997-98, for each state. Standard deviation of year-to-year growth rates has been taken to represent production instability. If growth rates are uniform, there is no instability. If the growth rate fluctuates drastically then there will be instability. The annual growth rate is computed by taking the first differences in

the natural log of cereal production. ([Table 2.5](#) and [Map 2.2](#))

Production instability was lowest in the states of Kerala, Punjab, West Bengal, Assam and Uttar Pradesh. These states have assured irrigation, or rainfall, or both. Hence, they have an instability of lower than 8 per cent. The states with a medium level of instability are Madhya Pradesh, Karnataka, Andhra Pradesh, Tamil Nadu, Haryana, Himachal Pradesh and Bihar. The instability is about 10 per cent for Madhya Pradesh and 15.8 per cent for Bihar. The cereal crops in these states are irrigated, though a large part of the area under other crops is not irrigated. The state with the highest level of instability in cereal production is Gujarat, where there are large tracts of rain-fed lands. The instability here is about 58 per cent. Rajasthan follows with 38 per cent, Maharashtra with 29 per cent and Orissa with 25 per cent.

2.5 Environmental Sustainability

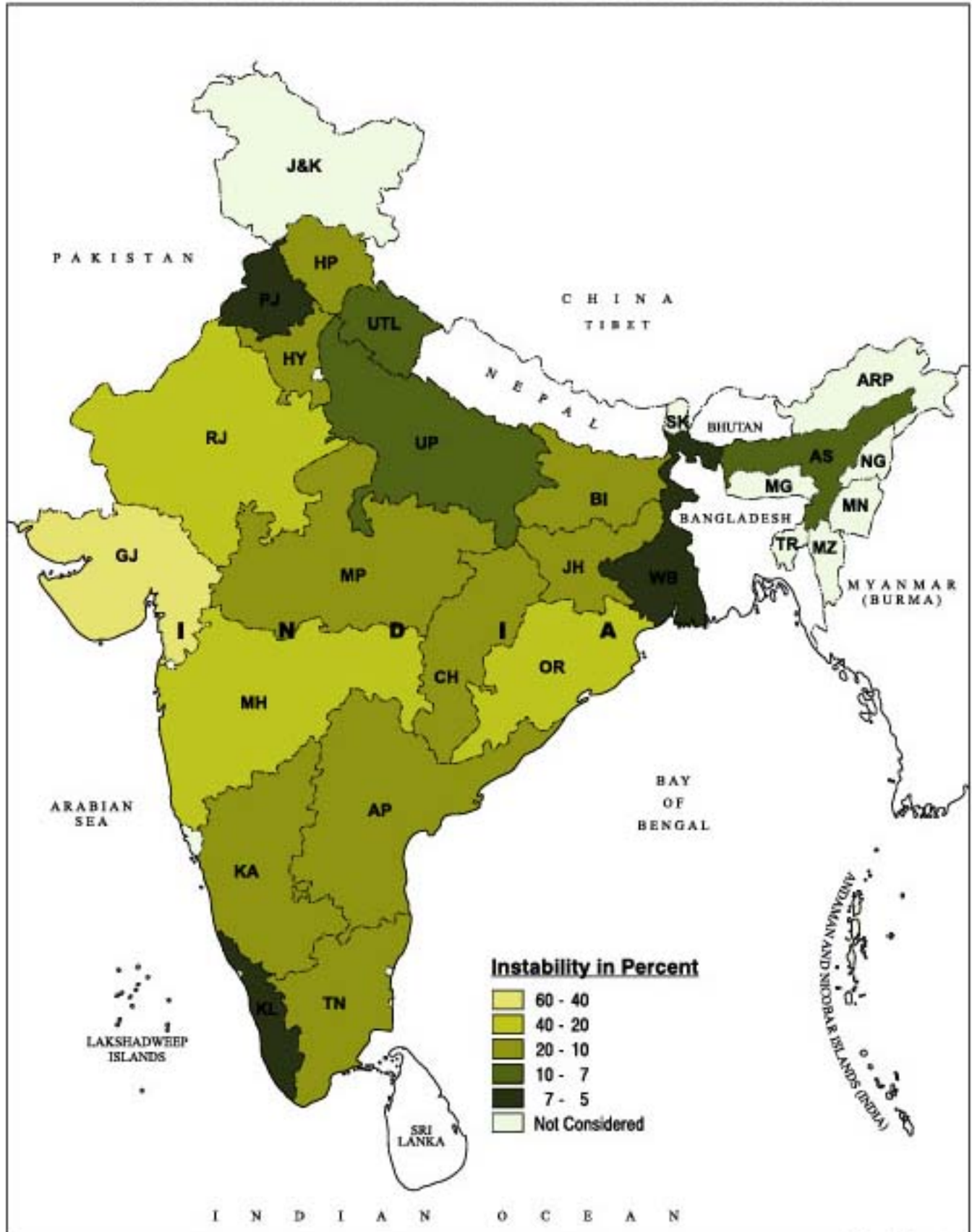
Instability in production is a cause of short-term food insecurity. Other factors that cause long-term food insecurity are not apparent from production in the short run. Environmental degradation, soil degradation and climate change are longer term threats to sustained productivity. For example, some studies show that 13.7 million hectares are expected to be affected by fertility-decline, 4.1 million hectares by salinity, 3.1 million hectares by water logging and 0.6 million hectares by physical degradation.⁸

Potential food insecurity may arise out of unsustainable livelihood and production practices. These lead to deforestation and degradation, soil erosion, desertification etc. Sustainability is not limited to food production but includes environmental sustainability, which is essential for long-term viable crop and animal production. Practices which make a state food secure at present may lead to food insecurity in future, if there is over-exploitation of

⁷ Rao, C.H., Hanumantha (1989)

⁸ Lal, Rattan (1994)

INSTABILITY IN CEREAL PRODUCTION IN INDIA



Map No. 2.2

non-renewable natural resources. Hence, it is important for us to look at sustainable land-use, sustainable water-use, sustainable cropping systems and sustainable technologies.

In this connection, it is advisable to define the term 'sustainability' as it is closely connected with food security. We may define sustainability as the use of natural resources or the application of a practice or technology in a manner in which the long-term net impact on natural resources is not negative. In other words, we must use only as much of natural resource as can be replenished. Replenishment can be natural as in the case of ground water or rainwater, or it may take place through restoration techniques as in the case of soil conservation. When the need or demand for the use of a natural resource in a state is larger than the capacity for replenishment, alternative ways of fulfilling that particular need must be found.

Sustainability of food production in the long run depends upon care of the soil, levels of degradation and exploitation. More ecologically friendly practices of production, preservation of forestlands, less exploitation of the static component of ground water etc., would sustain production for longer periods.

The index of environmental sustainability is not an index of production sustainability. The states said to be environmentally most sustainable may not be able to increase their food production. Those branded by the index as least sustainable may continue to produce more food. All the same, ecological and environmental safety is at stake in the states identified as least sustainable.

Four indicators have been used for assessing environmental sustainability. In the construction of the food insecurity map, these are aggregated into one index. Each indicator merits a close examination. The four indicators are:

1. Area under forests as a percentage of the geographical area of the state
2. Level of ground water exploitation represented by net draft as a percentage of net available ground water for irrigation
3. The area under leguminous crops as a percentage of gross cropped area
4. Total degraded land as a percentage of the geographical area of the state.

The irrigated area is not taken into consideration, as irrigation itself may lead to soil degradation through water logging if not appropriately managed. Submerging of forest areas by reservoirs in irrigation projects has become a controversial issue. The sustainability index measures forest resources, present level of ground water exploitation, area cultivated with least damage to soil in each state and the existing and potential land degradation. This list is not complete. It is only an attempt to rank states according to defined problems. The most sustainable state need not necessarily be the best producer of food. However, it also shows whether the best producers of food have become least sustainable. For the sake of making the indicators unidirectional, we have taken the non-forest area and area under non-leguminous crops (Tables 2.6, 2.7).

Forest areas and vegetation not only attract rain clouds, but also stop run-off water and help in the percolation of water into the soil. Over-exploitation of ground water makes the water table recede further. Deeper and deeper tube wells may finally make the water source disappear. Leguminous crops replenish soil fertility, while other crops deplete soil fertility. An appropriate mix of leguminous crops in the cropping systems would help nitrogen fixation and replenish the soil fertility. Land degradation reduces the cultivable area, without bringing about an increase in the area under crop production.

1. Area under Forests

It is important to protect forests and vegetation to guard against the depletion of topsoil, allow percolation of water into the soil and stop desertification. Destroying forests in order to increase croplands often increases the chances of desertification.

Forest cover for the country as a whole is not more than 17 per cent. The forest area has declined over time due to the cutting down of trees and sometimes due to

Table 2.6
Environmental Sustainability Indicators (Area in '000hectares)

Sl.No.	State	Area not under forest as a percentage of total geographical area (1996-97)	Ground water Exploitation (percentage of net draft to available ground water) (1992-93)	Percentage of Area under non leguminous crops to total Gross cropped Area (1995-96)	Wasteland as a percentage of total geographical area (1999)	Degraded land as a percentage of total geographical area (1996-97)
1	Andhra Pradesh	82.80	23.64	70.54	18.81	38.79
2	Assam	68.80	4.48	100.00	25.52	35.23
3	Bihar	84.70	19.19	86.65	12.08	28.30
4	Gujarat	93.90	41.40	73.36	21.95	49.62
5	Haryana	98.80	83.88	92.52	8.45	75.68
6	Himachal Pradesh	76.30	18.04	99.98	56.87	27.50
7	Karnataka	83.10	31.26	76.40	10.87	39.20
8	Kerala	73.40	15.28	86.84	3.73	37.23
9	Madhya Pradesh	69.50	16.49	63.88	15.72	34.80
10	Maharashtra	85.70	30.39	78.42	17.38	28.89
11	Orissa	69.70	8.42	89.53	13.71	44.58
12	Punjab	97.30	93.85	98.56	4.42	42.93
13	Rajasthan	96.20	50.63	78.84	30.87	100.00
14	Tamil Nadu	86.40	60.44	75.32	17.70	14.21
15	Uttar Pradesh	88.50	37.66	75.32	13.17	29.77
16	West Bengal	90.80	24.18	97.23	6.44	42.66

Source : Col.1-2, Ministry of Statistics and Programme Implementation, Compendium of Environment Statistics (1997).

Col.3, Centre for Monitoring Indian Economy, 'Agriculture', (1999)

Col.4, Ministry of Rural Development, and National Remote Sensing Agency, Wastelands Atlas of India, (2000)

Col.5, Ministry of Agriculture, Agriculture in Brief, (2000)

degradation. The states of Assam, Madhya Pradesh and Orissa have about 30 per cent of their geographical area under forests. Decline in forest area from 1971 to 1997 was the maximum in Andhra Pradesh as per the NRSA data.⁹ The states of Punjab, Haryana and Rajasthan have less than 4 per cent of the geographical area under forests.

2. Level of Ground Water Exploitation

Ground water has been depleted due to over exploitation for the purposes of agricultural, domestic and industrial

use in many states. Some of the reasons for the over-exploitation of ground water are the availability of cheap electricity for agriculture and the lack of alternative sources of water for households and industries. Though rainfall is good in many areas, water management is poor. Water collection and storage methods are outdated and neglected by water supply authorities. The capacities of reservoirs are reduced due to silt. Poor maintenance of field channels of irrigation projects results in loss of water during transportation. Lack of vegetative cover results in poor percolation of water and low water tables. Ground water

⁹ NIRD, India Rural Development Report, (1999)

Table 2.7
Sustainability Index(value-min/range)

Sl.No.	State	1 Index of Area not under forests	2 Index of Ground water Exploitation	3 Index of Area under non leguminous crops	4 Index of Degraded Land	5 Sustainability Index (percent)	6 Rank
1	Andhra Pradesh	0.47	0.21	0.18	0.28	29	13
2	Assam	0.00	0.00	1.00	0.24	31	12
3	Bihar	0.53	0.16	0.63	0.16	37	9
4	Gujarat	0.84	0.41	0.26	0.40	48	5
5	Haryana	1.00	0.89	0.79	0.69	85	1
6	Himachal Pradesh	0.25	0.15	1.00	0.15	39	7
7	Karnataka	0.48	0.30	0.35	0.28	36	10
8	Kerala	0.15	0.12	0.64	0.26	29	13
9	Madhya Pradesh	0.02	0.13	0.00	0.23	10	16
10	Maharashtra	0.56	0.29	0.40	0.16	36	10
11	Orissa	0.03	0.04	0.71	0.34	28	15
12	Punjab	0.95	1.00	0.96	0.32	81	2
13	Rajasthan	0.91	0.52	0.41	1.00	71	3
14	Tamil Nadu	0.59	0.63	0.32	0.00	39	8
15	Uttar Pradesh	0.66	0.37	0.68	0.17	47	6
16	West Bengal	0.73	0.22	0.92	0.32	55	4

availability differs from state to state and the use of available ground water also differs. Punjab and Haryana are the states with the highest levels of exploitation of ground water compared to availability. Their exploitation rates are as high as 94 per cent and 84 per cent respectively. Tamil Nadu exploits as much as 60 per cent of the available ground water. Assam and Orissa exploit the least amount of ground water at 4.48 per cent and 8.42 per cent of the net available water respectively.

3. The Area under Leguminous Crops

A number of varieties of leguminous crops were traditionally cultivated in India prior to mono-cropping and the green revolution. Pulses, some oilseeds and fodder

crops come under the category of leguminous crops. Ever since single cropping has replaced the practice of mixed cropping, the production of pulses and oilseeds has been pushed to marginal lands and the cultivation of some varieties of crops has ceased altogether. We have considered the area under cultivation of pulses, soybean and groundnut as the area under leguminous crops in our study.

Madhya Pradesh has the maximum area of 36 per cent of the gross cropped area under leguminous crops. Andhra Pradesh and Gujarat come next with 29 per cent and 27 per cent respectively. States like Bihar, Haryana, Kerala, Orissa and Uttar Pradesh have 10 to 13 per cent of the gross cropped area under leguminous crops. Punjab, West Bengal and Haryana come next with less than ten per



Mangrove forests are unique coastal tropical wetlands. They grow in the inter-tidal areas and estuary mouths between land and sea. Healthy mangrove forests are the key to a healthy marine ecology. In fact, mangrove forests fix more carbon dioxide per unit area than phytoplankton in tropical oceans. Mangroves help to protect coastlines from erosion, storm damage, and wave action. They prevent shoreline erosion by acting as buffers and catch alluvial materials, thus stabilizing land elevation by sediment accretion that balances sediment loss. Vital coral reefs and sea grass beds are also protected from damaging siltation. Mangrove forests once covered three-fourths of the coastline of tropical and subtropical countries. Mangrove trees have specially adapted aerial and salt-filtering roots and salt-excreting leaves that enable them to occupy the saline wetlands where other plant life cannot survive.

cent of the gross cropped area under leguminous crops. The states without any leguminous crops are Himachal Pradesh and Assam.

4. Total Degraded Land

Data are available on degraded lands and wastelands. Some of the wastelands such as deserts and ravines are natural and not manmade. However, not all wastelands are degraded lands. Uncultivated lands and lands, left with wild natural habitat, are also referred to as wastelands.

There are other lands, which have become degraded over time, due to human encroachment and misuse. According to the Wasteland Atlas of India, 'waste lands' make up 20 per cent of the geographical area of the country as a whole. However, the 'degraded area' (as defined by the Ministry of Agriculture) is high, constituting 53 per cent of the geographical area of the country.

The estimates of the Ministry of Agriculture are on land susceptible to water and land erosion. The estimates are based on the data on rainfall, humidity, terrain, soil

Box 2.1**Mangrove Management by Irula Tribe in Tamil Nadu**

A programme of mangrove restoration and environment conservation is on in MGR Nagar. This is a hamlet located 16 kilometres east of Chidambaram in Tamil Nadu. It has 136 households, with a population of 495. The villagers belong to the Irula tribe. All the villagers are landless; the mangrove wetland is their main resource system and fishing in the mangrove waters is their main source of livelihood. For some time it was noticed that one part of the mangrove forest were declining in thickness and slowly disappearing. The officials of the government of Tamil Nadu complained that the villagers had been cutting the mangroves for their livelihood and requested MSSRF to talk to the villagers about the need to keep the mangroves intact. When MSSRF staff first went to the village and inquired about the degraded mangroves, the villagers denied having cut the mangroves. They pointed out that if they had been cutting the mangroves, they would not have left a healthy patch of thick mangroves. The villagers asked MSSRF staff to explain the reason for this uneven growth of mangrove forest.

The scientists of MSSRF found a trough-shaped topography and healthy mangroves in one area and degraded mangroves adjacent to it. Ecological study in the area has indicated that felling of trees in the early 1960s by the Forest Department exposed the mangrove patch, causing changes in the physical structure of the forest floor (Trough shaped topography). This in turn increased the soil salinity to a level lethal to any mangrove species. Reduction of fresh water flow into the mangrove wetland also aggravated the problem. Grazing by buffaloes during the monsoons, when the mangroves regenerate and bunding method of fishing by the locals reduced the thickness of the mangroves. The villagers are now being trained in alternative methods of fishing and other sources of livelihood.

MSSRF undertook work in the area and has restored six hectares of mangrove forests. Subsequently, a specific piece of land has been identified and a Mangrove Management Unit (MMU) set up. Traditionally, the identified land with mangroves is conserved and utilised by the people managing it to meet their basic requirements. An area of 62 ha was delineated as the land belonging to the Mangrove Management Unit of MGR Nagar. Of this, seventeen hectares were degraded and 45 hectares had healthy mangroves, including the six hectares restored by MSSRF from 1994-98. Canal construction to direct the right mix of saline and fresh water was completed in 19 ha of degraded mangroves in September 1998. 200,000 plants of the species *Avicennia marina* were planted in January 1999. The land managed by the Mangrove Management Unit is protected against cattle grazing and bunding method of fishing by the Village Development and Mangrove Council (VDMC) constituted by the villagers. The mangrove restoration is being monitored.

type, wind movements etc. These are referred to as problem areas that are likely to be degraded in the future. Yet this does not mean that they are unfit for productive use. They may still be under crop production with high yields when inputs such as water and fertiliser are used in sufficient quantities.

Wastelands and 'degraded problem areas' are closely correlated. Problem areas are large and seem to include wastelands as well, as in the case of Haryana, where the area under wastelands is only 8.45 per cent whereas the

problem area is estimated to be more than 75 per cent (Table 2.6). In the case of Himachal Pradesh, however, 57 per cent of the area is under wastelands whereas only 28 per cent is a problem area. The entire state of Rajasthan is declared as a problem area. The states of Gujarat, Orissa, West Bengal and Punjab show 40 to 49 per cent of their geographical area as problem areas. The states with the lowest level of problem areas are Tamil Nadu, Himachal Pradesh, Bihar and Maharashtra. Thus, degradation seems to be high in agriculturally better-endowed states such as

22 FOOD INSECURITY ATLAS OF RURAL INDIA

Punjab, Haryana and Rajasthan. Kerala, Punjab and West Bengal have less than 6 per cent of the geographical area under wastelands.

Due to differences in definition, wastelands and degraded problem areas measure only some aspects of degradation and ignore others. Attempts have to be made to map the exact locations of natural wastelands, degraded lands which can be restored, degraded lands which cannot be restored and soils which may become eroded in future. Much more information is needed to successfully implement programmes of soil and water conservation and land restoration in a systematic manner. In the Sustainability Index, we have included only the 'problem areas'.¹⁰

The method of compiling the index consists of first computing individual indices for each of the indicators and then averaging the same to get the composite index. The index takes the four indicators of environmental sustenance into consideration. The sustainability index places Haryana at the top as environmentally the most unsustainable state. (See [Table 2.7](#) and [Map 2.3](#)). Punjab and Rajasthan occupy the next positions as the least sustainable states. These three states are in the category of states suffering 60 to 85 per cent overall, long-term, potential environmental damage, compared to only 10 per cent damage in Madhya Pradesh, 28 per cent in Orissa and 29 per cent in Andhra Pradesh and Kerala.

The index only shows the extent of potential damage as they appear today. It does not indicate the rate of environmental degradation in the past or at present. In some states such as Andhra Pradesh, deforestation may be occurring at a faster rate. Yet, Andhra Pradesh has been given a better position, because at present the state still has about 22 per cent of its area under forests and has less ground water exploitation than Punjab. States with high levels of potential degradation may have been working towards reversing the process through remedial steps and

soil and water conservation methods. Such occurrences are not captured in the index.

2.6 Natural Disasters

A natural disaster is an event of 'nature', which causes disruption to the normal life of the people and causes damage to crops, assets and lives. It manifests itself as an interruption in the supply of food. Every aspect of nature is subject to seasonal, annual and sudden fluctuations. These may prove to be disastrous to people because the timing, frequency and magnitude of occurrence are mostly unpredictable. In such situations, the social and economic coping mechanisms available are inadequate to restore normalcy. Most of the natural disasters create problems at short notice. The disasters that cause widespread damage and disruption in India are droughts, floods, cyclones, earthquakes, landslides and avalanches due to heavy rains.

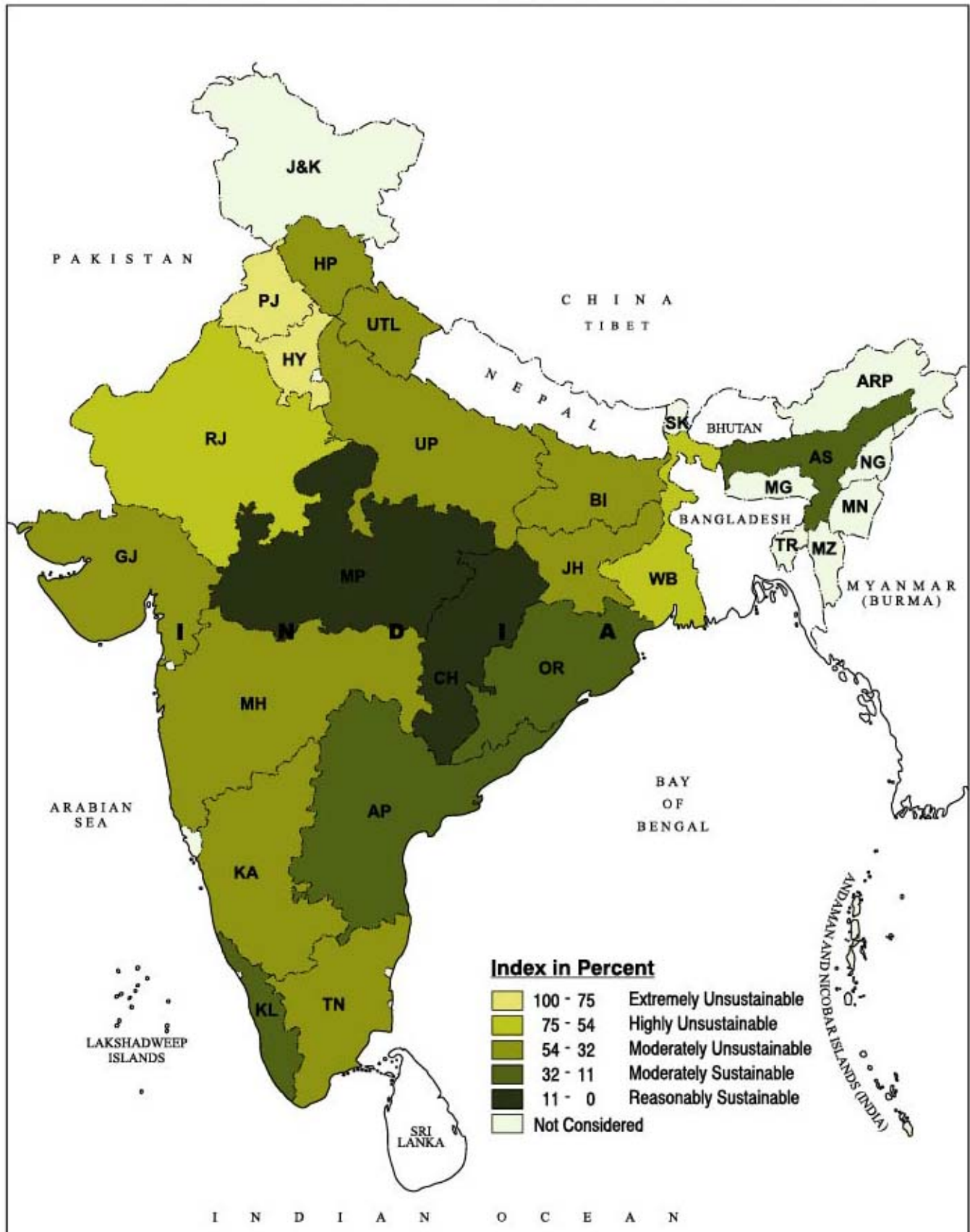
Natural calamities often result in transitory food insecurity of the people in the region. The length of the transient phase depends upon the severity of the disaster, the preparedness systems in place and the ability of the affected people to cope with the shock. In addition to natural calamities and a decline in availability, a fall in income, increase in food prices, and a shortage of production, etc., may result in a temporary shortfall in consumption. The transitory food insecurity¹¹ due to disasters is normally spread over one season or one agricultural year, before the people and the region recover. However, in the case of the 1999 super cyclone in Orissa and the 2001 earthquake in Gujarat, this has not been the case. The impact is prolonged. Disaster preparedness in such cases ought to be a long-term process.

Transitory food insecurity is different from chronic food insecurity. Those who are poor and those who are not so poor, and even the rich may become victims of transitory food insecurity when calamity strikes. A disaster can lead to a breakdown of the normal functioning of

¹⁰ See [Appendix 2.2](#) for the calculation of Sustainability Index.

¹¹ Transitory food insecurity may be defined as a temporary shortfall in food availability and consumption. It can also be defined as variation in availability and consumption.

ENVIRONMENTAL SUSTAINABILITY INDEX OF INDIA



Map No. 2.3

the economy. Disasters may also lead to chronic food insecurity for people who lose their assets, homes and livelihoods. Their lifestyles and livelihoods may change. People may migrate due to repeated disasters. This could happen even in the case of a single event, if it is severe.

Droughts, floods, and desertification are directly connected with precipitation patterns, ocean circulation, soil moisture and water availability. The problems of Indian rainfall are diverse, in terms of both geographical distribution and seasonality, and spread over a period of years. There are large variations in the total rainfall received in each geographical division, causing both droughts and floods. The same geographical division could experience drought in summer and floods in the rainy season. The fury of these natural disasters has arguably been made more intense and more frequent by the abuse of nature and degradation of the environment.

The frequency, as well as the intensity, of disasters in India in the past decade appear to have increased. There were five instances of earthquakes in India in the past decade, affecting four states, compared to only one instance of earthquake affecting three states in the 1980s. There have been 118 instances of floods since 1990, compared to only 31 instances between 1980 and 1989. The incidence and intensity of the four major natural disasters, floods, cyclones, earthquakes and droughts, seems to be higher in the 1990s compared to the 1980s.¹² This may only be a short-run statistical phenomenon, particularly in the absence of long-term comparative analysis covering more than one century.

Desertification, droughts, floods and landslides can be exacerbated by the overuse and abuse of natural resources. Soil erosion by rain and river flow takes place in hilly areas due to the cutting of trees and bushes for firewood, timber and farming. Overgrazing, construction of roads, indiscriminate quarrying and other activities lead to the opening of hill faces to heavy erosion and run-off water.

Soil erosion causes degradation through the creation of gullies and ravines, which leads to landslides and avalanches. The entire Himalayan region is prone to landslides and avalanches due to deforestation.

Denuding the hills of vegetation and deforestation prevents the absorption of heavy monsoon rains by the forests. The flowing water rages down from high altitudes to the low lying areas, carrying a heavy sediment of soil suspended in water and deposits it in the river beds, making them shallow and flood prone. Of all the rivers in the world, the Ganga and the Brahmaputra carry the largest amount of sediment and are most flood-prone.¹³

Deforestation also causes desertification. Forests absorb excessive rainwater and release moisture into the air, leading to the formation of clouds, which precipitate over dry areas. Absence of trees and vegetative cover leads to wind erosion. Wind erosion in turn, leads to expansion of deserts, dust storms, whirlwinds and destruction of crops, while moving sands cover the land and make it sterile. Lack of vegetative cover also exposes the earth to the direct sun and dries it, making it unfit for cultivation. Such rapid desertification has been witnessed in many parts of India in recent years. The pressure of population on limited land, forces people to inhabit areas that are prone to disaster. Disaster vulnerability is increased due to insufficient investment on measures that could prevent land degradation.

Earthquakes: In the past decade, there have been five instances of earthquakes; in 1991 in Uttar Kashi, Uttar Pradesh, 1993 in Latur, Maharashtra, 1997 in Jabalpur, Madhya Pradesh, 1999 in Uttar Pradesh and 2001 in Kutch, Gujarat. In the previous decade, there was only one instance of earthquake in 1988, at the Indo-Burma border and Indo-Nepal border. The earthquakes in this decade occurred in the middle of the country, causing large devastation. The earthquakes have also been of a severe magnitude.¹⁴

¹² GOI, Compendium of Environment Statistics (1999)

¹³ NATMO (1991)

¹⁴ Previous major earthquake was that of Assam in 1950.

24 FOOD INSECURITY ATLAS OF RURAL INDIA

The data on earthquakes for the past twenty years, including the earthquake in Gujarat of 2001, have been collected from various sources, the main source being the Environmental Compendium of the Central Statistical Organization. Wherever the reported number of people affected by an earthquake was not available, the number of people of an entire district as per the 1991 census was considered as the affected population. The use of the reported number sometimes and at other times the entire population is highly arbitrary. It could not be helped without bringing in more calculations that are arbitrary and guesswork on the number of people affected. This calls for a need to improve the statistics on disasters.

Earthquakes that measure more than 6.5 on the Richter scale have occurred six times in ten years. Since it occurred twice in Uttar Pradesh, the number of persons affected was the maximum there, though the death toll was not very high. Deaths were highest in the Gujarat earthquake of 2001 followed by the one at Latur in Maharashtra in 1993. (Table 2.8)

2.7 Population Affected by Floods, Cyclones and Heavy Rains

Floods: Eight major river valleys are spread over 40 million hectares of area in the country. While the area prone to floods is 40 million hectares, the average area affected by annual floods is 8 million hectares. The annual average cropped area affected is approximately 3.7 million hectares. Of the annual rainfall, 75 per cent is concentrated over the four months of the monsoon (June-September) and as a result, almost all the rivers carry heavy discharge during that period. The average annual total damage to crop, houses and public utilities during the period 1953-95 was about Rs. 972 crores, while the maximum damage was Rs. 4630 crores in 1988.¹⁵ Apart from the most flood-prone areas of the Brahmaputra and the Gangetic basin, as mentioned earlier, the other flood-prone areas are the plains of the west-flowing rivers Narmada and Tapi in Central

India. The east-flowing rivers Mahanadi, Krishna, Godavari and Cauvery are also flood-prone.

The flood hazard is compounded by the problems of sediment deposition, drainage congestion and synchronisation of floods with high tides in the coastal plains. The rivers originating in the Himalayas also carry a lot of sediment and cause erosion of the banks in the upper reaches and over-topping in the lower segments. Excess rainfall can cause lakes and other watershed areas connected by lakes to flood temporarily, causing extensive damage.

Cyclones: In recent decades, there have been many yearly cyclonic storms of varying intensity. The frequency and intensity of the cyclones were higher in this decade compared to the previous decade. 'Super cyclones' have occurred thrice during this decade, once in 1990, a second time in 1998 and the third time in 1999. They have caused extensive damage in Andhra Pradesh, Orissa, West Bengal and Gujarat between 1990 and 1999. There was only one super cyclone between 1980 and 1990.¹⁶

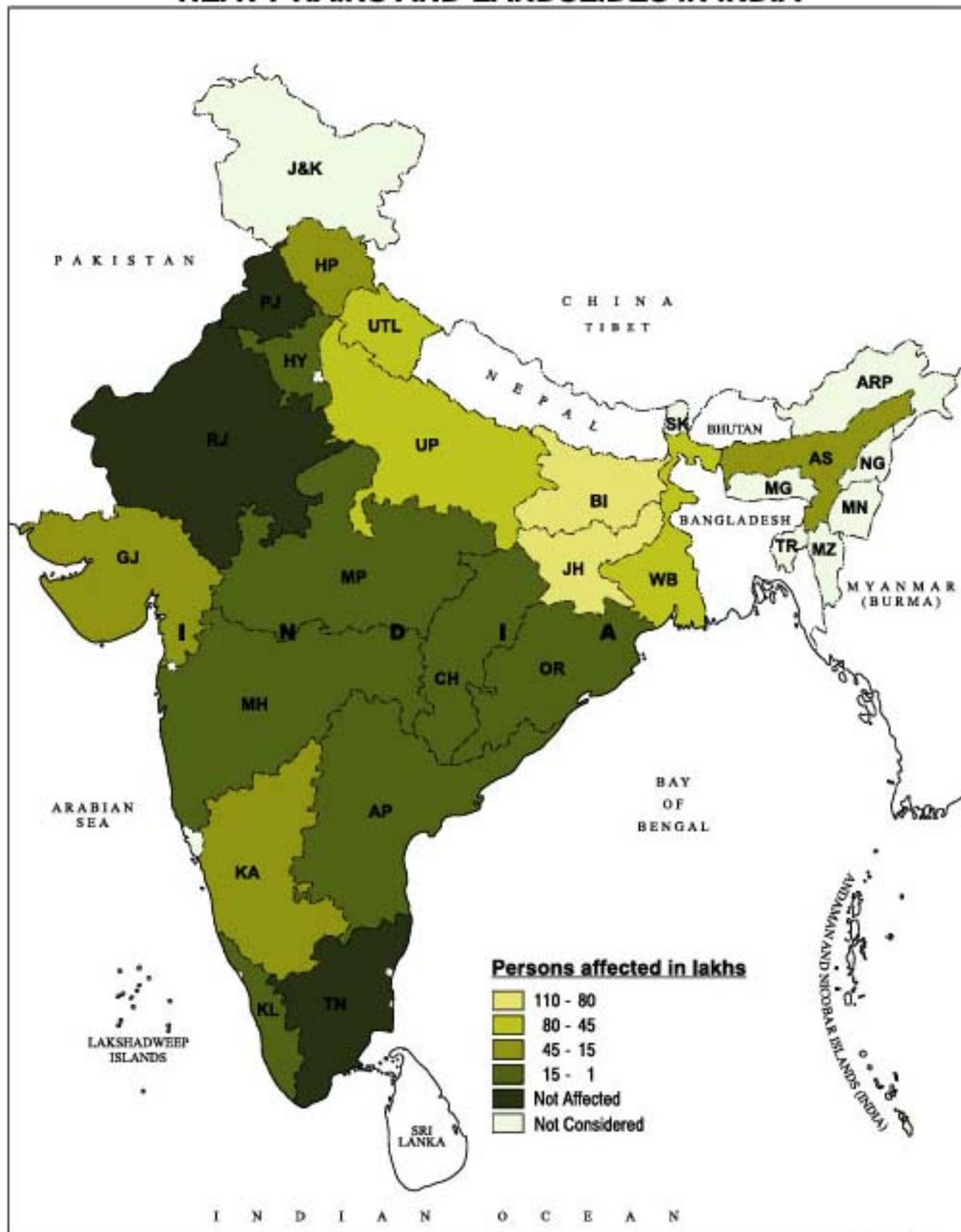
India has a long coastline of 8000 kilometres. About 71 per cent of this area is in ten states (Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Pondicherry, Andhra Pradesh, Orissa, and West Bengal). The islands of Andaman, Nicobar and Lakshadweep are also prone to cyclones. On an average, about five or six tropical cyclones form in the Bay of Bengal and Arabian Sea and hit the coast every year. Out of these, two or three are severe.

Analysis of cyclone events during the 100 year period from 1891-1991 reveals that as against 117 cyclones of varied intensities formed in the Arabian Sea, 442 cyclones were formed in the Bay of Bengal. The coastal districts of Andhra Pradesh and Orissa and the southern part of West Bengal are most vulnerable. The super cyclones of Andhra Pradesh in 1977 and 1990, and that of Orissa in 1999, were accompanied by tidal waves of more than 5 feet height and a wind speed of more than 250 kilometres.

¹⁵ GOI, Agriculture in Brief (2000)

¹⁶ A super cyclone of the intensity and devastating nature as that of 1990 cyclone occurred in 1977 in coastal Andhra Pradesh.

POPULATION AFFECTED BY FLOODS, CYCLONES, HEAVY RAINS AND LANDSLIDES IN INDIA



Map No. 2.4

Table 2.8
Data on Disaster

Sl.No.	State	1 Average Population affected by floods cyclones, heavy rains land slides- (in Lakhs) (1998 & 1999)	2 Percentage of lives lost in the state to total lives lost to total lives lost two years	3 Percentage of drought affected area to the total geographical area of the state*	4 Number of persons killed in earthquake (for the past 20years) (magnitude)**	5 Number of people affected by earthquake (lakhs)
1	Andhra Pradesh	1.485	1.4748	11.940	0.00	0
2	Assam	27.875	0.987	0.000	0.00	0
3	Bihar	105.455	4.053	0.000	1000 (6.5)	0.0000201
4	Gujarat	33.142	10.994	54.493	19727(6.9)	0.00159
5	Haryana	13.760	0.000	18.860	0.00	0
6	Himachal Pradesh	23.370	0.616	0.000	0.00	0
7	Karnataka	42.798	2.035	30.056	0.00	0
8	Kerala	1.497	2.322	0.000	0.00	0
9	Madhya Pradesh	2.180	0.165	8.413	38 (6.0)	0.0000264
10	Maharashtra	2.290	3.273	18.740	7601 (6.3)	0.002
11	Orissa	8.535	62.326	1.286	0.00	0
12	Punjab	0.030	0.347	0.000	0.00	0
13	Rajasthan	0.003	0.353	56.745	0.00	0
14	Tamil Nadu	0.000	0.000	5.729	0.00	0
15	Uttar Pradesh	62.245	8.818	1.566	1536 (6.6)	0.008
16	West Bengal	79.315	1.914	0.000	0.00	0

* Estimate of drought prone area is based on information available till 1989

** Figures in the bracket indicate Magnitude on the Richter Scale

Source : Col. 1-2, Parasuraman S. & Unnikrishnan, P.V. (edited), India Disaster Report, (2000) for 1998 data and Ministry of Statistics and Programme Implementation, Compendium of Environment Statistics (1999) for 1999 data.

Col. 3-5, Ministry of Statistics and Programme Implementation, Compendium of Environmental Statistics, (1999)

They resulted in the deaths of thousands of people and cattle and destruction of trees, crops and property.

Nevertheless, the impact of these cyclones is confined to the coastal districts. The maximum destruction is within 100 kilometres from the centre of the cyclone and on either side of the storm track. State-wise data on cyclones are rather sketchy. The thematic map of 'India Natural Hazards' of the National Atlas and Thematic Mapping Organisation of the Government of India shows the areas hit by cyclones and gives the direction and path of various cyclones in different months. However, it is not accompanied by statistics on the area affected state-wise. The data sources are the Government of India and the International Centre for Research on Epidemiological

Disasters (CRED). Only for the year 1999, are season-wise data for cyclones available for each state.

Data are not available separately on floods and cyclones. State-wise data on people affected by floods, heavy rains, landslides and cyclones taken together are available for the year 1998 from the Disaster Report of India. Whenever data on people affected were not available, but data on houses and huts damaged were available, the affected population was estimated by assuming that each household had 5 persons, and each house or hut represented one affected family (Karnataka, Kerala, Punjab, 1999). When the data on houses damaged was not available, but the area affected was available, persons affected were estimated with the help of the density of population in that state

26 FOOD INSECURITY ATLAS OF RURAL INDIA

(Haryana 1998). When no other information was available, the proportion of dead to the proportion affected was used to estimate the number of affected population in lakhs (Gujarat, 1998). The flood-cyclone-heavy rains and landslide situation represents the short-term situation of the states in the past two years.

The data for persons affected by natural disasters (floods, cyclones, heavy rain and landslides) show that Bihar is the worst hit state (see Table 2.8). Floods and heavy rains affected more than 105.5 lakh persons in 1998-99 in Bihar. West Bengal is another state greatly affected by both cyclones and floods. The states of Tamil Nadu and Rajasthan did not have floods or cyclones during this period. Heavy rains, landslides and floods affected more than 62.25 lakh people in Uttar Pradesh. Even low rainfall states such as Karnataka were affected by floods (Map 2.4).

While the number of persons affected was low in Orissa, the death toll in the cyclone of 1999 was the highest. The Gujarat cyclone of 1998 accounted for 10 per cent of the total deaths due to floods and cyclones in the country. Uttar Pradesh not only had a large number of people affected by floods and landslides, but also accounted for more than 8 per cent of the deaths in the country from the same causes.

2.8 Drought Prone Area

India experienced 12 years of normal or excessive rainfall, from 1987 to 1999. 9 out of the 12 years experienced excess rainfall during the southwest monsoon. In the other 3 years, the shortfall of the southwest monsoon was less than nine per cent of the normal rainfall. Sometimes the Northeast monsoon was also above normal or normal. For both the seasons put together, there was no deficiency of rainfall.

Even though the nation on an average received normal or above normal rainfall, there are specific areas of drought within the country. For example, deficient and scanty rainfall

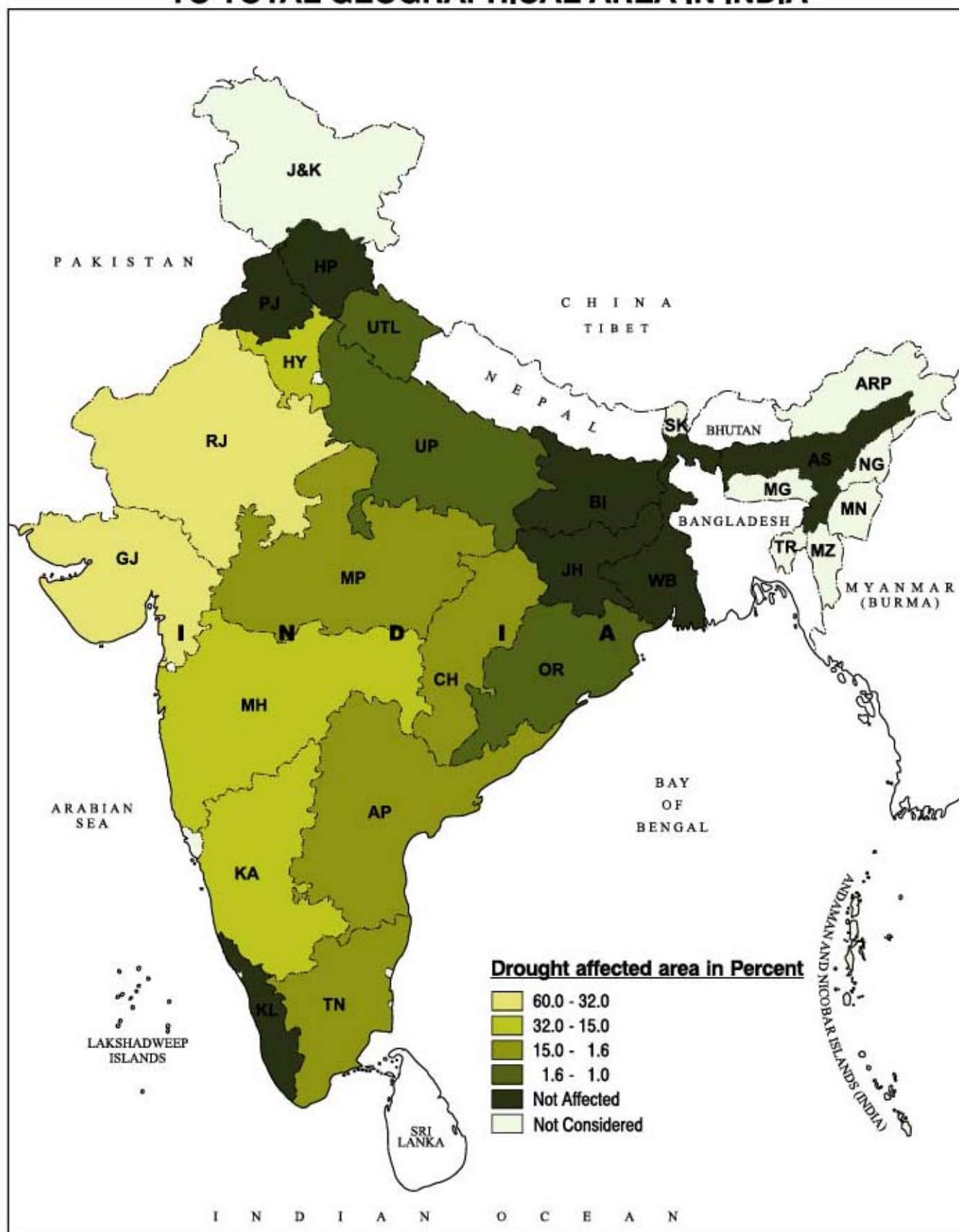
was experienced in 8 subdivisions in 1991, 10 subdivisions in 1994 and 7 subdivisions in 1999 during the southwest monsoon. Further deficient and scanty rainfall was experienced in 8 to 19 subdivisions in many years during the Northeast monsoon. Despite 12 consecutive years of normal and above normal rainfall, the country has not escaped drought. In 1999, drought was experienced in 92 districts spread over nine states, though the national average was above normal rainfall. Certain districts in the states of Tamil Nadu, Kerala, Gujarat, Rajasthan and Madhya Pradesh experienced two to three consecutive years of below average rainfall in 1998, 1999 and 2000.

Analysis of 100 years of rainfall pattern reveals that the frequency of the occurrence of below normal rainfall in arid, semi-arid and sub-humid areas is 54 to 57 per cent, while severe and rare droughts occur once in every 8 to 9 years in arid and semi-arid zones. In semi-arid and arid climatic zones, about 50 per cent of the severe droughts generally affect 76 per cent of the area. In this region, rare droughts of most severe intensity occurred on an average once in 32 years and almost every third year was a drought year. The impact of drought varies from year to year. The 1987 drought, which was one of the worst droughts of the century, with an overall rainfall deficiency of 19 per cent, affected 58-60 per cent of cropped area and a population of 285 million.¹⁷ For the country as a whole, rainfall seems to have been normal or above normal since 1987. This does not rule out drought in various parts of the country in some seasons. The Central Water Commission's data on drought prone areas of 74 districts have been taken to represent the drought proneness of a state over two decades, based on the conditions of rainfall and other problems of the area.

Drought prone area, as a percentage of the total geographical area, is the highest in Rajasthan and Gujarat at 57 and 54 per cent respectively. Karnataka comes next with about 30 per cent of the geographical area being drought prone. Other states such as Maharashtra, Haryana

¹⁷ The 1987 drought had a relatively soft impact on the country as a whole, compared to earlier droughts. The impact on food availability and prices was not severe due to adequate food stocks in the country. Droughts of 1965-66, 1973, and 1977 had a much harder impact on the economy and the food situation due to lack of food stocks with the government.

PERCENTAGE OF DROUGHT AFFECTED AREA TO TOTAL GEOGRAPHICAL AREA IN INDIA



Map No. 2.5

Table 2.9
Disaster Index

Sl.No.	State	1 Index of population affected by floods and cyclone	2 Index of human lives lost in floods and cyclones	3 Index of drought affected area	4 Index of human lives lost in earthquake	5 Index of earthquake affected area	Disaster Index (Percent)	Rank
1	Andhra Pradesh	0.014	0.02	0.21	0	0	4.963	11
2	Assam	0.264	0.02	0.00	0.000	0.000	5.603	10
3	Bihar	1.000	0.07	0.00	0.051	0.003	22.364	3
4	Gujarat	0.314	0.18	0.96	1.000	0.199	52.994	1
5	Haryana	0.130	0.00	0.33	0.000	0.000	9.257	9
6	Himachal Pradesh	0.222	0.01	0.00	0.000	0.000	4.630	11
7	Karnataka	0.406	0.03	0.53	0.000	0.000	19.363	7
8	Kerala	0.014	0.04	0.00	0.000	0.000	1.029	14
9	Madhya Pradesh	0.021	0.00	0.15	0.000	0.003	3.497	12
10	Maharashtra	0.022	0.05	0.33	0.385	0.250	20.796	5
11	Orissa	0.081	1.00	0.02	0.000	0.000	22.072	4
12	Punjab	0.000	0.01	0.00	0.000	0.000	0.117	15
13	Rajasthan	0.000	0.01	1.00	0.000	0.000	20.113	6
14	Tamil Nadu	0.000	0.00	0.10	0.000	0.000	2.019	13
15	Uttar Pradesh	0.590	0.14	0.03	0.078	1.000	36.743	2
16	West Bengal	0.752	0.03	0.00	0.000	0.000	15.656	8

and Andhra Pradesh have about 12 to 19 per cent of the area designated as drought prone. Madhya Pradesh has about 8.5 per cent of drought prone area. Tamil Nadu has only 6 per cent of its area prone to droughts. The states of Bihar, Assam, Kerala, West Bengal, Himachal Pradesh and Punjab do not have any drought prone area. The data on droughts, unlike that on floods and heavy rains and cyclones, are based on the long-term average rainfall data in various meteorological centres. Hence, the actual situation may be different after one or two years. Some of the areas, which are said to be without drought, may experience drought in the short-term of one to three years. The data are indicative of the long-term average, based on rainfall and irrigation ([Table 2.8](#) and [Map 2.5](#)).

2.9 Disaster Index

The measurement of the impact of a disaster and its relative severity is very difficult. Either the impact can be uniformly measured in terms of the geographical area or the number of people affected. However, measurement in terms of geographical area affected, by itself does not reveal the actual impact. This is because each disaster is measured in different units, which are not comparable. For example, drought is measured in terms of deviation from normal rainfall, earthquake is measured on a Richter scale and a cyclone is measured in terms of wind speed and the height of the tidal wave it whips up. Measurement in terms of the number of people affected need not accurately

correspond to the severity of the disaster. In areas where disasters are frequent, people are often better prepared, than when they hit an unexpected area. Kutch in Gujarat and Latur in Maharashtra had unexpected earthquakes. Andhra Pradesh was better prepared to face the cyclone in 1990 after the experience in 1977. A disaster of the same natural magnitude can lead to varying levels of destruction and loss, depending upon the location of its occurrence and the preparedness of the state and its people.

There are further limitations to the Disaster Index. Drought is measured in terms of a long-term situation. Earthquakes are measured over ten years. Flood data are an average of two years. Given the paucity of comparable data, attempting a relative measurement of natural calamities and drawing conclusions as to which state is more disaster prone than others is a difficult task.

Thus, the Disaster Index computed here is only an indicative one.¹⁸ This is probably the first attempt to bring the states on a comparative scale. Gujarat, Uttar Pradesh, Bihar and Orissa turn out to be the most disaster-prone states, in that order. Punjab, Kerala, Tamil Nadu and Madhya Pradesh are the states, which are least disaster-prone. Punjab and Kerala seem to be almost disaster free. The states of Karnataka, West Bengal, Haryana, Assam and Andhra Pradesh are prone to one or more of the disasters: cyclones in West Bengal, cyclones and droughts in Andhra Pradesh, floods in Assam and droughts in Haryana and Karnataka. This is a broad indication of the disaster proneness of a state in the short term. (Table 2.9)

2.10 Food Availability Map of India

The five indicators discussed and selected for inclusion in the food availability map are as follows: (Table 2.10, 2.11)

- Deficit of food production over consumption
- Instability in cereal production
- Environmental Sustainability Index
- Number of people affected by floods, cyclones, heavy rains and landslides
- Percentage of area affected by drought to total geographical area

All the states have been ranked for these chosen parameters and the rank for each state has been summed up to get a cumulative ranking Index. The mapping index is obtained by dividing the cumulative ranking index with the number of indicators. This mapping index of availability is divided into five class intervals, using the natural break in the series. The five classes represent five typologies. The states, which show the worst situation of availability, are shown in light green and the states that have good availability are in the darkest shade of green.

Gujarat emerges as the most food insecure state, from the point of view of availability with Rajasthan and Bihar following it. The states of Andhra Pradesh, Tamil Nadu, Orissa, Uttar Pradesh, Himachal Pradesh and Assam are seen to be better while the best states are Punjab, Madhya Pradesh and Kerala.

Gujarat is the worst because it not only has a food deficit, but also high instability, drought, a higher percentage of drought-prone area and a larger population affected by natural disasters and unsustainable environment. Rajasthan's position is bad as it has the largest percentage of drought-prone area and high instability in cereal production. Bihar is also a food insecure state because of the higher percentage of population affected by floods and the deficit in food production.

The states of Punjab, Kerala and Madhya Pradesh occupy the best position for a number of reasons. Though Punjab has a problem of environmental sustainability, other factors like surplus cereal production, stability in cereal production and less disaster proneness put it in a relatively good position. As far as Kerala is concerned, though it is a state deficient in cereal production, stability in cereal production, better levels of environmental sustainability and a smaller population affected by natural disasters, gives it the first position along with Punjab and Madhya Pradesh. Environmental sustainability is the highest in Madhya Pradesh. The state has no shortage of food, is not prone to disasters and hence merits the best position. (Tables 2.10 and 2.11 and Map 2.6)

¹⁸ See Appendix 2.3 for the calculations of Disaster Index.

Table 2.10
Indicators of Food Availability Situation in India*

Sl.No.	State	1		2		3		4		5	
		Deficit in production (Ratio of consumption to production of cereals) (1993-94)	Rank	Instability in cereal production (1987-88 to 1997-98)	Rank	Sustainability Index	Rank	Population affected by floods /cyclone (in Lakhs) Avg (1998 & 1999)	Rank	Percentage of drought affected area to TGA**	Rank
1	Andhra Pradesh	1.158	9	12.91	9	29.00	13	1.495	13	11.94	6
2	Assam	1.286	4	7.34	13	31.00	12	27.885	6	0.00	11
3	Bihar	1.791	2	15.82	5	37.00	9	105.455	1	0.00	11
4	Gujarat	1.745	3	57.79	1	48.00	5	33.142	5	54.49	2
5	Haryana	0.329	15	13.68	7	84.00	1	13.760	8	18.86	4
6	Himachal Pradesh	0.765	14	15.28	6	39.00	7	23.370	7	0.00	11
7	Karnataka	1.110	11	12.43	10	35.00	10	42.798	4	30.06	3
8	Kerala	3.989	1	5.39	16	29.00	13	1.497	12	0.00	11
9	Madhya Pradesh	0.973	12	10.80	11	10.00	16	2.180	11	8.41	7
10	Maharashtra	1.274	5	29.29	3	35.00	10	2.290	10	18.74	5
11	Orissa	1.126	10	25.08	4	28.00	15	8.535	9	1.29	10
12	Punjab	0.156	16	5.65	15	81.00	2	0.030	14	0.00	11
13	Rajasthan	1.252	6	38.92	2	71.00	3	0.003	15	56.74	1
14	Tamil Nadu	1.179	8	13.63	8	38.00	8	0.000	16	5.73	8
15	Uttar Pradesh	0.839	13	7.35	12	47.00	6	62.245	3	1.57	9
16	West Bengal	1.182	7	6.04	14	55.00	4	79.315	2	0.00	11

* Refer Appendix 5.1 for sources of data.

** TGA - Total Geographical Area

Table 2.11
Mapping Index of Food Availability

Sl.No.	State	Indicators					Cumulative Rank	Mapping Index	Mapping Rank	Mapping Typology
		1	2	3	4	5				
1	Andhra Pradesh	9	9	13	13	6	50	10.0	13	4
2	Assam	4	13	12	6	11	46	9.2	10	4
3	Bihar	2	5	9	1	11	28	5.6	3	2
4	Gujarat	3	1	5	5	2	16	3.2	1	1
5	Haryana	15	7	1	8	4	35	7.0	5	3
6	Himachal Pradesh	14	6	7	7	11	45	9.0	9	4
7	Karnataka	11	10	10	4	3	38	7.6	6	3
8	Kerala	1	16	13	12	11	53	10.6	14	5
9	Madhya Pradesh	12	11	16	11	7	57	11.4	15	5
10	Maharashtra	5	3	10	10	5	33	6.6	4	3
11	Orissa	10	4	15	9	10	48	9.6	11	4
12	Punjab	16	15	2	14	11	58	11.6	16	5
13	Rajasthan	6	2	3	15	1	27	5.4	2	2
14	Tamil Nadu	8	8	8	16	8	48	9.6	11	4
15	Uttar Pradesh	13	12	6	3	9	43	8.6	8	4
16	West Bengal	7	14	4	2	11	38	7.6	6	3

Mapping Index

Below 5.0
5.0-6.5
6.5-8.5
8.5-10.0
above 10.00

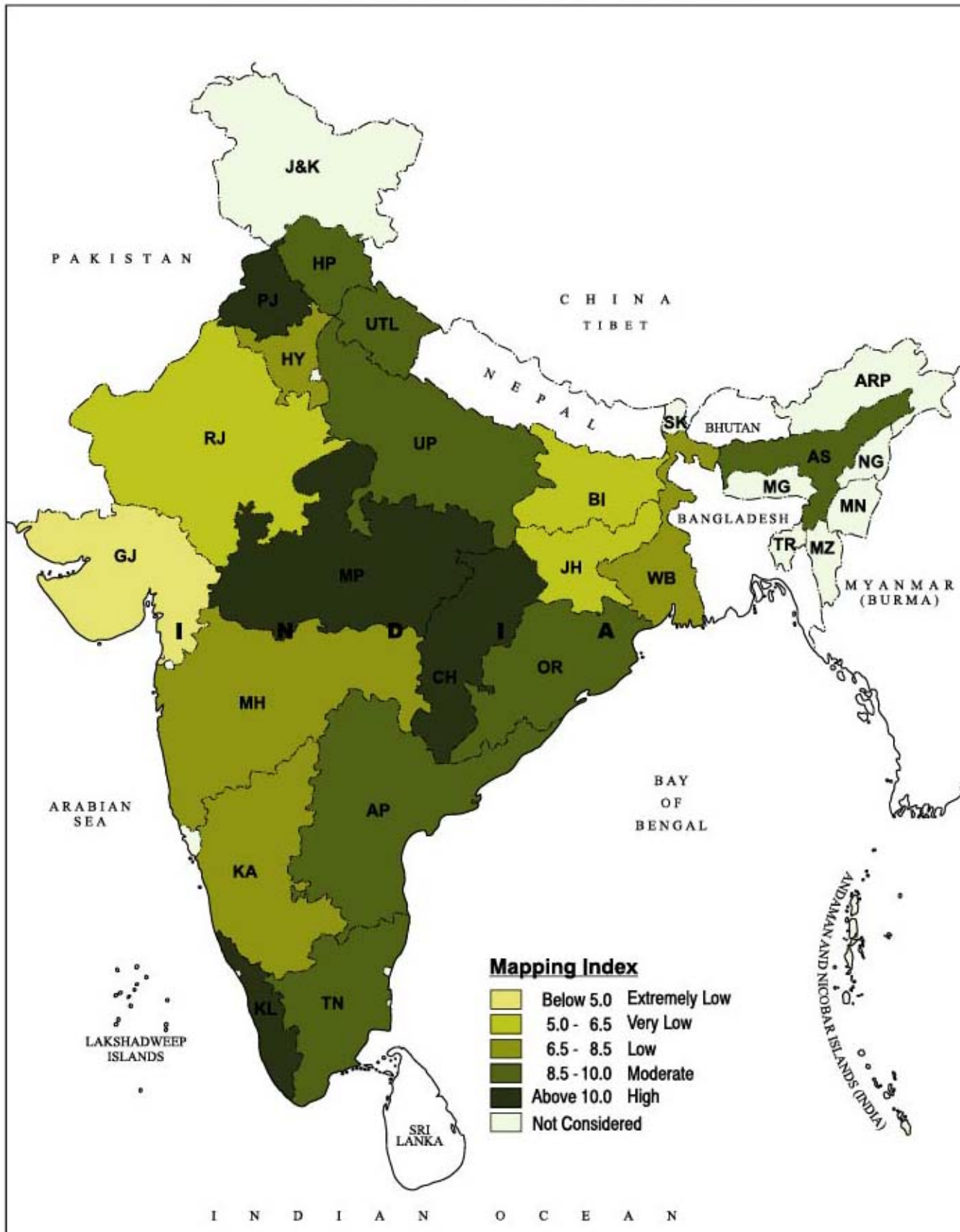
Mapping Typology

1. Extremely Low
2. Very Low
3. Low
4. Moderate
5. High

States

GJ
RJ, BH
MH, HY, KN, WB
UP, HP, AS, TN, OR, AP
KL, MP, PJ

FOOD AVAILABILITY MAP OF INDIA



Map No. 2.6

2.11 Availability of Food Grains- Buffer Stocks

The foregoing analysis shows that compared to the requirement as stipulated by the Indian Council of Medical research, we do not seem to have large surpluses of even cereals. On one hand, there are some deficit states and some surplus states. On the other hand, the country at present has a large quantity of buffer stocks of food grains. A study of food availability in India is not complete without a reference to the available food stocks.

The agricultural price policy of the government of India provides price supports and incentive prices to selected crops. Food grains are procured, stocked and distributed to the consumers at subsidised prices. The price policy created stocks of food grains called “buffer stocks”, which are expected to stabilise the availability as well as the prices of food grains. The government purchases the grains at a price which is above the market price, and sells it to the low-income consumer below the market price. Recently, the introduction of the Targeted Distribution System has made a distinction between the low-income consumer as the one below poverty line (BPL) and the others as above the poverty line (APL). A larger subsidy was made available to the BPL consumer.

The Food Corporation of India is responsible for procuring the food grains and maintaining the buffer stocks. The operation is restricted to wheat and rice. Better-endowed states, with surplus production and better infrastructure of roads, transport facilities and market facilities, seized the opportunity and supplied the required stocks to the government. Major contributors to the central pool at present are the states of Punjab, Haryana, Uttar Pradesh and Andhra Pradesh.¹⁹

In recent years, the Central Government has made an offer to the state governments to procure and distribute grains within the state and take the subsidy from the centre. The states of West Bengal, Madhya Pradesh and Rajasthan

have taken the offer. They do not send grain to the central pool any more. The state of Tamil Nadu provides incentive price to all its farmers who want to sell the grain to the state government.

However, the government policy has resulted in huge stocks of food grains in recent years. The norms stipulated for the food grain stocks range between 16.8 million tonnes in the month of January to about 24.3 million tonnes in the month of July, soon after the harvest. Food stocks at these levels are expected to be adequate to take care of the public distribution system and reserves to provide security against unforeseen shortages. As against these norms, the present levels of food stocks stand at 45.7 million tonnes as on January 2001. The stocks are expected to go up in the coming months.

The minimum support price of rice and wheat has been increased in recent years, without much reference to the cost of production. There has been a serious misalignment of the minimum support price, the consequent acquisition cost to FCI and the issue price of the public distribution system. The market prices of wheat and rice have been below that of the issue price of the public distribution system in many areas.²⁰ This has happened particularly after the introduction of the targeted public distribution system and increase in the issue price of above poverty line population. The result was poor offtake by the public distribution system and unsold stocks of food grains with the government. The procurement in the five major states was also higher than expected, as the market prices have fallen far below that of the procurement price offered by the government. At present, government procurement accounts for about 40 percent of the marketed surplus of the food grains in the country. Excess of supply over demand may also occur due to poor purchasing power of the population. A detailed study of the levels of consumption would be useful. Consumption depends upon livelihood access and food access. These issues are discussed at length in the next chapter.



¹⁹ GOI, Economic Survey (2000- 2001)

²⁰ GOI, Economic Survey (2000- 2001)

CHAPTER 3

Food Access

The central theme of this chapter is food affordability and food access. Food access is bound up in the bundle¹ of 'entitlements'. The term 'entitlements' stands for the different things that a person can acquire. It also includes initial endowments such as land, assets, skills, knowledge, physical ability etc., and what can be acquired through exchange. People have to go hungry when their entitlement does not include enough food.² This may happen either due to a change in the endowment such as a loss of assets, loss of crops etc. or due to a change in the conditions of exchange, such as a fall in the price of their produce or a fall in wages. Endowments may also change due to the loss of one's physical ability to work due to illness, etc.

Sometimes people may have other organizational and collective bargaining strengths such as labour unions, farmers' organizations and women's self help groups and so on. All the abilities of a person to acquire food may be included except those that involve illegal means.

While dealing with the issue of food access in the context of discrimination against females, or discrimination based on class, caste or community, the problems of affordability remain centre-stage. In communities with limited means, the problem of discrimination becomes acute. The inability to avoid starvation and under-nourishment and to escape premature mortality among children and women, scheduled castes and scheduled tribes and disadvantaged communities, is due to the lack of affordability and their lack of means. Enhancement of individual affordability through livelihood access helps such disadvantaged groups to escape starvation, under-nourishment, disease and premature mortality.

Public policy and public action can create opportunities for livelihood. Public action is embodied in the existence of hard infrastructure and soft infrastructure.³ Livelihood access and food access improve with better infrastructure and better governance, which make a difference to the livelihood status of the deprived sections.

Public action includes the actions of the members of the community, non-governmental organizations and individuals. Either singly or collectively, they can create an enabling atmosphere. There are examples of an enabling atmosphere being created through community participation. A disabling atmosphere created by local, national and international vested interests, may cause problems of livelihood access and food access for vulnerable people. They may alter individual entitlements. Protecting the interests of one section of the population may lead to the deprivation of the livelihoods of others. Protection of the farmers of one country may lead to a deprivation of the livelihoods of the farmers of another country.

Factors that reveal food access and livelihood access, such as food consumption, poverty and employment are considered in this chapter. Rural infrastructure is an important indicator that enhances livelihood opportunities. Gender discrimination and caste discrimination are the important indicators of discrimination and denial of food access. Eight indicators are chosen for discussion and inclusion in the food access map of rural India. There are two indicators of physical access to food and three indicators that are related to livelihood access and three indicators that show discrimination by gender and caste.

¹ Sen, A.K. (1977)

² Dreze, Jean and Sen Amartya (1995)

³ Soft infrastructure includes marketing institutions, financial institutions, seller's forums, buyer's forums, and organizations. Institutions providing forward and backward linkages of the local economy with the rest of the country are also very important.

3.1 Access to Adequate Food

The recommended daily allowances of various foods proposed by the Indian Council of Medical Research (ICMR) have been used to examine the adequacy of consumption of cereal and non-cereal food items. The calorie adequacy is set at three levels at 2430 Kcal, 2160 Kcal and 1890 Kcal to examine adequacy of calorie consumption. The National Sample Survey data give information on the quantity of various foods consumed and the calorie intake levels of various per capita monthly expenditure classes.⁴ The same survey provides information on the perceptions of people about food adequacy.⁵

Access to Adequate Quantities: Cereals and Non-cereals

Cereals are the basic ingredients of the average Indian diet. For rural India as a whole, 71 per cent of energy is derived from cereals.⁶ The quantity of cereal consumption varies from state to state. It is the lowest in Kerala at 337 grams per capita per day, and is the highest in Orissa at 531 grams per capita per day.⁷ The Indian Council of Medical Research (ICMR) has recommended 420 grams of cereal per capita per day as adequate. Cereal consumption is below this recommended level in the rural areas of Gujarat, Maharashtra, Tamil Nadu, Kerala and Punjab. In the states of Orissa, West Bengal and Rajasthan, the consumption is much above the level recommended by ICMR. The data show that cereals are consumed in adequate quantities in eleven out of sixteen states (Tables 3.1 and 3.2).⁸

In the Nineties, the consumption pattern has shifted away from cereals towards a more diversified food basket. Such shifts are more apparent in the better-endowed states

of Punjab and Haryana than in less endowed states such as Bihar and Orissa, where the average food basket is tilted towards cereals to the exclusion of most other foods.⁹

There is considerable literature on the declining levels of per capita cereal consumption over the years, in rural areas.¹⁰ The per capita monthly cereal consumption has declined from 15.3 kilograms in 1972-73 to 13.4 kilograms in the year 1993-94 as per the National Sample Surveys. A number of non-cereal food items are not consumed in adequate quantities even at the average level. Cereal substitutes, pulses, fats and oils, vegetables, fruits, eggs and meat, are not consumed in adequate quantities in any of the states (Tables 3.1 and 3.2). Fish is consumed in adequate quantities only in Kerala. Gujarat is the only state in which consumption of oils and fats is close to the ICMR norm. Sugar is consumed in adequate quantities only in Punjab, Haryana, Rajasthan, Gujarat, Maharashtra and Himachal Pradesh. Only six states consume milk in adequate quantities. Thus, the consumption of protective foods such as pulses, fruits, vegetables, eggs, fish and meat is far from adequate even at the average level in many states.

The pattern of consumption shows that in general the consumption of food is restricted to mostly cereals and milk. There are further variations in the levels of consumption between the states. Some states consume enough of the main items. Other states are deficient in the consumption of even these. While most of the states consume quantities below the ICMR norm, there is a pattern shift to non-cereal items across the states. Wherever cereal consumption is low, consumption of other food items is relatively high, reiterating the fact noticed by many, that the average consumption basket is definitely tilting towards

⁴ NSSO, 50th round, Report No. 402, (1993-94)

⁵ NSSO, 50th round, Report No.415, (1993-94)

⁶ NSSO, Sarvekshana, 73rd Issue (1997)

⁷ Higher calorie consumption noticed in the higher expenditure groups in rural areas might be due to the accounting procedures adopted by the National Sample Survey to treat the food served to the guests and employees as that consumed by the members of the household. See Minhas, B. S., *Journal of Development Studies*, (1991)

⁸ See Appendix 3.1 on Consumption Index with ICMR norm as the base.

⁹ As per NSSO, Sarvekshana, 73rd Issue (1997), the lower expenditure groups in rural Orissa derive about 89 percent of energy from cereal consumption.

¹⁰ Rao, Hanumantha, C.H. (2000)

Table 3.1
Per capita Consumption of Various Foods Items (gms / day)

Sl. No.	State	Cereals	Cereals Substitute	Sugar	Pulses	Vegetables	Fruits	Fats and Oils	Milk	Eggs	Meat	Fish
	ICMR Norm	420	75	30	40	125	50	22	150	45	25	25
1	Andhra Pradesh	442.33	0.00	14.33	23.33	66.00	22.36	12.33	78.60	6.00	7.33	3.67
2	Assam	439.00	0.33	14.00	17.00	47.33	32.15	11.00	36.30	4.67	5.00	14.33
3	Bihar	477.00	0.00	10.67	24.00	63.00	17.52	9.67	71.70	0.58	2.33	4.00
4	Gujarat	355.33	0.00	32.00	12.33	74.67	17.72	21.67	152.10	0.71	1.67	0.67
5	Haryana	430.67	0.00	53.33	20.67	64.67	30.18	9.67	414.60	0.33	2.00	0.00
6	Himachal Pradesh	445.67	0.00	32.33	36.00	51.33	12.88	18.00	225.60	0.92	3.00	0.00
7	Karnataka	438.33	0.00	19.00	26.33	62.67	31.93	8.00	86.40	3.71	4.33	4.67
8	Kerala	337.00	54.00	27.67	14.33	35.67	43.41	8.67	78.30	8.33	8.00	45.00
9	Madhya Pradesh	473.33	0.67	19.33	32.33	56.33	10.27	10.00	82.80	0.63	2.00	2.00
10	Maharashtra	379.67	3.00	33.00	31.00	61.67	20.57	10.00	75.00	2.54	4.00	3.67
11	Orissa	531.00	0.33	11.00	15.00	58.67	13.50	6.00	23.10	1.21	2.00	9.67
12	Punjab	359.33	0.00	56.00	29.67	77.33	21.50	18.00	429.90	1.96	2.00	0.00
13	Rajasthan	495.00	0.00	32.00	21.33	47.33	14.91	8.67	312.30	0.29	1.67	0.00
14	Tamil Nadu	390.67	0.67	14.67	22.67	67.33	35.38	8.67	63.60	4.42	5.67	5.67
15	Uttar Pradesh	463.67	0.33	17.33	32.67	56.33	18.08	12.67	163.20	0.88	3.67	1.33
16	West Bengal	498.67	0.33	12.00	14.00	63.67	19.20	11.33	46.20	7.04	4.33	18.00
	Average	434.79	3.73	24.92	23.29	59.63	22.60	11.52	146.23	2.76	3.69	7.04

Source : Col. 1,2,4 NSSO, 50th Round,(Report No.402), Level and Patterns of Consumer Expenditure (1993-94)

Col. 3,5-11, NSSO, 50th Round, Quantity of consumption of all Food Items (Rural)

Table 3.2
Consumption Index with ICMR as the Base for Various Food Items

Sl. No.	State	1	2	3	4	5	6	7	8	9	10	11
		Cereals	Cereals Substitute	Sugar	Pulses	Vegetables	Fruits	Fats and Oils	Milk	Eggs	Meat	Fish
1	Andhra Pradesh	1.05	0.00	0.48	0.58	0.53	0.45	0.56	0.52	0.13	0.29	0.15
2	Assam	1.05	0.00	0.47	0.43	0.38	0.64	0.50	0.24	0.10	0.20	0.57
3	Bihar	1.14	0.00	0.36	0.60	0.50	0.35	0.44	0.48	0.01	0.09	0.16
4	Gujarat	0.85	0.00	1.07	0.31	0.60	0.35	0.98	1.01	0.02	0.07	0.03
5	Haryana	1.03	0.00	1.78	0.52	0.52	0.60	0.44	2.76	0.01	0.08	0.00
6	Himachal Pradesh	1.06	0.00	1.08	0.90	0.41	0.26	0.82	1.50	0.02	0.12	0.00
7	Karnataka	1.04	0.00	0.63	0.66	0.50	0.64	0.36	0.58	0.08	0.17	0.19
8	Kerala	0.80	0.72	0.92	0.36	0.29	0.87	0.39	0.52	0.19	0.32	1.80
9	Madhya Pradesh	1.13	0.01	0.64	0.81	0.45	0.21	0.45	0.55	0.01	0.08	0.08
10	Maharashtra	0.90	0.04	1.10	0.78	0.49	0.41	0.45	0.50	0.06	0.16	0.15
11	Orissa	1.26	0.00	0.37	0.38	0.47	0.27	0.27	0.15	0.03	0.08	0.39
12	Punjab	0.86	0.00	1.87	0.74	0.62	0.43	0.82	2.87	0.04	0.08	0.00
13	Rajasthan	1.18	0.00	1.07	0.53	0.38	0.30	0.39	2.08	0.01	0.07	0.00
14	Tamil Nadu	0.93	0.01	0.49	0.57	0.54	0.71	0.39	0.42	0.10	0.23	0.23
15	Uttar Pradesh	1.10	0.00	0.58	0.82	0.45	0.36	0.58	1.09	0.02	0.15	0.05
16	West Bengal	1.19	0.00	0.40	0.35	0.51	0.38	0.52	0.31	0.16	0.17	0.72
	All India	1.04	0.05	0.83	0.58	0.48	0.45	0.52	0.97	0.06	0.15	0.28

non-cereals. The high level of consumption of milk and milk products may be the main reason for the reduced consumption of cereals in rural Punjab. The reduced consumption of cereals in rural areas seems to be of some concern in other states, where there is no improvement in the consumption of other food items.

The shortfall in average cereal consumption has been compensated to some extent in Gujarat, Maharashtra and Kerala by higher than average consumption of other foods. Maharashtra is a surplus producer of sugar and pulses. People in these states consume more of these items than those in other states. In the state of Kerala, the consumption of large quantities of tubers (cereal substitutes), fish, fruits and nuts compensates for low consumption of cereals to some extent. Kerala also accounts for higher than average consumption of meat. Tamil Nadu by contrast, consumes less than the recommended level of cereals, but this is not compensated by above average consumption of any other foods. Hence, the average calorie consumption of Tamil Nadu is the lowest. Expensive protective foods are out of the reach of a majority of the rural population. The levels of consumption of protective foods, such as pulses, vegetables, fruits, eggs, meats and fish are far below the requirement specified by ICMR even at the average level. The consumption of milk is also low in some states such as Orissa.

Data on the quantity of various foods consumed by the lower expenditure classes are not readily available for examining the consumption pattern of deprived sections with limited affordability. Levels of consumption of the lower expenditure classes need not necessarily be high just because the average consumption in the state is high.

3.2 Access to Adequate Energy

The Food and Agricultural Organisation has estimated that India has 207 million people consuming diets inadequate in calories. FAO has fixed India's minimum requirement as

1810 Kcal per capita per day. The minimum calorie requirement calculations are based on the age-sex composition, the lowest acceptable weight for the typical height of the group in a country and the light activity norm.¹¹ The Government of India has set its own norms at 2400 Kcal per consumer unit per day for rural India and 2100 Kcal per consumer unit per day for urban India in connection with the definition of the poverty line.¹² Despite these cut-off points, it is a well-known fact that the actual requirement of calories depends upon multiple factors such as age, sex, body weight, nature of work, environment, metabolic efficiency etc. These norms may undergo changes, based on new information on the understanding of nutrition. Hence, energy adequacy even after adjustments in terms of consumer units is a grey area. Any norm used may either overestimate or underestimate the actual need. Further, the norm can be defined either in terms of per capita or in terms of per consumer unit. The consumer unit is adjusted for sex and age composition of the population. Four norms are used in the present study in different contexts. Two on the higher side, at 2430 Kcal per consumer unit per day and at 2300 Kcal per consumer unit per day, and the other two on the lower side at 2160 Kcal per consumer unit per day and 1890 Kcal per consumer unit per day. The choice of these norms is purely incidental. The use of 1890 Kcal, 2160 Kcal and 2430 Kcal instead of any other figure is to facilitate easy computation from NSS tables. The levels of 1890 Kcal, 2160 Kcal and 2430 Kcal correspond to the 70 per cent, 80 percent and 90 per cent norm of 2700 Kcal per consumer unit.¹³ All computations are based on published NSS tables. In the case of landless labour and small farmers, the information was compiled and analysed by other authors.¹⁴ These authors have calculated the calorie inadequacy based on the original primary data collected by NSS, using 2300 Kcal as the calorie norm. We have reported their findings in this study.

¹¹ FAO (2000)

¹² GOI, Perspective Planning Division (1993)

¹³ FAO (1985), The average level for international comparisons is usually taken as 2700 Kcal.

¹⁴ Kumar, Praduman, and Joshi, P.K. (2000)

If we wish to estimate the number of persons consuming diets deficient in calories, we have to adopt one of the norms of calorie adequacy. We can estimate the number of underfed people in rural India. We would get different estimates depending upon the norm of adequacy adopted. The estimates of the underfed population differ not only due to the norm adopted but also due to the method of calculation and the source of data. Since one of the major aims of policy making is to make India hunger free, we may present some rough estimates of the underfed and hungry.

The Food and Agricultural Organisation estimated 207 million people as underfed and hungry in 1996 for the country as a whole (both urban and rural put together). The estimate is based on production data, estimated population data and an assumed coefficient of variation in consumption. The calorie norm adopted was 1810 Kcal per capita.¹⁵

If we adopt the norm of 2160 Kcal per consumer unit per day as the level of adequacy, as per the NSS 50th round data 26.40 percent of the rural population was below this level of consumption in rural India in 1993-94. If we apply this percentage to the estimated rural population in 2001, we get the figure of 201.4 million as the estimated number of underfed in rural India. Instead if we adopt an adequacy norm of 1890 Kcal per consumer unit per day and apply this percentage of 13.4 in 1993-94 to the 2001 estimated rural population, we get a figure of 102.23 million as the number of under fed in rural India in 2001.¹⁶

Average Calorie Intake

The NSS consumer data show that at the national level, average per capita calorie intake has declined by about 45 Kcal, from 1972-73 to 1983. It has declined by 68 Kcal

from 1983 to 1993-94 in rural India.¹⁷ Decline in the calorie intake is also noticed among the lower expenditure groups. Several explanations have been offered for this observed decline. It has been directly linked to the decline in the cereal consumption. Substantial differences are noticed in the average calorie intake across the states in 1993-94, in rural India. (Table 3.3)

Haryana recorded the highest level of energy intake per consumer unit per day at 3109 Kcal, followed by Rajasthan at 3090 Kcal and Punjab at 3007 Kcal in rural areas.

There are five states showing a relatively low average calorie intake. Tamil Nadu with 2347 Kcal, Assam with 2406 Kcal, Maharashtra with 2427 Kcal, Kerala with 2451 Kcal and Gujarat with 2470 Kcal are at the bottom of the list. Cereals contribute the most to calorie intake compared to other foods. A higher level of cereal consumption is associated with higher levels of calorie intake in most states except Punjab. Here again Bihar is a little off the mark. Even though the cereal consumption is high, the consumption of other foods is very low and hence, the average calorie consumption is below the national average. The states of Kerala, Tamil Nadu, Maharashtra, Assam, Karnataka and Gujarat show moderate levels of average calorie consumption but are below the national average. At the level of state averages, we find that all the states consume adequate calories per consumer unit as per the norm set by India for rural areas. Only Tamil Nadu shows a slight shortfall, which is negligible.

Even if the average level of calorie intake is adequate, the lower income groups may not be consuming adequate calories. This is a cause for concern, if proved correct. Compared to the high level of average calorie intake of the states, the calorie intake of the lower expenditure groups, with a per capita monthly expenditure below Rs.190, has

¹⁵ FAO (1996)

¹⁶ The percentages are taken from NSSO, Sarvekshna, 73rd Issue (1997). The rural population is obtained by applying the 1991 percentage of rural population to the actual population total of 2001 census. The urban rural break-up was not available to us at the time of printing this book. The 55th round NSS data were not yet available to know the estimate of the underfed population in 1999.

¹⁷ NSSO, Sarvekshana, 73rd Issue, (1997)

been below the requirement. The daily calorie intake per consumer unit of these groups is 1390 Kcal in Kerala, 1684 Kcal in Tamil Nadu and 1685 Kcal in Gujarat.

The states with low-level per capita production of cereals showed not only a low level of average calorie intake, but also the lowest levels of calorie intake for the poor in 1993-94. We shall look into the possible reasons for such low levels of food intake and the poverty situation later in the chapter.

Uttar Pradesh, Bihar, Orissa, Rajasthan and Madhya Pradesh by contrast, show a higher level of calorie consumption for this expenditure group in 1993-94. The highest level of calorie consumption in the expenditure group below Rs. 190 was 2253 Kcal in Orissa, 2240 Kcal in Uttar Pradesh, 2156 Kcal in Rajasthan, 2143 Kcal in Bihar and 2127 Kcal in Madhya Pradesh. ([Table 3.3](#))

3.3 Calorie Intake among the Poorest

The level of calorie consumption of the lowest expenditure deciles represents the depth of hunger or calorie deficiency in various states. Hence, it is taken as one of the indicators of the physical access to food by the poor. The depth of hunger¹⁸ is defined as the deficiency of a diet from the norm in terms of calories. The smaller the gap in terms of calories from the norm, the shallower the hunger, and the larger the gap, the deeper the hunger. There is no hunger if there is no gap. The Food and Agricultural Organization (FAO) measures the depth in terms of shortfall ranging from 100 to 400 Kcal. A shortfall of less than 200 Kcal is not considered very deep.

Per consumer unit average calorie intake of the lowest expenditure deciles is calculated from the published tables of National Sample Survey. Hence, these figures may differ from the calculations made by others directly from the primary data. The calorie intake of the lowest ten per cent

of the population shows that calorie intake exceeds 2000 Kcal per consumer unit per day only in some states such as Punjab, Haryana, Rajasthan, Himachal Pradesh, Uttar Pradesh and West Bengal. The lowest ten percent in Tamil Nadu and Kerala consume only around 1551 Kcal and 1556 Kcal per consumer unit per day respectively. Maharashtra and Gujarat have also recorded lower levels of calorie consumption of their lowest ten percent at 1747 Kcal and 1788 Kcal per consumer unit per day. These four states remain at the bottom of the calorie intake of the poorest. The lowest deciles in Andhra Pradesh, Assam, Karnataka and Madhya Pradesh consume 1800-1900 Kcal ([Table 3.3](#) and [Map 3.1](#)).

The lower calorie consumption in Kerala and Tamil Nadu is normally attributed to the fact that the lower income groups consume non-cereal foods such as tapioca, which are under-reported by the National Sample Survey. The other argument for the low level of calorie consumption of the lower expenditure groups in general is that they consume a number of meals outside the home, normally provided free by the employers, which are not included in the calorie consumption of the National Sample Survey. Adjustments in the calorie consumption have been suggested by experts based on the meals taken inside and outside the house.¹⁹

The NSS 50th round data has included tapioca among the cereal substitutes, and potato and sweet potato among vegetables.²⁰ This is reflected in the per capita per day consumption of cereal substitutes in Kerala and Tamil Nadu.²¹ The data of the NSS 50th round on meals consumed outside the home by several lower calorie consumers do not seem to explain the additional calories consumed. Lower income groups do not seem to be eating substantial calories outside their homes. Even after adjustment for the meals given and received, not many households turn out to be net receivers

¹⁸ FAO (2000)

¹⁹ Minhas, B.S (1991)

²⁰ NSSO, Sarvekshana, 73rd Issue (1997)

²¹ See [Table 3.1](#)

Table 3.3
Calorie Intake among the States

Sl. No.	State	1 Average intake per consumer unit per day Kcal	2 Average per capita intake per day Kcal	3 Calorie intake of the lowest decile (Kcal) per cu/day	4 Average intake of lower Exp Groups ₹s.190 per cu/day Kcal	5 Percentage of households in the lower Exp Groups ₹s.190
1	Andhra Pradesh	2559.00	2052.00	1858.39	1920.50	22.15
2	Assam	2406.00	1983.00	1842.48	1747.50	16.69
3	Bihar	2637.00	2115.00	1790.88	2142.75	39.53
4	Gujarat	2470.00	1994.00	1788.34	1685.25	12.93
5	Haryana	3109.00	2491.00	2022.33	1875.50	9.71
6	Himachal Pradesh	2916.00	2324.00	2170.65	2075.75	9.12
7	Karnataka	2575.00	2073.00	1803.85	1929.75	23.54
8	Kerala	2451.00	1965.00	1556.33	1390.25	8.14
9	Madhya Pradesh	2697.00	2164.00	1894.03	2127.50	33.28
10	Maharashtra	2427.00	1936.00	1747.75	1919.50	28.76
11	Orissa	2740.00	2199.00	1918.96	2253.00	39.63
12	Punjab	3007.00	2418.00	2116.48	1743.50	3.37
13	Rajasthan	3090.00	2470.00	2249.85	2155.75	12.11
14	Tamil Nadu	2347.00	1884.00	1551.38	1683.75	22.99
15	Uttar Pradesh	2899.00	2307.00	2103.15	2240.00	26.29
16	West Bengal	2733.00	2211.00	2012.57	2032.75	19.80
	All India	2683.00	2153.00	1954.03	2049.25	22.19

Source : Col. 1-5, NSSO, Sarvekshana, Vol. XX, No.2 73rd Issue, (1997)

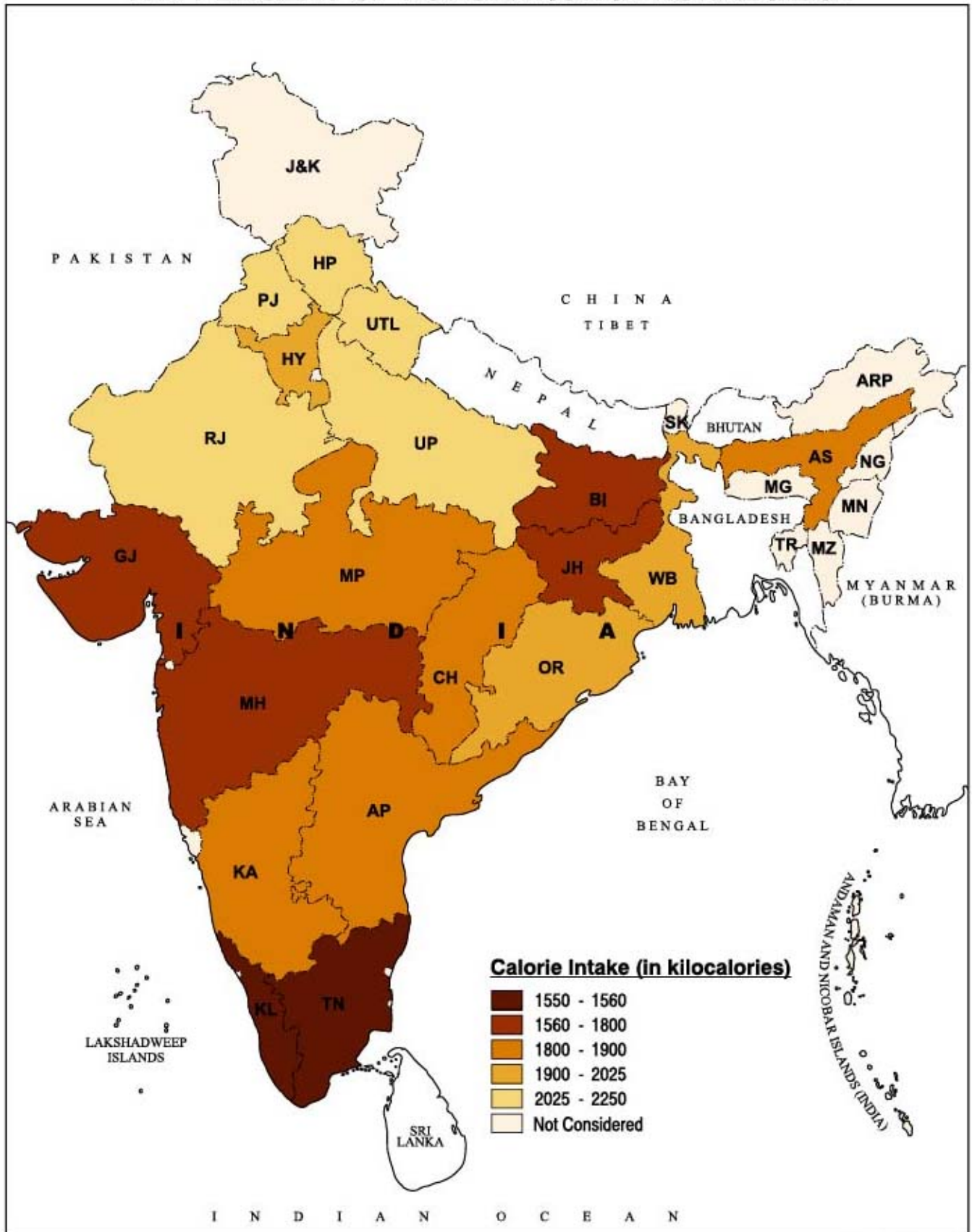
of food.²² Among the rural sector in most states, more than 95 per cent of the meals are consumed at home. More than 3 per cent of the meals in Kerala and more than 5 per cent in Tamil Nadu are taken while away from home, indicating very little calorie intake outside the home. Consumption by lower expenditure groups in the states of Kerala, Tamil Nadu, Maharashtra and Gujarat probably requires a more in-depth investigation to find the reasons for the low levels of consumption of the lower expenditure groups. We cannot presume that their consumption is under-reported.

We may have to concede the fact that in 1993-94, for whatever reason, the calorie intake of the lower expenditure

groups was low in the states of Tamil Nadu, Kerala and Gujarat. It appears that in states with higher per capita production of cereals, the lowest ten per cent of the population consumed more calories. In the states with lower per capita production, the lowest ten per cent of the population consumed fewer calories. Hence, there is every reason to believe that in the states that are deficient in the production of staple foods, the lower income groups face problems of low calorie intake, even though the average consumption of the state is adequate. The calorie intake of the lowest ten per cent of the population as well as the average level of calorie intake in the state, are significantly correlated to the per capita net production of cereals. There

²² Though one would expect net receivers and net givers to be equal, the survey data do not support this. One has to be cautious in using the data.

PER CONSUMER UNIT CALORIE INTAKE OF THE LOWEST TEN PERCENT OF POPULATION IN RURAL INDIA



Map No. 3.1

are two reasons for this. In centres of abundant production, the prices are likely to be low, enabling the poor to eat enough calories. Second, in areas with adequate livelihood opportunities, the lowest deciles are better off. There is a possibility of consuming more calories. We shall return to this aspect when we discuss poverty.

3.4 Percentage of Population Consuming less than 1890 Kcal

Persons consuming less than 1890 Kcal per consumer unit per day may be considered as hungry as the consumption is very much lower than the food adequacy norms of ICMR. The percentage of population consuming less than 1890 Kcal per consumer unit per day would represent the spread of hunger. It is taken as an important indicator of physical access to food. About 42 per cent of the rural population consumes less than 2430 Kcal per consumer unit per day. The average calorie consumption for rural India is 2683 Kcal per consumer unit per day. For the purpose of this analysis and mapping, a lower adequacy norm is used. Furthermore, the calorie level of 1890 Kcal is approximately two standard deviations below the international average calorie consumption level of 2700 Kcal. It is also close to the norm fixed by FAO at 1810 Kcal per capita, after considering the age and sex composition of the population and the mean height of persons. A person consuming anything below this bare minimum level is likely to face long-term ill effects of malnourishment.

The NSS data of the 50th round for 1993-94 show that 13.4 per cent of the population was consuming less than 1890 Kcal per consumer unit per day in rural areas. Thus, about 102 million rural people were consuming less than 1890 Kcal. The state with the largest spread of hunger is Tamil Nadu followed by Kerala, Maharashtra and Gujarat (Table 3.4). These are the very states in which the depth of hunger — measured in terms of the average calorie consumption of the lowest ten per cent of the population — has been the highest. The spread as well as the depth of hunger are found in these cereal deficit states.

Table 3.4
Deficient Calorie Intake (per cu/day)

Sl. No.	State	1	2
		Percentage of Households consuming less than 1890 Kcal	Percentage of Households consuming less than 2400 Kcal
1	Andhra Pradesh	14.10	48.40
2	Assam	13.30	53.90
3	Bihar	14.10	41.80
4	Gujarat	20.40	53.70
5	Haryana	8.70	28.40
6	Himachal Pradesh	5.30	29.30
7	Karnataka	17.40	48.60
8	Kerala	23.70	55.10
9	Madhya Pradesh	12.20	41.00
10	Maharashtra	21.90	57.40
11	Orissa	10.40	35.40
12	Punjab	6.30	27.60
13	Rajasthan	4.20	23.00
14	Tamil Nadu	28.20	61.30
15	Uttar Pradesh	8.00	31.00
16	West Bengal	7.40	37.20
All India		13.40	42.00

Source :Col. 1-2, NSSO, Sarvekshana, Vol. XX, No.2, 73rd Issue, (1997)

There are a large number of persons dependent on labour as their main source of income in the rural areas of these states.

In the states with surplus food grain production per capita, compared to the recommended daily allowance, the spread of hunger is negligible. Less than ten percent of the population is consuming a diet deficient in calories. In Punjab, Uttar Pradesh, Haryana, Himachal Pradesh, Rajasthan and West Bengal less than ten percent of the population consumes less than 1890 Kcal. The state of West Bengal falls in this category, though the cereal production has a small shortfall below the required production. More than 20 percent of the population

consumes less than 1890 Kcal in Tamil Nadu, Kerala, Maharashtra and Gujarat. All these states are deficit states for cereal production per capita compared to RDA. The persons consuming less than 1890 Kcal are between 10 percent and 20 percent in Karnataka, Andhra Pradesh and Orissa. ([Table 3.4](#) and [Map 3.2](#)).²³

Calorie deficiency in terms of both spread and depth may be due to higher food prices, lower incomes, lack of assets, fewer work opportunities, or a combination of many factors, tracing its origins to deficient cereal production in the state. We shall return to this question later in connection with livelihood access. Lower calorie consumption is likely to result in certain growth disorders among the population. In Chapter four, we shall examine whether the states with higher spread and depth of calorie deficiency suffer from such problems.

3.5 Calorie Intake among Landless and Cultivators

Inadequate calorie consumption is seen among the lower expenditure groups and among certain occupations. Of the rural households, about 66 per cent are cultivator households, about 14 per cent are landless agricultural labourers and about 4 per cent are artisan households. The rest belong to other classes. The dividing line between these is rather blurred in practice. In some states, small landowners and marginal cultivators depend mainly on seasonal labour outside their own farms for their livelihood. The landless depend upon both agricultural labour and non-agricultural labour. If we go by income criteria and classify the households as those dependent upon labour income and those dependent upon farm income, we find that about 45 per cent of the households in the country were labour households in 1993-94.²⁴

It is often felt that cultivators who have access to land and who produce food are likely to be more food secure

than the landless. The evidence available from the NSS 50th round data, as analysed by the authors²⁵ reveals that a number of sub-marginal cultivators, cultivating less than one acre (roughly less than 0.40 hectares) are equally food insecure. Sub-marginal cultivators consume less than 2300 Kcal per consumer unit per day. A large number of the landless labour households also consume less than 2300 Kcal per day. For the country as a whole, 49 per cent of the landless and about 29 per cent of the sub-marginal farmers consume less than 2300 Kcal per consumer unit per day. ([Table 3.5](#))

Among the states, Tamil Nadu has the highest percentage of landless labour. About 27 per cent of rural households in Tamil Nadu are landless labour households. As high as 65 per cent of them consume less than 2300 Kcal per consumer unit per day. Landless labour households consuming less than 2300 Kcal per capita per day constitute about 17 per cent of the total rural households in Tamil Nadu. More than 50 per cent of the landless labour households in the states of Karnataka, Kerala, Maharashtra, Gujarat, Assam and Andhra Pradesh consume less than 2300 Kcal per consumer unit per day. Agricultural labour households constitute about 20 per cent of the households in the states of Maharashtra and Andhra Pradesh. They constitute about 18 per cent of the rural households in Gujarat. Landless households consuming less than 2300 Kcal constitute about 10 per cent of the total households in Andhra Pradesh and Gujarat and about 12 per cent in the state of Maharashtra ([Table 3.5](#)).

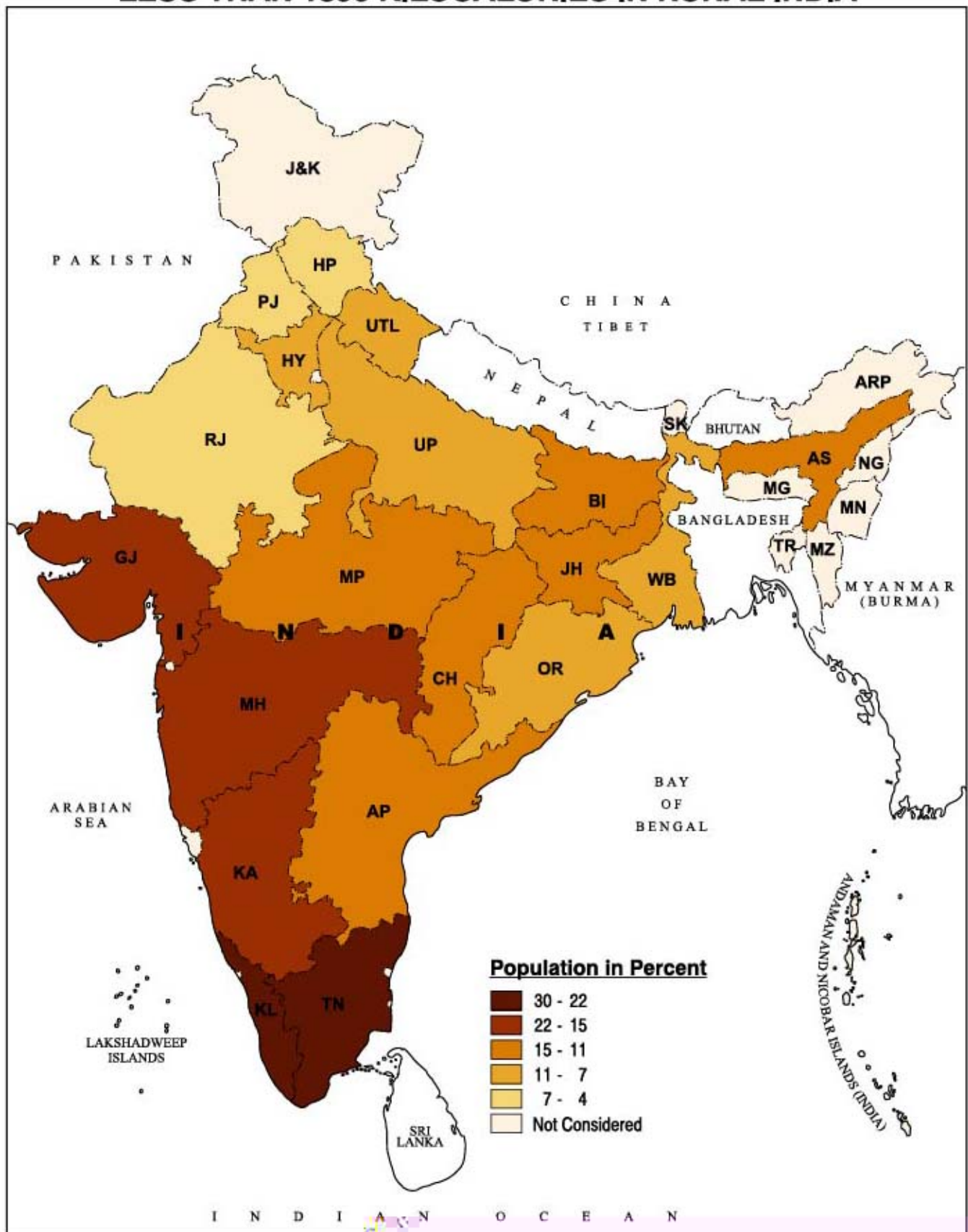
The study further reveals that 55 to 65 per cent of the landless labourers in food deficient states consumes diets deficient in calories. Tamil Nadu, Assam, Karnataka, Kerala, Maharashtra and Gujarat are among these states. However, the number of landless labourers is low in Kerala. The number of small landowners is high. Their calorie intake is less than 2300 Kcal. Tamil Nadu seems to have the largest

²³ Also see [Table 2.4](#) for the deficit in production over consumption.

²⁴ There may be some change in the percentage, depending upon a good or bad agricultural year and the changes in the non-agricultural work opportunities available in various states over a period of time.

²⁵ The section on the consumption of cultivators and landless is based on the paper prepared by Kumar, Praduman and Joshi, P.K (2000)

PERCENTAGE OF POPULATION CONSUMING LESS THAN 1890 KILOCALORIES IN RURAL INDIA



Map No. 3.2

Table 3.5
Calorie Intake of Landless Labourers and Cultivators

Sl. No.	State	1 Percentage of landless labour households to total HH	2 Percentage of landless labour HH consuming <2300 Kcal to total landless labour HH	3 Percentage of landless labour HH consuming <2300Kcal to total HH	4 Percentage of submarginal cultivators (with ≤ 0.40 ha) to total holding	5 Percentage of cultivator consuming <2300 Kcal to total cultivators	6 Percentage of hungry sub marginal cultivators to total cultivators
1	Andhra Pradesh	19.80	52.00	10.30	29.98	35.00	20.18
2	Assam	8.00	61.00	4.88	35.91	42.00	24.72
3	Bihar	19.00	45.00	8.55	52.03	27.00	31.22
4	Gujarat	17.90	56.00	10.02	26.77	40.00	19.12
5	Haryana	7.80	36.00	2.81	35.14	13.00	12.69
6	Himachal Pradesh	0.90	38.00	0.34	45.43	23.00	27.50
7	Karnataka	14.70	59.00	8.67	25.87	33.00	14.47
8	Kerala	3.60	56.00	2.02	75.18	40.00	53.70
9	Madhya Pradesh	12.70	50.00	6.35	18.90	29.00	10.96
10	Maharashtra	20.20	59.00	11.92	23.91	42.00	17.02
11	Orissa	12.00	36.00	4.32	27.91	16.00	12.40
12	Punjab	20.10	37.00	7.44	52.17	8.00	11.28
13	Rajasthan	4.90	33.00	1.62	18.43	15.00	8.38
14	Tamil Nadu	26.60	65.00	17.29	53.65	43.00	35.49
15	Uttar Pradesh	7.60	41.00	3.12	38.00	20.00	18.53
16	West Bengal	13.90	44.00	6.12	54.59	22.00	27.29
	All India	14.20	49.00	6.96	37.71	29.00	22.32

Source: Col.1-6, Kumar Praduman & Joshi P.K., 'Determinants of Food Intake and Nutritional Status of Farm Households in Rural India' (2000), Mimeograph.

number of food insecure cultivators, constituting 43 per cent of all the cultivators, followed by Maharashtra and Assam with 42 per cent each. The states of Kerala, Gujarat, Andhra Pradesh, Karnataka, Madhya Pradesh, Bihar, Himachal Pradesh, West Bengal and Uttar Pradesh have 20-40 per cent of cultivator households consuming less than 2300 Kcal. The states of Punjab and Haryana have the lowest number of calorie deficient cultivators. Thus, agricultural labour households appear to be the most vulnerable ([Table 3.5](#)).

3.6 Persons Reporting Food Inadequacy

Food adequacy can also be assessed from the point of view of the individual. Food adequacy as perceived by individuals is revealed in the National Sample Survey. There are three different sets of data that help us to get the perceptions of food adequacy. National Sample Survey has collected information from households on the number of meals eaten. One of the questions pertains to the number of meals eaten during the 30 days preceding the

date of survey. On an average, even in the lowest expenditure group, everybody had more than two meals a day in all the states. However, the size of the meal is unknown.

Number of persons reporting zero meals

There are some persons reporting zero meals.²⁶ The persons reporting zero meals are spread across all expenditure groups, though their concentration is higher among the lower expenditure groups. It shows the number of persons not having had a single meal on the day of the survey. The date of the survey differs from person to person in the sample. Hence it represents persons who go without a meal at least occasionally. For all classes put together there is only 1.6 per cent reporting zero meals in rural India. Persons reporting zero meals in the lower monthly per capita expenditure groups below Rs.190 are only two per cent for the country as a whole (Table 3.6).

There is no relationship between those reporting zero meals and the general affluence or poverty of the state. For instance, the persons reporting zero meals in the lower expenditure group in Punjab where poverty level is the lowest for the country, is higher than in Bihar which has the highest level of poverty. Irrespective of the level of average calorie consumption there is a small percentage of people who belong to the absolutely deprived category.

Judging from the small percentage of these persons and the lack of any relationship with production, poverty or Gross Domestic Product, it appears that they may be either a destitute population or those who had abstained from taking meals due to other reasons. Some among the higher expenditure classes as well as lower expenditure classes may be temporarily or chronically sick and unable to have a meal. Others might have abstained from taking meals due to religious or other reasons.

If we presume that those reporting zero meals are the 'actual' hungry in the subjective sense, then those literally

Table 3.6
Number of Persons Consuming Zero Meals

Sl. No.	State	1	2
		No of persons reporting zero meals per 1000 persons All Classes	No of persons reporting zero meals per 1000 persons in the Lower Exp.Groups below Rs.190*
1	Andhra Pradesh	12.00	18.50
2	Assam	9.00	9.00
3	Bihar	11.00	14.50
4	Gujarat	18.00	25.50
5	Haryana	19.00	18.25
6	Himachal Pradesh	17.00	23.50
7	Karnataka	12.00	17.25
8	Kerala	6.00	11.25
9	Madhya Pradesh	19.00	23.50
10	Maharashtra	17.00	22.00
11	Orissa	14.00	16.00
12	Punjab	11.00	23.50
13	Rajasthan	18.00	24.75
14	Tamil Nadu	13.00	16.25
15	Uttar Pradesh	23.00	26.50
16	West Bengal	14.00	21.25
	All India	16.00	20.00

* Average of all classes below Rs. 190/-

Source: Col. 1-2 NSSO, Sarvekshana, Vo. X, No.2, 73rd Issue, (1997)

going hungry were only 2 percent in the lowest expenditure groups. In contrast the normatively hungry in terms of deficient calorie consumption (of less than 1890 Kcal) was 13.4 percent.

The perceived hunger was insignificant, even when the calorie consumption was below the levels of acceptable norms. In addition everybody reported having two square meals a day, irrespective of the low levels of calorie consumption reported. When people are consuming food below the stipulated calorie norm for long periods of time and sustaining themselves on the minimum possible

²⁶ For the number of meals taken the recall period is thirty days. However the recall period for the persons reporting zero meals is the day of the survey. The day of the survey differs from person to person.

Table 3.7
Per Thousand Distribution of Households by Availability of Two Square Meals a Day

Sl. No.	State	1	2	3	4	5	6
		Members of households getting two square meals a day					
		Throughout the year	Only some months of the year	Not getting throughout the year	Not getting meals Col. 2&3	Not reported	All
1	Andhra Pradesh	966.00	17.00	12.00	29.00	5	1000.00
2	Assam	901.00	61.00	30.00	91.00	8	1000.00
3	Bihar	928.00	51.00	15.00	66.00	6	1000.00
4	Gujarat	976.00	9.00	4.00	13.00	11	1000.00
5	Haryana	992.00	8.00	0.00	8.00	0	1000.00
6	Himachal Pradesh	NA	NA	NA	NA	NA	NA
7	Karnataka	960.00	27.00	8.00	35.00	4	1000.00
8	Kerala	910.00	74.00	4.00	78.00	12	1000.00
9	Madhya Pradesh	970.00	25.00	3.00	28.00	1	1000.00
10	Maharashtra	954.00	41.00	4.00	45.00	1	1000.00
11	Orissa	844.00	149.00	5.00	154.00	2	1000.00
12	Punjab	999.00	1.00	0.00	1.00	0	1000.00
13	Rajasthan	985.00	6.00	0.00	6.00	8	1000.00
14	Tamil Nadu	969.00	15.00	9.00	24.00	7	1000.00
15	Uttar Pradesh	963.00	29.00	5.00	34.00	3	1000.00
16	West Bengal	856.00	111.00	30.00	141.00	4	1000.00
	All India	945.00	42.00	9.00	51.00	4	1000.00

Source : Col. 1-6, NSSO, (Report No. 415) Reported Adequacy of Food Intake in India (1993-94)

diet, their perception of deficiency obviously changes. What they eat is their normal meal. Hence they do not consider themselves hungry in the subjective sense.

Number of persons not getting two square meals a day throughout the year

Interestingly, for a related survey result on subjective food adequacy, when a person was asked whether she/he was getting two square meals a day throughout the year, the response varied widely among the states and was at variance with the response to zero meals. This is probably due to the difference in the recall periods. For the earlier question on number of meals eaten, the recall period was the past 30 days; for the number of persons taking zero meals the recall period was the day of the survey and for

the number of person getting two square meals a day, the recall period was one year.

In Orissa 14.9 per cent of the population reported having two square meals a day only in some months of the year. Another 0.5 per cent reported not having two square meals a day throughout the year. Together, 15.4 per cent of people in Orissa reported not having two square meals a day throughout the year or for a part of the year. Next to Orissa, West Bengal with a percentage of 14.1 reported the highest number of people not having two full meals throughout the year. The states reporting highest levels of seasonal food inadequacy appear to be the states in which the reported calorie inadequacy is not very high. It is probably an indication that seasonal and transitory problems of food inadequacy can be different from

permanent food adequacy. Orissa is a state in which there is a high tribal population who live in remote areas and may be more vulnerable to transitory food inadequacy in summer and monsoon months.²⁷ (Table 3.7)

Food Prices

Food access depends upon the affordability of adequate food. Food, being the most basic need, gets the first priority in expenditure among the poor. Thus, food access depends upon the income of the people and the prices prevailing in the market. Both of them vary from year to year and from region to region. If incomes rise at a slower rate than food prices, the purchasing power is undermined. The poor can access only smaller amounts of food, thus leading to inadequate calorie consumption.

The decline in cereal consumption and calorie consumption noticed at the average level is due to the increase in per capita incomes and the diversification of the food basket away from cereals, which is partly an indication of relative affluence. However, the same logic does not apply to the lower expenditure groups. Deficient calorie consumption at least among the poor would be due to the mismatch of incomes and prices. The price and the seasonal variations in prices further lead to transitory food insecurity of people not being able to eat well throughout the year. Transitory problems of loss of work and loss of income also add to the problems. Shortage of food during droughts and the increase in food prices could be seasonal. Hence one has to study food adequacy along with growth in incomes and growth in prices on one hand and the variations in price and incomes on the other. The trickle down effect of increasing per capita income in the country at the average level cannot be taken for granted as an assurance of adequate food consumption.

The public distribution system that provides food at affordable prices and the poverty alleviating programmes

that put more income in the hands of the people are of crucial importance. They help to correct the mismatch of the rate of growth of incomes and prices to some extent. We shall discuss the relative success and failure of these later in the chapter.

3.7 Head Count Ratio of Poverty

Food access depends upon purchasing power linked to livelihood access. Livelihood access is not just any employment. It means assured access to income over long periods. What is important for increasing affordability of food is to possess a sustainable livelihood. Those without sustainable livelihoods remain poor. Poverty is a bigger problem than unemployment and it can primarily be solved through productive livelihoods. The number of people below the poverty line represents those without access to productive livelihoods. The larger the number of poor, the lower would be their access to food and the higher would be their food insecurity and vulnerability.

The estimates of head count ratio of poverty are the same as those of the Planning Commission²⁸ (Table 3.8 and Map 3.3). These estimates are used because they form the basis for allocation of funds and food grains for the Targeted Public Distribution System across the states. It should be pointed out that head count ratio of poverty and its methodology are shrouded in controversy due to multiple adjustments made for state specific poverty lines. The relationship of poverty estimated by the Planning Commission, with other indicators of food insecurity and livelihood access, has to be interpreted with great caution.²⁹

Bihar comes out as the poorest state in the country followed by Orissa, Assam, Uttar Pradesh, West Bengal and Madhya Pradesh. In all these states, more than 40 per cent of the rural population was poor in 1993-94. Bihar had the largest number of poor at 58 per cent, followed by Orissa at about 50 per cent. The states of Punjab and

²⁷ CAPART (2000), (mimeograph)

²⁸ The Planning Commission estimates are reprinted in the India Rural Development Report (1999) of NIRD, Hyderabad.

²⁹ See Appendix 3.2 for the definition and estimation of poverty.

Table 3.8
Livelihood Access Indicators

Sl. No.	State	1 Percentage below poverty line	2 Real wage/day for male labour for agri work at 1970-71 prices (Rs.)	3 Percentage of population dependent on labour income	4 Daily Status Unemployment rate- per 1000 population	5 GDP Per capita Rs. at current prices (1995-96)
1	Andhra Pradesh	15.92	4.81	47.80	63.00	9274
2	Assam	45.01	5.02	30.50	78.00	6624
3	Bihar	58.21	4.51	38.50	60.00	3533
4	Gujarat	22.18	4.77	45.30	56.00	12914
5	Haryana	28.02	8.30	28.10	66.00	13573
6	Himachal Pradesh	30.34	7.05	14.50	17.00	8747
7	Karnataka	29.88	3.19	38.60	44.00	9359
8	Kerala	25.76	9.12	48.30	147.00	9004
9	Madhya Pradesh	40.64	4.24	35.60	26.00	6775
10	Maharashtra	37.93	5.15	47.50	43.00	15770
11	Orissa	49.72	3.80	27.40	69.00	6236
12	Punjab	11.95	8.38	33.30	27.00	16053
13	Rajasthan	26.46	4.69	23.80	11.00	7523
14	Tamil Nadu	32.48	4.15	53.30	122.00	10222
15	Uttar Pradesh	42.28	4.02	17.20	31.00	5872
16	West Bengal	40.80	6.53	39.80	91.00	8491
	Average	33.60	5.48	35.59	59.44	10103

Source : Col. 1-2, NIRD, India Rural Development Report, (1999)
Col. 3-4, NSSO, (Report No.409), Employment and Unemployment in India (1993-94)
Col. 5, Ministry of Finance, Economic Survey (1999-2000)

Andhra Pradesh recorded the lowest levels of poverty, of about 12 per cent and 16 per cent respectively.

A number of authors have explained levels of poverty in various states.³⁰ The states with diversified agriculture are relatively less poor. States with less than 25-30 per cent of population below the poverty line, as per the Planning Commission's estimate, had more production of animal foods and non-cereal crops. Kerala, Punjab, Andhra Pradesh, Haryana, Himachal Pradesh, Rajasthan, Karnataka and Gujarat seem to have diversified more into animal husbandry and non-cereal crops. Diversification of

agriculture provides more employment for agricultural labour in some states. Rural non-farm employment is also important for poverty alleviation. Only a combination of non-farm and on-farm diversification of economic activities seems to help in poverty alleviation. A number of authors have analysed the factors that explain poverty levels.³¹ Most agree that the agricultural prices and real income from employment are important; non-agricultural rural employment and government expenditure have also come out as important factors in various models of poverty. However, there are many competing models of

³⁰ See the poverty literature given in the [Appendix 3.2](#)

³¹ Tendulkar, S.D, et.al (1993,1996,1998), Sen, Abhijit (1997), Ravallion, Martin and Datt, Gaurav (1995)

poverty causation and resolution. Infrastructure, literacy, safety nets such as the Public Distribution System, wages and employment, have all been identified as factors that help to alleviate poverty.³²

3. 8 Calorie Intake and Poverty

It is logical to expect a positive and significant relationship between the level of poverty given by the head count ratio and the number of those consuming less than the minimum calorie norm. The larger the percentage of people below the poverty line, the larger should be the number of people consuming less than 1890 Kcal, this being the lowest level of consumption. Similarly, it is also logical to expect a negative correlation between the head count ratio of poverty and the calorie intake of the lowest deciles in various states. However, the data do not show any such relationship. The percentage of population consuming less than 1890 Kcal in the poorest states is not high. Bihar with 58.21 per cent of the population below the poverty line shows only 14.10 per cent consuming less than 1890 Kcal per consumer unit. In Orissa where 49.72 per cent of the population is below the poverty line, those consuming less than 1890 Kcal per consumer unit constitute only 10.40 per cent. In Uttar Pradesh, with 42 per cent below the poverty line, only 8 per cent consume less than 1890 Kcal. Similarly, states such as Kerala, Tamil Nadu and Gujarat, with relatively low levels of poverty ratios, show a relatively higher percentage of population (or at least matching levels) consuming less than 1890 Kcal per consumer unit per capita. These are also the states with an efficient Public Distribution System. A large network of Public Distribution System outlets, however, does not seem to have much of an impact on the calorie consumption of the lowest deciles.

An important observation in recent literature is that the head count ratio of poverty measured at present is income poverty, divorced from the underlying calorie intake norm

of 2400 Kcal. If the poverty line were to be redefined on the basis of calorie intake of 2400 Kcal in 1993-94, estimates of poverty would increase considerably.³³ The divergence is due to a number of factors connected with the methodology of estimation. Two factors are worth noting here.

(1) On an average, the divergence is due to the declining levels of calorie intake. This is mostly due to falling calorie intake among the more affluent sections, which is not compensated by improvement in the calorie intake of the lower deciles³⁴. The calorie requirement of 2400 Kcal per capita is based on the weighting diagram using the age, sex and activity composition of the population in 1982-83. When it is applied to the age, sex and activity adjusted calorie requirement per capita of 1993-94, it probably overestimates those consuming inadequate calories. The calorie norm of 2400 Kcal per capita is obviously too high for rural India as a whole given the population composition with more aged persons than before.

(2) Moreover, after 1973-74, the poverty line is inflated to other years using appropriate price indices. The changes in food basket or calorie intake are not considered in those years. Hence, the value of expenditure and its capacity to buy a certain amount of food with specific caloric value cannot be maintained.

The weakening of the statistical link of measurement need not mean that poverty is unrelated to food insecurity. The head count ratio of poverty is an important measure of the capacity of the people to face food insecurity and disasters. The capacity to eat a balanced diet to cope with food shortages during drought, get medical help and stay healthy has a lot to do with poverty levels. The income transfers affected by the state by way of subsidized food, safe drinking water, medical facilities and free education, improve real incomes and become important correlates of income poverty. Therefore, divergence of the poverty

³² Chaudhri, D.P. and Wilson, E.J. (2000), *Sen, Abhijit (1997)*.

³³ Palmer-Jones, Richard and Sen, Kunal (2001)

³⁴This is clear from the average calorie intake of various deciles from (1972-73) to (1993-94).

line from the calorie intake should not affect the linking of employment generating programmes such as the Integrated Rural Development Programme and the Jawahar Rozgar Yojana to income-poverty.

Furthermore, divergence of the measured poverty ratio from calorie intake does not mean that poverty is not related to calorie intake. In fact, the National Sample Survey data emphasize this point. The calorie intake of the lower expenditure groups is less than the calorie intake levels of the higher expenditure groups. It is obvious that the population belonging to the lowest expenditure deciles consumes much less than the others.

The other question is, how relevant is the poverty ratio for allocation of food grains in various states or even districts within the states for that matter. This is not an easy question to answer. At the policy level one has to be sure that a region with high levels of poverty is also faced with problems of chronic and transitory hunger. The need of the lowest deciles can often be transitory in nature. Given the findings that the calorie deficient population need not necessarily be located in the regions where the head count ratio of poverty is high, it is better to evolve alternative measures of chronic or transitory food insecurity. They could be based on other vulnerability factors such as casual labour, tribal population, nutritional guidelines such as calorie protein malnutrition etc.

3.9 Rural Employment and Population Dependent on Labour

Food access depends on access to income and regular employment. Considering that in recent years there has been 'casualisation' of labour,³⁵ and workers move between employment and unemployment on a daily basis, the best measure is the daily unemployment rate. ([Table 3.8](#) and [Map 3.4](#))

According to the National Sample Survey, the state unemployment rate varies from a high of 14.7 percent in Kerala and 12.2 per cent in Tamil Nadu to a low of about

1.1 per cent in Rajasthan. Daily status unemployment rate is not correlated with the head count ratio of poverty. This can happen for several reasons. Disguised unemployment, which is not captured even in daily status unemployment, is one of the reasons. The poor will take up whatever work they get. They cannot afford to remain unemployed, as they need to earn money that allows them to buy enough food for sustenance. Often a higher rate of unemployment exists among educated persons, rather than the illiterate rural poor. Sometimes when labour is exploited, the labourers are over-worked for small wages. Then there will be very little unemployment and widespread poverty. At the other extreme, when the labour is unionised as in Kerala, they push up the wage rates and hence the employers do not hire many labourers. While poverty is less due to better wages and safety nets provided by the government, enough work might not be available because of high wages as compared to other states leading to unemployment in states like Kerala. Unemployment also depends upon density of population and availability of agricultural and non-agricultural work. For example, in Tamil Nadu labour is not unionised, but a large percentage is landless. To get a comprehensive picture, we have to look at unemployment, wages and poverty together. While poverty is not significantly related to unemployment, the correlation coefficient of poverty with agricultural real wages is significantly negative at -0.708. When real wages are high, poverty tends to be low.

Rural non-farm employment is the key to poverty alleviation, particularly when traditional agriculture cannot absorb all the workers. As yield growth stagnates, labour absorption in agriculture declines. As a result, there is a shift towards non-farm employment. Normally non-agricultural employment pays higher wages than agricultural employment. This is one of the reasons why rural male workers go long distances to take up non-agricultural work, leaving agricultural work in the village to the women. Kerala tops the list with 46 per cent of the rural work force being

³⁵ Unni, Jeeemol (1997)

Table 3.9
Percentage of Non-agricultural Male Workers in Rural Workforce

Sl. No.	State	1	2
		1987-88	1993-94
1	Andhra Pradesh	25.90	24.40
2	Assam	NA	NA
3	Bihar	20.00	18.00
4	Gujarat	31.40	28.90
5	Haryana	29.10	39.10
6	Himachal Pradesh	31.30	34.20
7	Karnataka	20.40	21.20
8	Kerala	45.80	46.80
9	Madhya Pradesh	14.70	12.80
10	Maharashtra	24.20	24.70
11	Orissa	25.10	21.30
12	Punjab	31.20	31.90
13	Rajasthan	34.80	30.40
14	Tamil Nadu	34.80	36.00
15	Uttar Pradesh	21.10	23.70
16	West Bengal	27.80	35.30
	All India	25.50	25.90

Source: Col. 1-2, G Parthasarathy, Shameem & B Sambhi Reddy, 'Determinants of Rural Non-agricultural Employment: The Indian Case', IJAE, Vol.53, No.2, (1998)

engaged in non-agricultural occupations.³⁶ Haryana comes next with 39.1 per cent. Tamil Nadu, West Bengal, Himachal Pradesh, Punjab and Rajasthan show 30 to 36 per cent of rural population in non-agricultural occupations. The poorest states of Bihar and Madhya Pradesh show low levels of non-farm employment of less than 20 per cent of the rural population. Orissa has about 21 per cent of the rural population in non-farm occupations but the level of employment in 1993-94 was lower than that in 1987-88. (Table 3.9)

Thus, not only the volume of employment but also the qualities of employment and wage rates are important

for poverty alleviation. Casual employment leads to uncertain livelihoods whether it is within agriculture or outside agriculture. The higher the existence of casual employment, the larger will be the risk of being out of employment and the risk of transient food access and food insecurity. As discussed earlier, calorie intake is low not only among the landless but also among the marginal cultivators who own less than 0.4 hectares of land.³⁷ Many marginal cultivators depend upon casual labour as their main source of income. Hence, it is worthwhile to classify workers on the basis of the principal source of income rather than their ownership of land. National Sample Survey data give us information on the percentage of households and the percentage of population dependent upon labour as the main source of income. In Himachal Pradesh it is 14.5 per cent and in Uttar Pradesh it is 17.2 percent. Tamil Nadu has the largest number of persons dependent on labour income, followed by Kerala, Andhra Pradesh, Maharashtra and Gujarat. About 45 to 53 percent of the rural households in these states are dependent on labour income (Table 3.8 and Map 3.4).

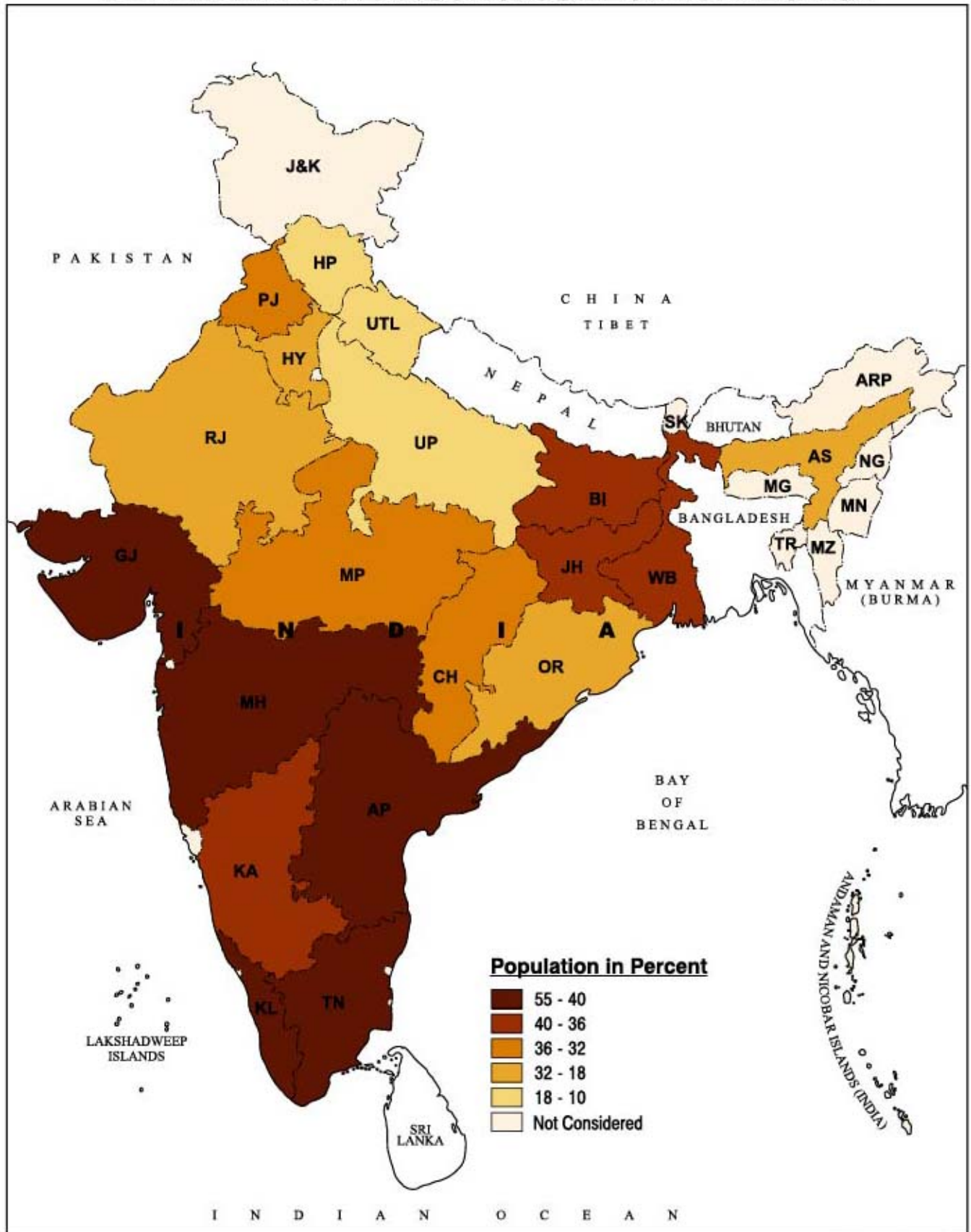
While rural poverty is not high in these states because of the prevalence of a large number of labour households, calorie intake of the lowest deciles is low. The correlation coefficient between calorie intake of the lowest deciles and the percentage of population dependent on labour is significant and negative. Similarly, the percentage of population consuming less than 1890 Kcal and the percentage of population dependent on labour income are correlated.

While the number dependent upon labour varies from 45 to 53 per cent, those consuming less than 1890 Kcal constitute around 30 per cent or less, even in the food deficit states such as Kerala, Tamil Nadu, Maharashtra and Gujarat. The final calorie intake appears to be a function of real wages, employment and the relative prices of food grains. Casual labour is an important factor for livelihood access. Those dependent on labour are adversely affected during disasters.

³⁶ Parthasarathy, *et. al.*, (1998)

³⁷ See Table 3.5

PERCENTAGE OF POPULATION DEPENDENT ON LABOUR INCOME IN RURAL INDIA



Map No. 3.4

3.10 Rural Infrastructure and Livelihood Access

The importance of rural infrastructure to livelihood access and food access cannot be overstated. Infrastructure consists of both hard infrastructure and soft infrastructure. Hard infrastructure refers to physical assets such as roads, transport system, water supply, electricity supply, irrigation facilities, storage facilities, market places for output as well as inputs to agriculture, etc. Soft infrastructure consists of marketing federations, marketing institutions, credit institutions, consumer protection agencies, farmers' organizations, commodity exchanges and a variety of organizations that facilitate the smooth movement of commodities and establish forward and backward linkages of the rural economy with the rest of the country. Due to

the paucity of comparative data, institutional factors and soft infrastructure have not been considered.

Hard infrastructure is a basic requirement of food access. Without roads, it is not possible to have movement of goods. Local produce has to first reach the markets and then the processing centres. Movement of inputs for crops and sale of crop and animal outputs will be better when a road network is established. Availability of work and non-agricultural employment also improve with better road links.

The next important item of infrastructure is electricity. Rural electrification helps the establishment of non-agricultural enterprises in the village, improves livelihood access and helps in irrigation. Availability of electricity in the households and in the village is necessary for overall

Table 3.10
Rural Infrastructure Indicators

Sl. No.	State	1	2	3	4
		Percentage of villages without electricity	Road length per 1000 persons (kms)	Percentage of HH without electricity	Percentage of HH without piped water
1	Andhra Pradesh	0.08	2.44	37.00	69.00
2	Assam	23.03	2.72	56.00	91.00
3	Bihar	29.15	0.93	90.00	96.00
4	Gujarat	0.56	1.97	28.00	40.00
5	Haryana	0.00	1.49	18.00	56.00
6	Himachal Pradesh	2.13	4.89	12.00	29.00
7	Karnataka	1.49	2.88	37.00	53.00
8	Kerala	0.00	4.65	39.00	83.00
9	Madhya Pradesh	5.63	2.65	49.00	89.00
10	Maharashtra	0.00	4.12	40.00	57.00
11	Orissa	30.14	7.54	81.00	76.00
12	Punjab	0.00	2.83	16.00	79.00
13	Rajasthan	11.44	2.56	51.00	72.00
14	Tamil Nadu	0.00	3.44	37.00	50.00
15	Uttar Pradesh	22.80	1.60	80.00	85.00
16	West Bengal	22.79	1.00	84.00	91.00
Average		9.33	2.98	47.19	69.75

Source : Col. 1, Ministry of Statistics and Programme Implementation, Compendium of Environment Statistics, (1999)

Col. 2, Ministry of Surface Transport, Basic Roads and Statistics of India, (1996-97)

Col. 3-4, Shariff, A., NCAER, India Human Development Report, (1999)

Table 3.11**Rural Infrastructure Index(Value-min/range)**

Sl. No.	State	1 Index of Percentage of villages without electricity	2 Index of Road length per 1000 persons	3 Index of Percentage of HH without electricity	4 Index of Percentage of HH without piped water	5 Rural Infrastructure Index (Percent)	6 Rank
1	Andhra Pradesh	0.00	0.77	0.32	0.60	42.30	8
2	Assam	0.76	0.73	0.56	0.93	74.60	4
3	Bihar	0.97	1.00	1.00	1.00	99.20	1
4	Gujarat	0.02	0.84	0.21	0.16	30.80	15
5	Haryana	0.00	0.92	0.08	0.40	34.90	12
6	Himachal Pradesh	0.07	0.40	0.00	0.00	11.80	16
7	Karnataka	0.05	0.71	0.32	0.36	35.80	11
8	Kerala	0.00	0.44	0.35	0.81	39.70	9
9	Madhya Pradesh	0.19	0.74	0.47	0.90	57.40	6
10	Maharashtra	0.00	0.52	0.36	0.42	32.40	13
11	Orissa	1.00	0.00	0.88	0.70	64.60	5
12	Punjab	0.00	0.71	0.05	0.75	37.70	10
13	Rajasthan	0.38	0.75	0.50	0.64	56.90	7
14	Tamil Nadu	0.00	0.62	0.32	0.31	31.40	14
15	Uttar Pradesh	0.76	0.90	0.87	0.84	84.10	3
16	West Bengal	0.76	0.99	0.92	0.93	89.90	2

development. Water supply is another important basic facility. Water is required not only for agriculture but also for households and non-agricultural enterprises. Further, the lack of piped water supply in the household or in the vicinity would require spending a long time in fetching water from long distances. Piped water reduces drudgery and improves the productivity of labour. Water is also required in non-agricultural enterprises and allied activities of agriculture such as livestock enterprises. A rural infrastructure index has been calculated for various states for comparison. (Tables 3.10 and 3.11 and Map 3.5)

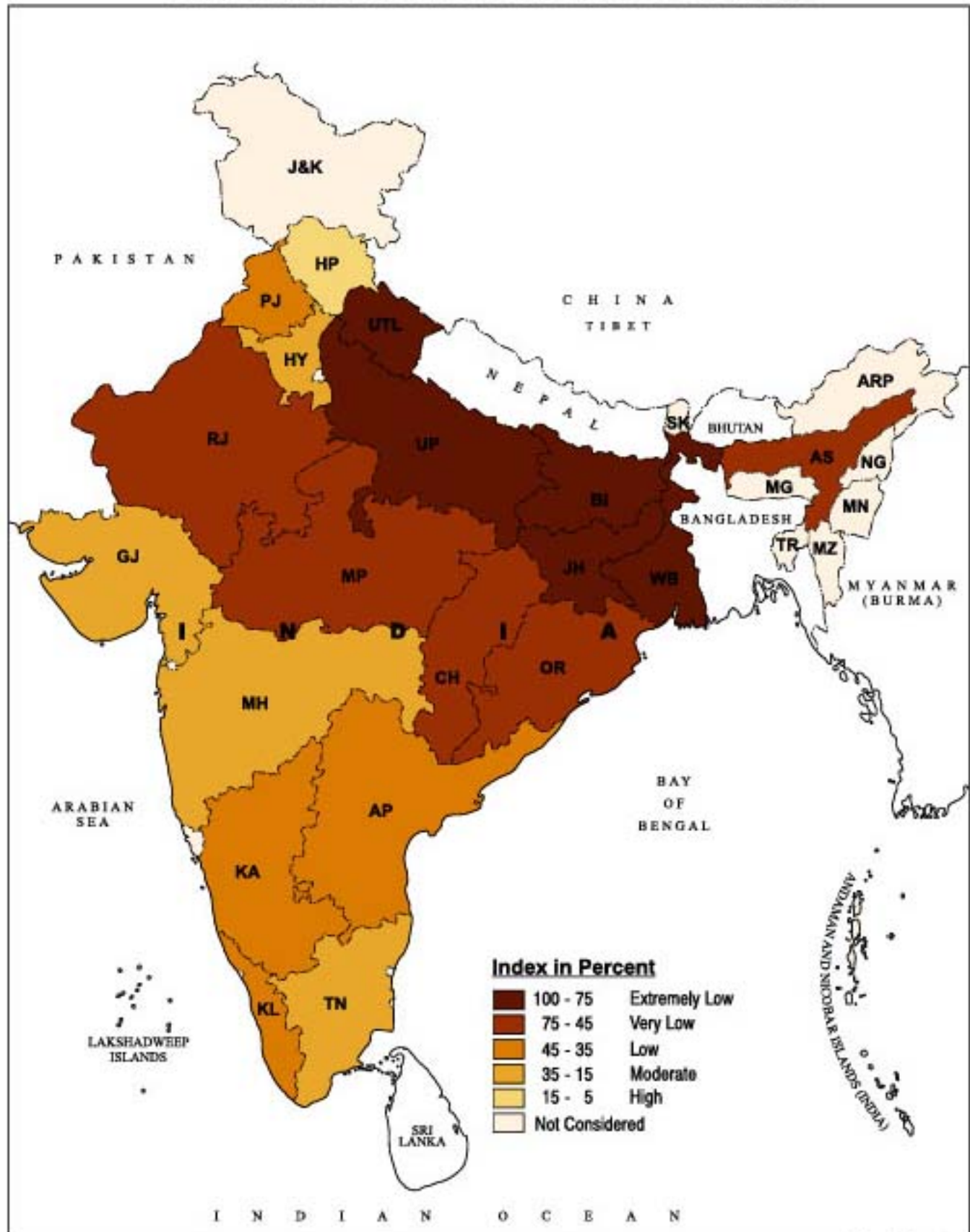
The Rural Infrastructure Index consists of the following four indicators:

1. Percentage of villages without electricity to the total villages in the state

2. Percentage of households without electricity to the total households
3. Percentage of households without piped water to the total households
4. Road length per thousand persons

It is not possible to improve livelihood opportunities without these amenities. The existence of these facilities and the statistics about their existence do not tell us anything about the quality of these facilities. For example, Orissa has the highest road length per capita in the country as per the statistics. To begin with, Orissa is sparsely populated, with a large forest area. Villages and hamlets are spread out across these forest areas. To reach these places one needs a better road network per person. Thus, even if all the villages are reachable by road, it will not tell us anything

RURAL INFRASTRUCTURE INDEX OF INDIA



Map No. 3.5

about the quality of the roads.³⁸ Similarly, there are alternative facilities, which are more effective but are not taken into consideration. For example, piped water supply in Kerala is not good, but private wells are common. Ground water is easily accessible. Water may be available within the premises of the household in many cases. This is not captured in the data.

Bihar is the state with the worst infrastructure facilities, followed by West Bengal, Uttar Pradesh, Assam and Orissa (Tables 3.10 and 3.11 and Map 3.5). The best states for infrastructure are Himachal Pradesh, Gujarat, Tamil Nadu and Maharashtra. Livelihood opportunities are facilitated by the infrastructure in these states. Food access and livelihood access are problems in the four states where infrastructure is not good.

The Index is able to capture the essential view that rural infrastructure is important for livelihood access. For example, the percentage of households using electricity is related to per capita animal food production (the coefficient of correlation being 0.649). Places with poor infrastructure experience problems of food availability in times of need, crisis and disaster. People remain poor with low purchasing power, due to a lack of livelihood opportunities and a lack of increased production opportunities.

3.11 Discrimination by Gender

Food access and livelihood access opportunities are not available equally to everybody. Prominent among the disadvantaged are women and the Scheduled Castes and Scheduled Tribes. They consume less than others. They also earn less. Many of them are illiterate. They face entry barriers to livelihoods, either because of prejudice or because of their social status. Access to food is not equal

for men and women. In many societies, cutting across social class, caste and community and ethnicity, gender discrimination of some sort or the other is prevalent. In this section the denial of the basic needs of women is considered.

Why do women not have access to food if they handle the food in the family? It is often said that there are no data to substantiate that women do not have access to food. NNMB data do not show any gender bias in intra-household distribution. However, there is also enough evidence to show that the gender discrimination prevailing in many spheres of life is translated into denial of access to adequate food.³⁹ Studies show that women are primarily responsible for providing food to the family. Mostly women collect food and fodder from forests and Common Property Resources. In a study of a village in West Bengal, rural women were found to be more capable than men, in describing the food that they collected from different sources.⁴⁰ They also collect supplementary food such as fruits, leaves, fish and raw food, which fulfil the food deficit in the household. Women also make decisions about what to cook. The National Family Health Survey Report indicates that 71.2 per cent of women in urban and rural India decide what items are to be cooked.⁴¹ They, however, eat only after they have fed the other members of the family.⁴² Such an eating order has been a deep-rooted practice in Indian culture.

The bias against females is a result of 'the intangible variable of culture and custom'.⁴³ Such cultural practices may have had their origins in economic factors, as men, being the livelihood earners, should be fed first. It results in preference for male members in food and healthcare allocation within a household. Children come next, being dependent and in need of care. The needs of the woman

³⁸ WFP-MSSRF (2000). In Orissa, though the road length is highest the survey has revealed that the roads are not all weather roads and the condition is not good. As a result it takes longer for people to commute, than expected.

³⁹ WFP-MSSRF (2000) study in Orissa and [WFP study in Madhya Pradesh](#) clearly indicate that there is discrimination in food distribution within the household.

⁴⁰ Mukherjee, Neela and Mukherjee, Amitabha (1994)

⁴¹ NFHS- 2 (1998-1999)

⁴² Joshi, Varsha (2000)

⁴³ Basu, Alaka, Malwode (1993)

herself are considered only in the end. The intra-household food insecurity becomes even more pronounced under conditions of poverty and when there is limited access to resources. There is considerable gender difference in food distribution within households. The factors that determine food access of women in a household are economic, social and cultural. For a woman, in a patriarchal society like India, her family members are a priority. A woman subordinates her needs to the requirements of the family; her family's social class, her economic position, her life course, and her socialization, condition her attitudes and behaviour.⁴⁴

In the economic sphere, the rights of women are limited. In the agricultural sector, they do not have the rights of ownership of land and draught and milch animals. Men own the productive assets such as tube-wells, tractors, bullock carts, generators etc. Except in matrilineal societies, land ownership patterns favour men. Land reform measures have ignored women's interests as co-owners or cultivators of land.

The rights of women are also not clear with regard to the collection of forest produce or over the use of Common Property Resources, in spite of the fact that women collect fuel, wood, fodder and minor forest produce from Common Property Resources. Further, Common Property Resources in rural and tribal regions are declining due to bio-physical stresses, making it all the more difficult for households dependent on them to procure secondary food items. The declining benefits from Common Property Resources have two effects on women. First, women have to walk longer distances to collect non-timber forest produce and fodder. Often they carry their children with them, which adds to their burden. Second, women and girl children are the worst sufferers of the decline in secondary sources of food, which is compounded by the anti-female bias prevalent in many

rural households.⁴⁵ Overburdening of women means that women require high-energy foods that many of them do not get. Lack of food because of depleting food accessibility and degrading environment, is reflected in under-nourishment among females in the poorest socio-economic groups. The above factors have no doubt influenced the overall food situation of the poor, but due to the particular role of women in food, water and fuel collection, their hardships are more. Their reduced share in the food available makes things worse.

Lack of access to better livelihoods is not only due to lack of land ownership, but also due to work status and wage earning capacity. Wages of women are less than that of men, both in agricultural and non-agricultural work. It is assumed that having an independent income would give greater autonomy to female workers with regard to nutrition, family planning services and healthcare facilities. From an entitlement perspective, female work participation will enhance women's entitlements and food security. Having greater control over resource allocation within the household would imply less food insecurity for women.

Female work participation rates and wage differentials elaborate their access to work and income. Work participation rates are based on the status of activity as usual principal activity and usual subsidiary activity.⁴⁶ The average work participation rates (usual and subsidiary status) for the country as a whole, for adult males and females in the age group of fifteen to fifty nine years are 83.2 per cent and 40.7 per cent respectively, revealing much lower work participation rates for women. The coefficient of variation of 2.9 per cent for males and 33.7 per cent for females indicates that there are wide variations in the usual and subsidiary status employment of women across states. The lowest female work participation rates are seen in Assam at 12 per cent, Haryana at 26 per cent, West

⁴⁴ Joshi, Varsha (2000)

⁴⁵ Jodha, N.S. (1995)

⁴⁶ Usual status activity is the work on which an individual had spent relatively longer time in the preceding six months. If a person had been either seeking work or was out of labour for most of the year, that person is a non-worker. If he had pursued some economic activity in a subsidiary capacity, that person is called a subsidiary worker.

Table 3.12**Work Participation Ratios of Adult Men and Women for all and Scheduled Castes and Scheduled Tribes**

Sl. No.	State	1	2	3	4	5
		SC & ST Men	All Men	SC & ST Women	All Women	Percentage of SC & ST Population (1991)
1	Andhra Pradesh	86.70	85.30	75.70	56.00	25.99
2	Assam	83.10	81.10	11.90	11.50	21.11
3	Bihar	84.40	82.30	37.30	30.50	23.45
4	Gujarat	87.10	85.40	60.40	43.30	27.94
5	Haryana	83.30	83.30	36.00	26.00	21.56
6	Himachal Pradesh	82.60	79.60	72.60	74.60	30.50
7	Karnataka	85.70	82.30	59.90	49.10	23.41
8	Kerala	77.70	76.70	59.70	40.90	12.43
9	Madhya Pradesh	89.50	86.80	56.90	47.30	43.62
10	Maharashtra	87.60	85.00	73.80	59.40	24.71
11	Orissa	90.30	84.40	49.40	36.40	41.02
12	Punjab	86.70	82.70	53.10	44.50	31.93
13	Rajasthan	86.90	83.20	52.40	46.00	33.36
14	Tamil Nadu	84.10	83.60	54.00	41.10	24.29
15	Uttar Pradesh	86.40	81.70	42.60	35.50	23.40
16	West Bengal	85.10	82.40	33.60	29.90	34.87
	All India	86.20	83.20	49.70	40.70	27.85

Source : Col. 1-4, Shariff, A. NCAER, India Human Development Report, (1999)

Col. 5, Registrar General and Census Commissioner, Census of India, (1991)

Bengal and Bihar at 30 per cent. The highest female work participation rates are found in Himachal Pradesh at 74.6 per cent, followed by Maharashtra at 59.4 per cent and Andhra Pradesh at 56 per cent. The range is between 35 per cent and 50 per cent in all the other states (Table 3.12).

The average Work Participation Rates for the country, for adult males and females in the Scheduled Castes and Scheduled Tribes as a group, are 86.2 per cent and 49.7 per cent respectively. Looking at the Work Participation Rates among females in the Scheduled Castes and Scheduled Tribes groups across states, one finds that work

participation is higher among the women of Scheduled Castes and Scheduled Tribes in all the states except Himachal Pradesh. Assam with 12 per cent, West Bengal with 34 per cent, Haryana with 36 per cent and Bihar with 38 per cent, have the lowest work participation rates among female Scheduled Castes and Scheduled Tribes. About 70 per cent of the Scheduled Castes and Scheduled Tribes women work in the states of Himachal Pradesh, Maharashtra and Andhra Pradesh (Table 3.12).

There are various possible explanations for the variations in female Work Participation Rates, across states

and social groups. In the southern states, more women participate in rice transplantation; in Himachal Pradesh, Rajasthan and Madhya Pradesh more men migrate to other states in search of work; hence, the female Work Participation Rates are relatively high.

The participation of women in work is determined by culture, status of the family, caste, class, religion and ethnicity. These reasons explain the wide intra-state variations in female participation in work. In the 'usual principal status' and 'usual and subsidiary status' for adults in the age groups of 15-59 years, there is a negative relationship between the income of the household and female participation rates. More females in the lower income groups participate in work. Their participation rate declines in the higher income groups. A larger number of women work as landless wage earners.⁴⁷

There has been some controversy about female participation in economic activity in self-employed households. All the work is attributed to the men in the household and the women's contribution to economic work is not recognized. This is because in such cases, the earnings are in the hands of the men and not in the hands of the women, although they contribute substantially to economic work.

Women's work is often under-reported or not reported as work at all. Female work, especially female domestic work, is invisible, as a woman's household work culturally and subjectively is not considered to be contributing to household income. There is a move in recent years to include women's contribution to work in the house, household enterprises and own farms. This would increase the work participation rates of women but these women will not have any access to income and assets and decision making in the household enterprise or family farm.

Therefore, while the contribution of women to economic activity has to be recognized, a distinction should

be made between paid work and unpaid work. This is a crucial factor for the food security and livelihood security of women. In recent years, there has been an attempt to value the housework done by women as a contribution to the economy (time-use survey, NSS). This, however, would not reveal their access to household assets and income.

Constrained work opportunities because of ecological, economic, cultural and social reasons reduce women's access to entitlements and resources like food and medical care within the household. Higher work participation of women is normally considered as a positive sign as it improves their access to food and medical care. Then again, the high work participation ratios of poor rural women and Scheduled Castes and Scheduled Tribes need not necessarily indicate empowerment and access to food and medical care. It may be an additional burden when combined with domestic work, child bearing and child rearing. Unless work participation or employment along with adequate incomes, increases their food access, it will not remove gender discrimination.

Male-Female Wage Differentials

Wage differentials exist in both agricultural and non-agricultural work — where men are paid more than women for the same work. Sometimes women are employed just because their labour is cheap. The All-India average agricultural wage rate per day for females is Rs.16.4, whereas for males it is Rs.23.4.⁴⁸ The states where female wages are less than the national average for females are Madhya Pradesh, Orissa, Maharashtra and Karnataka. Haryana pays the maximum wages to females (Rs.39.4). The states where the wage differentials are less are Haryana, West Bengal, Gujarat, Himachal Pradesh and Bihar. In non-agricultural work also, there is a difference in the wage rates for males and females (Rs.30.5 and Rs.18.7 respectively). An analysis of wages indicates that in spite of the Minimum Wages Act, women earn less than men. An earning capacity, which is less than that of men, has an

⁴⁷ Shariff, Abusaleh (1999)

⁴⁸ Shariff, Abusaleh (1999)

impact on the bargaining ability of women in the households. Gender divergence in agricultural and non-agricultural work and in real wage rates creates gender inequalities in the access to necessities within households.

3.12 Juvenile Sex Ratio

The juvenile sex ratio refers to the sex ratio of individuals aged zero to nine years. It is an outcome indicator of gender discrimination. Many authors argue that the juvenile sex ratio is a better indicator than the adult sex ratio for analysing gender discrimination. This is because juvenile sex ratio is said to be free from migration noise.⁴⁹ The population under the age of nine years normally lives with the parents, and sex distribution is not affected by any other factor, except death; whereas adult men and women in some states migrate unevenly, leaving more men or more women behind. Generally, men migrate, leaving the women behind, which gives an impression of more females to males as in Kerala. In parts of Madhya Pradesh, such as Jhabua, women migrate to Gujarat for higher wages in the lean season. When we consider a lower age group, there is no incidence of migration. Hence, the juvenile sex ratio reflects the birth and survival positions better than the adult sex ratio.

Among poor families, when there is not enough food for everybody to eat, women get less food. When the choice is to feed or give medical care to one of two infants, male babies are given priority. When the choice is to send a child to school or to work, boys go to school and girls go to work. When there is paucity of funds for medical care of the ailing, men get medical care and women are left to fight the disease on their own. This is not to say that all the females of the country are ill treated but that such occurrences are spread along the length and breadth of the country. The net result of such a neglect of women has a cumulative impact on the adult sex ratio being skewed in favour of men.

Left to nature and given equal care, women would outnumber men, as they are biologically the stronger sex. Typically, one would expect the sex ratio to be more than 1,000. In India, we find only 933 women for every 1,000 men. To reverse a natural phenomenon and to make it highly skewed, among other reasons requires deliberate neglect in food and health care access, which leads to more deaths of females than males.

Many would argue that food security has nothing to do with the sex ratio. In affluent states, it is argued, the sex ratio is adverse towards females due to prejudice and not through denial of food and medicine. But prejudice translates itself slowly into discrimination with respect to food and medical care.

The sex ratio can get skewed due to differential death rates of infants and children and high maternal mortality rates. In some isolated parts of the country, female infanticide increases the female infant mortality rates. In most parts of the country, the sex selectivity is much more subtle through discrimination in food and medical care. A new dimension is added to the problem of sex ratio by female foeticide. Advanced technology makes it possible to detect the sex of the unborn baby. To establish a causal relationship between the ultimate sex ratio and food insecurity, we need to show that the states with a higher number of deaths of female babies below the age of five have a skewed juvenile sex ratio. Wherever the maternal mortality rates are high in addition to the large deaths of female children, the adult sex ratio gets skewed.

Unfortunately, comparable data on death ratios of infants and children by sex are not available for each state. Further, there is a tendency of under-reporting of females and over-reporting of males in the lower age groups. Interstate migrations and refugee population from outside the country (particularly from Bangladesh and Sri Lanka) and reporting of wrong age, can cause distortions.⁵⁰

⁴⁹ Agnihotri, Satish (2000)

⁵⁰ Ranade, Sudarshan (2001)

Table 3.13
SexRatio and Juvenile (0-9) SexRatio

Sl. No.	State	1 Death ratio of female to male below 1	2 Death ratio of female to male 0-4	3 Sex ratio (number of females per 1000 males)	4 Juvenile Sex Ratio (0 - 9) (number of females per 1000 males)
1	Andhra Pradesh	NA	NA	977.1	981
2	Assam	1.07	1.15	933.8	978
3	Bihar	0.98	1.11	921.4	951
4	Gujarat	1.05	1.19	949.2	945
5	Haryana	1.00	1.28	863.9	881
6	Himachal Pradesh	0.95	1.07	990.4	961
7	Karnataka	1.08	1.12	973.3	977
8	Kerala	1.20	1.14	1037.3	967
9	Madhya Pradesh	0.89	1.00	943.2	963
10	Maharashtra	0.88	0.99	972.4	953
11	Orissa	0.99	0.99	988.0	975
12	Punjab	1.11	1.23	887.7	881
13	Rajasthan	1.30	1.32	918.9	919
14	Tamil Nadu	1.15	1.15	980.9	956
15	Uttar Pradesh	1.12	1.27	883.6	917
16	West Bengal	0.85	0.86	940.5	972
	All India	1.02	1.12	938.5	948.0

Source : Col. 1-2, Census of India, Sample Registration Surveys, (1997)

Col. 3-4, Census of India, (1991)

Supporting an argument with census-related figures, in a chronological manner, age group to age group and from one period to another is neither possible nor advisable, given the distortions mentioned above.

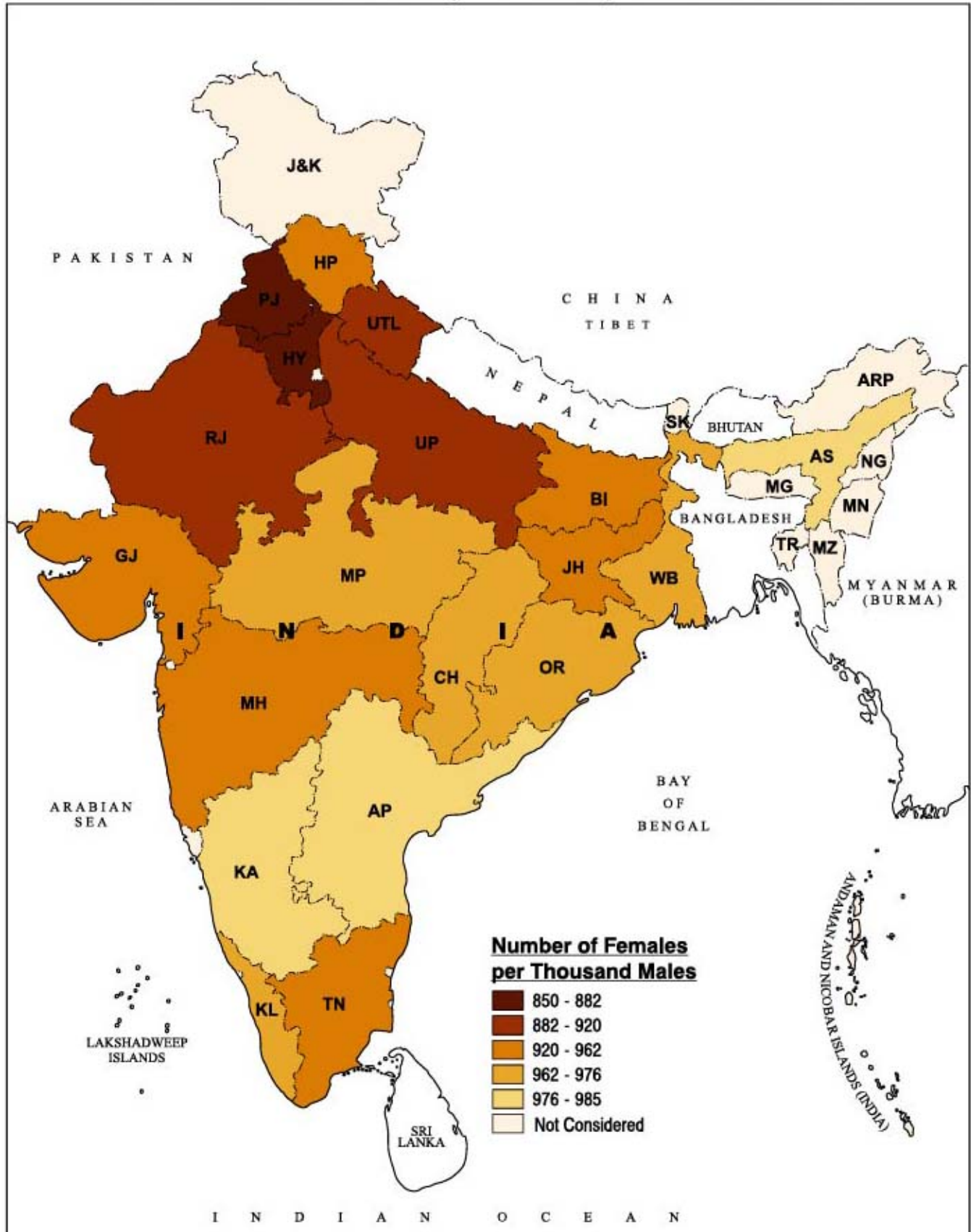
All the same, the evidence of death rate⁵¹ differentials by sex for infants and children below four showed a bias against females in the 1997 Sample Registration Survey data. We also looked at the data of the 1991 census, to see if the states in which the deaths of female infants and children under four were high in 1997 are those very states

in which the sex ratio was skewed in 1991 ([Table 3.13](#) and [Map 3.6](#))

The data show that in at least the four states of Punjab, Uttar Pradesh, Haryana and Rajasthan, where the sex ratios reported in 1991 were only 887, 884, 864 and 919 respectively, there were more deaths of female children compared to male children in the year 1997. This only points to the indicated bias against females in states where the sex ratio was very low in 1991. Rajasthan has shown the maximum imbalance of 30 to 32 per cent more female

⁵¹ Death rate is defined as number of deaths per thousand populations; whereas mortality rate measures the number of deaths per thousand live births.

JUVENILE SEX RATIO (0 - 9 Years) IN RURAL INDIA



Map No. 3.6

deaths than male deaths in 1997 for both infants and children below four years of age. The juvenile (0-9) sex ratio and the sex ratio of Rajasthan in 1991 were about 920 per 1,000. Rajasthan was fourth among the states having the worst sex ratios in 1991. The states of Haryana, Uttar Pradesh and Punjab indicated about 23 to 28 per cent more deaths of female children than male children, of less than four years. Even infant deaths (below one year) were higher in the states of Punjab and Uttar Pradesh by about 11 to 12 per cent in 1997. The 2001 Census has shown a further deterioration of the sex ratio in the age group 0-6 in all these states.⁵² The deaths of female infants were 30% higher than male deaths in Rajasthan. Female deaths are higher by 20% in Kerala over male deaths. Tamil Nadu also showed a 15 per cent higher death rate for female infants. All the states except Maharashtra, Orissa, Madhya Pradesh and West Bengal have shown higher deaths of females when compared to males. Contrary to the belief that in Kerala there is no bias against females, the data show that not only are the female infant and child death ratios higher by 20 and 14 per cent respectively, even the juvenile sex ratio (age group of 0-9) in 1991 was 970 which is much worse than that of Karnataka, Andhra Pradesh, Assam, Orissa and West Bengal. The higher sex ratio of females to males in the population of Kerala is no doubt due to the migration of men to the Gulf leaving their families behind. If we look at the juvenile sex ratios in 1991 and in 2001, none of the states have a sex ratio favouring girls.

Further, an important observation has been that in 1991 the juvenile sex ratios were better than adult sex ratios in many states except in Kerala, Himachal Pradesh, Maharashtra and Orissa. Worsening of the adult sex ratios in 1991 could have been due to high maternal mortality rates in the previous years. If the number of maternal deaths

has fallen, there should be an improvement in the adult sex ratio. The provisional population totals for 2001 released by the Census Commissioner indicate a slight improvement in the sex ratio.⁵³ Since female deaths are high among children in states with a lower number of females than males, it is indicative of the fact that there could be a neglect in feeding and health care of the female babies and female children under four, leading to their eventual death.

Infanticide

Though we do not have any data on sex at birth to prove foeticide, or data on children killed deliberately in infancy to prove infanticide, there is ample evidence of both, in various parts of the country. According to reports by Pranab Bardhan,⁵⁴ female infanticide still exists in parts of Rajasthan, Bihar, Uttar Pradesh and West Bengal. It existed among the Toda tribe of Tamil Nadu and has been reported from Usilampatti taluka in the past two decades where the 'Kallar' population is largely predominant. Among the Kallars, nearly 70 per cent of the children below the age of ten are boys.⁵⁵ Nearly 6000 female babies were killed in Usilampatti itself during the decade ending 1986.⁵⁶

Female infanticide and foeticide have caused widespread concern in all sections of society. Infanticide is a fatal form of child abuse. Besides this, neglect, sustained nutritional deprivation and delayed healthcare for female infants and female children, lead to female deaths. Such instances remain largely unrecorded.

The media has played a key role in highlighting female infanticide as a contemporary problem in India. But it has also led to a negative impact by lending support to certain misguided views that the community indulging in it is basically violent by nature and, therefore, impervious to legal restrictions or societal controls.

⁵² NSSO, 50th round, Report No. 422, (1993-94)

⁵³ Ramanujam, M.S. (2000).

⁵⁴ NSSO, 50th round, Report No. 422 (1993-94)

⁵⁵ NSSO, 50th round, Report No. 422 (1993-94)

⁵⁶ WFP-MSSRF (2000)

Foeticide and Sex Selective Abortion

The Prenatal Diagnostic Techniques (prevention and misuse) Act of 1994 came into effect in 1996. Genetic sex determination tests were made illegal. However, the act has had no impact on the conduct of such tests and selective abortions. The law also makes the registration of ultrasound equipment compulsory. Yet, a large number of ultrasound equipment is in use without registration. Foeticide can be detected by looking at the sex at birth. Information on 'at birth sex ratio' can be computed from hospital data. Systematic information is not available state-wise or for all the districts, but isolated district-wise data from some states prove the prevalence of foeticide.⁵⁷ District health surveys conducted by the Government of Tamil Nadu give us information on the sex ratio at birth. The data reveal that infanticide prone areas such as Salem and Dharmapuri, as well as prosperous areas such as Thanjavur, Kanyakumari and Coimbatore, show a highly skewed sex ratio at birth. Sex ratio at birth of 839 per thousand in Salem district, 876 in Periyar district, 883 in Thanjavur, 890 in Coimbatore, and 893 in Dharmapuri district, are all below the state average of 929 females per thousand males.

3.13 Female Literacy

Female literacy is the first step towards empowerment and thus, has intrinsic value.⁵⁸ It gives self-confidence and reduces dependency on others, improves the numerical knowledge required for transactions and the ability to interact better. Often it helps in getting better deals in the purchase of food and selling of produce or their own labour. Second, it helps women to get better paid semi-skilled jobs, as against manual work. It helps women to adopt technology and start an enterprise when the opportunity arises. It helps them to approach banks for

loans, keep accounts and manage enterprises.⁵⁹ Third, literacy and education facilitate and increase the awareness of social needs and encourages public discussion and collective action in the common interest.⁶⁰ Fourth, it helps women to resist oppression both at home and in the workplace. It helps them to protect their interests in legal matters of land and assets and acts as a defence against exploitation. It broadens their horizon and enables them to fight for distributive justice. Fifth, female literacy improves knowledge of nutrition and medical facilities, enabling them to look after their children better. A fall in child mortality rates is inversely related to female literacy. Finally, the process of education can help a girl child to escape the drudgery of child labour both at home and outside. School enrolment enables a child to spend time as a child and not as an adult.⁶¹

The states with the lowest female literacy in rural India are Rajasthan and Bihar at 11.6 and 17.9 per cent respectively, followed by Uttar Pradesh with 19 per cent and Madhya Pradesh with 19.7 per cent. Kerala is way ahead in female literacy at 85 per cent. The states of Himachal Pradesh, Punjab, Maharashtra and Tamil Nadu have achieved literacy levels of 41 to 49 per cent. The states of West Bengal, Assam and Gujarat have female literacy levels of about 38-39 per cent. Karnataka, Haryana and Orissa show rural female literacy levels of about 30-35 per cent. Female literacy levels are low in Andhra Pradesh at about 24 per cent. ([Table 3.14](#) and [Map 3.7](#))

The National Sample Survey of 1993-94 gives us information about school attendance and percentage of dropout children in the age group of five to fourteen. The data show that school attendance is the lowest for girls at 31 per cent in Rajasthan, 39 per cent in Bihar, 44 per cent in Madhya Pradesh and 45 per cent in Uttar

⁵⁷ MSSRF (2000)

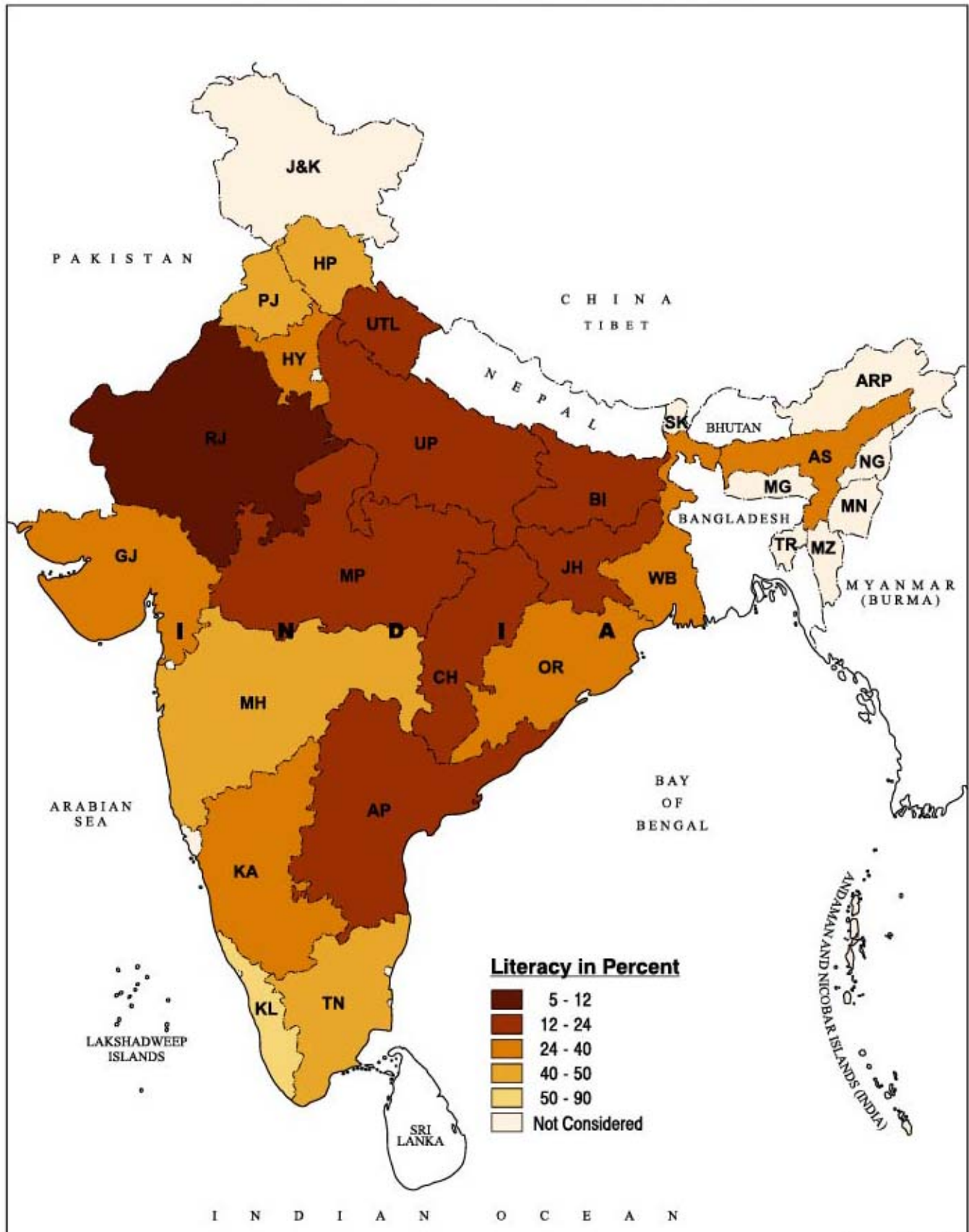
⁵⁸ See Dreze, Jene and Sen, A.K. (1999) for a detailed discussion of female education in India, and the five important roles of literacy.

⁵⁹ Higher percentage of literacy facilitated adoption of technology by women in Pondicherry bio-village programmes.

⁶⁰ The success of the women's self help groups in raising of micro credit is a case in point.

⁶¹ In micro studies in Orissa, we found that girls are made to work, while boys are allowed to either go to school or laze around. Hence, the discrimination is not only in food distribution but also in work distribution.

FEMALE LITERACY IN RURAL INDIA



Map No. 3.7

Table 3.14**Literacy**

Sl. No.	States	1	2	Percentage of children in the school going ages (5 -14 yrs)								
		Percentage of adult literacy (1991 census)	Percentage of female literacy (1991 census)	Attending school			Dropped out from school			Never attended school		
				Male	Female	Both	Male	Female	Both	Male	Female	Both
1	Andhra Pradesh	35.70	23.90	68	51	59	27	43	35	5	7	6
2	Assam	49.30	39.20	76	73	74	21	23	22	3	4	4
3	Bihar	33.80	17.90	58	39	50	37	56	45	5	5	5
4	Gujarat	53.10	38.60	76	61	69	20	36	28	4	3	4
5	Haryana	49.90	32.50	80	66	74	18	32	24	2	2	2
6	Himachal Pradesh	61.90	49.80	90	82	86	7	15	11	2	3	3
7	Karnataka	47.70	34.80	73	62	68	24	34	29	3	3	3
8	Kerala	88.90	85.10	93	94	93	4	3	3	4	3	4
9	Madhya Pradesh	35.90	19.70	61	44	54	37	54	45	2	2	2
10	Maharashtra	55.50	41.00	83	73	78	14	23	18	3	4	4
11	Orissa	45.50	30.80	67	54	61	30	43	36	3	3	3
12	Punjab	52.80	43.90	80	73	77	19	25	22	2	2	2
13	Rajasthan	30.40	11.60	68	31	52	25	61	42	7	7	7
14	Tamil Nadu	54.60	41.80	83	74	78	13	21	17	4	5	5
15	Uttar Pradesh	36.70	19.00	67	45	57	31	53	41	2	3	3
16	West Bengal	50.50	38.10	69	61	65	29	36	33	2	3	2
	All India	44.70	30.60	70	55	63	26	41	33	3	4	4

Source : Col. 1-2, Registrar General and Census Commissioner, Census of India (1991)

Col 3-11 NSSO, Sarvekshana, Vol XX, No.2, 73rd Issue (1997)

Pradesh. School dropout percentage is very high for girls at 61 to 54 per cent in these states. The differentials in school dropouts between boys and girls are the highest in Rajasthan. Literacy and school dropouts, especially for girls are negatively correlated, the correlation coefficient being -0.927. Female literacy shows significant positive correlation with school attendance of children at 0.85. Female literacy has significant negative correlation with child mortality rates at -0.809, across the states.

There is no relationship between female literacy and the juvenile sex ratio since prejudice against the female child exists even in the literate parts of the country such as Punjab. Further, work participation ratios are not correlated, but the wage ratios are influenced by female literacy. Stunting and underweight are also not directly related to female literacy across the states.

This by itself does not mean that literacy has no impact on these issues. At every level of literacy and development the social values change. The impact would definitely be felt after literacy, education and awareness reach a certain level. Female literacy is only a beginning. When it translates itself into education and higher levels of freedom for women, the impact will undoubtedly be felt.

3.14 Discrimination by Caste

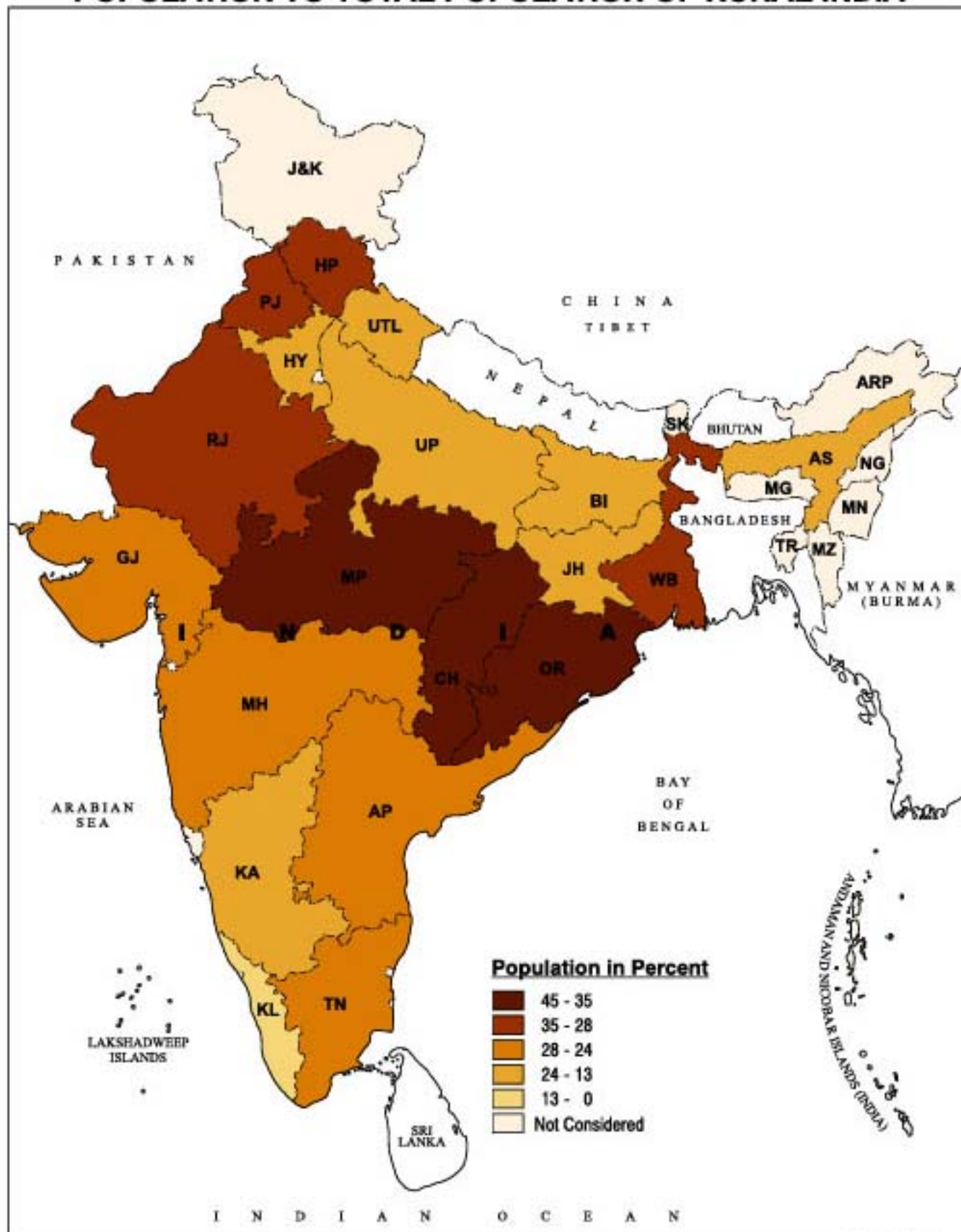
Certain sections of the population are deprived of food access and livelihood access due to their disadvantaged position as a Scheduled Caste or Scheduled Tribe. They constitute a high percentage of the lower expenditure groups. Among the rural population, the concentration of Scheduled Castes and Scheduled Tribes is the highest in Madhya Pradesh and Orissa. They constitute about 44 per cent of the rural population in Madhya Pradesh and about 41 per cent of the rural population in Orissa. Kerala has the lowest percentage of the rural population belonging to Scheduled Castes and Scheduled Tribes. They constitute only 12 per cent of the rural population in Kerala. In all the other states, they constitute about 20 to 36 per cent of the population in the rural areas ([Table 3.12 Column 5](#) and [Map 3.8](#))

Most of the persons belonging to Scheduled Castes and Scheduled Tribes are in the lower expenditure groups. About 30 per cent of the total rural population belongs to the lowest expenditure class of less than Rs.190 per capita per month. As per the National Sample Survey, in the rural areas, 44 per cent of the Scheduled Tribe population and about 40 per cent of the Scheduled Caste population were in the lower expenditure groups below Rs.190, in the year 1993-94.

Particularly in the states of Orissa, Bihar and Madhya Pradesh, Scheduled Tribes are significantly below the poverty line. In Orissa, 69.6 per cent of the Scheduled Tribe population is in the expenditure group below Rs.190 ([see Table 3.15 and Map 3.8](#)). In Bihar, 60 per cent of the Scheduled Tribe population is in this expenditure group. In Madhya Pradesh, 55 per cent of the Scheduled Tribe population is in the same expenditure class. In Andhra Pradesh, Haryana, Maharashtra and Tamil Nadu, approximately 40 to 50 per cent of the persons belonging to Scheduled Castes are in the monthly expenditure classes below Rs.190. In some states such as Himachal Pradesh, Assam, Punjab, Kerala, Gujarat, Rajasthan and Uttar Pradesh, most of the Scheduled Tribe population are better off as compared to those in the states of Orissa, Bihar and Madhya Pradesh. However, even when their percentage in lower expenditure classes is less, in some of the states such as Gujarat and Rajasthan, the deprivation and vulnerability of Scheduled Tribes in the extremely low expenditure class of less than Rs.140 per capita per month are likely to be severe. Vulnerability of these populations is higher in disaster prone states such as Gujarat and Rajasthan.

The Scheduled Caste population in the lower expenditure groups is the highest in the states of Bihar, Maharashtra, Uttar Pradesh, Karnataka, Orissa, Madhya Pradesh, Andhra Pradesh and Tamil Nadu. In all these states, except in Bihar, about 40 to 49 per cent of the Scheduled Caste population belongs to the lower per capita expenditure class, spending less than Rs.190. The major occupation of the Scheduled Caste population is labour. Although some of them belong to the category of small

PERCENTAGE OF SCHEDULED CASTE AND SCHEDULED TRIBE POPULATION TO TOTAL POPULATION OF RURAL INDIA



Map No. 3.8

Table 3.15
Percentage Distribution of ST and SC Population in the MPCE* class below Rs.190
(1993-94)

Sl. No	State	1	2	3	4	5	6
		Scheduled Tribes		Scheduled Caste		All Castes	
		Below Rs.190	Above Rs.190	Below Rs.190	Above Rs.190	Below Rs.190	Above Rs.190
1	Andhra Pradesh	40.50	59.50	42.30	57.70	28.40	71.60
2	Assam	12.90	87.10	18.00	82.00	20.50	79.50
3	Bihar	60.30	39.70	60.30	39.70	47.00	53.00
4	Gujarat	25.90	74.10	27.60	72.40	17.80	82.20
5	Haryana	41.50	58.50	23.10	76.90	12.40	87.60
6	Himachal Pradesh	28.60	71.40	18.00	82.00	11.90	88.10
9	Madhya Pradesh	55.30	44.70	44.20	55.80	39.30	60.70
10	Maharashtra	47.90	52.10	49.70	50.30	36.10	63.90
11	Orissa	69.60	30.40	46.70	53.30	47.60	52.40
12	Punjab	22.00	78.00	7.90	92.10	4.40	95.60
13	Rajasthan	30.80	69.20	25.50	74.50	16.50	83.50
14	Tamil Nadu	41.70	58.30	41.10	58.90	29.60	70.40
15	Uttar Pradesh	30.80	69.20	48.80	51.20	32.70	67.30
16	West Bengal	37.50	62.50	28.10	71.90	25.00	75.00
	All India	44.10	55.90	40.30	59.70	30.20	69.80

*MPCE : Monthly Per Capita Expenditure

Source: Col. 1-6, NSSO, 50th Round, (Report No.422), Differences in Level of Consumption among Socio-economic Groups-(1993-94).

and marginal cultivators, their economic conditions are as bad as that of the landless groups. In Orissa and Madhya Pradesh, there are many poverty groups possessing land.⁶²

Some micro studies conducted in Gujarat, Andhra Pradesh and Madhya Pradesh for Scheduled Tribes, show that the consumption level of tribal populations is very low and is below the recommended level of intake.⁶³ Staple foods such as cereals are also not consumed in adequate quantities. The calorie intake was as low as 987 Kcal per capita per day in Khammam district of Andhra Pradesh and as high of 1833 Kcal per capita per day was reported

in Vadodara district of Gujarat. The calorie consumption was 1517 Kcal per capita per day in Bastar, 1440 Kcal per capita per day in Jhabua and 1259 Kcal per capita per day in Mandla districts of Madhya Pradesh. Food grains included millets and pulses and higher nutrient grains than wheat and rice, but these are of little consequence when the total energy intake is deficient.

The studies found a significant shift in the occupation of Scheduled Tribes away from forest products. Their present occupation is mostly wage labour and a considerable percentage of the tribal population in the study area is

⁶² NSSO, 50th round, Report No. 422, (1993-94)

⁶³ Ramanujam, M.S. (2000).

engaged in the cultivation of land. In all the states studied, nearly 50 per cent of the tribal population is engaged in cultivation. Only in Jhabua and Bastar districts of Madhya Pradesh, about 30 per cent of the tribal population earns their livelihoods from the collection of minor forest products.

Scheduled Castes and Scheduled Tribes are relatively disadvantaged in terms of assets, education, incomes, land ownership and operation, when compared to other castes. One third of the labour households in the country belong to Scheduled Castes. Only in the agriculturally prosperous areas of the country are the Scheduled Caste labour households not worse off than the other labour households. However, the Scheduled Tribe population faces hardships, particularly in the poorer states.⁶⁴

The Scheduled Tribe population lives mostly in forest areas. Historically, they have been poor and backward and have lived on subsistence nutrition. Extreme poverty is common among them, no matter whether they belong to the occupational group of cultivators or labour households. The cultivators belonging to Scheduled Tribes are poorer than those dependent on agricultural and non-agricultural labour.⁶⁵ They live mostly in forest areas and depend on rain-fed agriculture. Some of their agricultural practices such as shifting cultivation, particularly in Assam and parts of Orissa,⁶⁶ not only undermine their present ability to produce food but damage future chances of producing enough to eat. Shifting cultivation consists of clearing the forests by felling the trees, burning the stubs and using the land for cultivation for a short period of a few seasons. Then they shift their residence to another part of the state and clear the forests and start cultivating. With shifting cultivation, they cannot hope to ever produce enough, as the assets and irrigation facilities can never be built on a permanent basis.

Second, in the process they permanently damage the forests, which provide them with livelihood and food for most of the year even when they are not cultivating. Despite the efforts of the government to discourage such practices, the problem persists in Orissa as well as in Assam. The reason for the persistence of this practice of shifting cultivation is the interference of vested interests, which encourage the tribal population to clear forests so that they can benefit from the available timber. The decline in non-timber forest produce, which was traditionally traded by Scheduled Tribes living in forest areas, is another cause of poverty and lack of food access.

Some of the areas in which Scheduled Tribe populations live are inaccessible, particularly in the states of Orissa and Madhya Pradesh. Scheduled Tribes have historically depended upon natural forest products for food in the seasons when crops could not be cultivated.⁶⁷ Their conditions have worsened with the depletion and degradation of forests. Traditional sources of free food are no longer available. Purchased foods are neither available nor affordable for them. Hence malnutrition and starvation occur during droughts.

3.15 The Food Access Map of Rural India

The cumulative index of food access is based on eight variables that represent the deprivations as discussed in the previous sections of the chapter. The selected indicators of livelihood access and food access are given below ([Table 3.16](#) and [3.17](#)).

1. Average per consumer unit per day calorie intake (Kcal) of the lowest deciles
2. Percentage of population consuming less than 1890 Kcal per consumer unit per day
3. Percentage of population below the poverty line

⁶⁴ NSSO, 50th round, Report No. 422 (1993-94)

⁶⁵ NSSO, 50th round, Report No. 422 (1993-94)

⁶⁶ WFP-MSSRF (2000)

⁶⁷ WFP-MSSRF (2000) Orissa study shows that varieties of products are still being consumed by the tribal people, though their availability is declining.

Table 3.16
Indicators of Food Access Situation in India*

		1	2	3	4	5	6	7	8								
Sl. No.	State	Calorie intake of the lowest decile (Kcal) per cu/day (1993-94)	Rank	Percentage of population consuming <1890 Kcal (1993-94)	Rank	Percentage of population below poverty line (1993-94)	Rank	Percentage of population dependent on labour income (1993-94)	Rank	Rural Infrastructure Index	Rank	Juvenile Sex Ratio (Females per thousand males) (1991)	Rank	Percentage of Female Literacy (1991)	Rank	Percentage of SC & ST Population (1991)	Rank
1	Andhra Pradesh	1858.39	8	14.10	6	15.92	15	47.80	3	42.30	8	981	16	23.90	5	25.99	8
2	Assam	1842.48	7	13.30	8	45.01	3	30.50	11	74.60	4	978	15	39.20	11	21.11	15
3	Bihar	1790.88	5	14.10	6	58.21	1	38.50	8	99.20	1	951	6	17.90	2	23.45	11
4	Gujarat	1788.34	4	20.40	4	22.18	14	45.30	5	30.80	15	945	5	38.60	10	27.94	7
5	Haryana	2022.33	12	8.70	11	28.02	11	28.10	12	34.90	12	881	1	32.50	7	21.56	14
6	Himachal Pradesh	2170.65	15	5.30	15	30.34	9	14.50	16	11.80	16	961	9	49.80	15	30.5	6
7	Karnataka	1803.85	6	17.40	5	29.88	10	38.60	7	35.80	11	977	14	34.80	8	23.41	12
8	Kerala	1556.33	2	23.70	2	25.76	13	48.30	2	39.70	9	967	11	85.10	16	12.43	16
9	Madhya Pradesh	1894.03	9	12.20	9	40.64	6	35.60	9	57.40	6	963	10	19.70	4	43.62	1
10	Maharashtra	1747.75	3	21.90	3	37.93	7	47.50	4	32.40	13	953	7	41.00	12	24.71	9
11	Orissa	1918.96	10	10.40	10	49.72	2	27.40	13	64.60	5	975	13	30.80	6	41.02	2
12	Punjab	2116.48	14	6.30	14	11.95	16	33.30	10	37.70	10	881	1	43.90	14	31.93	5
13	Rajasthan	2249.85	16	4.20	16	26.46	12	23.80	14	56.90	7	919	4	11.60	1	33.36	4
15	Uttar Pradesh	2103.15	13	8.00	12	42.28	4	17.20	15	84.10	3	917	3	19.00	3	23.4	13
16	West Bengal	2012.57	11	7.40	13	40.80	5	39.80	6	89.90	2	972	12	38.10	9	34.87	3

* Refer Appendix 5.1 for sources of data.

Table 3.17

Mapping Index of Food Access

Sl. No.	State	Indicators								Cumulative Rank	Mapping Index	Mapping Rank	Mapping Typology
		1	2	3	4	5	6	7	8				
1	Andhra Pradesh	8	6	15	3	8	16	5	8	69	8.63	9	3
2	Assam	7	8	3	11	4	15	11	15	74	9.25	12	4
3	Bihar	5	6	1	8	1	6	2	11	40	5.00	1	1
4	Gujarat	4	4	14	5	15	5	10	7	64	8.00	7	3
5	Haryana	12	11	11	12	12	1	7	14	80	10.00	14	4
6	Himachal Pradesh	15	15	9	16	16	9	15	6	101	12.63	16	5
7	Karnataka	6	5	10	7	11	14	8	12	73	9.13	11	4
8	Kerala	2	2	13	2	9	11	16	16	71	8.88	10	3
9	Madhya Pradesh	9	9	6	9	6	10	4	1	54	6.75	2	2
10	Maharashtra	3	3	7	4	13	7	12	9	58	7.25	4	2
11	Orissa	10	10	2	13	5	13	6	2	61	7.63	5	2
12	Punjab	14	14	16	10	10	1	14	5	84	10.50	15	4
13	Rajasthan	16	16	12	14	7	4	1	4	74	9.25	12	4
14	Tamil Nadu	1	1	8	1	14	8	13	10	56	7.00	3	2
15	Uttar Pradesh	13	12	4	15	3	3	3	13	66	8.25	8	3
16	West Bengal	11	13	5	6	2	12	9	3	61	7.63	5	2

Mapping Index

- 0- 5.5
- 5.5 - 7.8
- 7.8 - 9.0
- 9.0 - 11.2
- 11.2 - 12.8

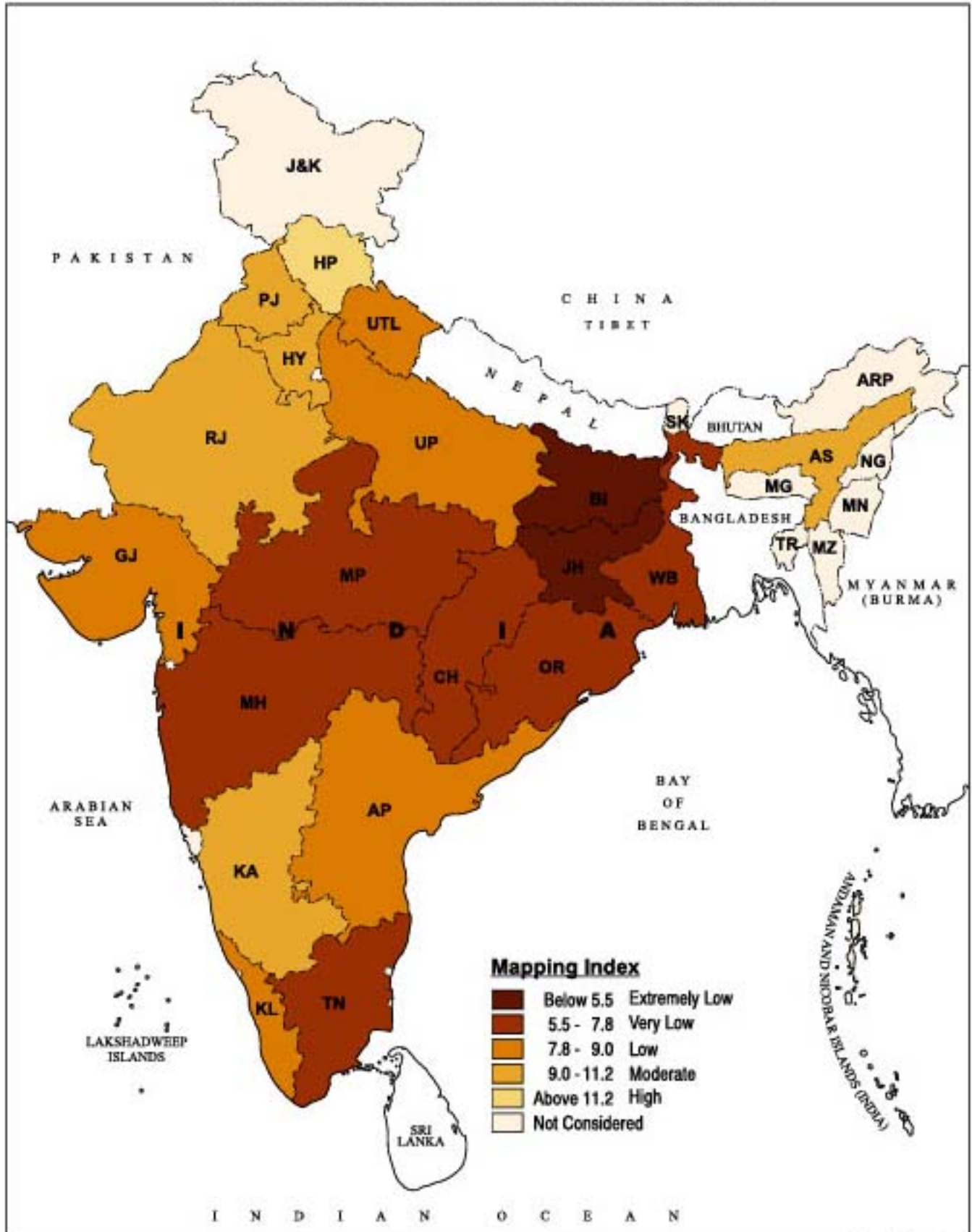
Mapping Typology

- 1 - Extremely Low
- 2 - Very Low
- 3 - Low
- 4 - Moderate
- 5 - High

States

- BH
- MP, TN, MH, OR, WB
- GJ, UP, AP, KL
- KN, AS, RJ, HY, PJ
- HP

FOOD ACCESS MAP OF RURAL INDIA



Map No. 3.9

4. Percentage of persons in labour households to the total population
5. Rural Infrastructure Index
6. Juvenile sex ratio (Females per thousand males in 0-9 years)
7. Percentage of literate females to total female population
8. Percentage of Scheduled Caste and Scheduled Tribe population to total population

The cumulative mapping index denoting food access ranks all the indicators as per the level of food insecurity. Adding up the ranks, gives the cumulative ranking position of the states. This is divided by the number of indicators, in this case eight, to make the index uniform for all the composite maps. The ranks of various indicators chosen varied between one and sixteen. Rank 1 symbolizes maximum food insecurity or the worst possible position. Rank 16 indicates the best possible position. The cumulative index could thus vary between a minimum of 8 and a maximum of 128. The lowest cumulative rank represents the state where the people have least access to food. The Food Access Map of Rural India shows that the state with extremely poor food access is Bihar, with a cumulative index of 40 and showing a relatively bad position with respect to most indicators. Himachal Pradesh comes out as a state with good food access and the best among all the states, with a cumulative rank of 101. Punjab is the next best state for food access. Other relatively food insecure states from the point of view of livelihood access are Madhya Pradesh and Tamil Nadu. Tamil Nadu turns out to be a state with limited livelihood access, due to the presence of a large percentage of the population dependent upon labour and a large percentage consuming less than 1890 Kcal. The poor food access situation of Madhya Pradesh is largely because of the high percentage of Scheduled Caste and Scheduled Tribe population and low female literacy. It is also reflected in many other indicators, where the position of Madhya Pradesh is worse as compared to those of the other states.

Other states in this category are Maharashtra, Orissa and West Bengal. In the case of Maharashtra, it is because

of low per calorie intake of the lowest deciles and high percentage of population consuming less than 1890 Kcal. The highest percentage of population below the poverty line and a high percentage of Scheduled Caste and Scheduled Tribe population place Orissa in a low position. West Bengal has a high level of poverty, a large percentage of Scheduled Caste and Scheduled Tribe population and bad rural infrastructure.

The states of Punjab, Haryana, Rajasthan, Assam and Karnataka are better off because at least in respect of some indicators they show a very good position. All these states except Karnataka have a very low percentage of population dependent upon casual labour.

3.16 Government Programmes to Improve Food Access

We have looked at the indicators of food access and livelihood access in the rural economy. Livelihood access determines the entitlements and affordability. These entitlements can be altered through public action and public programmes. The existing government programmes, awareness about the programmes and their effective implementation would have had an impact on the outcomes. Hence, without a reference to some of the important programmes that would have benefited the low-income population, the study on food access is not complete.

For the present, let us look at the government policy and programmes. Government policy can increase the entitlements of the people, either by enhancing incomes or subsidising consumption, or both. This would improve affordability and food access. In this section we shall consider only two programmes of the government and their effectiveness in altering the entitlements:

1. Public distribution of food grains
2. Employment generating schemes

Public distribution of food grains

Food grains are procured and stocked by the Food

Table 3.18
Public Distribution System

Sl.No.	States	Percentage of Households (by type of purchase)			Percentage of Households using PDS among		
		No purchase	Partial purchase	All purchase	Income group	STs & SCs	All Groups
		(1986-87)	(1986-87)	(1986-87)	below 20,000/ annum (1990)	(1990)	(1990)
1	Andhra Pradesh	40.30	47.30	12.40	74.00	71.70	66.40
2	Assam	75.40	21.90	2.80	23.60	29.20	21.70
3	Bihar	98.30	1.20	0.50	3.10	9.40	5.00
4	Gujarat	55.50	30.00	14.60	53.40	52.80	47.60
5	Haryana	96.90	1.60	1.50	8.80	11.10	9.00
6	Himachal Prades	71.80	13.10	15.10	73.80	79.30	75.60
7	Karnataka	38.10	53.90	8.00	72.50	71.20	70.10
8	Kerala	12.30	79.00	8.60	80.80	74.50	78.00
9	Madhya Pradesh	90.90	4.80	4.30	32.20	34.70	34.20
10	Maharashtra	52.30	32.40	15.30	50.90	56.50	50.70
11	Orissa	98.30	1.20	0.50	4.20	5.10	5.20
12	Punjab	99.90	0.00	0.10	6.60	10.50	5.60
13	Rajasthan	91.20	3.60	5.20	25.60	25.50	23.60
14	Tamil Nadu	46.50	44.90	8.50	83.80	88.90	82.40
15	Uttar Pradesh	97.90	0.60	1.60	5.80	6.10	5.20
16	West Bengal	73.10	22.70	4.10	14.20	12.00	11.30

Source: Col. 1-3, Parikh (1994) in Madhura Swaminathan, *Weakening Welfare* (2000)

Col.4-6, Shariff, A., NCAER, *India Human Development Report*, (1999)

Corporation of India. The Ministry of Food allots the food grains to the respective state governments for distribution through fair price shops. The respective state governments are responsible for the establishment of the fair price shops and the actual sale of grains to the holders of ration cards. Since the grains are sold at a price normally lower than the prevailing market rate, a system of rationing is followed. Ration cards are issued to the families. The ration card specifies the entitlement of each cardholder to the list of commodities and the quantities of the commodities entered therein.

State governments own the ration shops in some states. In other states, private traders are given the grains to be distributed to cardholders. To begin with, ration cards were available to all citizens of India. The system was universal. All the cardholders were entitled to buy the grains as per

the entitlement mentioned therein. The items supplied through ration shops differ from state to state. The rural-urban spread of fair price shops also differs from state to state. This network of fair price shops or ration shops is popularly referred to as the Public Distribution System in India. The network of the Public Distribution System (PDS) consists of about 4,51,000 fair price shops covering about 180 million ration cards held by households.

In some states the Public Distribution System has spread to a large percentage of the population. As per the National Sample Survey conducted in 1987-88, 79 percent of households in Kerala, 54 percent in Karnataka, 47 percent in Tamil Nadu, 32 percent in Maharashtra and 30 percent in Gujarat depended partially on the Public Distribution System in 1987-88. In West Bengal and Assam about 22 percent of the households depended partially on the Public

Table 3.19
Offtake of TPDS Rice and Wheat in 100Tonnes

Sl.No. States	1 Rice Off take by BPL (Apr - Nov,99)	2 Wheat Off take by BPL (Apr - Nov,99)	3 Total cereal Off take by BPL
1 Andhra Pradesh	268.17	0.00	268.17
2 Assam	127.96	0.00	127.96
3 Bihar	138.13	314.52	452.66
4 Gujarat	58.83	70.03	128.85
5 Haryana	0.00	23.50	23.50
6 Himachal Pradesh	0.00	10.79	10.79
7 Karnataka	160.37	33.76	194.13
8 Kerala	128.29	0.00	128.29
9 Madhya Pradesh	163.96	6.88	170.84
10 Maharashtra	142.97	213.68	356.64
11 Orissa	258.03	0.00	258.03
12 Punjab	0.16	2.35	2.51
13 Rajasthan	0.83	84.88	85.71
14 Tamil Nadu	319.21	0.00	319.21
15 Uttar Pradesh	215.68	200.76	416.44
16 West Bengal	79.59	135.82	215.41
All India	2150.32	1106.82	3257.14

Source: Col 1-3, Government of India, Ministry of Food (web site)

Distribution System. Other states such as Madhya Pradesh, and Rajasthan had less than 5 percent of the households dependent upon the Public Distribution System. In Bihar, Haryana, Orissa and Uttar Pradesh less than 2 percent of the households depended upon the Public Distribution System.

Since 1987-88, the Public Distribution System has spread to more households in many states. As per the NCAER survey, conducted in 1994, 82 percent of rural households in Tamil Nadu and more than 75 percent of the households in Kerala, Karnataka and Himachal Pradesh were using the Public Distribution System for some commodity or the other. In Andhra Pradesh 66 percent of the households were covered by the PDS. Gujarat and Maharashtra had coverage of 47 percent and 50 percent, respectively. Madhya Pradesh also increased its PDS coverage from a mere 4.8 percent in 1987-88 to 34 percent. In West Bengal,

where the coverage was only 22 percent in 1987-88, it declined to about 11 percent in 1994. The survey also revealed that in the states of Bihar, Uttar Pradesh, Orissa, Punjab and Haryana, the Public Distribution System was utilised by less than 6 percent of the households. Even in Rajasthan, the Public Distribution System had spread only to about 23.6 percent of the households. The figures given here are the results of surveys and hence indicate the effective coverage of the Public Distribution System and not just the official number of cardholders. All the people may not purchase all their grain requirements from the PDS, but they depend upon the PDS for some items, regularly. (Tables 3.18 and 3.19)

Targeted Public Distribution System

Massive efforts were taken to spread the Public Distribution System after the mid eighties. However, since then, there was a policy decision to direct the distribution more effectively to the poverty groups and to discourage the supply of grain to those above the poverty line.

A variation has been introduced in recent years, by way of the Revamped Public Distribution System and Targeted Public Distribution System. Revamped Public Distribution System refers to fair price shops in 1750 blocks, identified as those consisting of tribal areas, hilly areas and drought prone or desert areas. The Targeted Public Distribution System introduced in 1997 sought to remove the element of universality from the system. The ration cardholders are partitioned into families below the poverty line and above the poverty line. The price, at which the food grains are to be sold to the families below poverty line, is set at half the economic cost of the operations to the government. Food grains are sold at economic cost to the above poverty line families. As a result, the price to the consumer has increased by 66 percent to below the poverty line families and by 22.7 percent for above the poverty line families.⁶⁸ Procurement and maintenance of stocks and other overheads are high and carried out at an enormous cost. The quantity of grains provided to the

⁶⁸ Economic Survey (2000-2001)

families below the poverty line, was reduced to ten kilograms. The “Antyodaya” scheme, introduced recently, offers 25 kilograms to the poorest ten million families in the country. The Planning Commission has recommended that the coverage of the Public Distribution System be abolished to those above the poverty line, in the midterm appraisal of the ninth plan.

A number of problems have cropped up after the introduction of the Targeted Public Distribution System. The allotment of cheaper grains to Below Poverty Line (BPL) families was reduced in the states with lower levels of poverty and increased in states with high levels of poverty. The number of those who benefited from the TPDS has dwindled. The quantity of cereals lifted has also declined in these deficit states.

The data show that from April 1999 to November 1999⁶⁹, rice distributed to families below the poverty line was 319 thousand tonnes in Tamil Nadu. Kerala distributed 128 thousands tonnes of rice. Maharashtra distributed 143 thousand tonnes of rice and 213 thousand tonnes of wheat. Gujarat distributed a mere 58 thousand tonnes of rice and 70 thousand tonnes of wheat, for both rural and urban populations. (Table 3.19)

About 53 percent of the households in Gujarat, 80 percent in Kerala, 83 percent in Tamil Nadu and 50 percent in Maharashtra in the lower income group of less than two thousand rupees per household per month depend on the Public Distribution System. (Table 3.18, column 4)

The story was not any better in other states. More grain was allotted to states such as Bihar and Orissa. In these states, the off-take was better than before.⁷⁰ About 425 thousand tonne of cereals were lifted by Bihar and about 258 thousand tonnes of cereals were lifted by Orissa. However there is no assurance that these grains reached the poorest. The PDS coverage in the states was very poor.

Less than five percent of the population benefited from the PDS in the nineties in Bihar and Orissa. Even the Revamped Public Distribution System is not successful in many tribal areas. Micro studies and the study of the National Council of Applied Economic Research in Orissa⁷¹ show that the tribal population hardly receive any help from the PDS in Orissa, Uttar Pradesh and Bihar. (Table 3.18).

3.17 Employment Generating Programmes of the Government

Livelihood access can improve through employment generating programmes. A number of programmes for self-employment and wage employment are available for rural people. Successive governments that came to power named them differently. Sometimes they were consolidated under a new name, and sometimes they were divided into different programmes. In addition to the centrally sponsored schemes, there are numerous state sponsored programmes that differ from state to state. Some of the programmes in some pockets of the country are very effective. Others exist only in name and on paper. Some state governments execute them more seriously than others.

Ongoing programmes of the Central Government, which are meant to act as instruments of income generation or income transfer, are listed separately.⁷² Most prominent of the schemes sponsored by the Central Government are those which are continuing for quite some time, such as the “Integrated Rural Development Programme” for self-employment, “Jawahar Gram Samridhi Yojana” for wage employment and “Training of Rural Youth for Self-Employment”. Employment guarantee scheme is another successful state government scheme.

Integrated rural development programmes provided bank loans to purchase assets such as livestock, for people

⁶⁹ For a period of seven months excluding September, the Government of India has given the information on the total off-take by BPL families for the year 1999.

⁷⁰ Shariff, Abusaleh (1999)

⁷¹ Preliminary results of MSSRF-WFP (2000) study of four districts of Orissa.

⁷² See Appendix 3.4

Table 3.20**Per 100 Number of Households Receiving IRDP Assistance for Different MPCE* Classes**

Sl.No.	State	1	2	3	4	5	6
		MPCE <Rs120	MPCE Rs120-Rs140	MPCE Rs140-Rs160	MPCE Rs160 -Rs190	MPCE <Rs 190	MPCE All
1	Andhra Pradesh	24	33	28	43	128	39
2	Assam	43	61	26	43	173	27
3	Bihar	52	63	51	64	230	52
4	Gujarat	82	206	73	114	475	92
5	Haryana	109	92	97	44	342	72
6	Himachal Pradesh	0	59	36	78	173	55
7	Karnataka	35	26	81	49	191	54
8	Kerala	47	26	50	24	147	44
9	Madhya Pradesh	89	113	65	107	374	92
10	Maharashtra	63	115	65	107	350	77
11	Orissa	51	69	59	55	234	60
12	Punjab	0	0	0	85	85	38
13	Rajasthan	35	27	85	60	207	54
14	Tamil Nadu	48	103	75	58	284	58
15	Uttar Pradesh	69	56	62	74	261	70
16	West Bengal	84	42	77	47	250	70
	All India	60	72	66	69	267	63

*MPCE : Monthly Per Capita Expenditure

Source : Col 1-6, NSSO, 50th round, IRDP Assistance and Participation in Public Works, Report No.423.

to start a new enterprise. Wage employment programmes provided seasonal employment to agricultural labourers, mostly on public works such as roads, buildings, irrigation facilities etc. Rural youth who had some education were given training to establish their own enterprises under one of the programmes. The employment guarantee scheme of Maharashtra gave an employment guarantee of a hundred days in a year to all rural labour families. The present employment assurance programme does not have any such guarantee. It is no different from other wage employment programmes, except that it is earmarked for tribal and hilly areas and drought prone and desert areas.

There were a number of evaluation studies undertaken

in the past on these schemes. These schemes were partially successful in some parts of the country and provided employment to the rural people. Wage employment schemes have been successful in many states with good governance to provide seasonal employment to agricultural labourers in off peak agricultural seasons. As a result, under-employment of rural people has declined over the years.⁷³ More person-days of employment were made available to rural people. However, the wage employment programmes failed in creating any long lasting assets in rural areas and rural infrastructure has not improved. These schemes did not succeed in providing more remunerative wage employment to the labour.

⁷³ GOI, Ministry of Human Resource Development, (1991)

The National Sample Survey also conducted surveys to assess the impact of Integrated Rural Development Programmes. Evaluation studies in the past have pointed out that the self-employment schemes under the integrated rural development programme benefited those with some land base and asset base. The landless have not benefited. The programme of training the rural youth for self-employment has been a total failure. The training provided was not relevant and it was too short to impart any skill.

The National Sample Survey of 1987-88, as well as 1993-94, studied IRDP assistance as well as participation in public works to assess their effectiveness. The results⁷⁴ show that the percentage of households benefited by IRDP has remained unchanged at 6.3 percent for the entire country in both the periods. The beneficiaries from IRDP range between 3.9 percent in Andhra Pradesh and 9.2 percent in Gujarat and Madhya Pradesh. In the states of West Bengal, Uttar Pradesh, Haryana and Maharashtra, 7 to 7.7 percent of the rural population benefited. (Table 3.20)

Forty percent of the assistance went for milch animals in 1987-88. About 51 percent of the assistance went towards milch animals in 1993-94. About 11 percent of the assistance went for drought animals. About 30 percent went for other purposes such as pump sets, shallow wells, goats, sewing machines manufacturing equipment etc. In Rajasthan, 70 percent of the assistance went towards livestock, milch animals, drought animals and goats.

IRDP assistance went mostly to the landholding sector, that too, to the landholding class operating between two and four hectares of land. IRDP did not benefit the landless and those operating less than 0.4 hectare of land in many states. West Bengal is an exception to these states. Most of the IRDP assistance in West Bengal went to those operating less than 0.01 hectare of land. In Orissa also there are more

beneficiaries from this class, though there is an equal number of big landholders. IRDP assistance went mostly to the Scheduled Castes and Scheduled Tribes for the country as a whole. The major reason could be the changing political power equations in the rural areas of the states, where Scheduled Castes and Scheduled Tribes constitute a large percentage. The assistance was spread over all the expenditure classes below 190 per capita per month. There is not much variation among the states.

Wage employment through participation in public works benefited about 5.9 percent of the rural population in 1993-94 as against 6.4 percent in 1986-87. The household is considered as having participated in public works if even one person received employment for a period of 60 days in a year. Some states have shown an increase in the number of persons participating and others have shown a sharp decline in participation in public works. In Gujarat, Maharashtra and Rajasthan, the proportion of households participating in public works has fallen sharply from 17 to 18 percent to a mere 5 to 6 percent. In Maharashtra, it has declined from 12 percent to 8 percent. Decline and increase would probably depend upon the allocation of funds by the states. Interestingly, participation was rather evenly spread over the land-possessing classes, holding up to 4 hectares. This only shows that labour income is required for many households owning land up to 4 hectares, depending upon their size. While participants in public works belong to all the expenditure classes up to Rs.190 per capita per month, most of them belonged to the lower expenditure classes. Comparatively more persons belonged to Scheduled Castes and Scheduled Tribes. (Table 3.20)

In the next chapter, we shall study the impact of food access and livelihood access on the nutritional status of the population. The impact of the programmes will have to be captured indirectly in the nutritional status of the people.



⁷⁴ NSSO, 50th round, Report No. 423, (1997)

CHAPTER 4

Food Absorption

Food absorption means being able to assimilate the food consumed for a healthy life. Availability of food is the first step. Livelihood access and physical access to food constitute the second step. Food absorption or assimilation of the food into the body is the final step in achieving food security for a healthy and long life. Food absorption depends upon the following factors:

- Mainly, proper absorption of the food into the body is possible only when the food consumed contains all the essential nutrients and micronutrients and is consumed in a manner in which it is absorbed well into the body. Hence, a balanced diet, knowledge of nutrition and good dietary practices are important.
- Secondly, food absorption also depends upon the state of health of the individual, safe water supply, environmental sanitation and hygiene.

The outcome of proper food absorption would be a long healthy and productive life of the individual in society. Hence, in this chapter, we are concerned with the three major aspects of

- Dietary deficiencies, malnutrition and symptoms
- The outcome of proper absorption, indicated by the nutritional status of the population
- Availability of health care, environmental sanitation, hygiene and safe drinking water to prevent further infection.

Problems of food absorption lead to an unhealthy population of malnourished adults with low body mass Index. The children would be stunted, under weight and wasted. The population would suffer from diseases of various sorts. Prolonged malnutrition would impair the mental and physical faculties of a person. Prolonged conditions of disease and morbidity may lead to other

problems. The ultimate outcome can be premature death and shorter life spans.

In addition, maternal health and child health are of utmost importance for the nutritional well-being of future generations. Nutritious diet, as well as medical care should go together in respect of pregnant women, lactating mothers, infants and children. Access to safe drinking water and sanitation further prevents infectious diseases. Thus, it is important that all the three aspects go together for effective food absorption which will result in a population with better nutritional status.

The aim of this chapter is to look into the problems of nutrition, rural health and hygiene. After a detailed discussion of various aspects, we pick up six relevant indicators to get the food absorption map of India. Some of these indicators are also used in the final food insecurity map of India. The food absorption map of India shows the relative position of the states in respect of nutritional status and health care facilities. Some of the outcomes are results of public action to substantially improve health and hygiene and nutrition knowledge. Hence we have also discussed the needs of the Integrated Child Development Services (ICDS) programme and its shortcomings and advantages.

To study the nutritional status of the population, we have used clinical survey data collected by the National Nutrition Monitoring Bureau in 8 states in 1994 and the District Nutritional Profiles data of 187 districts in 1995-96. They cover 10 major states. The surveys overlap in the case of some states and do not exist for some. In all we have data for 14 major states considered by us. The data for Uttar Pradesh and West Bengal are taken from a different survey. For some aspects, the survey data of the National Council of Applied Economic Research (NCAER) have been used, though the sample size of this

survey is much smaller. National Family Health Survey data have also been used in some cases to fill the data gaps for Uttar Pradesh and West Bengal. Thus, the gaps in information on nutritional status have been filled in different ways. The data available on nutrition at the state level is not strictly comparable in all respects. The findings of this chapter thus depend upon the pooled data from three different nutritional surveys. The size of the sample, the method of collection and the definitions and norms adopted differ between the surveys, in addition to the reference periods. Hence one has to be careful in interpreting the results. It is safe to attach importance to the relative position of a state rather than the figure quoted for a particular state.¹

4.1 Protein Energy Malnutrition

Malnutrition has several dimensions, including protein energy malnutrition and deficiencies of one or more micronutrients. Protein is an essential nutrient for bodybuilding and is found in cereals and pulses. These are staple foods of common consumption. Protein is also found in the foods of animal origin such as milk, cheese, eggs, fish, meat etc. Animal proteins are superior to plant proteins as they are assimilated better into the body. To a person consuming enough calories, the protein consumed is useful as a protective food, assisting in growth and regeneration. However, when a person consumes a diet deficient in calories but sufficient in protein, the protein is utilized for generating energy and cannot perform the function of a protective food. One has to consume enough calories to achieve protein adequacy. Hence it is referred to as protein energy malnutrition. Moreover, it is found that when people eat sufficient calories, the protein requirement is generally taken care of.

If under-nutrition is measured by the inadequacy of protein and calories, there is a problem in defining the norms. As in the case of calorie adequacy, protein adequacy

has also come under debate. The Indian Council of Medical Research (ICMR) had recommended 70 grams per consumer unit per day as the protein requirement in the Seventies. It reduced the requirement to 40 grams in its recommendation in the Eighties. The ICMR now recommends the protein adequacy level of 60 grams per consumer unit per day. State level data on protein calorie intake are available from the National Sample Survey Organization and other nutrition surveys though they differ from each other.

As per the NSS data average protein intake in rural India remained at 62 grams per consumer unit per day until 1983 but declined by 2 grams in 1993-94. There are some states where the average protein intake has been declining continuously since 1972-73. These are Assam, Himachal Pradesh, Punjab, Tamil Nadu and Uttar Pradesh. In Kerala, Orissa and West Bengal, protein intake has increased. On the whole at the average level protein energy malnutrition is not apparent in any of the states.² This however does not rule out the possibility of protein energy malnutrition in the lower expenditure groups.

Protein calorie malnutrition has to be tackled together with food adequacy. On an average, at the all India level, about 70 per cent of protein comes from cereals, about 10 per cent from pulses and about 9 per cent from milk and milk products. However, this pattern differs in some states. In Kerala, about 20 per cent of protein comes from fish, eggs and meat. In many states, pulses contribute about 8 to 10 per cent of the protein. In Punjab, Haryana and Rajasthan, milk and milk products contribute more protein than pulses. In Orissa, pulses contribute about 6 to 7 per cent and milk contributes about 2 per cent of the total protein consumption. In lower income groups up to 80 per cent of the protein is derived from cereals. Pulses are still very important in rural diets in many states. The average protein consumption of these states is very high and is derived from milk and milk products.³

¹ See Appendix 4.1

² NSSO, Sarvekshana, 73rd Issue (1997)

³ NSSO, Sarvekshana, 73rd Issue, (1997)

Table 4.1
Protein Calorie Inadequacy (Percentage of population with protein and/or calorie deficiency)

		1	2	3	4
Sl. No.	State	P-C-	P-C+	P+C+	P+C-
1	Andhra Pradesh	10.4	0.0	68.9	21.0
2	Assam	27.9	0.5	41.8	29.8
3	Bihar	12.3	1.2	76.5	10.0
4	Gujarat	2.5	0.0	60.3	37.3
5	Haryana	4.6	0.0	64.6	30.8
6	Himachal Pradesh	6.7	0.1	63.1	30.1
7	Karnataka	14.9	0.0	51.8	33.4
8	Kerala	19.9	2.4	58.9	18.8
9	Madhya Pradesh	19.7	0.0	59.9	20.4
10	Maharashtra	19.7	0.0	59.9	20.4
11	Orissa	24.1	0.0	49.2	26.7
12	Punjab	3.0	0.0	65.1	31.9
13	Rajasthan	15.0	0.2	69.8	15.0
14	Tamil Nadu	41.4	0.0	29.7	28.9
15	Uttar Pradesh	NA	NA	NA	NA
16	West Bengal	NA	NA	NA	NA

P : PROTEIN C : CALORIE + : ADEQUATE - : INADEQUATE

Calorie Adequacy : 2425 Kcal per consumer unit per day.

Protein Adequacy : 60 grams per consumer unit per day.

Source: Col,1-4, Ministry of Human Resource Development,
 India Nutrition Profile (1998)

The extent of measured protein calorie malnutrition depends upon the norms of calories and protein adopted. The protein intake per consumer unit, reported by the National Nutrition Surveys conducted by the National Nutrition Monitoring Bureau and India Nutrition Profiles seems to be much less than that of the National Sample Survey data. The discrepancy in the average level of protein intake could be due to the better representation of the richer income groups in the NSS data. The difference could also be due to sample size, time frames and population cohort.

As per the India Nutrition Profile, protein consumption is below the norm of 60 grams in many

states, except Punjab, Haryana, Rajasthan, Himachal Pradesh, Bihar, Gujarat and Andhra Pradesh. Data are not available for Uttar Pradesh and West Bengal.

Nutritional surveys have collected information on the percentage of households with a deficient intake of calories and protein. Protein Energy Malnutrition is as high as 41.40 per cent in Tamil Nadu, 24.10 per cent in Orissa, 27.90 per cent in Assam, 19.90 per cent in Kerala and 19.70 per cent in Madhya Pradesh and Maharashtra, if we adopt the calorie norm of 2425 Kcal and 60 grams of protein intake as the normative threshold. (Table 4.1)

Effective protein inadequacy appears to be quite large in many states. Those who consume diets deficient in protein or calorie or both are as high as 70 percent in Tamil Nadu, followed by 58 percent in Assam and 50 percent in Orissa. This is obvious from the pattern of consumption studied by us in the second chapter. The smaller percentage of protein deficient population in states such as Punjab, Haryana and Rajasthan could be due to diets rich in milk, pulses and other non cereal items. Protein adequacy in Bihar, particularly, appears to be the result of a high average level of consumption of cereals compared to other states. About 14 percent of the population consumed less than 1890 kcl per capita per day in Bihar in 1994. Food security in Bihar is largely cereal based.

A prolonged intake of inadequate calories and protein would, however, lead to certain nutritional deficiency diseases such as marasmus and kwashiorkor. The incidence of these deficiency diseases is very low. In India, the pooled data for eighteen states shows that the occurrence of marasmus in rural areas is as low as 0.04 per cent and that of kwashiorkor is as low as 0.07 per cent.⁴ (Table 4.2).

The states in which the food basket is not diversified are those where there is also a high percentage of protein deficient population. What is important to note here is that the outcome is not the severe type of diseases such as

⁴ GOI, Ministry of Human Resources Development, India Nutrition Profile (1998)

Table 4.2
Protein Calorie Malnutrition (Percentage of population with protein and/or calorie deficiency)

Sl. No.	State	1	2
		Marasmus	Kwashiorkor
1	Andhra Pradesh	0.050	0.000
2	Assam	0.030	0.000
3	Bihar	0.070	0.050
4	Gujarat	0.000	0.000
5	Haryana	0.110	0.005
6	Himachal Pradesh	0.080	0.005
7	Karnataka	0.000	0.000
8	Kerala	0.000	0.000
9	Madhya Pradesh	0.180	0.000
10	Maharashtra	0.000	0.000
11	Orissa	0.160	0.000
12	Punjab	0.000	0.000
13	Rajasthan	0.040	0.005
14	Tamil Nadu	0.050	0.000
15	Uttar Pradesh	NA	NA
16	West Bengal	NA	NA

Source: Col.1-2, Ministry of Human Resource Development, India Nutrition Profile, (1998)

marasmus and kwashiorkor but low body mass index of men and women, as we shall see later. A milder form of growth disorders seems to result from diets consumed by a vast majority of people. One has to further investigate this issue.

4.2 Micronutrient Deficiencies

Data on micronutrient deficiencies is available from two nutritional surveys conducted by the National Nutrition Monitoring Bureau (NNMB) and the District Nutrition Profiles (DNP) conducted by the Department of Women and Child Development, Ministry of Human Resources and Development.

Micronutrients are essential vitamins and minerals needed in minute quantities, usually only a few milligrams or even micrograms per day. Iron, vitamin A, iodine and calcium are among the important nutrients needed by the

body. These are vital for the growth and development of a person, viz. normal learning, cognitive functions, immunity, work capacity and reproductive health. We have compared the average intake of some essential nutrients with the recommended daily intake levels. (Tables 4.3, 4.4 and 4.5).

Iron: A prolonged lack of iron absorption results in iron deficiency known as anaemia. Anaemia results from deficiency of iron, foliate and/or vitamin B12. A low level of hemoglobin in the blood characterizes anaemia. Hemoglobin is necessary for transporting oxygen from the lungs to other tissues and organs of the body.

Iron deficiency is an important cause of morbidity and severe morbidity leads to mortality. Further, iron deficiency reduces work capacity and has adverse effects on productivity. Maternal anaemia results in intra-uterine growth retardation, low birth weight, increased pre-natal mortality, high maternal mortality and also premature deliveries. Iron deficiency in infancy and childhood is associated with apathy, inactivity and significant loss of cognitive abilities.⁵ One of the greatest problems caused by iron deficiency is that it diminishes one's ability to fight infection and thus increases vulnerability to transmittable diseases.⁶

In India, anaemia affects an estimated 50 per cent of the population.⁷ The average recommended daily intake of iron in adults is 28 mg per day. In most states, adults consume less than this and Assam consumes the lowest amount of 12.00 mg per day (NNMB and DNP).

National Family Health Survey - 2, of 1998-99, has undertaken an extensive testing for hemoglobin. Hemoglobin levels were tested for a selected sample. The study revealed that 52 per cent of women have some degree of anaemia, 35 per cent of women are mildly anaemic, 15 per cent are moderately anaemic and 2 per cent are severely anaemic. As per the findings of the study,

⁵ Beaton, George, H and McCabe, George, P (1999)

⁶ The Micronutrient Initiative (1997)

⁷ Seshadri, S (1997)

Table 4.3**Micro Nutrient Deficiency**

		1	2	3	4	5	6	7	8	9	10
Sl. No.	State	Energy (Kcal)	Protein (grams)	Fat (grams)	Calcium (mg)	Iron (mg)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Vit.C (mg)	Vit.A (µg)
1	Andhra Pradesh	2430.00	57.60	28.30	518.00	26.20	0.87	0.77	13.60	34.00	352.00
2	Assam	1975.00	51.00	17.00	364.00	12.00	0.70	0.60	12.00	47.00	235.00
3	Bihar	2464.00	69.64	24.29	432.80	22.01	1.89	0.90	20.39	59.86	262.84
4	Gujarat	2298.00	64.10	44.10	536.00	26.60	1.70	1.15	15.90	25.40	263.00
5	Haryana	2336.00	71.80	48.60	886.00	25.70	2.40	1.10	20.00	38.50	415.00
6	Himachal Pradesh	2323.00	74.00	41.00	640.00	23.00	2.10	0.90	16.00	55.00	481.00
7	Karnataka	2196.00	55.50	24.20	839.00	30.60	1.54	0.89	12.20	32.70	286.00
8	Kerala	2231.00	57.10	58.80	696.00	22.80	0.70	0.77	12.60	50.30	214.00
9	Madhya Pradesh	2238.00	57.90	17.70	354.00	27.00	1.13	0.83	15.80	44.50	343.00
10	Maharashtra	2065.00	61.10	33.80	404.00	28.60	1.82	0.90	16.30	18.50	222.00
11	Orissa	2106.00	49.00	13.00	381.00	27.00	0.80	0.60	12.00	40.00	436.00
12	Punjab	2341.00	76.70	34.30	966.00	27.70	2.50	1.20	21.20	38.10	448.00
13	Rajasthan	2386.00	76.55	46.51	733.90	30.52	2.58	1.23	21.07	45.98	399.79
14	Tamil Nadu	1814.00	44.40	20.10	455.00	20.20	0.77	0.63	9.70	29.90	184.00
15	Uttar Pradesh	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16	West Bengal	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	RDA*	2425.00	60.00	-	400.00	28.00	1.20	1.40	16.00	40.00	600.00

*RDA = Required Daily Allowance as per Indian Council of Medical Research (ICMR)

Source: Col.1-10, Ministry of Human Resource Development, India Nutrition Profile, (1998)

Table 4.4
Percentage of Women and Children with Iron Deficiency (Rural and Urban)

Sl.No	State	1	2	3	4	5
		Percentage of women with:				Percentage of children
		Any anaemia	Mild anaemia	Moderate anaemia	Severe anaemia	with any anaemia (6-35 months)
1	Andhra Pradesh	49.80	32.50	14.90	2.40	72.30
2	Assam	69.70	43.20	25.60	0.90	63.20
3	Bihar	63.40	42.90	19.00	1.50	81.30
4	Gujarat	46.30	29.50	14.40	2.50	74.50
5	Haryana	47.00	30.90	14.50	1.60	83.90
6	Himachal Pradesh	40.50	31.40	8.40	0.70	69.90
7	Karnataka	42.40	26.70	13.40	2.30	70.60
8	Kerala	22.70	19.50	2.70	0.50	43.90
9	Madhya Pradesh	54.30	37.60	15.60	1.00	75.00
10	Maharashtra	48.50	31.50	14.10	2.90	76.00
11	Orissa	63.00	45.10	16.40	1.60	72.30
12	Punjab	41.40	45.10	12.30	0.70	80.00
13	Rajasthan	48.50	32.30	14.10	2.10	82.30
14	Tamil Nadu	56.50	36.70	15.90	3.90	69.00
15	Uttar Pradesh	48.70	33.50	13.70	1.50	73.90
16	West Bengal	62.70	45.30	15.90	1.50	78.30
	All India	51.80	35.00	14.80	1.90	74.30

Source: Col.1-5, National Family Health Survey (NFHS-2), (1998-99)

there are some differences in the prevalence of anaemia depending on the background, but anaemia is found among women in every population group.

The highest prevalence of anaemia among children (6-35 months) is found in Haryana, Rajasthan, Bihar and Punjab, where at least 80 per cent of the children are anaemic as per NFHS - 2. The percentage of women suffering from anaemia is also high in these states at 47 percent, 48.5 percent, 63.4 per cent and 41.4 per cent respectively. The highest percentage of women suffering from anaemia is found in Assam at 69.7 percent. Levels of anaemia among women and children are substantial in every state in India. The lowest prevalence of anaemia in

women (23 per cent) and children (44 per cent) is seen in Kerala. The majority of women are anaemic in 10 states and anaemia is particularly pronounced in the Eastern region and in many states in the North-Eastern region (Table 4.4).

Vitamin A: The consequences of vitamin A deficiency range from mild deficiency signs such as night blindness, to Bitot's spots that may lead to a total loss of vision if not treated early. The immune system of the body is weakened due to a lack of vitamin A and resistance to infections declines. None of the states meet the minimum intake requirement of 600 mcg/day of retinol among adults. The data show that Tamil Nadu has the highest percentage of population with vitamin A deficiency.⁸

⁸ It is remarkable that the Government of Tamil Nadu is fortifying milk with vitamin A.

Table 4.5
Percentage of Population with Vitamin A Deficiency

		1	2	3	4	5
Sl. No.	State	Bitots Spot	Corneal Xerosis	Corneal Opacity	Kerato Mal.	Percentage of population with Vit.A deficiency
1	Andhra Pradesh	0.79	0.00	0.00	0.00	0.79
2	Assam	0.45	0.00	0.00	0.00	0.45
3	Bihar	0.14	0.09	0.06	0.06	0.35
4	Gujarat	0.20	0.00	0.00	0.00	0.20
5	Haryana	0.04	0.01	0.00	0.00	0.05
6	Himachal Pradesh	0.01	0.00	0.00	0.00	0.01
7	Karnataka	0.77	0.00	0.00	0.00	0.77
8	Kerala	0.25	0.00	0.00	0.00	0.25
9	Madhya Pradesh	2.62	0.00	0.00	0.00	2.62
10	Maharashtra	0.72	0.00	0.00	0.00	0.72
11	Orissa	0.86	0.00	0.00	0.00	0.86
12	Punjab	0.12	0.00	0.00	0.01	0.13
13	Rajasthan	0.25	0.18	0.02	0.11	0.56
14	Tamil Nadu	3.11	0.00	0.00	0.00	3.11
15	Uttar Pradesh	NA	NA	NA	NA	NA
16	West Bengal	NA	NA	NA	NA	NA

Source : Col. 1-5, Ministry of Human Resource Development, India Nutrition Profile, (1998)

Among all the states studied, Himachal Pradesh shows better per capita intake and hence only a small percentage of the population is affected.

Vitamin B: As far as thiamine is concerned, studies show that the states of Andhra Pradesh, Assam, Kerala, Madhya Pradesh, Orissa and Tamil Nadu consume less than the required level of 1.20 mg/day. The other eight states in the study consume more than the required amount. Thiamine intake is the highest in Rajasthan, at 2.58 mg per capita per day.

The average intake of niacin is the lowest in the state of Tamil Nadu at 9.70 mg, as against the minimum requirement of 16.00 mg per day. The highest per capita per day intake of niacin is seen in the states of Punjab and Rajasthan followed by Bihar and Haryana. Out of the 14 states studied, eight states are found to consume less

than the required amount. None of the states in the study meet the minimum requirement of riboflavin of 1.40 mg/day. Assam and Orissa indicate the lowest intake of riboflavin at 0.60 mg per capita per day.

Vitamin C: In the case of vitamin C, Bihar ranks first with a consumption of 59.86 mg as against the daily requirement of 40.00 mg per capita per day. Six other states namely Assam, Himachal Pradesh, Kerala, Madhya Pradesh, Orissa and Rajasthan also meet the minimum requirement along with Bihar. The lowest intake of 18.50 mg is found in the state of Maharashtra.

Iodine: Iodine is an important micronutrient. A lack of iodine in the diet can lead to Iodine Deficiency Disorders (IDD) which, according to the World Health Organization, can cause miscarriages, brain disorders, cretinism and retarded psychomotor development.

Goiter is the most visible sign of iodine deficiency. It is a swelling in the neck caused by an enlarged thyroid gland. Iodine deficiency is the single most important and preventable cause of mental retardation worldwide. Iodine deficiency also results in stillbirths and high rates of infant mortality. In pregnant women, this deficiency leads to mental and physical defects in the baby, ranging from mild mental retardation to cretinism⁹.

About 200 million people in India are exposed to the risk of iodine deficiency and 70 million suffer from goiter and other iodine deficiencies¹⁰. In addition, about one-fifth of pregnant women are considered at risk of giving birth to children who will not reach their optimum physical and mental potential because of maternal iodine deficiency.¹¹

Calcium: The minimum calcium requirement is 400 mg per day, which is met in almost all the states except Assam, Orissa and Madhya Pradesh. Punjab and Haryana report the highest intake of calcium. The consumption of cereals, green leafy vegetables, milk and milk products may have an influence on the intake of calcium.

Milk is a major source of calcium. Inadequate consumption of milk may be one of the reasons for the inadequate calcium intake in some states. This could be particularly true in Assam and Orissa where the levels of intake of milk are very low at 36.30 grams and 23.10 grams respectively. These states also fall short of the required minimum calcium intake of 400 grams. The states with high milk consumption also have high calcium availability, with the exception of Kerala and Karnataka. The reason for their high calcium availability, even with less milk intake, may possibly be the high levels of consumption of small fish with bones and other calcium-rich foods. Another reason for lower levels of calcium intake could be a less diversified food basket as in the case of Assam, Madhya Pradesh and Orissa, where the high poverty level may

reduce the diversity of food consumption, resulting in micronutrient deficiency (see Table 3.1).

We find that micronutrients are not consumed in adequate quantities in many states. As per nutritional surveys, none of the states consume adequate quantities of all the seven nutrients. Rajasthan is the only state in which 5 nutrients are consumed at adequate levels. An adequate average intake of micronutrients does not mean that all sections of the population are consuming adequate amounts. The lower income groups and those consuming less variety of foods suffer from micronutrient deficiencies. But inadequate consumption does not mean that the clinical signs of deficiency are felt. Clinical signs of deficiency are felt by a very small percentage of the population.

Food-based strategies are the most sustainable approaches for improving the micronutrient status of population groups. These are most useful as they avoid any negative effects on local food production and consumption patterns and at the same time, improve the nutrition and quality of life of the most vulnerable people at critical times in their lives. These strategies also promote self-reliance among poor people and communities.

The major strategies or direct nutritional interventions to deliver micronutrients are dietary diversification through behaviour modification, fortification of foods with nutrients and other foods, supplementation with nutrients in capsule, tablet or liquid form and horticulture diversification for adequate supply of nutrient rich foods.

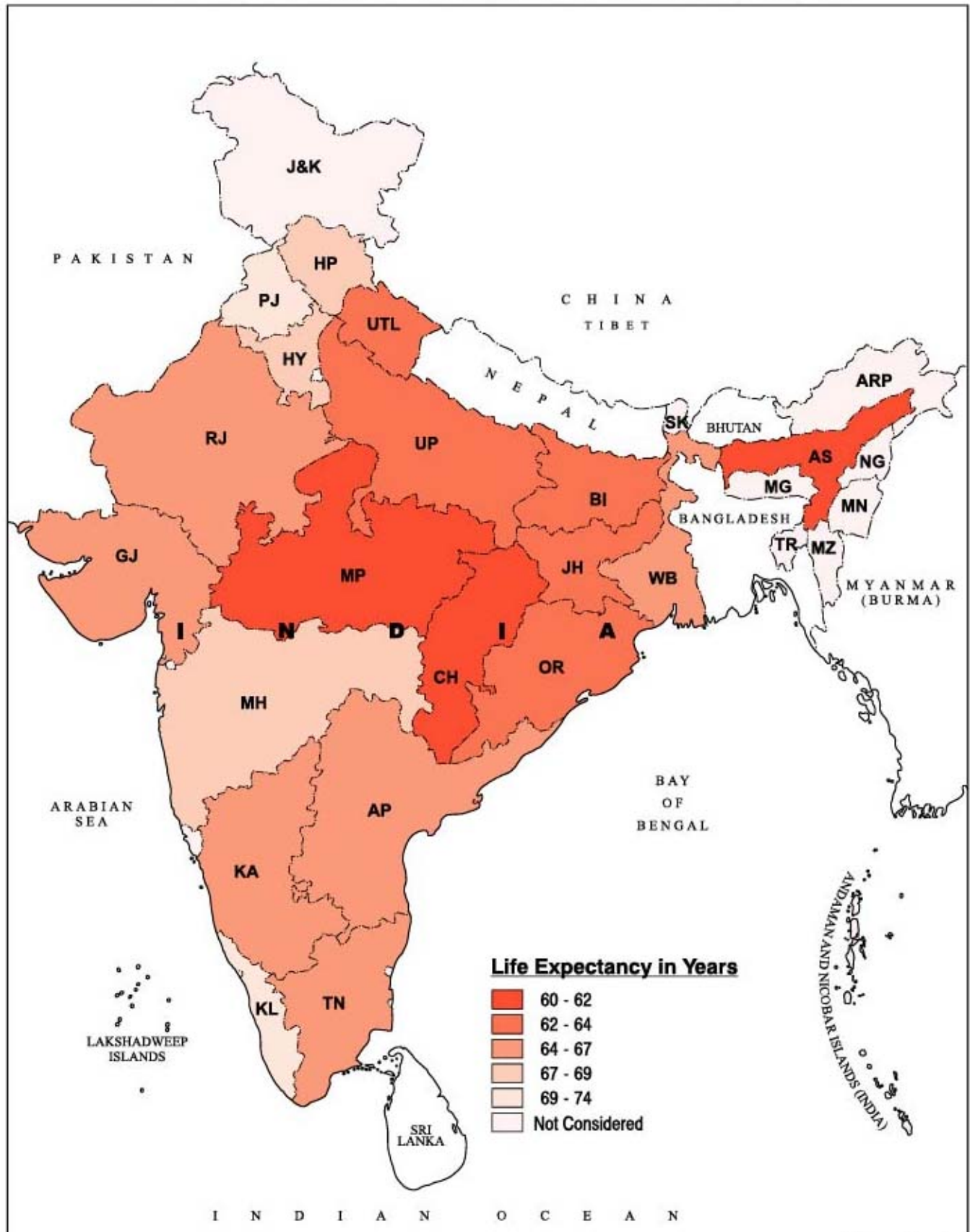
In recent times, the use of synthetic nutrients as supplements to overcome nutritional deficiencies has been widely promoted. In certain situations, these are useful adjuncts to a food-based approach. Synthetic nutrients are specifically recommended as routine public health measures for the prevention of malnutrition and for ensuring normal health. All the nutrients required for human health and well-being can be derived from foods. Supplementation/

⁹ The Micronutrient Initiative (1997)

¹⁰ GOI, Ministry of Health and Family Welfare (1998)

¹¹ Vir, Sheila (1995)

LIFE EXPECTANCY AT AGE ONE IN RURAL INDIA



Map No. 4.1

Table No. 4.6
Life Expectancy at Age One

1			
Sl.No	State	Life Expectancy at the age one (1992-96)	Rank
1	Andhra Pradesh	65.2	8
2	Assam	60.6	1
3	Bihar	63.2	5
4	Gujarat	65.1	7
5	Haryana	67.6	12
6	Himachal Pradesh	68.1	13
7	Karnataka	66.6	11
8	Kerala	73.2	16
9	Madhya Pradesh	61.2	2
10	Maharashtra	68.1	13
11	Orissa	62.6	4
12	Punjab	70.5	15
13	Rajasthan	64.6	6
14	Tamil Nadu	66.1	10
15	Uttar Pradesh	62.2	3
16	West Bengal	65.8	9

Source: GOI, Registrar General and Census Commissioner, Sample Registration Surveys, (1992-96)

fortification should be considered as a necessary adjunct to dietary diversification and dietary improvement and not merely as an alternative strategy.

Dietary diversification and consumption of fortified foods are the two ways of attacking the problem of micro nutrient deficiency. Both the approaches are used in practice. Sometimes supplementation through fortification becomes a matter of policy option.

4.3 Life Expectancy

Efficient food absorption is apparent in outcomes such as nutritional status of adults and children. The status of adult health can be examined in terms of several indicators such as life expectancy, calorie consumption, mortality rates

and chronic energy deficiency. Life expectancy is one of the most important of these indicators. The long-term outcome of food security is ultimately reflected in an improvement in the life expectancy of the population. Increasing life expectancy is a pointer to the improving food security of India. However, many states have low life expectancies. The country as a whole has yet to achieve better living standards, reduce the nutritional deficiencies of various types and provide better medical facilities before it can achieve higher levels of life expectancy.

Let us examine the state level differences in life expectancy. Assam has the lowest life expectancy at age one (60.6 years). Madhya Pradesh comes next with a life expectancy at age one of 61.2 years, followed by Uttar Pradesh at 62.2 years and Orissa at 62.6 years. The best state is Kerala with 73.2 years, followed by Punjab, where it is 70.5 years. Himachal Pradesh and Maharashtra fall in third place with a figure of 68.1 years (see [Table 4.6](#) and [Map 4.1](#)).

It is observed that life expectancy at birth is lower in all the states in comparison with life expectancy at age one. It is because the risk of death is higher before the age of one. In Kerala, where life expectancy at age one is the highest at 73 years, life expectancy at birth is also the highest at 70 years. In Assam, where life expectancy at age one is the lowest at 60.6 years, life expectancy at birth is still lower at 53.5 years. Life expectancy at birth is the lowest in Madhya Pradesh at just 52 years. ([Table 4.7](#))

Life expectancy at birth is not correlated to average calorie consumption and is negatively related to the calorie consumption of the lower expenditure groups.¹² Such a relationship is not surprising. Life expectancy is not an outcome of one time consumption. It is a long-term nutritional outcome. Hence it depends upon a large number of other factors such as level of literacy, knowledge of nutrition and health care of the past generations. Eating well is only one part of staying healthy and living longer. Assimilation and absorption depend upon the balanced

¹² Correlations are not meant to explain the cause and effect relationship. They are used to grasp the broad sign of the existing association.

Table 4.7
Adult Health Indicators

	1	2	3
Sl.No	State	Maternal Mortality Rate	Percentage of population with CED*
			Expectation of Life at Birth (1990)
1	Andhra Pradesh	443.00	49.40
2	Assam	204.00	17.10
3	Bihar	482.00	51.30
4	Gujarat	129.00	53.10
5	Haryana	381.00	25.90
6	Himachal Pradesh**	456.00	38.90
7	Karnataka	172.00	53.80
8	Kerala	179.00	33.20
9	Madhya Pradesh	567.00	53.30
10	Maharashtra	266.00	51.00
11	Orissa	679.00	57.30
12	Punjab	187.00	23.00
13	Rajasthan	335.00	36.20
14	Tamil Nadu	218.00	37.30
15	Uttar Pradesh	649.00	44.00
16	West Bengal	389.00	56.00
	SD	176.20	12.71
			4.89

* CED - Chronic Energy Deficiency

** HP rural data is not available and All India data is taken

Col.1 Srinivasan, K and Shariff, A. (1997), India Towards Population and Development Goals, (Compiled from data given in Survey on causes of Death (Rural) India, Annual Report (1992)).

Col. 2. Ministry of Human Resource Development, India Nutrition Profile, (1998)

Col. 3. GOI, Registrar General and Census Commissioner, Sample Registration Surveys (1990)

diet and state of health. Calorie consumption and balanced diet are necessary conditions, but not sufficient conditions for long life. Where life expectancy is high, the percentage of literacy is also high. Thus, a number of other factors apart from calorie consumption seem to contribute to higher life expectancy, as in Kerala.

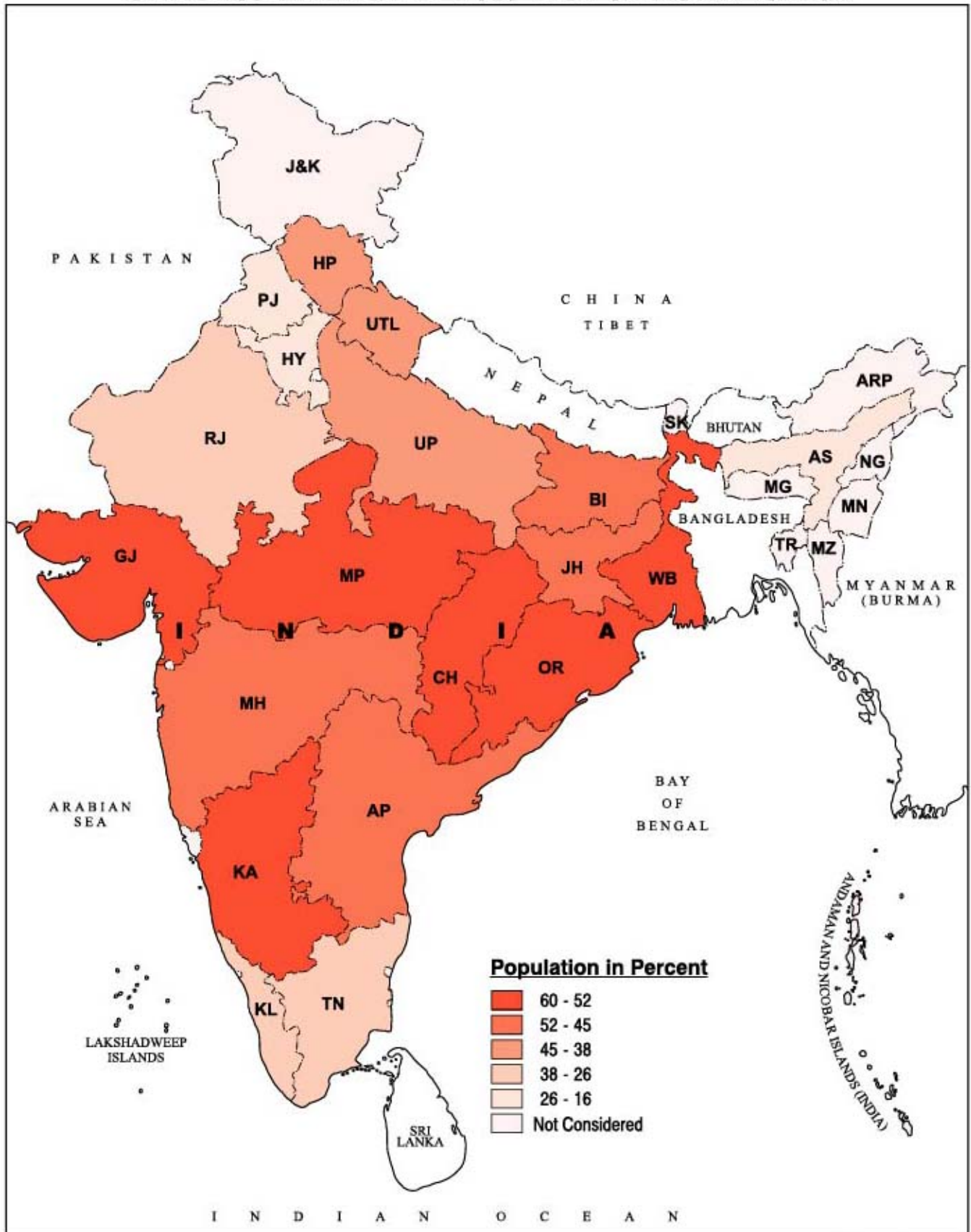
4.4 Chronic Energy Deficiency

Chronic Energy Deficiency (CED) in adults is a result of long-term under-nutrition and malnutrition. Recent studies have documented significant relationships between anthropometric measures and health status. The Body Mass

Index can be used to assess both leanness and obesity. Body Mass Index is defined as the weight in kilograms divided by the height in meters squared (kg/m^2). CED is usually indicated by a BMI of less than 18.5.

We have taken the percentage of the population with chronic energy deficiency as an indicator of food insecurity in rural India. Orissa is found to occupy the worst position in this respect with 57 per cent of the population having chronic energy deficiency. West Bengal, Karnataka, Madhya Pradesh and Gujarat come next with 56 percent, 54 per cent and 53 per cent respectively. Assam is in the best

PERCENTAGE OF POPULATION WITH CHRONIC ENERGY DEFICIENCY IN RURAL INDIA



Map No. 4.2

position with only 17 per cent of the population suffering from low BMI. Punjab and Haryana follow with 23 and 26 per cent of the population suffering from energy deficiency (see [Table 4.7](#) and [Map 4.2](#))¹³.

It is interesting to note that the percentage of population with chronic energy deficiency shows a significant negative correlation with areas producing high energy foods such as cereals, tubers, fats and oils and sugar. It appears that in areas where the food basket is diversified, a smaller percentage of the population suffers from CED. The data seem to suggest that people living in the areas producing and consuming a variety of crops and animal foods show higher Body Mass Index. Further investigation is needed in this area.

An Index of Adult Health and Nutrition

Consumption, calorie intake, protein intake and micronutrient intake have to be ultimately reflected in the nutrition and health status of the population. An index of adult health has also been calculated, taking life expectancy at birth, maternal mortality rates and the percentage of population with chronic energy deficiency.¹⁴ This index represents the outcome of long-standing health status. Maternal mortality rate gives the number of maternal deaths per one hundred thousand live births. It is highest in Orissa at 679, followed by Uttar Pradesh with 649 and Madhya Pradesh with 567. It is lowest in Gujarat at 129 followed by Karnataka with 172 and Kerala with 179. The index shows that Kerala and Punjab have the best health. The positions of Assam, Haryana, Tamil Nadu, Himachal Pradesh and Karnataka are relatively better. The positions of Gujarat and Maharashtra are relatively less encouraging. Orissa, Madhya Pradesh and Uttar Pradesh are the worst in terms of the adult health index, with high levels of maternal mortality and low BMI. ([Table 4.8](#))

What is remarkable is that Kerala and Punjab are equally good in adult nutrition. Punjab has obviously achieved

higher life expectancy and higher body mass index and low maternal deaths. The long-term outcome is a function of three important factors, namely, balanced diet, nutrition knowledge and health care. The interaction of these three factors determines the final outcome. The state of Kerala shows lower per capita income since the remittances from the Gulf are not reflected in the state GDP. There is hidden wealth in Kerala, which is reflected in affordability of more expensive health care and not only primary health care. Though the calorie intake levels are among the lowest in the country, since the Seventies, life expectancies and lower mortality rates indicate superior health care available to all in Kerala. Punjab has achieved the superior adult health status through prosperity, better livelihood security and more balanced diets rich in nutrients. Interestingly, these two states are far ahead in adult nutrition compared to other states. The next set of states are far behind Punjab and Kerala in respect of adult health. Yet, Assam, Haryana and Tamil Nadu show better adult health for varied reasons. Better food intake, affordability and prosperity put Haryana in a relatively better position, despite poor health facilities. Despite low calorie consumption and lack of overall affluence, Tamil Nadu is there due to government-supported health care for everyone. Although Assam has very low life expectancy, it has the lowest percentage of population suffering from low BMI and relatively low maternal mortality rates, which improve its status on the adult nutrition index scale.

Orissa, Madhya Pradesh, Uttar Pradesh and Bihar come out as the worst states for adult nutrition. These states do not have severe problems of calorie intake as in Tamil Nadu and Kerala at the lower levels. At the average level, their cereal consumption far exceeds the consumption of many states, including that of Punjab and Haryana. Yet, lack of health care keeps the mortality rates high and life expectancies low. Affordability of more expensive secondary health care such as hospitalization may be limited in these states due to high levels of poverty. Public health

¹³ See [Appendix 4.1](#) for details of data and adjustments

¹⁴ See [Appendix 4.2](#)

Table 4.8**Adult Health Index(Value - Mh / Range)**

		1	2	3	4
Sl.No	State	Index of Maternal Mortality Rate	Index of Percentage of population with CED	Index of Expectation of Life at Birth (1990)	Adult Health Index
1	Andhra Pradesh	0.57	0.80	0.61	0.66
2	Assam	0.14	0.00	0.92	0.35
3	Bihar	0.64	0.85	0.74	0.74
4	Gujarat	0.00	0.90	0.69	0.53
5	Haryana	0.46	0.22	0.48	0.39
6	Himachal Pradesh	0.59	0.54	0.41	0.52
7	Karnataka	0.08	0.91	0.54	0.51
8	Kerala	0.09	0.40	0.00	0.16
9	Madhya Pradesh	0.80	0.90	1.00	0.90
10	Maharashtra	0.25	0.84	0.49	0.53
11	Orissa	1.00	1.00	0.49	0.95
12	Punjab	0.11	0.15	0.29	0.18
13	Rajasthan	0.37	0.48	0.85	0.57
14	Tamil Nadu	0.16	0.50	0.58	0.41
15	Uttar Pradesh	0.95	0.67	0.87	0.83
16	West Bengal	0.47	0.97	0.59	0.67

care facilities are non-existent in these states. The analysis of the inter state differentials shows how important health care is for long-term well-being of the population. ([Table 4.8](#))

4.5 Severe Stunting in Children

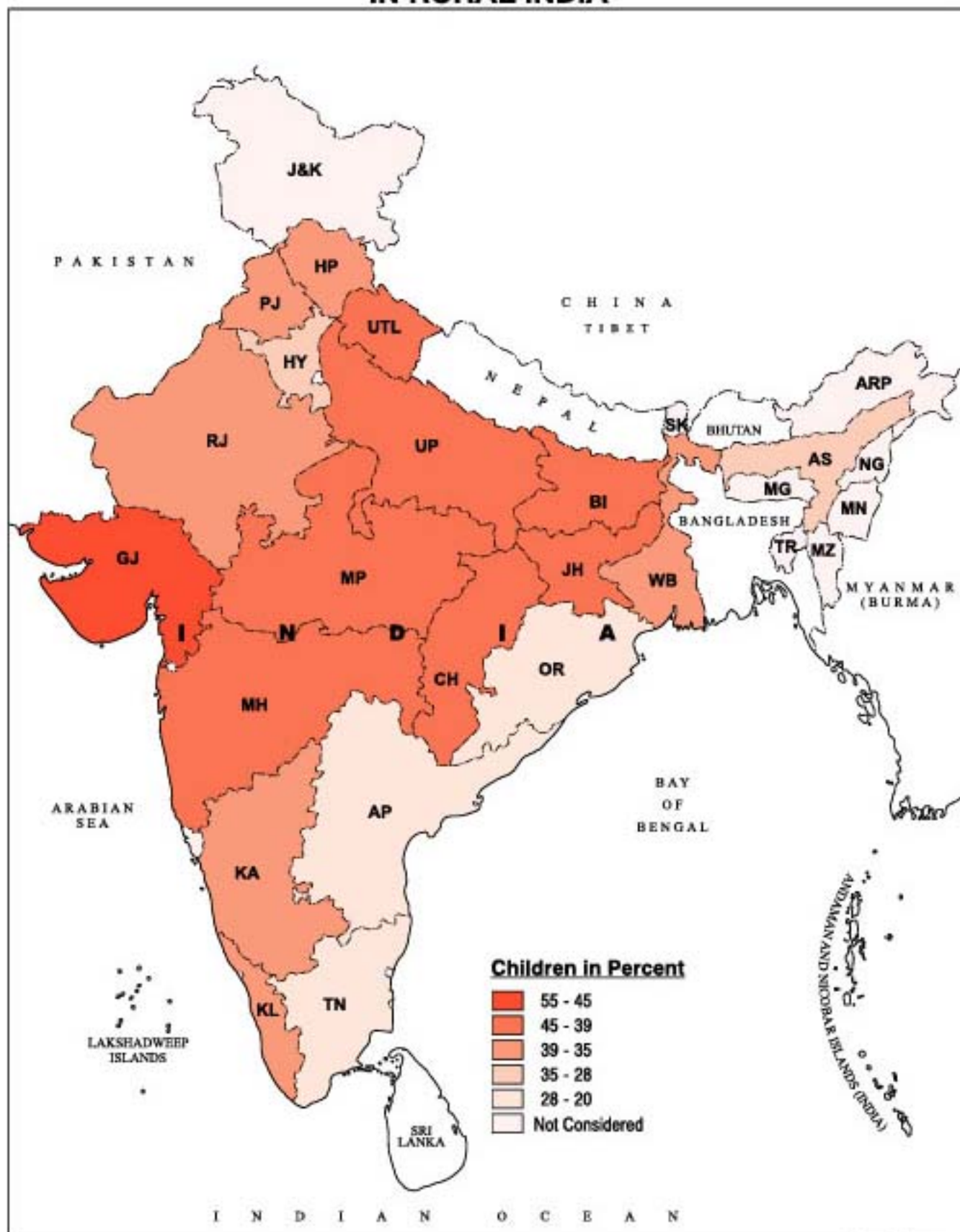
Child nutrition is extremely important, as better health of infants and children below five will influence their future growth, health, immunity to diseases and mental faculties. The pooled data from Nutritional Surveys have been used to get the percentage of children who are stunted and underweight. The nutrition and health status of a child can be assessed in terms of height-for-age and weight-for-age. The height-for-age index measures linear growth retardation (being shorter for any given age than expected against an international reference — the National Center for Health Statistics (NCHS) standard). The severity of this stunting is expressed as a number of standard deviations

from the international reference median of height-for-age. The height-for-age estimates, expressed as percentages, falling below three standard deviations, are considered to suffer from severe stunting. Those between two standard deviations and three standard deviations are considered as moderately stunted. We have used severe stunting (< -3 SDs) as an important indicator of child health.

In the case of the percentage of severely stunted children under five, Gujarat is in the worst position with 54 per cent, followed by Bihar with 44 per cent, Maharashtra with 43 per cent, Uttar Pradesh with 40 and Madhya Pradesh with 40 per cent. Tamil Nadu occupies the best position in this regard with only 22 per cent of severely stunted children. ([Table 4.9](#) and [Map 4.3](#)).

Underweight children (under five) were similarly classified. Children whose weights-for-age are three standard deviations away from the NCHS international

PERCENTAGE OF STUNTED CHILDREN (0 - 5 Years) IN RURAL INDIA



Map No. 4.3

Table 4.9
Child Health Indicators

		1	2	3	4	5
Sl.No	State	Percentage of severely stunted Children under five	Percentage of severely underweight Children under five	Percentage of severely wasted Children Under five	Child Mortality Rate (1990)	Infant Mortality Rate (1997)
1	Andhra Pradesh	27.00	22.20	3.50	17.00	70.00
2	Assam	32.60	17.90	5.30	28.00	79.00
3	Bihar	44.00	29.50	9.50	27.00	73.00
4	Gujarat	54.20	36.27	3.90	24.00	69.00
5	Haryana	34.70	19.10	3.70	23.00	70.00
6	Himachal Pradesh	38.90	19.70	2.00	16.00	64.00
7	Karnataka	37.70	22.80	1.10	20.00	63.00
8	Kerala	37.30	15.70	2.90	3.00	11.00
9	Madhya Pradesh	40.00	33.40	4.20	35.00	99.00
10	Maharashtra	43.30	28.60	1.10	14.00	56.00
11	Orissa	26.50	22.00	3.10	29.00	100.00
12	Punjab	38.20	19.10	2.80	16.00	54.00
13	Rajasthan	37.20	16.40	3.90	32.00	89.00
14	Tamil Nadu	21.50	16.10	1.70	15.00	58.00
15	Uttar Pradesh	40.50	24.60	3.80	32.00	89.00
16	West Bengal	37.60	18.40	1.20	18.00	58.00
	SD	7.69	6.29	2.05	8.46	21.35

Source: Col.1,2,3 National Nutrition Monitoring Bureau (NNMB) (1996), Ministry of Human Resource Development, India Nutrition Profile (1998) and Shariff, A., (NCAER) India Human Development Report (1999)
Col. 4,5 GOI, Registrar General and Census Commissioner, Sample Registration Surveys (1990 and 1997)

reference median weight-for-age are classified as severely underweight. It is found that many Indian adults and children of well-nourished, affluent families are not far from the international median.¹⁵ Gujarat, which has the largest percentage of severely stunted children under than five years of age, also has the largest percentage of severely underweight children at 36 per cent. Gujarat is followed by Madhya Pradesh with 33 per cent. Kerala, Rajasthan and Tamil Nadu are at the other end of the scale with only about 16 per cent of severely underweight children under five years of age.

Severe stunting and underweight are growth disorders that cannot be ignored. They are important parameters of food insecurity, since the nutritional problems of children are perpetuated in adults and cannot be easily remedied. Stunting and underweight of children under five are significantly related to CED in adults, suggesting that stunted children grow up to be short and low-weight adults, with low body mass index. Stunting is the result of months and years of continued malnutrition. It is a long-term outcome and a better indicator than wasting, which may be temporary.

¹⁵ Gopalan, C (1995)

4.6 Severe Wasting in Children

Wasting is a measure of leanness. It is the ratio of weight-to-height. Wasting has less bias than stunting when judging the growth of Indian children against international standards. Children whose weight for height is two standard deviations below the international median weight-for-height are considered to be in the category of wasting. Those children whose weight-for-height is three standard deviations below the international median weight-for-height are considered severely wasted. Children with severe wasting are a small percentage compared to stunted children. Children with severe wasting are a sign of either disease or malnourishment. They need immediate attention.

It can be seen that the highest percentage of children under the age of five suffering from severe wasting is in Bihar at 9.5 per cent. Assam and Madhya Pradesh occupy the next worst positions with 5 and 4 per cent respectively. Karnataka, Maharashtra, Tamil Nadu and West Bengal are in better positions, where less than 2 per cent of children show signs of wasting. ([Table 4.9](#) and [Map 4.4](#)).

4.7 Infant Mortality Rate

Infant mortality indicates the number of infants dying before the age of one, per thousand live births. The problem of nutrition starts with the malnutrition of pregnant women and is manifested in Low-Birth-Weight babies and infant deaths. Infant mortality also results from a lack of immunization, medical help, safe drinking water etc. It is associated positively with maternal mortality and percentage of scheduled caste and scheduled tribe population. Infant mortality is negatively related to female literacy and the number of hospital beds per thousand population indicating that health facilities are important.

The data for 1997 show that Orissa and Madhya Pradesh occupy the worst position with about 100 deaths per thousand live births, with Rajasthan and Uttar Pradesh close behind. Kerala is in the best position with only 11

infant deaths per thousand births. Punjab, Maharashtra, Tamil Nadu and West Bengal show infant mortality rates ranging between 54 and 58 deaths per thousand live births. These are the next best states. They are no match to the achievement of Kerala at 11 per thousand. Most states have a rate of 60 to 70 deaths per thousand live births. ([Map 4.5](#)).

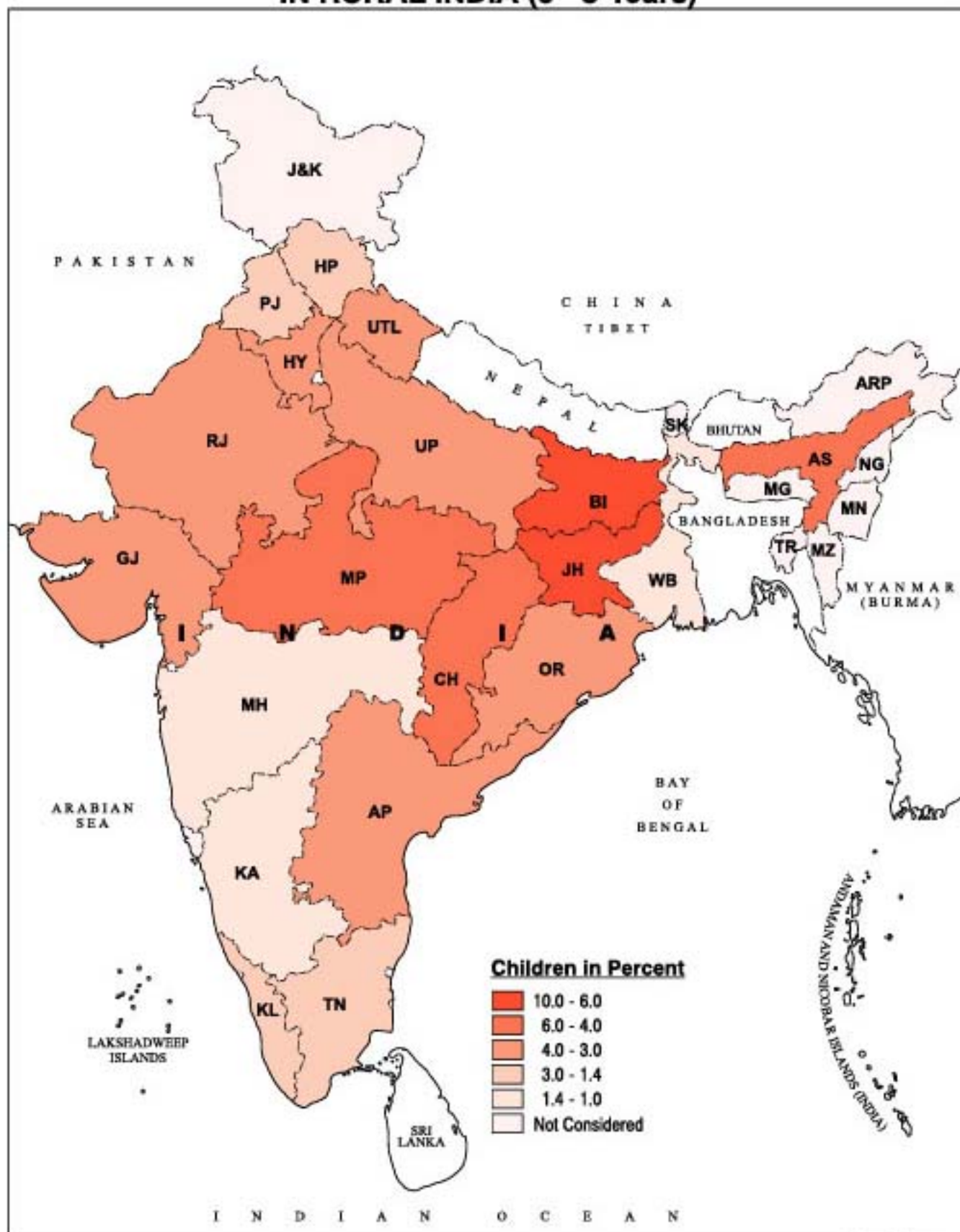
Index of Child Health and Nutrition

An index of child nutrition was calculated using the percentages of severely stunted children, severely underweight children and the infant mortality rate.¹⁶ The Child Nutrition Index ranks Kerala as the best state in terms of child health. Close behind is Tamil Nadu as another state for best child health. These two states achieved a better nutritional status for children through public health care facilities, spreading the knowledge of nutrition and an effective ICDS programme aimed at providing crucial services to children and mothers. Gujarat with the largest population of severely stunted and underweight children ranks worst on the child nutrition index followed by Madhya Pradesh, Bihar and Uttar Pradesh.

Unlike the adult Nutrition index, the child nutrition index shows the achievement in the past five years in respect of immunisation, primary health care, supplemental feeding and nutrition knowledge. Probably the major contributor has been universal immunisation. The states of Punjab, Haryana and Rajasthan are far behind Tamil Nadu and Kerala in this respect. The index throws up some interesting questions. What prevents affluent states like Punjab and Haryana from achieving lower levels of infant and child mortalities? Stunting and wasting in children in Kerala is not the lowest. The key to lowest infant mortality obviously lies in better primary health care facilities and safe drinking water. In Tamil Nadu, child health is as good as that of Kerala due to universal ICDS services and spread of primary health care. ([Table 4.10](#)).

¹⁶ See appendix 4.2

PERCENTAGE OF CHILDREN UNDERWEIGHT FOR HEIGHT IN RURAL INDIA (0 - 5 Years)



Map No. 4.4

Table 4.10
Child Health Index

		1	2	3	4
Sl.No	State	Index of Infant Mortality Rate	Index of severe underweight in children under five	Index of severe stunting in children under five	Composite Index with IMR Stunting and underweight
1	Andhra Pradesh	0.62	0.32	0.17	0.37
2	Assam	0.76	0.11	0.34	0.40
3	Bihar	0.70	0.67	0.69	0.68
4	Gujarat	0.65	1.00	1.00	0.88
5	Haryana	0.66	0.17	0.40	0.41
6	Himachal Pradesh	0.60	0.19	0.53	0.44
7	Karnataka	0.58	0.35	0.50	0.47
8	Kerala	0.00	0.00	0.48	0.16
9	Madhya Pradesh	0.99	0.86	0.57	0.80
10	Maharashtra	0.51	0.63	0.67	0.60
11	Orissa	1.00	0.31	0.15	0.49
12	Punjab	0.48	0.17	0.51	0.39
13	Rajasthan	0.88	0.03	0.48	0.46
14	Tamil Nadu	0.53	0.02	0.00	0.18
15	Uttar Pradesh	0.88	0.43	0.58	0.63
16	West Bengal	0.53	0.13	0.49	0.38

4.8 Rural Health Infrastructure

Consumption, lack of disease and better absorption depend not only on nutrition knowledge, education and resources but also on the type of health care facilities available in a state. Good rural health infrastructure is important to keep the population free from disease. We have considered some key healthcare facilities, on which information is available, as determinants of rural infrastructure. The following indicators are included in the index of rural health infrastructure index:¹⁷ ([Table 4.11](#))

- The percentage of children not immunized to the total number of children in the age group of one and two
- The percentage of the population without access to safe drinking water
- The number of persons per bed in rural areas in all the hospitals and dispensaries owned by government, private and local bodies and voluntary organizations
- The number of persons per Primary Health Centre
- The number of persons per doctor

¹⁷ See Appendix 4.3

Table 4.11
Rural Health Infrastructure Indicators

Sl. No.	State	1 Percentage of not immunized children 1 to 2 years (Rural and Urban) (1992-93)	2 Percentage of population with access to safe drinking water (1991)	3 No of persons per hospital bed (1996)	4 No. of persons per Public Health Centre (1996)	5 No of Persons per Doctor (1991-96)
1	Andhra Pradesh	45.00	49.00	5194.40	41113.90	31605.23
2	Assam	19.40	66.90	5516.09	35511.52	36881.93
3	Bihar	10.70	56.60	26780.62	36588.46	38106.51
4	Gujarat	49.80	60.00	4162.98	31181.06	30574.05
5	Haryana	53.50	67.10	24926.35	35223.38	27690.46
6	Himachal Pradesh	62.90	75.50	7815.81	22299.00	12588.15
7	Karnataka	52.20	67.30	9521.21	23362.52	22528.70
8	Kerala	54.40	12.20	515.68	23766.49	16564.00
9	Madhya Pradesh	29.20	45.60	9218.88	41417.96	11409.63
10	Maharashtra	64.10	54.00	5072.20	31318.95	17607.17
11	Orissa	36.10	35.30	5679.25	28251.05	10708.22
12	Punjab	61.90	92.10	2194.97	32557.15	21322.95
13	Rajasthan	21.10	50.60	33346.78	24394.91	17945.15
14	Tamil Nadu	64.90	64.30	8952.04	27261.33	15430.53
15	Uttar Pradesh	19.80	56.60	16264.89	33394.71	4999.01
16	West Bengal	34.20	80.30	8517.14	34769.21	32202.91
	All India	35.40	55.50	5120.68	31757.71	

Source: Col.1. NFHS-1 (1992-93)

Col. 2. GOI, Registrar General and Census Commissioner, Census of India (1991)

Col. 3-5. Compiled from information given in Health information of India, Ministry of Health and Family Welfare (1995-96).

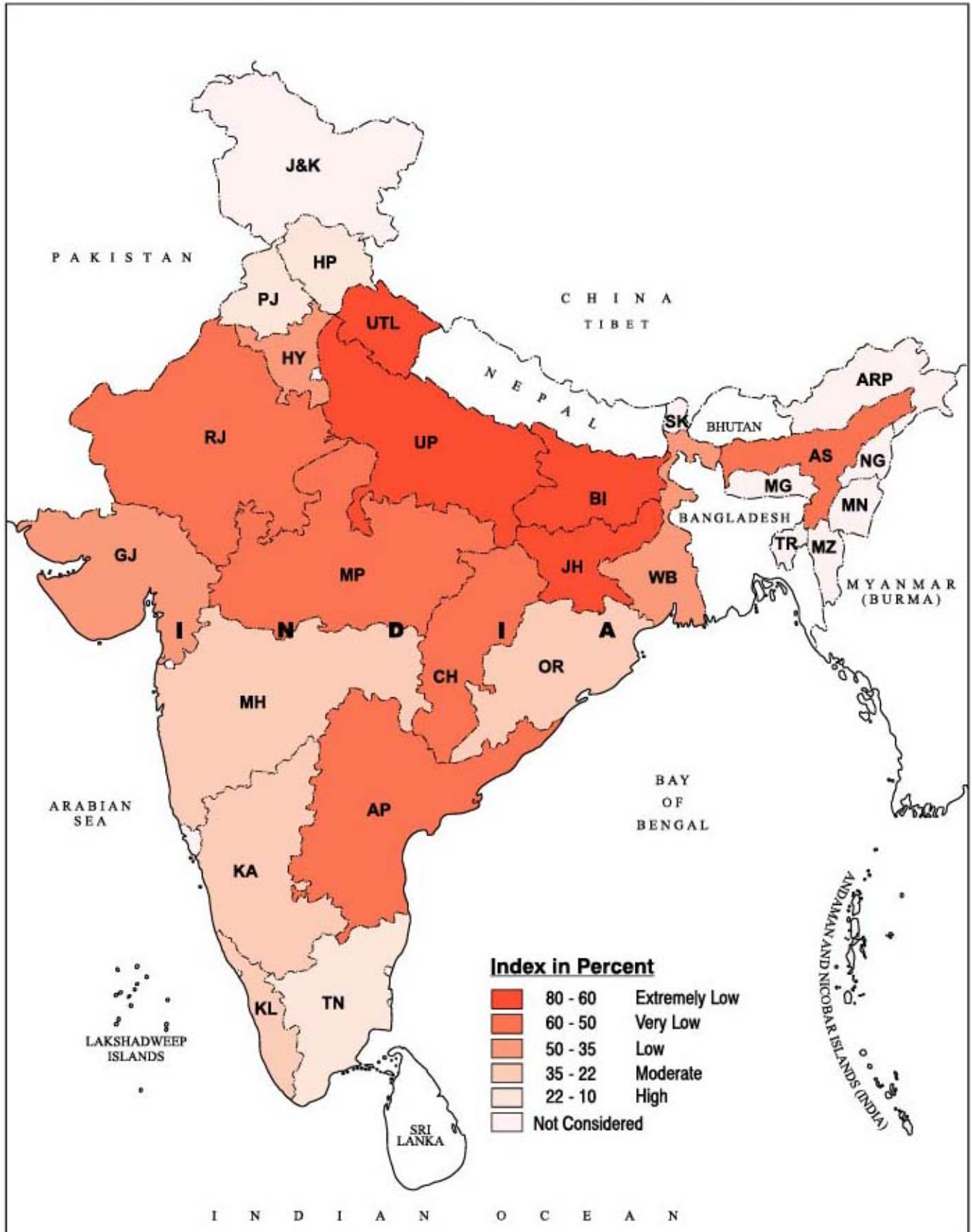
The existence of hospital beds, doctors and primary health centres by itself does not mean availability of health facilities. The quality of services provided by the hospitals is difficult to capture in these indicators. Yet, they provide some idea of the facilities available. The number of hospital and dispensary beds per thousand population and life expectancy show a significant correlation of 0.698. The number of hospital beds and percentage of children immunized are positively related to life expectancy (0.698 and 0.726) and negatively related to child mortality rates (-0.667 and -0.751) and infant mortality rates (-0.762 and -0.587). Thus, health facilities are important to keep the population healthy and achieve long-term food security.

According to the health infrastructure index, Bihar and Uttar Pradesh occupy the worst positions. Himachal Pradesh has by far the best facilities compared to any other state in the country. Punjab and Tamil Nadu have good health infrastructure. Karnataka, Maharashtra and Kerala occupy the middle positions ([Table 4.12](#) and [Map 4.6](#)).

4.9 Food Absorption Map of India

The parameters used to estimate the food absorption situation in rural India are (a) life expectancy at age one (b) percentage of the population with CED (c) percentage of severely stunted children under the age of five (d) percentage of severely wasted children under the age of

HEALTH INFRASTRUCTURE INDEX OF RURAL INDIA



Map No. 4.6

Table 4.12
Rural Health Infrastructure Index

Sl. No.	State	1 Percentage of children not immunized (1 to 2 years) (Rural and Urban) (1992-93)	2 Percentage of population without access to safe drinking water (1991)	3 No of persons per bed in rural areas (1996)	4 No. of persons per PHC in rural areas (1996)	5 No of Persons per Doctor (1991-96)	6 Health Infrastructure Index (HII) (percent)	Rank
1	Andhra Pradesh	0.37	0.54	0.14	0.98	0.53	51.00	5
2	Assam	0.84	0.32	0.15	0.69	0.67	53.00	3
3	Bihar	1.00	0.44	0.80	0.75	0.70	74.00	1
4	Gujarat	0.28	0.40	0.11	0.46	0.51	35.00	9
5	Haryana	0.21	0.31	0.74	0.68	0.43	47.00	7
6	Himachal Pradesh	0.04	0.21	0.22	0.00	0.05	10.00	16
7	Karnataka	0.23	0.31	0.27	0.06	0.30	24.00	13
8	Kerala	0.19	1.00	0.00	0.08	0.15	28.00	11
9	Madhya Pradesh	0.66	0.58	0.27	1.00	0.02	50.00	6
10	Maharashtra	0.01	0.48	0.14	0.47	0.18	26.00	12
11	Orissa	0.53	0.71	0.16	0.31	0.00	34.00	10
12	Punjab	0.06	0.00	0.05	0.54	0.27	18.00	15
13	Rajasthan	0.81	0.52	1.00	0.11	0.18	52.00	4
14	Tamil Nadu	0.00	0.35	0.26	0.26	0.12	20.00	14
15	Uttar Pradesh	0.83	0.44	0.48	0.58	1.00	67.00	2
16	West Bengal	0.57	0.15	0.24	0.65	0.55	43.00	8
	SD	18.22	18.58	9511.44	6064.66	11250.52		

five (e) infant mortality rate and (f) a health infrastructure index. The states were ranked according to these six parameters. After ranking, the individual rank of each state was summed to derive a final cumulative index.¹⁸ The average value of this cumulative index is taken as the mapping index. The index varies between 3.5 and 13.00. The states are divided into five typologies using natural break in the series. (Tables 4.13 and 4.14 and Map 4.7)

The food absorption map of India shows that the states of Bihar, Madhya Pradesh and Uttar Pradesh have very low nutritional status. Gujarat, Assam, Orissa and Rajasthan are also do not show a better status for their population. The states that stand out as the best in terms of absorption are Punjab, Kerala and Tamil Nadu. Himachal Pradesh and Karnataka are close behind. Rural health facilities

determine the long term outcomes. The entire section on food absorption stresses the importance of urgent public action to achieve the goals of nutrition set by the government.

Bihar has the worst health infrastructure (in terms of healthcare facilities) and the highest percentage of severely wasted children under five. It also has a high percentage of severely stunted children below five. Madhya Pradesh has a high infant mortality rate, low life expectancy at the age of one and a high percentage of severely wasted children under five. Uttar Pradesh has a very poor health infrastructure. It also has a low life expectancy at the age of one and a high infant mortality rate.

Punjab emerges as the best state as far as food absorption is concerned. The state has a low percentage

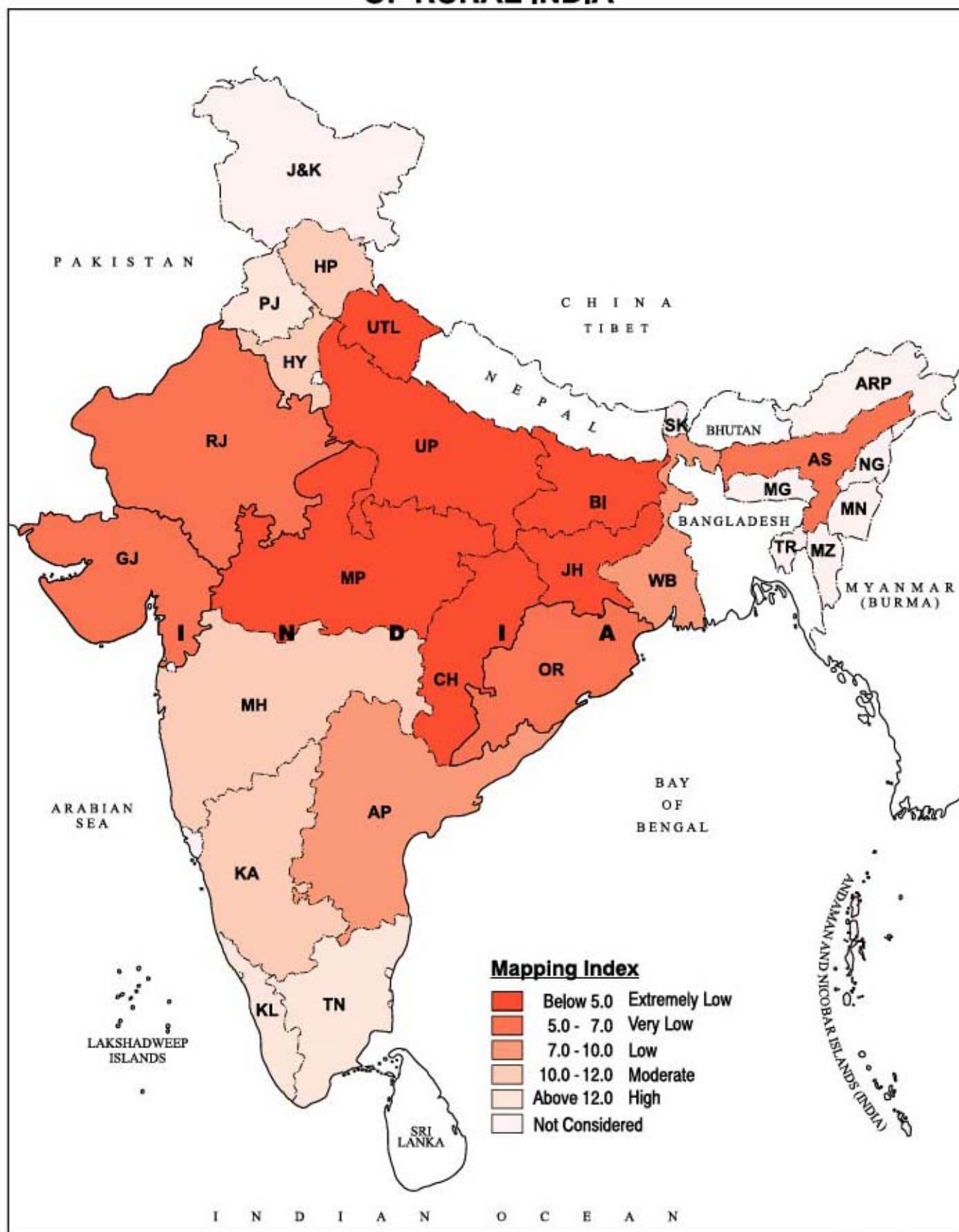
¹⁸ See Chapter One for the methodology of cumulative mapping Index

Table 4.13**Indicators of Food Absorption and Nutritional Situation in India***

		1	2	3	4	5	6						
Sl. No.	State	Life expectancy at age one (1992-96)	Rank	Percentage of population with chronic energy deficiency	Rank	Percentage of severely stunted children under five (1994)	Rank	Percentage of severely wasted children Under 5 (1994)	Rank	Infant Mortality Rate (1997)	Rank	Health Infra-structure Index	Rank
1	Andhra Pradesh	65.2	8	49.40	8	27.00	14	3.50	8	70.00	7	51.00	5
2	Assam	60.6	1	17.10	16	32.60	13	5.30	2	79.00	5	53.00	3
3	Bihar	63.2	5	51.30	6	44.00	2	9.50	1	73.00	6	74.00	1
4	Gujarat	65.1	7	53.10	5	54.20	1	3.90	4	69.00	9	35.00	9
5	Haryana	67.6	12	25.90	14	34.70	12	3.70	7	70.00	7	47.00	7
6	Himachal Pradesh	68.1	13	38.90	10	38.90	6	2.00	12	64.00	10	10.00	16
7	Karnataka	66.6	11	53.80	3	37.70	8	1.10	15	63.00	11	24.00	13
8	Kerala	73.2	16	33.20	13	37.30	10	2.90	10	11.00	16	28.00	11
9	Madhya Pradesh	61.2	2	53.30	4	40.00	5	4.20	3	99.00	2	50.00	6
10	Maharashtra	68.1	13	51.00	7	43.30	3	1.10	15	56.00	14	26.00	12
11	Orissa	62.6	4	57.30	1	26.50	15	3.10	9	100.00	1	34.00	10
12	Punjab	70.5	15	23.00	15	38.20	7	2.80	11	54.00	15	18.00	15
13	Rajasthan	64.6	6	36.20	12	37.20	11	3.90	4	89.00	3	52.00	4
14	Tamil Nadu	66.1	10	37.30	11	21.50	16	1.70	13	58.00	12	20.00	14
15	Uttar Pradesh	62.2	3	44.00	9	40.50	4	3.80	6	89.00	3	67.00	2
16	West Bengal	65.8	9	56.00	2	37.60	9	1.20	14	58.00	12	43.00	8

* Refer [Appendix 5.1](#) for sources of data.

FOOD ABSORPTION AND NUTRITIONAL STATUS OF RURAL INDIA



Map No. 4.7

Table 4.14
Mapping Index of Food Absorption and Nutritional Situation in India

Sl.No	State	Indicators						Cumulative Rank	Mapping Index	Mapping Rank	Mapping Typology
		1	2	3	4	5	6				
1	Andhra Pradesh	8	8	14	8	7	5	50	8.33	8	3
2	Assam	1	16	13	2	5	3	40	6.67	5	2
3	Bihar	5	6	2	1	6	1	21	3.50	1	1
4	Gujarat	7	5	1	4	9	9	35	5.83	4	2
5	Haryana	12	14	12	7	7	7	59	9.83	10	4
6	Himachal Pradesh	13	10	6	12	10	16	67	11.17	13	4
7	Karnataka	11	3	8	15	11	13	61	10.17	11	4
8	Kerala	16	13	10	10	16	11	76	12.67	14	5
9	Madhya Pradesh	2	4	5	3	2	6	22	3.67	2	1
10	Maharashtra	13	7	3	15	14	12	64	10.67	12	4
11	Orissa	4	1	15	9	1	10	40	6.67	5	2
12	Punjab	15	15	7	11	15	15	78	13.00	16	5
13	Rajasthan	6	12	11	4	3	4	40	6.67	5	2
14	Tamil Nadu	10	11	16	13	12	14	76	12.67	14	5
15	Uttar Pradesh	3	9	4	6	3	2	27	4.50	3	1
16	West Bengal	9	2	9	14	12	8	54	9.00	9	3

Mapping Index

Below 5.0

5.0 - 7.0

7.0 - 10.0

10.0 - 12.0

Above 12.0

Mapping Typology

Extremely Low

Very Low

Low

Moderate

High

States

BH, MP, UP

GJ, OR, RJ, AS

AP, WB

HY, KN, MH, HP

TN, KL, PJ

of population with CED, a low infant mortality rate, good health infrastructure and high life expectancy at the age of one. The lowest infant mortality and highest life expectancy help Kerala to acquire the second best position.

4.10 Nutritional Programmes

Integrated Child Development Service Programme (ICDS) is designed to bring about nutritional benefits to expectant and nursing mothers, women in reproductive age groups and children below the age of six. The scheme was launched on 2nd October, 1975 in 33 blocks. The programme has short-term as well as long-term objectives. The programme aims at improving the nutritional and health status of the

target group, to reduce the incidence of malnutrition, morbidity and mortality. It also seeks to lay the foundations for the psychological, physical, and social development of the child. It aims at reducing school dropouts. It tries to enhance the capability of mothers to look after the health and nutritional needs of the child.

ICDS today reaches out to 4.8 million mothers and 22.9 million children under six years of age belonging to the low-income groups. The network consists of 5,171 projects, covering over 80 percent of the country's community development blocks including urban slum pockets.¹⁹

¹⁹ GOI, Ministry of Human Resource Development, ICDS Report, (2001)

Box 4.1

Nutrition Programmes – The success of India Mix: Since its inception in the early 1960s, the World Food Programme (WFP) has been making continuous efforts to alleviate hunger and malnutrition. It has been actively involved in this endeavor in India since the early 1970s, working in close collaboration with state governments to provide a nutritious food supplement to the malnourished sections of the people. They undertook the distribution of corn-soya-blend, a blend of pre-cooked maize and soya fortified with micro-nutrients. As a next step, they developed an indigenously produced low cost nutritious supplement, Indiamix (blended mix of wheat and soya enriched with vitamins and minerals). The distribution of Indiamix commenced in Rajasthan in 1995. It has since been extended to other states. Rajasthan also produced its own variation of Indiamix - Rajasthan mix. Further, in times of acute food shortage and other emergency situations, Indiamix is proving to be a lifesaver, having been distributed in drought stricken Rajasthan and cyclone ravaged Orissa and earthquake struck Gujarat. A side effect has been employment generation and local manufacturing units.

A unique experience for WFP was using this support to establish a small plant with a production capacity of 500 MT of blended and fortified food similar to Indiamix, in Kazlidungri village in Jhabua district of Madhya Pradesh. The plant is run by a group of twelve tribal women, who have formed a cooperative. The group of women was provided the necessary training by WFP. Today, the product is purchased entirely by the Department of Women and Child Development for use in the Integrated Child Development Services (ICDS) in Jhabua. Quality testing is done before distribution to the ICDS beneficiaries. The unit in Kazlidungri is now working very well. On their own, the women's group manages the entire operation of producing blended food for 20,000 beneficiaries. The unit has the complete support of the state and as the plant caters to the requirements of a totally backward population, the government has sanctioned wheat at below poverty line price. After one year of operations, the unit has realized profit. Based on the performance of this pilot project, WFP and the state government of Madhya Pradesh now has more requests from other districts for similar ventures. This venture has attracted other such group to join hands with the state government of Madhya Pradesh and World Food Programme on a pilot "Community Entrepreneurship for Food Production". The entire process from project designing to implementation is being done through a participatory approach and various NGOs are involved in training women's groups.

The six major services provided by ICDS are: 1) Supplementary nutrition, 2) Immunization, 3) Health check-up, 4) Referral services, 5) Non-formal pre-school education for 3-6 year olds, and 6) Nutrition and health education for women. The ICDS programmes are structured around Anganwadi workers based in Anganwadi centres located in project villages and they receive support from health workers. The ICDS workers are usually from the local area and they are the primary contact persons for the target population. These Anganwadi workers are responsible for selecting participants, organizing nutrition and health education classes, providing supplementary food and maintaining records of immunisation, health status and attendance. The medical

officer, the auxiliary nurse cum midwife and a lady health visitor provide guidance to the Anganwadi workers. A supervisor usually supervises twenty centres and a child development project officer at the block level administers five to seven supervisors.

ICDS is monitored at the state level by a central cell established in the nodal department implementing the programme. It collects and analyses periodic work reports. Based on this, programme strategies are refined and timely interventions made, ensuring effective programme planning, implementation and monitoring. A national ICDS Management Information System (MIS) working group facilitates this process. Each state government has an MIS coordination cell. Districts with more than five projects

also have an ICDS monitoring cell at the district level, to facilitate programme monitoring. MIS ensures a regular flow of information and feedback between each Anganwadi and the project, between the ICDS project and the State Government and between the State Government and the Government of India. Under the national plan to monitor ICDS, Anganwadi workers compile standardized monthly and half-yearly reports based on their register data. Through monthly review meetings of ICDS and health functionaries at various levels – block, district, division and state both the Monthly Progress Report (MPR) and the Monthly Monitoring Report (MMR) are discussed for promoting joint action.

The coverage of the ICDS programme differs from state to state. Though it has been extended to the entire country, all the blocks are not covered. Tamil Nadu, Karnataka, Himachal Pradesh and West Bengal have achieved the coverage of all blocks in the state. Bihar has the lowest coverage at 54 percent (Table 4.15).

Most of the evaluation studies indicate that wherever ICDS has been implemented, there has been a positive impact. Overall improvement is also obvious in child and infant mortality rates across the country, due to the universal immunization programme. There has also been an improvement in the nutritional status of the population in general and particularly in ICDS areas. A significant decline in the levels of severely malnourished and moderately malnourished children has been observed in the ICDS blocks in the country.²⁰ Data from the evaluation conducted by the National Institute of Public Cooperation and Child Development (NIPCCD) indicates²¹ that there was a reduction in severe chronic energy deficiency (CED) in ICDS areas from 15.3% during 1976-78 to 8.7% during 1989-90. The nutritional status of children in ICDS areas was found to be better than that of children in non ICDS areas. The ICDS blocks were found to compare favorably

with non ICDS blocks on major indicators such as infant mortality rates, immunization, utilization of health services and scholastic enrollment and performance.

However, the ICDS has its own drawbacks. All the objectives have not been realized. It did not have the intended nutritional impact on young children and mothers nationwide. This is because its effective national coverage is low. ICDS provides supplementary feeding for only 30 million of the country's approximately 162 million 0-6 year olds or less than one child in five. For many reasons the programme's main focus gradually has become food supplementation and preschool education for 3-6 years olds, to the neglect of children under 3, especially those aged 6-24 months.²² Moreover, as the 1992 NIPCCD evaluation has demonstrated, ICDS has not brought about the behavioural changes necessary among families to prevent malnutrition in young children or low birth weight babies.

Table 4.15
Coverage of ICDS Projects

Sl.No.	State	Presently operational	Total needed	Percentage of coverage
1	Andhra Pradesh	209	351	59.54
2	Assam	107	196	54.59
3	Bihar	323	597	54.10
4	Gujarat	203	227	89.43
5	Haryana	114	116	98.28
6	Himachal Pradesh	72	72	100.00
7	Karnataka	185	185	100.00
8	Kerala	120	163	73.62
9	Madhya Pradesh	355	488	72.75
10	Maharashtra	271	363	74.66
11	Orissa	279	326	85.58
12	Punjab	110	142	77.46
13	Rajasthan	191	257	74.32
14	Tamil Nadu	432	432	100.00
15	Uttar Pradesh	560	690	81.16
16	West Bengal	294	NA	100.00

Source: Ministry of Human Resource Development, ICDS

²⁰ NNMB Technical Report No.18, (1999). Reduction in mortality rates is obvious from sample registration surveys. Reduction in percentage of children stunted and wasted and underweight has been noticed by NNMB from Seventies to Nineties.

²¹ NIPCCD (1992)

²² Swaminathan, Meena (1991)

It is important to note that no monitoring and evaluation system exists that can reliably gauge the impact of the ICDS on its primary objectives.²³

A World Bank study conducted in 1996-97 has also identified certain weaknesses in the implementation of the programme in some locations. For example, over one-third of Anganwadi workers were found to be unable to perform the growth monitoring function that is critical in identifying children in need of nutritional supplementation. Links with the health system were likewise found to be weak in some cases. In some cases over-burdened and under-trained workers have had to neglect a key service, such as outreach or nutrition and health education in order to fulfill the basic feeding, weighing and childhood education requirements.²⁴

Other reasons for the lack of significant improvement in the nutritional status of ICDS areas include irregularity of food deliveries to Anganwadis and hence irregular feeding. Inadequate rations of as little as 254 kcl and 7.61 grams of protein and 7 grams of fat are not of much use. Poor nutrition education of mothers and communities to improve feeding practices at home, inadequate training of

workers in nutrition, growth monitoring and communication, poor supervision, poor coordination and linkage with health workers and lack of community ownership and participation have also been noted.²⁵

A World Bank research on ICDS effectiveness in two states namely Maharashtra and Rajasthan, revealed that while those who are covered by ICDS services are predominantly poor, not all the poor are actually covered by the programme. Data from the field study show that 15-25% of the population in blocks covered by ICDS lives in villages that do not have Anganwadi workers and so does not have access to services provided through the programme. Thus, in rural Maharashtra, in the tribal ICDS blocks, at least half the population is not covered. The more serious problem is the under-coverage that takes place within the Anganwadi area. This village level under-coverage appears largely to be skewed against the poor. Distant hamlets, scheduled caste clusters and dispersed marginal households tend to be left out, since anganwadi centres are located in central sections of the village.²⁴ There have been no significant consultations with the poorer groups in many locations either regarding the location of the Anganwadis or their activities.



²³ Measham, R. Anthony and Chatterjee, Meera (1999)

²⁴ World Bank (1997)

²⁵ Measham, R. Anthony and Chatterjee, Meera (1999)

CHAPTER 5

Food Insecurity Map of Rural India

The composite map of food insecurity is based on various indicators and indices explained in the preceding chapters. The three aspects of food insecurity, i.e., food availability, food access and food absorption, analysed in detail in chapters two, three and four, have been consolidated into a single map.

5.1 Measuring Food Insecurity

The mapping index of food insecurity has been calculated by combining 19 indicators as noted earlier. All these indicators carry the same weight. However, there is an implicit weight to each dimension, such as availability, access and absorption. If more than one indicator belongs to one aspect, that aspect gets more weight. Out of the nineteen indicators chosen,¹ five indicators represent food availability, eight indicators represent food access and six indicators represent food absorption.

Within food availability, deficit in production and fluctuations in production get two indicators. The environmental factors indicating long-term sustainability have one indicator. Transitory food insecurity gets two indicators, one on flood and the other on drought. Out of the eight indicators that represent food access, two represent actual physical access to food. They measure the depth and spread of hunger through calorie consumption. Three indicators indirectly measure the possibility of discrimination in food access. These are juvenile sex ratio, female literacy and percentage of Scheduled Castes and Scheduled Tribes. Two others represent livelihood vulnerability due to poverty and casual labour employment. One indicator is for rural infrastructure that has a direct bearing on livelihood security. To represent food absorption, six indicators have been chosen. All the indicators of food absorption except wasting are long-

term outcomes of inadequate food intake and proper absorption. Life expectancy at age one and chronic energy deficiency in adults represent adult health. Infant mortality, severe stunting and wasting in children represent child health. Rural health infrastructure facilitates health care and better absorption. The weighting is implicit in the number of parameters in each group. With five indicators, food availability gets an implicit weight of 26 per cent, eight indicators of food access give it a weight of 42 per cent and food absorption with six indicators gets a weight of 32 per cent.

The 16 states have been put into five typologies, based on the composite Mapping Index calculated. Class intervals of each typology have been chosen by the GIS software Arc-view, following natural breaks in the series. Minor adjustments have been made in the class limits to round them off to the nearest decimal point. The index ranges from 4 to 12. All the states that are extremely food insecure are put in the class below 5. Bihar is the only state, which falls in this typology. All the states that are food secure fall between the class interval of 11 and 12. Punjab is the most food secure state, followed by Himachal Pradesh, and these two states fall in this category. The next typology consists of moderately food secure states and the class limits are 9.5 and 11, in which we have Kerala and Tamil Nadu. Kerala is better off than Tamil Nadu. The typology of severely food insecure states, falling in the interval of 5 and 8 are the states of Gujarat, Madhya Pradesh, Uttar Pradesh, Rajasthan and Orissa in that order. The remaining states of West Bengal, Maharashtra, Assam, Andhra Pradesh, Karnataka and Haryana fall in the middle typology of 8 to 9.5. They are moderately food insecure. (Table No. [5.1](#) & [5.2](#))

¹ See Appendix 5.1 for the sources of data.

Table No. 5.1
Indicators of Food Insecurity Situation of India

Sl.No.	State	1		2		3		4	
		Deficit in prod. represented by the ratio of consumption to production of cereals (1993-94)	Rank	Instability in Cereal Production (in percent) (1987-88 to 1997-98)	Rank	Sustainability Index (in percent)	Rank	Population affected by flood/cyclone/heavy rains/landslides (in Lakhs) (1998-99)	Rank
1	Andhra Pradesh	1.158	9	12.91	9	29.00	13	1.495	13
2	Assam	1.286	4	7.34	13	31.00	12	27.875	6
3	Bihar	1.791	2	15.82	5	37.00	9	105.455	1
4	Gujarat	1.745	3	57.79	1	48.00	5	33.142	5
5	Haryana	0.329	15	13.68	7	84.00	1	13.760	8
6	Himachal Pradesh	0.765	14	15.28	6	39.00	7	23.370	7
7	Karnataka	1.110	11	12.43	10	35.00	10	42.798	4
8	Kerala	3.989	1	5.39	16	29.00	13	1.497	12
9	Madhya Pradesh	0.973	12	10.80	11	10.00	16	2.180	11
10	Maharashtra	1.274	5	29.29	3	35.00	10	2.290	10
11	Orissa	1.126	10	25.08	4	28.00	15	8.535	9
12	Punjab	0.156	16	5.65	15	81.00	2	0.030	14
13	Rajasthan	1.252	6	38.92	2	71.00	3	0.003	15
14	Tamil Nadu	1.179	8	13.63	8	38.00	8	0.000	16
15	Uttar Pradesh	0.839	13	7.35	12	47.00	6	62.245	3
16	West Bengal	1.182	7	6.04	14	55.00	4	79.315	2

5		6		7		8		9	
Percentage of drought prone area to total geographical area (1999)	Rank	Calorie intake of the lowest decile (Kcal) per cu/day (1993-94)	Rank	Percentage of population consuming <1890 Kcal (1993-94)	Rank	Percentage below poverty line (1993-94)	Rank	Percentage of population dependent on labour income (1993-94)	Rank
11.94	6	1858.39	8	14.10	6	15.92	15	47.80	3
0.00	11	1842.48	7	13.30	8	45.01	3	30.50	11
0.00	11	1790.88	5	14.10	6	58.21	1	38.50	8
54.49	2	1788.34	4	20.40	4	22.18	14	45.30	5
18.86	4	2022.33	12	8.70	11	28.02	11	28.10	12
0.00	11	2170.65	15	5.30	15	30.34	9	14.50	16
30.06	3	1803.85	6	17.40	5	29.88	10	38.60	7
0.00	11	1556.33	2	23.70	2	25.76	13	48.30	2
8.41	7	1894.03	9	12.20	9	40.64	6	35.60	9
18.74	5	1747.75	3	21.90	3	37.93	7	47.50	4
1.29	10	1918.96	10	10.40	10	49.72	2	27.40	13
0.00	11	2116.48	14	6.30	14	11.95	16	33.30	10
56.74	1	2249.85	16	4.20	16	26.46	12	23.80	14
5.73	8	1551.38	1	28.20	1	32.48	8	53.30	1
1.57	9	2103.15	13	8.00	12	42.28	4	17.20	15
0.00	11	2012.57	11	7.40	13	40.80	5	39.80	6

Table No. 5.1 Contd...
Indicators of Food Insecurity Situation of India

Sl.No.	State	10	Rank	11	Rank	12	Rank	13	Rank
		Rural Infra- structure Index (in percent)		Juvenile Sex Ratio (Females per thousand males) (1991)		Percentage of Female Literacy (1991)		Percentage of SC & ST Population (1991)	
1	Andhra Pradesh	42.30	8	981	16	23.90	5	25.99	8
2	Assam	74.60	4	978	15	39.20	11	21.11	15
3	Bihar	99.20	1	951	6	17.90	2	23.45	11
4	Gujarat	30.80	15	945	5	38.60	10	27.94	7
5	Haryana	34.90	12	881	1	32.50	7	21.56	14
6	Himachal Pradesh	11.80	16	961	9	49.80	15	30.50	6
7	Karnataka	35.80	11	977	14	34.80	8	23.41	12
8	Kerala	39.70	9	967	11	85.10	16	12.43	16
9	Madhya Pradesh	57.40	6	963	10	19.70	4	43.62	1
10	Maharashtra	32.40	13	953	7	41.00	12	24.71	9
11	Orissa	64.60	5	975	13	30.80	6	41.02	2
12	Punjab	37.70	10	881	1	43.90	14	31.93	5
13	Rajasthan	56.90	7	919	4	11.60	1	33.36	4
14	Tamil Nadu	31.40	14	956	8	41.80	13	24.29	10
15	Uttar Pradesh	84.10	3	917	3	19.00	3	23.40	13
16	West Bengal	89.90	2	972	12	38.10	9	34.87	3

14		15		16		17		18		19	
Life Expectancy at the age one (1992-96)	Rank	Percentage of population with chronic energy defficiency (1994)	Rank	Percentage of severely stunted children under five (1994)	Rank	Percentage of children underweight for height under five (1994)	Rank	Infant Mortality Rate (1997)	Rank	Health Infrastructure Index (in percent)	Rank
65.2	8	49.40	8	27.00	14	3.50	8	70.00	7	51.00	5
60.6	1	17.10	16	32.60	13	5.30	2	79.00	5	53.00	3
63.2	5	51.30	6	44.00	2	9.50	1	73.00	6	74.00	1
65.1	7	53.10	5	54.20	1	3.90	4	69.00	9	35.00	9
67.6	12	25.90	14	34.70	12	3.70	7	70.00	7	47.00	7
68.1	13	38.90	10	38.90	6	2.00	12	64.00	10	10.00	16
66.6	11	53.80	3	37.70	8	1.10	15	63.00	11	24.00	13
73.2	16	33.20	13	37.30	10	2.90	10	11.00	16	28.00	11
61.2	2	53.30	4	40.00	5	4.20	3	99.00	2	50.00	6
68.1	13	51.00	7	43.30	3	1.10	15	56.00	14	26.00	12
62.6	4	57.30	1	26.50	15	3.10	9	100.00	1	34.00	10
70.5	15	23.00	15	38.20	7	2.80	11	54.00	15	18.00	15
64.6	6	36.20	12	37.20	11	3.90	4	89.00	3	52.00	4
66.1	10	37.30	11	21.50	16	1.70	13	58.00	12	20.00	14
62.2	3	44.00	9	40.50	4	3.80	6	89.00	3	67.00	2
65.8	9	56.00	2	37.60	9	1.20	14	58.00	12	43.00	8

Table 5.2

Mapping Index of Food Insecurity Situation in India

Sl.No	State	Indicators																		Cumulative Rank	Mapping Index	Mapping Rank	Mapping Typology	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18					19
1	AP	9	9	13	13	6	8	6	15	3	8	16	5	8	8	8	14	8	7	5	169	8.9	10	3
2	AS	4	13	12	6	11	7	8	3	11	4	15	11	15	1	16	13	2	5	3	160	8.4	9	3
3	BH	2	5	9	1	11	5	6	1	8	1	6	2	11	5	6	2	1	6	1	89	4.7	1	1
4	GJ	3	1	5	5	2	4	4	14	5	15	5	10	7	7	5	1	4	9	9	115	6.1	2	2
5	HY	15	7	1	8	4	12	11	11	12	12	1	7	14	12	14	12	7	7	7	174	9.2	12	3
6	HP	14	6	7	7	11	15	15	9	16	16	9	15	6	13	10	6	12	10	16	213	11.2	15	5
7	KN	11	10	10	4	3	6	5	10	7	11	14	8	12	11	3	8	15	11	13	172	9.1	11	3
8	KL	1	16	13	12	11	2	2	13	2	9	11	16	16	16	13	10	10	16	11	200	10.5	14	4
9	MP	12	11	16	11	7	9	9	6	9	6	10	4	1	2	4	5	3	2	6	133	7.0	3	2
10	MH	5	3	10	10	5	3	3	7	4	13	7	12	9	13	7	3	15	14	12	155	8.2	8	3
11	OR	10	4	15	9	10	10	10	2	13	5	13	6	2	4	1	15	9	1	10	149	7.8	6	2
12	PJ	16	15	2	14	11	14	14	16	10	10	1	14	5	15	15	7	11	15	15	220	11.6	16	5
13	RJ	6	2	3	15	1	16	16	12	14	7	4	1	4	6	12	11	4	3	4	141	7.4	5	2
14	TN	8	8	8	16	8	1	1	8	1	14	8	13	10	10	11	16	13	12	14	180	9.5	13	4
15	UP	13	12	6	3	9	13	12	4	15	3	3	3	13	3	9	4	6	3	2	136	7.2	4	2
16	WB	7	14	4	2	11	11	13	5	6	2	12	9	3	9	2	9	14	12	8	153	8.1	7	3

Mapping Index

Below 5.0

5.0 - 8.0

8.0 - 9.5

9.5 - 11.0

Above 11.0

Mapping Typology

Extremely Insecure

Severely Insecure

Moderately Insecure

Moderately Secure

Secure

States

BH

GJ, MP, UP, RJ, OR

WB, MH, AS, AP, KN, HY

TN, KL

HP, PJ

We have already discussed the problem of aggregation of indicators in the first chapter, in the section on methodology. It is worthwhile to caution once again that the simple adding up of the ranks of indicators influences the interpretation of the relative position of the various states. The rank of a state differs from one indicator to another. It may happen that except for a state with an extreme value, most of the states would be in the middle ranges. A normal distribution or a skewed distribution to the right or left would occur. While adding up the ranks, the difference between the states is reduced. The final cumulative ranking index would have a lower variation. In such an instance, actual comparison and assigning a hierarchical position becomes rather subjective. The rank of the indicator and the weight of the indicator in the index, determine the position of the state. In the shape of things, food absorption and health infrastructure indicators have tilted the position of the states towards food insecurity, though they are good in food availability and physical food access. The states which are not so good in food availability and physical access to food have turned more food secure as they could ensure better nutritional status and better infrastructure for residents. The map is useful only in making broad comparisons across typologies. To facilitate such comparison and to avoid value judgment in such cases, individual maps based on the actual data have been provided in the other chapters. The composite map has to be interpreted carefully.

5.2 Interpreting the Food Insecurity Map

The food insecurity map of rural India gives an overall picture of the food insecurity situation at the state level. The map is an advocacy tool; it heightens peoples' awareness. The food insecurity map does not reveal everything about the food insecurity of a state at a glance. It is necessary to go through a series of maps and indices and interrelationships on each aspect to understand the complex food insecurity situation. A map is a good beginning to do this.

The map thus captures and summarizes the distribution in a large number of indicators. It shows the typology of the state with each typology having certain problems in common. We shall illustrate these not only with the parameters included in the mapping index but also with the help of the insights gained from the preceding analysis. An attempt to go deeper into the causes of food insecurity within the state and districts would require a typology specific to that geographical entity. Each state will have its own specific set of problems.

It is important to note that several of the indicators pertain to the most vulnerable sections of the population within the states. The map lays greater emphasis on deprivation and vulnerability. Hence, the indicators chosen are not always average figures for a particular state. This is an important factor to keep in mind while interpreting the map. As has already been stressed in the previous chapters, the average may be very different from the plight of the lowest ten per cent. In the food insecurity map, we have attempted to represent deprivation rather than the average status of a state. Only three parameters of food security, viz. rural infrastructure, rural health infrastructure and life expectancy, represent the average status of the state. All the other sixteen parameters represent deprivation and vulnerability of some sort or the other. Three against sixteen shows how careful one has to be in judging that it is the average situation in the state. This map particularly emphasizes vulnerable persons and vulnerable situations and is ideally suited for programme intervention for the poor and vulnerable sections of the population. The food insecurity map of rural India thus highlights the situations that need public action and specific interventions.

5.3 The Pattern of Food Insecurity

The map clearly shows that on the whole, Bihar is the most food insecure state in every way. It is 'poor' in terms of almost all the indicators. The most food secure states are Punjab and Himachal Pradesh. These states are good in terms of many indicators, which carry weight in the

index. There are moderately food secure states such as Kerala and Tamil Nadu and severely food insecure states such as Gujarat, Orissa, Rajasthan, Madhya Pradesh and Uttar Pradesh.

What we see from the map are the major typologies of food insecurity. Each group of states has a set of specific problems common to it. None of the states is in an ideal position of being totally food secure, including Punjab, which has severe problems of long-term environmental sustainability. Even a state like Bihar has some good points such as being free from droughts and having enough water resources. The typologies are not meant to certify states as 'good' or to tag certain states as 'bad'. The typologies show the common problems of food availability, food access and food absorption in these states.

The analysis of the problems is based on many more indicators, which tell us a more complete story. If one were to start with the map and then go beyond the indicators of the map, searching for answers to questions, the story of food insecurity would unfold.² The story of the final food insecurity map is not the same as that of food availability or food access or food absorption. It has a different story to tell. ([Map 5.1](#))

1. The States in Red and Shades of Red

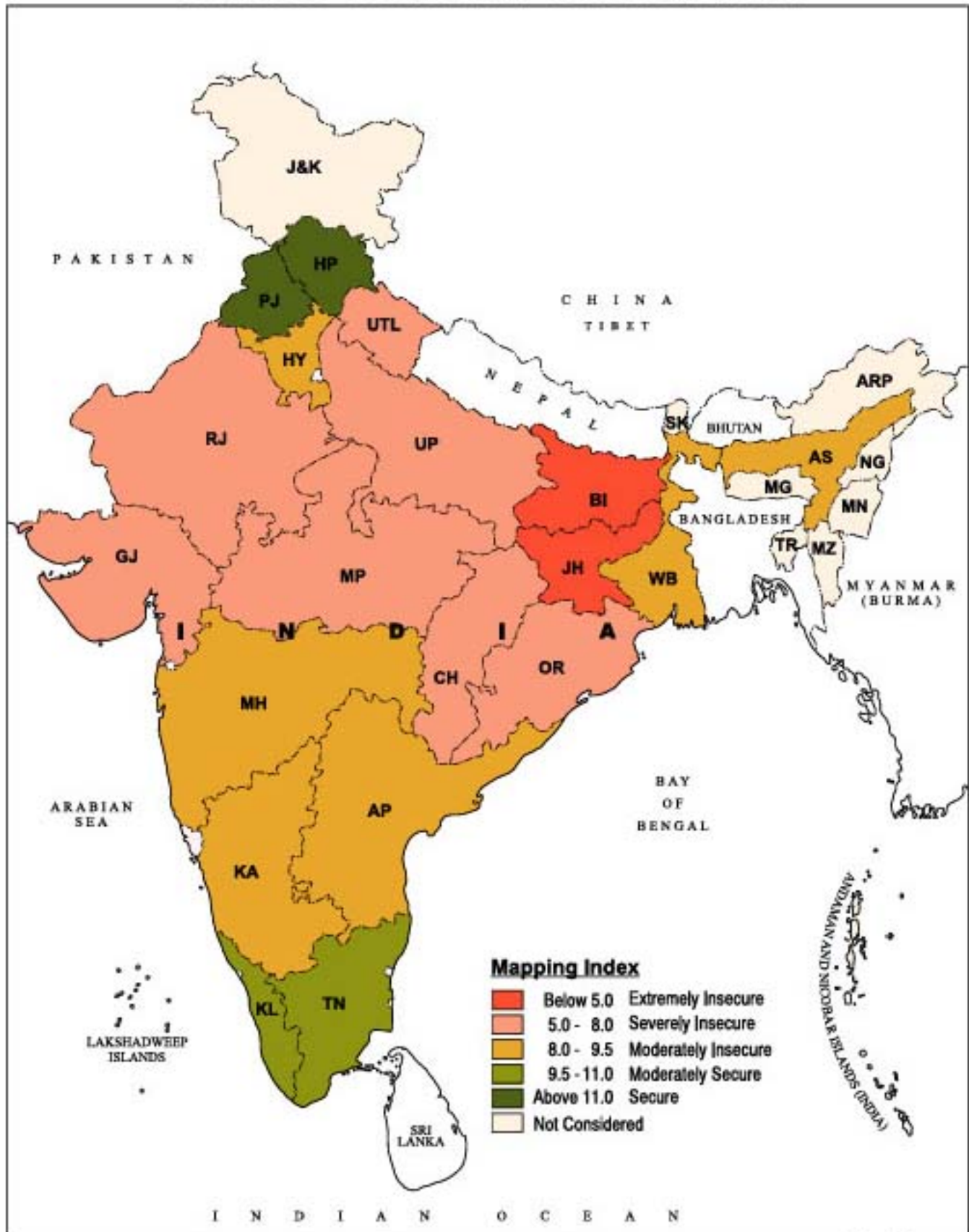
The two typologies in the most food insecure category are depicted in the shades of red to impart a sense of urgency. The most food insecure state is Bihar (including the present-day state of Jharkhand) in darkest red. It is most food insecure because its position is relatively grave with respect to most indicators. The food access and livelihood access situations in Bihar are grim. Livelihood opportunities are not so good and poverty levels are high. Food absorption and nutritional status are also among the lowest. The state also occupies the penultimate position in terms of availability. Hence, it comes out as the most food insecure state in rural India.

However, Bihar has some positive aspects. It is relatively free from droughts. It has better water sources than the other states. The spread of hunger as measured by the number of persons consuming less than 1890 Kcal is moderate in Bihar. About 14 per cent of the people consumed diets deficient in calories in 1993-94. This is lower than the spread of hunger in the four food deficit states of Tamil Nadu, Kerala, Gujarat and Maharashtra, where it affects between 20 and 28 per cent of the population. It has a lower percentage of population dependent on labour income. Despite these push factors that push the state up the food security ladder, the factors that pull down the overall status of Bihar are prominent. The normative consumption to actual production ratio is the second worst, after Kerala; instability in cereal production is relatively high owing to its proneness to natural disasters like floods. The other prominent factors in addition to poverty that pull the state down are poor rural infrastructure, high female illiteracy, high percentage of stunted and wasted children under 5 years, high levels of infant mortality and poor health infrastructure.

In the next category, we have the five states of Gujarat, Madhya Pradesh, Uttar Pradesh, Rajasthan and Orissa. Barring Gujarat, all the other states seem to have much in common. They all have high levels of poverty. Poor health facilities, high child and infant mortality rates and maternal mortality rates are seen in all these states and life expectancy is low. Another interesting feature is that in all these states, the spread of hunger is much lower. The major reason could be the low percentage of landless in these states. Physical access to food is better in these states though there is income poverty. The livelihood access position is also not good for the states of Madhya Pradesh, Orissa and Bihar, but it is much better for Uttar Pradesh and Rajasthan. Food access in terms of spread and depth of hunger is low in Uttar Pradesh due to better livelihood access. As mentioned earlier, despite better food access and better

² The correlation matrix of nineteen indicators is given in [Appendix 5.3](#)

FOOD INSECURITY MAP OF RURAL INDIA



Map No. 5.1

livelihood access, the nutritional status is quite bad in all the states. The healthcare facilities and rural infrastructure are also quite poor. This leads to poor nutrition and high mortality rates.

Gujarat is an outlier. The state is included in the category of severely food insecure states due to multiple problems of transitory food insecurity. It is a food deficit area. It has high instability in food production and this is linked to drought and disasters. Gujarat is the most food insecure state in terms of food availability. Its highly unstable cereal production as a result of acute crisis of water due to persistent drought is a matter of grave concern. Though the average poverty levels are relatively low (at about 20 per cent) in the state, the average calorie consumption of the lowest deciles is much below the national average and the population consuming less than 1890 kcal per consumer unit per day is very high. This lower level of calorie consumption is manifested through high Chronic Energy Deficiency and high percentage of stunted children, despite good rural health infrastructure.

The states shaded in red have their own strengths and weaknesses. On an average, the people of Bihar, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh consume more cereals and more calories than people in many other states do. They have more forest area than any of the other states. They produce more leguminous crops than other states. They may have better rainfall as in the case of Madhya Pradesh and Bihar, and better production than other states as in the case of Rajasthan.

Bihar, Gujarat and Orissa, record low calorie consumption of the lowest deciles but Rajasthan and Uttar Pradesh do not have a problem of low calorie consumption among the lowest deciles. However, if we probe more closely, we find poverty associated with a lack of balanced diet of the poor leading to nutritional and health problems.

These states have other serious problems as well. All the states in the region have a vulnerable rural population

either due to lack of livelihood access or livelihoods susceptible to natural disasters. The rural population in states such as Bihar, Orissa, Madhya Pradesh and Uttar Pradesh show poor livelihood access. States such as Rajasthan and Gujarat have risky livelihoods due to rain-fed and drought-prone agriculture. Even when they produce enough per capita on average, the seasonal risk of production makes them food insecure. Lack of safe drinking water, proper health infrastructure, rural infrastructure and female literacy are also common to these states, with a few exceptions.

The lack of livelihood opportunities makes it difficult for them to afford basic amenities. In addition, certain other amenities such as the Public Distribution System, health centres, hospitals and doctors are also poor. These states are not rich enough to afford private facilities, as is the case in Punjab and Haryana. They are food insecure due to a lack of amenities, which are attributable to poor infrastructure and poor governance of social sectors.

What Gujarat has in common with the other states is a high infant mortality rate. It also has the highest level of stunted and underweight children. Despite a very good health infrastructure, these problems persist. Gujarat needs special attention due to its problems. The benefits of low levels of poverty, higher incomes, higher female literacy etc., do not seem to have percolated to the lower strata in the state of Gujarat. One has to probe further to know the specific problems of food insecurity and the remedies. Pockets of the state suffering from acute transitory food insecurity may be the reason. The scheduled tribe population of this state also seems to be among the vulnerable sections.

To make these states in the red more food secure and remove hunger and deprivation, food assistance has to be especially directed to specific pockets of suffering. Malnutrition and under nourishment have to be addressed more urgently in these states. Vulnerability to frequent natural disasters is another area of urgent policy intervention in these states.

2. The States in Green and Shades of Green

The two prosperous and relatively food secure states are Punjab and Himachal Pradesh. They have fewer problems of availability, access and absorption. These two states (especially Punjab), are far ahead of the others in per capita production, consumption of diversified foods and livelihood access of the people. Even in respect of health facilities and rural infrastructure, they are far better than the other states. They have a higher level of female literacy, better nutrition for adults as well as children, lower mortality rates and higher life expectancies. The rural food security of Punjab is a consequence of enterprise and a strong support of its agriculture by the government. Prosperity and higher incomes have eventually brought the inhabitants better education, health and longer life expectancy. The benefits seem to have reached the lower strata to reduce poverty and improve food access and the nutritional standards of the poor. Himachal Pradesh has a low land-man ratio, commercial horticultural crops and fewer livelihood problems. It is a food surplus state, though its production is not as high as that of Punjab.

Punjab and Himachal Pradesh are food secure because they are livelihood secure. The major problem faced in Punjab in particular and Himachal Pradesh to a lesser extent seems to be reserved for the future. Environmental sustainability is the worst in Punjab. The forest area is the lowest and rainfall is low. Though the Himalayan rivers provide sustained irrigation, ground water exploitation in the state is the highest in the country. There is also a problem of water logging and alkalinity, although the area affected so far has been low. The cultivation of high yielding varieties of rice, wheat and sugarcane in succession leads to depletion of soil fertility in the long run. The situation is not reflected in the production or yield at present, but the potential problems loom large. It is necessary for Punjab to make an effort to reintroduce leguminous crops into its cropping system, with or without government support and to curb the excessive use of ground water. The Wasteland Atlas of India may not reflect these problems because the potential problem areas under present vegetative cover are not fully captured by remote sensing methods.

The next important and equally serious problem in Punjab is its deteriorating sex ratio. The prosperity of Punjab with 50 per cent of illiterate women among the population, shows 11 per cent higher death ratio for females in the age group of less than one and almost double the number of female deaths compared to male deaths in the age groups of one to four. The juvenile sex ratio as well as the overall sex ratio is highly in favour of males.

Among the other typologies, Tamil Nadu and Kerala deserve special mention. Their livelihood opportunities are limited. These states have better health facilities, infrastructure, lower infant mortality rates and relatively higher female literacy. The states have become fairly food secure despite natural odds. They are food deficit states and poor in food access. Public safety nets provided by the respective state governments have made a difference to these states. The public distribution system and public health facilities are freely available to the poor in these states. Rural infrastructure and health infrastructure are very good. Rural electrification is hundred percent in these states. Higher literacy levels and awareness of their rights and resistance to exploitation help the people to achieve food security, despite livelihood access problems. It is remarkable that these states have achieved the nutritional status of Punjab, without the rural prosperity of Punjab.

Kerala has the added advantage of remittances from the Gulf countries. Land reforms and unionised labour, high wages and fewer landless labourers have probably improved incomes in Kerala. These states however, have not achieved the livelihood security levels of Punjab, Haryana and Himachal Pradesh.

Agriculture in these states needs to be managed more efficiently. Ground water exploitation is high in Tamil Nadu. Despite state transfers, the lowest deciles report very low calorie intake. Further insights are needed to take corrective action. Part of the answer lies in providing community level services. Due to the high level of awareness and literacy, community approaches are likely to succeed.

3. The States in the Middle Range in Yellow

The six states of Andhra Pradesh, Assam, Maharashtra, West Bengal, Karnataka and Haryana fall under the third typology or the middle category. These states are neither severely food insecure nor are they fully food secure. Some of them such as Assam, Maharashtra and West Bengal are food deficit states. All these states are prone to natural disasters like floods, cyclones, droughts or a combination of them and thus face the problem of risky agriculture. All of them except Maharashtra, Karnataka and Haryana have poor or only average rural health infrastructure.

These states, particularly Andhra Pradesh, Karnataka, Maharashtra and West Bengal, have made moderate but consistent efforts to provide rural safety nets. They have also made significant progress in consolidating their agricultural production gains and enhancing livelihood security. However, they are all food deficit states or states with small surpluses. They still need to improve their agricultural productivity and rural livelihood security. Government price supports have not helped all producers. Efforts should be made to spread the price support to both dry and wet agriculture. The states of Andhra Pradesh, Maharashtra and Karnataka particularly, seem to have diversified into dairying and horticulture and succeeded in reducing the levels of rural poverty.

Despite high poverty, Assam has unused water resources and potential for improving food availability and access. West Bengal deserves a special mention in this category. Despite high levels of rural poverty, a high percentage of the population dependent upon labour income and poor infrastructure, the spread and depth of hunger are negligible. West Bengal has a small percentage (7.5 per cent) of the population consuming less than 1890 Kcal.

The contrast between Kerala and West Bengal in respect of calorie consumption for the year 1993-94 is interesting. Lowest levels of calorie consumption persist among the

lowest ten percent of the population in Kerala, despite widespread safety nets available to the poor. In West Bengal, the calorie consumption of the lowest ten percent of the population is as high as that of the lowest ten percent in Punjab. Relatively better wages and well-targeted employment programmes for the poor, coupled with better local production, might have helped the poor to achieve food security in West Bengal. While Kerala concentrated on the universal public distribution system, West Bengal concentrated on an effective rural employment programme for the most vulnerable Scheduled Caste and Scheduled Tribe population.

The states in the middle typology need to improve the literacy and nutritional status of their children and invest in rural infrastructure and rural health infrastructure. Being moderately food insecure, all the programmes of production, sustainability and food access are relevant to them.

Haryana should ideally be as food secure as Punjab, but it has slid down to the third typology because of several problems. A large part of the state is drought prone which explains its instability in agricultural production. The riskier agriculture has made Haryana poorer than Punjab. Haryana also faces the challenges of environmental sustainability.

Haryana has good rural infrastructure, high life expectancy and low chronic energy deficiency among its population. It has very poor rural health infrastructure and health facilities, leading to nutritional insecurity. Declining juvenile sex ratio is another area of concern for the state.

5.4 Food Insecurity Map with New States

The Map with the new states of Jharkhand, Chhattisgarh and Uttaranchal has been prepared with just twelve indicators. Five of the indicators viz. deficit in production over consumption, percentage of population below poverty line, percentage of Scheduled Caste and Scheduled Tribe population, Juvenile Sex Ratio and Infant Mortality Rate are common with those used in the earlier map.

Jharkhand, Chhattisgarh and Uttaranchal were included in Bihar, Madhya Pradesh and Uttar Pradesh respectively in the earlier map. Indices of sustainability, rural infrastructure and health infrastructure could not be developed for these 19 states, due to lack of separate data for the new states. Separate data on absorption indicators viz. stunting, wasting and chronic energy deficiency, which were taken from the Nutrition Surveys, are also not available for the new states.

The indicators of the three new hill states of Jharkhand Chhattisgarh and Uttaranchal and the three truncated states of Bihar, Madhya Pradesh and Uttar Pradesh are compiled with the help of district level data. The data for relevant districts has been aggregated to get the indicators for these six states.³

The same methodology has been followed as that described for the food insecurity map of Rural India of 16 states. If a state is in the worst situation in respect of all indicators, it will have a cumulative rank of 12. If it is the best in all categories, it will have a cumulative rank of 228. The cumulative ranking index for each state has been divided by the total number of indicators to get the Mapping Index. The states are distributed into five typologies, each representing a certain rating as per food insecurity. The extremely food insecure states are in the range of 6 to 7. Severely food insecure states are in the range of 7 to 9 and moderately food insecure states are in the range of 9 to 11. The moderately food secure states are in the category of 11 to 13 and all the states in the food secure category have an average ranking score of 13 to 15.⁴

I. The States in Red and Shades of Red

Bihar, Jharkhand and Madhya Pradesh emerge as the most food insecure states. In fact, the position of Madhya Pradesh deteriorates when Chhattisgarh is not included. Jharkhand is a food deficit state, with the highest percentage of

population below the poverty line, a high level of Scheduled Caste and Scheduled Tribe population, a high percentage of illiteracy, households without electricity and without access to safe drinking water. Being a tribal state, it has a very small percentage of agricultural labour population and the juvenile sex ratio is comfortable at 979. Bihar has a low tribal population but suffers from high levels of poverty and illiteracy and very poor infrastructure in terms of roads, electricity and hospital beds.

Madhya Pradesh has a very high infant mortality rate, high levels of poverty and a high percentage of scheduled castes and scheduled tribes and an unfavourable juvenile sex ratio of 913. Chhattisgarh, which falls in the next shade of red, has a more favourable sex ratio at 969 and a lower percentage of wasteland; but it also suffers from problems of high infant mortality rate and a high percentage of Scheduled Caste and Scheduled Tribe population. Rajasthan, Orissa and Uttar Pradesh continue to remain in the lighter shade of red as before. The needs for improved infrastructure and improved livelihood access are the key issues in these areas.

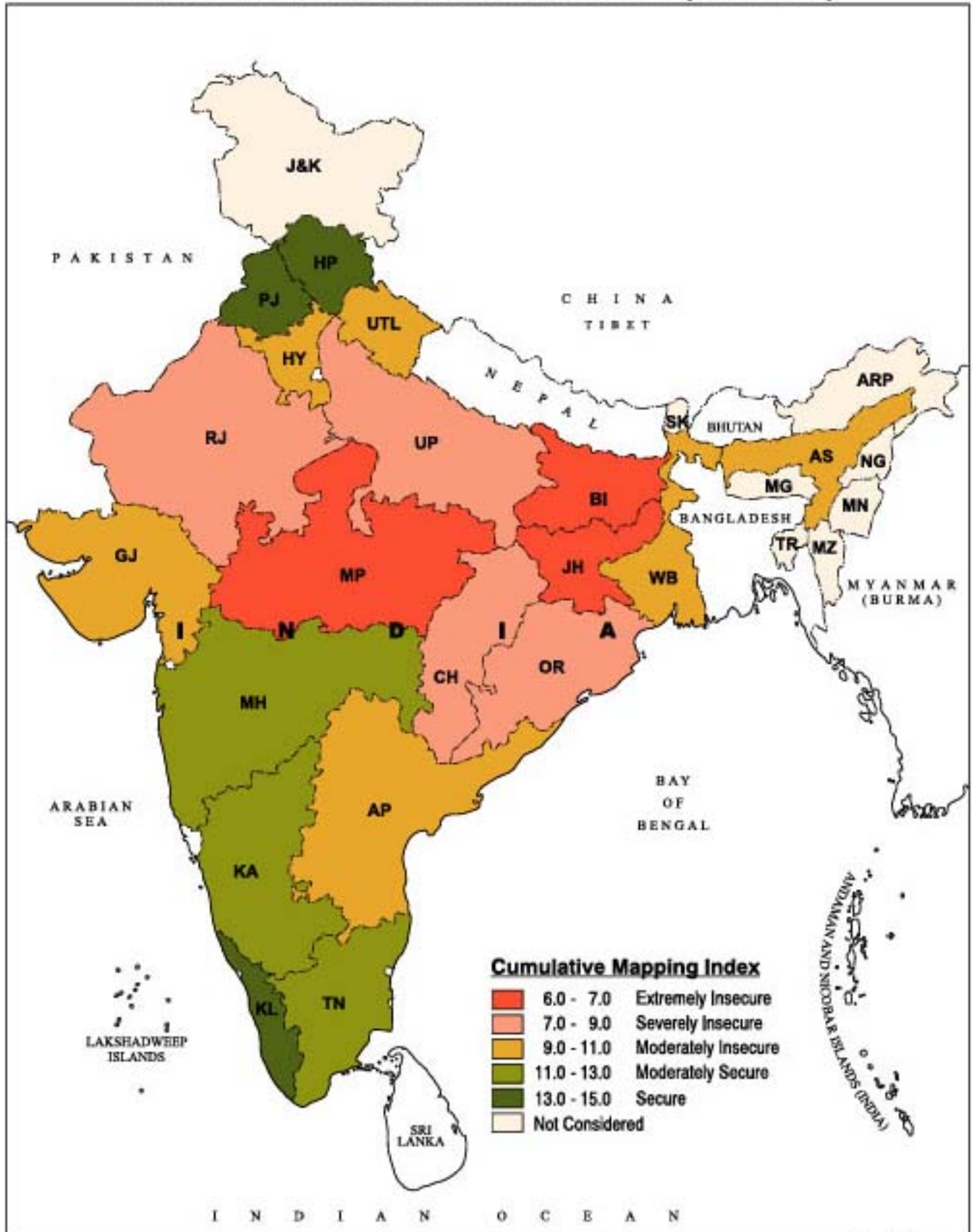
II. The States in Green and Shades of Green

Punjab, Himachal Pradesh and Kerala emerge as the most food secure states followed by Maharashtra, Karnataka and Tamil Nadu in the next shade of green. The absence of the indicators of calorie intake of the lowest deciles and percentage of population consuming less than 1890 Kcal, (where Kerala ranks low), pushes Kerala up onto a higher typology. The position of both Karnataka and Maharashtra improves by one shade from the earlier map. The lack of disaster indicators and instability and calorie consumption data are responsible for this change. Karnataka has a relatively high percentage of illiterates. All three states have a high percentage of agricultural labour in their population.

³ See Appendix 5.2 for sources of data and method of compilation.

⁴ See Appendix Tables 5.2.1, 5.2.2, and Map 5.2

FOOD INSECURITY IN RURAL INDIA (19 States)



Map No. 5.2

III. The States in Yellow

West Bengal, Assam, Andhra Pradesh, Uttaranchal, Gujarat and Haryana fall in the category of moderately food secure states. The situation of Gujarat has improved from insecure in the map showing 16 states to moderately secure, primarily because of the absence of the instability and disaster indicators. West Bengal has problems of poor infrastructure; Andhra Pradesh has a relatively low level of poverty but a high percentage of agricultural labourers; Assam has a high percentage of wasteland; Haryana has a very unfavourable sex ratio at 881 and problems of underdeveloped infrastructure in terms of road length and hospital beds. The new state of Uttaranchal emerges better

than its parent state Uttar Pradesh because of lower poverty levels, a much higher sex ratio, lower infant mortality rates, and a relatively lower level of illiteracy.

Use of the Maps for Policy and Planning

We have used the maps to highlight the issues that need emphasis. The knowledge gained should now be used for planning to achieve a hunger free India. In the next chapter, we shall elaborate on the following: policies for enhancing sustainable food production and availability, policies for improving economic access to food and policies and programmes for improvement of nutrition. The programmes that emanate out of the policies will have to be implemented at the district and block levels.



CHAPTER 6

Policy Implications and Public Action

Issues relating to food insecurity at the level of every child, woman, and man in the country have been considered in an integrated and holistic manner in the preceding chapters. The exercise dealt with food availability, which is a function of home production and imports; food access, which is a function of purchasing power, sustainable livelihoods and employment opportunities and food absorption in the body, which is a function of access to clean drinking water, environmental hygiene and primary health care.

The three time dimensions of food availability discussed are present availability, potential availability and availability under unforeseen crisis-situations.

- Present availability is based on current production across the states.
- Potential productivity is based on sustainability criteria like forest cover, soil degradation and ground water pollution and depletion. Biodiversity loss and climate change are other factors for which data is not currently available, but they could cause production instability in the future.
- Crisis in food availability is also caused by disasters such as drought, floods, cyclones and earthquakes.

Food access has been considered from three angles — chronic problems of food access, transient problems of food access and problem of food access caused by gender and social discrimination.

- Chronic problems of food access and deficient calorie consumption are due to extreme poverty and the lack of assets, education, employment

opportunities and rural infrastructure.

- Transient problems of food access are due to seasonal factors such as failure of monsoon or excess rains, changes in prices, etc., which cause crop loss and loss of livelihoods and entitlements, and are normally restricted to a single agricultural season.
- Problems of food access are associated with gender and social discrimination. Differentials in wages, literacy and access to health care and disparities in food distribution are common across the states. They are reflected in the highly skewed sex and female literacy ratios.

Food absorption has been found to be affected by problems caused by deficient calorie intake, deficient micro nutrient intake and incidence of disease.

- Inadequate absorption of calories leads to protein calorie malnutrition, and associated problems of marasmus, kwashiorkar, stunting, underweight and wasting in children and low body mass index in adults.
- Inadequate absorption of micronutrients results in iron deficiency, anaemia, vitamin A deficiency, etc.
- Problems of absorption are often caused by disease and intestinal infection arising from the lack of safe drinking water and health care facilities.

All these aspects have been examined across the states with the help of the chosen indicators, placing each state in the order of severity of the problem. The analysis has

revealed that non-food factors also play an important role in causing food insecurity.

It has also been found that the link between production and consumption is weakening. Production is being increasingly undertaken for the market and driven by the market and prices. The local food requirements of the people and the local demand for food are met by trade, wherever the livelihood access is good. Diversification of agriculture particularly, into horticultural crops as in Karnataka, Andhra Pradesh and Maharashtra, or diversification into livestock products as in Gujarat, Punjab, Haryana and Rajasthan, improves livelihood access. The link between production and consumption is mainly livelihood access. It should however be emphasized that farm families constitute the majority of our population. Their first priority in land use is to meet their home needs, next comes the market.

Environmental degradation has important implications for sustainable food production and availability. States that produce large amounts of food grains today will have to protect their environment from degradation. The states of Punjab and Haryana particularly, seem to be exploiting natural resources at a much faster pace. Other states such as Assam and Bihar have a vast potential to produce more by utilizing the natural resources to greater levels. Moreover, the introduction of leguminous crops into the cropping systems has to be considered more seriously, at least whenever it is possible, to make them profitable. Forest management and conservation are important in the states of Orissa, Assam and Madhya Pradesh, which have a higher forest area. There is a danger of forest depletion in these states; if people are not provided with non-agricultural employment, forests may be destroyed for crop and animal production.

The analysis has brought out some important aspects of food consumption of the lower income groups. We shall summarize the food insecurity situation, in terms of depth and spread of hunger. As we have elaborated earlier,

the spread is given by the percentage of population consuming less than 1890 Kcal per consumer unit per day. The depth is given by the calorie consumption of the lowest ten percent of the population per consumer unit per day. The spread and depth of hunger are more in the areas with deficit production and the areas with a large number of people dependent on casual employment as in Kerala, Tamil Nadu, Gujarat and Maharashtra. Other factors that contribute to the depth of hunger appear to be lack of non-agricultural employment opportunities and low wages to the labour as in the case of Madhya Pradesh and Bihar. Transitory food insecurity such as drought probably adds to the problems as in the case of Gujarat.

Another important finding is that the states with access to more land and less dependence on casual labour are protected from hunger. The depth and spread of hunger is very little in these states, as in the case of Rajasthan and Uttar Pradesh. Fewer landless has not helped Kerala, since those dependent upon casual labour are high and the land base is too small. Yet another important factor, which probably helps to reduce the depth and spread of hunger, seems to be government transfers. West Bengal is a case in point. The calorie consumption of the lowest ten percent in West Bengal is as good as that of Haryana, Rajasthan and Uttar Pradesh, despite a larger number of landless families and those dependent upon labour income. Probably better targeting of the rural programmes, which reach the landless more effectively, relatively better wages, and more importantly, a smaller deficit in production over requirement might have helped West Bengal. While deficit in production over consumption of cereals is the same in Tamil Nadu and West Bengal, the deficit of production over requirement is only 2 percent in West Bengal, whereas it is as high as thirty six percent in Tamil Nadu. In recent years, Tamil Nadu has shown considerable improvement in this situation.

Gender discrimination in access to food, health care, literacy, livelihoods and wages is of great concern. The sex

ratio is becoming increasingly adverse to women. Women and girl children often suffer greater nutritional deprivation. Except in Kerala, the average life span of women is also low. These trends are opposite to global trends and point to the need for viewing a household not as a homogenous unit and for designing hunger elimination strategies, based on individuals and not households.

Another important finding is that rural health infrastructure plays an important role in reducing the infant and child mortality rate, improving life expectancies and nutrition status, even if the livelihood access is not so good and calorie consumption is low. Government programmes such as Mid-day Meal Programme, Integrated Child Development Services and other programmes such as universal immunization etc., bring better nutrition status to the population. On the other hand, those who seem food secure and consume sufficient calories seem to have high infant mortality rates, high maternal mortality rates and low life expectancies. This seems to have a bearing on female literacy and rural health infrastructure. Tamil Nadu and Kerala are cases in point.

The study clearly points to the need for policy and programme interventions, for environmental conservation and improvement of both livelihood access, food access and the nutritional status of the people. We cannot wait for the per capita income growth to trickle down. We cannot wait for overall development to take place to reduce hunger and deprivation.

Thus, sustainable food security will have to be defined as “physical, economic, social and ecological access to balanced diets and safe drinking water, so as to enable every individual to lead a productive and healthy life in perpetuity”. A life cycle approach will have to be followed in the case of nutrition, ranging from *in utero* to old age¹.

Achieving such a form of food security will require public policies and action on the lines indicated below.

6.1 Policies for Enhancing Sustainable Food Production and Availability

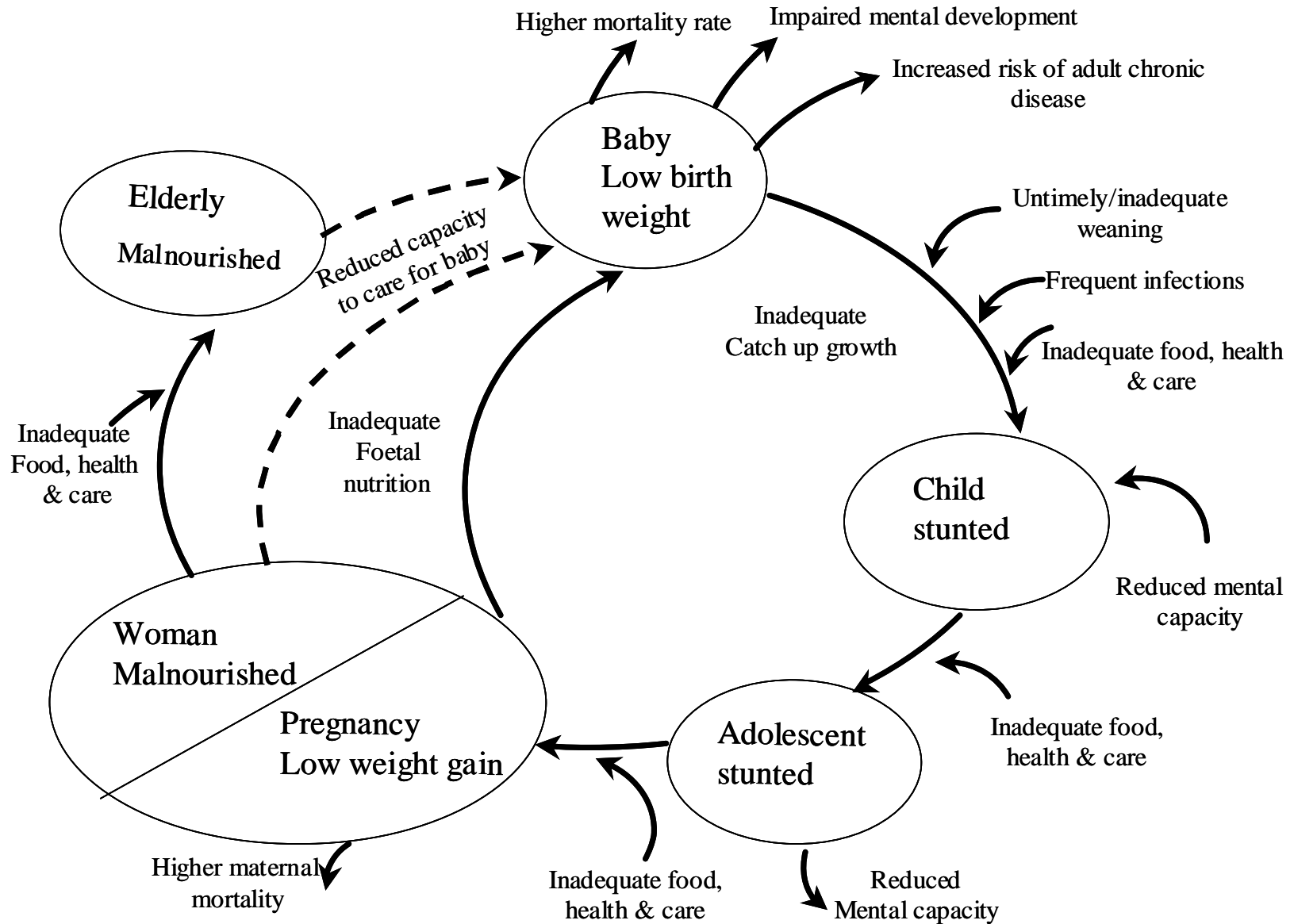
The analysis in the second chapter makes it clear that from the point of view of requirement, India does not produce large surpluses of any food item, including food grains. In fact, the production of a number of items is far below the requirement, particularly that of protein-rich protective foods such as pulses, oilseeds, milk, eggs, fish etc. Thus, it is clear that we have to produce more in the coming years to meet both the needs of an increasing population and better consumption for the currently undernourished. The present patterns of production of both vegetable as well as animal foods show that per capita net production variations are very high across the states as discussed in chapter two.

Long-term sustainability was not given adequate thought either by the policy makers or by the landowners. The analysis with reference to Punjab and Haryana clearly shows that increased production has to come hereafter, from pathways that are environmentally sustainable. In other words, we have to produce more but produce it through technologies, rooted in the principles of ecology, social and gender equity and livelihood and employment generation. This will call for policies and public action for enhancing food availability in a sustainable manner. Conserving and enhancing the ecological foundations essential for sustainable advances in production and productivity are of utmost importance. Public policy in this area will have to address two major concerns, conserving prime farmland for agriculture and increasing production and productivity through environmentally friendly technologies.

¹ See Figure 6.1

Figure 6.1

Lifecycle: the proposed causal links



Source: UN Commission on the Nutrition challenges of the 21st century (United Nations University press)

Bridging the gap between potential and actual yield in major farming systems:

The smaller the farm, the greater is the need for marketable surplus to ensure cash income. Fortunately the gap between potential and actual yields is high in most farming systems. In the case of most crops, the present average yield is just one third of what can be achieved even with technologies currently on the shelf. Therefore a massive effort should be made to launch a productivity revolution in farming. An integrated approach is necessary to remove the technological, infrastructure and social and policy constraints responsible for the productivity gap and in some cases, productivity decline. Reducing the cost of production through eco-technologies and improving income through efficient production and post-harvest technologies will help to enhance opportunities for both skilled employment and farm income. Precision farming methods which can help to enhance income and yield per drop of water and per units of land and time need to be standardized, demonstrated and popularised speedily, if we are to achieve cost reduction without associated yield reduction.

As an immediate measure for strengthening food security at the level of individuals and households, there is no better option than initiating a systematic effort in each agro-climatic zone to identify and remove the constraints responsible for the prevailing yield gaps. This is true not only of crop plants but also of livestock and fisheries. The local **panchayati raj** institutions or other forms of local bodies should be fully involved both in identifying constraints that limit production and in removing them.

1. Conserving prime farmland for agriculture:

The following measures will help to conserve land for agricultural purposes –

- Arresting land degradation and the loss of the biological potential of the soil (desertification)
- Promoting land and water use on the basis of agro-ecological, meteorological and marketing factors
- Restoring degraded and wasted land through

agro-forestry and other appropriate methods of restoration ecology

- Launching community centred water harvesting, conservation and use programmes to ensure efficient harvest of rainwater and the sustainable use of ground water. The adoption of conjunctive water use practices ensures integrated use of river, rain, ground, treated sewage and sea water, in such a manner that every drop yields more crop and income.

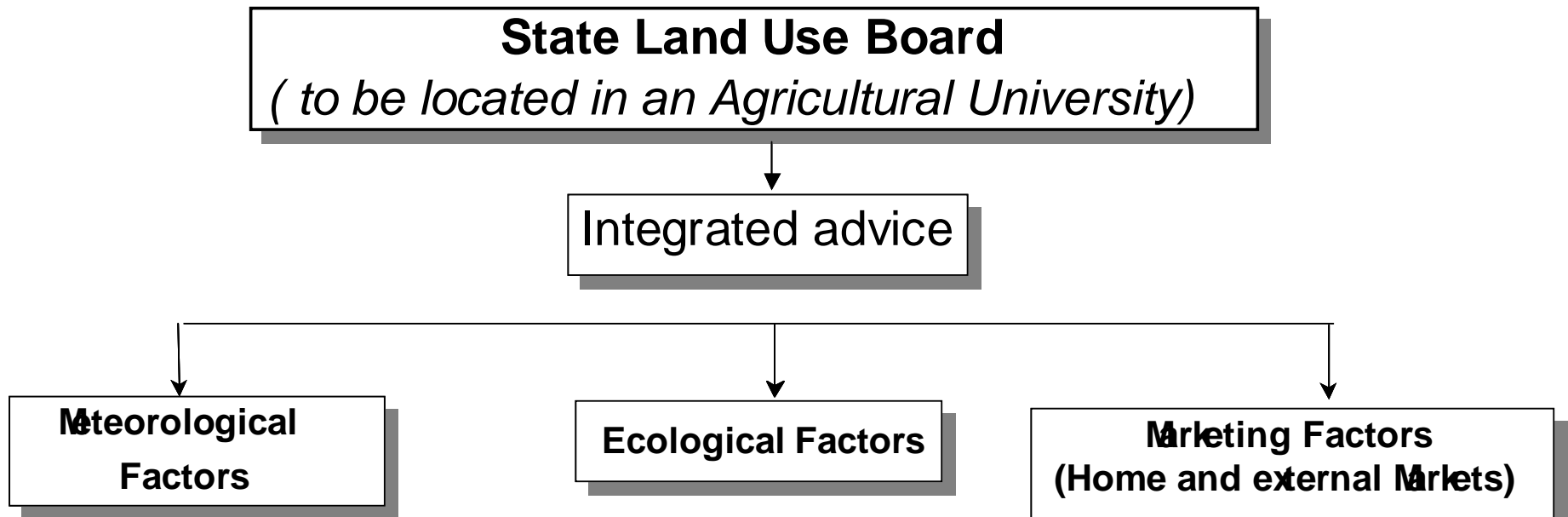
There are currently several Central and State Government programmes dealing with wasteland development, rainwater harvesting, watershed development, command area management, shallow tube well construction, social and agro-forestry and prevention of damage to hydrologic cycles in hill areas. There is an urgent need for convergence and synergy among these programmes so that land and water conservation and use can be dealt with in a scientific and holistic manner. Land and water management problems (the term ‘management’ is used to denote concurrent attention to conservation, sustainable use, and equitable sharing of benefits) are multi-dimensional. So uni-dimensional approaches through numerous independent schemes implemented by separate departments of central and state governments will only result in inefficient and ineffective use of financial and technical resources. At present, land care and restoration issues are dealt with by the Ministry of Rural Development and water issues by the Ministry of Water Resources of the Government of India. The Ministry of Agriculture however has the responsibility of advising crop and land use planning. The following two steps will help in fostering a holistic land and water care and use movement in the country.

First, Schedule 11 of Constitution amendment 73, relating to Panchayati Raj institutions, entrusts to Panchayats/local bodies, responsibilities for the management of land, water and common property resources. If these bodies, in which a third of the members

Figure 6.2

Proactive Advice on Land use

(Land use decisions are also Water use decisions)



The Land Use Board through a virtual college should give proactive advice on the choice of crops and farming systems, so as to achieve a match between demand and supply in farm commodities and to ensure that the most efficient crops are grown in different agro-climatic and agro-ecological regions.

are women, are legally, technically and financially enabled to discharge the functions listed in Schedule 11, a beginning can be made in fostering land and water management in an environmentally and socially sustainable manner. There are some legislative, administrative and legal hurdles in the way of decentralized planning. Hence, it is important to address these issues immediately.

Second, the existing State Land Use Boards should be revitalised and reorganised in such a manner that they can give proactive advice to farm families on land use during the south-west and north-east monsoon periods based on the following factors ([see also Figure 6.2](#))

- Farming systems (crop, livestock, fish and agro-forestry) which will be most efficient under the given soil, water and climatic conditions
- Short and medium range weather forecasts (the country has developed considerable capability in this area)
- Projected market demand (both home and external markets)
- Cost of production, risks involved and expected return
- Potential for on-farm and non-farm livelihood generation, so as to maximize income and employment per units of land and water.

If such advice is given at least a few weeks before the sowing season, a proper match can be achieved between production and potential market demand. Uneconomic market interventions can then be avoided. The agro-ecological potential of every village can be utilized in an ecologically and economically optimum manner. The “Blue Box” of the Agreement on Agriculture of the World Trade Organization provides for expenditure on achieving a balance between demand and supply in farm products. Seed Banks of alternative crops will have to be established at the local level.

The reorganized Land Use Boards should also be able to develop contingency cropping patterns to suit different rainfall and water availability patterns. Thanks to the long-range weather data available with the Meteorological Department, it is now possible to develop computer simulation models of likely deviations in monsoon behaviour. These can be used for formulating land use advice based on GIS maps, which also take into consideration the moisture holding capacity of soils, physiological efficiency of crops, home needs and market demand.

If these two steps are taken, we can promote land use based on considerations of both ecological sustainability and economic efficiency. Since land use decisions are also water use decisions, land and water care and use are best dealt with in a simultaneous and interactive manner. For example, if the ongoing technology missions in crops like oilseeds, pulses, maize and cotton are linked to the watershed development and dry farming programmes, these missions will become more effective.

2. Increasing production and productivity:

Future agricultural production programmes will have to be based on a three-pronged strategy designed to foster an evergreen revolution, which leads to increased production without associated ecological and social harm. The following are the four major elements of this strategy for producing more in an environment-friendly manner:

a. Defending the gains already made: This will call for conservation and enhancement of soil and water resources as well as forests and biodiversity through an integrated package of government regulation, education and social mobilization (through Panchayats and local bodies). The traditional “green revolution” areas are in urgent need of such an integrated natural resources management strategy so that the pattern of present production does not erode future prospects. The case of Punjab has already been mentioned in this context. Defending the gains already

achieved will also need stepping up maintenance research for ensuring that new strains of pests and pathogens do not cause crop losses. Special steps are needed to prevent the introduction of invasive alien species, which are coming into the country along with imported food and agricultural commodities. These invasive alien species, like new and aggressive weeds, nematodes etc. can cause incalculable harm to the future of Indian agriculture.

Conservation and enhancement of land and water resources is important. Water harvesting, watershed development and economic and efficient water use can help to enhance productivity and income considerably. Conjunctive use of different water sources should become the rule, rather than the exception. Unless there is equity in water sharing, there will be no cooperation in water saving. Therefore, equitable methods of water sharing should be promoted. Where water is scarce, high value but low water requiring crops should be grown. **In this context, the organization of Pulses and Oilseed Villages should become a national movement.** This should be a major aim of the Pulses and Oilseeds Technology Missions. Solving internal shortages of pulses and oilseeds through imports will only add to the economic woes of dry land farming communities. Pulses and oilseeds are important income earning and soil enriching crops in dry land areas. Various estimates of land degradation exist. The Ministry of Rural Development has also published a Wasteland Atlas of India. The following kinds of soil degradation have been quantified:

Wind erosion	19.7 million ha.
Salinization	4.1 million ha.
Water logging	3.1 million ha.
Water erosion	69.6 million ha.
Soil fertility decline	13.7 million ha.

Thus, there are vast opportunities for launching **Wasteland Development Enterprises** by local self-help groups through the following strategy.

Identify the precise nature of soil degradation and develop scientific restoration measures. Based on agro-

ecological conditions, choose tree species which can help to initiate suitable enterprises. For example, a plant pesticide model of wasteland development could involve the planting of neem and melia. Appropriate species can be chosen and planted, depending on soil and water conditions, for undertaking the preparation of furniture, doors, windows etc. or paper, fibre or fruit packaging industries.

The aim is to add value to wasteland development through an integrated strategy of restoration and commercialization. Such a twin approach will impart greater momentum to wasteland reclamation particularly in peri-urban areas.

b. Extending the gains to rain-fed and semi-arid, hill and island areas, which have so far been bypassed by yield enhancement technologies: regional imbalances in agricultural development are growing, based largely on the availability of assured irrigation on the one hand and assured and remunerative marketing opportunities on the other. North Bihar is an exception, where water is plentiful but agricultural growth is slow. Eastern India has a large untapped yield reservoir and by and large, falls under the “green but no green revolution” category. West Bengal has made impressive progress during the nineties, while more recently Assam has started making progress, thanks to a large shallow-tube well programme designed to tap ground water during rabi and summer (*boro*) seasons. The introduction of **eco-regional technology missions**, aimed to provide appropriate packages of technology, techno-infrastructure, services and input and output pricing and marketing policies will help to include the excluded in agricultural progress.

Technologies for elevating and stabilising yields are available for semiarid and dry farming areas, as a result of the work done by the Indian Council of Agricultural Research institutions, State Agricultural Universities and International Crop Research Institute for Semi Arid Tropics. Agro-forestry and animal husbandry are extremely important in arid and semi-arid regions. Livestock and

livelihoods are closely linked in such areas. A major effort in water conservation and management and land use planning is needed in all areas that have been by-passed by scientific agriculture. Attention to horticulture, with particular emphasis on post-harvest technology, will help to optimise income and employment from every drop of water. Both livestock and tree farming will provide opportunities for downstream employment. Therefore the emphasis should be on farming systems that can optimise the benefits of natural resources in a sustainable manner and not merely on cropping systems. Also, in coastal areas, there is need for a massive programme of coastal systems research and development, involving capture and culture fisheries, coastal forestry and agro-forestry and integrated crop and animal husbandry. Coastal agro-forestry and forestry can provide much of the fuel wood needs of inland areas. As in the crop sector, there is a vast untapped production reservoir in the fisheries sector. With the coming into force of the UN Convention on the Law of the Sea, India's exclusive economic zone in the oceans around the country extends to over 2 million sq.kms.

Dry farming areas are also ideal for the cultivation of low water requiring but high value pulses and oilseeds. The Pulses and Oilseeds Technology Missions should be revitalised and linked to the water harvesting and watershed development during the Tenth Plan (2002-2007). As emphasised earlier, taking the easy option of importing large quantities of pulses and oilseeds forecloses the great opportunity for improving the economic wellbeing of farm families in dry farming areas through improving the production and productivity of pulses and oilseeds.

c. Making new gains through farming systems intensification, diversification and value-addition:

During the past decade, discoveries in information and biological technologies have contributed in unanticipated ways to fundamental changes in the global economy and to unprecedented economic growth, particularly in industrialized countries. There are also growing bonds of partnerships between Universities and industries. In the

USA, for example, industrial research parks surround leading research universities. We have more than forty agricultural, animal sciences, fisheries and rural universities, in addition to numerous agricultural and forestry research institutions. Universities and research institutions should serve as the engines of growth in a knowledge-based economy. They should also address, through their research and training agenda, the great challenges that confront our country in terms of poverty and the lack of basic human needs.

Detailed agro-climatic and soil maps are available for the country. Watershed and Wasteland Atlases are also available. We have considerable capacity in remote sensing and GIS mapping. These should be used for developing improved farming systems, which can provide more income and jobs. Value addition to primary products should be done at the village itself. Integrated crop-livestock-fish production systems should be fostered. Opportunities for non-farm employment will then improve.

d. Institutional support: Higher production can be sustained only if there are opportunities for assured and remunerative marketing. A major challenge relates to reducing the cost of production by improving productivity. This will call for appropriate institutional structures which can help to provide key centralized services to small and marginal farm families and to provide them with the power of scale in eco-farming (i.e., integrated pest management, scientific water management, integrated nutrient supply, precision farming etc.) as well as in marketing. The role of the Small Farmers Agri business Consortium (SFAC) that was established for this purpose should be reviewed and appropriate institutional structures, owned and controlled by farm families, should be promoted. Federations of self-help groups, farmer controlled cooperatives and corporate business entities, and other socially relevant institutional structures should be promoted. Without enhanced efficiency in the production and post-harvest phases of agriculture, Indian farmers will

not be able to face the challenge of globalisation in terms of cost competitiveness, quality of produce and consistency of supply.

It should not be forgotten that but for the existence of a very capable and professionally run National Dairy Development Board as well as a dairy farmers' cooperative movement, we would not have been able to achieve the first position in milk production in the world. User controlled and driven institutional structures characterized by low transaction costs, are essential to provide the needed assistance in post-harvest technology, like drying, storage, processing and marketing.

Adequate food availability is necessary both for stabilising prices and ensuring the operation of an effective public distribution system. There is therefore no time to relax on the food production front. There is particularly an urgent need for greater investment in irrigation, power supply, rural roads, cold storages, godowns and food processing units. By extending the benefits of technological transformation and institutional reform to more areas and farming systems, India can become a leader in world agriculture.

6.2 Policies for Improving Economic Access to Food

As early as 1856, Col. Baird Smith, who investigated the causes of a serious famine in North West India, wrote: "Indian famines are famines of work, and not of food. Where there is work, there is money. Where there is money there is food". This situation is as relevant today as it was 150 years ago. Food security in India is best described in million person years of jobs and livelihoods rather than in million tonnes of food grains.

Agriculture, comprising crop and animal husbandry, inland and marine fisheries, forestry and agro-forestry, agro-processing and agribusiness, constitutes the backbone of the livelihood security system of India, particularly in

rural areas. Our agriculture is still "farmers' farming" and not "factory farming", as in industrialized countries. This is our great strength, since the health of plants and animals and other hazards associated with factory farming are now becoming evident. **Therefore, jobs / livelihoods for Indians must be the bottom line of all our economic and development policies.** Unfortunately, modern industry is not labor absorbing and usually enhances its efficiency by downsizing of staff to improve output per person. The "new economy" based on information technology and knowledge industries is also by itself not employment intensive, but could lead to "new employment", if intelligently used.

Farming is the largest private sector enterprise in India. Nearly 58.9 percent² of the workers depend upon agriculture for their income and livelihoods. Now that the share of agriculture in total workers is declining, we must think of increasing their productivity and alleviating rural poverty. Rural poverty is greater than urban poverty. Nearly, 50 percent of the rural population³, belonging to labour families, are engaged in unskilled low-wage work in several parts of the country. Therefore, the following steps will be needed to achieve the goal of food for all. New employment in the new economy and transition from unskilled to skilled work have to be achieved.

1. New economy and new employment opportunities:

Opportunities for new employment include the production of eco-foods, 'biological-software' for sustainable agriculture like bio-fertilizers, bio-pesticides and vermiculture, bio-processing, health foods, herbal medicines, recycling of solid and liquid wastes and agriculture and agro-processing machinery. In the new knowledge based economy, good ecology will be fundamental to good business.

Advances in information technology also provide opportunities for farm graduates to establish computer-aided and internet connected Rural Knowledge Centres. These centres should help to convert generic into location

² Census of India, 2001

³ NSS, 55th Round (2000)

specific information. The present extension service has outlived its utility (see Planning Commission's mid-term appraisal of the Ninth Plan). It can be replaced over time by farmer owned and operated knowledge centres. A virtual college linking such village knowledge centres to agricultural universities and research institutions can be established, so that farm women and men are able to get up-to-date and authentic technical advice. Nearly a million farm graduates (both men and women) can be involved in establishing and operating such Rural Knowledge Centres based on modern information and communication technology. Such centres can also operate local community radio stations. Such a restructuring and retooling of extension services will help to provide demand driven and environment and farming systems specific advice to farmers. They will trigger a knowledge revolution in agriculture and will lead to an efficient and eco-sensitive precision farming movement. This great opportunity for achieving a transition from unskilled to skilled work and for designing a new extension service for the new economy should not be ignored ([Figure 6.3](#)).

2. The biovillage model of sustainable job-led economic growth: The Biovillage Model developed by MSSRF provides a methodology for concurrently achieving the following objectives:

- Conservation, enhancement and sustainable and equitable use of land, water and common property resources
- Poverty eradication through livelihood access
- Gender equity

A National Network of Bio-villages supported by Community Banking will help to strengthen rural livelihoods and to impart a pro-nature, pro-poor and pro-women orientation to development planning. Activity based self-help groups can manage the community banks.

The Agri-clinics and Agribusiness Centres Programme announced in the budget of 2001-2002 can be designed in such a manner that they are able to provide technical

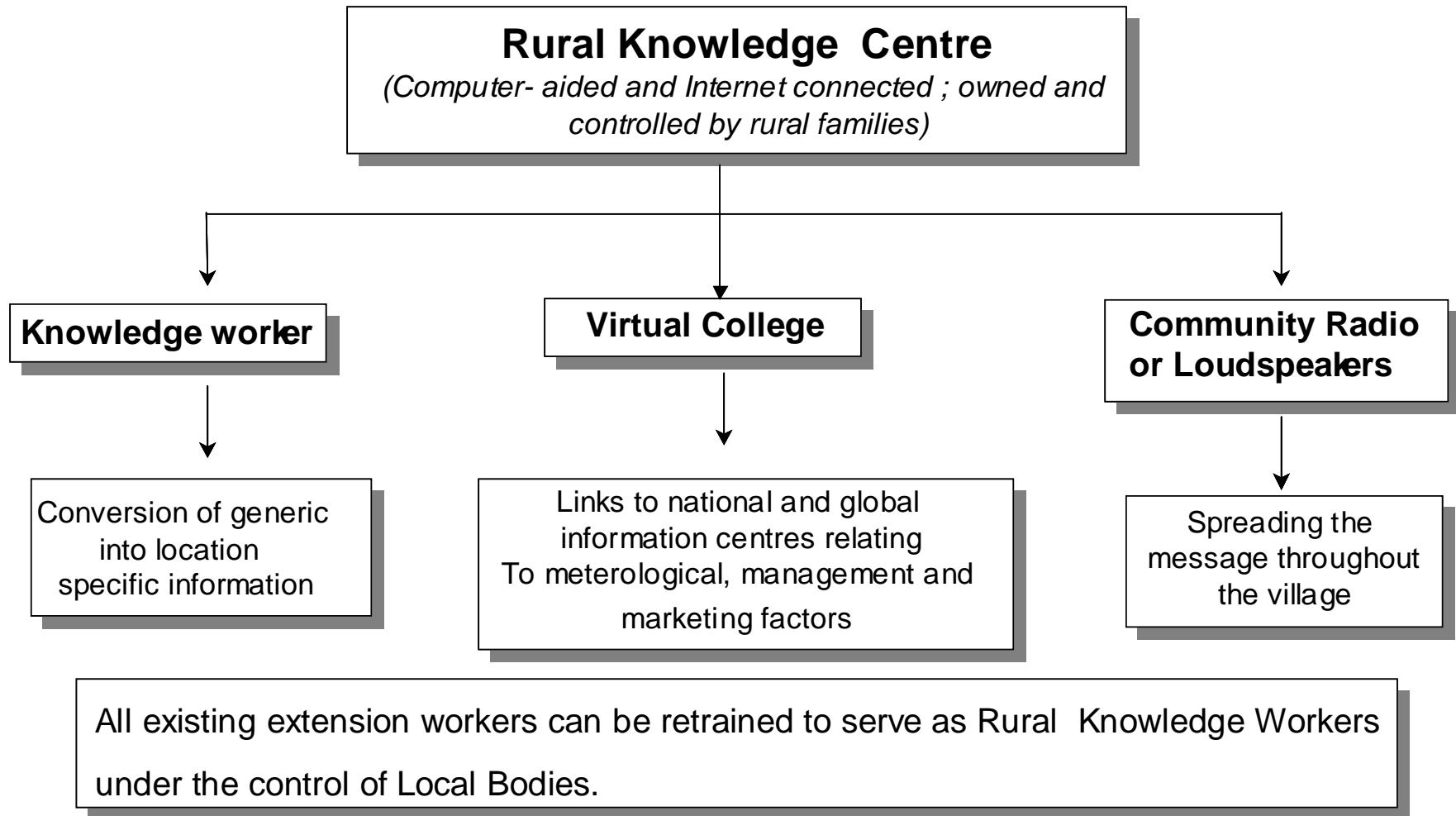
back-stopping to rural self-help groups. They can provide gainful employment to many farm graduates, who can operate the "bio-centres" which are a single window service providing units for a homogenous agro-ecological area. If these centers perform demand driven functions and are able to assist farm men and women with location and farming-system specific advice in areas relating to meteorological, management and marketing factors, they will become instruments for fostering an evergreen revolution movement (i.e. continuous improvement in biological productivity without associated ecological and social harm).

3. Employment generation programmes: Swarnajayanti Gram Swarozgar Yojana is being seen as a holistic self-employment programme with the objective of establishing a large number of micro-enterprises in rural areas. However, the Integrated Rural Development Programme, Training of Rural Youth for Self Employment, Development of Women and Children in Rural Areas and Million Wells Schemes were found to be working as a matrix of multiple programmes without the desired linkages. They were implemented as separate programmes without keeping in mind the overall objective of generating sustainable incomes. While the programmes were found to have been successful in providing incremental income to poor families, in most cases the incremental income was not adequate to enable the participants to cross the poverty line on a sustained basis mainly because of low per family investment.

The training for rural youth for self-employment has not been effective since the training given is too short and not linked to remunerative self-employment avenues. Hence, these systems need to be revamped to provide more long-lasting entrepreneurial capacity to the rural poor. They need to be combined with micro credit and marketing facilities. It has been proposed that the Integrated Rural Development Programmes be converted into a micro-credit programme linked to the Rashtriya Mahila Kosh under the Tenth Plan, for greater efficacy.

Figure 6.3

Restructuring and Retooling Extension Services for an Era of Precision Farming



The wage employment programmes such as Jawahar Rozgar Yojana and Employment Assurance Scheme only succeeded in giving some relief to the underemployed persons. Another drawback has been the lack of asset formation in the rural areas through these programmes. Because there is often no provision for infrastructure building in these schemes, labour hours tend to get wasted. Employment assurance programmes should be re-vamped on the lines of the Employment Guarantee Scheme of Maharashtra. Each family should get assured employment of at least three months in a year.

The stocks of food grains with the government can be utilized for infrastructure building in the drought and flood prone areas. This should be a long-term programme to build infrastructure. Larger allocations for infrastructure, particularly the storage facilities in rural areas, cyclone shelters in cyclone prone areas, water and soil conservation in degraded areas etc., should be taken up. The Public Distribution System should be strengthened in the areas until grain banks develop. Alternatively, the Public Distribution System should buy from the grain banks.

4. Micro-level planning, Micro-enterprises and Micro-credit: Nationally and internationally, promoting micro-enterprises supported by micro-finance has been identified as an economically efficient method of strengthening the livelihood security of the poor. Under such a system of job-led growth, transaction costs are low, repayment record is high and technological and market linkages are strong. Micro-enterprises succeed when the production of goods and commodities, or organization of services, is related to assured and remunerative marketing opportunities. In the case of goods and services based on local natural resources, it is important that detailed micro-level planning is undertaken, so as to ensure that the natural resources, particularly land and water, are used in a sustainable manner. It has been increasingly proved by experiences at the micro-level, that the mechanism most likely to succeed is a decentralized and participatory system that makes the participants responsible for making the system work.

Self Help Groups (SHGs), linking of savings and credit systems, delivering small loans, portfolio financing, flexible and frequent repayment schedules, scope for innovation, and incentives and venture capital for small enterprises are some of the mechanisms for overcoming the constraints that impede the commercial success of micro-enterprises.

The economic survival of micro-enterprises supported by micro-finance will depend upon the macro-economic and trade policies of the government. There is no level playing field between goods produced by “mass-production” i.e., factory farming and “production by masses” i.e. farmers’ farming technologies. Securing the livelihoods of the millions engaged in small-scale production should be the aim of all economic and trade policies. At the same time, every effort should be made to confer the power of efficiency and scale on small producers through suitable institutional structures, such as the successful dairy and marketing cooperatives.

5. Increasing income and employment opportunities through increased farm exports: The global trade systems operate on the principle of comparative advantages. India’s comparative advantages in farming are in areas such as the following — eco-foods produced through small-scale organic farming enterprises (i.e. farmers’ farming), fruits, vegetables and flowers; medicinal plants and green health products; feed grains; livestock (dairy, poultry, sheep and goat) products; plantation crops, particularly tea, coffee and spices and marine and inland fisheries products.

To enlarge our agricultural exports, there is need for greater investment in post harvest technology, sanitary and phyto-sanitary measures and in meeting ISO 9000, 14000 and Codex Alimentarius standards. Agricultural Products Export Parks should be established in all parts of the country, to provide key centralised services including E-commerce facility to farm women and men cultivating smallholdings. Such parks can also be established in peri-urban areas in order to link the rural producer and urban consumer in a symbiotic manner. From the policy angle,

what is needed is a single window service and clearing agency, which will help rural women and men to take to remunerative self-employment in the agricultural export sector.

Unless farming becomes both intellectually stimulating and economically rewarding, it will be difficult to attract and retain educated youth in rural areas. If the steps recommended above are adopted, a new chapter can commence in Indian agriculture, where farming helps not only to provide the food the country needs, but more importantly more income and sustainable livelihoods. Institutions authorized to provide “eco-foods” certification and labeling need to be set up.

6.3. Enabling Development and Food Assistance

Given the household food insecurity scenario, food assistance assumes importance to ensure food security in the short and long run for the most vulnerable sections of society. Today national and donor-supported food assistance efforts are dramatically different from what they were even a decade ago. They pay more attention to developmental results and better targeting. More than ever before, they are concerned with the needs of society and of the food insecure families. Consequently, participants and partners are increasingly interacting in the definition of the problem (of food insecurity) and feasible solutions.

National programmes are often resilient to change and many food assistance programmes are designed as ‘entitlements’ and a form of affirmative action. However there is need for targeting these to the real food insecure people. Reaching the un-reached and giving operational content to Gandhiji’s concept of *antyyodaya* are major challenges today.

There is a continuing need for *food assistance*, for the groups which are extremely vulnerable and food insecure. In India as a whole, there is presently no overall shortage of food. Yet, current surpluses may distract from less optimistic projections for the future and the uneven food

supplies within parts of the country at present. There are pockets that do face chronic and/or transitory food availability problems and the challenge is to ensure accessibility and the most effective use of food. There is a continued role for food aid to develop models of how best to deal with food security problems of particular groups and in particular regions of the country.

Food assistance programmes are powerful tools in tackling hunger, but only where food, as food, makes a difference. It does not matter how large a programme is, if it lacks clarity in its goals and is not clearly focused on dimensions of the problem that are appropriately addressed with food the assistance may not yield the desired result. Food assistance is not the only solution to food insecurity, but it is a critical part of the solution in specific contexts. For example, food assistance has a comparative advantage in feeding children in schools, providing nutritional supplement to expecting and nursing mothers, building and preserving assets in food insecure communities and in meeting the needs of people affected by natural disasters. It can also be specifically designed to reduce the incidence of low birth weight babies

Food assistance provides leverage to improve policy coherence and cross-fertilization of best-demonstrated practices. It proves the potential of new technologies such as nutritionally fortified or blended foods. Food aid is flexible and can play a role in piloting new approaches, as for example in eliminating hidden hunger. However, food aid interventions too must be refocused to areas of strategic priority. For example, geographic targeting, gender and age targeting and a refocusing on specific nutritional gaps would all lead to greater impact.

Apart from targeting households and individuals, food assistance can benefit farmers, private sector entrepreneurs and the nation as a whole. By ending the inheritance of hunger, a stronger human capital base is created while saving future health and welfare costs. Moreover, food assistance programmes can play an important role in making productive use of surplus stocks.

Food insecurity gets in the way of sustainable development. The food assistance focus should thus shift from appeasing hunger towards enabling the development of human faculties. The current system of authority and decision-making on food security interventions is fragmented, hindering our understanding of the linkages between different aspects of the problem. Difficult decisions will have to be made about how to allocate — and possibly redistribute — resources with a view to not only meeting existing World Food Summit targets for the year 2015 but also to make faster and deeper cuts in the huge numbers of undernourished and food insecure people. Solutions to food insecurity require actions by the concerned ministries, agencies and Non Governmental Organizations in a variety of sectors, integrated under a **coherent policy framework**, for food assistance.

Strategies must be guided by a better understanding of how hunger and food insecurity perpetuate poverty and malnutrition. Anti-poverty measures must link up with agricultural, nutrition and disaster mitigation strategies. Food based programmes have a natural advantage in combining these elements.

Resources and actions must be prioritized towards those who are highly vulnerable and food insecure. Among the highest priorities is the need to give greater attention to the special problems of children, adolescent girls and pregnant and nursing women. Breaking the inter-generational cycle of hunger is crucial in addressing food insecurity in the long run.

Furthermore, attention is needed to find ways of mitigating the effects of natural disasters so that a single calamity does not push some people over the edge. Existing food assistance channels can be used to make relief more timely and effective. Asset building through food-for-work can create physical and institutional structures that enable communities to weather the storm more effectively. More food assistance should be targeted to disaster-prone areas that are home to many food insecure people. It should strengthen the ability of these households to cope better

with short-term shocks.

Pockets of extreme food insecurity are often geographically concentrated in particular regions. The food assistance response should thus include locally appropriate elements instead of a ‘one-size-fits-all’ approach. There is an urgent need to explore why public action has so far failed to address the problems in certain areas and what can be learned and replicated from other regions where public action has been relatively more successful. There is a need to redesign and improve the existing food assistance programmes, which will make for better targeting and implementation. The prime focus of the food assistance programmes needs to be concentrated into five priority areas: 1. Nutrient-rich foods for women, infants and children with particular emphasis on eliminating maternal and foetal undernutrition; 2. School feeding programmes and food support to training and literacy programmes, especially for women; 3. Shifting food-for-work from mere employment generation to creating and preserving assets for the poor; 4. Focusing on sustainable livelihoods of the food insecure with natural resource conservation and enhancement programmes; and 5. Focusing on disaster prevention, preparedness, relief and rehabilitation.

The existing food assistance programmes need to be reviewed and strengthened, particularly in the following operational directions for effective targeting and management.

- Implement better ways of identifying and targeting food insecure people
- Facilitate more participatory and decentralized approaches involving women at the community level
- Improve timeliness and enhance cost effectiveness
- Expand the base of the food basket, by including nutrition rich underutilized crops as well as the use of relevant micronutrient fortification.
- Market-friendly food procurement and delivery
- Promote policy advocacy and partnerships with the community and local NGOs

Lastly, food-programming successes need to be shared and replicated across the states. To promote this, available institutional mechanisms should be strengthened. Effective mechanisms need to be designed as a part of a conscious policy programme to ensure timely transfers of food from surplus states to the deficit states, which will ensure balanced allocation of production among the different regions. This will help to promote the growth of regional food security grids. India is a role model in this area because of its effective public distribution system.

6.4 Policies and Programmes for Improvement of Nutrition

The ongoing nutrition programmes like the ICDS and noon meal schemes do not cover children below the age of two. This crucial age group is left out of the ambit of the existing programmes⁴. Steps need to be taken to address this lacuna. The additional food required to ward off under nutrition in children is quite small and if the family has knowledge, they will be able to provide this additional amount of food from within their own resources. The three major interventions required for improving the nutritional status of children are equitable distribution of available food between members of the household, better child rearing practices and prompt attention to infection.

The experience of Thailand and Indonesia indicates that if knowledge and access to care are provided there could be a substantial improvement in the nutritional status of the population without specific food supplementation programmes. The major key for improving the nutritional status of young children and mothers lies in improving the knowledge and attitudes of the communities and families. This can be achieved through community-based organizations, women groups, panchayat, and Non Governmental Organisations.

Food distribution through ICDS is not an answer to meeting the nutritional needs of very young child as they

seldom go to the Anganwadi; the quantity of food that children in the age group of 6-12 months can consume in a sitting is also quite low. The young child needs to be fed small quantities of semisolid in addition to breast milk about five times. The knowledge and awareness about this, which is lacking in the ICDS programme, needs to be strengthened.

There is a need to work out whether better child rearing practices could be inculcated so that the nutritional needs of very young infants are met from the family food. A Pilot Project can also be taken up to see whether engaging an additional worker in the village will help in improving child rearing practices in the community.

One of the major problems in any food supplementation programme is that food provided often acts as a substitute and not as a supplement. The food distributed through the ICDS programme and the Mid Day Meal Programme can result in some improvement in the household food security but the share of the target child is not always sufficient.

Salt iodisation was a very good step initiated by the Government and notification-banning the use of non-iodized salt for the use of human consumption should not be withdrawn. To tackle the problem of widespread iron deficiency anaemia iron fortification may be considered seriously. Emphasis should also be laid on the identification of problem areas and tackling the problem through improved consumption of vitamin A and beta carotene rich foods. This will also provide phytochemicals, which are antioxidants and anticancer agents. Greater attention should also be paid to ensuring the adequate supply of lipids in the diets of children.

Repeated infections contribute to malnutrition. Priority needs to be given to environmental sanitation, safe drinking water and ready access to health care. Both the health and ICDS infrastructure should be energized towards

⁴ Swaminathan, Mina (1999)

promoting this. The service delivery system needs to be reorganised. Utilization of services cannot be ensured in the absence of proper programme implementation; it may be better to decentralize the programme and give it to the people themselves to implement.

To break the intergenerational cycle of malnutrition, initiatives need to be taken to increase the marriage age, provide adequate nutrition within the means of the family without discrimination, provide adequate care during pregnancy, reduce the prevalence of low birth weight babies and increase awareness and knowledge of every level of community worker for the rational feeding of young children. Improving the nutrition of adolescent girls and pregnant women to reduce incidence of low birth weight becomes all the more important in the light of the recent findings linking foetal malnutrition with adult diseases such as coronary heart disease, type 2 diabetes mellitus and hypertension(see [Figure 6.1](#))

Women groups actively involved in government programmes other than health and ICDS should also be used to propagate the nutrition programmes. The Departments of Women and Child Development of the Central and State Governments should bring out capsules of nutrition messages for children and women and provide them to Panchayats, particularly to the women members of elected local bodies.

Studies in Calcutta have shown that street foods provide 200 calories of energy per rupee. If the safety of street food is maintained, it can be used as a cost-effective mechanism for meeting the food requirements of the poorer segments of the working population and for generating self-employment. This could be tried out in railway and bus stations.

Creating an infrastructure and posting adequate manpower therein are not enough to get the desired results; people's involvement is necessary. There should be a regional dimension to address nutritional problems and

there is need for a holistic approach to take into account the nutritional and genetic problems and provide appropriate counseling.

The production of fortified high-energy food for mothers and adolescent girls and weaning foods for children through industry will be a very good effort in meeting the health needs of these groups. **Aspergillus** and **Salmonella** infections resulting in the production of mycotoxins in food can be avoided through proper drying of grains and hygienic handling of fish and meat.

It is important to mobilise the youth in the villages and improve their knowledge in maternal and child nutrition so that they can act as a link with the community and improve performance. NSS volunteers can be mobilized and assigned 10 households each to improve child rearing practices. In addition to the improvement in practices of mothers, the youth, who are tomorrow's parents, are sensitized and trained. The volunteers must also be educated and their services be used to implement nutrition programmes. There is a need to develop a module for school children and youth. NSS can spread this message to the population as well as farmers⁵.

Schemes need to be taken up for the promotion and production of inexpensive, simple and indigenous methods of drying or preserving fruits and vegetables during the glut season at the village level. This can also be a means of employment generation⁶.

There is also a need for designating *jowar*, *bajra*, *ragi* and other millets as "nutritious cereals", instead of being grouped under "coarse cereals" as at present. These grains and many minor millets are rich in protein as well as micronutrients like iron and calcium. There is a need for a massive effort in promoting restaurant chains based on such nutritious cereals, on the model of the Annapoorna movement launched by the late Dr K M Munshi after World War II.

⁵ Meeting of the Steering Committee on Nutrition for the Tenth Plan, 7th Feb, 2001

⁶ Meeting of the Steering Committee on Nutrition for the Tenth Plan, 7th Feb, 2001

6.5 Decentralized Planning for Development

1. Community Food and Water Security Systems

With the emergence of grass root democratic institutions with one-third representation to women, a unique opportunity has become available for developing and launching a Community Food and Water Security System. Such a system can help to provide concurrent attention to all links in the food security chain, starting with cultivation and extending up to consumption. Such a system will also involve conservation of natural resources, such as genetic variability and the conjunctive use of rain, surface and ground water. The major components of the system are the following:

Field Gene Bank: Wherever farm families are still maintaining varietal diversity in economic plants, they should be assisted to continue *in situ* on-farm conservation of such variability. This will also help them to get recognition and reward under the forthcoming Protection of Plant Varieties and Farmers' Rights Act and Biodiversity Act. Particular attention should be paid to "life-saving" crops which are able to survive biotic and abiotic stresses. In times of calamities, life saving crops enhance the coping capability of local communities.

Seed Bank: Quite often, during periods of drought or other natural disasters, rural families have no option except to use seeds as grain for consumption. Hence, in all drought and natural calamity-prone areas, village level seed banks can be established. This will also help to implement alternative cropping strategies based on monsoon forecasts and behaviour.

Water Bank: Rainfall in India is highly skewed. Most of the rainfall tends to be received in a few hundred hours during a year. Therefore, water harvesting and conservation must become a fundamental ethic of both rural and urban communities. Unless there is equity in water sharing, there will be no cooperation in water saving. Therefore, local

communities should help to establish self-help groups whose responsibility will be the promotion of community water harvesting and efficient and equitable use.

Grain Bank: Local level grain banks operated by self-help groups supported by revolving funds can help to (a) prevent distress sales, (b) give visibility to grain availability, thereby avoiding panic purchase by well to do consumers and (c) minimize transportation and transaction costs. In view of the significant role that local area Grain Banks can play in ensuring sustainable food security this approach is dealt with in detail below.

At present, the link between production and consumption tends to be weak at the state level, as has been explained in chapter two. This is due to the centralized activity of procurement and distribution. If this activity is decentralized and the price incentives are spread across the states and farms as proposed in the Union budget of 2001-2002, the link between production and consumption would improve, particularly to the advantage of lower expenditure groups and small and marginal farmers. The aim of the local area grain bank is to enhance production and market links to the advantage of the producers and consumers in the region.

Direct participation of producers and consumers in the operation of grain banks, would enable them to protect their interests better, without the intervention of middlemen. This will help to achieve a forward as well as backward integration of the activities through grain banks, so that the system becomes more efficient. The idea is to bring down the losses of farming, by cutting off the middlemen, forging alliances with consumers and forming partnerships with NGOs and the government. There can be grain banks with surpluses and there can be grain banks with deficits. They can negotiate directly with each other. Private traders can negotiate with grain Banks. The Public Distribution System of the government can also negotiate with grain Banks. Indian farming can then survive competition and onslaught from outside. Local Area Grain Banks work on the principle of peoples' participation with

available government support for procurement prices. Even remote areas have become price and technology sensitive. The new scenario presents an opportunity to experiment with grain banks.

Due to the problems of lack of markets, infrastructure and communication facilities, farmers are often not able to sell their produce at remunerative prices. Farmers have been shifting from one crop to another in the hope of finding a buyer. Grain banks and timely advice in land use planning can solve this problem. What is crucial to the success of the grain bank is the availability of the storage facility for which the government should provide funds through the rural infrastructure and godown development.

2. Gram Sabhas and Local Body level “Freedom from Hunger” Movement

On the basis of detailed studies carried out jointly with several partner institutions in different parts of Tamil Nadu, representing diverse agro-ecological and socio-cultural conditions, MSSRF has identified the following seven major steps which could be initiated at the local level by **Gram Sabhas**, **Palli Sabhas**, **Mahila Mandals** and other people’s organizations.

a. Identification of the Ultra-poor

The first step is to identify families and individuals suffering from poverty-induced endemic hunger. This is best done by the **Gram Sabha/Palli Sabha**. Usually, such families/ individuals tend to have no assets like land, cattle, fishpond and education. They live by daily unskilled wage work.

b. Information Empowerment

Families / individuals identified as vulnerable to endemic hunger can be given **Household Entitlement Cards** which give information on all Government projects (both Central and State Government) relating to poverty and hunger elimination, to which they are entitled. The various government projects can be disaggregated by gender, age, class and caste and precise information provided on methods of accessing the benefits to which they are entitled.

Land ownership records should be periodically updated and made available to the people.

c. Eliminating protein calorie under nutrition and energy deprivation

Existing projects like the targeted PDS and nutrition programmes will have to be mobilized to ensure that they reach those who have so far been bypassed by such schemes. Local level grain banks can also play a useful role.

d. Eliminating hidden hunger caused by micronutrient deficiencies

A two-pronged strategy consisting of direct interventions like the administration of oral doses of vitamin A, iron and iodine fortified salt, as well as the promotion of the cultivation of vegetables and trees like **amla** in the small area surrounding the huts/homes (home garden), can be introduced in every village. The highest priority should go to the elimination of hidden hunger as soon as possible.

e. Safe drinking water and environmental hygiene

Environmental hygiene can be improved through cooperation among local communities. Every village and town should have a policy for the treatment and recycling of solid and liquid wastes. In towns and cities, the treatment and disposal of hospital wastes should receive particular attention. Waste recycling could also become a remunerative enterprise and self-help groups can be trained to take up such environment enhancing enterprises. Clean drinking water is necessary to ensure the efficient biological absorption and digestion of food. Meeting this basic need must receive overriding priority. In addition, the consumption of boiled water should be encouraged and facilitated. This one step could help to bring down infant and child mortality rates significantly.

f. Enhancing purchasing power through sustainable livelihoods

Lack of economic access to food is the major cause of food insecurity in India today. Therefore an integrated

on-farm and non-farm livelihood strategy involving cooperation with the corporate and business sectors with reference to contract farming and buy-back arrangements should be developed in each agro-climatic zone. Livestock and agro-forestry are important to livelihood security in semi-arid and arid areas. Infrastructure for perishable commodities including livestock and poultry products as well as fruits, vegetables and flowers should be developed as soon as possible. The Rural Infrastructure Development Fund needs to be harnessed for this purpose. Every individual should be able to earn his/her daily bread through economically and ecologically viable means of self-employment. To this end, the organization of an innovative **National Livelihood Security Scheme** with provisions for both skilled and unskilled work can be considered. Assistance under such a programme can take the form of food, cash and infrastructure.

g. Special attention to Women and Children

Pregnant and nursing mothers as well as pre-school children need special attention. Nearly 30% of the new born children are characterized by low birth weight, caused by maternal and foetal undernutrition and malnutrition. This has serious implications for the future of the country in this “Knowledge Age”, since Low Birth Weight (LBW) children are handicapped in brain development (See Fig. 6.1). The Prime Minister of India drew attention to this serious problem in his address to the Indian Science Congress on 3 January, 2001. Since the onus of population stabilization has practically fallen on women, facilities for health care, particularly reproductive health, need strengthening at the local level. There are several national and state schemes intended to help pregnant and nursing women. Steps should be taken to ensure that the benefits of such projects reach the unreached. They can be listed in the Household Entitlement Cards. The preliminary results of Census 2001 has revealed an increase in “missing girl children” in the 0-6 age group. In the office of every Panchayat and Nagarpalika, the sex ratio in that village or town should be prominently displayed. Education, regulation and social mobilisation will be needed to prevent

female foeticide and infanticide. Balanced sex ratio is a good barometer of the state of gender equity and justice prevailing in different parts of the country.

This 7-point action plan lends itself to easy implementation by local communities and will help to achieve convergence and synergy among all on-going hunger elimination, antipoverty and gender equity programmes. Additional efforts and investment will be needed only to fill gaps. If such a countrywide community led programme can be initiated during the Tenth Plan period, substantial progress can be made in achieving the goal of a Hunger Free India by August 15, 2007, which represents the 60th anniversary of our independence.

6.6 National and Global Action

While the above 7 point action plan directly relates to the situation at the village and local level, there is an equal need for concerted action at both the national and global level in the following areas:

First, there is need for a strengthening of food based safety nets. The focus of food assistance should shift from appeasing hunger towards enabling development of human faculties. Programmes must use food consumption to encourage investment, and leave behind a lasting asset, which will continue to help the community, household or individual into the future. Thus, food should work as an enabler, a pre-investment, which frees people to take up development opportunities and escape the hunger trap.

Solutions to food insecurity require action by concerned ministries and government and non-government agencies, in a variety of sectors, integrated under a coherent policy framework for food assistance. Areas and groups of people have to be identified for whom securing adequate food consumption is a problem. Geographic targeting, social, age and gender targeting and refocusing on specific nutritional gaps could all lead to greater impact.

Second, both at the national and global level there is an immediate need to link disaster mitigation with development. Without disaster preparedness, development

itself is at risk. Increased attention is needed to finding ways of mitigating the effects of natural disasters so that a single calamity does not push some people over the edge.

Existing food assistance channels can be used to make relief more timely and effective. Asset building through food-for-work can create physical and institutional structures that enable communities to weather natural disasters more effectively. Food assistance programmes can contribute to a process of transforming insecure, fragile conditions into more durable, stable situations. Linking relief, recovery and development is the challenge in disaster mitigation.

At the global level, countries not only need to respect each other but they also need to take responsibility for the effects they cause across international boundaries. This need is most apparent in the area of environment. At this time, when substantial scientific evidence is in broad agreement on the adverse impact of global warming, it behoves us all to both think of the future of our small planet and take concerted action. It is always poor nations and the poor in all nations who suffer most from natural and human made disasters.

Finally, industrialized countries must provide greater market access to the farm products of developing countries. If trade and not aid is to become the pathway for poverty reduction, trade should become not only free but also fair.

6.7 Lesson from the Atlas and Analysis

Think, plan and act locally and support nationally and globally

The analysis and atlas reveal that every state in the country has its strengths and weaknesses in relation to achieving the goal of sustainable food security. For example, Punjab and Haryana presently occupy the top positions in relation to security of food availability. However, Punjab and Haryana are in a very unenviable position with reference to sustainability criteria such as forest cover, ground water

exploitation, soil degradation and the use of nitrogen-fixing leguminous species in crop rotation. Similarly, Gujarat, which does not fare well in food availability in terms of production within the state because of drought, lack of irrigation, etc., occupies a reasonable position in relation to food access and food absorption.

In order to assist policy makers to draw up a **food security balance sheet** of strengths and weaknesses, separate maps are given for each indicator and composite maps are given for food availability, access and absorption as well as for the long term sustainability of the production system. Such a state level balance sheet will help to identify priorities in public action and investment. The next step in our analysis will be a more in-depth consideration of the situation prevailing in each state and finally each district.

Eastern India (West Bengal and Assam) is relatively food secure with reference to availability and access, but wanting in security with reference to food absorption and utilization. These States have to pay greater attention to environmental hygiene and safe drinking water. Tamil Nadu, which is good in food availability and absorption, is rather poor in food access. This is because of a high proportion of landless labour families in villages. Tamil Nadu will have to pay special attention to building the assets of the poor including knowledge and skills. A transition from unskilled to skilled work and greater attention to non-farm employment will bring many families above the poverty line.

Gujarat will have to pay special attention to water harvesting, conservation and sustainable and equitable use. Climate and disaster management are particularly important. The maps bring home a central lesson, that we have to shift our attention from the slogan, “think globally, and act locally” to “think, plan and act locally, and support nationally and globally”. Fortunately, it is now possible to develop synergy between representative democracy (i.e. elected local bodies) and participatory democracy (i.e. Gram Sabhas) at the local level. The 7-point local level and the 3-point national and global level action plan recommended by us can be implemented effectively if

synergy and convergence can be generated at various levels.

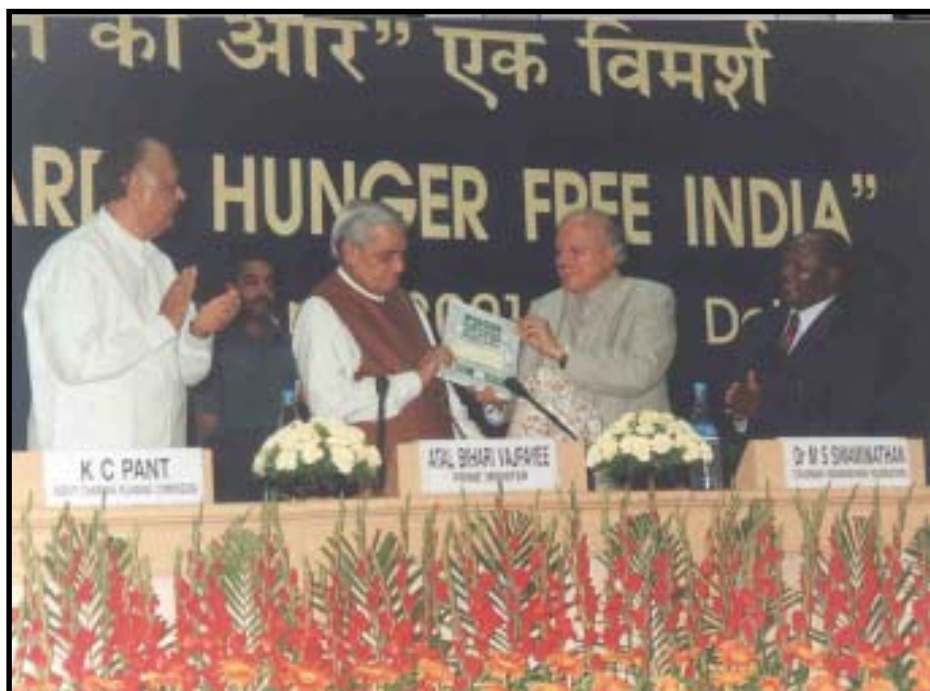
Soon after this analysis was completed, the National Sample Survey Organisation (NSSO) had released the results of the NSS 55th Round, which revealed that in areas like poverty reduction, there has been good progress since 1993-94. Also, the share of the farm sector in labour absorption records a significant decline to just below 60 percent to reduce marginally the absolute number of workers in agriculture for the first time since

independence⁷. The preliminary results of the 2001 census also reveal some encouraging trends in terms of literacy and demographic transition, although we are yet to make progress in improving gender equity reflected in sex ratios in 0-6 and older age groups. In the subsequent series of this Atlas, the latest available data will be used. Nevertheless, the broad features revealed by this Atlas are unlikely to undergo major changes, unless conscious steps are taken to address the issues highlighted by our analysis.



⁷ Sundaram, K. (2001)

Release of the Food Insecurity Atlas of Rural India



On the occasion of the release of the Food Insecurity Atlas of Rural India by the Honourable Prime Minister, Shri Atal Bihari Vajpayee, a Consultation on “Towards Hunger Free India” was held at Vigyan Bhavan, New Delhi, from April 24 – 26, 2001. The consultation was attended by leading food security experts from the academic world, Government Departments and Non-Governmental Organisations as well as international organisations. The participants discussed the implications of the findings reported in the Food Insecurity Atlas and recommended a 10-point Agenda for Action designed to assist India to make substantial progress in ending hunger by August 15 2007, which marks the 60th anniversary of India’s Independence. Ten Point Agenda for Action adopted at the Closing Session of the Consultation on April 26, 2001

1. Identification of the vulnerable individuals
2. Information Empowerment
3. Eliminating Protein Calorie Malnutrition and Energy Deprivation
4. Eliminating Hidden Hunger caused by Micronutrient Deficiencies
5. Safe Drinking Water and Environmental Hygiene
6. Enhancing Purchasing Power through Sustainable Livelihoods
7. Special Attention to Women and Children
8. Strengthening Food Based Safety Nets
9. Linking Disaster Mitigation with Development
10. Greater Market Access to Farm products



APPENDIX 2.1

I. Methodology for computing Net Production with ICMR base

The food items considered are the following:

1. Cereals (rice, wheat and coarse cereals)
2. Tubers (potato, sweet potato and tapioca)
3. Sugar
4. Pulses
5. Edible Oilseeds
6. Fruits
7. Vegetables.
8. Milk
9. Eggs
10. Fish

Triennium average production of 1995-96, 1996-97, 1997-98 is considered for cereals, tubers, sugar, pulses and edible oils. For the production of fruits and vegetables the two years average of the 1996-97 and 1997-98 is considered. The production of milk, eggs and fish refer to the triennium average of 1993-94, 1994-95 and 1995-96. Triennium average production indicates the level of production free from fluctuations.

Production of each of these items in tonnes is divided by the projected population of the year 2000 to obtain per capita production in Kgs/month and gms/day. Litres of milk is converted into kilograms by taking 900ml as equivalent to a kilogram. Similarly one egg is taken as 125 grams for the purpose of converting the number of eggs into tonnes.

The state population projections given by the Registrar General of Census are used for the index. The implication of this exercise is that we expect food production to continue at the triennium average level of the chosen period even in the year 2000. If the year 2000 is a normal year, there may not be an over estimation or under estimation of considerable dimensions in the per capita production. The year 1999-2000 has turned out to be a normal year for the country as a whole.

II. Net Production Index with ICMR norm as the base

Separate indices are computed for net production. Net production is nothing but food production after deducting certain percentages for seed, feed and wastage for some of the food items.

Net production index is computed to compare the sufficiency of food production with consumption norms given by the Indian Council of Medical Research (ICMR).

Production of food cannot be directly compared with consumption norms, as the consumption norms are in edible portions and production is in total raw weight and includes seed, feed and wastage.

Per capita net production is calculated by removing 13 per cent of per capita production for seed, feed and wastage in respect of cereals, pulses, tubers and vegetables. The present level of wastage is no more than 12 per cent. The requirement for seed, feed and wastage is expected to increase in future.

No wastage is deducted for sugar, milk, eggs and fish to compute availability index. 70 per cent and 50 per cent of the weight is deducted as seed, feed and wastage for oil seeds and fruits respectively.

The net production index is computed using ICMR recommended levels of intake as the basis for indexing.

$$INP_{ij} = (X_{ij} / X_{i\text{ICMR}})$$

Where

INP_{ij} = Index of food availability of the j^{th} state for i^{th} food item

X_{ij} = Per capita availability of i^{th} food item per day in the j^{th} state

$X_{i\text{ICMR}}$ = Per capita per day recommended intake of the i^{th} food item,



APPENDIX 2.2

Sustainability Index

Sustainability Index refers to environmental sustainability. Long-term environmental sustainability leads to long-term food production sustainability. Though it is difficult to establish a specific relationship based on any predictable model (Bo. R. Doo and Roderick Shaw, 1999)¹ we can safely establish a positive relationship between food production sustainability and factors affecting environmental sustainability, such as:

1. Area not under forests as a percentage of the geographical area of the state
2. Area not under leguminous crops as a percentage of total gross cropped area
3. Percentage of area degraded through wind and water erosion, as a percentage of the total geographical area
4. Percentages of ground water exploitation to the existing capacity

The short-term relationship between environmental sustainability and food production may be negative, but the long-term relationship is bound to be positive for the country as a whole. Hence the sustainability index, unlike the index of production, is an indicator of production far into the future.

Forest land and Degraded land

Data on forest area and degraded land, available from the Ministry of Forests and National Remote Sensing Agency (NRSA), appear to be different. The forest area given by NRSA seems to be less than the area reported under forests by the Department of Forests. It is understandable, as NRSA considers only area with more than 40 per cent canopy cover, while the Department of Forest takes into account the entire forest area. We have taken the NRSA data.

The reverse is the case with degraded land. Area under wasteland reported by NRSA is much smaller at 13.5 per cent of the geographical area, compared to the problem area reported as susceptible to soil erosion by wind and water by the Ministry of Water Resources, which stands at 53.2 per cent of the total geographical area. A number of studies (Sehgal, J. and Abrol, I.P. 1994)² have taken degraded area at 187.7 million hectares, which is higher than the official figure of 174.9. NRSA data does not recognize the possible water and wind erosion in the areas presently covered by crops. Recognition of possible problem area is easier to calculate if based on easily available data on rainfall, humidity, soil type, etc.

NRSA information is available on actual reduction in thick forest area between 1972-75 and 1993-95, which gives the area of degraded forests. This land overlaps the reported area of degraded land. All the same we have taken it into consideration for the purpose of indexing. Total degraded land consists of reduction in forest area as well as the reported problem area. This is expressed as a proportion of the total geographical area. Hence, though the percentages may appear high, the same relative position does not alter.

Computation of Sustainability Index

The Index of Sustainability considered the proportion of degraded area to total geographical area, actual non-forest area as a proportion of geographical area, proportion of area under non-leguminous crops to total gross cropped area, (excluding total pulses, groundnut, mustard and rape seed, sesame and soybean), proportion of Ground water net draft as a proportion of net ground water availability, and proportion of either wasteland or area degraded by wind and soil, to the total geographical area. Individual indices were calculated as follows

¹Bo R. Doos and Roderick Shaw, *Global Environmental Change*, Volume 9, 1999 pages 261-283.

²Sehgal, J., and I.P. Abrol, *Soil Degradation in India - status and impact*, New Delhi, 1994, Oxford IBH.

$$I_s = \frac{\sum_{i=1}^n \{ (X_{ij} - X_{\min}) / (X_{\max} - X_{\min}) \}}{n} * 100$$

Where,

I_s = Index of sustainability

X_{ij} = i^{th} sustainability indicator in the j^{th} state

X_{\max} = i^{th} sustainability indicator in the maximum state

X_{\min} = i^{th} sustainability indicator in the minimum state

' i ' = 1 to 4 sustainability indicators

' j ' = 1 to 16 states in the country

The Composite Index is nothing but the average of all the four indices. Each index measures the distance of the State from the most environmentally sustainable State as a proportion of the difference between the most sustainable and least sustainable States. An index of 83 percent for Punjab means that Punjab has to travel a distance of 83 percent to reach the level of the most sustainable state, while Madhya Pradesh will have to travel a distance of only 10 percent to reach the level of ideal situation of the most sustainable State, where all the sustainability indicators are at the best possible level in the country.



APPENDIX 2.3

Disaster Index

Data on disasters is not easily available. The following sources provide information on disasters:

1. Map prepared by 'National Atlas and Thematic Mapping Organization' (NATMO), Department of Science and Technology, Government of India. "India Natural Hazards", 1991
2. Central Statistical Organization, Ministry of Statistics and Programme Planning, GOI, "Compendium of Environmental Statistics", 1999
3. Centre for Research on Epidemiological Disasters (CRED)— Web Site
4. Parasuraman S. and Unnikrishnan P.V., 2000 (edited) "India Disaster Report - towards a policy initiative", Oxford.
1. Average population affected by Heavy rains, floods cyclones and landslides in 1998
2. Percentage of lives lost in the state to total lives lost in the country due to flood, heavy rains, landslides and cyclones in 1998 and 1999
3. Percentage of drought affected area to the total geographical area of the state in 1999 in lakhs
4. Number of persons killed in earthquake
5. Number of people affected in lakhs

In view of the problems of comparability and gaps in data, we have only considered droughts, floods, heavy rains and cyclones in the Disaster Index. Only a two-year average of 1998 and 1999 are taken into consideration for floods, heavy rains and cyclones. The number of districts affected by drought in 1999 is also available. Disaster Index uses only the short-term view of the disasters in the past two years.

The drought prone area data was also available state-wise. It was estimated by the Water Commission. The data represents the long-term drought proneness. We have considered the following indicators to compute a Composite Index of disaster:

Data sources and adjustments

The extent of drought prone area is available district wise. The area affected by drought in these drought prone districts was estimated by the Central Water Commission of the Government of India in 1989. However these districts do not tally with the list of districts, declared as drought prone by the various State Governments or the districts in which drought prone areas programme is undertaken. The drought prone area data is taken from

the Environmental Compendium of the Government of India, 2000. This data only considers the areas within the drought prone districts which are affected by drought. The data belongs to 1987-89. This data has no gaps.

The flood and cyclone data are taken from two sources. For 1999 we have taken the data given in the Environmental Compendium 2000 season-wise, for pre-monsoon, south-west monsoon and north-east monsoons. The total number of people affected in all the three seasons are added up both for floods and cyclones to represent the people affected by these disasters in 1999. For the year 1998, the information provided by the Government in the Rajya Sabha, to an un-starred question, re-produced in the India Disaster Report edited by S. Parasuraman et.al. is taken.

Even after restricting ourselves to just two years for the data on floods and cyclones, we still found a number of data gaps. The data gaps are filled in different ways. Data on number of people affected is not available for all states. In respect of Kerala, Karnataka and Punjab, the number of persons affected is estimated on the basis of the number of houses and huts damaged. Five persons are taken for each house damaged to get the number of people affected in 1999, due to floods and cyclones. Information on houses damaged as well as number of persons affected and the area affected are not available for Gujarat in 1999. We have roughly estimated the number of affected population, by taking the proportion dead to the proportion of those affected in 1998 floods. The number of dead is available for Gujarat in 1999. In respect of Haryana for 1998, the affected people are estimated, based on the area affected and the density of population in the state. After the adjustment, an index of people affected is computed.

The severity of the disaster is measured in terms of the number of human lives lost due to floods and cyclones. (Similar data is not available for droughts as the number of lives lost is generally negligible.) The proportion of the dead in the state to the total number of people dead in the country due to floods and cyclones that year is used to indicate the severity of the disaster. This proportion is used as a separate index of severity of floods and cyclones. Index of people affected and index of severity of flood and cyclone and the index of drought prone area are averaged together to get the Disaster Index.

The data on earthquakes in the past twenty years has been collected from various sources, the main sources being the Environmental Compendium of the Central Statistical Organization. The latest earthquake in Gujarat has been included. Wherever we could not get the reported number of people affected by an earthquake, we have taken the number of people of the entire district as per the 1991 census as the number of people affected. Using sometimes the reported number and at other times, the entire population is highly arbitrary, but it could not be helped, without bringing in some more arbitrary calculation and guess work on the number of people affected. This calls for the need to improve the statistics on disasters.

The final Disaster Index is computed as follows:

$$I_D = \left[\frac{\sum_{i=1}^n \{(X_{ij} - X_{imn}) / (X_{imx} - X_{imn})\}}{n} \right] * 100$$

Where, I_D = Index of 'i' th disaster indicator

X_{ij} = Value of the 'i' th disaster indicator in the 'j' th state

X_{imn} = Minimum Value of the 'i' th indicator

X_{imx} = Maximum Value of the 'i' th indicator



APPENDIX 3.1

Consumption Index with ICMR base

National Sample Survey of the 50th round conducted in 1993-94, provides information on quantity and value of consumption of various food items. Although information is available for 1995-96 from NSS consumer expenditure survey, the sample size is much smaller. Hence we have relied on 1993-94 data.

Consumption index has the ICMR recommended level as the basis for indexing. The weights used for aggregation

are All India weights and not state specific as in the case of production.

$$IFC_{ij} = (X_{ij}/X_{i\text{ICMR}})$$

where

IFC_j = Index of food consumption in the j^{th} state for the i^{th} food item

X_{ij} = Per consumer unit per day consumption of i^{th} food item in the j^{th} state in grams.

$X_{i\text{ICMR}}$ = Per consumer unit per day recommended intake of the i^{th} food item



APPENDIX 3.2

Estimation of Poverty in India

There is considerable controversy in the literature since 1970, about the number of poor and the trend in poverty.¹ While we shall not go into the controversial issues regarding the trend in poverty, it is important to elaborate the method of calculation and the implications. The head count ratio of poverty gives the proportion of population below a stipulated state specific and all India specific poverty line for the country and for each individual state. The poverty line is different from one state to the other and adjusted for the purchasing capacity of the people.

Poverty line is defined as the per capita expenditure level at which the average per capita calorie intake is 2434 Kcal for rural areas.² Thus it refers to the money income and not to the calorie consumption. Applying linear inverse interpolation method to the data on average per capita monthly expenditure and the associated calorie content of food items in each expenditure class, the monthly per capita

expenditure corresponding to 2435 Kcal intake per capita per day was worked out. The poverty line for 1973-74 based on 28th round data, worked out to Rs. 49 at 1972-73 prices.

State specific poverty lines are first formed for the base year, using the commodity basket corresponding to the poverty line at the national level, at the prices prevailing in the base year. Later it is updated to the current year by using the state specific consumer price indices constructed by having weighted average of group wise consumer price indices of agricultural labourers.

The all India poverty ratio is derived as a ratio of the aggregate number of state-wise poor persons to the total all India population. The Planning Commission in 1997, accepted the recommendations of the task force,³ and calculated the poverty ratios for the years, 1973-74, 1977-78, 1983, 1987-88 and 1993-94.



¹ There has been considerable controversy on the head count ratios in various states. The major issues are, the underestimation of total NSS consumption expenditure, the deflator used for the poverty lines in each state, and the methodology of determining the state specific poverty line.

² The average calorie intake is obtained for rural areas as weighted average of the calorie intake of 16 homogeneous groups of age-sex and occupation categories, as projected for the population in 1982-83.

³ The task force was appointed in 1989 and submitted its report in 1993.

At present there are various poverty lines, varying with the deflators used and the base year poverty line. Some estimates use Rs.15 at 1960-61 prices as the poverty line. Official Poverty line for rural India used by the Planning Commission and most other estimates are Rs. 49 per capita per day at 1972-73 prices. Estimates of poverty differ even when the same poverty line is used. The estimates differ due to the price deflators used. The poverty ratios calculated and used by the government and the Planning Commission are the lowest.

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APPENDIX 3.3

Rural Infrastructure Index

Rural Infrastructure Index consists of certain key indicators, which facilitate livelihood access. They reflect certain basic amenities available in rural areas such as:

1. Road length per thousand persons
2. Percentage of villages without electricity
3. Percentage of households without electricity and
4. Percentage of households without piped water

Road length facilitates transport of more food to the villages. Electrification helps better production. Electrification also helps processing industries and other non-agricultural enterprises, which would enhance livelihood access and food access.

Better water supply and availability of electricity in the households would enhance the capacity for enterprise. Productivity of the rural population would go up if there were a reduction in the time and effort involved in carrying water and fuel from long distances. Rural infrastructure has a direct bearing on livelihood access and food access.

For livelihood access, markets and credit institutions are also very important. However we have restricted our analysis to basic amenities.

The chosen indicators are first converted into indices and then averaged together to get the composite index. The method of calculating the index is as follows for all the indicators, except 'Road length per thousand persons'.

$$I_{ij} = (X_{ij} - X_{imn}) / (X_{imx} - X_{imn})$$

where

X_{ij} = i^{th} Rural infrastructure indicator in the j^{th} state

X_{imx} = i^{th} Rural infrastructure indicator with maximum value among all the states indicating the worst situation (This gets the value of One)

X_{imn} = i^{th} Rural infrastructure indicator with minimum value among all the states indicating the best situation (This gets the index value of Zero)

In respect of Road length per thousand population, the following formula was used to get the Index of road length.

$$I_{ij} = (X_{imx} - X_{ij}) / (X_{imx} - X_{imn})$$

I_{RI} = Index of Rural Infrastructure is calculated as follows:

$$I_{RI} = \left\{ \sum_{i=1}^n (I_{ij}) / n \right\} * 100$$

' i ' = 1 to 4 Rural infrastructure indicators

' j ' = 1 to 16 states in the country

The composite Index is the average of all the four indices. Each index measures the distance of the state from the worst possible situation, compared to the distance between the best and the worst states. A Composite rural infrastructure index of 99 percent for Bihar means that Bihar has to travel 99 percent of the distance to reach the level of state with best infrastructure. While Himachal Pradesh will have to travel a distance of only 12 percent to reach the level of ideal situation of the best possible state in India at present.



APPENDIX 3.4

3.4 Government Programmes to Improve Rural Access

Absolute poverty is a state of being for more than one-third of India's population. Poverty eradication is one of the major objectives of planned development. Over the years, the country has tried out a variety of state sponsored rural poverty alleviation programmes. The expectation has been that anti-poverty programmes will contribute towards increased economic access and stabilize the demand for food, for a food insecure population. But rural poor families have remained nearly constant in number in the last 20 years, despite high growth and investment in poverty alleviation programmes.

An analysis of the various programmes over the years reveals that the results are far from encouraging and that most of the programmes have by-passed the very people they were supposed to benefit. A brief survey is made below, of some of the programmes, their performance and the budget outlay in the current year.

Employment Generation Programs: **Under employment generation programmes, there are both self-employment and wage employment programmes.**

I. Self-Employment Program:

Swarnajayanti Gram Swarozgar Yojana:

Various ongoing programs, Integrated Rural Development Program (IRDP) and allied programs such as Training of Rural Youth for Self Employment (TRYSEM), Development of Women and Children in Rural Areas (DWCRA) and Million Well Scheme (MWS) have been restructured into a single self-employment program called the **Swarnajayanti Gram Swarozgar Yojana (SGSY)** from April 1999 with the following objectives:

- Focussed approach to poverty alleviation
- Capitalizing advantages of group lending
- Overcoming the problems associated with multiplicity of programs

- To bring the existing poor families above the poverty line by providing them income generating assets through a mix of bank credit and government subsidy
- Ensure that an assisted family has a net monthly income of at least Rs.2000;

SGSY is being seen as a holistic self-employment program with the objective of establishing a large number of micro-enterprises in rural areas.

IRDP, introduced during the Sixth five year Plan (1980-85) and its allied programmes, **TRYSEM**, **DWCRA** and **MWS** were found to be working as a matrix of multiple programmes without the desired linkages. They were implemented as separate programmes without keeping in mind the overall objective of generating sustainable incomes. While the programmes were found to have been successful in providing incremental income to the poor families, in most cases the incremental income was not adequate to enable the beneficiaries to cross the poverty line on a sustained basis mainly because of low per family investment.

Although these programmes have since been merged into SGSY in an attempt to rectify the weaknesses, SGSY also remains a credit cum subsidy programme and the drawbacks of IRDP maybe perpetuated.

In the Central Plan for 2001-2002, Rs.500 crore has been provided for SGSY. It aims to bring every assisted family above the poverty line in three years. At least 50% of the swarozgaris will be Schedule Caste and Schedule Tribe, 40% women and 3% disabled.

II. Wage Employment Program:

1. Jawahar Gram Samridhi Yojana: The existing **Jawahar Rozgar Yojana (JRY)** was restructured as **Jawahar Gram Samridhi Yojana (JGSY)**, to be implemented by the Gram Panchayats, with effect from April 1999. JGSY aims at creation of demand driven community infrastructure that would increase opportunities for sustained

employment among the rural poor. The objectives of JGSY are:

- Creation of sustained employment by strengthening the rural economic infrastructure
- Creation community and social assets
- Creating assets in favor of the rural poor for their direct and continuing benefits
- Positive impacts on wage levels
- Overall improvement of the quality of life in rural areas.

People below the poverty line constitute the target group under the JGSY. Preference is given to members of Schedule Caste and Schedule Tribe and freed bonded labors. Another objective of this program is to generate supplementary employment for the unemployed rural poor.

Jawahar Rozgar Yojana (JRY) had been launched in 1989, with the aim of generation of gainful employment for the unemployed and underemployed in rural areas, by merging two existing employment generation programmes. Evaluation studies of the programme have however revealed that employment generated per person was too inadequate to bring about any meaningful increase in the earnings of the beneficiaries.

2. Employment Assurance Scheme (EAS): The Scheme was launched in 1993; by 1997-98, it was being implemented in all the rural blocks in the country. The main objectives of the EAS are:

- Creation of additional wage employment opportunities for the rural poor living below the poverty line through manual work, during periods of acute shortage of wage employment and
- Creation of durable community, social and economic assets, to sustain future employment and development

The experience has been that employment provided under the scheme was meagre. The EAS was restructured in 1999-2000. It is now an allocation-based scheme, the allocation being based on incidence of poverty and backwardness.

Under the Central Plan outlay for 2000-01, a provision of Rupees 1600 crore has been made for providing single wage employment program in the country to create additional wage employment opportunities for the rural poor living below the poverty line. 70 percent of the funds are to be allocated to the blocks and 30 percent reserved for the areas of distress.

Infrastructure Development Program

1. The **Indira Awas Yojana (IAY)** addresses the problem of shelter faced by BPL families. Till end of the Eighth Five year Plan, 37.21 lakh houses were constructed as against the rural housing shortage of 137.20 lakh as per the 1991 census, indicating a yawning demand supply gap.

Taking off from the goals set in the National Housing and Habitat policy, 1998 and recognizing housing as a basic necessity, the government has redefined its role from being a provider to that of facilitator. The National Agenda for Governance has identified housing for all as a priority area with particular emphasis on the needs of the vulnerable groups. It is proposed to facilitate the construction of 20 lakh additional dwelling units every year with emphasis on Economically Weaker Section and Lower Income Groups of the population as also the needs of Schedule Caste, Schedule Tribe and other vulnerable groups. An action plan for implementation of the new policy for achievement of targets has been drawn up. The Golden Jubilee Rural Housing Finance Scheme of the National Housing Bank aims at targeting 1.25 lakh dwelling units. In 2000-2001, Rs.1527 crore has been provided for rural housing with physical target of construction of 9.84 lakh houses for rural poor, to be built by themselves.

2. The **Pradhan Mantri Gramodaya Yojana (PMGY)** has been introduced with the objective of undertaking time bound programmes to fulfil the critical needs of the rural people. In the 2000-01 Budget, there is an allocation of Rs.5000 crore for focussing on village level development in five critical areas: health, primary

education, drinking water, housing, and rural roads for improving the quality of life of people in the rural areas.

- a) **Central Rural Water Sanitation Program:** Under the Central Plan outlay for 2000-2001, Rs.2010 crore has been provided to supplement the States in their efforts to provide Safe Drinking Water to all rural habitations. Rs.150 crore has been provided as 70% allocation for total Sanitation Campaign in selected districts to be decided by the states.
- b) The **Pradhan Mantri Gram Sadak Yojana** was launched in December 2000, with a fund of Rs.2500 crore, to provide connectivity of every village with a population of over 1000 persons by 2003 and with a population of up to 500 persons by 2007. An additional allocation of Rs.2500 crore has been made for the current year. Fifty percent of the diesel cess has been earmarked for the development of rural roads.
- c) **Rural Electrification:** A package of initiatives has been launched for completion of electrification of bulk of the villages within the next six years. States are to get assistance for village electrification under the PMGY. A sum of Rs.750 crore has been earmarked out of the Rural Infrastructure Development Fund for rural electrification works.

Literacy Development Programs:

The National Education Policy (1986) provides a broad policy framework for total eradication of illiteracy and a commitment to make primary education free and compulsory up to the fifth standard, besides ensuring higher government and non-government expenditure on education. Several schemes have been launched by the Central Government to meet not only the educationally disadvantaged but also for overall strengthening of the social infrastructure for education.

There is a national and political commitment to achieve the objective of eradicating illiteracy in the country. The

Non-Formal Education (NFE) program was launched to cater to school dropouts, girls, working children and those belonging to Schedule Caste and Schedule Tribes. Rs.364 crore has been provided for promotion of non-formal education, in the Central Plan outlay for 2001-2002. As a result, of the efforts intensified under the National Literacy Mission, literacy rate has shown a much sharper increase. The Plan outlay also provides for Rs.500 crore for **Sarva Shiksha Abhiyan**. It proposes to implement universalisation of elementary education in a mission mode with a clear district focus to provide quality elementary education to children in the age group of 6-14 years with special focus on girls, children belonging to Schedule Caste and Schedule Tribe communities and low female literacy blocks. Rs.1100 crore has been provided for District Primary Education Project, Rs.520 crore for Operation Black Board, Rs.930 crore for nutritional support to primary education, Rs.200 crore for Adult Education and Rs.220 crore for Teacher Training Programs. It is proposed to converge all existing and on-going schemes on elementary education into an integrated national education programme.

National Social Assistance Programs:

The National Social Assistance Program launched in 1995, is a Centrally sponsored scheme with the objective of providing social assistance benefit to poor households by old age, death of primary bread winner or need for maternity care (**National Maternity Benefit Scheme**). The program supplements the efforts of state governments, with the objective of ensuring minimum level of well being. It provides benefits under three heads: viz.,

Rs.835 crore has been provided in 2001-02 for giving pension to 62 lakh destitute persons under the **National Old Age Pension Scheme** and compensating 2.40 lakh households of the deceased under the **National Family Benefit Scheme**. The IRDA to look into social security issues of the unorganised sector and provide a roadmap for pension reforms by October 1, 2001.

Further, Rs.300 crore has been provided for the Scheme “Annapurna” which aims at food security by providing 10kg of foodgrains per month to all those who, though eligible for old age pension, remain uncovered under National Old Age Pension Scheme. About 40 Lakh beneficiaries will be eligible under the Scheme.

Initiatives in Micro Finance:

There is an emerging consensus that poverty alleviation programmes based on rural credit subsidies, like IRDP, have not worked. The Report of the Committee to Review Arrangements for Institutional Credit for Agriculture and Rural Development (CRAFICARD) 1981¹ observed that “The normal criterion of banking that a family of the poor is not creditworthy will have to give place to the concept that many of the poor can be brought into the mainstream of economic development through creditworthy programmes”. In recent times, micro finance is being seen as an important means of alleviating poverty. “Micro finance is the provision of thrift, credit and other financial services and products of very small amounts to the poor, in rural, semi-urban and urban areas, for enabling them to raise their income levels and improve living standards”². Linked with such effort is savings mobilization and making the poor, stakeholders in the development exercise. In fact, it has been suggested that in the Tenth Plan, IRDP be converted into a micro finance programme to be run by banks, with no subsidy, on the lines of the Rashtriya Mahila Kosh³.

Micro credit is already making positive inroads as a means of poverty alleviation. As per a Report brought out by NABARD⁴, 81,780 Self Help Groups (SHGs)

received micro-credit aggregating Rs.1359 million from banks, in 1999-2000. The number of SHGs credit linked to banks aggregated 1,21,744 (1.9 million poor families) as on September 2000. 85% of the SHGs are women’s groups and there is 95% recovery of loans. 40 commercial banks, 165 Regional Rural Banks and 61 co-operative banks have tied up under the exercise for lending to SHGs. The target of NABARD is to cover 20 million poor households by 2008 under the Bank-SHG linkage model. A Micro Finance Development Fund has also been created in NABARD to give a thrust to micro credit.

An essential component of SHG functioning is regular savings in small amounts, to build the own fund component. Several Non Government Organizations (NGOs) operating in the country are promoting micro credit as a means for improving the livelihood access of the very poor. The basic philosophy underlying micro credit is that the poor need access to small amounts of credit at the right time for using the skills they have, to climb the ladder of development. The NGOs act either as direct lenders or as Self Help Promotion Institutions (SHPI), linking SHGs with banks (the Bank-SHPI-SHG model).

Micro studies have revealed that the experience of such efforts is satisfying and the repayment record of the SHGs/borrowers is very high. The emphasis under SHG and micro credit is on decentralisation and participatory development, with the beneficiary having a say in the means of development, rather than dependence on a programme dictated from above. The thrust here is on local level participation and initiative, which is being increasingly seen as the means of successful poverty eradication and economic development.



¹ Reserve Bank of India, CRAFTICARD, RBI, Mumbai, 1981

² Annual Report of NABARD, 1999-2000

³ “How have the Poor Done? Mid Term Review of Ninth Plan, NC Saxena, Economic and Political Weekly, October 7 2000.

⁴ NABARD & microFinance, 1999-2000, National Bank for Agriculture and Rural Development, Mumbai

APPENDIX 4.1

Comparative Account of the Nutritional Surveys

S.No	NAME OF THE SURVEY	STATES COVERED	SAMPLE SIZE	TYPES / NO OF SURVEYS UNDERTAKEN	REFERENCE YEAR/PERIOD	CONDUCTING ORGANIZATION
1	NSS 50th Round	AP, Assam, Bihar, Guj, Har, HP, Kar ,MP Kerala , Mah , Orissa , Punjab , TN & WB	115354 Households	Sub-Round - 1 Sub-Round - 2 Sub-Round - 3 Sub-Round - 4	Jul - Sep 1993. Oct - Dec 1993 Jan - Mar 1994 Apr - Jun 1994	National Sample Survey Organization , Department of Statistics Ministry of Planning and Implementation Government of India
2	Nutritional Status of Rural Population 1996	AP, Guj, Kar, MP Kerala ,Mah, Orissa & T N	2450 Households	Household Surveys to get Nutritional Status	1996	National Nutrition Monitoring Bureau Hyderabad
3	India Nutrition Profile District Nutrition Profile	Punjab, Har , HP, Assam Bihar,Raj, Sikkim & N-E States.	Varies from state to state and according to each type of Survey	Household surveys to find 1. Food Consumption. 2. Food Frequency. 3. Individual Intake. 4. Clinical & Anthropometry data 5. Knowledge, Attitude and Practice Survey	1993	Department of Women & Child Development Ministry of Human Resource Development , Government of India in association with 1.National Institute of Nutrition,Hyderabad . 2.Institute of Research in Medical Statistics , New Delhi. 3.Protein Food & Nutrition Development Association of India , Mumbai.
4	National Family Health Survey - 2	AP, Kar , Kerala , TN Guj , Mah , Bihar, Orissa WB, MP, UP, Raj, HP Har , Delhi , J&K, Goa & N-E States.	91196 Households	I - Phase II - Phase. Both collecting household data on the following areas 1. Reproductive health. 2. Women's Nutrition. 3. Women's Status in addition to that covered in NFHS - 1	Nov-98 May-99	International Institute of Population Studies Mumbai.
5	India - Human Development Report.	AP, Kar , Kerala , TN Guj , Mah ,HP, Orissa MP, UP, Raj, Punjab Har ,W.B, Bihar & Assam	33230 Households	Household Surveys to get Human Development Indices.	Jan 94 - June 94	National Council for Applied Economic Research, New Delhi

APPENDIX 4.2

Index of Nutritional Status

National Nutritional Bureau (NNMB) and Department of Women and Child Development, Ministry of Human Resource Development, Government of India (District Nutrition Profiles - DNP), together surveyed 18 states and union territories. The reference year of NNMB is 1994 and that of DNP is 1995-96. Only rural areas were covered by NNMB. DNP covered both rural and urban areas in some states but only rural areas in others. On the whole, urban studies are available only for 10 states and union territories. Data are collected with the help of 3 types of surveys in DNP, household surveys, family diet survey and individual diet survey. The sample size differs from one survey to another, for DNP itself. NNMB has covered 8 states and DNP has covered 18 states. For all the states where NNMB has conducted surveys we have used the NNMB data. For the remaining, we have taken DNP data.

Both studies have excluded Uttar Pradesh and West Bengal. National Family Health Survey - NFHS (1992-93) survey data are has been used to fill in some of the gaps, particularly the percentage of stunted and underweight children, for Uttar Pradesh and West Bengal. The information refers to the entire state. Urban-rural break up is not available.

In respect of chronic energy deficiency in adults and wasting in children, data is not available from Uttar Pradesh and West Bengal. Hence, the information is taken from the National Council of Applied Economic Research (NCAER) survey. The survey has a much smaller sample than that of NNMB and DNP. The reference year for NCAER is 1995-96. The data refers to rural areas only.

Data on Child and Infant Mortality Rates is taken from the Sample Registration Surveys, Registrar General and Census Commissioner, Government of India.

Life Expectancy at Birth and Maternal Mortality Rate are based on data for 1990 and 1992 for rural India of

the Sample Registration Surveys conducted by the Registrar General and Commissioner of Census.

The following indicators have been used to calculate the indices of Child and Adult Health.

Indicators of Child Health

1. Percentage of severely stunted children under five
2. Percentage of severely under weight children under five
3. Infant Mortality Rate

Indicators of Adult Health

1. Maternal Mortality Rate: number of maternal deaths per one lakh population
2. Percentage of population with Chronic Energy Deficiency measured by Body Mass of less than 18.0
3. Expectancy of life at birth.

The growth status of a child is assessed in terms of height for age and weight for age. The number of children reported as having less height for their age, compared to the 'National Center for Health Statistics (NCHS)' standard is considered as stunted. Stunting is expressed as the number of standard deviations from the international reference median height for age. The height for age estimates expressed as percentages, falling 3 standard deviations short are considered to be severe stunting. Those between 2 standard deviations and 3 standard deviations are considered as stunted.

Underweight, under five children are similarly classified. Children whose weights for age are 3 standard deviations away from the NCHS international reference median weight for age are expressed as being severely underweight. Even for adult nutrition international reference median is used. National Council for Health Statistics is an international organization. Many nutritional experts, including NNMB and INP, accept the reference. It is found that many Indian adults and children of well-nourished affluent families are not different from the international median¹.

¹ Gopalan, C., "Assessment of Child Growth: Some Basic Issues", Nutrition in Children. Executive Director H.P.W. Sachdev and Panna Choudhury, 1995.

146 FOOD INSECURITY ATLAS OF RURAL INDIA

The indicators are, indexed separately and then averaged.

I_{CH} = Index of Child Health

$$I_{CN} = S(X_{ij} - X_{imn}) / (X_{imx} - X_{imn}) / n$$

Where

X_{ij} = i^{th} child nutrition indicator in the j^{th} state

X_{imx} = i^{th} child nutrition indicator in the state the highest value of the indicator

X_{imn} = i^{th} child nutrition indicator in the state with lowest value of the indicator

I_{AH} = Index of Adult Health

I_{LE} = Index of life expectancy

$$I_{LE} = (X_{imx} - X_{ij}) / (X_{imx} - X_{imn})$$

I_{MMR} = Index of Maternal Mortality

$$I_{MMR} = (X_{ij} - X_{imn}) / (X_{imx} - X_{imn})$$

I_{CED} = Index of Chronic Energy deficiency

$$I_{CED} = (X_{ij} - X_{imn}) / (X_{imx} - X_{imn})$$

$$I_{AH} = S (I_{LE} + I_{MMR} + I_{CED}) / n$$

Where

X_{ij} = i^{th} adult nutrition indicator in the j^{th} state

X_{imx} = i^{th} adult nutrition indicator in state highest value

X_{imn} = i^{th} adult nutrition indicator in the state lowest value

'n' = Number of indicators



APPENDIX 4.3

Rural Health Infrastructure Index

The nutritional status of the Population depends up on the health facilities available in the rural areas. Hence we have selected certain important indicators of rural health facilities available and constructed a rural health Infrastructure Index.

Indicators of rural health facilities

1. Percentage of children not immunized
2. Percentage of population without access to safe drinking water
3. Number of persons per hospital or dispensary bed
4. Number of persons per Primary Health Center
5. Number of persons per Doctor in rural areas

I_{RHI} = Index of Rural Health Infrastructure

$$I_{RHI} = \left\{ S \sum_{i=1}^n \{ (X_{ij} - X_{imn}) / (X_{imx} - X_{imn}) \} / n \right\} * 100$$

Where

X_{ij} = i^{th} Rural Health facility indicator in the j^{th} state

X_{imx} = i^{th} Rural Health facility indicator in the state with

maximum value indicating worst possible situation (The state gets the index of One)

X_{imn} = i^{th} Rural Health facility indicator in the state with minimum value, indicating the best possible situation among all the states. (this state has the Index value of zero)

The index is expressed as the distance to be traveled by a state to reach the best possible situation as a proportion of the total distance between the best and the worst states.

All the individual health facility Indices are averaged together to get the composite Index of Rural Health Infrastructure. The composite Index of 0.74 for Bihar indicates that the state has to travel 74 percent of the distance to reach the stage of best possible health facilities. The composite index of 0.1 for Himachal Pradesh shows that it has to travel only 10 percent of the distance to reach the best possible situation prevailing in the country in respect of all the indicators. (Table 4.12)

Even though we have immunization data for 1999 from NFHS-2, we prefer to use 1991-93 data given in NFHS-1. The data on all the other indicators belong to years closer to the census year.



APPENDIX 5.1

Sources of Indicators used in the Food Insecurity Map of India (16 states)

Description of the indicators used and their source of information:

1. Deficit in Production represented by the ratio of per capita consumption of cereals to per capita production of cereals

Components:

1. Triennium average cereal production, for the triennium ending in 1993-94, (average of 1991-92, 1992-93, and 1993-94); per capita per day in grams.

Source: GOI, Ministry of Agriculture, (1995-96), Area and Production of Principal Crops in India.

2. Cereal consumption in kilograms per month in the year 1993-94

Source: NSSO, 50th Round, (1996): Report No. 402, Level and Pattern of Consumer Expenditure, 1993-94, Department of Statistic, GOI.

2. Instability of Cereal Production:

Calculated from the production data of ten years from 1987-88 to 1997-98. Instability is calculated as the standard deviation of annual growth rates and expressed as a percentage. Annual growth rates are given by the first differences in the natural log of the production statistics. It represents a measure, which is free from trend.

Source: GOI, Ministry of Agriculture, (1995-96) Area, Production of Principal crops in India (various issues) and Ministry of Agriculture, (2000), Agriculture in Brief, 27th edition.

3. Sustainability Index:

(See [Appendix 2.2](#) for the methodology of computation)

Components:

1. Area not under Forest as percentage of total geographical area.

Source: GOI, Ministry of Statistics and Programme Implementation, (1997), Compendium of Environment Statistics.

2. Percentage of ground water exploitation represented by net draft as a percentage of total available ground water resources

Source: GOI, Ministry of Statistics and Programme Implementation, (1997) Compendium of Environment Statistics.

3. Percentage of area under non-leguminous crops to total gross cropped area.

(Two-year average of 1994-95 and 1995-96)

Source: Centre for Monitoring Indian Economy, Agriculture, September, (1999).

4. Percentage of problem area susceptible to soil erosion by wind and water as a percentage of total geographical area.

Source: GOI, Ministry of Agriculture, (2000), Soil & Water Conservation Division, Agriculture in Brief, 27th edition.

4. Population affected by Flood/Cyclone/heavy rains/landslides in Lakhs for 1998 and 1999

Source: Data for 1998 was taken from the answer to the un-starred question No.1242 in the Rajya Sabha, 10th December 1998, quoted in S. Parasuraman and Unni Krishnan P.V. (edited) India Disaster Report 2000 and 1999 data from GOI, Ministry of Statistics and Programme Implementation, (1999), Compendium of Environment Statistics.

5. Percentage of Drought Prone area to total Geographical Area

Source: GOI, Ministry of Statistics and Programme Implementation, (1999). Compendium of Environment Statistics.

6. Calorie intake of the lowest deciles per capita per day (Kcal)

Source: NSSO, Sarvekshana, 50th round, 1993-94, Vol. XXI, No.2, 73rd issue Oct-Dec'97, Department of Statistics, Ministry of Planning and Programme Implementation, GOI.

7. Percentage of Population consuming less than 1890 Kcal

Source: NSSO, Sarvekshana, 50th round, 1993-94, Vol. XXI, No.2, 73rd issue Oct-Dec'97, Department of Statistics, Ministry of Planning and Programme Implementation, GOI.

8. Percentage of Population below Poverty Line, Rural, 1993-94

Source: Planning Commission estimates as quoted in Malhotra, 1997 represented in India Rural Development Report 1999; National Institute of Rural Development, Hyderabad.

9. Percentage of Population dependent on labour income

Source: NSSO, (2000) Report No. 409 Employment and Unemployment in India 50th round, 1993-94

10. Rural Infrastructure Index:

(See [Appendix 3.4](#) for the methodology of computation)

Components:

1. Percentage of households without electricity:

Source: Shariff A. (1999) NCEAR India Human Development Report, 2000.

2. Percentage of households without piped water

Source: Shariff A. (1999) NCEAR India Human Development Report, 2000.

3. Road length per thousand persons

Source: GOI, Ministry of Surface Transport, (1996-97) Basic Roads and Statistics of India, 1996-97.

4. Percentage of villages without electricity: Census of India 1991.

Source: GOI, Ministry of Statistics and Programme Implementation (1999), Compendium of Environment Statistics 1999, New Delhi

11. Juvenile Sex Ratio - Ratio of females to 1000 males in the age group of 0 - 9 years of age

Source: Census of India, 1991, Register general and Census Commissioner, India

12. Percentage of female literacy — Number of literate females as a percentage of total females

Source: Census of India, 1991, Register general and Census Commissioner, India

13. Percentage of Scheduled Caste & Scheduled Tribe Population in rural areas

Source: Census of India, 1991, Register general and Census Commissioner, India

14. Life Expectancy at the age One

Source: Sample Registration Surveys, Registrar General and Census Commissioner, 1992-96

· Data of Himachal Pradesh is a rough estimate.

15. Percentage of Population with chronic energy deficiency

Source: National Nutritional Monitoring Bureau, “Nutritional Status of Rural Population” —1996, and Ministry of Human Resource Development, Department of Women and Child development, GOI, “India Nutrition Profile” —1998.

Data for Uttar Pradesh and West Bengal are taken from, NCAER, India Human Development Report 1999.

16. Percentage of severely stunted children under five (Rural)

Severe stunting is defined as one whose weight for age is two standard deviations below the norm given by National Centre for Health Statistics, an international organization. International reference median is taken as the norm.

Source: National Nutrition Monitoring Bureau, “Nutritional Status of Rural Population” —1996, and Ministry of Human Resource Development, Department of Women and Child development, India Nutrition Profile —1998

Data for Uttar Pradesh and West Bengal are taken from, India Human Development Report NCAER 1999. NCAER data covers only 0-4 year category and hence is not strictly comparable to the 0-5 year category covered by NNMB and India Nutrition Profile.

17. Percentage of children severely underweight for height under five (Rural)

Wasting in children is defined as children with lower weight for height, compared to National Centre for Health Statistics norm.

Source: National Nutrition Monitoring Bureau, Nutritional Status of Rural Population- 1996, and Department of Woman & Child Development, Ministry of Human Resources, Government of India, Indian Nutrition Profile, 1998.

Data for Uttar Pradesh and West Bengal are taken from, India Human Development Report, NCAER 1999. NCAER data covers only 0-4 year category and hence is not strictly comparable to the 0-5 year category by NNMB and India Nutrition Profile.

18. Infant Mortality Rate in rural areas (Number of deaths per 1000 live births)

Source: Sample Registration Survey, Registrar General and Commissioner of Census, 1997

19. Health Infrastructure Index:

Computed from the data given in Health Information of India (See [Appendix 4.3](#) for the methodology of computation)

Components

1. Percentage of children immunized to total number of children in the age group of one and two.

Source: National Family Health Surveys, 1992-93

2. Percentage of population with access to safe drinking water in rural India

Source: Census of India, 1991

Census of India given in the publication of United Nations population Fund, "India, towards population and development goals", Oxford University Press

Arunachal Pradesh data are taken for Assam, as there were no data for Assam.

3. Number of persons per bed in rural areas in all hospitals and dispensaries owned by government, private and local bodies and voluntary organizations.

Source: Ministry of Health and Family Welfare, "Health Information of India, 1995-96

4. Number of persons per Primary Health Centre, in rural areas

Source: Ministry of Health & Family Welfare, "Health Information of India, 1995-96

5. Number of persons per doctor in rural areas

Source: Ministry of Health and Family Welfare, "Health Information of India, 1995-96. Bihar data are not available hence we have used Uttar Pradesh data for Bihar also.

Projected population for the year 2000 has been used to calculate the above statistics. The data refers to different years or different states but all of them belong to the nineties.

The data for different states are not strictly comparable. Health Infrastructure only gives a rough idea of the state of affairs.



APPENDIX 5.2

Sources of Indicators used in the Food Insecurity Map of India (19 states)

Deficit in Production represented by the ratio of per capita consumption of cereals to per capita production of cereals

Components

- a. Triennium average cereal production*, for the triennium ending in 1993-94, (average of 1991-92, 1992-93, and 1993-94); per capita per day in grams.

Source: GOI, Ministry of Agriculture, Area and Production of Principal Crops in India (1995-96).

District level data are aggregated to get the state level information for the three new states and the truncated states of Bihar, Madhya Pradesh and Uttar Pradesh.

- *The cereals consists of the following: Rice, Wheat, Maize, Bajra, Jowar, Ragi and Barley.

b. Cereal consumption in kilograms per month in the year 1993-94

Source: NSSO, 50th Round, Report No. 402, Level and Pattern of Consumer Expenditure, (1993-94), Department of Statistic, GOI.

Per capita consumption of cereals is not available for the three new states of Jharkhand, Chattisgarh and Uttaranchal. Hence the per capita consumption of cereals in the undivided states of Bihar, Madhya Pradesh and Uttar Pradesh is used for the three new states as well as the truncated states.

Percentage of Wastelands to the Total Geographical Area

GOI, Ministry of Rural Development and National Remote Sensing Agency, Wasteland Atlas of India, (2000).

District level data are aggregated to get the state level information for the three new states and the truncated states of Bihar, Madhya Pradesh and Uttar Pradesh.

Percentage of Population below Poverty Line (Rural, 1993-94)

Source: Planning Commission estimates as quoted in Malhotra (1997), represented in India Rural Development Report (1999), National Institute of Rural Development, Hyderabad.

For disaggregation of the figures for the three new states from their parent states, the NSS sub regional data have been used for cluster of districts. This information has been compiled by World Food Programme regional office South Asia.

Percentage of Scheduled Caste and Scheduled Tribe Population (Rural)

Source: GOI, Register General and Census Commissioner, Census of India, (1991)

District level data are aggregated to get the state level information for the three new states and the truncated states of Bihar, Madhya Pradesh and Uttar Pradesh. This information has been compiled by World Food Programme regional office South Asia.

Percentage of Illiteracy

Source: GOI, Register General and Census Commissioner, Census of India, (1991)

District level data are aggregated to get the state level information for the three new states and the truncated states of Bihar, Madhya Pradesh and Uttar Pradesh. This information has been compiled by World Food Programme regional office South Asia.

Juvenile Sex Ratio (Ratio of females to 1000 males in the age group of 0 - 9 years)

Source: GOI, Register General and Census Commissioner, Census of India, (1991)

District level data are aggregated to get the state level information for the three new states and the truncated states of Bihar, Madhya Pradesh and Uttar Pradesh. This information has been compiled by World Food Programme regional office South Asia.

Road length per thousand persons

Source: GOI, Ministry of Surface Transport, Basic Roads and Statistics of India, (1996-97). Source for three new states – CMIE, Profiles of States (2000), Economic Intelligence Service.

Percentage of villages without electricity

Source for undivided states: GOI, Ministry of Statistics and Programme Implementation, Compendium of Environment Statistics (1999), New Delhi.

Source for new states and truncated states: District level data are aggregated to get the state level information for the three new states and the truncated states of Bihar, Madhya Pradesh and Uttar Pradesh. This information has been compiled by World Food Programme regional office South Asia.

Percentage of Agricultural Labourers to Total Workers

Source:GOI, Register General and Census Commissioner, Census of India, (1991)

District level data are aggregated to get the state level information for the three new states and the truncated states of Bihar, Madhya Pradesh and Uttar Pradesh. This information has been compiled by World Food Programme regional office South Asia.

Infant Mortality Rate in rural areas (Number of deaths per 1000 live births)

Source: GOI, Registrar General and Census Commissioner, Sample Registration Survey, (1997).

Source for three new states are the district level estimates by Rajan and P. Mohanachandran, *Economic and Political Weekly*, May 9, (1998) based on the 1991 Census.

Hospital and Dispensary Beds per 1000 Population

Source for undivided states: GOI, Ministry of Health and Family Welfare, Health Information of India, (1995-96)

Source for new states and truncated states: District level data are aggregated to get the state level information for the three new states and the truncated states of Bihar, Madhya Pradesh and Uttar Pradesh. This information has been compiled by World Food Programme regional office South Asia.

Percentage of population without access to safe drinking water in rural India

Source: GOI, Register General and Census Commissioner, Census of India, (1991)

District level data are aggregated to get three new state level data and the truncated states of Bihar, Madhya Pradesh and Uttar Pradesh. This information has been compiled by World Food Programme regional office South Asia.



Appendix 5.2.1 Indicators of Food Insecurity Situation in India (19states)

Sl.No.	State	1		2		3		4		5		6
		Deficit in prod. represented by the ratio of consumption to production of cereals (1988-94)	Rank	Percentage of Wastelands to Total Geog. Area (in sqkms)	Rank	Percentage below poverty line (1988-94)	Rank	Percentage of Rural SC & ST Population (1991)	Rank	Percentage of illiteracy (1991)	Rank	SexRatio 0-9years Female per thousand males (1991)
1	Andhra Pradesh	1.16	10	18.81	8	15.92	18	25.99	10	63.18	7	981
2	Assam	1.29	5	25.52	4	45.01	4	21.11	16	57.54	9	978
3	Bihar	1.55	4	5.90	17	56.98	2	16.40	17	71.04	1	946
4	Chhatisgarh	0.42	17	7.53	15	44.38	6	48.88	1	67.42	5	959
5	Gujarat	1.74	3	21.95	5	22.18	17	27.94	9	48.85	15	945
6	Haryana	0.33	13	8.45	14	28.02	13	21.56	15	54.75	10	881
7	Himachal Pradesh	0.76	16	56.87	1	30.34	11	30.50	8	46.52	16	950
8	Karnataka	1.11	13	1087	12	29.88	12	23.41	13	53.28	11	976
9	Kerala	3.99	1	3.73	19	25.76	15	12.43	19	22.04	19	966
10	Jarhhand	3.70	2	18.89	7	62.00	1	42.37	2	67.72	3	979
11	Madhya Pradesh	1.12	12	1931	6	42.05	7	36.31	4	65.27	6	913
12	Mharashtra	1.27	6	17.38	10	37.98	9	24.71	11	46.17	17	953
13	Orissa	1.13	11	13.71	11	49.72	3	41.02	3	59.20	8	974
14	Punjab	0.16	19	4.42	18	11.95	19	31.98	7	51.08	14	880
15	Rajasthan	1.25	7	3087	2	26.46	14	33.36	6	69.21	2	919
16	Tamil Nadu	1.18	8	17.70	9	32.48	10	24.29	12	45.69	18	955
17	Uttar Pradesh	0.94	14	940	13	44.54	5	21.79	14	67.69	4	915
18	Uttaranchal	0.85	15	3027	3	24.98	16	14.00	18	52.84	12	1001
19	West Bengal	1.18	8	6.44	16	40.80	8	34.87	5	52.10	13	971

APPENDIX 153

7		8		9		10		11		12		
Rank	Road Length per 1000 persons (1985-97)	Rank	Percentage of households without Electricity (1991)	Rank	Percentage of Agricultural Labourers to Total workers (1991)	Rank	Infant Mortality Rate (1997)	Rank	Hospital and Dispensary Beds per 1000 Pop (1985-95)	Rank	Percentage of population without access to safe drinking water (1991)	Rank
18	2.44	8	37.00	13	44.74	3	66.00	12	192.52	15	51.00	4
16	2.72	11	56.00	8	11.37	17	79.00	6	181.29	14	33.10	12
7	0.96	1	91.14	1	43.21	4	70.97	8	24.16	1	31.79	15
12	3.76	15	68.70	6	25.43	13	110.00	2	32.34	3	50.08	5
6	1.97	7	28.00	16	24.63	14	69.00	10	240.21	17	40.00	9
2	1.49	3	18.00	17	21.16	15	70.00	9	40.12	4	32.90	13
10	4.89	18	12.00	19	2.75	19	64.00	13	127.95	12	24.50	17
15	2.88	13	37.00	14	32.17	7	63.00	14	105.08	9	32.70	14
11	4.65	17	39.00	12	27.47	11	11.00	19	198.918	19	87.80	1
17	1.76	6	83.08	3	20.27	16	68.08	11	53.34	6	68.79	2
3	2.71	10	53.67	9	30.27	8	120.00	1	43.97	5	46.68	7
8	4.12	16	40.00	11	32.57	6	56.00	17	197.15	16	46.00	8
14	7.54	19	81.00	4	27.07	12	100.00	3	176.08	13	64.70	3
1	2.83	12	16.00	18	29.66	10	54.00	18	455.59	18	7.90	19
5	2.56	9	51.00	10	9.04	18	89.00	5	29.99	2	49.40	6
9	3.44	14	37.00	15	41.58	5	58.00	16	111.71	10	35.70	11
4	1.60	4	76.58	5	53.20	2	89.52	4	54.31	7	38.63	10
19	1.60	5	61.96	7	54.22	1	71.77	7	101.46	8	27.81	16
13	1.00	2	84.00	2	29.74	9	58.00	15	117.41	11	19.70	18

Appendix 5.2.2

Mapping Index of Food Insecurity Situation in India (19 states)

Sl.No.	State	Indicators												Cumulative Rank	Mapping Index	Mapping Rank	Mapping Typology
		1	2	3	4	5	6	7	8	9	10	11	12				
1	Andhra Pradesh	10	8	18	10	7	18	8	13	3	12	15	4	126	10.50	10	3
2	Assam	5	4	4	16	9	16	11	8	17	6	14	12	122	10.17	9	3
3	Bihar	4	17	2	17	1	7	1	1	4	8	1	15	78	6.50	2	1
4	Chhatisgarh	17	15	6	1	5	12	15	6	13	2	3	5	100	8.33	6	2
5	Gujarat	3	5	17	9	15	6	7	16	14	10	17	9	128	10.67	12	3
6	Haryana	13	14	13	15	10	2	3	17	15	9	4	13	128	10.67	12	3
7	Himachal Pradesh	16	1	11	8	16	10	18	19	19	13	12	17	160	13.33	17	5
8	Karnataka	13	12	12	13	11	15	13	14	7	14	9	14	147	12.25	16	4
9	Kerala	1	19	15	19	19	11	17	12	11	19	19	1	163	13.58	18	5
10	Jharkhand	2	7	1	2	3	17	6	3	16	11	6	2	76	6.33	1	1
11	Madhya Pradesh	12	6	7	4	6	3	10	9	8	1	5	7	78	6.50	2	1
12	Maharashtra	6	10	9	11	17	8	16	11	6	17	16	8	135	11.25	14	4
13	Orissa	11	11	3	3	8	14	19	4	12	3	13	3	104	8.67	7	2
14	Punjab	19	18	19	7	14	1	12	18	10	18	18	19	173	14.42	19	5
15	Rajasthan	7	2	14	6	2	5	9	10	18	5	2	6	86	7.17	4	2
16	Tamil Nadu	8	9	10	12	18	9	14	15	5	16	10	11	137	11.42	15	4
17	Uttar Pradesh	14	13	5	14	4	4	4	5	2	4	7	10	86	7.17	4	2
18	Uttaranchal	15	3	16	18	12	19	5	7	1	7	8	16	127	10.58	11	3
19	West Bengal	8	16	8	5	13	13	2	2	9	15	11	18	120	10.00	8	3

Mapping Index

6.0-7.0

7.0-9.0

9.0-11.0

11.0-13.0

13.0-15.0

Mapping Typology

Extremely Insecure

Severely Insecure

Moderately Insecure

Moderately Secure

Secure

States

JH, BH, MP

RJ, UP, CH, OR

WB, AS, AP, UT, GJ, HY

MH, TN, KN

HP, KL, PJ

Appendix 5.3

Correlation matrix of Nineteen Indicators

	1	2	3	4	5	6	7	8	9
Indicators	Deficit in prod. represented by the ratio of consumption to production of cereals	Instability in Cereal Production (1987-88 to 1997-98) in percent	Sustainability Index in percent	Population affected by Flood/Cyclone/ heavy rains/ landslides (in Lakhs)	Percentage of drought affected area to total geographical area	Calorie intake of the lowest decile (Kcal) per cu/day (1993-94)	Percentage of population Consuming <1890 Kcal (1993-94)	Percentage below poverty line (1993-94)	Percentage of population dependent on labour income (1993-94)
1	1.00	0.059	-0.414	0.029	-0.003	-0.624**	0.555*	0.073	0.459
2		1.00	0.108	-0.126	0.820**	0.032	0.137	-0.126	0.086
3			1.00	0.004	0.286	0.553*	-0.459	-0.422	-0.289
4				1.00	-0.187	0.074	-0.178	0.581*	-0.144
5					1.00	0.136	0.052	-0.369	0.074
6						1.00	-0.953**	-0.119	-0.832**
7							1.00	-0.020	0.828**
8								1.00	-0.193
9									1.00
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									

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

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

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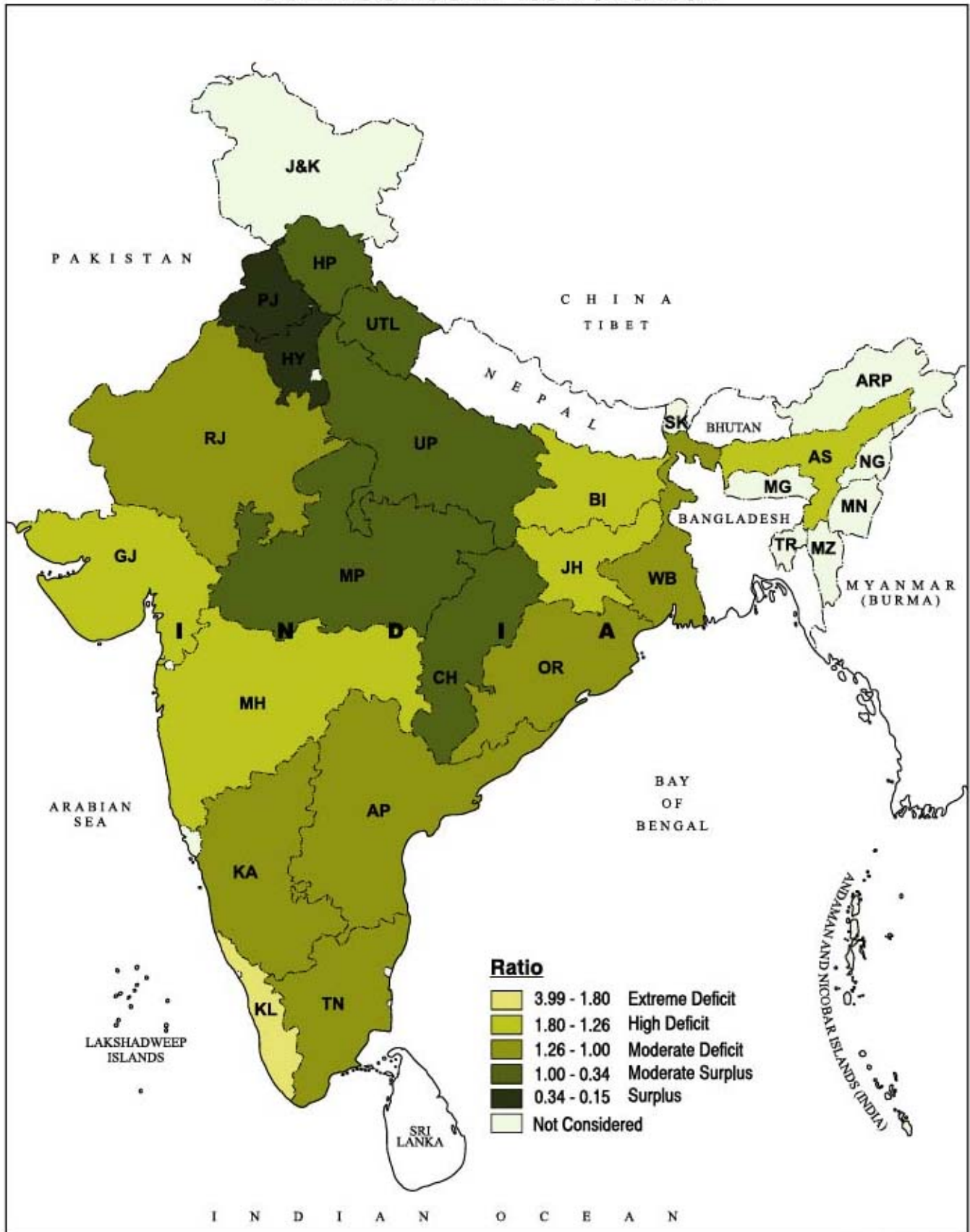
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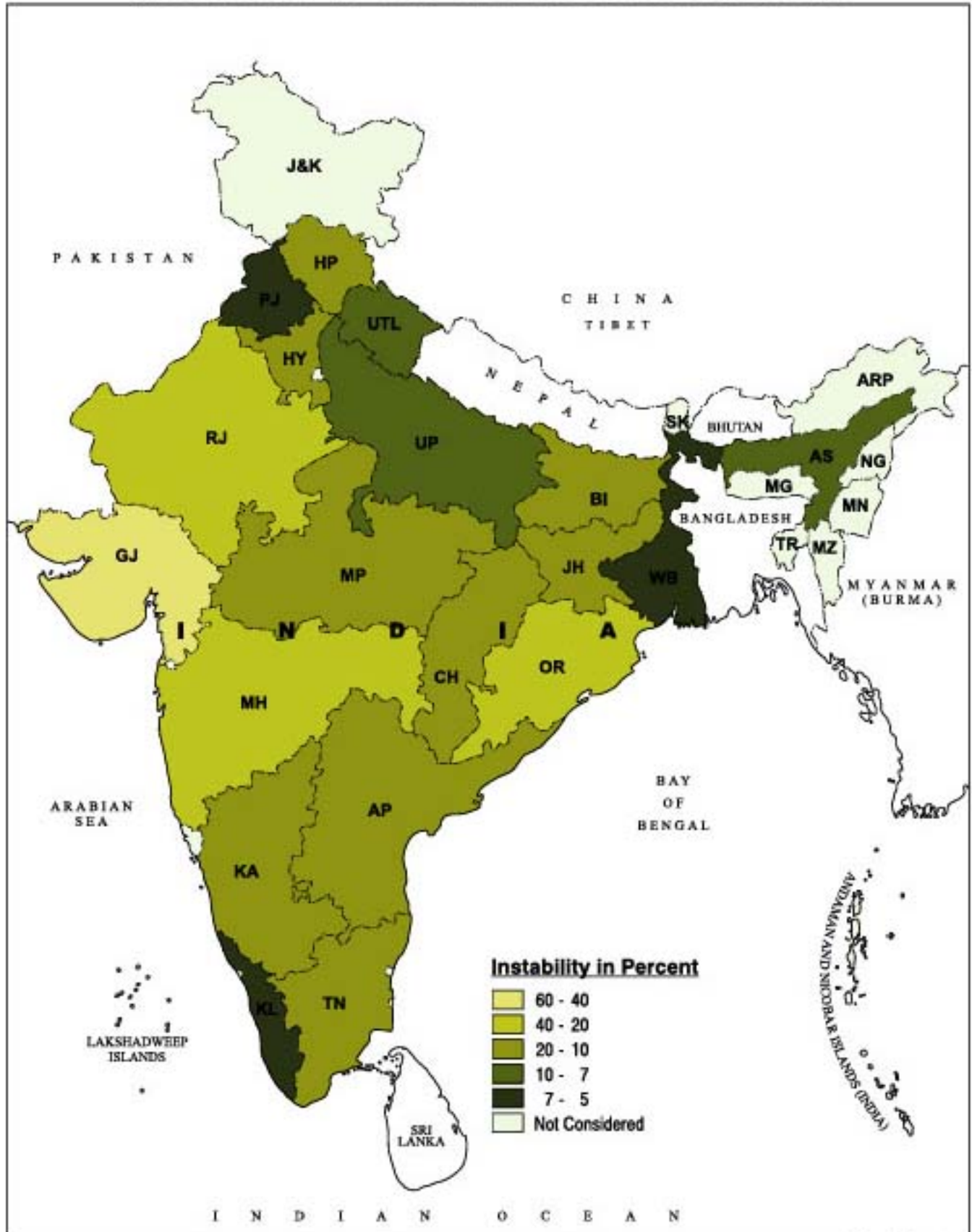
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DEFICIT OF CEREAL PRODUCTION OVER CONSUMPTION IN INDIA



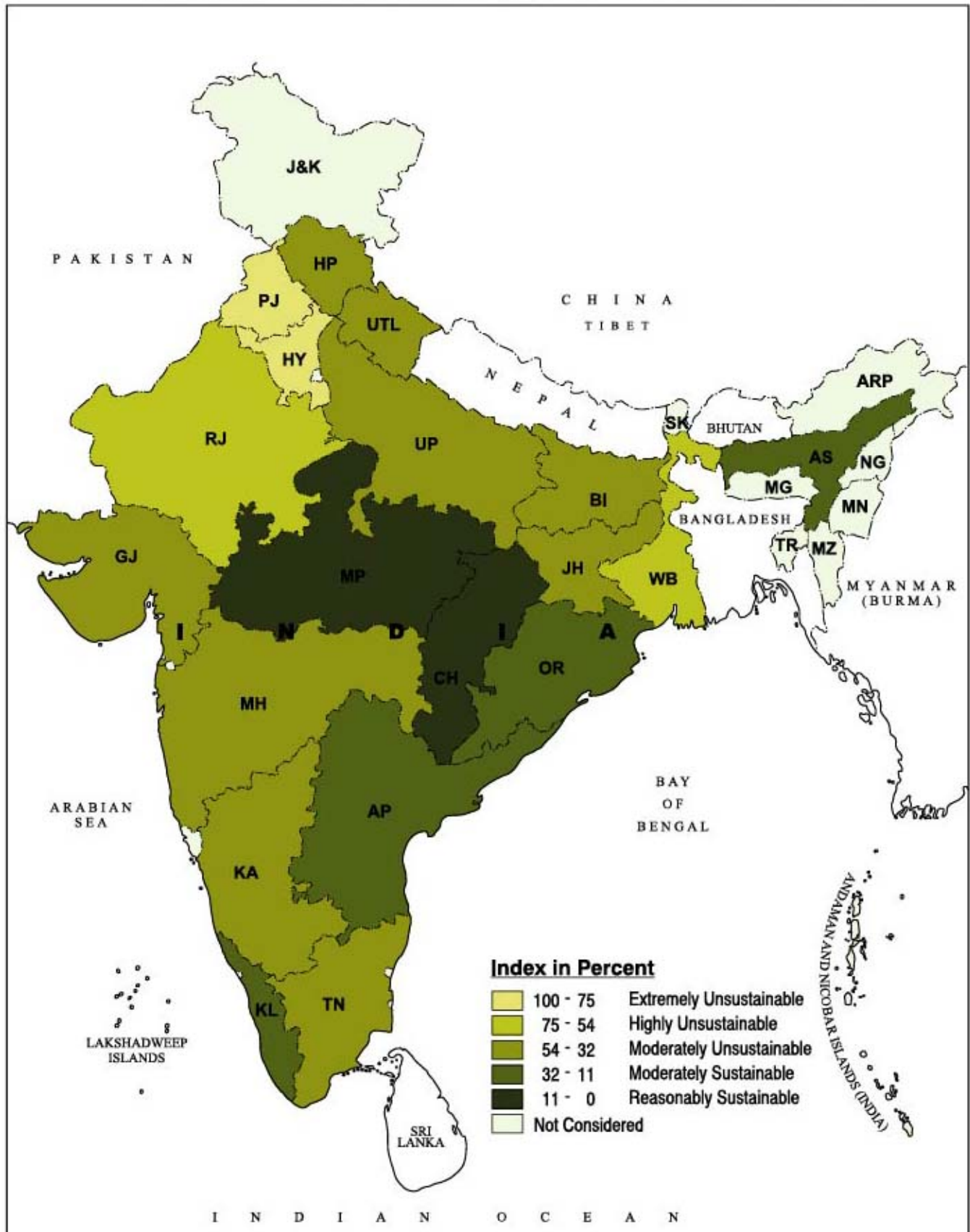
Map No. 2.1

INSTABILITY IN CEREAL PRODUCTION IN INDIA



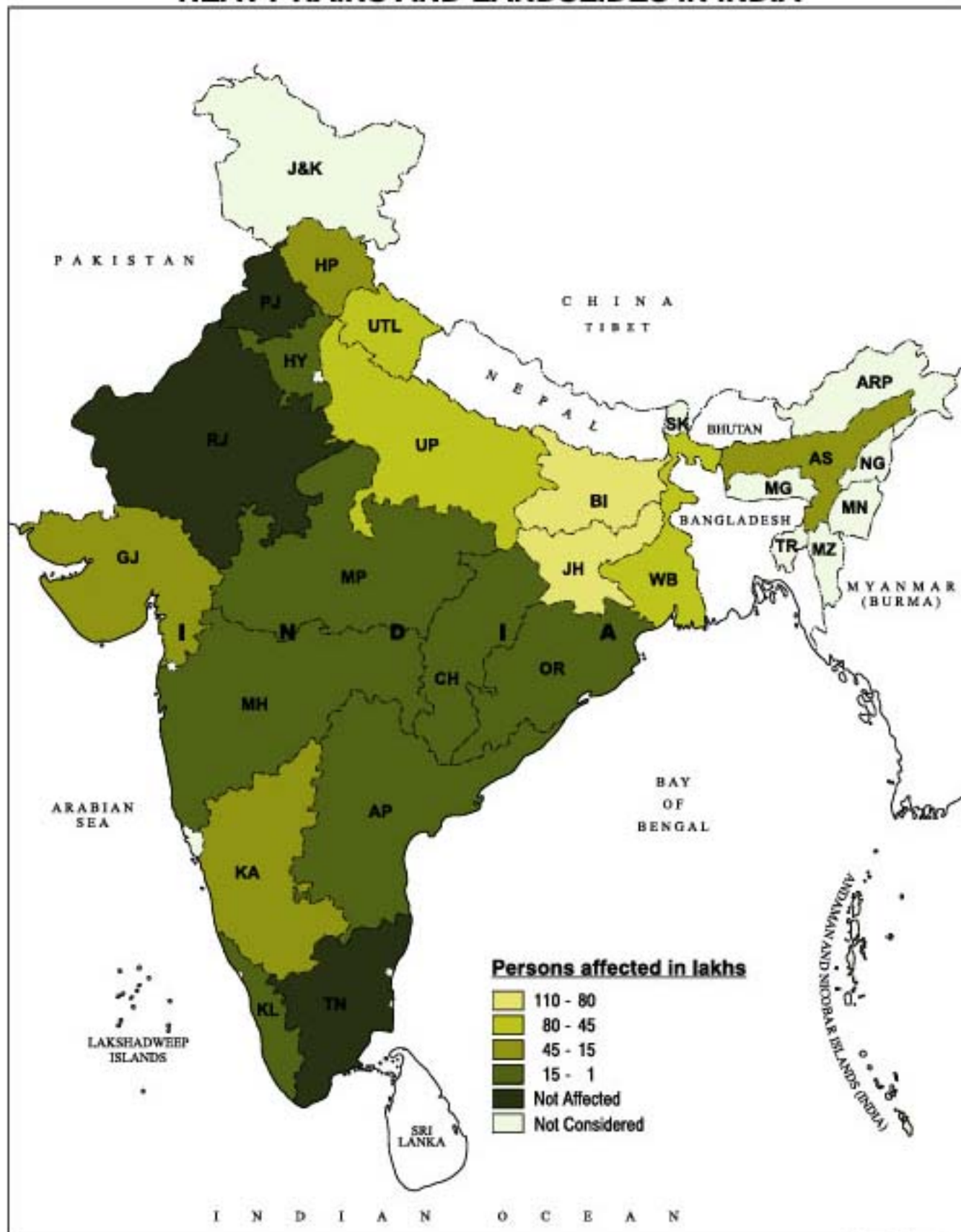
Map No. 2.2

ENVIRONMENTAL SUSTAINABILITY INDEX OF INDIA



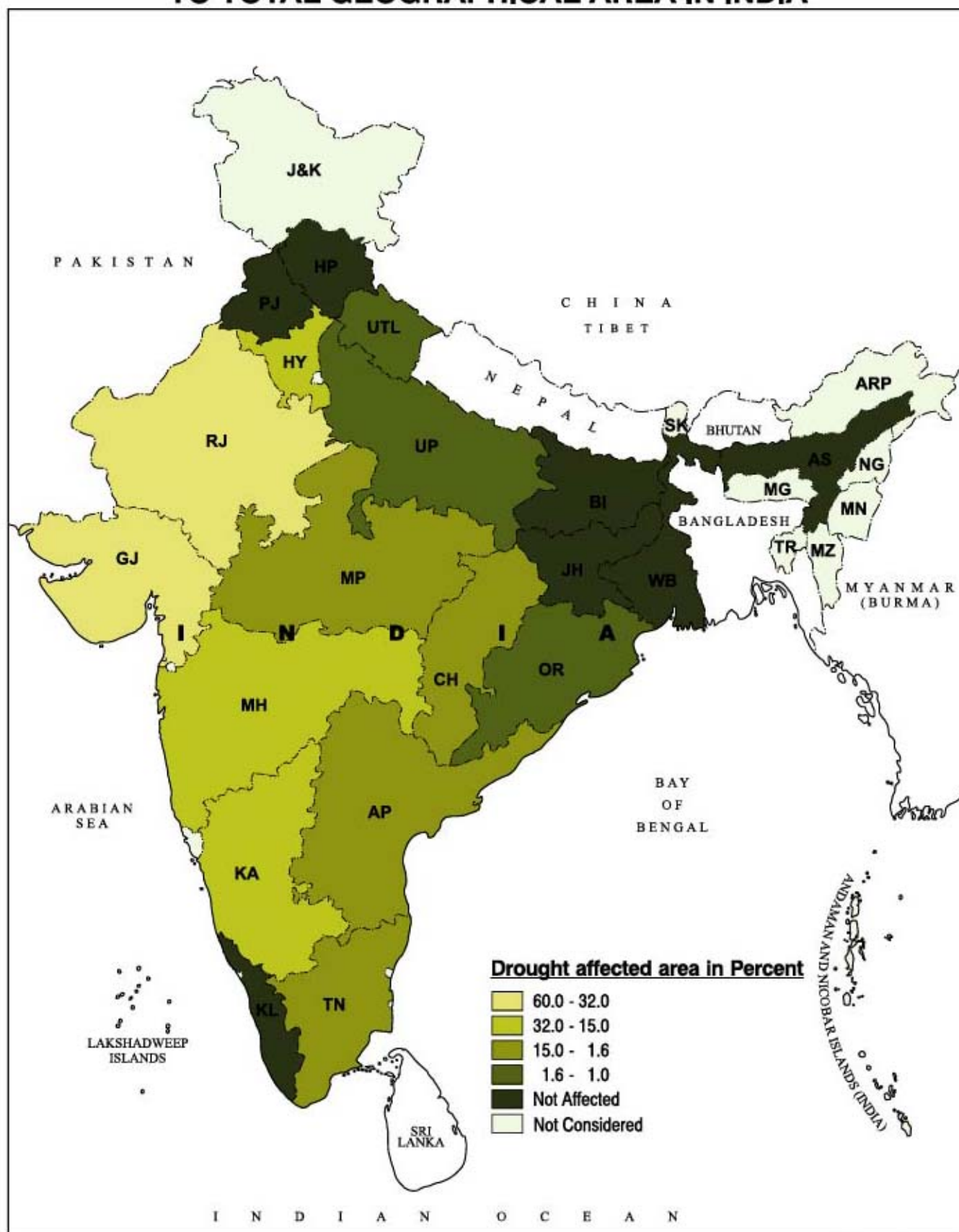
Map No. 2.3

POPULATION AFFECTED BY FLOODS, CYCLONES, HEAVY RAINS AND LANDSLIDES IN INDIA



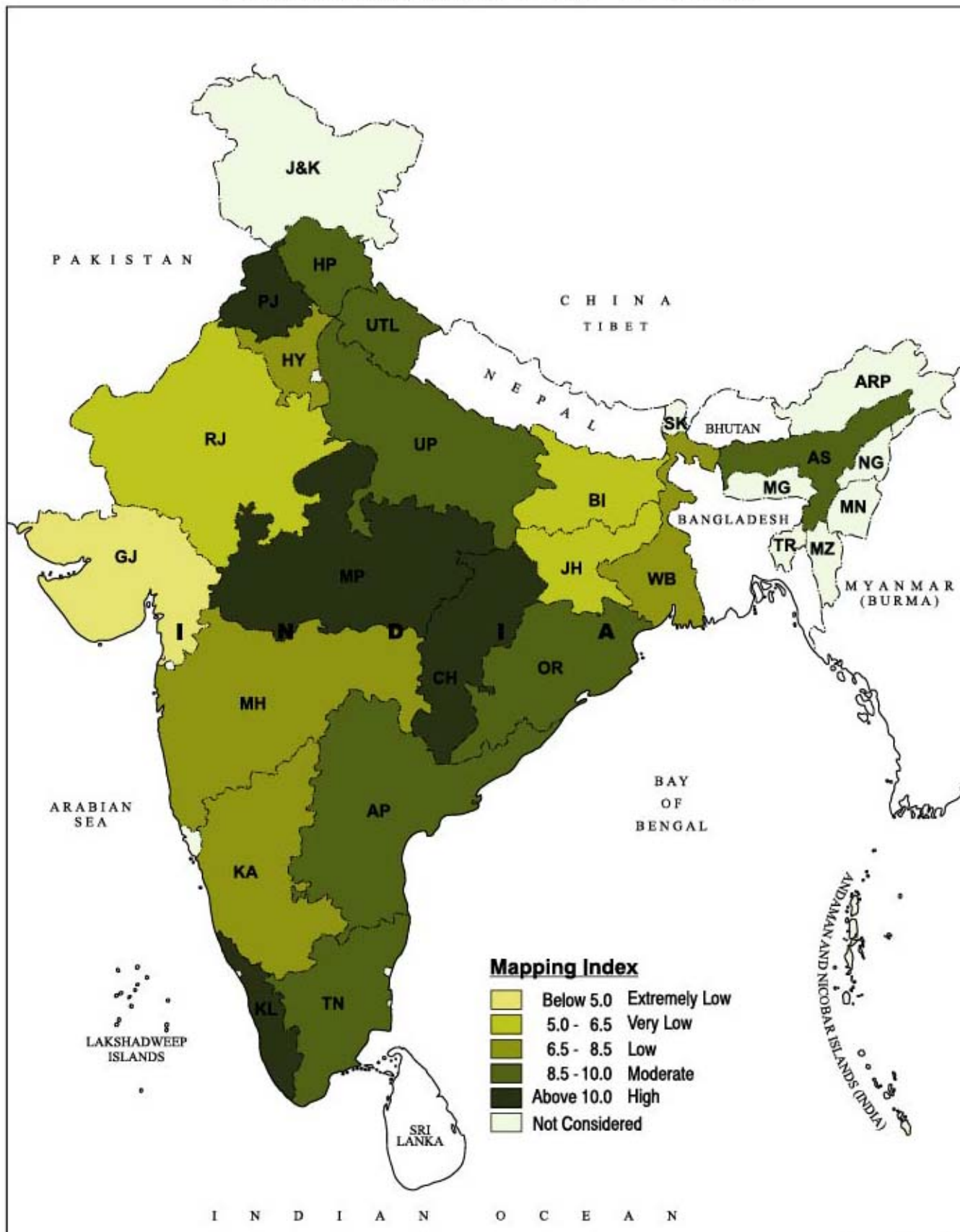
Map No. 2.4

PERCENTAGE OF DROUGHT AFFECTED AREA TO TOTAL GEOGRAPHICAL AREA IN INDIA



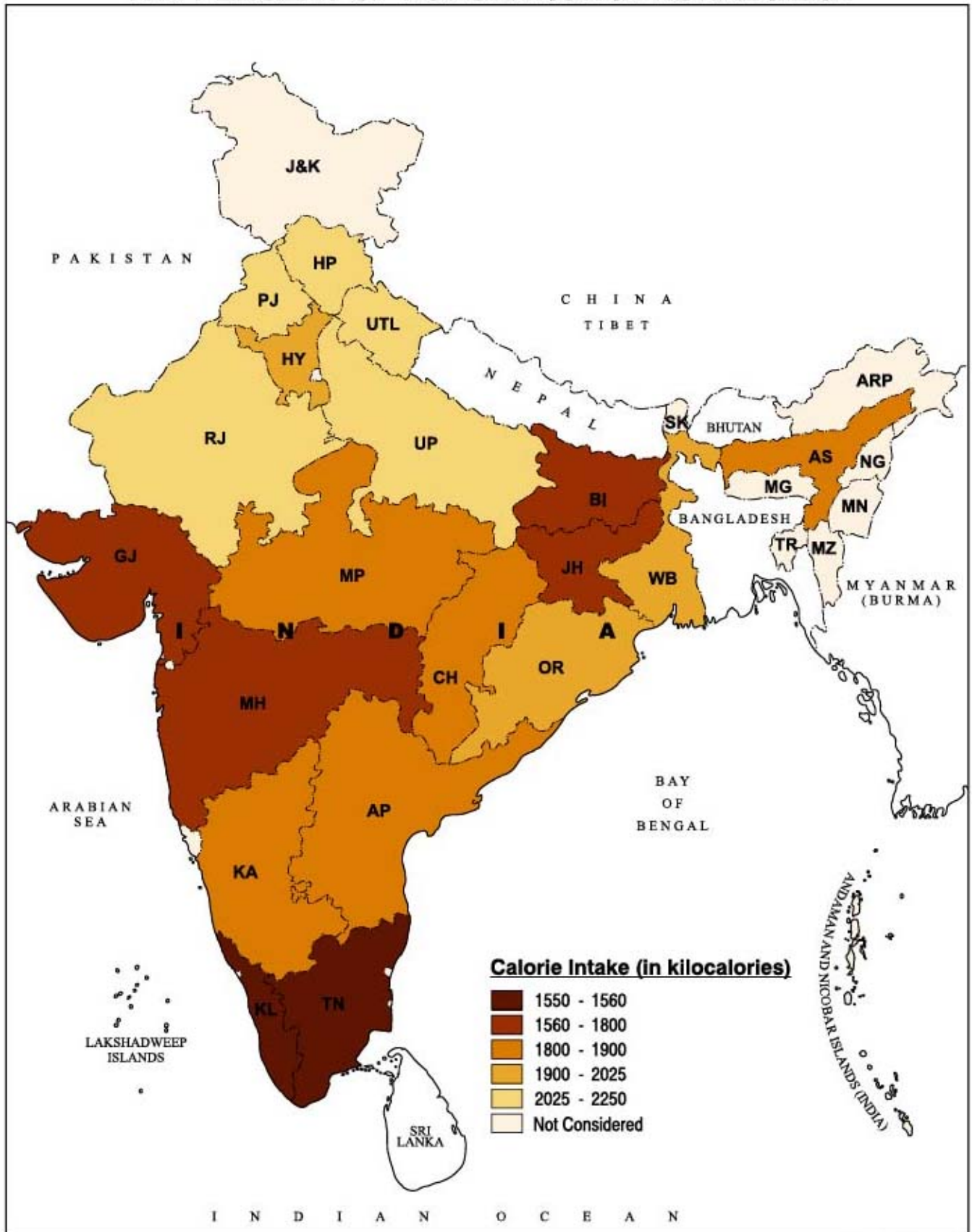
Map No. 2.5

FOOD AVAILABILITY MAP OF INDIA



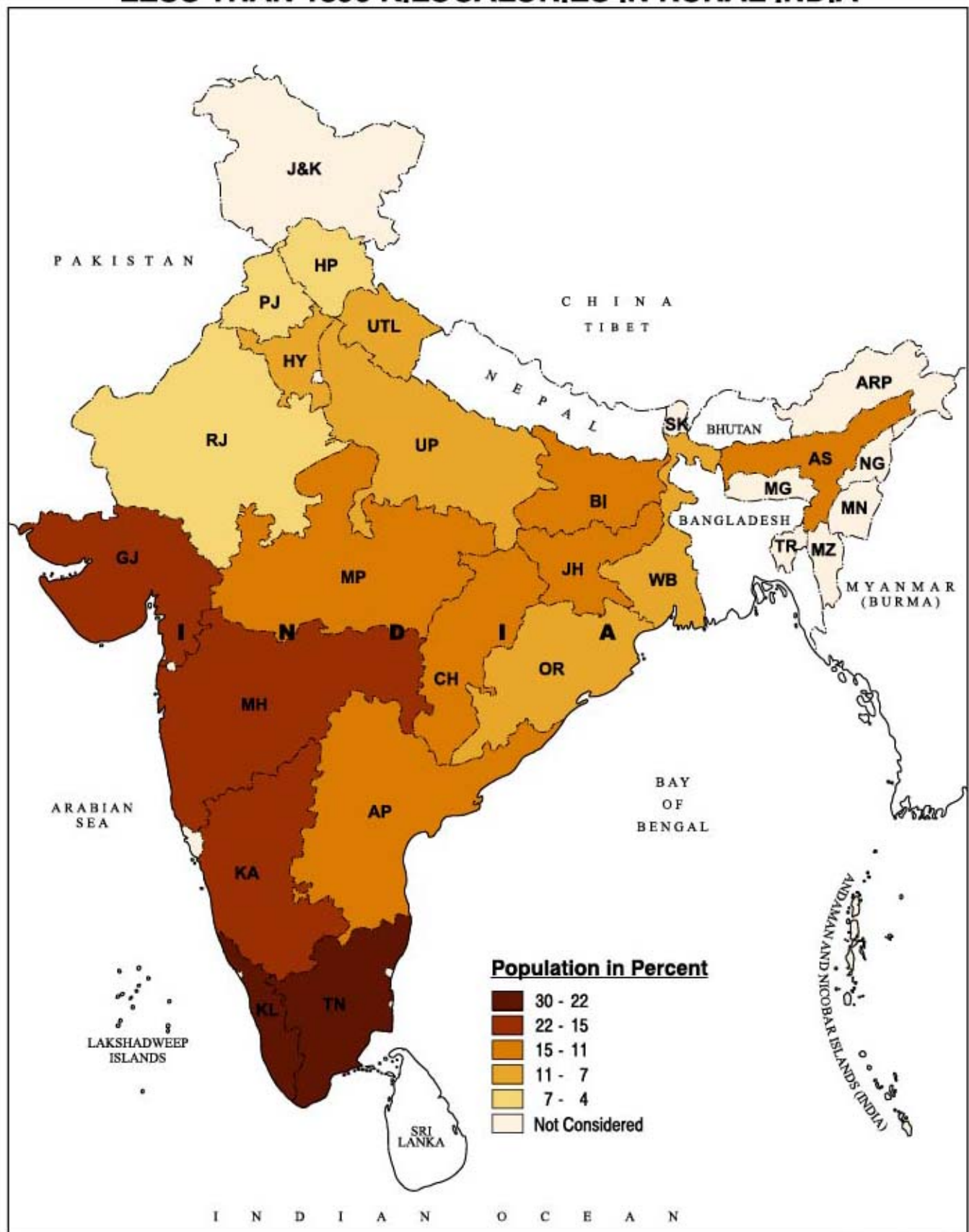
Map No. 2.6

PER CONSUMER UNIT CALORIE INTAKE OF THE LOWEST TEN PERCENT OF POPULATION IN RURAL INDIA



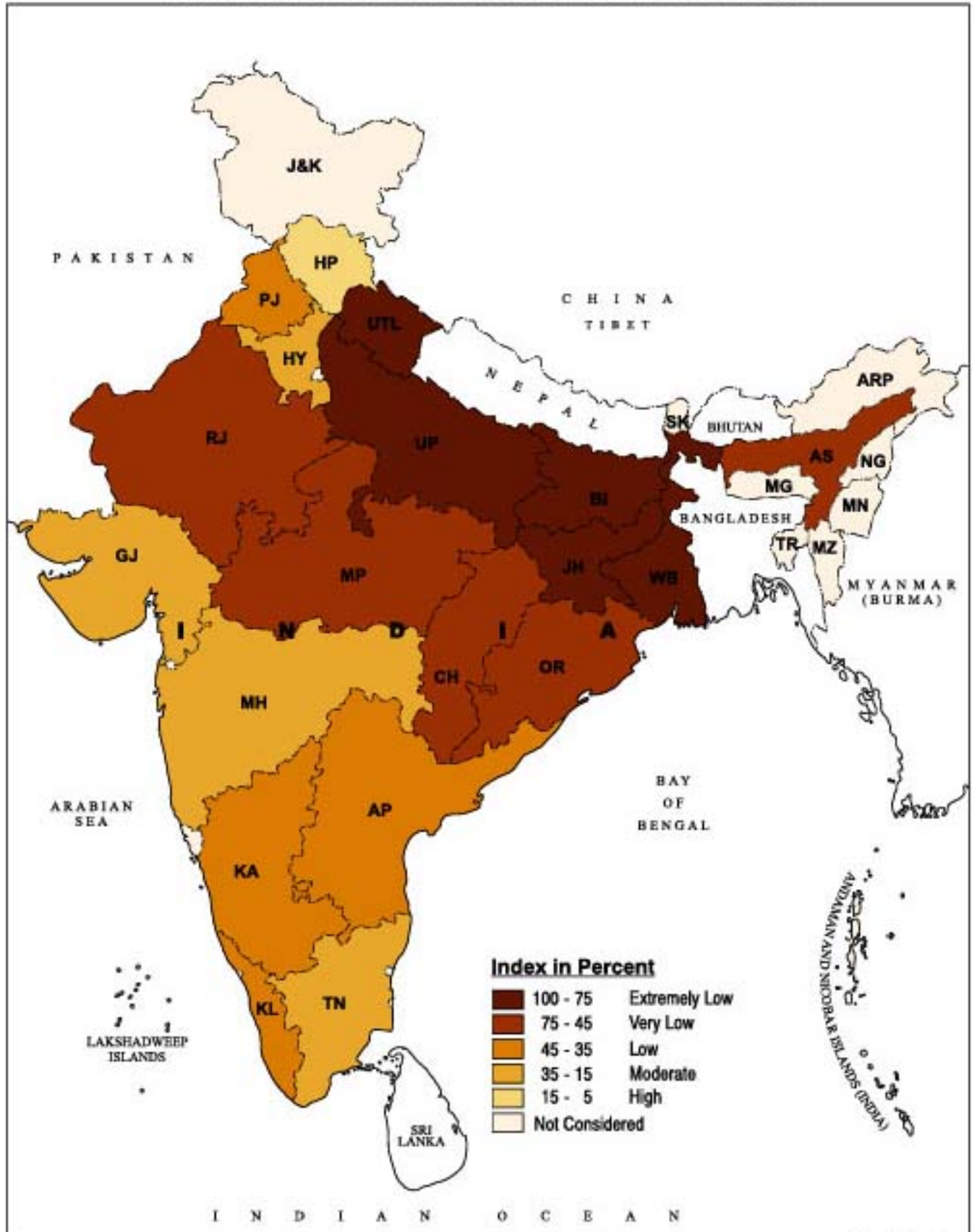
Map No. 3.1

PERCENTAGE OF POPULATION CONSUMING LESS THAN 1890 KILOCALORIES IN RURAL INDIA



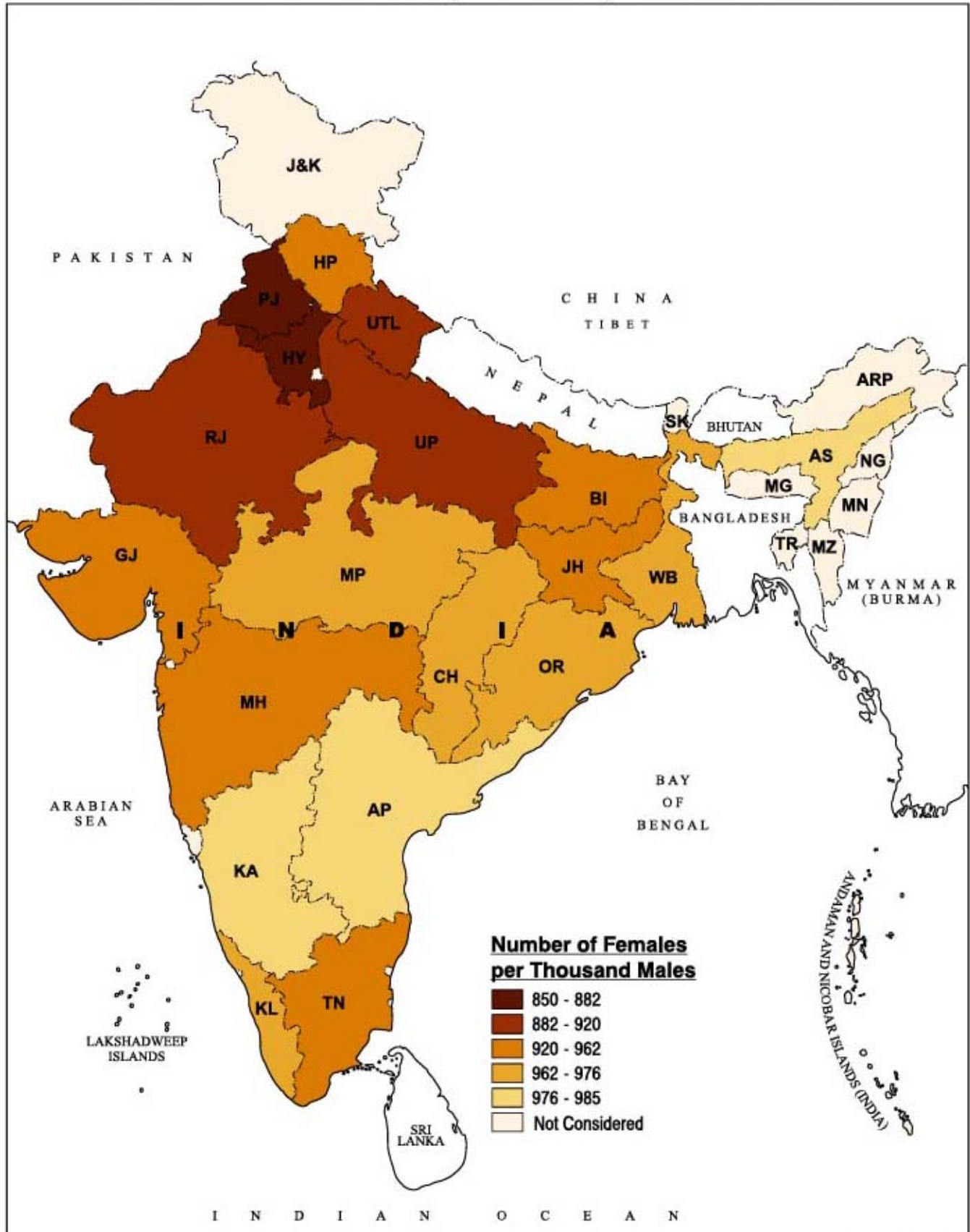
Map No. 3.2

RURAL INFRASTRUCTURE INDEX OF INDIA



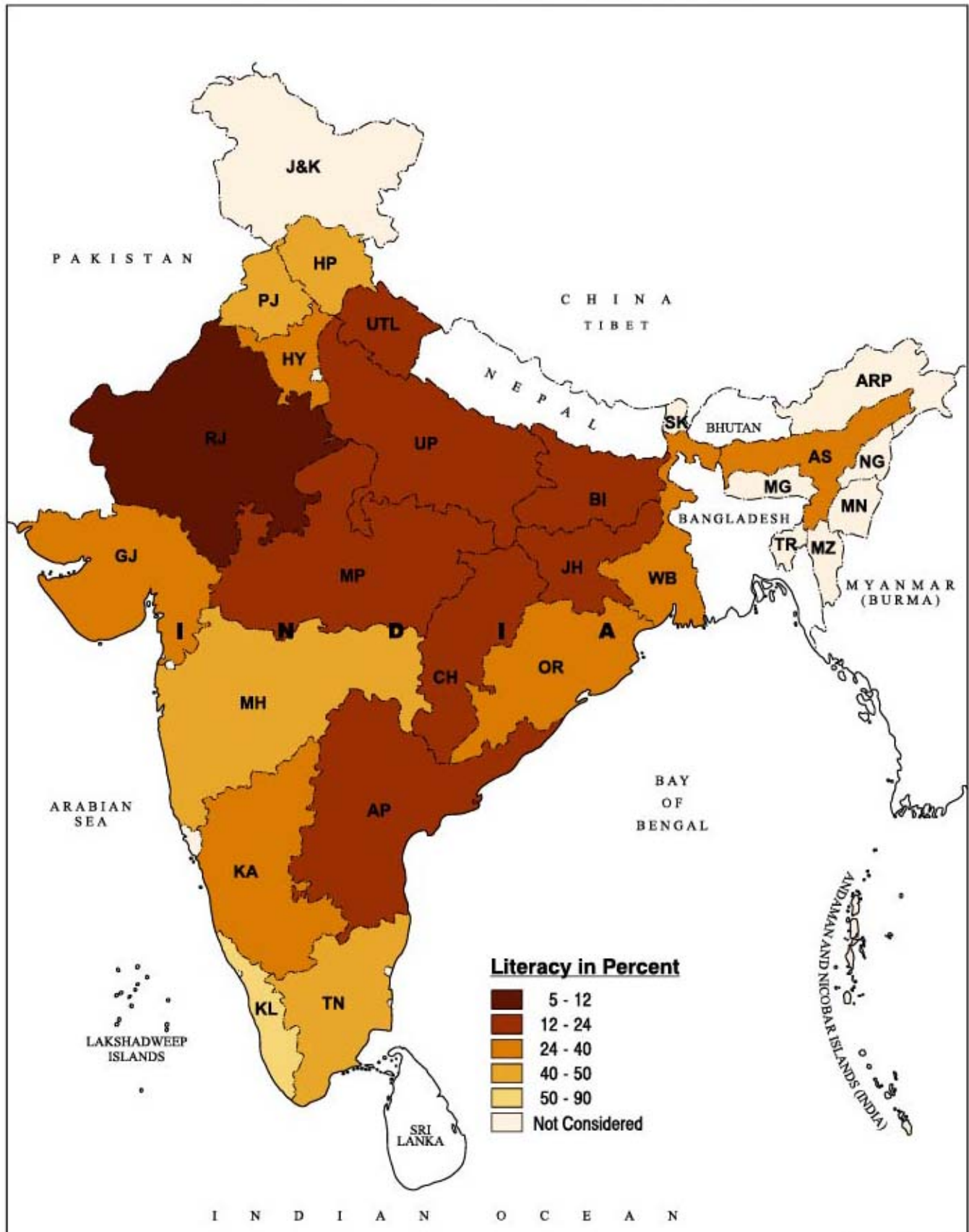
Map No. 3.5

JUVENILE SEX RATIO (0 - 9 Years) IN RURAL INDIA



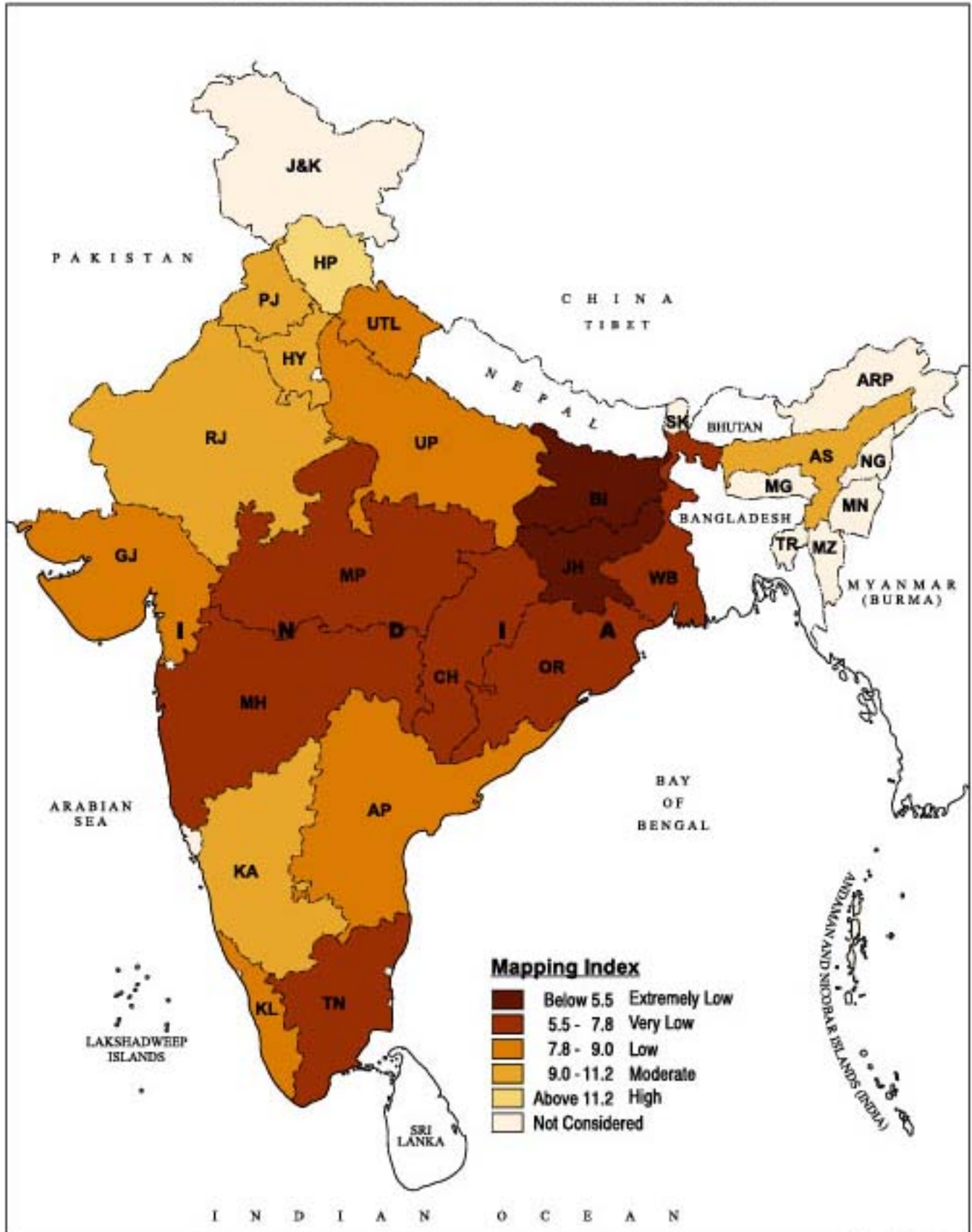
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FEMALE LITERACY IN RURAL INDIA



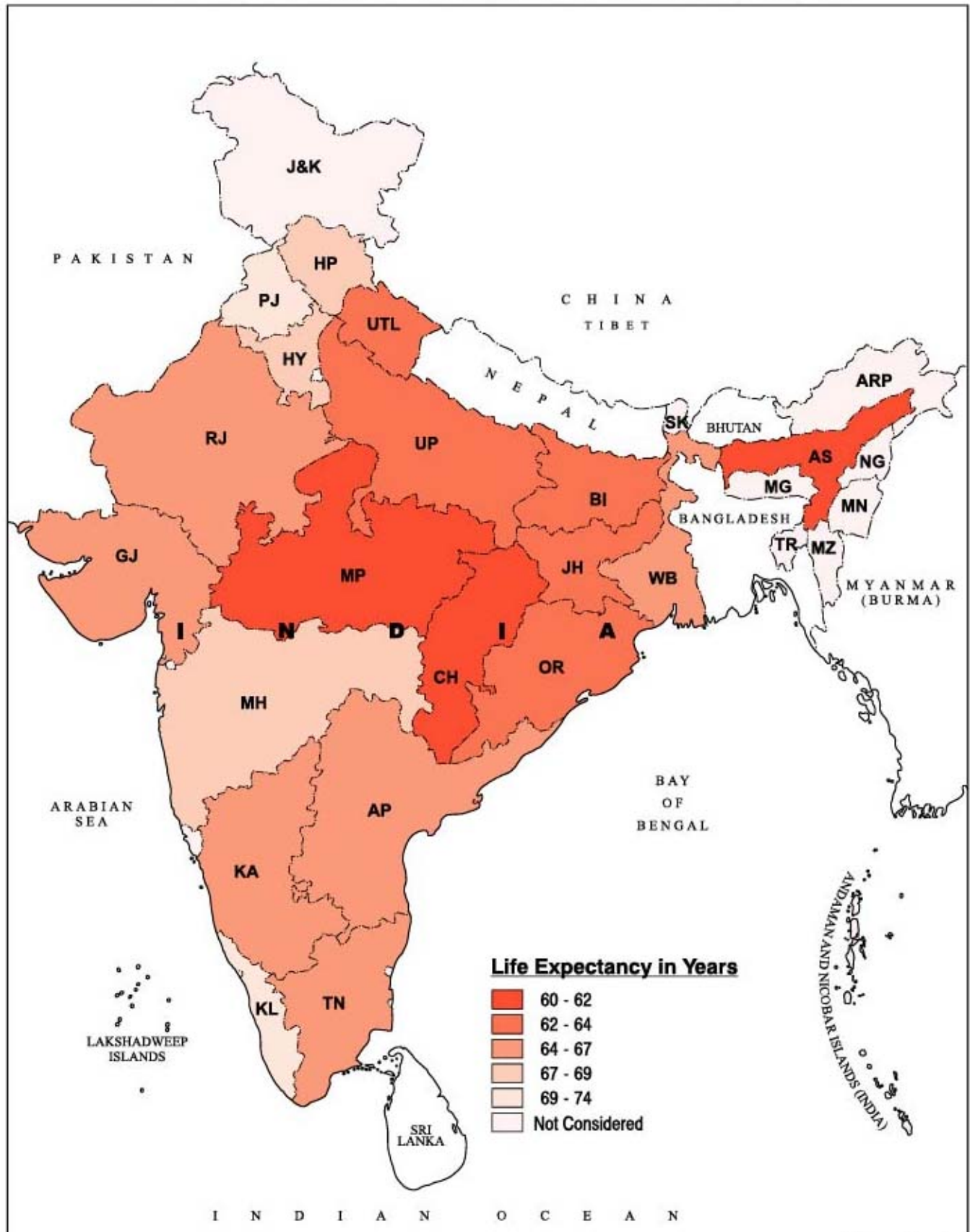
Map No. 3.7

FOOD ACCESS MAP OF RURAL INDIA



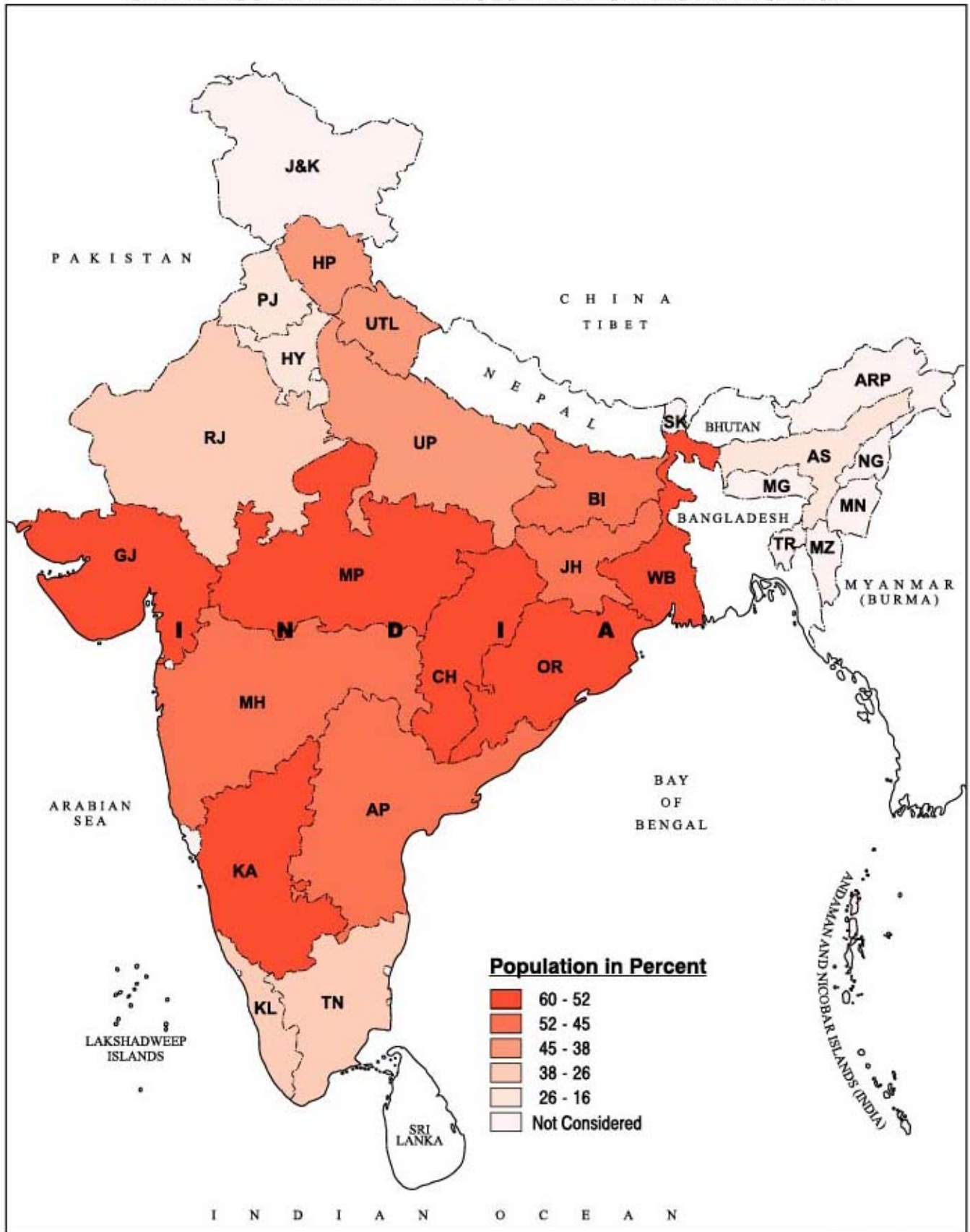
Map No. 3.9

LIFE EXPECTANCY AT AGE ONE IN RURAL INDIA



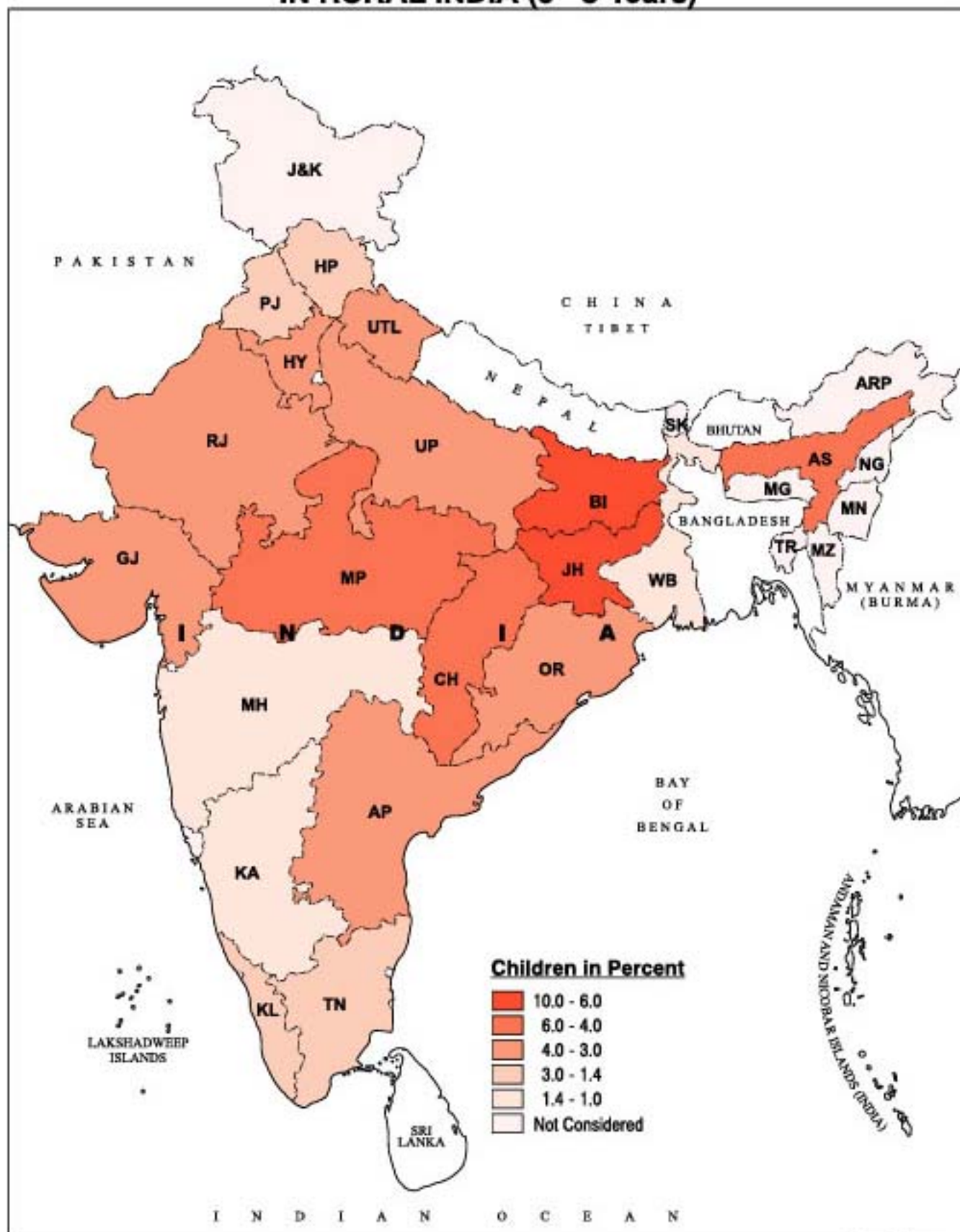
Map No. 4.1

PERCENTAGE OF POPULATION WITH CHRONIC ENERGY DEFICIENCY IN RURAL INDIA



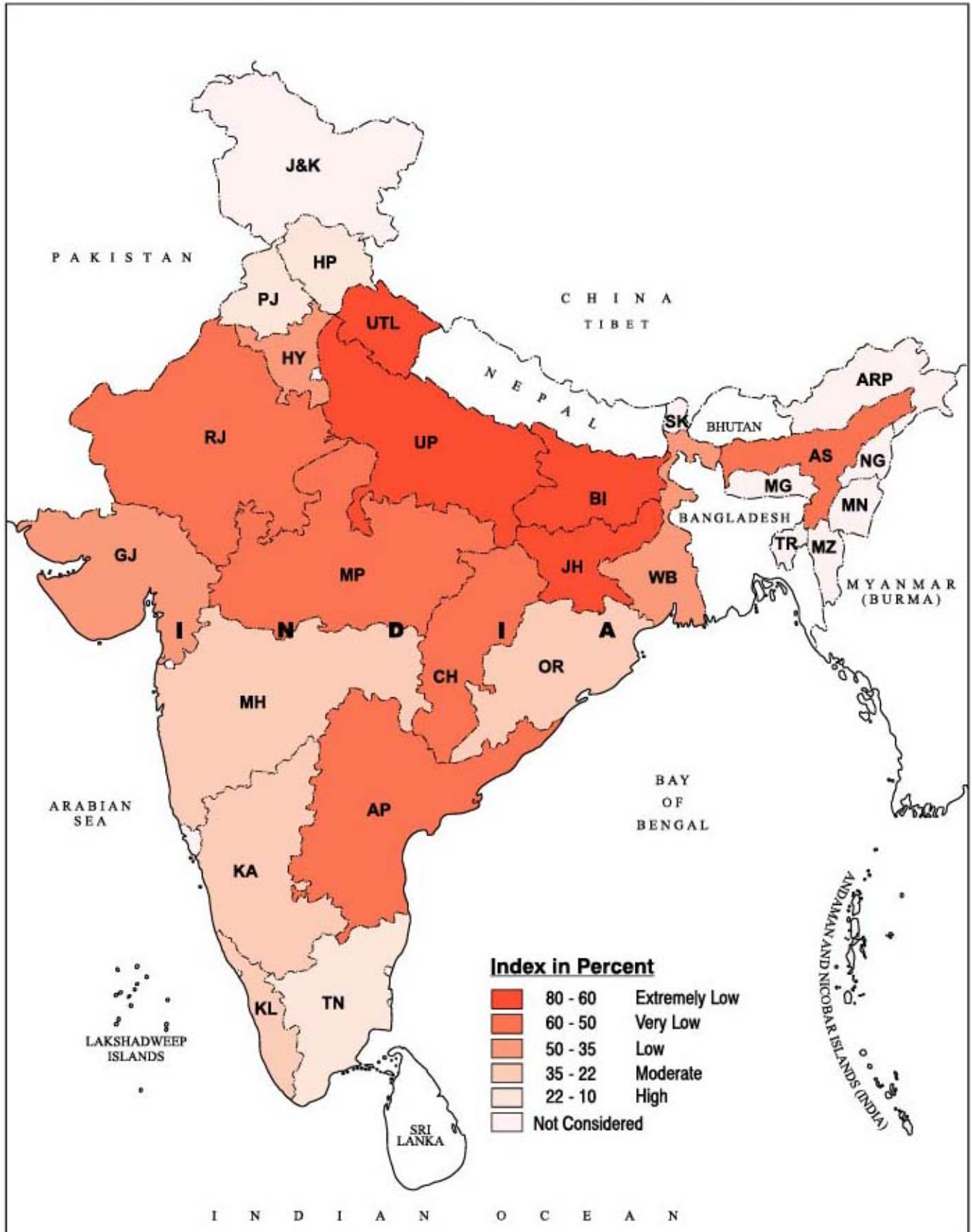
Map No. 4.2

PERCENTAGE OF CHILDREN UNDERWEIGHT FOR HEIGHT IN RURAL INDIA (0 - 5 Years)



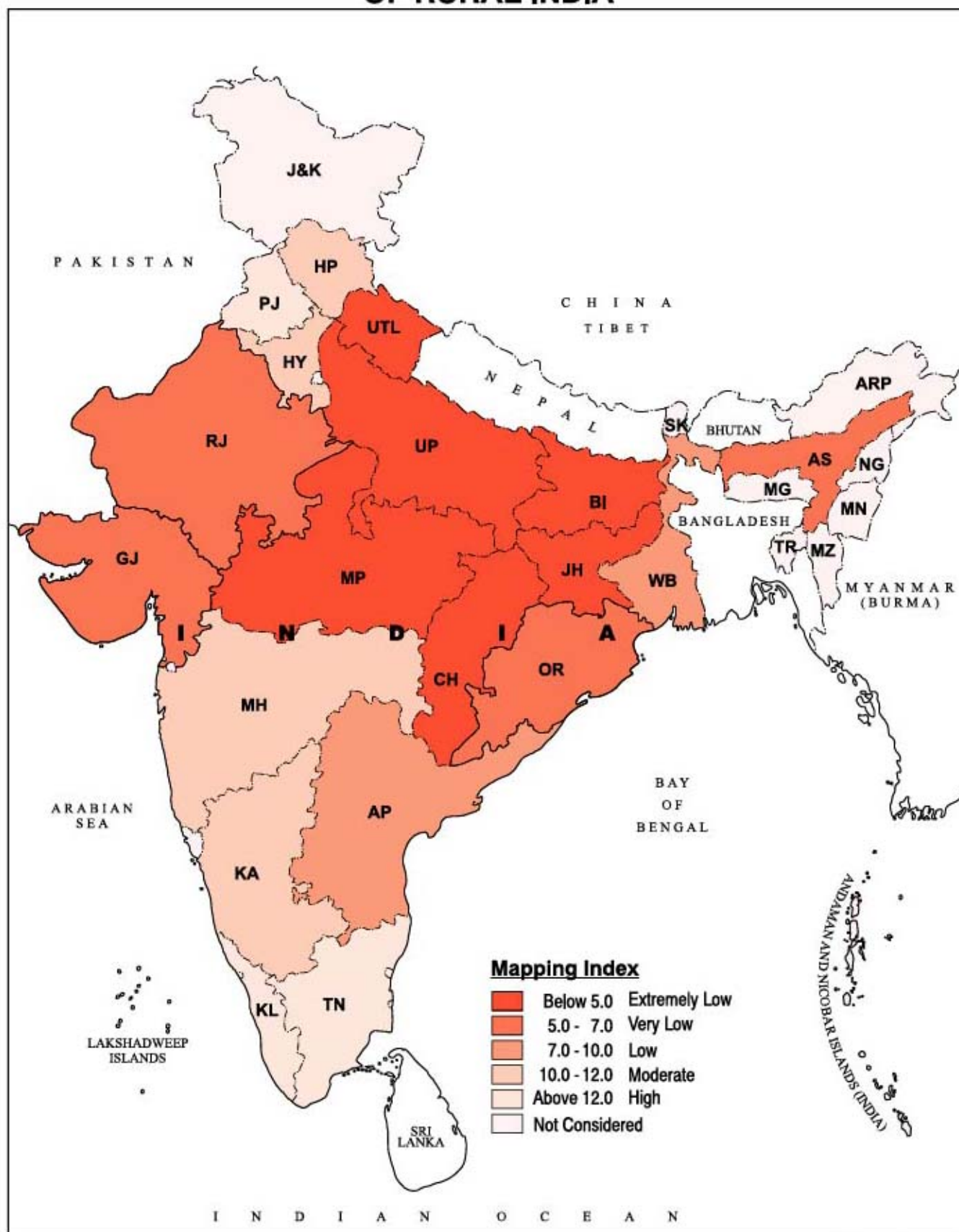
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HEALTH INFRASTRUCTURE INDEX OF RURAL INDIA



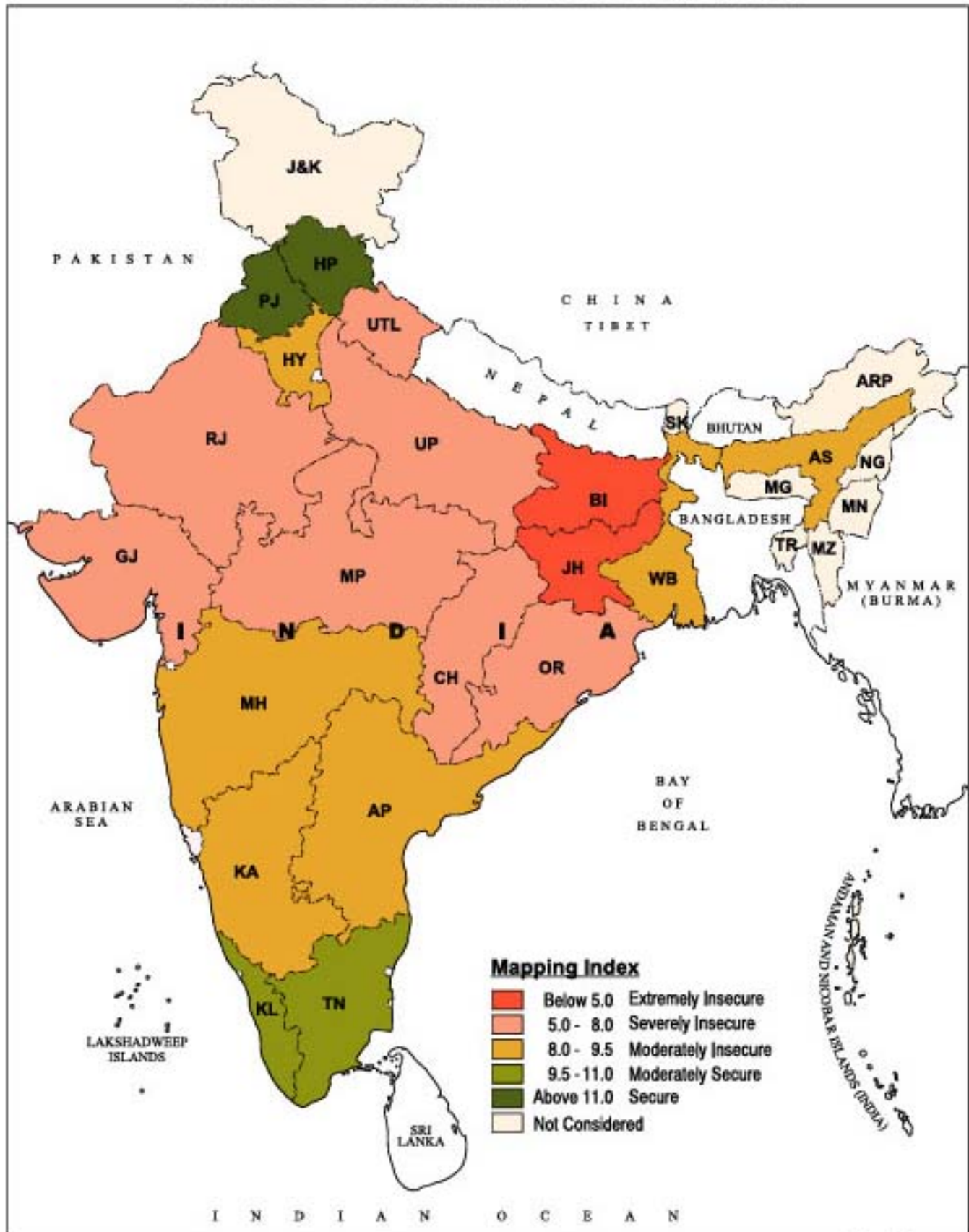
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FOOD ABSORPTION AND NUTRITIONAL STATUS OF RURAL INDIA



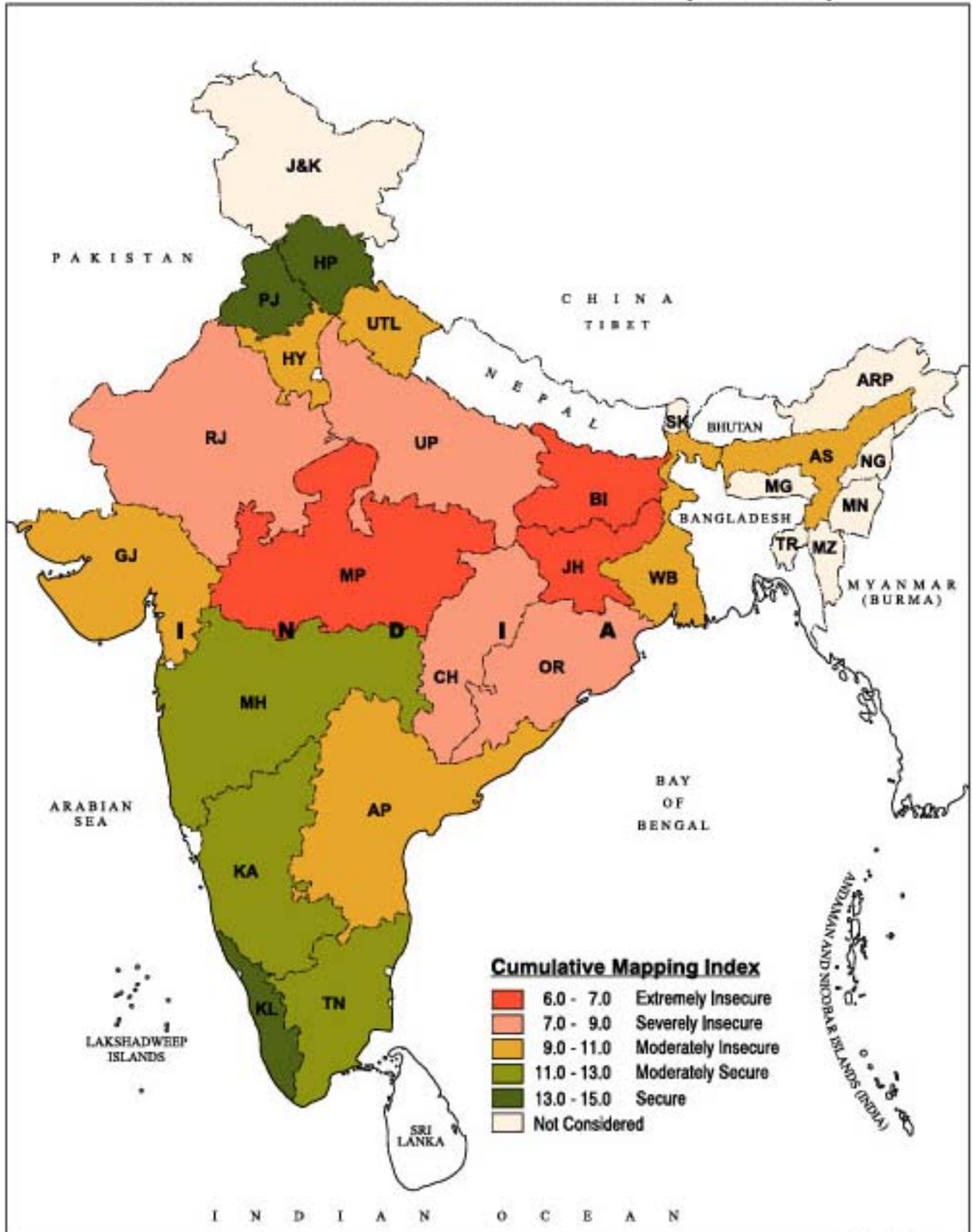
Map No. 4.7

FOOD INSECURITY MAP OF RURAL INDIA



Map No. 5.1

FOOD INSECURITY IN RURAL INDIA (19 States)



Map No. 5.2