Food Security Atlas

Of **RURAL BIHAR**

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Maps not to scale

The Food Security Atlas of Rural Bihar is dedicated to the memory of Late Professor Ashok Mathur, who was its Principal Author but tragically did not live to see it in print. His spirit of continuous enquiry and quest for accuracy guided this entire exercise.

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F O R E W O R D

Food Security has now taken centre-stage in policy discussions around the world. Along with issues of food production, there are also clearly issues of access of the poor to food. In India, despite high GDP growth rates over the past decade or so, the record in reducing hunger is not so impressive. This brings to the fore the question of inclusive growth, particularly the inclusion of the most deprived sections of our society and regions of our country, into benefiting from the growth process. Increased access to food comes forward as a basic component of inclusive growth.

It is apt that at such a time the Institute for Human Development (IHD) and the UN's World Food Programme (WFP) have produced this set of Rural Food Security Atlases for eight States of India.

Constructing a Food Security Index (FSI), the authors have tried to identify the districts that fare particularly badly and the factors behind the poor performance of these districts in each of the States. The identification of regions and social groups that are most food insecure should help draw attention to the regions and social groups that require most attention in order to reduce food insecurity. At the same time, an analysis of factors behind poor food security should help direct district-level interventions towards dealing with the factors that seem to be behind poor food security in these districts.

The authors argue that while paying attention to increasing food supply, it is critical to pay attention to improving the access of the poor to adequate food. They identify improvements in infrastructure and in the position of women as central to improving food security.

I hope the Atlases will stimulate discussion among policy-makers and social analysts on ways of designing district-level interventions that would enable India to reduce hunger as part of inclusive growth.

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Preface

India is home to more than a quarter of the hungry people in the world. The effect of climate change on agriculture will adversely affect Indian agriculture, making food availability scarce. The existing production levels barely manage to keep pace with the growing population, a problem that is aggravated by high disparities in resources and purchasing power.

The changing scenario of rising food prices has raised new concerns about food security. It has been estimated that globally 130 million more people have become food insecure due to high food prices, in addition to the existing 850 million. Soaring prices would require providing top priority to ensuring access to food by the most vulnerable, which can be achieved through expanded safety net programmes such as the PDS, and those programmes which address the nutritional status of pregnant and lactating women, and children of less than five years of age.

The prevalence of underweight children in India is among the highest in the world. Over 50 million children under five years are malnourished. There are multiple causes of this phenomenon. Looking at the problem spatially, a relatively small number of states, districts, and villages account for a large share of the problem – 5 states and 50 per cent of villages account for about 80 per cent of the malnutrition cases.

Therefore, the need of the hour is a comprehensive strategy to tackle the growing menace of food and nutritional insecurity. In a country of continental dimensions with vast disparities, it is pertinent that developmental efforts be directed in specific directions and in specific areas for optimum utilisation of resources.

To map food insecurity in the country, the World Food Programme had come out with a series of food insecurity atlases in collaboration with the M.S. Swaminathan Research Foundation. The most significant contribution of these atlases was to mainstream the issue of food security, besides identifying their incidence among the major states.

As a corollary to these atlases, on behalf of the WFP, the Institute for Human Development has prepared state-specific atlases with comprehensive analysis at district and regional levels. Looking through the child nutrition lens in view of prevalence of underweight children, and under-five mortality, these atlases help in identifying the districts at various levels of food security, within the most food insecure states. This will help in convergence of complementary programmes of the government in addressing undernutrition and child mortality in the country.

We are deeply indebted to all the members of the Technical Advisory Group (TAG), constituted to provide direction and technical inputs to the report. We would like to express our sincere gratitude to the TAG chairperson Prof. Abhijit Sen, Member, Planning Commission for his encouragement and deep involvement in this project.

Much of the credit for bringing out this publication goes to Dr. Dev Nathan, Professor, and Dr. Preet Rustagi, Senior Fellow, who coordinated the study from IHD; Dr. Sandip Sarkar, who provided the technical advice, especially the construction of the indices; Dr. Sunil Mishra and Ms. Payel Dutta Majumder who executed the work of calculation of indices and analysing the data: and Mr. Abhay Kumar who helped in finalising the report. We would also like to express our gratitude to Dr. Minnie Mathew, Head of Programme Unit, WFP-India for providing her guidance to the study; Dr. Nisha Srivastava, who led the project in WFP; Mr. Bal Paritosh Dash and Mr. Animesh Kumar for providing their critical inputs.

We hope that the atlases will serve as a tool for the government and policy-`makers to target interventions more effectively and fine-tune assistance strategies to target the most vulnerable groups and areas. An important outcome of this exercise is a systematic and integrated food security information system located within the state governments. Finally, it will enhance advocacy at the state level so as to direct policy focus, resources and initiatives to the most food insecure.

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Acknowledgements

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List of Abbreviations

AAGR	Average Annual Growth Rates
ADRI	Asian Development Research Institute
AIDS	Acquired Immune Deficiency Syndrome
ANMs	Auxiliary Nurse Midwife
APL	Above Poverty Line
ARWSP	Accelerated Rural Water Supply Programme
BDR	Bihar Development Report
BMI	Body-mass index
BSEB	Bihar State Electricity Board
CBOs	Community-Based Organizations
CV	Co-efficient of Variation
DLHS	District Level Household Surveys
EIS	Extremely Insecure
FCI	Food Corporation of India
FSI	Food Security Index
FSOI	Food Security Outcome Index
GCA	Gross Cropped Area
GER	Gross Enrolment Ratio
GoB	Government of Bihar
GOI	Government of India
GSDP	Gross State Development Product
Ha	Hectares
HIV	Human Immunodeficiency Virus
HSD	High Speed Diesel
HYV	High Yielding Varieties
ICDP	Integrated Cereal Development Programme
ICDS	Integrated Child Development Services
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IHD	Institute for Human Development
ISOPOM	Integrated Scheme on Pulses, Oilseeds and Maize
ITI	Industrial Training Institute
Kg	Kilo grams
MDGs	Millennium Development Goals
MDMS	Mid Day Meal Scheme
MIS	Moderately Insecure
MPCE	Monthly Per Capita Expenditure
MS	Moderately Secure
MSSRF	MS Swaminathan Research Foundation
NFHS	National Family Health Survey

NFSM	National Food Security Mission
NGOs	Non-governmental Organizations
NIA	Net Irrigated Area
NREGA	National Rural Employment Guarantee Act
NREGS	National Rural Employment Guarantee Scheme
NSS	National Sample Survey
OBCs	Other Backward Classes
PHCs	Primary Health Centres
PDS	Public Distribution System
PMGSY	Pradhan Mantri Gram Sadak Yojana
PRI	Panchayati Raj Institutions
RTI	Right to Information Act
S	Secure
SC	Scheduled Caste(s)
SCD	Special Category District
SCP	Special Component Plan
SDP	State Domestic Product
SFC	Standing Finance Committee
SHG	Self-help Group
SIS	Severely Insecure
ST	Scheduled Tribe(s)
TPDS	Targeted Public Distribution System
TSP	Tribal Sub-Plan
UNICEF	United Nations' Children's Fund
UN	United Nations
USB	Unspent Balance
VAT	Value Added Tax
WFP	The UN World Food Programme
WHO	World Health Organization
WWPR	Women's Workforce Participation Rate

Despite India's recent record of high rates of economic growth, it is a major concern that growth is not proportionately contributing to reduction of poverty and malnutrition. The UN World Food Programme (WFP) and the MS Swaminathan Research Foundation (MSSRF) earlier collaborated in analysing the food insecurity situation in different states in the country. Using chosen indicators to map the relative standing of states with regard to food security, MSSRF and WFP prepared three Food Insecurity Atlases of India in 2001 (Rural), 2002 (Urban) and 2004 (Sustainability of Food Security). The atlases raised the bar in the analysis and understanding of food security across states.

Following the path-breaking national-level atlases, it was decided to extend the analysis to the district level, the level at which food security interventions are implemented. As India lacks estimates of an important indicator like poverty for a district, the Institute for Human Development (IHD) and the UN World Food Programme (WFP) have together undertaken an analysis of the dimensions of food security at the sub-state or district level, for eight states of India including Orissa, Jharkhand, Chhattisgarh, Madhya Pradesh, Rajasthan, Bihar, Uttar Pradesh and Maharashtra. This report deals with the food security situation in Bihar based on the findings from a recent exercise with the following underlying objectives:

l   To identify the regions and social groups in Bihar most affected by food insecurity;

l   To analyse the nature and dynamics of the food security situation at the sub-state level; and

l   To suggest policy interventions appropriate to improving food security for those regions and social groups.

The study suggests five dimensions of the Bihar economy which have a direct bearing on food security in the state which are as follows:

1. The main strength of the Bihar economy, after bifurcation in 2000, lies in its rich agricultural soil and water resources as its forest areas are mainly absorbed with Jharkhand. The flood-prone area in Northern Bihar affects agricultural yields.

2. Variability of agricultural growth rate was more than three times higher in Bihar than at the all India level.

3. In terms of its infrastructure, rural road connectivity, which, among other things is essential to support agricultural growth, is very poor.

4. The incidence of poverty in rural Bihar is one of the highest in the country though the pace of its decline during 1994-2005 was higher than at the all-India level.

5. Female literacy in Bihar (33.6%) is well below the all-India Level (54.2%).

The report attempts to define food security and its significance, which becomes the basis of identifying the most food insecure districts in Bihar. In order to examine food security at the district level, three contributing dimensions at the input level, namely availability of food, access to it through the market and absorption of food by the body have been considered.

The issue of food security has been implicated by outcomes (child mortality and under-nutrition), improvements in which take a longer time to manifest themselves. From the policy point of view, input dimensions of food security are relatively more relevant since they are based on variables that can be influenced by the state, while outcomes are an end product of food security and availability of health facilities. Keeping this in mind, this report first examines output and outcome measures of food security and then examines the input dimensions of food security.

Bihar displays one of the highest degrees of year-to-year fluctuations in the agriculture produce due to frequent floods. This has a severe negative impact on food security in the state, both at the macro as well as micro level (household and individual) access to food. Although the overall food availability in rural Bihar has improved over the years, the per capita availability of foodgrains in Bihar is among the lowest in the country. The overall per capita availability of cereals has declined over the years.

Data for outcome of food security were neither available nor accessible at the district level, which led the study to consider proxies. There is abundant evidence that child-related outcome indices are very closely related to food security. There are two child-related variables for which NFHS data are available at the district level and which are fairly accurate indicators of food security outcomes. These are the child mortality rate for children below five years of age and child under-nutrition as reflected in the proportion of underweight children. Using the Range Equalisation method, these two indicators have been composited by taking their average to obtain an intermediate overall district level index of Food Security Outcome for Bihar. On the basis of this index, the districts have been classified into five groups, namely, Secure (S), Moderately Secure (MS), Moderately Insecure (MIS), Severely Insecure (SIS) and Extremely Insecure (EIS).

On the basis of food security outcome index, the current 37 districts of Bihar are classified in five groups. Seven districts fall in the first group (S), and 11, 10, 7 and 2 districts fall in the second (MS), third (MIS), fourth (SIS) and fifth (EIS) groups, respectively. In case of input factors (availability of food, access to food and absorption of food), a total of eleven variables (three for availability of food, six for access to food and two for absorption of food) have been considered. The Composite Food Security Input Index (FSI) based on all the indicators has been classified into aforesaid five gradations of food security, as in the case of Food Security Outcome Index. Comparing the classification of districts by the output and the input approaches, a total of 12 food insecure districts are identified. These are Kishanganj, Araria, Jamui, Katihar, Madhepura, Purnia, Sheohar, Aurangabad, Kaimur, Sitamarhi, Lakhisarai and Banka. These have been designated 'Special Category Districts' (SCD).

Having identified the twelve most food insecure districts in terms of the two approaches, the study attempted to asses the comparative significance of variables which have policy implications.

In order to examine district level policy towards food security, the study considered all eleven variables constituting the input index. These are considered to be not equally amenable to state's policy control. Of these variables, five variables (percentage of net sown area under Irrigation, accessibility through paved roads, percentage of female literates, percentage of households with access to safe drinking water and number of public health centers) can be directly influenced by the state through policy action. Unlike these, three other variables (per capita agricultural output, consumption expenditure and rural wage rate) can be indirectly influenced, but within a limited range. The remaining three variables (percentage of SC/ST, dependency ratio and the proportion of agricultural labour) stay beyond the state's control. But the state can adopt welfare measures to improve the economic condition of SC/ST, agricultural labour and children/old age population, whose magnitude is one of the main determinants of the dependency ratio.

The study also identified districts that are below the average state level performance on the variables concerned. Finally, the study focuses attention on the twelve "Special Category Districts", which belong to the most food insecure categories. These twelve districts and their position in respect of the five variables which can influence policy has been ascertained.

Identified districts, which are at the lowest level, need specific policy interventions. Food security is dependent, in the first place, on availability of food. But in case adequate purchasing power is not available, household level access to food gets curtailed even if physical availability exists. Thus access to food is the second most important determinant of food security. However, even in the presence of these two determinants, inadequate health status prevails at the household level in absorption of food and its nutritional impact. Thus the third basic component of food security is taken to be body absorption of food.

For enhancing food security in Bihar, specific recommendations for the programme include the Public Distribution System (PDS), National Rural Employment Guarantee Scheme (NREGS), National Food Security Mission (NFSM), and Rural Road Connectivity, and Mid Day Meal (MDM) Scheme has been discussed.

The percentage of BPL households covered by PDS in Bihar is less than one-third of the all-India level. An IHD study on the functioning of PDS has drawn attention to five problems facing TPDS in Bihar. In order to overcome these, three specific suggestions have been made: (i) State Food Corporation (SFC) godowns should open more frequently; (ii) In view of difficulties of transportation, dealers may be compensated for additional cost; (iii) public needs to be educated about the new "food coupon system".

NREGA is a powerful means of providing income and hence access to food security. Moreover, nearly 67 per cent of income generated is spent on food in Bihar which indicates its key role in providing food security. Further, while the proportion of SCs provided employment is much higher in case of Bihar than in India as a whole, the reverse is the position in the case of women and STs. Distribution of land to the landless would also improve their food security situation.

The drawback of NFSM is that it primarily addresses the Food Availability dimension of food security, but ignores the Access to Food dimension. Moreover, it covers only a very limited number of 'Special Category Districts'.

The MDM Scheme provides a potent means for enhancing food security in the state. But it was introduced in the state only in January, 2005. An assessment of the Scheme in Bihar shows some good practices but at the same time they have some weak spots. The main defects include inadequate and erratic lifting of food stocks by the state resulting in accumulation of unspent food stocks. Inadequate utilisation of cooking cost (only 46 per cent of cooking cost allocated was utilised) is another concern. Both the issues need to be addressed through a streamlined system for cooking of Mid-day Meals in Schools in order to permit the MDM scheme to achieve its objectives. The provision of some land to the landless and of land titles for women would improve the food security situation. In linking food acess scheme with development, special attention has to be paid to increasing irrigation and improving rural connectivity.

The world is home to over a billion undernourished people and as many as 8.4 million children and 300,000 women die every year because of malnutrition in developing countries. The situation is particularly grave in Sub-Saharan Africa and South Asia. Despite the immensity of the problem and the fact that reducing hunger is one of the Millennium Development Goals (MDGs), hunger and food security receive less attention than poverty reduction from both a policy and research perspective.

Food security is not just a matter of the availability of food, but also of the access of households and individuals to sufficient nutritious food. The absorption of food as nutrition in the body is further mediated by access to safe drinking water, hygiene and sanitation facilities. Consequently, food security is analysed along the axes of availability, access and absorption. The importance of entitlements in food security is further underlined by the Supreme Court's judgments validating the Right to Food. As a signatory to the UN's Millennium Development Goals (MDGs), the Government of India and all state governments have an obligation to reduce by half the proportion of people suffering from hunger by 2015.

Despite India's recent record of high rates of economic growth, there is a major concern about the failure of that growth to translate into a somewhat proportionate reduction in poverty and malnutrition. The problem of large-scale famine-related starvation deaths seems to have been largely resolved, due to a combination of a vigilant civil society and press. Nonetheless, there are periodic reports of malnutrition and starvation from different parts of the country; particularly affected are the marginal social groups, such as the Scheduled Tribes (STs) and Scheduled Castes (SCs). Besides this problem of hunger among the STs and SCs, there is the pervasive incidence of malnutrition, particularly of children and women.

The UN World Food Programme (WFP) and the MS Swaminathan Research Foundation (MSSRF) earlier collaborated in analysing the food insecurity situation in different states in the country. Using chosen indicators to map the relative standing of states with regard to food security, the MSSRF and WFP prepared the *Food Insecurity Atlas of Rural India* in 2001. This was followed by the *Food Insecurity Atlas of Urban India* in 2002. The third in the series, the *Atlas of Sustainability of Food Security* was launched in 2004. The atlases raised the bar in the analysis and understanding of food security across states. At the same time, the Atlases posed fresh challenges. They brought into focus the need for analysis at the sub-state level. States in India are typically large and diverse. Intra-state disparities in socio-economic development impact on the food security status of households. For effective policy and focused intervention, identifying and mapping the worst-off areas is important. Following the path-breaking national-level atlases, it was decided to extend the analysis to the district level, the level at which food security interventions are implemented.

The need for such disaggregated analysis is only matched by the dearth of data at such levels. To take only one example, we do not have estimates of an important indicator like poverty for a district. Strengthening planning and performance requires that more data is available at the district level. In this regard, the District Level Household Surveys (DLHS) show welcome progress. These surveys provide valuable demographic data and information relating to reproductive and child health.

To contribute to reaching the above goals, the Institute for Human Development (IHD) and the UN World Food Programme (WFP) have together undertaken an analysis of the dimensions of food security at the sub-state or district level, for eight states of India: Orissa, Jharkhand, Chhattisgarh, Madhya Pradesh, Rajasthan, Bihar, Uttar Pradesh and Maharashtra. This report documents the food security situation in Bihar based on the findings from a recent exercise, with the following underlying objectives:

- To identify the regions and social groups in Bihar most affected by food insecurity;

- To analyse the nature and dynamics of the food security situation at the sub-state level; and

- To suggest policy interventions appropriate to improving food security for those regions and social groups.

It is hoped that this Atlas will stimulate action and further analyses. The issue of food security needs to be brought to the forefront of the development agenda not only at the Centre, but also at the state/sub-state level.

1.1 Definitions and Significance of Food Security

What constitutes food security has gone through two phases of understanding or definition. In the 1970s, food security was understood as the 'availability at all times of adequate world food supply of basic foodstuffs…[1]' (UN, 1975). This was also the understanding at the time of the first UN Report of the World Food Conference held in 1975 in Rome. But the 1981 publication of Amartya Sen's 'Poverty and Famines: An Essay on Entitlement and Deprivation' brought forward a new understanding of the problem of hunger or food security. Rather than just the 'availability' of food, Sen emphasised 'access' to food through what he called 'entitlements' – a combination of what one can produce, exchange in the market plus state or other socially provided supplies.

What Sen posited is that availability or supply of food does not itself create entitlements for food.[2]

What an individual or household can consume or access depends on the individual's or household's entitlements. Entitlements draw attention to the conditions under which people access food, whether from direct production (or exchange with nature), market exchange (income from either goods

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1. The World Food Summit (1974) defined food security as 'availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices'.

2. In a sense, Sen's emphasis on entitlements is similar to Keynes' notion of 'effective demand'. Both entitlement and effective demand are quite different from need. Since Keynes was dealing with a fully capitalist market economy, with only two classes, employers and workers, all effective demand was related to monetary income. But Sen is dealing with a 'mixed economy' with at least three classes, employers, workers and peasants or other own-account producers. For those who produce food, part, if not all, of their entitlement is due to their own production. This portion of the consumption of food is not mediated by the market. Consequently, this is not captured by the market-based notion of effective demand.

produced or wage labour) and social security measures. Entitlements also draw attention to the rules that govern intra-household allocation, as a result of which women and girls may face hunger or deprivation even though they are part of households whose general entitlements are sufficient.

The definition of food security adopted at the World Food Summit of 1996 is comprehensive and widely accepted - 'Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life' (FAO, 1996).

Food, of course, is not an end in itself. Food is consumed for nutrition. Instead of focusing attention on the commodity, one can look at the objective for which food is consumed, that is providing nutrition for the body. The purpose of nutrition itself is not just to survive, but to lead a healthy and meaningful life – to be in the state one wants to be in (well-being) and to do various things one wants to do.

At one level, some health questions, like the prevalence of intestinal parasites, affect the very ability of the human body to absorb nutrients. Thus, health concerns, focused on the availability of clean water and access to health facilities, are very much part of the very concept of food security itself. At another level, some health questions, like HIV/AIDS most dramatically but also endemic malaria, affect the ability of the individual/household to engage in those livelihood activities that could ensure food security. Consequently, in order to deal with food security, it is not sufficient to pay attention to food alone, but also to access to, at least, clean water and sanitation, which affect the ability to absorb food, or turn consumption of food into nutrition. It may thus be seen that all these factors affect food security in one way or the other. Hence they can be used as components of elementary well-being needed to lead a healthy and meaningful life.

Entitlements point to the fact that hunger is situated within poverty, rather associated with extreme poverty, as a result of which households and individuals do not have adequate entitlements to food. Thus, the elimination of hunger is the first landmark in reducing poverty.

Capabilities are a combination of two factors – states of well-being (like being well nourished, being healthy, and so on) and activities (achieving self-respect, or being socially integrated). Self-respect and social integration are in themselves goals of a meaningful life. But they are also instrumentally important, in that those without self-respect or the socially marginalised may not be able to achieve food security. Consequently, achieving self-respect or playing a meaningful part in social life may both be necessary to achieve food security. This leads to the proposition that food security is not just a matter of some external organisation, whether the state or society, providing food, but of the enhancement of the agency of the hungry or poor. Thus, some level of complex capabilities, like agency, becomes necessary to reach adequate levels of primary well-being.

Given women's general responsibility for food security in rural areas of developing countries, and given the pervasive gender bias in these societies, enhancement of the agency of the poor translates

particularly into the enhancement of the agency of poor women. Consequently, food security approaches increasingly pay attention to the elimination of gender inequality and women's empowerment as important preconditions for food security.

Agency of poor women, or of the poor as a whole, is not only a matter of individual agency (which itself might be dependent on collective mobilisation) but also of the poor putting their stamp on economic policies. This is necessary in order to bring about the much-needed political will that is often referred to as missing, in order to bring about adequate attention to food security policies. Without adequate political pressure for reform, proper food security policies are unlikely to be adopted. There can be no question that the political mobilisation of the poor is required for such a food security policy to be implemented.

In its historical dimension, responsibility for provision of sufficient food was viewed as that of individuals themselves or that of the household unit to which an individual belonged. But with advancement in the conceptualisation of governance and growth of international co-operation, it has come to be increasingly recognised that provision of food cannot be relegated to the background as the sole responsibility of individuals or their households, but governments of different nations as also the international community must take appropriate measures to help in achieving food sufficiency for all. In this context, food security has come to the forefront of the agenda of most governments. The World Food Summits of 1995 and 2003, inclusion of food security as a part of the Millennium Development Goals (MDGs) and the United Nations World Food Programme are reflections of the growing global concern about achievement of adequate food security.

Figure 1.1: Food Utilization Model
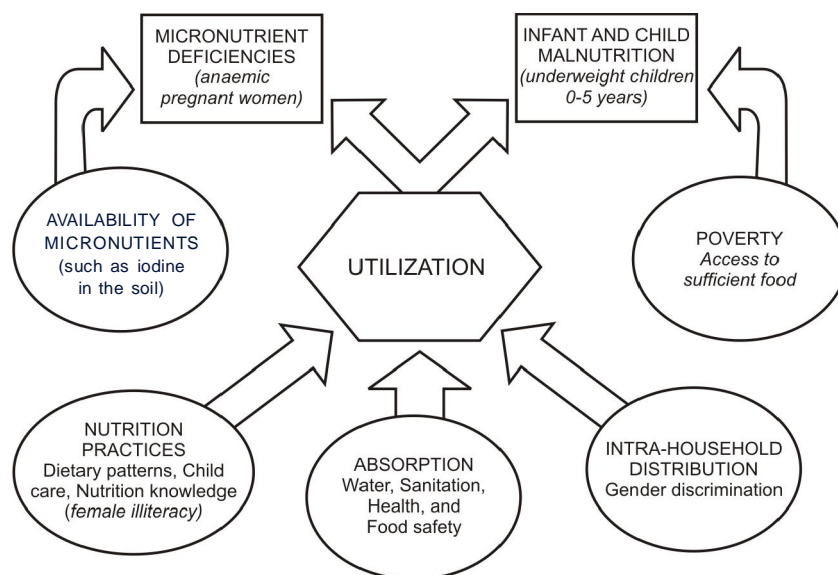
Source: WFP Enabling Development Food Outcome in South Asia

As we have seen earlier, a reasonably good level of health status of the population is essential to facilitate adequate conversion of food into a higher nutrition level for the body. The ultimate outcome of food security over the long run for a number of indicators of health is critical. Absence of food security over the long run results in outcomes which manifest themselves in the form of morbidity, low body-mass ratio and higher level of mortality which result in low expectancy of life. The entire process may be portrayed in an input-output flow chart given in Figure 1.1.

Whereas the inputs into food security can be steered in the relatively short run, the outcomes take a longer time to manifest themselves. Moreover, from the policy point of view, the inputs into food security are more relevant since they are based on variables that can be influenced by the state, while outcomes are an end product of food security and availability of health facilities, nutritional practices specifically for child-population.

In what follows, we shall first examine output or outcome measures of food security and then come to measurement of input dimensions of food security.

1.2   Structure of the Report

This report is an effort to provide a district level profile of food security in Bihar. As the country moves towards greater devolution and decentralisation, data at disaggregated levels remains a stumbling block. District level data is notoriously inadequate and this report urges that greater attention be paid to data collection and dissemination at sub-state levels. The next chapter – Chapter 2 – provides an overview of the state and places it in the context of other states in the country. In line with the current – and correct – approach that emphasises outcomes rather than inputs, Chapter 3 derives a composite index of food security outcomes and provides a brief methodological note. It draws a distinction between the Food Security Outcome Index (FSOI) that is based on outcome measures on the one hand, and the Food Security Index (FSI) that is a composite index of the factors that are critical to food security on the other hand. Chapters 4 to 6 analyse the food security situation along the dimensions of availability, access and absorption. Chapter 7 deals with the analysis of food security Index in Bihar. It includes the indentification of priority districts. Chapter 8 discusses strategies for action that emerge from our analysis, in the context of the broader state and national strategic interventions already in place. It also provides the policy initiatives that may be considered for the most food insecure districts in Bihar to improve their food insecurity. Chapter 9 wraps up the report with the final conclusions.

2. A Profile of the State of Bihar

The present state of Bihar was born in November 2000 when erstwhile Bihar was bifurcated into what is the present day Bihar and Jharkhand. At present the state has 38 districts.[1] All the districts are shown in Map 2.1, while Map 2.2 gives their delineation according to the two NSS regions in Bihar, viz., Northern Bihar and Southern Bihar (see Map 2.1 and 2.2). It may be noted that the NSS Central region is now the southern part of Bihar. This report will therefore refer to it as the Southern region instead of Central Region.

2.1. Background of the State Economy

The Bihar economy is marked by four dominant characteristics which underlie its present status.[2] First, the mighty Ganga passes right through the heart of Bihar, thus providing it with rich alluvial soil as also a very potent source of irrigation. Together with a large number of its tributaries which criss-cross the northern part of Bihar, this state is one of best endowed in terms of its water and agricultural soil. But it is also bedevilled by the untamed tributaries flowing down from the North, a good many from Nepal, which annually cause some of the worst flood havocs in the country, despite efforts to firm up embankments.

Map 2.1: Bihar: Administrative Divisions

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1. The latest district to be formed is Arwal, carved out of Jehanabad. However Arwal could not be brought into analyses as data for this district was not available at the time of preparation of the Atlas. Hence, all analyses in this report are based on 37 districts.

2. A substantial portion of Sections II-V is based on Institute for Human Development (2007) "Bihar Development Report", draft submitted to the Planning Commission, Government of India, New Delhi.

Map 2.2: Districts by NSS Regions in Bihar

NSS Regions
- Northern
- Southern*

* Southern denotes Central region of the NSS Regional Classification
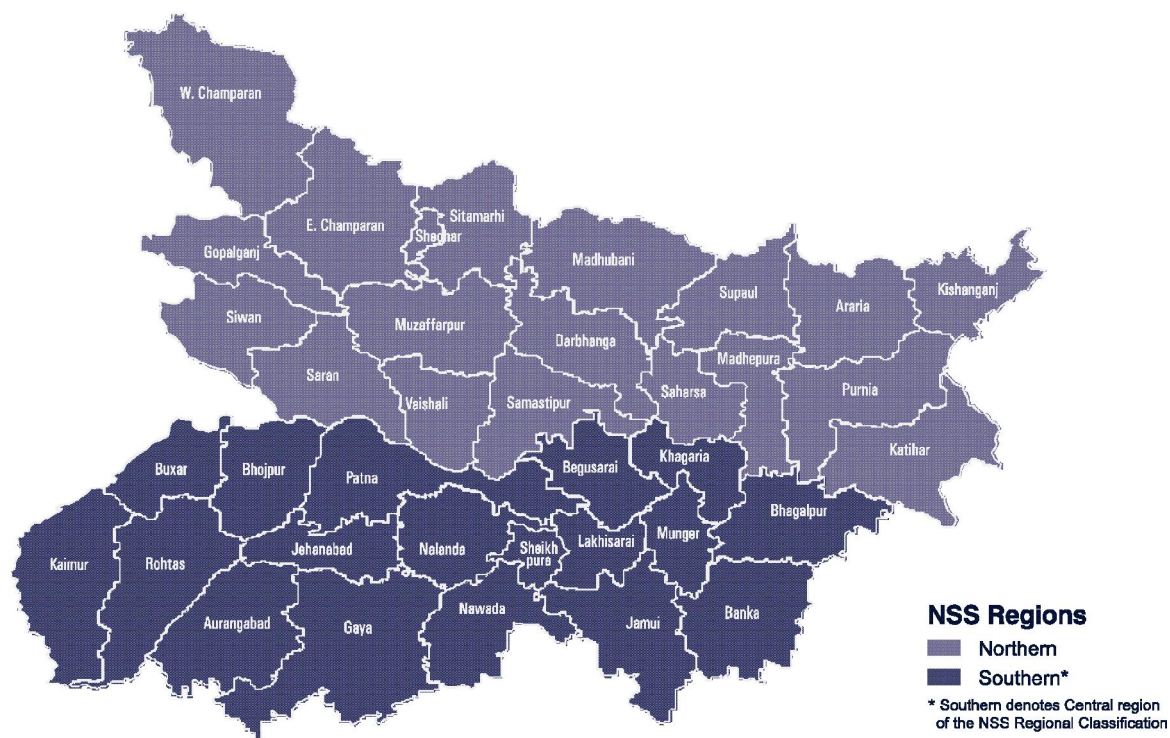
Second, after carving out of Jharkhand from the area under erstwhile Bihar, present-day Bihar lost most of the major industrial centres, urban centres, forest area and mining resources to Jharkhand, leaving Bihar deprived of the richest part of natural resources and non-agricultural assets. This also implied loss of a good bit of revenue and taxes in the form of royalties and excise duties. This is important from the point of view of the capability of the state to finance some of the social welfare programmes which have a bearing on food security in the state.

Third, even before bifurcation, demographic pressure on the state's land resources was very high. Natural growth of population of erstwhile Bihar during 1981-91 was 23.6 per cent. But during 1991-2001, the population growth in Bihar spurted up to 28.4 per cent, well above the national growth of 21.3 per cent. Moreover, after bifurcation of the state, Bihar got 54 per cent of the area but 75 per cent of its population. Thus, the population density of the state also registered a significant increase from 685 per square kilometer in 1991 to 880 per square kilometer in 2001, against an all-India population density of 324 per square kilometer.

The high and growing demographic pressure is one of the factors responsible for the fourth dominant characteristic of the state economy, namely, its very low relative per capita income. By 2003-04, the

Table 2.1: Income, Population and Related Development Indicators: Bihar & All-India

Variables	Triennium Average		Development Gaps
Per Capita Income (NSDP) in Rs. (1993-94 prices)	Bihar	All India	Bihar / All India(%)
1993-94	3326	8769	37.93
2000-01	3852	11762	32.75
2003-04	4053	13332	30.40
2005-06	3983	–	–
Per Capita Income Change			
2004 minus 1994	729	4563	–
2006 minus 1994	657	–	–
Urban Population (%)			
1991	10.4	25.7	-15.30*
2001	10.47	27.78	- 17.31*
Population Density/Sq.Km.			
1991	685	267	257
2001	880	324	272
Per Capita Power Consumption (kwh)			
1998	54.9	334.3	16.4
2005	74.5	335.0	12.3

Note: (i) Bihar Per Capita Income figures are the Triennium Averages. It may, however, be noted that for terminal years, the Bihar estimates are triennium averages of the first three and last three years.

(ii) All-India figures of GDP at 1993-94 prices are available only up to 2003-04, after which they are at 1999-2000 prices. Therefore, 2003-04 is the latest year for which comparable figures are available for Bihar and at All India level at a uniform price base.

* Development gaps here are shown by the percentage point difference between Bihar and India.

proportion of per capita income in Bihar was just 30.40 per cent of the national level, at Rs. 4053 as against Rs. 13332 at the All-India level (See Table 2.1). This has a direct implication for the food security scenario in the state.

2.2. Basic Indicators of Socio-economic Status

Some of the other key features of the state's economy, many of which are directly or indirectly closely related to the dominant characteristics outlined above and which exercise an influence on the state of food security in the state, are discussed here.

(i) Human Development

We may first look at some of the key human development indicators (Table 2.2), many of which have a direct bearing on the state of food security in the state. Bihar presents a mixed picture in relation to the All-India scenario of human development. In respect of the poverty scenario, as evident from Table 2.2, the incidence of both rural and urban poverty is considerably more in Bihar than India as a whole. But the difference in Bihar's incidence of poverty and All-India incidence of poverty was higher in respect of rural poverty in 1993-94 (19.33 percentage points) than urban poverty (8.37 percentage points). Table 2.2 gives changes in rural and urban poverty for Bihar as well as at the All-India level. It may be seen that the decline in both urban and rural poverty in Bihar was higher (-14.50 and -6.13) than at All-India level (-8.97 and – 6.66 respectively) during 1994-2005.

Table 2.2: Human Development Indicators

Variables	Year	Bihar	All India	Development Gaps {Bihar (%) – All India (%)}
Rural Poverty (%)	1993-94	56.60	37.27	19.33
Urban Poverty (%)	1993-94	40.73	32.36	8.37
Rural Poverty (%)	2004-05	42.10	28.30	13.80
Urban Poverty (%)	2004-05	34.60	25.70	8.90
Rural Poverty Change	2005 minus 1994	-14.50	-8.97	
Urban Poverty Change	2005 minus 1994	-6.13	-6.66	
Literacy (%)	1991	34.70	52.2	- 17.50
	2001	47.50	65.4	-17.90
Female Literacy (%)	1991	22.00	39.3	-17.30
	2001	33.60	54.2	- 20.60
Infant Mortality Rate	2001	62.00*	68	- 6.00
	2005-06	61.70	57.0	4.70
Life Expectancy	1992-96	54.40	60.7	- 6.30
	1998-02	60.80	61.6	- 0.80
Rural Population with Access to Safe Drinking Water (%)	2000	68.50	72.3	- 3.80

Source: Institute for Human Development (2007).

* These data are for Bihar & Jharkhand combined since separate estimates for IMR are not yet available.

The literacy percentage was also only 34.7 per cent and 47.5 per cent in 1991 and 2001, respectively in case of Bihar vis-à-vis 52.2 per cent and 65.4 per cent in the case of the country as a whole. In respect of female literacy, which has a greater bearing on food security, the figure for Bihar was only 33.6 per cent in 2001 vis-à-vis 54.2 per cent in India as a whole.

In contrast to the literacy dimension of human development, in respect of the two health-related dimensions of human development, the position of Bihar emerges to be only marginally below that of India as a whole. The Infant Mortality Rate (IMR) in 2003 was 60 in Bihar as well as in India. Life expectancy at birth was 54.4 years in Bihar as against 60.7 years in India during 1992-96, and the gap has narrowed to 60.8 in Bihar and 61.6 in India during 1998-2002, though some scholars doubt the authenticity of these data in respect of Bihar.

Similarly, in respect of access of rural population to safe drinking water, i.e. piped and hand pump water, Bihar has improved considerably and stands nearly level with the All-India percentage (Table 2.2).

Regional and Social Dimensions of Human Development

The previous section conveyed some idea of key components of human development for the state as a whole. However, there are substantial regional as well as social variations across the state. Table 2.3 shows the incidence of rural poverty in the Southern zone to be higher (44.1 per cent) than in the Northern one (41.6 per cent).

The variation is much wider across social groups. It is highest (64.2 per cent) among Scheduled Castes (SCs), followed by Scheduled Tribes (STs) (56.2 per cent) and Other Backward Classes (OBCs) (38.5 per cent) vis-à-vis 'Others' where it is only 26.4 per cent. This is somewhat different from the pattern within rural India as a whole. Apart from being at a lower level than in Bihar, for India as a whole the incidence is highest in case of STs, followed by SCs, OBCs and Others.

Table 2.3: Region-wise Poverty Rates (%) by Social Group for Rural Bihar (2004-05)

Region	ST	SC	OBC	Others	All*
Northern	54.3	62.9	38.7	25.0	41.6
Southern	60.3	65.7	38.3	28.7	44.1
Bihar	56.2	64.2	38.5	26.4	42.6
Rural India	44.7	37.1	25.8	17.5	28.1

Note: *Includes cases not reported.*
Source: *Calculated from Schedule 1.0, NSS, 61st Round, 2004-05.*

Table 2.4 shows the percentage distribution of the poor rural households across social groups in Bihar and rural India showing the high proportion of OBCs and SCs.

In terms of the share of poor rural households among different categories of the workforce (Table 2.5), it is agricultural labour among whom poor households are concentrated (49.8 per cent and 41.5 per cent, respectively in Bihar and rural India), followed by the self-employed in agriculture and then non-agricultural poor households.

Table 2.4: Region-wise Percentage Share of Households by Social Group for Rural Bihar (2004-05)

Region	ST	SC	OBC	Others	All*
Poor Households					
Northern	0.9	31.9	56.1	10.6	99.4
Southern	0.7	41.7	50.2	7.4	100.0
Bihar	0.8	35.7	53.8	9.4	99.6
Rural India	18.1	28.4	38.0	15.4	99.9
All Households					
Northern	0.7	21.6	60.1	17.3	99.7
Southern	0.8	27.8	57.9	13.4	99.9
Bihar	0.8	24.0	59.2	15.8	99.8
Rural India	10.9	21.4	42.0	25.6	100.0

Source: Calculated from NSS, 61st Round, 2004-05.

Note: As *includes cases not reported, % shares do not always add upto 100.0.

**Table 2.5: Region-wise Percentage Share of Households by
Household Type for Rural Bihar (2004-05)**

Region	Self-employed in non-agriculture	Agricultural labour	Other labour	Self-employed in agriculture	Others	Total
Poor Households						
Northern	14.9	50.9	2.7	17.4	14.2	100.0
Southern	16.2	47.9	7.1	22.1	6.7	100.0
Bihar	15.4	49.8	4.4	19.2	11.3	100.0
Rural India	12.8	41.5	12.1	26.5	7.1	100.0
All Households						
Northern	17.3	33.4	2.0	33.5	13.8	100.0
Southern	18.4	29.1	5.3	38.6	8.6	100.0
Bihar	17.7	31.8	3.2	35.4	11.8	100.0
Rural India	15.6	26.7	10.7	35.5	11.4	100.0

Source: Calculated from NSS, 61st Round, 2004-05.

Among cultivating households (Table 2.6), it is obviously the smallest size cultivating households which account for the largest number of poor rural households (60.1 per cent and 46.1 per cent in Bihar and rural India, respectively).

When we come to the literacy differentials (Table 2.7), literacy is higher (61.6 per cent) in the Southern zone than in the Northern one (53.4 per cent), despite the incidence of poverty being higher in the Southern zone than in the Northern one. However, capability to raise the level of literacy is obviously higher among the non-poor, with the result that literacy is higher (56.7 per cent) in the total than among

Table 2.6: Region-wise Percentage Share of Households by Land Cultivation Categories for Rural Bihar (2004-05)

Region	0.000-0.004 (Ha)	0.005-0.40 (Ha)	0.41-1.00 (Ha)	1.01-2.00 (Ha)	2.01-4.00 (Ha)	4.01 & above (Ha)	Total
Poor Households							
Northern	63.0	22.4	11.2	3.4	0.0	0.0	100.0
Southern	55.4	26.5	12.1	5.1	0.6	0.3	100.0
Bihar	60.1	24.0	11.5	4.0	0.2	0.1	100.0
Rural India	46.1	23.7	16.9	8.6	3.8	0.9	100.0
All Households							
Northern	46.4	22.7	15.6	9.5	4.6	1.3	100.0
Southern	41.9	21.3	21.3	11.5	3.3	0.8	100.0
Bihar	44.7	22.2	17.7	10.2	4.1	1.1	100.0
Rural India	41.7	19.4	17.7	11.6	6.7	2.9	100.0

Source: *Calculated from NSS, 61st Round, 2004-05.*

the poor (43.4 per cent). In case of the Southern zone, literacy among the poor is 49.8 per cent, which is higher than in the Northern zone (38.9 per cent).

Thus taken as a whole, in terms of various dimensions of human development, Bihar lags behind rural India as a whole.

Table 2.7: Region-wise Literacy Rates for Rural Bihar 2004-05 (%)

Region	Male		Female		Total	
	Poor	All	Poor	All	Poor	All
Northern	51.5	67.3	26.4	39.1	38.9	53.4
Southern	64.6	76.1	34.4	45.9	49.8	61.6
Bihar	57.0	70.9	29.7	41.8	43.4	56.7
Rural India	65.3	76.4	42.2	53.2	53.7	65.1

Source: *Calculated from NSS 61st Round, 2004-05.*

(ii) Physical Infrastructure

Power Infrastructure

Gaps in physical infrastructure stand in the way of optimizing growth potential of the Bihar economy. Power infrastructure holds the key to industrialization and growth of the Bihar economy. Bihar has remained far behind the national level in power availability as well as consumption, which stands at 75 kilo watt (kw) per hour (2004-05) as against 606 kwh at the national level. This is the lowest in the

country. Even in terms of rural electrification, only 47 per cent of villages in Bihar had been electrified till 2005 as against an All-India average of 86 per cent.

Harnessing of Water Potential

The irrigation potential is also of crucial importance. The assessed irrigation potential of Bihar (103 lakh hectares) exceeds even its gross cropped area of 80 lakh hectares. The state has assigned this sector a prime position in its development plans, which has enabled the state to attain 57.33 per cent of the gross cropped area that is irrigated.

(iii) Sectoral Structure

The sectoral structure of State Income can convey a fair idea about the state of development of the economy. In case of Bihar, the relatively low level of development is reflected in a much higher degree of dependence on agriculture-based primary sector in the state Income. Table 2.8 portrays the structure of the Gross State Domestic Product (GSDP).

Table 2.8: Sectoral Structure of GSDP (Bihar & India)

Sector	BIHAR			INDIA		
	Percentage share		Point Change	Percentage share		Point Change
	1993-94	2005-06	1994-06	1993-94	2005-06	1994-06
Primary	48.85	38.43	-10.42	32.41	22.65	-9.76
Secondary	9.23	12.25	3.02	24.41	25.28	0.86
Tertiary	41.92	49.33	7.40	43.18	52.05	8.87
State domestic product	100.00	100.00		100.00	100.00	

Notes: *(i) GSDP Estimates at the All – India level at 1993 -94 prices are available only up to 2003-04. Therefore, the 2004-06 data at 1999-2000 prices have been converted to 1993-94 price base through splicing.*

(ii) For the three years at both ends the average of percentages are, strictly speaking, supposed to indicate values for the mid-years 1994-95 and 2004-05. However, we have assumed them to be representing values for the initial and terminal years of the triennium, viz., 1993-94 and 2005-06.

Source: *Calculated from CSO, Various Years.*

When we turn to the detailed sub-sectoral picture, manufacturing, which is the backbone of the secondary sector, registered an increase in its percentage share in Bihar by only +0.83 points instead of a more prominent increase which characterizes the process of dynamic development. At the all-India level, the share of manufacturing also registered a very small increase of +0.71 points. A more substantial positive shift within the secondary sector is contributed by construction activity in Bihar (+1.93). In the tertiary sector, the two major sub-sectors in terms of income generated are trade, hotels & restaurants (13.77 per cent) and public administration (9.44 per cent) (Institute for Human Development, 2007).

In terms of workforce structure, Table 2.9 shows the NSS figures for 1993-94, 1999-2000 and 2004-2005. The bulk of the workforce in Bihar (73.5 per cent in 2005) is engaged in the primary sector as against 59.07 per cent in case of India as a whole. The second most prominent sector is the tertiary sector with 17.39 per cent in case of Bihar and 23.36 per cent in India as a whole. Bihar has, thus, lagged behind the average for All-India in terms of tertiary sector dependence of the workforce. The secondary sector absorbed only 9.12 per cent in Bihar vis-à-vis 17.57 per cent at the All-India level. The relative gap between All-India and Bihar sectoral employment percentages is, thus, the largest in the secondary sector, which is the weakest sector. It is also evident that structural dependence on the primary sector is far more prominent in Bihar, both in relation to the secondary and tertiary sectors of Bihar as also in comparison to the country as a whole. This reflects the underdevelopment of the state economy.

(iv) Growth Performance

Growth performance of any region conveys a bird's eye view of the nature of dynamism, or lack thereof, present in the concerned region. A more dynamic region would, by and large, also possess greater capability to overcome food insecurity, though it would also depend upon the sectoral composition of its overall growth. The growth performance of Bihar has been pretty poor as compared to the All-India average. Table 2.10 gives aggregate and sectoral growth rates for Bihar during 1994-2006.

Table 2.9: Employment Structure: Percentage of Sectoral Workforce

Industries	Bihar			India		
	1993-94	1999-00	2004-05	1993-94	1999-00	2004-05
Agriculture, forestry & fishing	77.57	77.11	73.40	64.75	59.84	58.50
Mining & quarrying	0.76	0.21	0.10	0.75	0.57	0.57
Primary	**78.33**	**77.32**	**73.50**	**65.50**	**60.41**	**59.07**
Manufacturing	4.58	6.61	6.15	11.35	12.09	11.73
Electricity	0.32	0.08	0.08	0.36	0.32	0.27
Construction	1.57	1.51	2.89	3.12	4.44	5.57
Secondary	**6.47**	**8.20**	**9.12**	**14.83**	**16.85**	**17.57**
Trade, hotels & restaurants	6.17	6.88	9.50	7.42	9.40	10.24
Transport, storage & communication	1.62	1.79	2.60	2.76	3.70	3.83
Finance, real estate & business	0.36	0.53	0.60	0.94	1.27	1.55
Pub admn, edu, health & others	6.46	5.29	4.69	9.38	8.36	7.74
Tertiary	**14.61**	**14.49**	**17.39**	**20.50**	**22.73**	**23.36**

Note: *Total Workforce based on the Usual Principal and Subsidiary Status.*
Source: *NSS, Various Rounds.*

As evident from Table 2.10, for the period from 1993-94 to 2005-06, the overall trend growth rate of GSDP of Bihar at 4.36 per cent per annum emerges to be lower than the growth rate for the country as a whole at 6.63 per cent. The primary sector growth rate is 1.99 per cent per annum, which is lower than at the All-India level (2.81 per cent) despite the inherent comparative advantage of Bihar in its agricultural and allied activities. Trend rate of growth of the agricultural sector, in fact, is only 1.65 per cent per annum.

Table 2.10: Growth Rates of Bihar and India, 1993-94 to 2005-06

Sectors	Average Annual Growth Rate (AAGR)		Trend Growth Rate (TGR)	
	Bihar	All India	Bihar	All India
Primary	3.39	3.57	1.99	2.81
Secondary	7.27	8.17	7.01	6.97
Tertiary	5.95	9.20	6.10	8.71
Gross State Domestic Product	4.59	7.36	4.36	6.63

Source: *Calculated from CSO, Various Years.*

In case of the secondary sector, the growth rate in case of Bihar (7.01 per cent) works out to be marginally above that of India as a whole (6.97 per cent). Growth performance of manufacturing (5.47 per cent), in fact, was lower than that at the All-India level (6.98 per cent). It is mainly construction (9.60 per cent) in Bihar which registered impressive growth rates, both absolutely as well as in comparison to the All-India growth rates (7.54 per cent).

The tertiary sector of Bihar has exhibited a lower rate of growth (6.10 per cent) than the All-India rate of growth (8.71 per cent).

Some of the sub-sectors have exhibited very wide variations in the annual growth rates during 1993-94 to 2004-05 (See Table 2.11). Among these, agriculture & allied activities are generally subject to considerable fluctuations. This is particularly so in the case of Bihar where agriculture displays violent fluctuations from year to year. Variations of this magnitude show the growth process in Bihar to be highly unstable even in sub-sectors like those in the tertiary sector where the co-efficient of variation (CV) is generally not that high.

(v) Role of Agricultural Sector

Bifurcation of Bihar in 2000 has brought out certain basic features of the state. The dominance of agriculture in Bihar's economy has become more apparent. In terms of population dependent on agriculture as well as share of agriculture in the State GDP, the numbers for Bihar are significantly higher than the pre-partition figures. These are also higher than the national average and almost all other states in the country. It is thus evident that the agriculture sector should assume centre-stage now.

Table 2.11: Coefficient of Variation of GSDP/GDP in Bihar and All-India (1994-2006)

	Sector	Bihar	India
Primary		*613.61*	*137.79*
1.	Agriculture	661.36	193.53
2.	Forestry & logging	102.28	72.20
3.	Fishing	136.03	90.35
4.	Mining & quarrying	280.36	109.83
Secondary		*228.38*	*52.53*
5.	Manufacturing	373.29	57.29
	5.1 Registered manufacturing	355.27	63.66
	5.2 Unregistered manufacturing	380.93	51.57
6.	Construction	161.90	62.70
7.	Electricity, gas, water supply	115.27	34.86
Tertiary		*125.63*	*29.74*
8.	Transport, storage & communication	40.28	29.24
	8.1 Railways	43.04	57.19
	8.2 Transport by other means	141.73	47.05
	8.3 Storage	-	243.78
	8.4 Communication	49.01	18.90
9	Trade, hotels & restaurants	404.79	39.76
10	Banking & insurance	127.29	59.01
11.	Real estate, ownership of dwellings and business services	19.57	52.69
12	Public administration	122.38	73.57
13.	Other services	202.52	28.72
14.	State Domestic Product (SDP)	267.04	39.77

Source: *Calculated from CSO, Various Years.*

Agricultural production cannot exhibit major gains unless it is backed by adequate supply of water. This is particularly so in the contemporary post-Green Revolution scenario in which agricultural productivity is crucially dependent upon irrigation, which determines the extent to which fertilizers can be profitably utilized. Similarly, even in rainfed areas, irrigation is crucial for overcoming the vagaries of rainfall and its timing. This is essential for raising overall agricultural production over a seasonal cycle and maintaining its upward path without undue fluctuations.

Agriculture in Bihar is much more dominated by small farms with fragmented landholdings than in India as a whole as well as the majority of other states. More than 84 per cent of the farmers have less than one hectare of operational holding and the average size of operational holding in the state is only 0.6 hectare, against the national average of about 1.06 hectares (IHD, 2007).

There is a very high rural population density in Bihar implying an intensive land use pattern. About 61 per cent of the reporting area is cultivated in the state as compared to 51 per cent in the country as a whole. The area under forests has increased slightly. Marginal lands (culturable and unculturable wasteland under village commons, rivers and tank beds) have also been brought under cultivation. Vertical intensification is also high and cropping intensity is 143 per cent. This compares well with 189 per cent in the Punjab, which has 94 per cent gross irrigated area as against 55 per cent in Bihar (Institute for Human Development, 2007).

Somewhat more than 61 per cent of land resources of the state are locked into crop production. Foodgrain crops account for 87 per cent of the gross cropped area (GCA) in the state (Institute for Human Development, 2007). On the other hand, at the country level, only about 65 per cent area is occupied by foodgrain crops.

2.3 Health and Nutritional Status

A healthy person has a higher capacity to work. The health of an individual is directly related to his or her economic status. Health and nutritional status can be measured through a number of indicators. While mortality under age one (infant mortality) is an indicator of poor reproductive health facilities and antenatal care, mortality under age five is closely linked with health and nutrition services including

Table 2.12: Mortality and Nutritional Status of Children and Women[*]

	Under-five Mortality	Infant Mortality	Under-weight Children(%)	Wasted Children (%)	Stunted Children (%)	Anemic Children (%)	Thin Women (%)
India	74.3	57	42.5	19.8	48.0	69.5	35.6
Uttar Pradesh	96.4	72.7	42.4	14.8	56.8	73.9	36.0
Madhya Pradesh	94.2	69.5	60.0	35.0	50.0	74.1	41.7
Jharkhand	93.0	68.7	56.5	32.3	49.8	70.3	43.0
Orissa	90.6	64.7	40.7	19.5	45.0	65.0	41.4
Chhattisgarh	90.3	70.8	47.1	19.5	52.9	71.2	43.4
Rajasthan	85.4	65.3	39.9	20.4	43.7	69.7	36.7
Assam	85.0	66.1	36.4	13.7	46.5	69.6	36.5
Bihar	84.8	61.7	55.9	27.1	55.6	78.0	45.1
Maharashtra	46.7	37.5	37.0	16.5	46.3	63.4	36.2
Best State	*16.3 (Kerala)*	*15.3 (Kerala)*	*22.9 (Kerala)*	*9.2 (Punjab)*	*24.5 (Kerala)*	*44.5 (Kerala)*	*18.0 (Kerala)*
Worst State	*96.4 (UP)*	*72.7 (UP)*	*60 (MP)*	*35.0 (MP)*	*56.8 (UP)*	*78.0 (Bihar)*	*45.1 (Bihar)*

Source: National Family Health Survey, 2005-06.

Note:* Only those states have been selected that have under-five mortality higher than 80 per thousand live births.

immunization and overall poverty levels. The latter is also useful for assessing both social practices and public policy and can be taken as a comprehensive indicator for the overall quality of life.

Table 2.12 shows the comparative mortality as well as nutritional status of children for states with an under-five mortality figure higher than 80 per 1000 live births. The under-five mortality rate in Bihar is 85 per 1000 live births which is higher than the national average. Bihar is also suffering from a higher infant mortality rate (62 per 1000 live births versus 57 per 1000 live births at the All-India level). For all malnutrition indicators, the figures for Bihar remain consistently poor.

Table 2.13 shows that in terms of the nutritional status of children, Bihar is lagging behind the national averages as well as trends in all indicators.

Table 2.13: Nutritional Status of Children (NFHS II and III)

Variable	NFHS III (2005-06)			NFHS II (1998-99)
Children (under 3 years)	Total	Urban	Rural	Total
Bihar				
Stunted (per cent)	50.7	40.2	52.0	58.4
Wasted (per cent)	32.9	3.6	33.1	25.4
Underweight (per cent)	55.5	45.2	56.8	52.2
India				
Stunted (per cent)	44.9	37.4	47.2	51.0
Wasted (per cent)	22.9	19.0	27.1	19.7
Underweight (per cent)	40.4	30.1	43.7	42.7

Note: *Bihar Figures for NFHS III have been calculated from unit level data.*
Source: *NFHS III and NFHS II Reports.*

Bihar is in the worst position among all other states in India if we consider the number of anaemic children and thin women per thousand.

High malnutrition levels – coupled with high mortality among children – point towards poor feeding practices in Bihar. But, poor access to food emanating from grave economic conditions is the prime reason for such a situation in this state.

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3. Analysis of Food Security

Food security is an outcome of the combination of food access of the household and the individual, and of the ability of the body to absorb nutrients. In more detail, food security of an individual is the result of:

a) Food availability of the household, which results from own production of food retained for household consumption, plus food purchased from the market through sale of other commodities, whether labour time or products, and any non-production based entitlements to food.

b) Household's access to food, depending upon socio-economic status and factors governing intra-houshold food distribution.

c) Capacity of an individual to absorb the consumed food - a factor affected by access to safe drinking water and health facilities.

3.1 Measuring Food Security Status

Given this definition of food security, how can its attainment be measured? Food security is a combination of access to food and its absorption by the body, which depends on a number of non-food factors such as sanitation, access to clean drinking water, access to health facilities, and so on. The outcome of food security can be taken to be the nutritional status of the individual, with the understanding that food intake is the basic, though not the only factor, that affects nutritional status.

In developing countries, the rural population, particularly children, are vulnerable to malnutrition because of low dietary intake, poor quality of diet, lack of appropriate care and inequitable distribution of food within the household. The measurement of the nutritional status of children is done through anthropometric methods; these include weight-for-age, height-for-age and weight-for-height. Each of these indices provides somewhat different information about the nutritional status of children. The height-for-age index measures linear growth retardation. Children who are more than two standard deviations below the median of the reference population in terms of height-for-age are considered short for their age or 'stunted'. The proportion in this category indicates the prevalence of 'chronic under-nutrition', which often results from a failure to receive adequate nutrition over a long period of time or from chronic or recurrent diarrhoea (NFHS, 2007).

The weight-for-height index examines body mass in relation to body length. Children who are more than two standard deviations below the median of the reference population for the same index are considered too thin or 'wasted' and this indicates prevalence of acute under-nutrition. Wasting is associated with the failure to receive adequate nutrition in the period immediately before the survey and may be the result of seasonal variations in food supply or recent episodes of illness (NFHS, *op cit*).

Children who are more than two standard deviations below the reference median on the index of weight-for-age are considered to be 'underweight'. We have opted for the proportion of underweight children as the indicator for capturing malnutrition among children, the primary reason being that weight-for-age is a composite measure that takes into account both chronic and acute under-nutrition. Secondly, while information on stunting and wasting is available at the state-level from the NFHS, the same is not available at the district level. The Reproductive and Child Health Survey, through its District Level Household Survey (DLHS), does give information at the district level but only for the index on weight-for-age. Therefore, we have selected this index as one of the two indicators for measuring food insecurity status.

Malnutrition in children weakens their immune system, making them more susceptible to disease and less able to fight off infection. It has been estimated that a child is almost ten times more likely to die from key diseases if he/she is severely underweight, and two and a half times more likely to die if he/she is moderately underweight, as compared to an average weight child (Black, *et al.*, 2008). Given the fact that more than 3.5 million children die globally on account of under-nutrition, it emerges as a major factor leading to child deaths.

Therefore, under-five mortality has been taken as the second indicator for measuring food insecurity. The under-five mortality rate indicates the probability of dying between birth and five years of age, expressed per thousand live births. There are a number of advantages of using the under-five mortality rate as an indicator of food insecurity. Under-five mortality is known to be the 'outcome' of the development process rather than an 'input', such as per capita calorie or protein consumption or access to medical facilities which are means to an end. Under-five mortality is known to be the outcome of a wide variety of factors, for instance, nutritional status of the child and its mother, food availability in the family, level of immunisation, availability of maternal and child health services, economic status, availability of safe drinking water, basic sanitation, and so on (UNICEF, 2005). Thus, under-five mortality encompasses a number of facets, most of which have been used as explanatory indicators, as already enumerated and as discussed later.

The significance of under-five mortality as an indicator lies in the fact that it is less susceptible to the fallacy of averages than, for instance, per capita income. This is because the natural scale does not allow children of the rich to be 1000 times as likely to survive, even if the human-made scale does permit them to have 1000 times as much income. To put it simply, it is much more difficult for a wealthy minority to affect a region's under-five mortality rate, and therefore it puts forward a more accurate picture of the health and nutritional status of the children of that region (UNICEF, 2007a).

The UN explicitly mentions reduction of under-five mortality by two-thirds by 2015 as one of its primary MDGs (MDG–4). The interrelation between nutritional status and under-five mortality can be gauged from the fact that under-nutrition contributes up to 50 per cent of all child deaths (WHO and UNICEF,

2006). Improving nutrition and achieving MDG–1 (eradication of extreme poverty and hunger) would substantially help avert child deaths from diarrhoea, pneumonia, malaria, HIV, or measles. Thus, improving nutritional status is a pre-requisite for achieving MDG–4 (UNICEF, 2006).

As many as 60 countries across the globe have been prioritised for urgent action, based on two criteria: countries with more than 50,000 deaths of children under five and countries with an annual under-five mortality of at least 90 per 1000 live births. In 2005, these 60 countries accounted for 93 per cent of all deaths of children under five. India figures prominently among these countries and shares place along with four other South Asian countries. Regrettably, India does not appear to be on track to achieve the MDG-4 (UNICEF, 2006) (See Box 3.1).

A statistical analysis of the NFHS–3 data across states reveals a significant negative correlation between micro-nutrient intake and proportion of underweight children and under-five mortality, implying thereby that an increased intake of micronutrient significantly reduces the risk of under-nutrition, which in turn, contributes to reduction in under-five mortality (Table 3.1).

Table 3.1: Correlation between Micronutrient Intake and Under-nutrition and Mortality Status

	Under 5 Mortality	Underweight Children	Vitamin Intake	Iron Intake
Under-5 Mortality	1.00	0.714**	- 0.501**	- 0.523**
Underweight Children		1.00	- 0.227	- 0.450*
Vitamin Intake			1.00	0.555**
Iron Intake				1.00

** Correlation significant at 0.01 level   * Correlation is significant at 0.05 level

3.2 The Food Security Outcome Index

Food Security Outcome Index (FSOI) can be assessed in terms of morbidity rate, body-mass index (BMI) and life expectancy. Data for some of these variables do not exist at the district level, while in case of others they cannot be readily accessed. In the absence of the relevant district level data, one has to draw upon district level variables which can act as the nearest proxies. There is abundant evidence that child-related outcome indices are very closely related to food security. This is particularly true in case of third world countries like India where the demographic structure is such that children form a very high proportion of total population. There are two child-related variables for which the District Level Household Survey of Reproductive and Child Health provides data at the district level and which are fairly accurate indicators of food security outcomes. These are under-five mortality rate for children and child under-nutrition as reflected in the proportion of underweight children. They have also been made use of in the World Hunger Index, prepared by International Food Policy Research Institute (IFPRI). Thus, the district level food security outcome index, is based on these two indicators (Table 3.2).

These two indicators have been converted into indices using the Range Equalisation Method. These two indices have been composited by taking their average to obtain a Food Security Outcome Index. However, it needs to be borne in mind that high values of this index reflect a low level of food security rather than a high level of food security since both variables, i.e. under-five mortality rate and proportion of underweight children are high where food security is poor. In order that a high value of this index comes to be associated with high food security districts, the FSOI values have been subtracted from 1. Table 3.3 and Map 3.1 presents the FSOI of districts in five different categories of food security from Secure to Extremely Insecure.

On the basis of this index, the districts have been classified into five groups, namely, those which are secure (S), moderately secure (MS), moderately insecure (MIS), severely insecure (SIS) and extremely insecure (EIS). The classification has been done on the basis of five equal divisions of values lying between the maximum and minimum overall Food Security Outcome Index values.

Table 3.2: Indicators Used to Compute Food Security Outcome (FSO) Index

Districts	Under-Five Mortality	Rank	Under-weight	Rank	FSOI	Rank
Araria	141.1	36	62.6	35	0.365	37
Aurangabad	123.4	32	60.0	34	0.462	34
Banka	99.1	14	44.3	2	0.670	5
Begusarai	106.4	21	48.5	6	0.611	12
Bhagalpur	99.5	15	55.6	20	0.598	15
Bhojpur	96.0	7	50.9	12	0.643	9
Buxar	96.9	9	56.8	24	0.602	14
Darbhanga	113.0	28	58.0	27	0.522	27
Gaya	108.0	22	59.2	31	0.537	25
Gopalganj	93.7	5	57.1	25	0.615	11
Jamui	106.1	20	55.4	19	0.569	21
Jehanabad	111.5	25	59.5	32	0.519	28
Kaimur	125.3	33	58.6	28	0.462	33
Katihar	123.1	31	53.2	16	0.506	29
Khagaria	101.7	18	56.2	23	0.584	17
Kishanganj	144.5	37	52.5	15	0.413	36
Lakhisarai	112.7	26	49.0	7	0.579	18
Madhepura	98.2	12	71.4	37	0.505	30
Madhubani	97.2	10	62.9	36	0.563	22
Munger	86.4	2	51.1	13	0.686	3
Muzaffarpur	122.5	29	50.8	11	0.523	26
Nalanda	108.3	23	50.4	10	0.590	16
Nawada	96.3	8	50.2	9	0.646	8
Pashchim Champaran	99.5	15	59.6	33	0.573	20
Patna	91.2	4	45.4	3	0.699	2
Purba Champaran	112.7	26	54.3	17	0.546	24
Purnia	122.5	29	54.7	18	0.499	31
Rohtas	94.4	6	47.5	5	0.672	4
Saharsa	97.2	10	56.1	22	0.605	13
Samastipur	105.8	19	57.8	26	0.556	23
Saran	86.7	3	45.7	4	0.718	1
Sheikhpura	111.2	24	37.4	1	0.659	7
Sheohar	131.8	35	52.0	14	0.474	32
Sitamarhi	125.6	34	58.7	30	0.460	35
Siwan	84.2	1	55.8	21	0.666	6
Supaul	100.7	17	58.6	28	0.574	19
Vaishali	98.8	13	49.8	8	0.637	10

Source: *Underweight from RCH-DLHS (2002-04): Under Five Mortaility Rate computed from Census (1991 and 2001) by Shekhar, et al. (2004). FSOI computed based on these data by IHD.*

Map 3.1: Food Security Outcome Map of Bihar

Outcome Index

- Secure [0.06475 - 0.7180]
- Moderetely Secure [0.5769 - 0.6474]
- Moderately Insecure [0.5063 - 0.5768]
- Severely Insecure [0.4357 - 0.5062]
- Extremely Insecure Insecure [0.3650 - 0.4356]
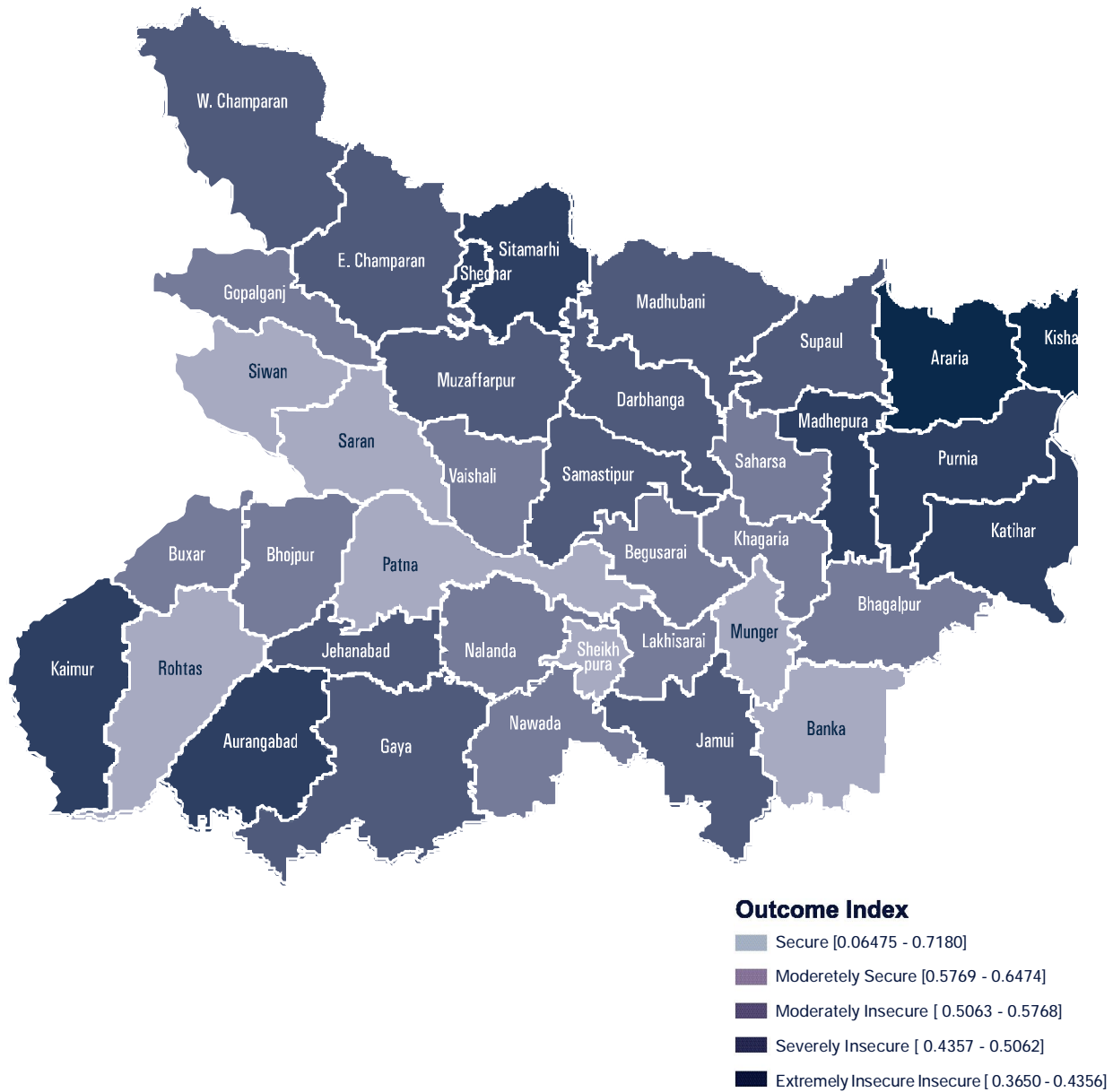
Table 3.3: Bihar Food Security Outcome Index (FSOI) Status

Secure	Moderately Secure	Moderately Insecure	Severely Insecure	Extremely Insecure
Saran	Nawada	Supaul	Katihar	Kishanganj
Patna	Bhojpur	Pashchim Champaran	Madhepura	Araria
Munger	Vaishali	Jamui	Purnia	
Rohtas	Gopalganj	Madhubani	Sheohar	
Banka	Begusarai	Samastipur	Aurangabad	
Siwan	Saharsa	Purbi Champaran	Kaimur	
Sheikhpura	Buxar	Gaya	Sitamarhi	
	Bhagalpur	Muzaffarpur		
	Nalanda	Darbhanga		
	Khagaria			
	Lakhisarai			
Number of Districts = 7	11	10	7	2

As may be observed from Table 3.3, the secure group contains 7 districts, followed by 11 in the moderately secure group which is the largest group, 10 in the moderately insecure group, 7 in the severely insecure group, and 2 in the extremely insecure group.

The two most food insecure districts are Araria and Kishanganj. As may be seen from Map 3.1, these lie in the north-east corner of Bihar and belong to the least developed region. As brought out earlier, the Northern portion of Bihar is by and large less developed than the Southern region. Among the seven districts in the very insecure category, Katihar, Madhepura, Purnia, Sheohar and Sitamarhi also lie in the Northern least developed region. Thus these nine districts belonging to the severely or very food insecure category need to be the special target of policies to eliminate food insecurity.

The ten districts in the moderately insecure (MIS) category comprise a mix of districts. Supaul, Purbi Champaran, Paschim Champaran and Madhubani all lie in the Northern region and belong to the low development category. Jehananbad belongs to the Southern region. The remaining districts all lie in the Southern region, which is relatively more developed. In contrast, the eighteen districts belonging to the secure (S) and moderately secure (MS) category are mostly located in the Southern region with the exception of two or three districts, e.g. Gopalganj, Saharsa and its neighbour Khagaria.

3.3 Explaining Food Security

Taking the under-five mortality and child malnutrition rates as the outcomes of food security, one could rank districts on the basis of this index, as done earlier. If the objective of the exercise were merely

to decide on the districts in which to concentrate food security interventions, then such a ranking would be sufficient. But this would say nothing about the *types* of interventions that should be undertaken in order to improve food security, which is one of the key objectives of the study.

However, food security indicators can draw attention to the factors and specific areas that distinguish the food secure from the food insecure districts. Of course, such association between indicators in an index cannot tell us what the causal relation between them and food security is. For instance, if we find that the adult female literacy is consistently higher in food secure districts and consistently lower in food insecure districts that only shows a correlation between adult female literacy and food security. A deeper analysis is required to explain why such a relationship exists. Whether it is due to an enhanced women's agency contributing to a better utilisation of household income, or through literate women having a better knowledge of improved nutritional practices, or some other relation, it is for analysis to bring out these relations. But the indicators can draw attention to the issues for which significant differences exist. It would even be possible to rank these variables, a rank that would point to the extent to which these variables are different between districts. Such an analysis could also point to variations between food insecure districts – the same variables may not contribute the most to the low index in all districts, or some of them may even move in opposite directions.

Food security is the ability of a household to command food (its food entitlements), generally acquired through the net result of its livelihood activities (plus any other non-livelihood-based entitlements), that is crucial in determining food security of the household. These livelihood activities, from the point of view of food security, are valued not only for the food they might directly produce, if at all they produce food, but also from the point of the command over food that they give to the household. It is at this level of effective demand for food (both consumed out of self-production and purchased) that market failures take place, requiring public intervention of different kinds. Food production, or agricultural production contributes as main part of rural livelihood activities that provide command over food.

Within a household, it is known that there are gender differences in entitlements. Consequently, it is necessary to deal with not just factors influencing household entitlements, but also those influencing individual entitlements within the household. Factors of gender differentiation and discrimination come into the picture in influencing individual entitlements of women and men, girls and boys. Further, there could be a substantial imbalance between the use of energy and its replacement through food. Given that women generally work longer hours than men and that women also get less nutrition than men, this imbalance could itself be a factor in nutritional shortfalls for women.

Entitlements are not only based on an individual's or household's own economic attainments. There are also government – or community-based – entitlements. Government-organised entitlements have been gaining in importance, while community-based entitlements have been in decline, even among *adivasis*. The operation of various schemes, such as the Mid-Day Meal Scheme in schools, do have

some, even substantial, impact on the access of children, girls and boys, to food. The performance of these schemes depends very substantially on demand from below for provision of these services, and also on the involvement of women in local governance. But, the entitlements that come through special interventions have been separated in our analysis from those that provide the 'normal' entitlements to food. Of course, we also try to see whether there is a connection, as there ought to be, between the food security status of a district and the public interventions in that district.

It therefore emerges that there are a number of indicators that influence food insecurity in one way or the other. We have combined these indicators into a set of three broad food security indices:

1. Production factors (at the district level) influencing *availability*;

2. Household and individual *access* to food; and

3. Ability to *absorb* food.

3.3.1 Food Availability

The concern for food availability stems from production and related aspects that sustain a desired level of food production (Box 3.2). Foodgrains are considered to be of paramount significance for household food and nutritional security, the reason being that cereals and pulses are staple foods and there are no perfect substitutes for them (Chand, 2007). Foodgrains are also the cheapest source

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Box 3.2. Agricultural Production and Food Security

It is commonly believed that agricultural production directly affects food security. However, there is more to it than a mere direct link. Rising agricultural productivity increases rural incomes and lowers food prices, making food more accessible to the poor. Improving irrigational facilities and growing drought-tolerant crops reduce income variability by mitigating the impact of drought. Productivity enhancements are key to greater food security for households with limited access to food markets. Nutritionally enriched crops give access to better diets, particularly through biofortification that substantially improves the nutrient content of the crop.

Thus investments in agriculture are important to ensure food security. However, there is an increasing concern about global food security in future, largely consequent upon growing resource scarcity and climate change. In the present world, many countries have diversified their export base, and trade at large stabilizes food availability. However, food availability is still a concern in many agriculture-based countries. Many countries have declining per capita production of food staples. Further, staple crop production in most of these countries is rain-fed and experiences large fluctuations caused by climatic variability.

The increase or even sustenance of the present level of production is limited by a number of factors – land constraints, water scarcity, high energy prices – along with the uncertain effects of climate change, which has been considered to be one of the areas of greatest uncertainties for agriculture. The combined effects of higher average temperatures, greater variability of temperature and precipitation, more frequent and intense droughts and floods and reduced availability of water for irrigation can be devastating for agriculture, particularly in the tropical regions. It has been predicted that agricultural GDP in Sub-Saharan Africa could contract by anywhere from 2 to 9 per cent.

Source: World Development Report, 2008.

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of energy as compared to other foods and are indispensable for the food security of low-income classes (Chand and Kumar, 2006).

In our analysis, the following indicators have been chosen to determine a broad picture of food availability:

1. **Per Capita Value of Agricultural Production:** Agricultural output is an indicator reflecting availability of food. Since agriculture is dependent on climate, it is advisable to take an average of three to five years' data of agricultural production to take into account the variability of production. Food and non-food production both would be included since non-food production would contribute to the income of households and therefore have an impact on food security. To account for variations in population across districts, the per capita value of agricultural production has been used.

2. **Proportion of Forests:** Forests are a form of common property resource. Availability of forest area can affect food security as access to forest products provides income and supports nutrition, depending on the type and magnitude of the produce. But there are both legal and geographical restrictions on developing production in forest areas. Thus, it can be assumed that forest area is negatively associated with food security, since it limits the extension of agricultural production.

3. **Irrigation Extent:** Irrigation has a key role in both stabilising agricultural production and, through an increase in cropping intensity and an associated increase in productivity, improving a district's food security position. It would also provide a better prospect in terms of rural employment.

4. **Rural Connectivity:** Access to paved roads has a big role in development. It reduces transport costs and can reduce transaction costs, with possible positive results on the prices realised by farmers. By improving communication, roads can increase the options available to rural producers, connecting them with larger national, regional and even international markets. Studies of rural roads have shown that they raise the productivity and value of land for poor farmers (Jacoby, 2000). It has been found that government spending on rural infrastructure, besides agricultural research and development, irrigation and rural development programmes targeted to the rural poor, have all contributed to reductions in rural poverty and increases in agricultural productivity. Marginal government expenditure on roads, in particular, has been found to have the largest positive impact on productivity growth (Fan, *et al.*, 1999).

3.3.2 Food Access

Access to food or food distribution has been regarded to be the most important factor determining food security. A household's access to food depends on its own production of food and the food it

can acquire through sale of labour power or commodities produced by it. These are linked to what Amartya Sen calls endowment and exchange entitlements: 'A person starves *either* because he does not have the ability to command enough food, *or* because he does not use this ability to avoid starvation. The entitlement approach concentrates on the former, ignoring the latter possibility' (Sen, 1981).

The following indicators have been considered in order to take into account the aspect of food accessibility:

1. **Proportion of Agricultural Labourers:** The total number of agricultural workers in the country has been estimated at 259 million as of 2004-05. Of these, more than one-third are wage workers and almost all of these are casual labourers. Agricultural labourers are characterised by extremely poor physical and human capital and also the highest poverty levels (NCEUS 2007). Thus, it is expected that the proportion of agricultural labourers will be negatively related to food security, i.e. the more the agricultural labourers in a district, the worse will be the food security situation.

2. **Proportion of Scheduled Tribes and Scheduled Castes:** The Scheduled Tribe (ST) and Scheduled Caste (SC) households are known to be generally more food insecure, largely on account of their economic and social deprivation – the former on account of geographical marginalisation and the latter due to historical deprivation and exclusion from the mainstream – all resulting in political marginalisation. The proportion of ST and SC population in a district has been taken as an indicator of this marginalisation. The assumption is that the greater the ST and SC population in a district, the less it will be associated with food security.

3. **Proportion of Working Age Population:** The ratio between the productive section of the population to the economically dependent part is a valid demographic indicator at the household level. A ratio higher than unity represents a positive scenario, with more productive population compared to the dependent population[1]. This 'demographic dividend', if effectively harnessed, leads to prosperity and hence food security (Chandrasekhar et al. 2006).

4. **Per Capita Consumption Expenditure:** The NSS estimates of per capita consumption expenditure, adjusted for inequality, is a proxy for per capita income reflecting a significant dimension of access to food. This variable accounts for all sources of income, including those which are depicted through availability of food as measured in terms of value of agricultural output. For instance, a district with low value of agricultural output along with a high value of consumption would mean that non-agricultural income, including remittances from migrants, plays a role in enabling consumption to be higher than agricultural production. This is the only way in which we can indirectly bring migration, which is such a crucial component of households' food security strategies, into the picture.

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1. One of the traits of any developed economy is a lower fertility rate, which leads to a 'bulge' in the working age group, thus improving the dependency ratio (reverse of working age group ratio), making it less than unity.

5. **Rural Female Literacy:** It is well-known that there are gender-based inequalities in food consumption within a household. Consequently, mere household consumption data or per capita household consumption data would not tell us the story of intra-household distribution of food and related facilities, such as access to medical services, which would affect the nutritional status of women and girls. That such gender-based inequalities in household consumption exist is attested to by numerous case studies (see those reviewed in Bina Agarwal, 1994). Further, the very high incidence of anaemia among women and girls shows that females are nutritionally deficient even in households that are not otherwise poor or nutritionally deficient. We have used the rural female literacy rate as the variable to represent gender-based inequality in household consumption. The argument is that a higher literacy rate for women is more likely to enable women to enhance their roles in family decision-making and increase their share of household consumption. At the same time, higher women's literacy is also likely to lead to better knowledge of nutritional systems and improved health practices in the household.

6. **Wage Rate of Rural Persons:** Casual wage workers constitute about one-fifth of the workers in the unorganised non-agricultural sector while almost all agricultural labourers are casual workers (NCEUS, 2007). Casual workers tend to be the least protected and have the lowest level of earnings. The understanding is that agricultural labour, without the backing of self-produced food, is particularly vulnerable to food insecurity. There is, therefore, a particular concern with the earnings of agricultural labour.

3.3.3 Food Absorption

The ability of the body to translate food intake into nutritional status is mediated by a number of factors, some genetic and others related to hygiene and morbidity.

The following indicators have been chosen to determine a broad picture of food absorption:

1. **Access to Safe Drinking Water:** Reduction of the proportion of people without access to safe drinking water by half has been mentioned as part of the seventh Millennium Development Goal. Polluted and contaminated water undermines the safety and the nutritional well-being of individuals. Studies have shown that water and sanitation accounts for a substantial portion of the difference in infant and under-five mortality rates experienced by the rich and the poor (Leipziger, *et al.*, 2003). Clean and safe water supply is an essential element for achieving food security and good nutrition.

    Although India has taken huge strides in terms of provision of safe drinking water since Independence, the fact remains that more people in India lack this basic minimum necessity now than 50 years ago. This is besides the fact that more people are vulnerable to water-borne diseases (Gujja & Shaik, 2005). Empirical studies have shown that water quality is a

big problem in rural areas (Krishnan *et al.* 2003). Almost two million children die each year because of lack of clean water and lack of sanitation (UNICEF, 2007c). The availability and quality of potable water is a big factor that affects food insecurity. As there is no direct method for calculating access to safe drinking water, we have considered access to tube-wells, taps and hand-pumps as three ways of acquiring safe drinking water.

2. ***Access to Primary Health Services:*** Public health services, which reduce a population's exposure to disease through such measures as sanitation and vector control, are an essential part of a country's development infrastructure. The health infrastructure prevents the local inhabitants from exposure to diseases, for instance, through assuring food safety, vector control and health education to improve personal health behaviour (Gupta, 2005). In rural areas, all the health services are pivoted around the PHCs, hence we have taken access to them as an indicator determining food absorption.

3.4 Food Security Index (FSI)

The FSI is a composite index covering three dimensions, i.e. Availability, Access, and Absorption factors. Districts having higher index value are considered relatively more food secure as compared to districts with lower index values. All variables included in the index are for rural areas, unless otherwise specified.

Besides these three groups of factors, an additional component, i.e. public entitlement, has been used to explain how this influences food security. But the public entitlement factor is not included in the index of food security. The reason is that public entitlements enter to make up for deficiencies in normal, private entitlements. The lower the level of food security, the greater should be public entitlement.

For each of the dimensions, as discussed earlier, some relevant variables have been chosen. All indicators used to calculate the composite index should be positively related to the index. In order to do that, some of the variables have been reversed. Table 3.4 gives the indicators, source of information and the reference year. (See Appendix 2 Table A2.1 for a description of the variables). Each indicator has been categorised into five levels of food security i.e. Secure (S), Moderately Secure (MS), Moderately Insecure (MIS), Severely Insecure (SIS) and Extremely Insecure (EIS).

3.5 Food Security in Bihar

We now turn to the food security status of Bihar. It is evident from the above discussions that Bihar displays one of the highest degrees of annual fluctuations in the agriculture production in the country, mainly due to frequent floods. This obviously leads to severe negative impact on the food security in the state, both at the macro level and its corresponding highly adverse implications at the micro level for household and individual access to food within the family.

Table 3.4: Indicators Used to Analyse Food Security in Bihar

Variable	Sources	Ref. Year
(a) Availability		
1. Proportion of net irrigated area to net sown area	Department of Planning, Government of Bihar http://planning.bih.nic.in/	1998-99
2. Per capita value of agricultural output	Department of Planning, Government of Bihar downloaded from http://planning.bih.nic.in/	1997-98 to 1999-2000
3. Percentage of inhabited villages having access to paved roads	Census of India	2001
(b) Access		
1. Percentage of agricultural labour to total workers*	Census of India	2001
2. Proportion of ST and SC population to total population*	Census of India	2001
3. Ratio of working age population	Census of India	2001
4. Per capita monthly consumption expenditure (inequality adjusted)	61st NSS round	2004-05
5. Rural casual wage rate	61st NSS round	2004-05
6. Women's literacy rate (7+)	Census of India	2001
(c) Utilization		
1. Percentage of households having access to safe drinking water.	Census of India	2001
2. Percentage of inhabited villages having access to PHCs	Census of India	2001
(d) Public Entitlement		
1. Percentage of PDS beneficiaries to total BPL households	Department of Rural Development, Government of Bihar	2000

Note: Set (d) pertaining to Public Entitlement variables has been analysed but not included in the construction of the Index.

* The direction of these variables has been reversed to have a positive association with food security.

Although the overall food availability in rural Bihar has improved over the years, the per capita availability of foodgrains in Bihar is among the lowest in the country. The overall per capita availability of cereals has declined over the years. Approximately one-fourth of all the households face an acute food crisis and do not get sufficient food round the year.

According to a study conducted by the Institute for Human Development (Sharma, *et al.*, 2000), the per centage of households 'not getting enough food' round the year has come down to 26 per cent in 1999-2000 from 68 per cent in 1981-82 (Table 3.5). The situation of food availability to the landless and agricultural labour households, although considerably improved, is still grim. Almost two-thirds of the households of agricultural labourers find that they do not get enough food round the year.

Table 3.5: Households Getting Insufficient Food in Bihar

Type of Household	Percentage of Households Getting Insufficient Food	
	1981-82	1999-00
A. Land owned (in acres)		
Landless	88.6	45.00
Up to 1	69.3	17.67
1 to 2.5	54.7	9.17
2.5 to 5	35.9	2.63
More than 5	13.3	0.00
B. Social group		
Agricultural labour	88.5	66.67
Poor peasants	59.8	22.22
Big peasants	44.2	6.10
Total	67.8	25.93

Source: Sharma, Alakh N., et al., 2000.

The recent NSS estimates of consumption of food items and nutrient intake indicate that the per capita cereal intake has declined, though per capita real expenditure on all food items has increased over the years. However, the degree of shift in the consumption basket in rural Bihar has been limited and a large proportion of the population still depends mainly on the consumption of the main cereals such as rice and wheat. There is an acute food shortage among the poorer sections of the population, particularly during the agricultural off-seasons. The IHD study shows that there is a period of near starvation for at least two to three months (from August-September to October-November), coupled with a period of general food shortage for at least another two to three months during other off-seasons (Sharma, *et al.*, 2000). Apart from this, the period of shortage and starvation varies widely across different regions and population groups. Since most of the households belonging to the Scheduled Castes, agricultural labour and poor peasants depend mainly on currently produced cereals, the period of food shortage is the longest for them.

*****

4. Food Availability

The concern of food availability stems from production and related aspects that sustain a desired level of food production. Where production is largely for subsistence and is the main source of a household's food entitlement, foodgrain production is of paramount significance for household food and nutritional security. Foodgrains are also the cheapest source of energy and proteins compared to other foods, and are indispensable for the food security of the lower income groups (Chand and Kumar, 2006).

This chapter analyses food availability across a number of component dimensions. Broadly, these dimensions are production and productivity, extent of irrigation, proportion of forests, and road connectivity. The effort is to compare the overall situation in Bihar vis-à-vis other states, and then analyse and map for inter-district disparities. The chapter also shows the position of each district with respect to the selected indicators and the composite index and map of avaialability.

4.1 Agricultural Growth

Reflecting the deepening agrarian crisis in the country, growth in agricultural Gross State Domestic Product (GSDP) in India declined during the decade 1993-94 as compared to the preceding decade (see Table 4.1). While agricultural GSDP grew at a very slow rate of about 3 per cent during the decade 1983-84 to 1993-94, it came down even further to 2.2 per cent in the next period from 1993-94 to 2003-04. Additionally, during the same period, the disparities among the states also widened. The coefficient of variation in the growth of agricultural GSDP, that is a measure of the disparities among states, increased significantly from 59 to 103 over the two decades. At the same time, there was a decline in the variation across states in the growth of overall GSDP (Table 4.1).

As can be seen, Bihar jumped from a negative growth (- 0.45) during the decade 1980-81 to 1993-94 to a positive growth (2.50) during the decade 1993-94 to 2003-04, which surpassed the agricultural GDP growth rate of India (2.19). Bihar led almost all states in terms of agricultural GSDP growth rate, except for three states of West Bengal (3.45), Karnataka (3.12) and Andhra Pradesh (2.80).

4.1.1 Production

However, despite favourable soil and agro-climatic features, yield levels for most crops are low in the state. The average yields in Bihar compared poorly with the national average and the best performing state. The average productivity of rice and wheat, the dominant crops of the state, are 22 and 26 per cent lower than the national average and less than half as compared to the best performing states. The same is true for the important commercial crops like sugarcane and potato. Table 4.2 presents the average yield of foodgrains. It remains very low (1498 kgs/ha), around 215 kgs per hectare less than the all-India average and less than half that of high-performing states like Punjab (3996 kgs/ha) and Haryana (3087 kgs/ha).

Table 4.1: Growth of Agricultural GSDP and GSDP across States

State	1983-84 to 1993-94 (at 1980-81 Prices)		1993-94 to 2003-04 (at 1993-94 Prices)	
	Agricultural GSDP	GSDP	Agricultural GSDP	GSDP
Andhra Pradesh	3.05	4.58	2.80	5.63
Assam	2.12	3.51	0.51	2.93
Bihar	-0.45 ***	2.69	2.50	5.34
Gujarat	0.84 ***	5.00	1.13 ***	6.19
Haryana	4.86	6.18	1.77	5.96
Himachal Pradesh	3.08	5.89	1.30	6.53
Jharkhand			4.25	4.28
Karnataka	3.54	5.86	3.12	7.10
Kerala	4.40	5.33	-2.00 *	4.85
Madhya Pradesh	2.82 *	5.21	0.23 ***	4.14
Maharashtra	5.39 *	7.42	1.27	4.92
Orissa	-0.57 ***	3.39	0.17 ***	3.96
Punjab	4.62	5.13	2.15	4.13
Rajasthan	3.93	6.19	1.21 ***	5.32
Tamil Nadu	4.43	7.45	-0.60 ***	5.08
Uttar Pradesh	2.8	4.66	2.18	3.76
West Bengal	4.45	4.73	3.45	7.03
India	3.05	5.32	2.19	6.01
CV for States	58.72	25.43	102.88	22.75

Notes: 1. Growth is Compound Annual Growth Rate. GSDP denotes Gross State Domestic Product.
2. All growth rates are significant at 5 per cent, but for * which is significant at 10 per cent and *** which is insignificant even at 20 per cent.
3. CV denotes coefficient of variation.

Source: CSO, *Gross State Domestic Product*, Various Years.

The extent of irrigation is found to be quite sufficient – above 60 per cent – more than 20 percentage points above the national average. Cropping intensity in Bihar surpassed the national average by four percentage points. Bihar experienced relatively lower instability in food-grain production than many other states.

4.1.2 Diversification of Production

Rice is the dominant crop of the *kharif* season and it occupies 44 per cent of the cropped area. Information provided in Table 4.3 shows that rice and wheat together account for nearly 70 per cent of the cropped area. The cereals (rice, wheat, maize, barley, *ragi, jowar* and *bajra*) occupy around 78 per cent of cropped area and leave very little area for pulses and other foodgrain crops. Oilseeds have a minor presence and non-food crops (sugarcane, potato, tobacco, onion), which generate much higher value of output per hectare, are grown only on 3.5 per cent of the area. These data and

Table 4.2: Level of Agricultural Development in India

State	% of National Foodgrain Production		Foodgrain Yield (TE 2005-06)		Instability in Foodgrain Production[1]		Cropping Intensity[2]		Irrigation Extent[3]	
	(TE 2005-06)	Rank	kg/ha	Rank	(1991-2005)	Rank	(%)	Rank	(%)	Rank
India	100		1714		9.4		134.4		39.6	
Andhra Pradesh	7.1	4	2155	4	18.9	7	121.7	11	38.1	7
Assam	1.8	15	1437	9	6.2	2	143.1	6	6.2	16
Bihar	4.5	9	1498	8	17.1	6	138.8	7	60.6	4
Chhattisgarh	2.8	14	1107	14	66.6	14	116.9	13	23.1	12
Gujarat	2.9	12	1554	7	43.6	13	113.8	16	31.6	10
Haryana	6.3	7	3087	2	6.5	3	177.5	2	84.0	2
Jharkhand	1.8	16	1265	12	122.4	15	120.3	12	9.3	15
Karnataka	3.6	10	1275	11	28.7	11	116.6	14	24.9	11
Madhya Pradesh	7.1	5	1184	13	23.9	9	128.4	8	33.5	8
Maharashtra	5.4	8	909	16	25	10	127.2	9	16.9	14
Orissa	3.4	11	1334	10	38.5	12	146	5	22.9	13
Punjab	12.2	2	3996	1	5.8	1	185.9	1	95.4	1
Rajasthan	6.6	6	1053	15	229.6	16	123.8	10	33.4	9
Tamil Nadu	2.9	13	1806	6	20.8	8	115.8	15	50.2	6
Uttar Pradesh	19.7	1	2119	5	9	5	153.4	4	73.7	3
West Bengal	7.8	3	2464	3	6.6	4	176.5	3	54.5	5

Notes: 1.   Instability in production = standard deviation of growth rates of total food grain production (1991-2005)
        2.   Cropping Intensity = Gross Area Sown / Net Area Sown (expressed as percentage)
        3.   Irrigation Extent = Net Area Irrigated / Net Area Sown (expressed as percentage)

Source: Ministry of Agriculture, Government of India (Various Years).

their comparison with national figures suggest that small farm size and high subsistence pressure have forced low-value subsistence crops on land even though these have high production potential. This is exacerbated by low productivity and limited diversification to higher value crops due to a number of technical and socio-economic constraints. The cropping pattern reveals a persistent rigidity over time and continued dominance of subsistence crops.

4.1.3   Per Capita Value of Agricultural Output (PCVAO)

Among the basic indicators of availability, agricultural output within the district is undoubtedly the most important since the higher it is, the lower would be the need for transporting food and other agricultural outputs from outside the district to meet local demand. At the same time, larger food output within each farm household enhances the probability of self-consumption of food within a farm household, thus improving its nutritional status. The position of each district in terms of this variable is shown in Table 4.4 and Map 4.1.

Table 4.3: Proportion of Crops in Total Production in Bihar (TE 2003-04)

S. No.	Crop/crop groups	Percentage (TE 2003-24)
1.	Rice	44.37
2.	Wheat	24.82
3.	Maize	7.51
4.	Coarse cereals	8.40
5.	Total cereals	77.59
6.	Total pulses	9.09
7.	Total foodgrains	86.68
8.	Total oilseeds	2.10
9.	Total fibres	2.05
10.	Sugarcane	1.28
11.	Tobacco	0.23
12.	Potato	1.66
13.	Onion	0.18
14.	Total fruits and vegetables	7.51
15.	Spices and condiments	0.16

Source: Directorate of Statistics and Evaluation, Government of Bihar.

Table 4.4: Per Capita Value of Agricultural Output (in Rs.)

High		Moderate		Low		Very Low		Extremely Low	
District	PCVAO	District	PCVAO	District	PCVAO	District	PCVAO	District	PCVAO
Kaimur	1407	Auranga-bad	1094	Bhojpur	923	Araria	708	Samastipur	500
Buxar	1399			Gopalganj	900	Katihar	697	Muzaffarpur	491
Paschim Champaran	1347			Madhepura	868	Supaul	691	Bhagalpur	483
Rohtas	1342			Nalanda	821	Siwan	691	Munger	460
				Sheikhpura	815	Purba Champaran	690	Begusarai	446
				Patna	802	Purnia	678	Sitamarhi	433
				Saharsa	758	Banka	663	Madhubani	406
				Jehanabad	755	Nawada	654	Vaishali	406
				Kishanganj	740	Khagaria	650	Darbhanga	325
						Sheohar	566	Jamui	286
						Gaya	528		
						Lakhisarai	525		
						Saran	513		

Source: As stated in Table 3.4, Variable a2.

Map 4.1: Status of Agricultural Production in Bihar

Proportion of Villages having
Access to Paved Roads (%)

- High [57.23 - 66.03]
- Moderate Secure [48.43 - 57.23]
- Moderately Insecure [39.63 - 48.43]
- Severely Insecure [30.83 - 39.63]
- Extremely Insecure [22.03 - 30.83]
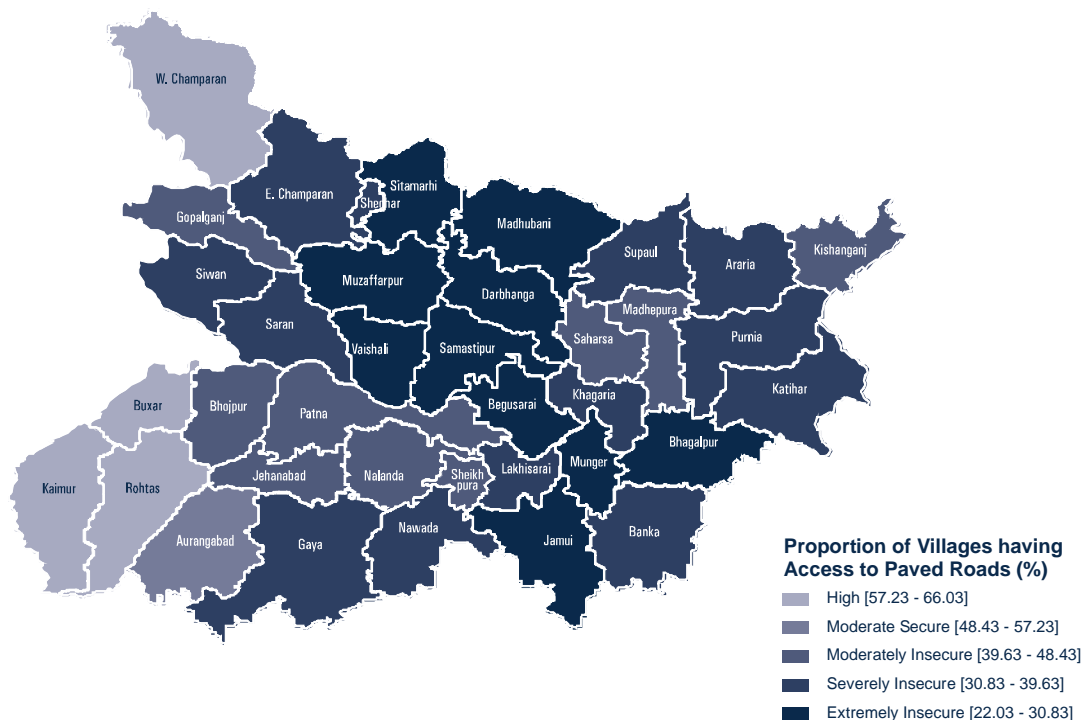
4.2. Extent of Irrigation

Gross irrigated area in the state has expanded at a much slower rate (1.82 per cent per annum) than the All-India rate of expansion at 2.6 per cent per annum. Moreover, 40 per cent agriculture in the state is rainfed making the state highly drought-prone and with low and erratic yields. Moreover, a good bit of area in its northern part is highly flood-prone. The implication, therefore, is that foolproof flood control measures have to be undertaken, possibly through up-stream utilisation of river waters for generating electricity and providing expanded irrigation utilisation which may require negotiations with the Nepal Government. In the meantime, the thrust should be on construction of anti-flood embankments as well as on executing drainage works so as to reclaim cultivation in water-logged terrain.

The extent of irrigation, represented by the ratio of the net area irrigated to the net area sown, is relatively good in most districts in Bihar. As can be seen from Table 4.5 and Map 4.2, the percentage of net irrigated area (NIA) to net sown area is high in the western and south-western part of Bihar. Buxar, Rohtas, Jehanabad and Kaimur have more than 90 per cent net irrigated area. Kishanganj has the lowest net irrigated area (15.13). Similarly, most of the northern districts have a relatively low level of irrigation facilities in comparison to southern districts like Gaya, Bhojpur, Nalanda, and Nawada which have more than 75 per cent net irrigated area.

Table 4.5: Percentage of Net Irrigated Area to Net Sown Area

High		Moderate		Low		Very Low		Extremely Low	
District	**NIA**	**District**	**NIA**	**District**	**NIA**	**District**	**NIA**	**District**	**NIA**
Buxar	99.31	Gaya	81.82	Patna	63.89	Muzaffarpur	48.08	Kishanganj	15.13
Rohtas	97.65	Khagaria	81.82	Vaishali	61.98	Samastipur	47.54		
Jehanabad	96.19	Bhojpur	81.32	Saran	54.64	Pashchim Champaran	47.48		
Kaimur	92.00	Nalanda	78.33	Katihar	54.42	Supaul	46.88		
		Nawada	78.05	Lakhisarai	51.28	Purba Champaran	46.08		
		Sheikhpura	77.42	Purnia	49.75	Sitamarhi	45.65		
		Siwan	74.1			Sheohar	42.86		
		Madhepura	73.88			Jamui	39.44		
		Begusarai	73.04			Bhagalpur	36.99		
		Saharsa	69.72			Madhubani	36.45		
		Aurangabad	69.57			Darbhanga	36.00		
		Munger	68.29			Araria	34.44		
		Gopalganj	67.32						
		Banka	65.75						

Source: As stated in Table 3.4, Variable a1.

Map 4.2: Share of Irrigated Area in Bihar

Proportion of Net Irrigated Area to Net Sown Area (%)
- Secure [82.47 - 99.31]
- Moderate Secure [65.64 - 82.47]
- Moderately Insecure [48.80 - 65.64]
- Severely Insecure [31.97 - 48.80]
- Extremely Insecure [15.13 - 31.97]

4.2.1. Returns to Cultivation

In 2003, the Situation Assessment Survey of Farmers' Indebtedness was released by the National Sample Survey Organisation. One of the aspects covered by the survey was the profitability of farming as an occupation. The returns to cultivation is a comprehensive indicator of the level of development of agriculture. An examination of returns to cultivation across states reveals that Bihar marches neck to neck with the national average. Profitability measured in terms of gross returns per hectare cultivated as well as returns to a farmer household is found to be at the average level (see Figure 4.1).

Figure 4.1 Returns to Cultivation, 2002-03
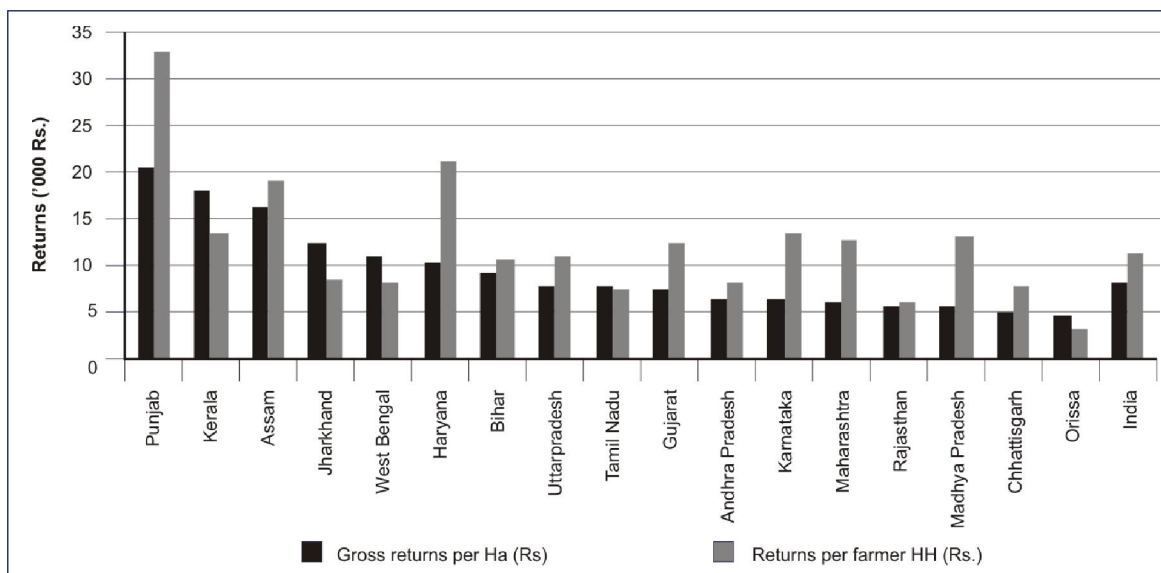
Source: Situation Assessment Survey of Farmers, National Sample Survey, 59th Round, Computed in Mishra (2007b).

4.3 Percentage of Area under Forests

This variable has been used in case of other states, but for Bihar it has been dropped since forests have an almost insignificant presence (6 per cent) in Bihar (see Table 4.6). Besides, it also details the various limitations of agricultural development in Bihar. Bihar ranks fifth in the percentage of wastelands to total area. It ranks third in the rainfall deviation from the norm. Agricultural extents which is proportion of net sown area and total reporting area is high in Bihar. Map 4.3 represents area other than forests in different districts of Bihar. It can be seen that some of the districts from South Bihar namely Kaimur, Nawada, Jamui and Munger have forest area in a quarter of their total geographical area. The rest of the districts have a very low proportion of area under forests.

Table 4.6: Environmental Limitations of Agricultural Development

	Per cent of Wastelands to total area		Rainfall Deviation from Norm		Forest Area (per cent)		Agricultural Extent* (per cent)	
	2003	Rank	TE 2004-05	Rank	2003	Rank	TE 2001-04	Rank
Andhra Pradesh	16.46	14	-8.3	11	16.2	9	36.62	13
Assam	17.89	15	6.7	1	35.5	15	35.34	14
Bihar	5.78	5	3.0	3	5.9	5	60.90	5
Chhattisgarh	5.61	4	-1.0	4	41.4	17	34.69	15
Gujarat	10.4	9	-4.3	7	7.6	6	50.83	9
Haryana	7.39	8	-6.0	9	3.4	2	80.48	2
Jharkhand	14.01	12	-5.7	8	28.5	13	22.20	17
Karnataka	7.06	7	-16.0	14	19.0	11	52.00	8
Kerala	4.6	2	-18.0	15	40.1	16	56.37	7
Madhya Pradesh	18.53	16	-8.3	11	24.8	12	33.31	16
Maharashtra	16.01	13	-13.7	13	15.3	8	57.04	6
Orissa	12.17	10	-3.0	6	31.1	14	37.08	11
Punjab	2.33	1	-24.3	16	3.1	1	84.38	1
Rajasthan	29.64	17	-27.0	17	4.6	3	43.74	10
Tamil Nadu	13.3	11	-2.0	5	17.4	10	37.05	12
Uttar Pradesh	7.05	6	-8.0	10	5.9	4	68.97	3
West Bengal	4.95	3	6.0	2	13.9	7	62.50	4
Total	17.45		-7.7		20.6		45.30	

Source: Wasteland – Wasteland Atlas, 2003; Forest – State of Forest Report, 2003; Rainfall and net area sown – Ministry of Agriculture
     * Agricultural Extent = Net area sown / Total Reporting Area x 100.

4.4 Connectivity

The percentage of villages having an approach to paved roads is essential for providing physical connectivity to markets. Connectivity efficiency in rural areas is of considerable importance for providing ready access to markets especially in a state like Bihar with a large produce of perishable fruits and vegetables. Similarly, supply of fertilisers and other agricultural inputs as also the stocks under the Public Distribution System (PDS) are dependent upon accessibility to the villages. The district-wise position in terms of this variable has been presented in Table 4.7 and Map 4.4.

Begusarai, Lakhisarai and Munger districts are found to be having relatively better connectivity in terms of proportion of villages having access to paved roads. On the other hand, southernmost districts and north-eastern districts have generally low connectivity. Banka, Jamui, Kishanganj, Katihar etc. fall under this category.

Map 4.3: Share of Area other than Forests in Bihar

Proportion of Area other than Forests [%]
High [93.53 - 100.00]
Moderate Secure [87.06 - 93.53]
Moderately Insecure [80.58 - 87.06]
Severely Insecure [74.11 - 80.58]
Extremely Insecure [67.64 - 74.11]
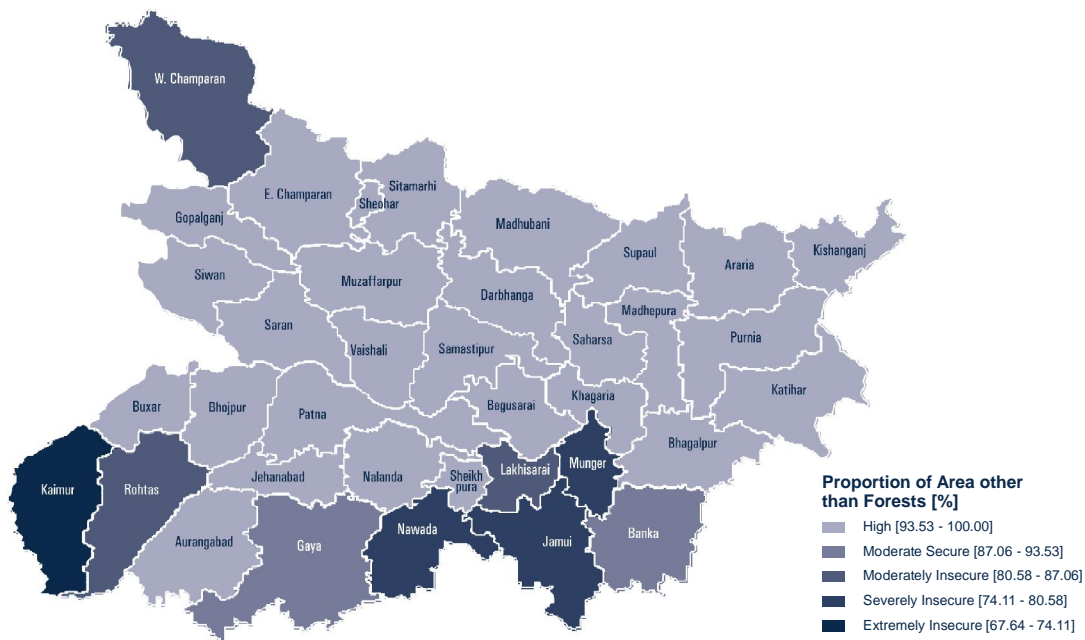
Table 4.7: Percentage of Villages having Access to Paved Roads

High		Moderate		Low		Very Low		Extremely Low	
District	Paved Roads	District	Paved Roads	District	Paved Roads	District	Paved Roads	District	Paved Roads
Sheikhpura	66.03	Samastipur	57.23	Bhojpur	46.75	Siwan	39.2	Buxar	30.33
Munger	64.21	Madhubani	52.91	Supaul	45.9	Saran	39.05	Gaya	27.04
Begusarai	62.93	Khagaria	52.28	Darbhanga	45.89	Purba Champaran	38.58	Purnia	26.06
		Bhagalpur	50.17	Vaishali	45.05	Nawada	37.89	Aurangabad	25.61
				Muzaffarpur	44.6	Jehanabad	36.46	Katihar	25.3
				Rohtas	43.89	Sheohar	36.17	Kishanganj	25.07
				Madhepura	43.32	Kaimur	35.71	Jamui	23.67
				Sitamarhi	43.22	Lakhisarai	35.33	Banka	22.03
				Saharsa	42.6	Araria	35.28		
				Patna	40.5	Pashchim Champaran	33.93		
				Gopalganj	40.28				
				Nalanda	39.8				

Source: As stated in Table 3.4, Variable a3.

Map 4.4: Status of Connectivity in Rural Bihar

Proportion of Villages having Access to Paved Roads (%)
- High [57.23 - 66.03]
- Moderate Secure [48.43 - 57.23]
- Moderately Insecure [39.63 - 48.43]
- Severely Insecure [30.83 - 39.63]
- Extremely Insecure [22.03 - 30.83]
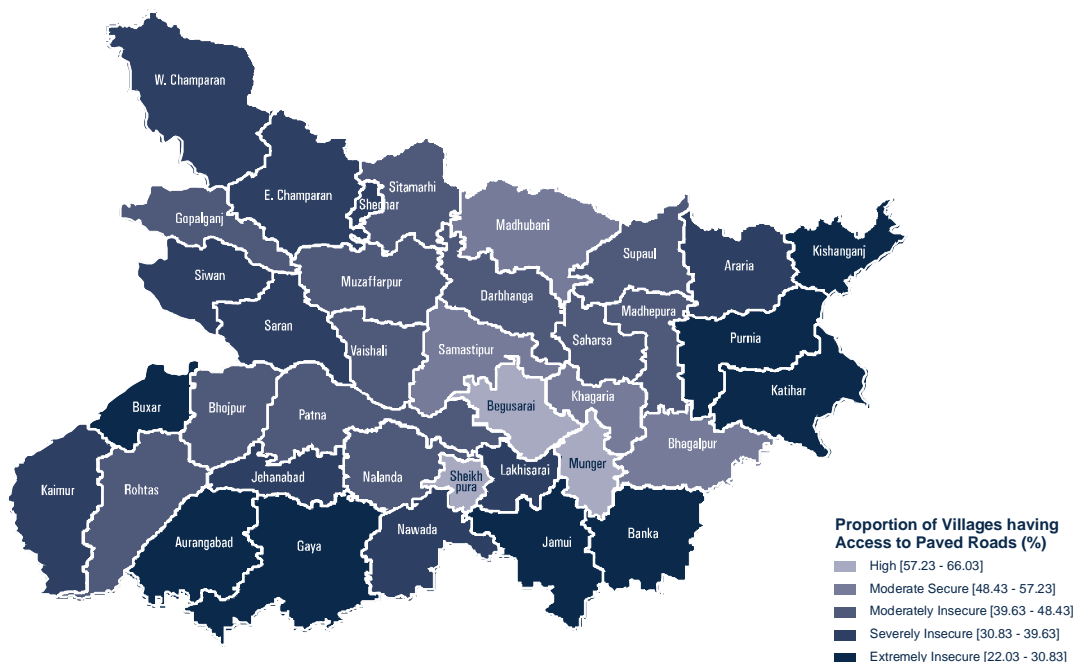
4.5 Status of Availability Index

Table 4.8 presents the indicators that have been used to form the Availability Index. These indicators have been discussed in the previous sections. Using the range equalisation method, these indicators have been computed into the availability index and districts have been categorised into five different categories of security (see Table 4.9 and Map 4.5).

As evident from Table 4.9 and Map 4.5, Jamui and Kishanganj are the districts which have been identified as the extremely insecure districts of Bihar in terms of food availability index. Northern and Eastern districts have been found to be severely insecure in comparison to the Central and Western districts. Thirteen districts are in the category of severely insecure, which require equal attention. Rohtas, Buxar, Kaimur and Sheikhpura are the four districts which have been identified as the secure districts in terms of the food availability index. Seven districts are moderately secure which comprises Bhojpur, Jehanabad, Khagaria, Begusarai, Munger, Madhepura and Nalanda. Eleven districts are in the moderately insecure category in terms of the availability index. These are Gopalganj, Saharsa, Nawada, Siwan, Patna, Aurangabad, Paschim Champaran, Gaya, Samastipur, Vaishali and Supaul. Together there are 11 districts in the two categories of secure and 26 districts in the three categories of insecure.

Table 4.8: Indicators Used in Construction of the Availability Index

Districts	PCVAO		NIA		% Area without Forest		Paved Roads	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Araria	708	15	34.44	36	99.01	26	35.28	28
Aurangabad	1094	5	69.57	15	95.58	28	25.61	33
Banka	663	21	65.75	18	93.02	29	22.03	37
Begusarai	446	32	73.04	13	99.69	11	62.93	3
Bhagalpur	483	30	36.99	33	99.26	25	50.17	7
Bhojpur	923	6	81.32	7	99.67	12	46.75	8
Buxar	1399	2	99.31	1	99.30	24	30.33	30
Darbhanga	325	36	36.00	35	99.52	19	45.89	10
Gaya	528	25	81.82	5	88.30	30	27.04	31
Gopalganj	900	7	67.32	17	100.00	1	40.28	18
Jamui	286	37	39.44	32	78.85	36	23.67	36
Jehanabad	755	13	96.19	3	99.81	7	36.46	24
Kaimur	1407	1	92.00	4	67.64	37	35.71	26
Katihar	697	16	54.42	22	99.84	3	25.30	34
Khagaria	650	23	81.82	5	99.80	8	52.28	6
Kishanganj	740	14	15.13	37	99.52	19	25.07	35
Lakhisarai	525	26	51.28	23	85.69	31	35.33	27
Madhepura	868	8	73.88	12	99.44	21	43.32	14
Madhubani	406	34	36.45	34	99.60	14	52.91	5
Munger	460	31	68.29	16	80.55	34	64.21	2
Muzaffarpur	491	29	48.08	25	99.87	2	44.60	12
Nalanda	821	9	78.33	8	97.34	27	39.80	19
Nawada	654	22	78.05	9	79.67	35	37.89	23
Paschim Champaran	1347	3	47.48	27	82.42	32	33.93	29
Patna	802	11	63.89	19	99.53	18	40.50	17
Purba Champaran	690	19	46.08	29	99.75	10	38.58	22
Purnia	678	20	49.75	24	99.54	17	26.06	32
Rohtas	1342	4	97.65	2	82.15	33	43.89	13
Saharsa	758	12	69.72	14	99.64	13	42.60	16
Samastipur	500	28	47.54	26	99.59	15	57.23	4
Saran	513	27	54.64	21	99.58	16	39.05	21
Sheikhpura	815	10	77.42	10	99.84	3	66.03	1
Sheohar	566	24	42.86	31	99.83	5	36.17	25
Sitamarhi	433	33	45.65	30	99.76	9	43.22	15
Siwan	691	17	74.10	11	99.82	6	39.20	20
Supaul	691	17	46.88	28	99.38	23	45.90	9
Vaishali	406	34	61.98	20	99.41	22	45.05	11

Map 4.5: Food Availability Map of Rural Bihar
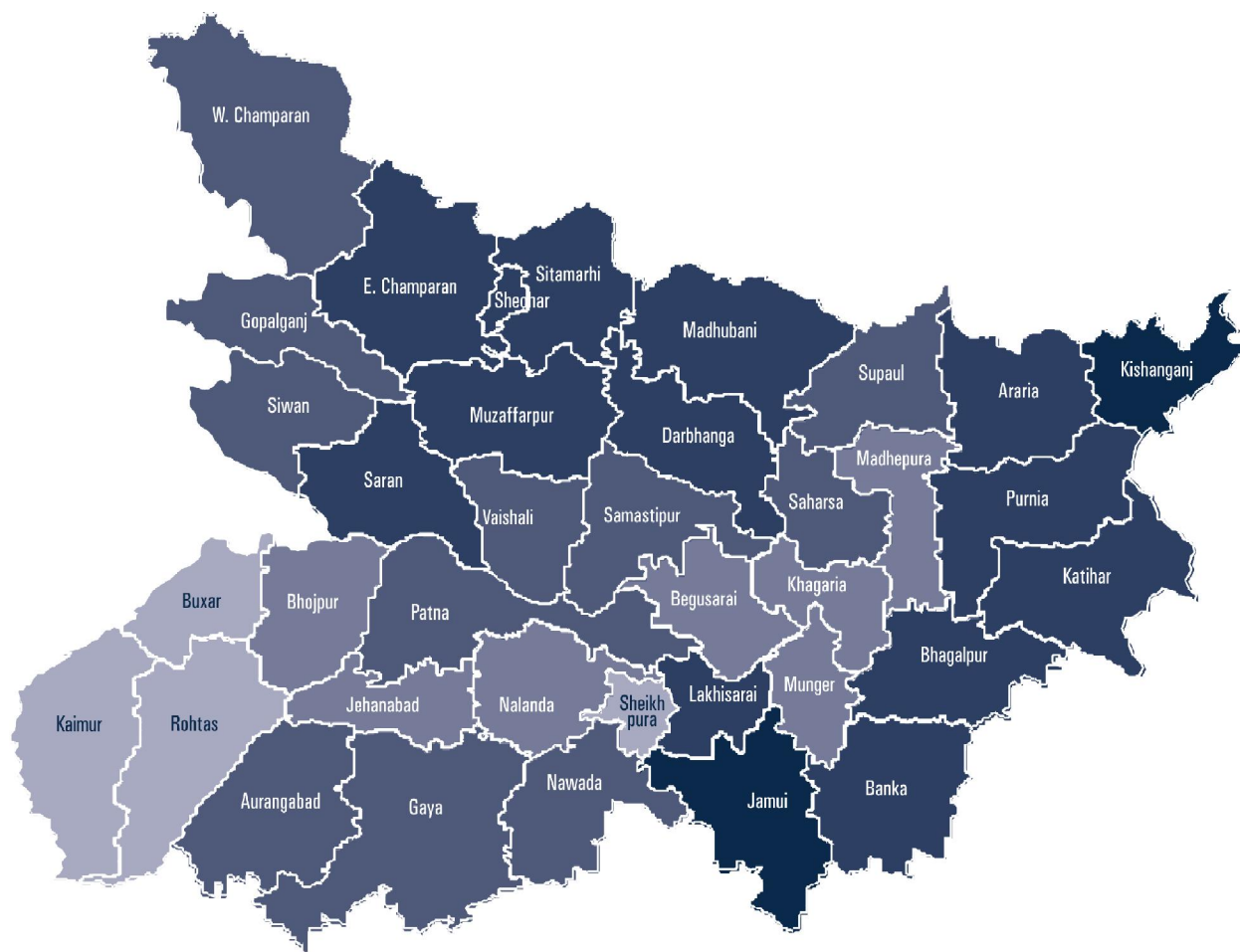
Availability Index

- Secure [0.5074 - 0.5900]
- Moderately Secure [0.4243 - 0.5074]
- Moderately Insecure [0.3413 - 0.4243]
- Severely Insecure [0.2583 - 0.3413]
- Extremely Insecure [0.1750 - 0.2583]

Table 4.9: Status of Districts in Availability Index

Secure		Moderately Secure		Moderately Insecure		Severely Insecure		Extremely Insecure	
Districts	**Index (Rank)**	**Districts**	**Index (Rank)**	**Districts**	**Index (Rank)**	**Districts**	**Index (Rank)**	**Districts**	**Index (Rank)**
Rohtas	0.59 (1)	Bhojpur	0.498 (5)	Gopalganj	0.424 (12)	Saran	0.332 (23)	Jamui	0.198 (36)
Buxar	0.552 (2)	Jehanabad	0.489 (6)	Saharsa	0.424 (13)	Muzaffarpur	0.328 (24)	Kishanganj	0.175 (37)
Kaimur	0.549 (3)	Khagaria	0.488 (7)	Nawada	0.422 (14)	Banka	0.324 (25)		
Sheikh-pura	0.543 (4)	Begusarai	0.474 (8)	Siwan	0.418 (15)	Purba Champaran	0.323 (26)		
		Munger	0.465 (9)	Patna	0.402 (16)	Bhagalpur	0.311 (27)		
		Madhepura	0.454 (10)	Aurangabad	0.4 (17)	Madhubani	0.31 (28)		
		Nalanda	0.45 (11)	Paschim champaran	0.387 (18)	Lakhisarai	0.309 (29)		
				Gaya	0.38 (19)	Sitamarhi	0.308 (30)		
				Samastipur	0.374 (20)	Katihar	0.302 (31)		
				Vaishali	0.366 (21)	Sheohar	0.288 (32)		
				Supaul	0.353 (22)	Purnia	0.287 (33)		
						Araria	0.274 (34)		
						Darbhanga	0.273 (35)		
No. of Districts	4		7		11		13		2

*****

The critical significance of access to food has been famously imprinted on the public mind by Sen's description of the Bengal famine, where people went hungry and starved, not because food was not available, but because they could not afford it (Sen, 1981). He linked the issue of access to a person's 'entitlements'. Broadly, entitlements refer to the bundle of goods and services that a person can acquire, based on his or her endowments such as wealth and assets, skills, knowledge, status, and so on. Thus, availability of food is important to food security but it is not enough; it should also be affordable and people should be able to access it. Access is tied up with people's capacity to buy food, their earnings, livelihoods and other socio-economic factors.

Access of those who may individually lack the ability to secure enough food is often bolstered through unions, community groups and self-help groups (SHGs). Thus, the ability to form and take action in groups is also a part of one's entitlements.

Historic injustice and discrimination faced by the Scheduled Castes and Tribes and by women and other marginalized groups are well-documented. This discrimination permeates all aspects of life including their livelihoods, education, health, participation in political life and access to food and the benefits of government programmes. Access to food thus depends both on the availability of economic opportunities and the social inclusion of the population in availing those opportunities.

The indicators that have been taken to discuss food acess are rural wages, monthly per capita expenditure, proportion of agricultural labourers, proportion of Scheduled Castes and Scheduled Tribes, ratio of rural working age population, rural female literacy, women's workforce participation rate and urbanization. The overall status of Bihar in relation to other states is presented first and thereafter we discuss the disparities across districts. Finally, we present the overall index of food access across districts and map food access.

Access to food is dependent basically upon purchasing power available to the population which is directly or indirectly dependent upon several factors which are discussed below:

5.1 Rural Wages

Casual workers tend to be the least protected and have the lowest level of earnings. The NSS defines the casual wage worker as one who was casually engaged in others' farm or non-farm enterprises (both household and non-household) and, in return, received wages according to the terms of the daily or periodic work contract. Table 5.1 shows that average casual rural wage rate in Bihar is Rs. 44 with only Andhra Pradesh (Rs. 42.13), Karnataka (Rs. 41.32), Maharashtra (Rs. 38.58), Orissa (Rs. 38.45), MP (Rs. 35.8) and Chhattisgarh (Rs. 34) below it. It is also rupees five below the national average casual wage rate of Rs. 49. The best performing state of Kerala in terms of average casual wage rate (Rs. 120) has an average casual wage rate that is nearly three times higher than that of Bihar.

Table 5.1: Wage Rate of Casual Workers by State

India/States	Average Casual Rural Wage		States	Average Casual Rural Wage	
	Value (Rs.)	Rank		Value (Rs.)	Rank
India	48.89	–	Kerala	119.51	1
Andhra Pradesh	42.13	12	Madhya Pradesh	35.76	16
Assam	60.18	5	Maharashtra	38.58	14
Bihar	43.95	11	Orissa	38.45	15
Chhattisgarh	34.07	17	Punjab	73.12	2
Gujarat	49.72	8	Rajasthan	62.12	4
Haryana	72.2	3	Tamil Nadu	56.48	6
Jharkhand	48.07	10	Uttar Pradesh	51.25	7
Karnataka	41.32	13	West Bengal	48.38	9

Source: NSS 59th Round – Situation Assessment Survey of Farmers, 2005.

The district-wise status of the rural agricultural wage rate has been presented in Table 5.2 and Map 5.1. Eleven districts have been found to have a casual wage rate that is higher than the national average. In Bihar, Patna district provides the highest wage rate of Rs. 58.38. At the other extreme, Nawada offers the lowest average wage rate of Rs. 31.86.

Map 5.1: Wage Rates of Rural Population in Bihar

Rural Casual Wage Rate (in Rs.)
- Secure [53.08 - 58.38]
- Moderately Secure [47.77 - 53.08]
- Moderately Insecure [42.47 - 47.77]
- Severely Insecure [37.16 - 42.47]
- Extremely Insecure [31.86 - 37.16]
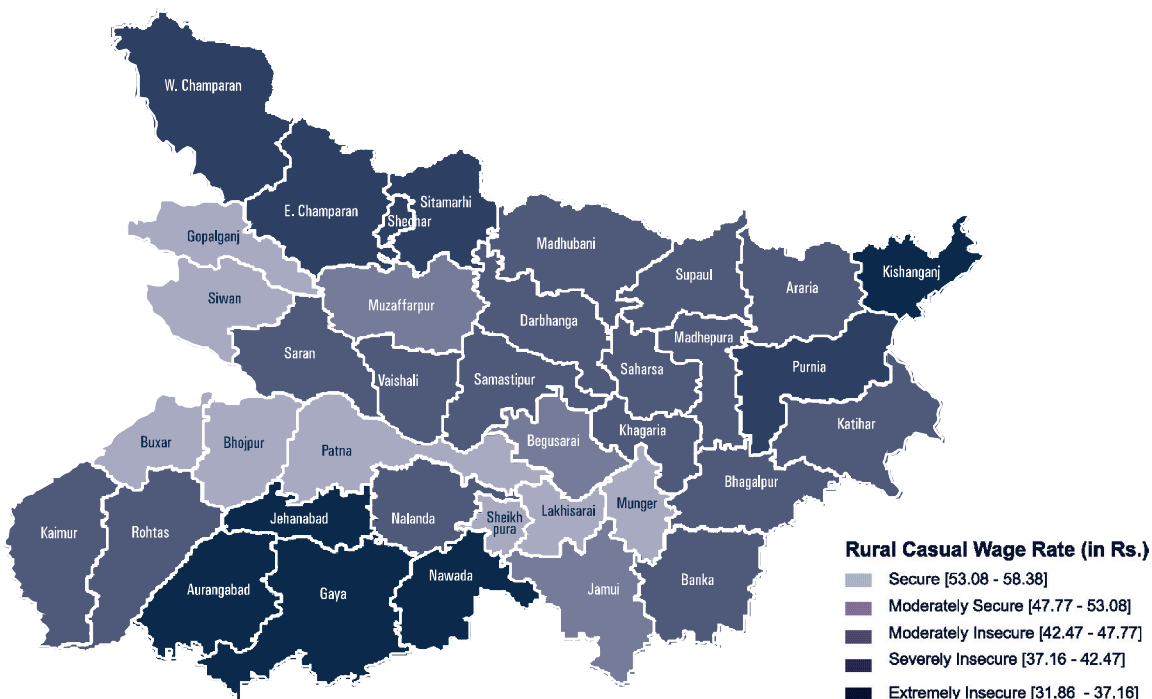
Table 5.2: Rural Casual Wage Rate by District in Bihar (in Rupees)

High		Moderate		Low		Very Low		Extremely Low	
District	**Wage**	**District**	**Wage**	**District**	**Wage**	**District**	**Wage**	**District**	**Wage**
Patna	58.38	Begusarai	50.08	Saran	47.66	Purnia	42.2	Kishanganj	36.93
Siwan	57.45	Muzaffarpur	49.69	Kaimur	47.25	Sitamarhi	41.36	Gaya	36.17
Bhojpur	55.98	Jamui	49.28	Bhagalpur	47.02	Purba Champaran	41.28	Aurangabad	33.69
Gopalganj	54.74			Katihar	47.02	Sheohar	41.28	Jehanabad	32.29
Buxar	53.94			Rohtas	45.80	Pashchim Champaran	40.68	Nawada	31.86
Sheikhpura	53.53			Banka	45.44				
Munger	53.53			Araria	45.44				
Lakhisarai	53.53			Supaul	45.44				
				Vaishali	44.78				
				Nalanda	44.16				
				Samastipur	43.94				
				Darbhanga	43.7				
				Madhepura	43.7				
				Saharsa	43.7				
				Khagaria	42.89				
				Madhubani	42.74				

Source: As stated in Table 3.4, Variable a1.

5.2 Monthly Per Capita Expenditure

The monthly per capita consumption expenditure (MPCE) on food is directly related to average income per capita and hence exercises a positive influence on access to food. Low income levels directly affect consumption. The per capita consumption expenditure in absolute terms is a good indicator of food security in rural areas. Bihar lies almost at the bottom in terms of consumption expenditure. The value of per capita consumption expenditure (Rs. 270) is substantially lower than the national average (Rs. 307). Out of the 17 major states presented in Table 5.3, Bihar ranks 13 which itself shows the low level of MPCE.

Although the state as a whole has very low consumption levels, there are stark disparities in consumption levels within the state. But six districts have an MPCE below the national average (see Table 5.4 and Map 5.2).

Table 5.3: Monthly Per Capita Expenditure in Rural Areas

India/States	Value (Rs.)	Rank	States	Value (Rs.)	Rank
India	307.60	-	Andhra Pradesh	323.15	9
Assam	358.44	4	Bihar	270.26	13
Chhattisgarh	239.08	16	Gujarat	345.46	6
Haryana	419.34	2	Jharkhand	263.22	14
Karnataka	283.04	12	Kerala	455.64	1
Madhya Pradesh	232.17	17	Maharashtra	293.29	11
Orissa	245.58	15	Punjab	416.45	3
Rajasthan	323.97	8	Tamil Nadu	315.49	10
Uttar Pradesh	345.88	5	West Bengal	329.93	7

Source: NSS 61st Round, 2004-05.

Table 5.4: Monthly Per Capita Consumption Expenditure by District, 2004-05 (in Rupees)

High		Moderate		Low		Very Low		Extremely Low	
District	MPCE	District	MPCE	District	MPCE	District	MPCE	District	MPCE
Madhepura	451	Purnia	386	Gopalganj	358	Gaya	336	Muzaffarpur	293
Supaul	435	Khagaria	384	Nawada	347	Nalanda	331	Jehanabad	289
		Lakhisarai	384	Katihar	343	Bhojpur	324	Aurangabad	282
		Munger	384			Darbhanga	323	Pashchim Champaran	267
		Sheikhpura	384			Vaishali	323		
		Sheohar	384			Patna	320		
		Sitamarhi	384			Bhagalpur	315		
						Begusarai	314		
						Banka	312		
						Jamui	312		
						Samastipur	310		
						Buxar	309		
						Kaimur	309		
						Araria	307		
						Kishanganj	307		
						Saran	305		

Source: As stated in Table 3.4, Variable b4.

Map 5.2: Status of Consumption Expenditure in Bihar

Ratio of Rural Population in Age Group 15-59 to Rural Population in 0-49 & 59+ Groups
- Secure [1.06 - 1.09]
- Moderately Secure [1.03 - 1.06]
- Moderately Insecure [1.00 - 1.03]
- Severely Insecure [0.97 - 1.00]
- Extremely Insecure [0.93 - 0.97]
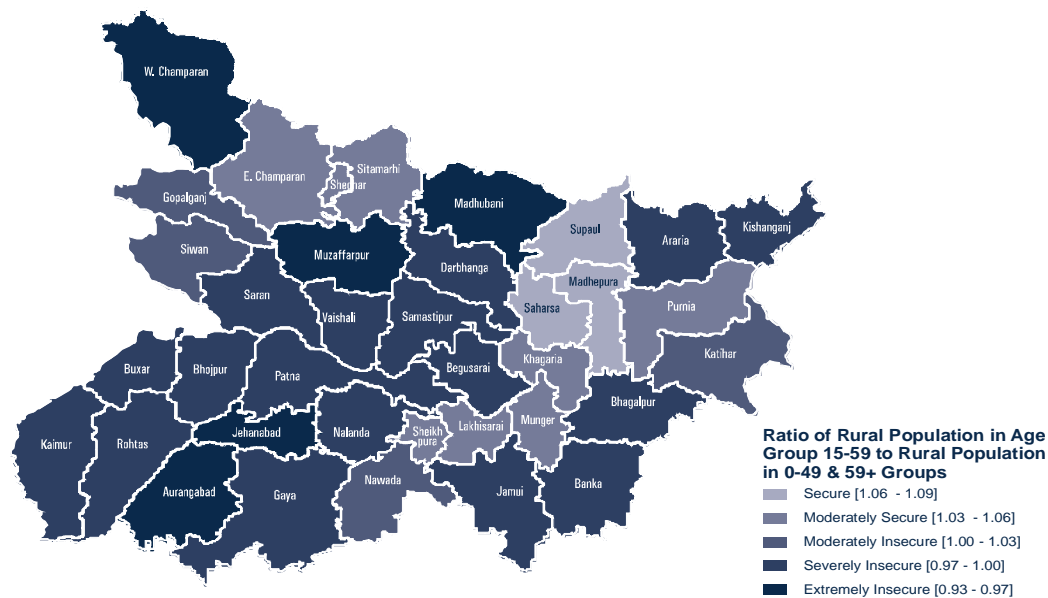
5.3 Agricultural Labourers

Bihar has the highest proportion (51 per cent) of agricultural labourers among the seventeen major states of India (see Table 5.5). The proportion is very high in comparison to the national average (33 per cent). Andhra and Tamil Nadu follow Bihar in terms of proportion of agricultural labourers. As discussed in Chapter 3, a high proportion of agricultural labourers is characterized by extremely poor physical and human capital and also the highest poverty levels (NCEUS, 2007). Thus, it is expected that the high proportion of agricultural labourers in Bihar is negatively related to food security.

Table 5.5: Proportion of Agricultural Labourers in Workforce by State

India/ States	Value (%)	Rank	State	Value (%)	Rank
India	33	–	Andhra Pradesh	47.5	16
Assam	14.9	2	Bihar	51.0	17
Chhattisgarh	36.1	12	Gujarat	33.2	9
Haryana	19.0	3	Jharkhand	32.8	7
Karnataka	34.5	11	Kerala	19.6	4
Madhya Pradesh	34.1	10	Maharashtra	37.8	13
Orissa	39.1	14	Punjab	21.9	5
Rajasthan	12.3	1	Tamil Nadu	42.9	15
Uttar Pradesh	28.9	6	West Bengal	33.1	8

Source: *Census of India, 2001.*

Table 5.6: Percentage of Agricultural Labourers in Workforce by District

Extremely Low		Very Low		Low		Moderate		High	
District	Value	District	Value	District	Value	District	Value	District	Value
Jamui	33.57	Gopalganj	41.1	Patna	46.94	Madhubani	53.64	Kishanganj	61.03
Siwan	35.05	Nawada	41.74	Gaya	47.45	Darbhanga	54.31	Sheohar	62.2
Saran	39.36	Rohtas	42.33	Samastipur	48.58	Bhagalpur	54.42	Katihar	64.31
		Buxar	42.67	Muzaffarpur	48.9	Saharsa	54.69	Araria	64.69
		Vaishali	42.87	Begusarai	49.43	Supaul	55.87	Pashchim Champaran	65.4
		Bhojpur	42.87	Kaimur	49.47	Khagaria	56.23	Purnia	66.31
		Aurangabad	43.98	Munger	51.03	Purba Champaran	56.66		
		Sheikhpura	44.82	Banka	52.21	Sitamarhi	57.3		
		Nalanda	45.8			Madhepura	57.37		
		Lakhisarai	45.88						
		Jehanabad	46.46						

Source: As stated in Table 3.4, Variable b1.

Map 5.3: Share of Agricultural Labourers in Rural Bihar

Proportion of Agricultural Labourers [%]

- Secure [33.570 - 40.118]
- Moderately Secure [40.118 - 46.666]
- Moderately Insecure [46.666 - 53.214]
- Severely Insecure [53.214 - 59.762]
- Extremely Insecure [59.762 - 66.310]
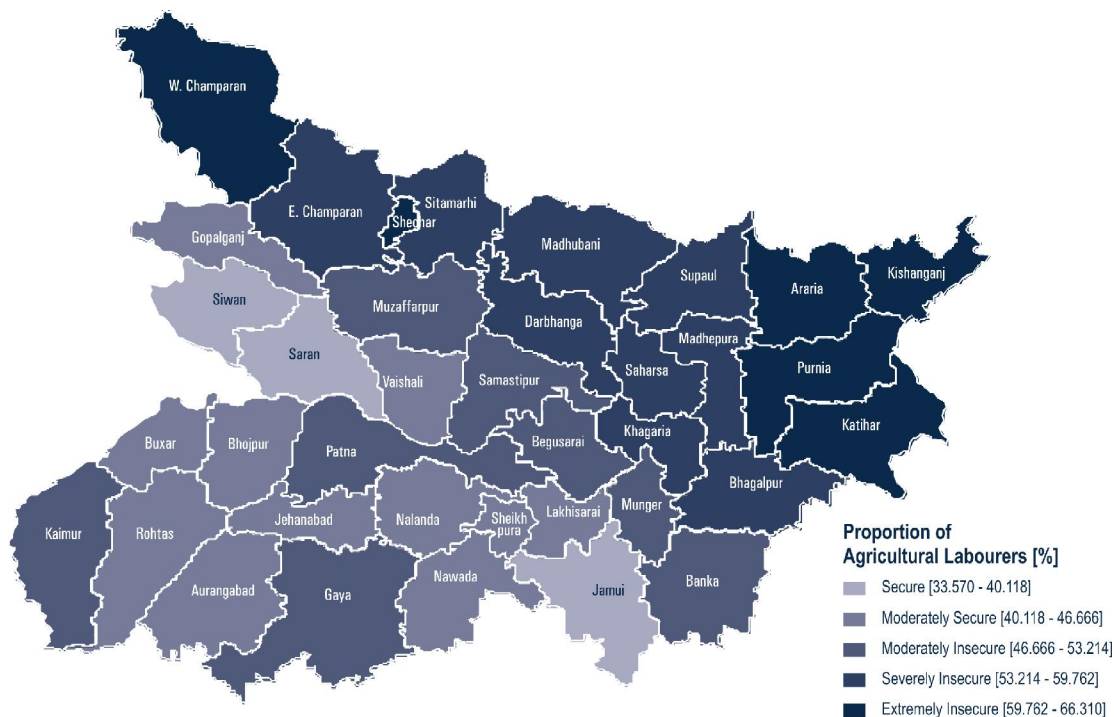
The proportion of agricultural labourers in the workforce by district has been presented in Table 5.6 and Map 5.3. The proportion of agricultural labourers is very high in Kishanganj, Sheohar, Katihar, Araria, Paschim Champaran and Purnia. The north-western and north-eastern districts of Bihar show a high proportion of the agricultural labourers indicating poor food access. The northern districts of Bihar also have a high level of agricultural labourers. The southern districts have a relatively low proportion of the agricultural labourers.

5.4. Proportion of Scheduled Tribes and Scheduled Castes

After the separation of Bihar and Jharkhand, Bihar has a low Scheduled Tribe population (1 per cent). The presence of the population of Scheduled Castes, however, is significant (16.4 per cent) and is close to the national average of 17.9 per cent (see Table 5.7). As in other states, the Scheduled Castes in Bihar are also marginalized. Among the major states of India, nine states have a higher proportion of Scheduled Caste population than Bihar, whereas in terms of proportion of Scheduled Tribe population, 13 states are ahead of Bihar.

Table 5.7: Percentage of Scheduled Tribes and Scheduled Castes in the Rural Population by State

	Proportion of Rural Scheduled Castes		Proportion of Rural Scheduled Tribes	
	Value	Rank	Value	Rank
India	17.9	-	10.4	-
Andhra Pradesh	18.4	11	8.4	8
Assam	6.7	1	13.6	11
Bihar	16.4	8	1.0	4
Chhattisgarh	11.4	5	37.6	17
Gujarat	6.9	2	21.6	13
Haryana	21.4	13	0	1
Jharkhand	12.4	6	31.0	16
Karnataka	18.4	11	8.4	8
Kerala	10.8	3	1.5	5
Madhya Pradesh	15.6	7	25.8	15
Maharashtra	10.9	4	13.4	10
Orissa	17.2	9	24.6	14
Punjab	33.0	17	0	1
Rajasthan	17.9	10	15.5	12
Tamil Nadu	23.8	15	1.6	6
Uttar Pradesh	23.4	14	0.1	3
West Bengal	26.9	16	7.2	7

Source: Census of India, 2001.

Table 5.8: Percentage of SC/ST Population to Total Population in Bihar

Extremely Low		Very Low		Low		Moderate		High	
District	SC/ST	District	SC/ST	District	SC/ST	District	SC/ST	District	SC/ST
Kishanganj	9.98	Katihar	14.78	Jehanabad	19.3	Aurangabad	24.52	Gaya	32.59
Sitamarhi	11.99	Begusarai	14.79	Patna	19.69	Nawada	25.32		
Siwan	12.19	Khagaria	14.94	Rohtas	20.67	Kaimur	25.39		
Saran	12.36	Buxar	15.2	Sheikhpura	20.72				
Gopalganj	12.85	Araria	15.29	Vaishali	21.01				
Purba Champaran	13.56	Supaul	15.58	Nalanda	21.55				
Madhubani	13.65	Darbhanga	15.96	Jamui	22.89				
Bhagalpur	13.87	Bhojpur	16.59						
Sheohar	14.39	Pashchim Champaran	16.59						
		Muzaffarpur	16.6						
		Munger	16.69						
		Purnia	17.06						
		Saharsa	17.08						
		Banka	17.32						
		Lakhisarai	17.38						
		Madhepura	17.95						
		Samastipur	18.76						

Source: As stated in Table 3.4, Variable b1.

Within the state, there are differences across districts in the composition of population by social group. Table 5.8 presents the percentage of SC/ST population to total population. There are a higher number of districts in Bihar which have a lower proportion of SC/ST population. On the one hand, Kishanganj has less than 10 per cent SC/ST population and on the other hand, districts like Gaya have more than 30 per cent SC/ST population. As can be seen from Map 5.4, the north-western region in particular, and the northern region in general, has a low proportion of SC/ST population in comparison to South Bihar, which has a high proportion of Scheduled Castes and is adjoined by Jharkhand which has high proportion of Scheduled Tribe population.

5.5. Ratio of Working Age Population

The proportion of working age population has varied implications for the food security situation in a region. The working age ratio is the ratio between the working population (15-59 years) and the

Map 5.4: Proportion of Population of Scheduled Castes and Scheduled Tribes in Rural Bihar

Proportion of Rural Population of ST/SC [%]
- Secure [9.980 - 14.502]
- Moderately Secure [14.502 - 19.024]
- Moderately Insecure [19.024 - 23.546]
- Severely Insecure [23.546 - 28.068]
- Extremely Insecure [28.068 - 32.590]
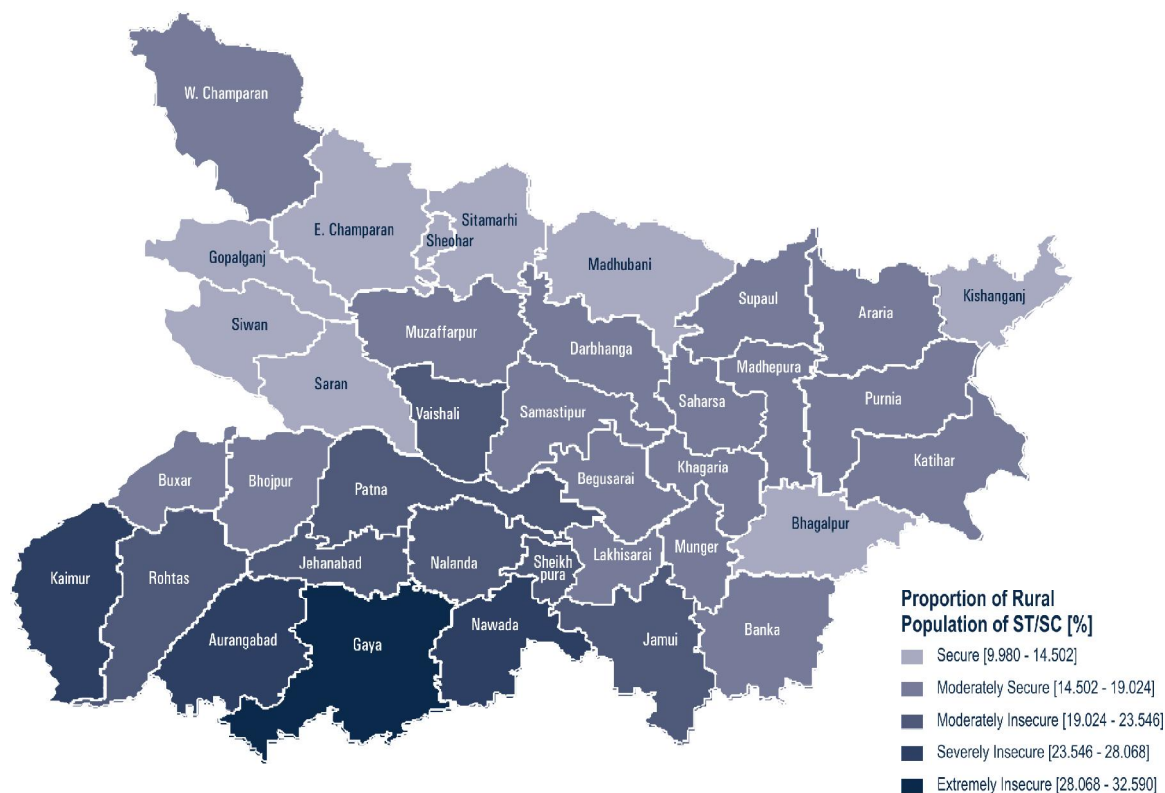
dependent population (less than 15 years and more than 59 years of age). The demographic transition from high fertility and mortality to low fertility and mortality goes through several phases. With development, fertility rates decline and the proportion of population in the working age group increases, resulting in a 'bulge' in the working age group. This leads to the hypothesis that the 'demographic dividend' derived from this gain would accelerate economic growth with a more productive population (Chandrasekhar, *et al.*, 2006[1]).

The situation in Bihar in terms of the ratio of population in the productive age is found to be worse than many states and the national average. Bihar (1.03) lies in the lower domain, ranking 16th, just after Uttar Pradesh (1.02). A low working age ratio implies a greater dependence on the existing productive population, and may also be related to high out-migration (Table 5.9).

The higher the extent of dependency, the lower the economically active population and hence the lower the aggregate level of income, which, in turn, lowers the expected degree of accessibility to

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1. Chandrasekhar and others have shown through employment figures that the absorption of the Indian youth into the labour force is not as high as one would expect. This is perhaps due to the poor employability of the workforce, which is severely affected by a deficit in educational attainment and health.

Table 5.9: Ratio of Working Age Population by State

India/states	Value	Rank	States	Value	Rank
India	1.22	–	Andhra Pradesh	1.44	3
Assam	1.24	10	Bihar	1.03	16
Chhattisgarh	1.19	12	Gujarat	1.38	5
Haryana	1.21	11	Jharkhand	1.11	13
Karnataka	1.41	4	Kerala	1.70	1
Madhya Pradesh	1.10	14	Maharashtra	1.26	9
Orissa	1.35	7	Punjab	1.37	6
Rajasthan	1.06	15	Tamil Nadu	1.67	2
Uttar Pradesh	1.02	17	West Bengal	1.34	8

Source: Census of India, 2001.

Table 5.10: Ratio of Working Age Population by District in Bihar

High		Moderate		Low		Very Low		Extremely Low	
District	Value	District	Value	District	Value	District	Value	District	Value
Munger	1.089	Rohtas	1.06	Sheikhpura	1.026	Khagaria	0.999	Saran	0.95
Jamui	1.089	Madhubani	1.059	Kaimur	1.024	Katihar	0.972	Siwan	0.937
Jehanabad	1.087	Sheohar	1.056	Vaishali	1.022	Gopalganj	0.971		
Patna	1.087	Paschim Champaran	1.054	Kishanganj	1.014				
Nalanda	1.082	Sitamarhi	1.054	Samastipur	1.012				
Aurangabad	1.066	Bhojpur	1.051	Araria	1.009				
Banka	1.061	Muzaffarpur	1.05	Purnia	1.005				
		Nawada	1.04	Lakhisarai	1.001				
		Supaul	1.04						
		Gaya	1.038						
		Buxar	1.038						
		Saharsa	1.035						
		Bhagalpur	1.035						
		Purba Champaran	1.034						
		Begusarai	1.033						
		Darbhanga	1.031						
		Madhepura	1.031						

Source: As stated in Table 3.4, Variable b3.

Map 5.5: Ratio of Working Age Population in Rural Bihar

Ratio of Rural Population in Age Group 15-59 to Rural Population in 0-49 & 59+ Groups

- Secure [1.06 - 1.09]
- Moderately Secure [1.03 - 1.06]
- Moderately Insecure [1.00 - 1.03]
- Severely Insecure [0.97 - 1.00]
- Extremely Insecure [0.93 - 0.97]
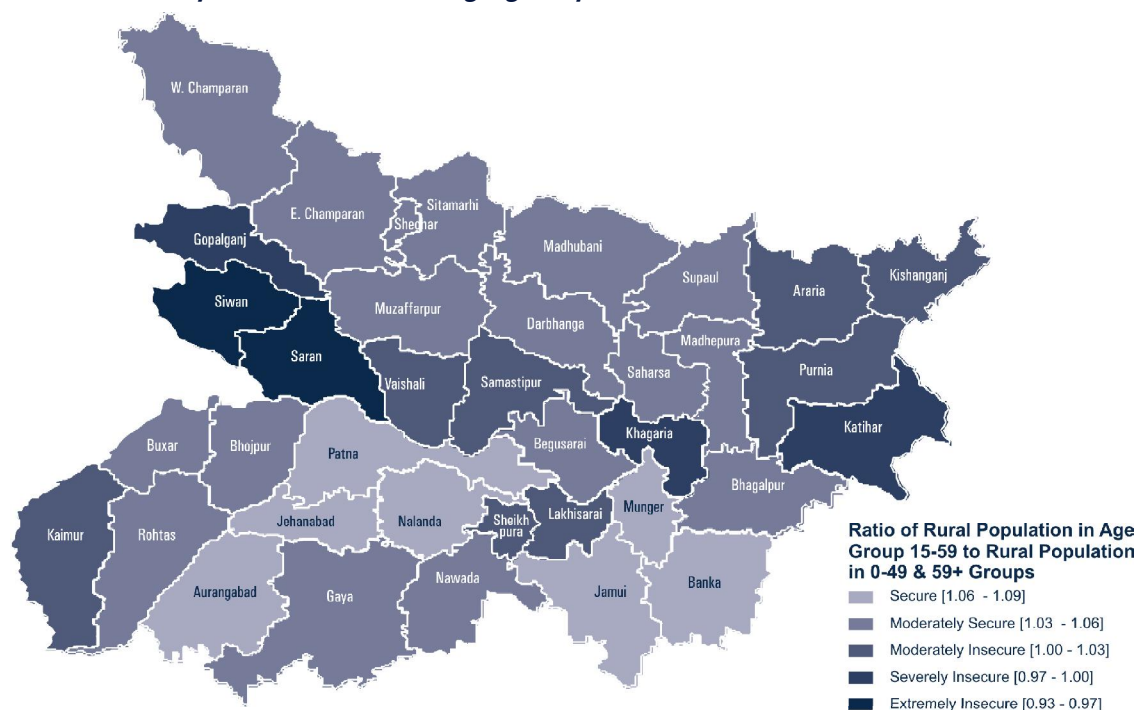
food. A district-wise analysis of Bihar shows a high disparity in terms of ratio of working age population. The Southern region of Bihar has a higher working age population than the Northern region (see Map 5.5). Munger, Jamui, Jehanabad, Patna have been found to have a high proportion of working age population in comparison to the districts like Siwan, Saran, Gopalganj (Table 5.10). As many as five districts have working age ratio lower than one, implying that the dependent population is greater than the productive age group population.

The change in working age population, at least at the sub-regional level, is highly influenced by the migration of population in this age group. In a developing region, young people move out in search of employment. Those who migrate due to lack of employment opportunities are stuck between the devil and the deep sea. They have little food security in their villages but are just as vulnerable in the destination areas. Several studies have shown the situation of migrant workers within and outside the state to be quite deplorable (Jha, 2005). The in-migrants in the destination area suffer from exploitation of different kinds at the hands of their employers who rarely provide anything apart from wages, and the labourers have to fend for themselves to meet their basic requirements (Srivastava & Sasikumar, 2003).

5.6. Rural Female Literacy

Enhancing female literacy has been recognized as the singlemost important factor contributing to increase in food security and decline in malnutrition and mortality levels (Save the Children, 2008).

The higher the literacy rate, particularly of females and adults, the higher the overall economic prospects of the region concerned, and hence, the greater the likelihood of an improvement in the scenario of accessibility of food in that region.

In the case of rural female literacy, Bihar ranked the last. More than 70 per cent of its rural female population is illiterate (Table 5.11). This itself reflects the low awareness and high sensitivity of the food security situation in the rural population in Bihar. Jharkhand, the erstwhile part of Bihar is no

Table 5.11: Rural Female Literacy by State (in per cent)

	Value	Rank		Value	Rank
India	46.1	-	Andhra Pradesh	43.5	12
Assam	50.7	6	Bihar	29.6	17
Chhattisgarh	47.0	10	Gujarat	47.8	9
Haryana	49.3	7	Jharkhand	29.9	16
Karnataka	48.0	8	Kerala	86.7	1
Madhya Pradesh	42.8	13	Maharashtra	58.4	2
Orissa	46.7	11	Punjab	57.7	3
Rajasthan	37.3	14	Tamil Nadu	55.3	4
Uttar Pradesh	36.9	15	West Bengal	53.2	5

Source: Census of India, 2001.

Table 5.12: District-wise Female Literacy in Rural Bihar (%)

High		Moderate		Low		Very Low		Extremely Low	
District	Literacy	District	Literacy	District	Literacy	District	Literacy	District	Literacy
Rohtas	42.85	Patna	36.57	Gaya	31.81	Madhubani	25.36	Madhepura	20.57
Aurangabad	39.91	Siwan	35.6	Lakhisarai	31.24	Sitamarhi	24.28	Araria	20.44
Munger	39.27	Vaishali	35.21	Gopalganj	31.03	Jamui	23.9	Katihar	19.69
Bhojpur	38.5	Nalanda	34.99	Sheikhpura	30.88	Sheohar	23.55	Purnia	19.63
Kaimur	37.88	Saran	33.98	Samastipur	30.33	Saharsa	22.14	Supaul	19.31
Jehanabad	37.88	Begusarai	33.96	Nawada	29.68	Purba Champaran	21.98	Kishanganj	15.39
Buxar	37.53	Bhagalpur	32.14	Banka	27.87	Paschim Champaran	21.95		
		Muzaffarpur	32.14	Darbhanga	27.61				
				Khagaria	27.33				

Source: As stated in Table 3.4, Variable b6.

Map 5.6: Status of Rural Female Literacy

Proportion of Rural Households having Access to Tube-well, Tap or Hand pump (in %)

- Secure [86.46 - 99.00]
- Moderately Secure [73.92 - 86.46]
- Moderately Insecure [61.39 - 73.92]
- Severely Insecure [48.85 - 61.39]
- Extremely Insecure [36.31 - 48.85]
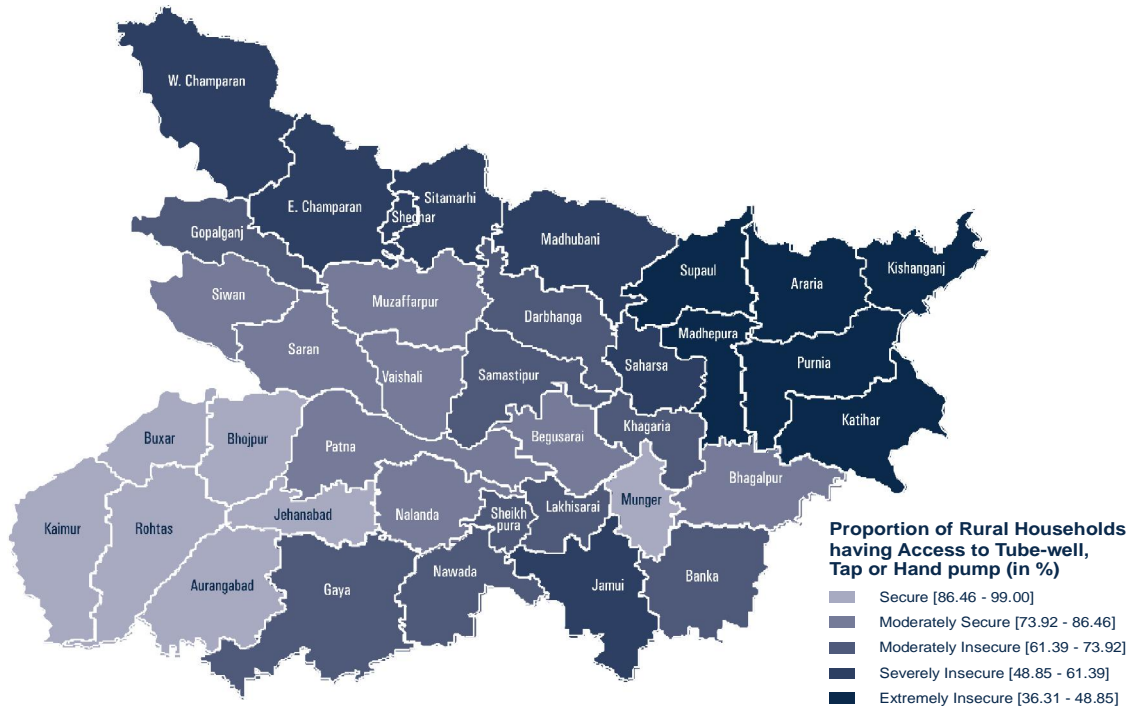
different. Kerala which is the best performing state among the major states of India has a percentage of literacy that is almost three times higher than that of Bihar.

The inter-district profile of rural female literacy has been presented in Table 5.12. More than four-fifth of the rural females in the north eastern region of Bihar are illiterate. The proportion is significant and itself says a lot. The highest rural female literacy has been found in Rohtas (42.85 per cent) which is also less than the national average (46.1 per cent) and almost half that of Kerala. The literacy figures over the last decade have seen a very slow increase and need a vital planning and resource input to improve this.

5.7. Women's Workforce Participation

The women's workforce participation rate (WWPR) is another indicator of the status of women in the society. Women's workforce participation improves the household's access to food, and is also likely to improve the woman's own access to food, following Amartya Sen's argument that women's independent income would increase their bargaining power within the household. At the same time, women's participation in the rural workforce is likely to be negatively related to a household's food security situation. It would be highest among agricultural labourers and go down as one moved up

the land cultivating categories. Women's workforce participation is also likely to be related to caste and ethnicity: it is higher among STs and lower as one goes up the caste ladder. Thus, one can expect a negative relation between women's workforce participation and the household's food security in a rural situation, particularly in the case of a state like Bihar. It is in urban households that the relationship between food security and women's workforce participation may go both ways. For rural food security, we can continue to use women's workforce participation as being negatively related to the food security situation, with high participation being associated with a poor food security situation.

Women's workforce participation is also intrinsically related to migration. The nature of migration largely reflects household subsistence strategies in the face of social, cultural, demographic and other constraints. It is generally males who predominate in the streams of labour migration, but in the case of tribals and lower economic strata, both men and women migrate together for work. This is because, as already stated, in these groups the constraints on women's participation in non-household activities are fewer. In some sectors, like construction, brick kilns and sugarcane cutting, family migration is common as it is more economical for employers (Srivastava & Sasikumar, 2003).

5.8. Urbanization

The low economic development of a state is also reflected in the extent of stagnation. Bihar is predominantly a rural state with almost 90 per cent of its people residing in the rural areas. Among all the major states, Bihar lies at the lowest rank in terms of urbanization. The rate of urbanization in Bihar is only 10.5 per cent which is 17.3 percentage points lower than the national average (Table 5.13). Tamil Nadu which has the highest urbanization rate in India is four times as urbanized as Bihar.

The pattern of urbanization has not changed much in the state during the last decade. Table 5.14 shows that the growth rate of urban population in 17 out of the state's 37 districts was higher than that of the state average. Patna, with a level of urbanization of 41.8 per cent, is the most urbanized district while Kaimur is the least urbanized (3.20 per cent). Nine districts enjoyed a level of urbanization higher than the state average. Five most urbanized districts namely, Patna, Munger, Bhagalpur, Sheikhpura and Nalanda account for 36.5 per cent of the state's urban population with Patna alone claiming 22.7 per cent. It shows its primacy by reporting the highest level of urbanization both in 1991 and in 2001, though it has not recorded the highest rate of growth of urban population during this decade. There are four districts where the rate of growth has been much higher than that experienced in Patna (3.64 per cent). The seventeen districts have witnessed an urban growth rate between 2-3 per cent, while four districts show negative growth. Patna has the maximum share of urban population, which has increased from 20.5 to 22.7 per cent during 1991-2001, while the share of the remaining 36 districts was between 0.2 to 5.5 per cent. This pattern has remained the same during 1991-2001, indicating lopsided urban growth and a consequent inequality in the development process.

Table 5.13: Level of Urbanization in Major States (%)

	Value	Rank		Value	Rank
India	27.8	-	Andhra Pradesh	27.3	8
Assam	12.9	16	Bihar	10.5	17
Chhattisgarh	20.1	14	Gujarat	37.4	3
Haryana	28.9	6	Jharkhand	22.2	12
Karnataka	34.0	4	Kerala	26.0	10
Madhya Pradesh	26.5	9	Maharashtra	42.4	2
Orissa	15.0	15	Punjab	33.9	5
Rajasthan	23.4	11	Tamil Nadu	44.0	1
Uttar Pradesh	20.8	13	West Bengal	28.0	7

Source: Census of India, 2001.

Table 5.14: Level of Urbanization by District

Rank in 2001	District	Level of Urbanisation (%) 2001	1991	Compound Rate of Growth of Urban Pop (%)	Rank in 2001	District	Level of Urbanisation (%) 2001	1991	Compound Rate of Growth of Urban Pop (%)
1	Patna	41.8	38.05	3.64	20	Nawada	7.66	6.95	3.9
2	Munger	27.88	30.04	1.12	21	Jehanabad	7.4	6.34	4.16
3	Bhagalpur	18.59	17.98	2.78	22	Jamui	7.38	7.09	3.3
4	Sheikpura	15.48	15.37	2.33	23	Vaishali	6.88	6.68	2.66
5	Nalanda	14.92	14.84	1.78	24	Champaran East	6.39	5.7	3.79
6	Lakhisarai	14.68	13.2	3.26	25	Araria	6.24	6.35	2.63
7	Bhojpur	13.98	13.14	2.86	26	Gopalganj	6.07	5.68	3.03
8	Gaya	13.71	13.36	2.93	27	Khagaria	5.97	5.96	2.63
9	Rohtas	13.34	13.93	2.03	28	Sitamari	5.74	5.84	2.51
10	Champaran West	10.17	10.09	2.78	29	Siwan	5.45	5.32	2.49
11	Kshanganj	9.97	10.09	2.65	30	Supaul	5.04	6.82	-0.4
12	Muzaffarpur	9.3	9.31	2.39	31	Begusarai	4.58	9.79	-4.93
13	Buxar	9.18	8.35	3.55	32	Madhepura	4.46	6.52	-1.22
14	Saran	9.17	9.11	2.44	33	Sheohar	4.15	3.68	4.36
15	Katihar	9.13	9.4	2.43	34	Samastipur	3.62	4.96	-0.88
16	Purnia	8.74	8.42	3.45	35	Banka	3.5	3.45	2.36
17	Aurangabad	8.42	7.67	3.64	36	Madhubani	3.48	3.63	1.93
18	Saharsa	8.23	7.08	4.46	37	Kaimur	3.23	2.75	4.38
19	Darbhanga	8.12	8.7	2.02		**Bihar**	**10.47**	**10.4**	**2.6**

Source: Calculated from Census of India, 1991 and 2001.

5.9 Access Index

Table 5.15 lists all the indicators which are used to compute Index of Food Access. The districts categorized into different food access categories have been listed in Table 5.16. Map 5.7 presents the districts on the basis of the Food Access Index.

Table 5.16 shows that five districts (Araria, Paschim Champaran, Katihar, Purnia and Kishanganj) fall in the two lowest categories (severely insecure and extremely insecure) of the food access index. There are six districts which are food secure namely Rohtas, Jehanabad, Aurangabad, Nawada, Siwan and Munger. All the five insecure districts are from northern Bihar.

Table 5.15. Indicators used to Compute Index of Accessibility (Value in %)

District	Agricultural Labourers		Proportion of SC/ST Population		Monthly Per Capita Expenditure		Rural Wage Rate		Ratio of Working Age Population		Female Literacy	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Araria	64.69	35	15.29	14	307	30	45.44	18	1.009	30	20.44	33
Aurangabad	43.98	10	24.52	34	282	36	33.69	35	1.066	6	39.91	2
Banka	52.21	22	17.32	23	312	25	45.44	17	1.061	7	27.87	22
Begusarai	49.43	19	14.79	11	314	24	50.08	9	1.033	22	33.96	13
Bhagalpur	54.42	25	13.87	8	315	23	47.02	14	1.035	20	32.14	14
Bhojpur	42.87	9	16.59	17	324	19	55.98	3	1.051	13	38.5	4
Buxar	42.67	7	15.2	13	309	28	53.94	5	1.038	18	37.53	7
Darbhanga	54.31	24	15.96	16	323	20	43.7	23	1.031	23	27.61	23
Gaya	47.45	16	32.59	37	336	17	36.17	34	1.038	17	31.81	16
Gopalganj	41.1	4	12.85	5	358	13	54.74	4	0.971	35	31.03	18
Jamui	33.57	1	22.89	33	312	26	49.28	11	1.089	2	23.9	27
Jehanabad	46.16	14	19.3	27	289	35	32.29	36	1.087	3	37.88	6
Kaimur	49.47	20	25.39	36	309	29	47.25	13	1.024	26	37.88	5
Katihar	64.31	34	14.78	10	343	15	47.02	15	0.972	34	19.69	34
Khagaria	56.23	28	14.94	12	384	6	42.89	26	0.999	33	27.33	24
Kishanganj	61.03	32	9.98	1	307	31	36.93	33	1.014	28	15.39	37
Lakhisarai	45.88	13	17.38	24	384	7	53.53	6	1.001	32	31.24	17
Madhepura	57.37	31	17.95	25	451	1	43.7	24	1.031	24	20.57	32
Madhubani	53.64	23	13.65	7	297	33	42.74	27	1.059	9	25.36	25
Munger	51.03	21	16.69	20	384	8	53.53	7	1.089	1	39.27	3
Muzaffarpur	48.9	18	16.6	19	293	34	49.69	10	1.05	14	32.14	15
Nalanda	45.8	12	21.55	32	331	18	44.16	21	1.082	5	34.99	11
Nawada	41.74	5	25.32	35	347	14	31.86	37	1.04	15	29.68	21

Continued...

Table 5.15 Contd...

Paschim Champaran	65.4	36	16.59	18	267	37	40.68	32	1.054	11	21.95	31
Patna	46.94	15	19.69	28	320	22	58.38	1	1.087	4	36.57	8
Purba Champaran	56.66	29	13.56	6	395	4	41.28	30	1.034	21	21.98	30
Purnia	66.31	37	17.06	21	386	5	42.2	28	1.005	31	19.63	35
Rohtas	42.33	6	20.67	29	338	16	45.8	16	1.06	8	42.85	1
Saharsa	54.69	26	17.08	22	451	2	43.7	25	1.035	19	22.14	29
Samastipur	48.58	17	18.76	26	310	27	43.94	22	1.012	29	30.33	20
Saran	39.36	3	12.36	4	305	32	47.66	12	0.95	36	33.98	12
Sheikhpura	44.82	11	20.72	30	384	9	53.53	8	1.026	25	30.88	19
Sheohar	62.2	33	14.39	9	384	10	41.28	31	1.056	10	23.55	28
Sitamarhi	57.3	30	11.99	2	384	11	41.36	29	1.054	12	24.28	26
Siwan	35.05	2	12.19	3	373	12	57.45	2	0.937	37	35.6	9
Supaul	55.87	27	15.58	15	435	3	45.44	19	1.04	16	19.31	36
Vaishali	42.87	8	21.01	31	323	21	44.78	20	1.022	27	35.21	1

Source: As stated in Table 3.4, Variable b.

Table 5.16: Status of Districts on Access Index

Secure		Moderately Secure		Moderately Insecure		Severely Insecure		Extremely Insecure	
Districts	Value	Districts	Value	Districts	Value	Districts	Value	Districts	Value
Rohtas	0.468	Saran	0.448	Begusarai	0.428	Kishanganj	0.394	Purnia	0.390
Jehanabad	0.467	Nalanda	0.446	Khagaria	0.428			Katihar	0.375
Aurangabad	0.461	Vaishali	0.445	Purba Champaran	0.427			Pashchim Champaran	0.374
Nawada	0.461	Bhojpur	0.441	Madhepura	0.425			Araria	0.372
Siwan	0.459	Buxar	0.441	Samastipur	0.424				
Munger	0.449	Gopalganj	0.440	Supaul	0.423				
		Saharsa	0.436	Kaimur	0.422				
		Lakhisarai	0.434	Bhagalpur	0.422				
		Jamui	0.432	Patna	0.421				
		Sheikhpura	0.432	Muzaffarpur	0.419				
		Sitamarhi	0.432	Sheohar	0.417				
		Gaya	0.430	Darbhanga	0.417				
				Banka	0.416				
				Madhubani	0.415				
No. of Districts	6		12		14		1		4

Source: As stated in Table 3.4, Variable b3.

Map 5.7: Food Access Map of Rural Bihar

Food Security Index

- Secure [0.4970 - 0.5370]
- Moderately Secure [0.4567 - 0.4970]
- Moderately Insecure [0.4164 - 0.4567]
- Severely Insecure [0.3761 - 0.4164]
- Extremely Insecure [0.3360 - 0.3761]

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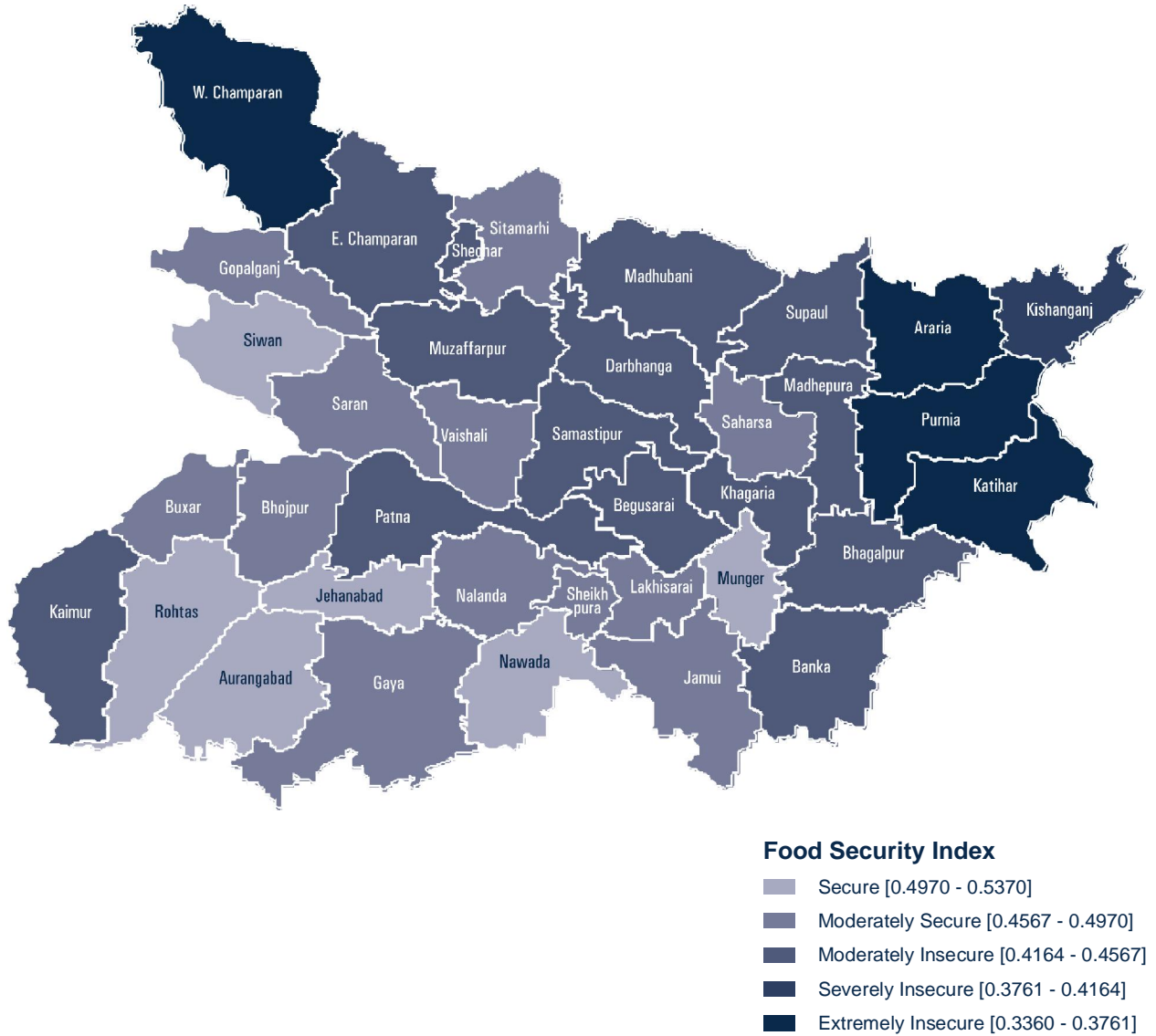
It has been estimated that in developing countries, one out of five people do not use safe water, and roughly half are without adequate sanitation (WHO, 2007). Primary health services in the country as a whole are utterly inadequate, particularly in rural areas. There are persistent gaps in human resources and infrastructure, disproportionately affecting the less developed rural areas. A significant proportion of hospitals do not have adequate personnel, diagnostic and therapeutic services and drugs. In Bihar, with a high burden of communicable and non-communicable diseases because of persisting poverty, primary health infrastructure at the village level assumes huge significance. However, a good number of villages in the state are not adequately covered by a Primary Health Centre (PHC), the most critical health facility in rural areas. Table 6.1 shows that in Bihar, every 27th village has a PHC, which is near the national average. Further, functioning of PHC in Bihar is widely belived to be poor, although in recent years it has shown improvement. It ranks tenth among 17 major states of India. This compares poorly to a state like Kerala that has excellent health infrastructure in the rural areas (one PHC for every one and half villages). Lack of primary health facilities forces the vulnerable populations to depend on private health services, often leading to indebtedness in rural areas.

Table 6.1: Factors Determining Status of Absorption

India/States	Households Having Safe Drinking Water		No. of Villages per PHC		Households Having Toilet Facility	
	Value (%)	Rank	Value (no.)	Rank	Value (%)	Rank
India	78	–	27.6	–	21.9	–
Andhra Pradesh	80.1	9	18.9	6	18.1	9
Assam	58.8	15	43.1	15	59.6	2
Bihar	86.6	4	27.4	10	13.9	13
Chhattisgarh	70.5	11	39.4	13	5.2	17
Gujarat	84.1	8	17.3	4	21.7	6
Haryana	86	5	17.0	3	28.7	4
Jharkhand	42.7	16	58.1	17	6.6	16
Karnataka	84.6	7	17.5	5	17.4	10
Kerala	23.4	17	1.5	1	81.3	1
Madhya Pradesh	68.4	12	46.4	16	8.9	14
Maharashtra	79.8	10	24.6	7	18.2	8
Orissa	64.2	14	40.1	14	7.7	15
Punjab	97.6	1	26.2	9	40.9	3
Rajasthan	68.3	13	24.7	8	14.6	11
Tamilnadu	85.5	6	11.8	2	14.4	12
Uttar Pradesh	87.8	3	29.5	11	19.2	7
West Bengal	88.5	2	34.8	12	26.9	5

Source: Census of India, 2001 and Health Information of India, 2005.

Access to safe drinking water and sanitation is another indicator of the health status of a population. Provision of safe drinking water (calculated in terms of availability of a tubewell, handpump or tap) reduces the occurrence of a number of diseases and, at the same time, ensures effective absorption of food, ultimately leading to improved nutrition. The access to safe drinking water in rural Bihar is quite substantial. As can be seen from Table 6.1, Bihar ranks fourth in terms of access to safe drinking water. Punjab, West Bengal and Uttar Pradesh are the three major states which have better access to safe drinking water. In Bihar, more than 86 per cent households in the rural areas have access to safe drinking water and it is 9 percentage points above the national level (78 per cent). However, mere availability of physical infrastructure in the form of a tubewell, handpump or tap does not suffice. The quality and quantity of water being used is a matter for further examination.

Sanitation facilities, as reflected in terms of existence of a toilet facility in the house, are poor in Bihar. The proportion of rural households in Bihar having toilet facility is only 14 per cent which remains well below the national average of 21.9 per cent. Inadequate integration of public interventions in the area of primary health centres and sanitation shows a failure to exploit potential synergies that reinforce health attainments of people.

6.1 Access to Safe Drinking Water

The district-wise access to safe drinking water in rural Bihar, however, does not present as rosy a picture as the state average. The access to safe drinking water is as low as 36.31 per cent in Jamui,

Map 6.1: Access to Safe Drinking Water in Rural Bihar

Proportion of Rural Households having Access to Tube-well, Tap or Hand pump (in %)

- Secure [86.46 - 99.00]
- Moderately Secure [73.92 - 86.46]
- Moderately Insecure [61.39 - 73.92]
- Severely Insecure [48.85 - 61.39]
- Extremely Insecure [36.31 - 48.85]
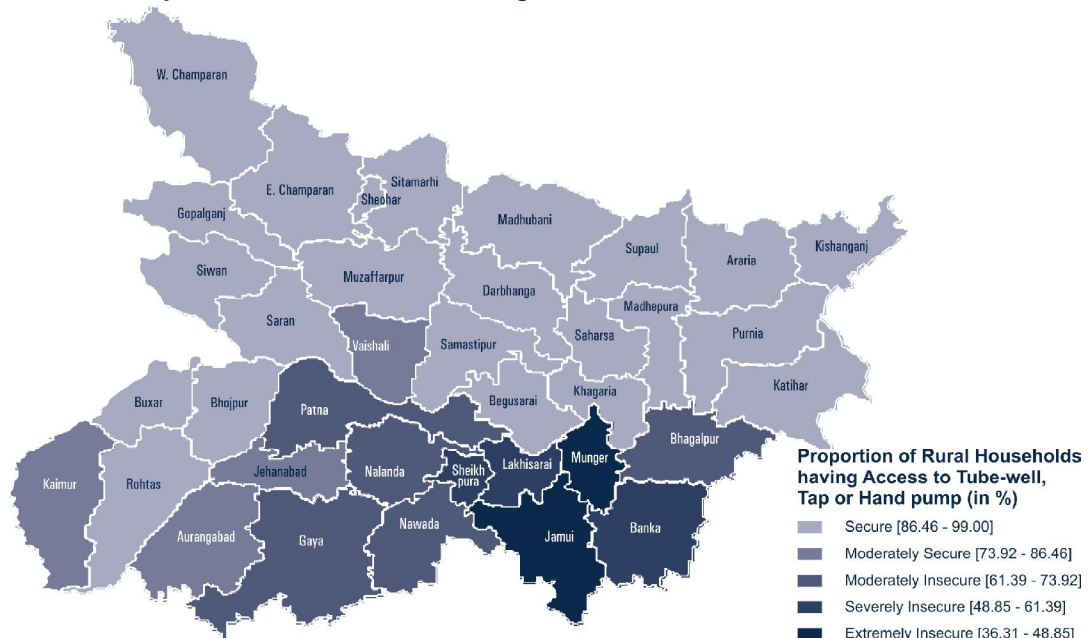
Table 6.2: Access to Safe Drinking Water in Rural Bihar (%)

High		Moderate		Low		Very Low		Extremey Low	
District	Access to Safe Drinking Water	District	Access to Safe Drinking Water	District	Access to Safe Drinking Water	District	Access to Safe Drinking Water	District	Access to Safe Drinking Water
Darbhanga	99.00	Jehanabad	82.67	Nawada	72.98	Sheikhpura	55.89	Munger	42.76
Araria	98.65	Aurangabad	82.53	Gaya	68.55	Lakhisarai	53.63	Jamui	36.31
Purnia	98.18	Vaishali	77.94	Patna	67.76	Banka	49.42		
Madhubani	98.08	Kaimur	74.18	Bhagalpur	65.38				
Sitamarhi	98.02			Nalanda	61.60				
Sheohar	98.01								
Supaul	97.38								
Gopalganj	97.28								
Katihar	96.85								
Paschim Champaran	96.66								
Madhepura	96.57								
Saharsa	96.41								
Siwan	96.30								
Khagaria	95.91								
Purba Champaran	92.71								
Muzaffarpur	92.62								
Rohtas	92.06								
Kishanganj	90.43								
Bhojpur	90.2								
Begusarai	88.97								
Buxar	87.39								
Saran	87.07								
Samastipur	86.49								

Note: No. of Districts Above Average = 23   No. of Districts Below Average = 14   Average = 86.11
Source: As stated in Table 3.4, Variable c1.

42.76 per cent in Munger and 49.42 per cent in Banka where the access to safe drinking water is a major concern. Nevertheless, nearly 25 districts in Bihar have more than 80 per cent households with access to safe drinking water (see Table 6.2). The regional pattern of access to safe drinking water in rural Bihar conspicuously reflects that the Northern Bihar is secure in terms of access to

safe drinking water; however, Southern Bihar pose a challenge. Particularly the south-eastern part of Bihar with districts of Jamui, Munger, Banka, Lakhisarai has low level of access to safe drinking water (Map 6.1).

6.2 Access to Primary Health Centres and Health Care Facilities

The access to primary health centres in Bihar, as seen earlier, is quite low. The district level access to PHCs in rural Bihar is very low and varied. Saran district has the maximum proportion (45.21 per cent) of villages having access to PHCs within 5 kilometers. At the other extreme, Jamui has the lowest proportion (14.9 per cent) of villages having access to PHCs. The average is 32.90 per cent villages with a PHC and there are 20 districts which have PHCs above this average (Table 6.3). As can be seen from Map 6.2, the Central part of Bihar has relatively better proportion of villages with PHCs in comparison to the bordering districts. The south-eastern and north-eastern parts of Bihar have quite low access to PHCs in its villages.

Map 6.2: Access to Health Services in Rural Bihar

Proportion of Villages having PHC within the Village or 5km from the village (%)

- Secure [39.15 - 45.21]
- Moderately Secure [33.09 - 39.15]
- Moderately Insecure [27.02 - 33.09]
- Severely Insecure [20.96 - 27.02]
- Extremely Insecure [14.90 - 20.96]
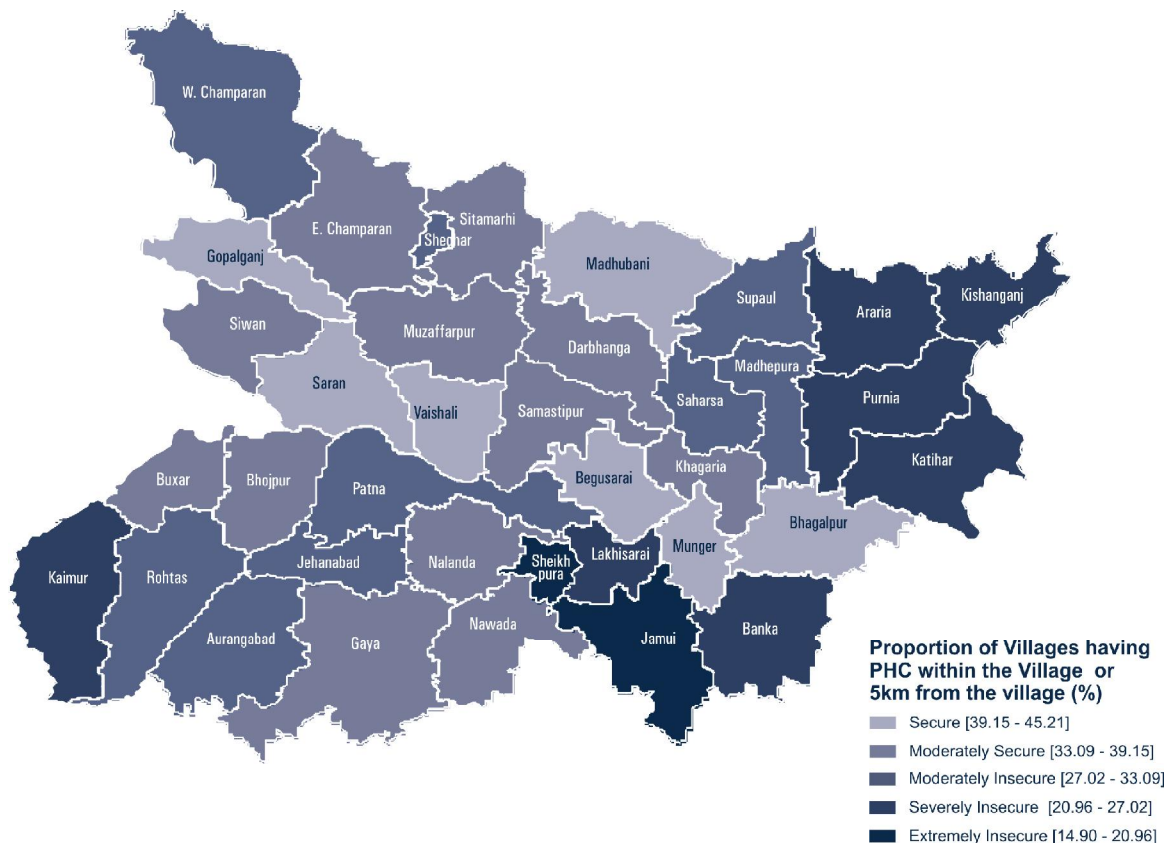
Table 6.3: Percentage of Villages Having Access to PHCs within Five Km Distance

High		Moderate		Low		Very Low		Extremely Low	
District	PHC	District	PHC	District	PHC	District	PHC	District	PHC
Saran	45.21	Bhojpur	38.72	Jehanabad	32.94	Lakhisarai	26.78	Sheikhpura	19.85
Vaishali	44.03	Siwan	37.51	Madhepura	31.55	Banka	26.11	Jamui	14.9
Madhubani	41.36	Muzaffarpur	37.29	Sheohar	31.38	Kaimur	25.53		
Begusarai	41.05	Buxar	37.22	Supaul	31.24	Purnia	25.41		
Gopalganj	40.8	Khagaria	35.27	Aurangabad	30.92	Araria	25.18		
Munger	40.56	Purba Champaran	35.12	Paschim Champaran	29.29	Kishanganj	24.93		
Bhagalpur	39.49	Nawada	35.07	Rohtas	29.28	Katihar	22.48		
		Sitamarhi	35.05	Patna	28.89				
		Samastipur	34.9	Saharsa	28.02				
		Darbhanga	33.64						
		Nalanda	33.2						
		Gaya	33.1						

Average 32.90: Number of Districts Above Average=20; Number of Districts Below Average=17
Source: As stated in Table 3.4, Variable c2

Contemporary Bihar is characterised by the 'triple burden of disease'. Apart from uncontrollable communicable diseases, the magnitude of expensive-to-treat lifestyle diseases has been on the rise. The tottering primary health system and rapidly increasing and an unregulated private sector are causes for heightened insecurity in terms of health.

The availability of hospitals, beds, doctors and nurses has declined in the State though the number of Primary Health Centres and Sub-centres has risen. However, these are of little consequence, especially when there has been little expansion in the number of healthcare personnel. It may be noted that the number of persons served per bed in Bihar in 2002, was one of the highest with 3029 as against the All-India average of 1503. Regarding services of ANMs/nurse-midwives which are extremely crucial for reducing maternal and infant mortality, the number available per 100,000 population in Bihar is the lowest, due to which coverage of immunisation and institutional deliveries is low.

The state also fares poorly in terms of critical health infrastructure. The ratio of number of doctors per lakh population is only 32.7 as against about 60 for all-India. Further, it is estimated that the ratio of pharmacists to total population of Bihar is also one of the lowest, 1:19908 as against the all-India average of 1:1840. According to Pharmacy Council of India, during 2004, there were only two institutions that provided diplomas in pharmacy in Bihar while Andhra Pradesh has 20 institutions, Karnataka 85, and Maharashtra has 68 pharmacy institutions (IHD, 2007).

Table 6.4: Indicators Used to Compute Absorption Index

District	Access to Safe Drinking Water		Access to PHC		Absorption Index	
	Value (%)	Rank	Value (%)	Rank	Value	Rank
Araria	98.65	2	25.18	33	0.672	20
Aurangabad	82.53	25	30.92	24	0.624	26
Banka	49.42	35	26.11	30	0.406	35
Begusarai	88.97	20	41.05	4	0.732	7
Bhagalpur	65.38	31	39.49	7	0.590	28
Bhojpur	90.20	19	38.72	8	0.722	10
Buxar	87.39	21	37.22	11	0.696	15
Darbhanga	99.00	1	33.64	17	0.735	6
Gaya	68.55	29	33.10	19	0.562	29
Gopalganj	97.28	8	40.80	5	0.776	2
Jamui	36.31	37	14.90	37	0.253	37
Jehanabad	82.67	24	32.94	20	0.639	24
Kaimur	74.18	27	25.53	31	0.539	30
Katihar	96.85	9	22.48	35	0.643	23
Khagaria	95.91	14	35.27	12	0.729	8
Kishanganj	90.43	18	24.93	34	0.625	25
Lakhisarai	53.63	34	26.78	29	0.434	34
Madhepura	96.57	11	31.55	21	0.706	14
Madhubani	98.08	4	41.36	3	0.785	1
Munger	42.76	36	40.56	6	0.472	33
Muzaffarpur	92.62	16	37.29	10	0.725	9
Nalanda	61.60	32	33.20	18	0.524	32
Nawada	72.98	28	35.07	14	0.600	27
Paschim Champaran	96.66	10	29.29	25	0.691	17
Patna	67.76	30	28.89	27	0.527	31
Purba Champaran	92.71	15	35.12	13	0.710	12
Purnia	98.18	3	25.41	32	0.671	21
Rohtas	92.06	17	29.28	26	0.665	22
Saharsa	96.41	12	28.02	28	0.680	18
Samastipur	86.49	23	34.90	16	0.674	19
Saran	87.07	22	45.21	1	0.751	3
Sheikhpura	55.89	33	19.85	36	0.397	36
Sheohar	98.01	6	31.38	22	0.713	11
Sitamarhi	98.02	5	35.05	15	0.739	5
Siwan	96.30	13	37.51	9	0.747	4
Supaul	97.38	7	31.24	23	0.709	13
Vaishali	77.94	26	44.03	2	0.692	16

6.3 Status of Districts on Absorption Index

Based on the two indicators discussed above, namely, safe drinking water and access to PHCs, an absorption index has been calculated and has been presented in Tables 6.4 and 6.5. Map 6.3 presents the districts on the basis of the value of the absorption index. The Map shows a clear regional pattern to the food absorption index. The southern region is insecure whereas the northern region is relatively secure in terms of the absorption index. Madhubani emerged to be the most secure district having an absorption index of 0.785, whereas Jamui is the least secure district with absorption index value of 0.253.

A quarter of the districts in Bihar fell in three different food insecure categories (five moderately insecure, three severely insecure and one extremely insecure), whereas almost half of the districts are secure in terms of the food absorption index. Ten districts are found to be moderately secure.

Table 6.5: Status of Districts on Absorption Index

Secure	Moderately Secure	Moderately Insecure	Severely Insecure	Extremely Insecure
Madhubani	Samastipur	Gaya	Lakhisarai	Jamui
Gopalganj	Araria	Kaimur	Banka	
Saran	Purnia	Patna	Sheikhpura	
Siwan	Rohtas	Nalanda		
Sitamarhi	Katihar	Munger		
Darbhanga	Jehanabad			
Begusarai	Kishanganj			
Khagaria	Aurangabad			
Muzaffarpur	Nawada			
Bhojpur	Bhagalpur			
Sheohar				
Purba Champaran				
Supaul				
Madhepura				
Buxar				
Vaishali				
Paschim Champaran				
Saharsa				
No. of Districts 18	**10**	**5**	**3**	**1**

Map 6.3: Food Absorption Map of Rural Bihar
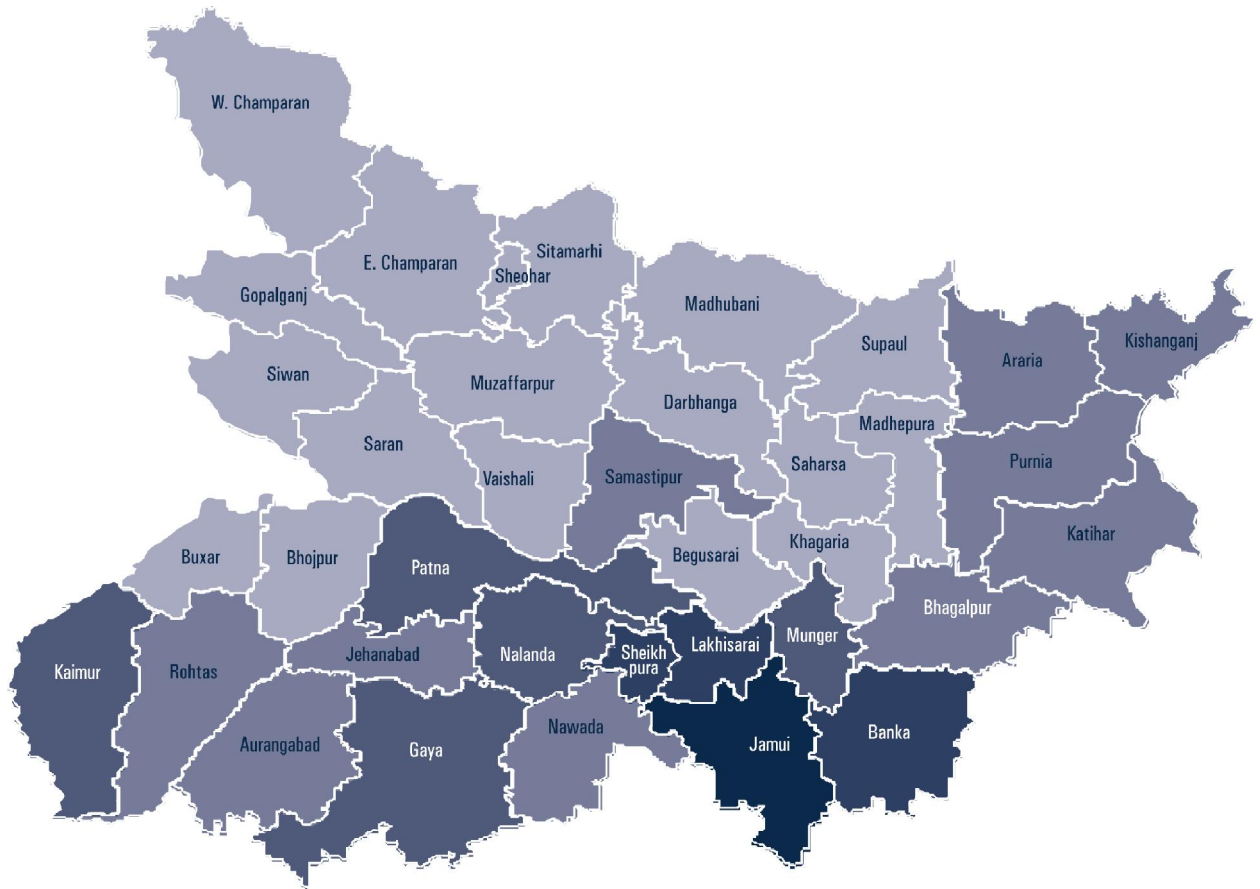
Absorption Index

- ☐ Secure [0.6783 - 0.7850]
- ☐ Moderately Secure [0.5719 - 0.6783]
- ☐ Moderately Insecure [0.4654 - 0.5719]
- ☐ Severely Insecure [0.3590 - 0.4654]
- ☐ Extremely Insecure [0.2530 - 0.3590]

7. Addressing Food Insecurity in Bihar

Chapter 3 developed an index to show the ranks of districts by outcomes of food insecurity. The next logical step was to look at factors that contribute to making these districts so prone to food insecurity. These factors were analysed in terms of the Availability, Access and Absorption framework in Chapters 4 to 6. In this chapter, all these factors are taken together to explain food security across districts and are combined to form a single index, called the Food Security Index (FSI). Map 7.1 gives districts by their rank on the FSI and Table 7.1 gives the corresponding table. The critical question is: Is there an overlap between the ranks of districts on the food security outcome index and the ranks on the food security index? In other words, do the districts that have poor outcomes (in terms of under-five mortality and underweight children) also have low availability, access and absorption? As we show that the factors or indicators that are included in the composite FSI do indeed contribute to food insecurity, any strategy to improve the food security status must address them (Table 7.2).

7.1 Food Security Index (FSI)

In this section, we bring together all the indicators chosen to explain food insecurity. The indicators hitherto clubbed into three sets – Availability, Access and Absorption – have now been individually clubbed together into one index, called the Food Security Index (FSI). This index shows the combined effect of all the indicators. Further, comparison with the individual sets of indices would reveal their relative significance in the Food Security Index. Table 7.2 and Map 7.1 presents the status of the districts in terms of Food Security Index (FSI).

Table 7.1 shows that in case of food availability index, the five worst districts are Purnia, Araria, Darbhanga, Kishanganj and Jamui. All these districts are from the northern part of Bihar except Jamui, indicating that North Bihar is worse off than South Bihar in terms of food availability. Again, North Bihar experiences grave food insecurity when we consider the Food Accessibility Index, as seen in Table 7.1. The five worst districts – Katihar, Purnia, Araria, Kishanganj and Paschim Champaran – are from North Bihar. The opposite is true when we look at food absorption index as the five worst ranked districts – Jamui, Sheikhpura, Banka, Lakhisarai and Munger – originate from Southern Bihar. In consequence, this gives a mixed ranking (districts originating from both Northern and Southern Bihar) when we look at the food security index as a whole: Out of the five most insecure districts, two (Jamui and Banka) are from south Bihar and three (Araria, Katihar and Kishanganj) are from North Bihar. However, it is noteworthy that 4 of these 5 districts are in the eastern part of the state.

Looking at the Food Security Outcome Index, we see three (Araria, Kishanganj and Sitamarhi) out of the five most food insecure districts are from North Bihar.

The composite Food Security Input Index (FSI) based on all the indicators has been classified into five levels of food security, as in the case of Food Security Outcome Index. As may be seen from Table 7.2 and Map 7.1, Rohtas and Buxar emerged as the two most food secure districts of Bihar, while Jamui and Araria emerged as the least food secure. However, according to the Outcome Index (Table 3.3),

Table 7.1: Ranks of Districts on Composite Food Security Index and Components

Districts	Availability		Access		Absorption		FSI Index		FSO Index	
	Index	Rank	Index	Rank	Index	Rank	Index	Rank	Index	Rank
Rohtas	0.590	1	0.468	1	0.665	22	0.537	1	0.672	4
Buxar	0.552	2	0.441	11	0.696	15	0.518	2	0.602	14
Kaimur	0.549	3	0.422	25	0.539	30	0.478	10	0.462	34
Sheikhpura	0.543	4	0.432	16	0.397	36	0.456	18	0.659	7
Bhojpur	0.498	5	0.441	10	0.722	10	0.508	3	0.643	9
Jehanabad	0.489	6	0.467	2	0.639	24	0.504	4	0.519	28
Khagaria	0.488	7	0.428	20	0.729	8	0.499	6	0.584	17
Begusarai	0.474	8	0.428	19	0.732	7	0.496	8	0.611	12
Munger	0.465	9	0.449	6	0.472	33	0.457	17	0.686	3
Madhepura	0.454	10	0.425	22	0.706	14	0.484	9	0.505	30
Nalanda	0.450	11	0.446	8	0.524	32	0.461	16	0.590	16
Gopalganj	0.424	12	0.44	12	0.776	2	0.497	7	0.615	11
Saharsa	0.424	13	0.436	13	0.68	18	0.477	11	0.605	13
Nawada	0.422	14	0.461	4	0.6	27	0.476	12	0.646	8
Siwan	0.418	15	0.459	5	0.747	4	0.400	5	0.666	6
Patna	0.402	16	0.421	27	0.527	31	0.435	28	0.699	2
Aurangabad	0.400	17	0.461	3	0.624	26	0.474	13	0.462	33
Paschim Champaran	0.387	18	0.374	36	0.691	17	0.435	29	0.573	20
Gaya	0.380	19	0.43	18	0.562	29	0.440	25	0.537	25
Samastipur	0.374	20	0.424	23	0.674	19	0.456	19	0.556	23
Vaishali	0.366	21	0.445	9	0.692	16	0.469	15	0.637	10
Supaul	0.353	22	0.423	24	0.709	13	0.456	20	0.574	19
Saran	0.332	23	0.448	7	0.751	3	0.472	14	0.718	1
Muzaffarpur	0.328	24	0.419	28	0.725	9	0.450	24	0.523	26
Banka	0.324	25	0.416	31	0.406	35	0.389	35	0.670	5
Purba Champaran	0.323	26	0.427	21	0.71	12	0.450	23	0.546	24
Bhagalpur	0.311	27	0.422	26	0.59	28	0.422	30	0.598	15
Madhubani	0.310	28	0.415	32	0.785	1	0.454	22	0.563	22
Lakhisarai	0.309	29	0.434	14	0.434	34	0.400	32	0.579	18
Sitamarhi	0.308	30	0.432	17	0.739	5	0.454	21	0.460	35
Katihar	0.302	31	0.375	35	0.643	23	0.404	34	0.506	29
Sheohar	0.288	32	0.417	29	0.713	11	0.436	26	0.474	32
Purnia	0.287	33	0.39	34	0.671	21	0.413	31	0.499	31
Araria	0.274	34	0.372	37	0.672	20	0.400	36	0.365	37
Darbhanga	0.273	35	0.417	30	0.735	6	0.435	27	0.522	27
Jamui	0.198	36	0.432	15	0.253	37	0.336	37	0.569	21
Kishanganj	0.175	37	0.394	33	0.625	25	0.376	33	0.413	36

Map 7.1: Food Security Map of Rural Bihar

Food Security Index

- Secure [0.4970 - 0.5370]
- Moderately Secure [0.4567 - 0.4970]
- Moderately Insecure [0.4164 - 0.4567]
- Severely Insecure [0.3761 - 0.4164]
- Extremely Insecure [0.3360 - 0.3761]
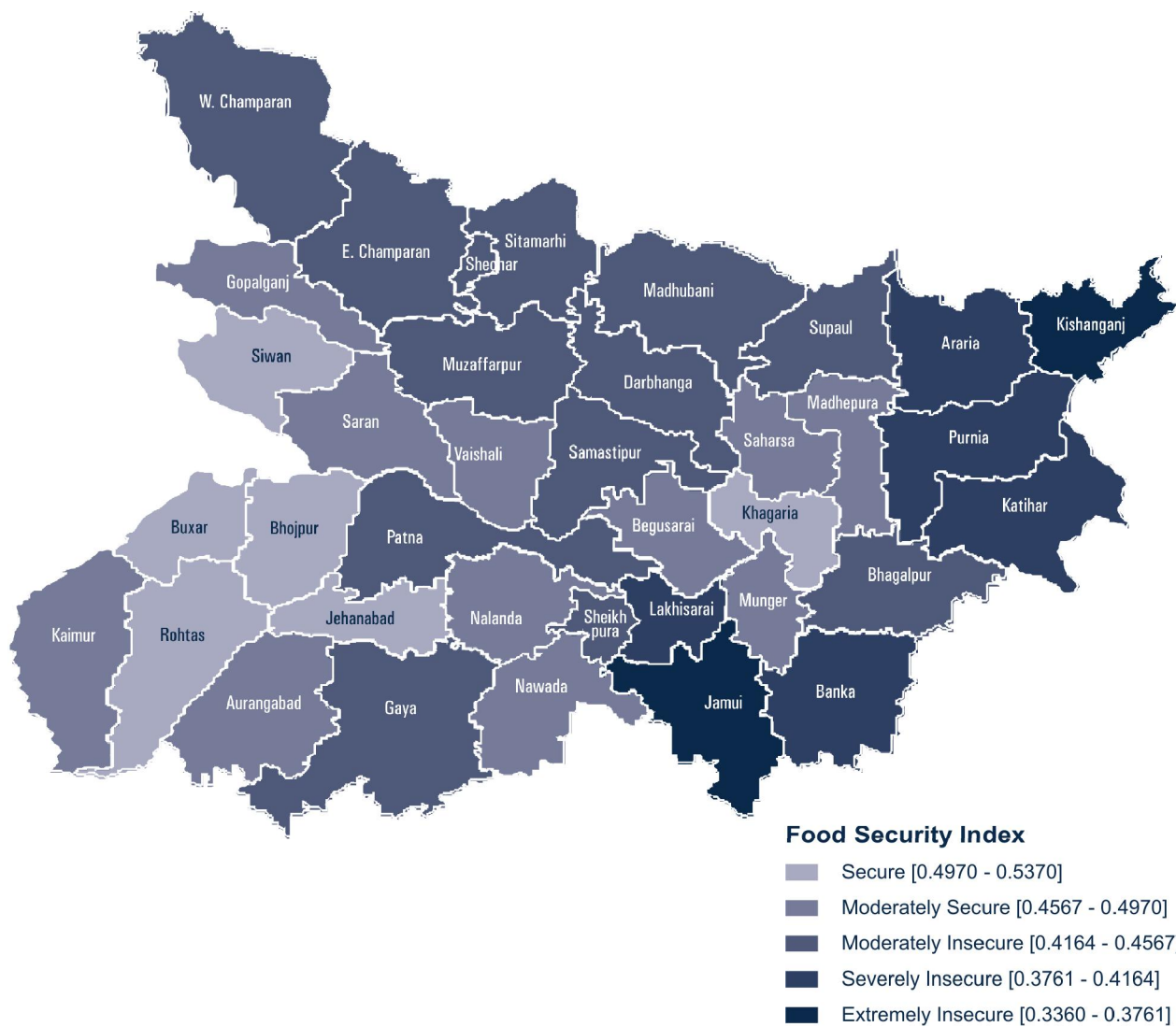
Table 7.2: Status of Districts on Food Security Index (FSI)

Secure	Moderately Secure	Moderately Insecure	Severely Insecure	Extremely Insecure
Rohtas	Gopalganj	Sheikhpura	Purnia	Jamui
Buxar	Begusarai	Samastipur	Lakhisarai	
Bhojpur	Madhepura	Supaul	Kishanganj	
Jehanabad	Kaimur	Sitamarhi	Katihar	
Siwan	Saharsa	Madhubani	Banka	
Khagaria	Nawada	Purba Champaran	Araria	
	Aurangabad	Muzaffarpur		
	Saran	Gaya		
	Vaishali	Sheohar		
	Nalanda	Darbhanga		
	Munger	Patna		
		Paschim Champaran		
		Bhagalpur		
No. of Districts 6	11	13	6	1

Saran and Patna are the two most food secure districts. It may also be borne in mind that even the two most food secure districts of Bihar may not figure very high in the All-India context.

If we compare the classification of districts by the output and the input approaches as given in Table 3.3 and Table 7.2, two points attract immediate attention. The two least secure categories – extremely insecure (EIS) and severely insecure (SIS) – which demand urgent attention, contain seven districts (1 EIS + 6 SIS) according to input method (Table 7.2) as against nine according to outcome approach (2 EIS + 7 SIS). Secondly, all these seven districts do not appear in the list of the two categories of districts according to outcome approach. Jamui, Banka and Lakisarai do not appear in the outcome list of least food secure districts. Jamui appears in the category of insecurity just above the lowest two (i.e. MIS), but Banka and Lakhisarai appear in the two highest categories of food security (i.e. S & MS), according to the outcome index.

Of the six food secure districts, except Khagaria, all the other are from western part of Bihar. The indicators for irrigation, paved roads as constituents of food availability index are reported to be fairly good for the district. In fact, both availability and absorption indices report a relatively secure situation for Khagaria.

7.2 Identifying Priority Districts (12 districts)

The Food Security Outcome Index described earlier provides the option of prioritising the developmental efforts in the most food insecure districts. The districts in the two lowest categories,

Table 7.3: Region-wise Priority Districts for Food Security Intervention

South Bihar	North Bihar
Jamui, Aurangabad, Kaimur, Lakhisarai and Banka	Kishanganj, Araria, Katihar, Madhepura, Purnia, Sheohar, and Sitamarhi
5 districts	**7 districts**

that is, the extremely and severely food insecure districts should be prioritised for developmental intervention for enhancing food security. These include a total of 12 districts of which 7 are from the 19 districts of North Bihar, and 5 are from the 18 districts of South Bihar. These are given as the priority districts for food security intervention in Table 7.3.

Table 7.4 shows the status of the 12 priority districts in terms of outcome and food security indices.

At the same time, there are five districts in the outcome list of the two most insecure categories which do not appear in the two most insecure categories (EIS & SIS) of districts according to inputs on food security. These are Madhepura, Sheohar, Aurangabad, Kaimur and Sitamarhi. Among these, two districts namely, Sitamarhi and Sheohar appear in the intermediate category of

Table 7.4: Status of Priority Districts on Outcome and Overall Indices

District	Ranks of Districts on the Food Security Outcome (FSOI) Index and the Food Security Index (FSI)	
	FSOI rank	FSI rank
Banka	5	35
Lakhisarai	18	32
Jamui	21	37
Katihar	29	34
Madhepura	30	9
Purnia	31	31
Sheohar	32	26
Aurangabad	33	13
Kaimur	34	10
Sitamarhi	35	21
Kishanganj	36	33
Araria	37	36

food security (i.e. MIS), while Madhepura, Kaimur and Aurangabad appear among the two second-most secure categories (S & MS). In our view, while taking into account the most food insecure districts, it would be advisable to include all the districts figuring in the two lowest categories of food security according to the outcome as well as input approaches. If one proceeds on this basis, one should consider for special targeting the twelve districts listed in Table 7.5.

Table 7.5: 'Special Category Districts' (SCD)

Degree of Food Security	Districts
Severely Insecure (SIS)	Katihar, Kishanganj, Madhepura, Purnia, Sheohar, Aurangabad, Kaimur, Sitamarhi, Lakhisarai and Banka
Extremely Insecure (EIS)	Araria and Jamui

Table 7.6: Districts Ranked by FSI Availability Index (Input Variables)

District	Availability Index	Net Irrigated Area (%)	Villages with Access to Paved Road	Per Capita Value of Agricultural Output
Banka	SIS	MS	EIS	SIS
Lakhisarai	SIS	MIS	SIS	SIS
Jamui	EIS	SIS	EIS	EIS
Katihar	SIS	MIS	EIS	SIS
Madhepura	MS	MS	MIS	MIS
Purnia	SIS	MIS	EIS	SIS
Sheohar	SIS	SIS	SIS	SIS
Aurangabad	MIS	MIS	EIS	MS
Kaimur	S	S	SIS	S
Sitamarhi	SIS	SIS	MIS	EIS
Kishanganj	EIS	EIS	EIS	MIS
Araria	SIS	SIS	SIS	SIS

Having identified the twelve most food insecure districts in terms of the two approaches, we will analyse the status of these Special Category Districts districts in terms of the Availability Index, the Access Index and Absorption Index as also the eleven variables in terms of which inputs into food security have been identified (Tables 7.6, 7.7 and 7.8). We first look at the Availability Index and the three indicators that reflect the position in terms of availability of food. These are given in Table 7.6. As may be observed, in case of the nine districts belonging to the extremely food insecure (EIS) and severely food insecure (SIS) in terms of the outcome approach, the Availability Index is extremely insecure (EIS) or severely insecure (SIS) in case of seven districts, but happens to be within the secure or moderately secure category in case of Kaimur and Madhepura. On the other hand, Banka, Lakhisarai and Jamui which belong to the extremely insecure and severely insecure category in terms of the Output/Outcome Approach to Food Security figure in the extremely insecure or severely insecure category in terms of the Availability Index.

All the three individual Availability indicators also belong mostly to the Extremely Insecure (EIS) or Severely Insecure (SIS) districts.

We now turn to the indicators of access to food (Table 7.7). Here also, many of the districts belong to the EIS, SIS or MIS category, the only exception being Sitamarhi which falls within the moderately secure category (MS) in terms of the Access Index. Similarly, Lakhisarai and Jamui also belong to the MS category. When we turn to the six individual Access Indicators, while a majority of districts also fall within the EIS or SIS category in case of the nine most insecure districts, the number of exceptions is larger than in case of Availability Indicators. If we leave out Araria, in case of all the remaining eleven Special Category Districts, there is at least one indicator out of the six individual Access Indicators in

Table 7.7: Districts Ranked by FSI Access Index (Input Variables)

District	Access Index	Agricultural Labourers	Proportion of SC/ST	Monthly Per Capita Expenditure	Wage Rate	Ratio of Working Age Population	Literacy
Banka	MIS	MIS	MS	SIS	MIS	S	MIS
Lakhisarai	MS	MS	MS	MS	S	MIS	MIS
Jamui	MS	S	MIS	SIS	MS	S	SIS
Katihar	EIS	EIS	MS	MIS	MIS	SIS	EIS
Madhepura	MIS	SIS	MS	S	MIS	MS	EIS
Purnia	EIS	EIS	MS	MS	SIS	MIS	EIS
Sheohar	MIS	EIS	S	MS	SIS	MS	SIS
Aurangabad	S	MS	SIS	EIS	EIS	S	S
Kaimur	MIS	MIS	SIS	SIS	MIS	MIS	S
Sitamarhi	MS	SIS	S	MS	SIS	MS	SIS
Kishanganj	SIS	EIS	S	SIS	EIS	MIS	EIS
Araria	EIS	EIS	MS	SIS	MIS	MIS	EIS

terms of which the eleven districts fall within the Secure or Moderately Food Secure category.

When we come to the Absorption Index (Table 7.8), there is a major difference in the Availability and Access Indices. In case of the Absorption Index, of the twelve Special Category Districts belonging to the Extremely Insecure or Severely Insecure category only three districts in the Absorption Index fall in the EIS or SIS category, namely Banka, Lakhisarai and Jamui. In case of the other nine districts, the Absorption status is either Secure or Moderately Secure. This is primarily on account of the success of the Safe Drinking Water Mission, which has helped to bring a majority of districts to the High Security category. This is true of EIS and SIS category districts as well. But in case of access to health services in rural areas through a PHC within 5 kms of villages, the position is not that favourable. Here, with a single exception, all the twelve EIS & SIS districts have a parallel EIS/SIS status in terms of Access to PHC. The only exception occurs in case of Sitamarhi which belongs to the Moderately Secure category in terms of access to rural health services.

Some aspects of state policy are more relevant with respect to food security in the different districts. However, all the variables are not equally amenable to the state's policy control. Among the eleven variables which are involved in construction of the Food Security Index in Bihar, five variables can, to a considerable extent, be influenced directly through policy instruments. These are: percentage of net sown area under irrigation, accessibility to paved roads, percentage of female literates, percentage of households with access to safe drinking water and number of Public Health Centres. Unlike these, per-capita agricultural output, consumption expenditure and rural wage rate can only be indirectly influenced and that too within a limited range. For example, agricultural output can be influenced by irrigation facilities. However, in addition to strengthening of irrigation facilities, provision of fertilisers,

Table 7.8: Districts Ranked by FSI Absorption Index (Input Variables)

District	Absorption Index	Access to Safe Drinking Water	Access to PHCs
Banka	SIS	MIS	SIS
Lakhisarai	SIS	MIS	SIS
Jamui	EIS	EIS	EIS
Katihar	MS	S	SIS
Madhepura	S	S	MIS
Purnia	MS	S	SIS
Sheohar	S	S	MIS
Aurangabad	MS	MS	MIS
Kaimur	MIS	MS	SIS
Sitamarhi	S	S	MS
Kishanganj	MS	S	SIS
Araria	MS	S	SIS

insecticides and electricity for rural areas can also be aided by state action. Consumption expenditure can only be influenced by taxation policies but they have a very limited role in rural areas. Similarly, the state has a very limited role in market wage rate determination. On the other hand, there are three variables which are not within the state's control. These are the percentage of SCs/STs, dependency ratio and the proportion of agricultural labour. Their quantum cannot be affected by the state. State policy can only undertake measures through which the welfare of SCs/STs and agricultural labourers can be effected.

Using this framework of analysis, we may focus specifically on the twelve districts belonging to the two lowest categories of food security both in terms of the outcome and input approaches to food security and analyse their relative positions with respect to the policy-amenable variables. These twelve districts and their position in respect of the five policy amenable variables which affect food security have been put together in Table 7.9. The status of the districts in respect of the five directly amenable policy variables has been given instead of giving ranks of the districts, in Table 7.9. Table 7.10 gives the position in respect of the three indirectly amenable policy variables and Table 7.11 gives the position in respect of variables needing independent policy support.

When we look at the directly amenable policy variables, in case of paved roads and PHC availability, all the twelve food insecure districts belong to the three lowest categories of food security, namely, EIS, SIS or MIS. The sole exception occurs in case of Sitamarhi whose position in respect of PHC availability is fairly comfortable, i.e. MS. In these cases, these policy variables can be directly used for improving their current level of food security at the lowest level. In case of net irrigated area, there are four districts of these twelve districts, namely Banka, Madhepura, Aurangabad and Kaimur, where

Table 7.9: Special Category Districts by Directly Amenable Policy Variables

Districts	% of Net Irrigated Area	Paved Road	Female Literacy	Access to Safe Drinking Water	Access to PHCs
Banka	MS	EL	MIS	SIS	SIS
Lakhisarai	MIS	SIS	MIS	SIS	SIS
Jamui	SIS	EIS	SIS	EIS	EIS
Katihar	MIS	EIS	EIS	SIS	SIS
Madhepura	MS	MIS	EIS	MIS	MIS
Purnia	MIS	EIS	EIS	SIS	SIS
Sheohar	SIS	SIS	SIS	MIS	MIS
Aurangabad	MS	EIS	S	MIS	MIS
Kaimur	S	SIS	S	SIS	SIS
Sitamarhi	SIS	MIS	SIS	MS	MS
Kishanganj	EIS	EIS	EIS	SIS	SIS
Araria	SIS	SIS	EIS	SIS	SIS

the irrigation percentage indicates the two highest categories, i.e. Secure and Moderately Secure. Thus, in case of these districts, attention to irrigation can be relatively lower than in case of other variables where the position is very poor. In the case of drinking water availability, there are nine food insecure districts which are in the Secure or Moderately Secure category, namely Katihar, Madhepura, Purnia, Sheohar, Aurangabad, Kaimur, Sitamarhi, Kishanganj and Araria. This shows the success of

Table 7.10: Special Category Districts by Indirectly Amenable Policy Variables

District	Per Capita Value of Agricultural Output	Monthly Per Capita Consumption Expenditure	Rural Wage
Banka	SIS	SIS	MIS
Lakhisarai	SIS	MS	S
Jamui	EIS	SIS	MS
Katihar	SIS	MIS	MIS
Madhepura	MIS	S	MIS
Purnia	SIS	MS	SIS
Sheohar	SIS	MS	SIS
Aurangabad	MS	EIS	EIS
Kaimur	S	SIS	MIS
Sitamarhi	EIS	MS	SIS
Kishanganj	MIS	SIS	EIS
Araria	SIS	SIS	MIS

Table 7.11: Special Category Districts by Variables Needing Independent Policy Support

District	Agricultural Labourers	Proportion of SC/ST	Ratio of Working Age Population
Banka	MIS	MS	S
Lakhisarai	MS	MS	MIS
Jamui	S	MIS	S
Katihar	EIS	MS	SIS
Madhepura	SIS	MS	MS
Purnia	EIS	MS	MIS
Sheohar	EIS	S	MS
Aurangabad	MS	SIS	S
Kaimur	MIS	SIS	MIS
Sitamarhi	SIS	S	MS
Kishanganj	EIS	S	MIS
Araria	EIS	MS	MIS

the state's direct role in respect of providing access to safe drinking water. In the case of female literacy, two out of the twelve food insecure districts, namely, Aurangabad and Kaimur are in the secure category.

In the case of the indirectly amenable policy variables and in the case of 'value of agricultural output', two of these twelve districts are in the S or MS category, namely, Aurangabad and Kaimur; while in the case of agricultural wages, Lakhisarai and Jamui belong to the S and MS categories. In case of 'average consumption expenditure', three districts are in the MS or S category, namely, Lakhisarai, Purnia and Sheohar. Thus in the case of a number of variables, whereas the food security level is in the lowest category, in respect of some variables these districts have a fairly comfortable position. Therefore, while determining areas for priority action, a uniform approach to all the variables cannot be followed, but action needs to be focused on those districts where specific variables also belong to the two lowest categories.

7.3 Comparative Significance of Food Policy Variables

The preceding discussion focused on the district level position in terms of component indices of Food Security. In order to examine the degree of influence exercised by different variables on the food security scenario in the state, we may first examine the strength of the relationship of the Food (Input) Security and Food (Outcome) Security Index to the three component indices, as also the inter-relationship of the aggregate input and outcome indices. These are given in Table 7.12.

The correlation between aggregate Input and Food Security Outcome Indices works out to be + 0.306. Thus, the relationship between both the aggregate food security indices is in the positive direction

Table 7.12: Intercorrelation Matrix of Input and Output Components of Food Security

	Availability	Access	Absorption	FSOI	FSI
Availabilty Index	1.000	0.560**	-0.049	0.439**	0.841**
Access Index	0.560**	1.000	-0.059	0.440**	0.683**
Absorption Index	-0.049	-0.059	1.000	-0.075	0.373
FSO Index	0.439**	0.440**	-0.075	1.000	0.306
FS Index	0.841**	0.683**	0.373*	0.306	1.000

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

but it is insignificant. Secondly, the Food Security Input Index is very strongly related to the Availability Index (r=+0.84**) and Access Index (+0.68**). It is also to some extent related to the Absorption Index (+0.37**). But the Outcome Index is much less strongly related to the Availabilty Index as well as the Access Index, and it is negatively related (-0.075) to the Absorption Index. This is apparently a consequence of the time lags involved in moving from the Input Indices to the Outcome Index as also the intervening impediments to such a movement.

We now focus on the inter-relationship of the eleven individual food security variables to the aggregate Food Input Security Index and its three component composite Indices, in order to assess the strength of relationship of these variables to the food security indices. These are shown in Table 7.13. On the basis of last row of this table, the variables which exercise a strong influence on the Food Security Index are:

(i)   Irrigation which shows a correlation of + 0.735**

(ii) Value of agricultural output which shows a correlation of + 0.437**

(iii) Female literacy which shows a correlation of + 0.586**

(iv) Public Health Centres which shows a correlation of + 0.578**

(v) Roads: which shows a correlation of +0.428**.

A slightly less strong influence is revealed by:

(vi) Agricultural labourers which has a correlation of +0.347*

(viii) Safe Drinking Water Availability which has a correlation of +0.375*.

** indicates significant r at 0.01 level;   * indicates significant r at 0.05 level.

One might argue that a correlation of the FSI with its components would not be valid. But the larger the number of component variables, the weaker is this argument. Since in this case the FSI is composed of eleven components, which is a fairly large number, the force of argument against using these correlations is relatively weaker. However, in case of the correlation of component variables with the three sub-indices, the force of this argument would be relatively stronger, since in case of some sub-indices, the number of components is rather small, e.g. the Absorption Index. On the other hand, the inter-correlation of sub-indices does not run into any problem of validity since their components are different. Also, while one may place a lower faith in the absolute level of correlation of component variables with the three sub-indices, the relative value of correlations of components with the three sub-indices can still be relied upon to show the relative importance of component variables.

As implicit in the approach to food security outlined earlier, these variables are supposed to exercise an influence on the food security through one of its three components viz., Availability, Access and Absorption, with which these indicators have been linked. We may, therefore, examine separately the correlation of each of the above variables with the component of food security whose part they form.

7.3.1   Availability Index

The three variables which go to form this Index are the per capita value of agricultural output, irrigation percentage and percentage of villages having approach to paved roads. All these three reveal a very strong correlation and in fact a much stronger correlation with the Availability Index than with food security. The percentage of net cropped area which is irrigated shows the strongest correlation (r=+0.909**) with the Food Security Availability Index. Per capita value of agricultural output also shows a very strong correlation (+0.610**), though a slightly less strong correlation than irrigation. Roads are somewhat less strongly correlated (r=+0.405*) to the Availability Index. Since these three variables are of key importance for Availability component of food security, in order to strengthen food security in the state, policy formulation should put an equally strong emphasis on measures which specifically address these three variables.

7.3.2   Access Index

We now look at the correlation of the Food Security Access Index with the six variables of which it is composed. Among these, only two variables reveal a strong and statistically significant correlation, namely, female literacy (r=0.723**) and the proportion of agricultural labour (r=+0.799**). The other variables do not reveal correlation above +0.166. This is somewhat surprising since income is well known to be a major determinant of access to food. It is possible that consumption per-capita is a good indicator of income, although here again theoretical as well as statistical evidence supports this hypothesis. In any case, consumption level by itself is also a key component of food security.

Table 7.13: Correlation Matrix of Food Security Index and Components

Variables	pcvao	nia	road	scst	rwap	literacy	mpce	wage	aglab
AvIndex	0.610**	0.909**	0.405*	-0.306	0.109	0.663**	0.088	0.223	0.371*
AccIndex	0.045	0.613**	0.235	-0.291	0.166	0.723**	0.096	0.035	0.799**
Absorption Ind	0.065	-0.065	0.188	0.491**	-0.392*	-0.115	0.066	-0.134	-0.262
FSI	0.437**	0.735**	0.428**	-0.030	-0.083	0.586**	0.120	0.083	0.347*

Variables	water	phcs	AvIndex	AccIndex	AbsIndex	FSI
AvIndex	-0.033	0.208	1.000	0.532**	0.057	0.832**
AccIndex	-0.271	0.397*	0.532**	1.000	-0.060	0.616**
Absorption Ind	0.921**	0.622**	0.057	-0.060	1.000	0.538**
FSI	0.375*	0.578**	0.832**	0.616**	0.538**	1.000

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

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

Notation:

*aglab:	% other than agricultural labourers to all workers	literacy:	Female literacy (7 years & above)
*scst:	% of non (SC+ST) popn to total	water:	% HH Access to safe drinking water
nia:	% Net Irrigated Area to Net Sown Area	phcs:	% of villages having PHCs within 5 km
pcvao:	Per Capita value of agricultural output	road:	% of villages having access to paved road
rwap:	Ratio of working age population	AvIndex:	Availability Index
mpce:	Monthly per-capita consumption expenditure	AccIndex:	Access Index
wage:	Rural casual wage rate	AbsIndex:	Absorption Index
FSI:	Overall Food Security Index		

*The direction of these variables has been reversed to have a positive association with Food Security.

In the case of casual wage rates it may not be a very good proxy of income since other incomes of casual rural agricultural wage workers are also quite important. This is borne out by the fact that the proportion of agricultural workers reveals quite a high correlation with the Index of Food Access. The proportion of agricultural workers is apparently quite a good indirect indicator of non-agricultural incomes. However, despite the absence of direct statistical evidence, in view of the well-supported supported general view that consumption per capita and wages are essential pre-requisites for access to food, we shall subsequently take account of these two variables while indicating the districts which are weak in terms of these indicators and need policy support to raise their level of food security.

7.3.3 Absorption Index

The Food Security Absorption Index is composed of only two variables, namely, availability of safe drinking water and Public Health Centres. Therefore, their separate correlations with the composite

Index would be expected to be quite high and they emerge to be very strong (r=+0.921** & r=0.622**, respectively). However, these two variables also bear quite a strong correlation with the food security index as well, viz. 0.375* & 0.578**. Hence, these two variables are of crucial importance from the point of view of food security.

Thus, all three component indicators of the Availability Index emerge to be statistically very significant from the point of view of providing support to the Availability Index. Two emerge to be statistically crucial from the point of view of the Access Index and two from the angle of Absorption Index. However, in the light of the argument presented above in the context of the Index of Access, two variables which do not show a statistically strong correlation with the Access Index but are of prime importance, may also be considered to be of crucial significance from the point of view of providing food security, viz. average per-capita consumption expenditure and agricultural wage per worker.

Keeping in mind the varying policy amenability of the variables, our approach to formulation of the food security policy at the district level will proceed within the framework indicated above. We identify those districts which are below the state average, and then focus attention on the twelve Special Category Districts which belong to the two most food insecure category.

We shall first of all take up the five variables which are directly amenable to state level policy. These are given in Table 7.14. Districts in this table, as also in Tables 7.15. and 7.16, have been arranged in descending order in terms of Food Security Index. The figures given in the first column of Tables 7.14, 7.15 and 7.16 indicate the declining rank of districts in terms of their food security. Among these, the first one is percentage of gross cropped area irrigated. As may be observed from Table 7.14, the study has identified seventeen districts which occupy a below average position in terms of percentage of area irrigated. Ranks of these seventeen districts are given in Table 7.14 for area irrigated. Their ranks in terms of Food Security Index are self-evident from Column 1 of Table 7.14. As may be observed, among the seventeen districts with below average irrigation level, the majority are below average in terms of food security index. Only 2-3 districts form an exception. The fact that irrigation percentage is a variable of prime significance for raising the Availability Index and ultimately the food security index may be seen from the fact that correlation between Index of Availability and Percentage of Area Irrigated as given in Table 7.13, is as high as +0.91**. Policy measures for raising irrigation would help in raising food security as well. In Tables 7.14, 7.15 and 7.16, the twelve priority districts are indicated in **bold font**.

When we turn to the other four variables under direct state control, namely, paved rural roads, female literacy, households with access to safe drinking water and PHCs, the correlation of all of these with the Food Security Index (FSI) is fairly high, though not as high as in case of irrigation percentage. It is significant at the 0.01 level in case of the correlation with PHCs (+0.578**), female literacy (0.586**) and roads (0.428**). Correlation with the availability of safe drinking water is significant at 0.05 level. Thus, correlations of all the variables on which state can directly exercise control, show a significant role of the state in enhancing food security. Table 7.14 also lists the

Table 7.14: District Ranks in Terms of Directly Amenable Policy Variables

Serial No. & FSI Rank	District	Value of FSI Index	District Rank In Terms of:				
			Irrigation Percentage	Access to Paved Roads	Female Literacy	Drinking Water Availability	PHCs Availability
1	Rohtas	0.537					26
2	Buxar	0.518		30			
3	Bhojpur	0.508					
4	Jehanabad	0.504		24		24	
5	Siwan	0.500					
6	Khagaria	0.499			24		
7	Gopalganj	0.497					
8	Begusarai	0.496					
9	**Madhepura**	0.484			32		21
10	**Kaimur**	0.478		26		27	31
11	Shaharsa	0.477			29		28
12	Newada	0.476		23		28	
13	**Aurangabad**	0.474	24	33		25	24
14	Saran	0.472					
15	Vaishali	0.469				26	
16	Nalanda	0.461				32	
17	Munger	0.457				36	
18	Sheikhpura	0.456				33	36
19	Samastipur	0.456	26				
20	Supaul	0.456	28		39		23
21	**Sitamarhi**	0.454	30		26		
22	Madhubani	0.454	34		25		
23	Purba Champaran	0.450	29		30		
24	Muzaffarpur	0.450	25				
25	Gaya	0.440		31		29	
26	**Sheohar**	0.436	31	25	28		22
27	Darbhanga	0.435	35		23		
28	Patna	0.435				30	27
29	Paschim Champaran	0.435	27	29	31		25
30	Bhagalpur	0.422	33			31	
31	**Purnia**	0.413	24	32	35		32
32	**Katihar**	0.404	22	34	34		35
33	**Lakhisarai**	0.400	23)	27		34	29
34	**Araria**	0.400	36	28	33		33
35	**Banka**	0.389		37	22	35	30
36	**Kishanganj**	0.376	37	35	37		34
37	**Jamui**	0.336	32	36	27	37	37

below average districts in case of these four variables on which the state should focus specific attention for improving food security.

Looking at the low ranking in all five variables which appear in Table 7.14, the district which fares poorly in four out of five is Kishanganj, while Araria, Katihar, and Jamui occur thrice each in the bottom five. These districts are thus the most vulnerable. They also figure among those which are among the lowest in terms of their food security index.

Thus, policy-makers can assess, which of the variables should be targeted for priority action for each of the low ranking food security districts.

At the same time, one may also observe from Table 7.14 that even in case of districts which are above average in terms of their food security index, they are not also above average in terms of some of the policy amenable variables. For example, Buxar which is the second highest in case of Food Security Index, has a rank as low as 30th in terms of access to rural paved roads. Similarly, Rohtas tops in terms of food security, but in terms of PHCs, it occupies 26th position. In fact, in case of nineteen districts pertaining to above average food security index, two districts have below average irrigation, five districts have below average road density, three districts have below average female literacy, eight districts have below average access to safe drinking water and six districts have below average access to PHCs. Thus, even in case of fourteen districts with above average food security index, specific policy measures will have to be targeted to raise their status in terms of the policy amenable variables.

We now analyse the three variables which can be influenced by the state but only by indirect measures. The state can improve overall agricultural output per capita through provision of irrigation facilities which have already been considered, by improving availability of fertilisers, insecticides and improved seeds. It can enhance the effectiveness of agricultural extension services which would improve agricultural technology to match it to varying needs of different areas and seasons. In case of consumption expenditure, the scope is rather limited. The PDS is one channel through which it can be improved, as taxation policies have a limited role in rural areas. In case of wages, apart from minimum wage legislation and improvement of its implementation, direct policy role in case of public sector wage rates has considerably reduced.

The position of the different districts in terms of these three variables is shown in Table 7.15. The position of eighteen below-average FSI districts in respect of agricultural output per capita may be gauged from Column (3), in which eleven among these eighteen districts are below the average. But it may also be observed that there are seven districts which are fairly comfortably placed above the average level of FSI and yet fall below the average in agricultural output performance. The fact that their FSI position is above average should not make us complacent in respect of their agricultural performance.

Table 7.15: District Ranks in Terms of Indirectly Amenable Policy Variables

Serial No. & FSI Rank	District	District Rank In Terms of		
		PCVAO	Monthly Per Capita Consumption Expenditure	Rural Wage Rate
1	Rohtas		16	
2	Buxar		28	
3	Bhojpur		19	36
4	Jehanabad		35	
5	Siwan			26
6	Khagaria			
7	Gopalganj	23		
8	Begusarai	32		
9	**Madhepura**		32	24
10	**Kaimur**		33	
11	Shaharsa		29	25
12	Newada	22		37
13	**Aurangabad**			35
14	Saran	27	36	
15	Vaishali	35	32	20
16	Nalanda		21	21
17	Munger	31	18	
18	Sheikhpura			
19	Samastipur	28		22
20	Supaul		27	
21	**Sitamarhi**	33		29
22	Madhubani	34		27
23	Purba Champaran			30
24	Muzaffarpur	29		
25	Gaya	25	34	34
26	**Sheohar**	24	17	31
27	Darbhanga	36		23
28	Patna		20	
29	Paschim Champaran		22	32
30	Bhagalpur	30	37	
31	**Purnia**	20	23	28
32	**Katihar**			
33	**Lakhisarai**	26		
34	**Araria**		30	
35	**Banka**	21	25	
36	**Kishanganj**		31	33
37	**Jamui**	37	26	

Similarly, in case of consumption expenditure per capita, though eleven districts are below average in respect of FSI, there are eleven with above-average food security but have below average consumption expenditure and hence are likely to suffer from a high level of poverty. Specific action through means of indirect control would be needed to raise their level of consumption expenditure to the extent possible. In case of wages, however, nine districts with below average FSI have lower than average rural wages as well. But nine districts with above average level of food security have lower than average level of wages which demands policy consideration.

This brings us to the last three variables, viz., SC/ST percentage, ratio of working age population and percentage of agricultural labourers. As already pointed out, the role of state policy in influencing a magnitude of these variables is very limited. These variables are primarily dependent upon historical, non-agricultural, demographic and socio-economic factors. But in case of rural workforce distribution between the agricultural and non-agricultural sectors, the state's policy towards supporting the process of industrialisation will also have some indirect role. Thus, in case of these variables, as suggested earlier, the state's role will primarily be in terms of welfare policies to improve the socio-economic status of those affected by these variables. This is quite evident from the distribution of the number of districts with less than average values in terms of the three variables (See Table 7.16). In case of the percentage of SCs/STs, only four districts are less than average and also fall within the category of districts with less than average FSI. Similarly, in case of the ratio or rural working age population, five out of thirteen below average districts are less than average in terms of FSI. In the case of agricultural labour, only three districts with above average FSI have a below average non-agricultural workforce.

Table 7.16: District Ranks in Terms of Variables Needing Independent Policy Support

Serial No. & FSI Rank	District	District Rank In Terms of		
		Proportion of SC/ST	Ratio of Working Age Population	Agricultural Labourers
1	Rohtas	29		
2	Buxar			
3	Bhojpur			
4	Jehanabad	27		
5	Siwan		37	
6	Khagaria		33	28
7	Gopalganj		35	

(Continued...)

Serial No. & FSI Rank	District	District Rank In Terms of:		
		Proportion of SC/ST	Ratio of Working Age Population	Agricultural Labourers
8	Begusarai			
9	**Madhepura**	28		31
10	**Kaimur**	36	26	
11	Shaharsa			26
12	Newada	35		
13	**Aurangabad**	34		
14	Saran		36	
15	Vaishali	31	27	
16	Nalanda	32		
17	Munger			
18	Sheikhpura	30	25	
19	Samastipur	26	29	
20	Supaul			27
21	**Sitamarhi**			30
22	Madhubani			23
23	Purba Champaran			29
24	Muzaffarpur			
25	Gaya	37		
26	**Sheohar**			33
27	Darbhanga			24
28	Patna	28		
29	Paschim Champaran			36
30	Bhagalpur			25
31	**Purnia**		31	37
32	**Katihar**		34	34
33	**Lakhisarai**	24	32	35
34	**Araria**		30	
35	**Banka**			22
36	**Kishanganj**		28	32
37	**Jamui**	33		

A noteworthy point that is highlighted in the context of inter-district analysis undertaken for Bihar is that the geography of hunger is much more of an east-west divide, rather than the usual north-south division. It is mainly the eastern part of Bihar that reflects intense bakwardness, both among the northern and southern districts of the state. Four of the north Bihar and three of the south Bihar districts which are affected by food insecurity are located in the eastern part.

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8. Specific Policy Interventions for Enhancing Food Security in Bihar

The districts most beset by hunger and food insecurity have been identified in Chapter 7. These are also the districts that call for priority intervention. The analyses of the earlier chapters suggest the measures and strategies that are needed for enhancing food security. Broadly, the measures to improve availability must include improving irrigation and agricultural productivity. Farm incomes can be improved through better rural connectivity. Access should be improved by policies for enhancing rural wages and thereby spending on food, improving the lot of agricultural labour, land re-distribution, and enhancing the status of women. There can be no two opinions on the need to expand the reach of public interventions.

The central and state governments have launched a number of schemes and programmes that are aimed at enhancing food security in the state (see Box 8.1). Some of them are recent and it is too early to see their impact, while some have been under implementation for some time. This section discusses food security interventions.

8.1 Enhancing Availability

More than a decade of low investment in agriculture, including agricultural research and infrastructure, has resulted in a relative stagnation in food output. With the present problems of spiralling food prices, there is a renewed emphasis on increasing food production.

8.1.1 Increasing Food Production: The National Food Security Mission

The dismal rate of growth in the agricultural sector in the country has been a cause for concern – the sector grew at a meagre rate of 1.8 per cent per annum during the 1990s. This has been coupled with rising international prices as well occasional wheat imports, bringing into question the food security of the country. With a view to increasing the rate of agricultural growth to 4 percent, the government has launched the National Food Security Mission (NFSM) entirely funded by the Central government, with a total estimated outlay of over Rs. 50,000 million (Figure 8.1). The programme specifically aims at increasing the production and productivity of three crops: rice, wheat and pulses. Ongoing related schemes like the Integrated Cereal Development Programme (ICDP Rice/Wheat) and the Integrated Scheme on Pulses, Oilseeds and Maize (ISOPOM Pulse) would cease to operate in the identified districts once the relevant component of the NFSM comes into execution in the district.

The objective of the mission is to increase the production of rice by 10 million tonnes, wheat by 8 million tonnes and pulses by 2 million tonnes, by the end of the Eleventh Plan. The targets are to be achieved by restoring soil fertility and hence productivity, which would be complemented by increasing employment opportunities.

Box 8.1: National Policy for Farmers, 2007

The National Policy for Farmers is intended to help in rejuvenating the farm sector and bringing about lasting improvement in the economic condition of farmers. The Government had constituted the National Commission on Farmers in 2004 under the chairmanship of Dr. M.S. Swaminathan. Based on the recommendations made by the Commission in its Revised Draft National Policy for Farmers and the comments/suggestions received from various Central Ministries and Departments and State Governments, the 'National Policy for Farmers, 2007' has been formulated and approved by the Government of India. The policy, among other things, aims to improve the economic viability of farming by substantially improving the net income of farmers in addition to improving productivity, profitability, land, water and support services and providing appropriate price policy, risk management measures.

The recommendations include:

a)   Human Dimension: In addition to production and productivity, the economic well-being of the farmers to be given prime importance.

b)   Asset Reforms: To ensure that every man and woman, particularly the poor, in villages either possesses or has access to a productive asset.

c)   Water Use Efficiency: The concept of maximizing yield and income per unit of water to be adopted in all crop production programmes, with stress on awareness and efficiency of water use.

d)   Use of Technology: New technologies which can help enhance productivity per unit of land and water are needed. Biotechnology, information and communication technology (ICT), renewable energy technology, space applications and nano-technology to provide opportunities for launching an 'Evergreen Revolution' capable of improving productivity in perpetuity without harming the ecology to be developed.

e)   Inputs and services - soil health: Good quality seeds, disease-free planting material, including in-vitro cultured propagules and soil health enhancement hold the key to raising small farm productivity. Every farm family to be issued with a Soil Health Passbook. Food security basket to be enlarged to include nutritious millets mostly grown in dryland farming areas.

f)   Credit & Insurance: The financial services to be galvanized for timely, adequate and easy reach to the farmers at reasonable interest rates.

g)   Single National Market: A Single National Market to be developed by relaxing internal restrictions and controls.

An Inter-Ministerial Committee has been set up to operationalize the implementation of the policy.

Source: Economic Survey, 2007-08

The mission would operate at multiple levels from the national level, to the state and district levels. At the grassroot level, the Panchayati Raj Institutions (PRIs) would play an active role and would be involved in the selection of beneficiaries and identification of priority areas and local initiatives.

Figure 8.1: Allocation Proposed under NFSM
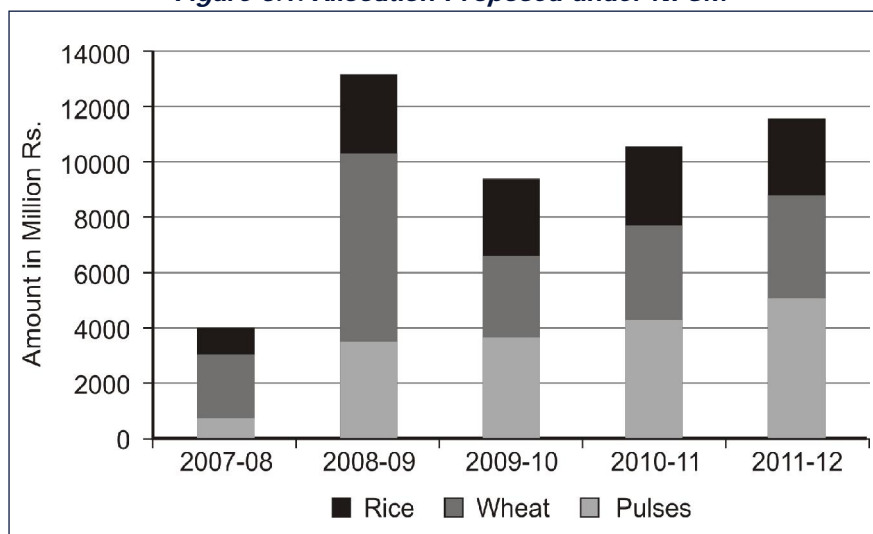
The mission would be implemented in 133 districts for the rice component, 138 districts for wheat and 168 districts for the pulse component – all in identified districts of different states. In terms of target beneficiaries, 16 per cent of the total allocation would be earmarked for Scheduled Castes under the Special Component Plan (SCP) and 8 per cent would be earmarked for Scheduled Tribes under the Tribal Sub-Plan (TSP). At least 33 per cent of the fund would be utilized for small, marginal and women farmers. Further, the allocation to the SC/ST farmers would be made in proportion to their population in the district.

The modality of implementation of the mission would be in the form of demonstration of an improved package at farmers' fields, assistance for production of hybrid rice, nutrient management for all the three crops, mechanization for sowing and weeding, and assistance for purchase of pump sets and sprinkler sets. Several capacity-building initiatives would also be undertaken which would be in the form of farmers' training in Farmers' Field Schools (FFS) and exposure visits to international organizations. Help from print and e-media and other methods would be taken as required for efficient information dissemination. All these would be followed by rewarding the best performing districts on a set of indicators.

Two points may be noted about this Mission. First, it aims at enhancing food production, which results in increased availability of food crops. In the approach to food security in this Report, food security of individuals is dependent on three dimensions, namely availability, access and body-absorption of food. No doubt, as argued by us earlier, availability of food is of prime importance, but access to food is almost equally important. Therefore, the mission objective forms only one component of food security.

Second, the districts which are chosen for implementing the scheme are not based on adequacy or inadequacy of food available in them, but on the basis of their production potential in the three specified crops. Efforts will be made to enhance farm productivity through extension of improved technologies and enhancing capacity of farmers to use these technologies in these districts. This is essentially an outcome of the primary objective of the Mission, which is to raise production of three food crops.

The districts which have been earmarked for enhancing production of the three crops in Bihar are listed in Table 8.1. The twelve least food secure districts are in **bold font.** It may be observed that in

Table 8.1: National Food Security Mission Districts in Bihar

Wheat		Rice		Pulses	
1.	**Araria**	1.	**Araria**	1.	**Araria**
2.	Bhagalpur	2.	**Banka**	2.	**Aurangabad**
3.	**Banka**	3.	Champaran (East)	3.	Bhojpur
4.	**Bhabua**	4.	Champaran (West)	4.	**Bhabhua**
5.	Champaran(E)	5.	Darbhanga	5.	Madhubani
6.	Champaran(W)	6.	**Gaya**	6.	**Madhepura**
7.	Darbanga	7.	**Katihar**	7.	Muzaffarpur
8.	**Jamui**	8.	**Kishanganj**	8.	Nalanda
9.	**Katihar**	9.	Madhubani	9.	Patna
10.	Khagaria	10.	**Madhepura**	10.	**Purnia**
11.	**Kishanganj**	11.	Muzaffarpur	11.	Saharsa
12.	Madhubani	12.	Nalanda	12.	Samastipur
13.	**Madhepura**	13.	**Samastipur**	13.	Supaul
14.	Muzaffarpur	14.	**Sitamarhi**		
15.	Nalanda	15.	Siwan		
16.	**Purnia**	16.	**Supaul**		
17.	Rohtas	17.	**Jamui**		
18.	Samastipur	18.	Saharsa		
19.	Saran				
20.	**Sitamarhi**				
21.	Supaul				
22.	Vaishali				
23.	Monghyr				
24.	Nawada				
25.	Sekhpura				
Total 25 Districts		18 Districts		13 Districts	

*Note: The districts in **bold font** are the "Special Category Districts".*
Source: Government of India (2007).

the case of 25 NFSM-wheat districts, nine belong to the least food secure districts. In case of 18 NFSM-rice districts, seven are from the least food secure category while in case of pulses, the number of such districts is five out of 13. This confirms that whereas the Mission will help to raise food security in the state, it will serve the cause of raising food security in the most food insecure areas only to a limited extent.

8.1.2 Rural Road Connectivity

The road infrastructure is essential not only for facilitating movement of goods and people among important urban centres where production activities are concentrated, but for providing arterial connection among all geographical areas as well. Without such arterial infrastructure, it is not possible to integrate the relatively prosperous urban areas with the economically backward rural areas. Thus marketing the rising production of perishable fruits and vegetables at remunerative prices becomes an acute problem for the peasantry in rural Bihar. Moreover, the functioning of the PDS is also adversely affected by poor rural connectivity, thus reducing efficiency of food security in Bihar.

In spite of the fact that density of population is much higher in Bihar and connecting the rural areas with nearby urban centres is a relatively less costly affair, the rural areas of Bihar are far less accessible by road than elsewhere in India. Only one-third of the villages in Bihar (36.1 per cent) are accessible by road, as compared to almost half the villages (47.9 per cent) in whole of India. This difference between Bihar and India vis-à-vis accessibility of villages persists for both small and large villages. Thus, while a road reaches no less than 91.7 per cent of the big villages in India (with a population exceeding 1500), in Bihar, it is much lower at 70.6 percent.

Although road density per 100 sq. km. (87.78 kms) is slightly above the national average (74.73 km), road density per 100,000 population is only 89.28 kms in Bihar vis-à-vis 234.58 kms at the all-India level, in Table 8.2.

Table 8.2: Accessibility of Villages by Roads in Bihar and India

Type of Villages	Percentage of village accessible by road	
	India	Bihar
Villages with Population <1000	37.4	27.7
Village with Population 1000-1500	75.9	53.2
Village with Population > 1500	91.7	70.6
All Villages	**47.9**	**36.1**

Recent Initiatives

The state government has, however, recently taken up quite an ambitious road upgradation programme. This is expected to bring about a major improvement in road infrastructure over the next

three years. Under the *Rashtrya Sam Vikas Yojana (Development and Reform Facility)*, all major roads have been upgraded so as to provide them with four-laned, two-laned and intermediate lane status.

In respect of rural connectivity, all-weather roads will be provided to all villages over the next 3-8 years, which should aid in improving food security in the rural areas. The proposed plan envisages provision of all-weather rural roads within the following time frame:

(a) All villages with a population of more than a thousand will be provided with such roads within three years.

(b) Villages with a population between 500 and 900 will have such roads within five years.

(c) Villages with a population below 500 will be provided *pucca (permanent)* roads within the subsequent three years.

Funding for this will come from the *Pradhan Mantri Gram Sadak Yojana (Prime Minister's, Village Road Programme)*. Works have already been taken up for: (i) construction of 2400 km of link routes and upgradation of 2000 km of through routes costing Rs. 14168.8 million under the *Pradhan Mantri Gram Sadak Yojana*, (ii) Construction of 1000 kms of link routes costing Rs. 3000 million under *Mukhya Mantri Gram Sadak Yojana (Chief Minister's Village Road Programme)*, (iii) Upgradation of 2460 kms of through routes costing Rs.59.9 million under the State Plan

Pradhan Mantri Gram Sadak Yojana (PMGSY)

One of the major developments in recent years as far as rural connectivity is concerned is the introduction of the Prime Minister's *Gram Sadak Yojana* (PMGSY) on 25th December 2000 to provide all-weather access to unconnected habitations. The *Pradhan Mantri Gram Sadak Yojana* (PMGSY) is a 100 per cent Centrally Sponsored Scheme. 50 per cent of the cess on high speed diesel (HSD) is earmarked for this programme. The primary objective of the PMGSY is to provide connectivity by way of an all-weather roads (with necessary culverts and cross-drainage structures, which are operable throughout the year).

The progress of this programme is quite satisfactory at the All-India level. However, in this regard too, Bihar has not been able to do much. Out of total 1680 packages sanctioned for the year 2004-05, only 68 were in Bihar. The total cost of the sanctioned project was 2309 million rupees (5.4 per cent of the total) against the all-India total of Rs. 39475 million. Table 8.3 shows the progress of PMGSY in Bihar since its inception.

Bharat Nirman: Rural Roads

Bharat Nirman is a plan for action in rural infrastructure that started in 2005 and will end in 2009. Under the scheme, action is proposed in the areas of irrigation, roads, rural housing, rural water

Table 8.3: Progress of PMGSY in Bihar

	2000-01	2001-02	2003-04	2004-05	2005-06
Allocation (Rs. in million)	1500	1500	1500	NA	NA
Value of projects cleared (Rs. in million)	1492.2	3024.1	0	3309.8	673.1
Amount released (Rs. in millin)	1499.0	0	649.9	NA	NA
Sanctioned					
No. of road works	298	670	25	117	29
No. of habitations to benefit	123	143	15	197	76
Length of road works (in km)	859.36	1531.8	222.31	1092.4	246.3
Completed					
No. of road works	30	22	NA	NA	NA
No. of habitations benefited	49	24	NA	NA	NA
Length of road works (in km)	66.11	53.17	NA	NA	NA
Total Expenditure (Rs. in million)	753.4	103.0	32.6	NA	NA

Source: www.pmgsy.nic.in.

supply, rural electrification and rural telecommunication connectivity, in partnership with the state governments and the PRIs.

8.2 Improving Access to Food

Improving access, the results of our analysis show, comes about through improvement on several fronts. These include:

a) Enhancing access to food provided in government schemes;

b) Improving wages, incomes and employment opportunities; and

c) Improving the position of the most marginal sections including women, and ST/SC communities.

The 2004-05 NSS round provides information on the extent to which various government schemes reach the poor in Bihar, and thus contribute something to food security, though it does not show us how much they add to food entitlements.

We may take a look at the percentage share of those poor households which benefited from the PDS and other schemes (Table 8.4). First, it may be noted that the proportion of targeted benificiaries in Bihar is much fewer than in rural India as a whole.

**Table 8.4: Share of Poor and Nearly Poor Households
Benefitting from Various Schemes in Bihar**

Region	Ration Card	Food for Work	Annapoorna	ICDS	Mid-Day Meal
Poor Households					
Northern	76.7	0.6	2.2	0.5	12.7
Southern	71.2	0.0	0.0	1.3	13.7
Bihar	74.6	0.4	1.4	0.8	13.1
Rural India	80.0	4.2	1.2	8.8	33.2
Nearly Poor Households					
Northern	79.7	0.0	5.2	1.3	12.1
Southern	72.3	0.0	1.5	0.1	8.6
Bihar	76.7	0.0	3.7	0.8	10.6
Rural India	82.9	2.8	1.1	6.7	29.5

Source: Calculated from NSS, 61st Round, 2004-05.

The differential is particularly wide in case of ICDS and Mid-day Meal Scheme. In case of ration card holders, Food for Work and Annapoorna, the northern region takes a lead over the southern region. But in case of the ICDS and Mid-day Meal Scheme, the northern region lags behind the southern one, though only by a small margin. Further, the proportion of ration card holders is far higher than in the other four schemes.

8.2.1 Status of Public Interventions

The Public Distribution System (PDS)

This is a major support programme of the government aimed at improving consumption of foodgrains in the country, specifically of those falling below the Poverty Line (BPL). Most of the states in southern India have achieved commendable success in making food available through efficient and Targeted Public Distribution System (TPDS). But in case of Bihar, its performance has been very poor. The percentage of households having access to PDS/TPDS by poverty status increased to a certain extent between the year 1993-94 to 1999-2000. However, it is far below the national average and the gap increased during this period. The percentage point gap of BPL households having access to PDS/ TPDS between Bihar and All-India is 22.4 and 27.0 percentage points in the respective years (Table 8.6).

At the district level, figures for actual off-take of cereals under the PDS are not available. But we have district-wise information about the number of BPL beneficiaries as a percentage of total BPL persons, given in Table 8.5 for 2004. The position in respect of the twelve least food secure districts is in **bold font**. It may be observed that in case of a six out of twelve least food secure districts, the status of TPDS intervention is pretty high, while it is very low or extremely low in case of only four

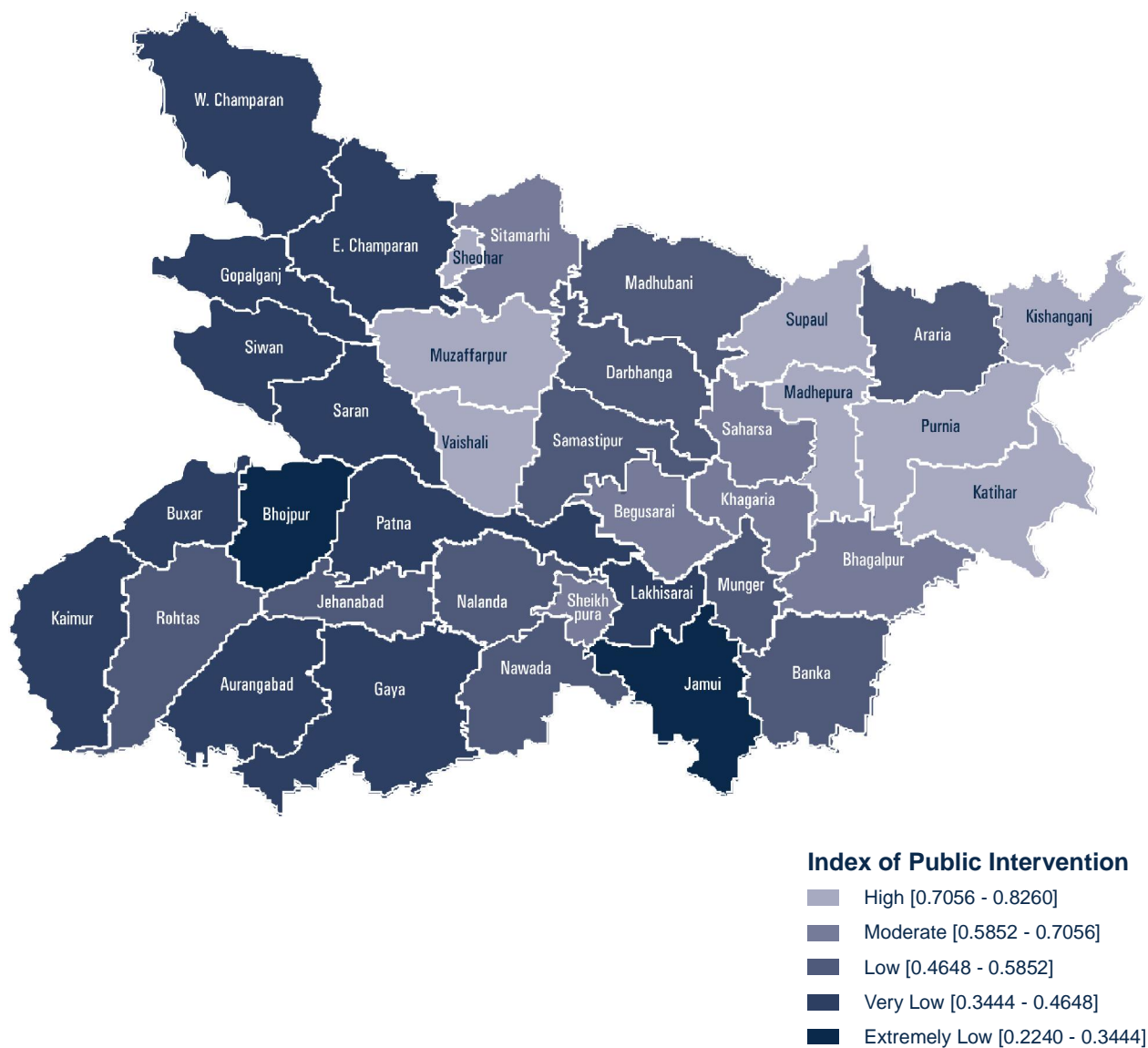## Map 8.1: Status of Public Interventions in Bihar

Index of Public Intervention

- High [0.7056 - 0.8260]
- Moderate [0.5852 - 0.7056]
- Low [0.4648 - 0.5852]
- Very Low [0.3444 - 0.4648]
- Extremely Low [0.2240 - 0.3444]

Table 8.5: Number of BPL Beneficiaries as a Percentage of total BPL Persons under TPDS

High		Medium		Low		Very Low		Extremely Low	
District	Value	District	Value	District	Value	District	Value	District	Value
Kishanganj	0.826	Saharsa	0.692	Madhubani	0.582	Purba Champaran	0.451	Bhojpur	0.272
Sheohar	0.810	Begusarai	0.641	Samastipur	0.538	Paschim Champaran	0.451	**Jamui**	0.224
Supaul	0.770	**Sitamarhi**	0.637	**Araria**	0.530	**Lakhisarai**	0.444		
Vaishali	0.755	Bhagalpur	0.631	Darbhanga	0.525	Buxar	0.444		
Purnia	0.745	Khagaria	0.620	**Banka**	0.523	Gaya	0.421		
Katihar	0.744	Sheikhpura	0.601	Jehanabad	0.503	Patna	0.420		
Muzaffarpur	0.731			Munger	0.502	Siwan	0.420		
Madhepura	0.730			Rohtas	0.497	**Aurangabad**	0.415		
				Nalanda	0.483	Saran	0.414		
				Nawada	0.466	Gopalganj	0.401		
						Kaimur (Bhabua)	0.398		

*Note: The districts in **bold font** are the "Special Category Districts"*

Source: As stated in Table 3.4, Variable d1.

(see Map 8.1). This may appear to be a satisfying picture, but Table 8.5 does not convey much in terms of district-wise performance of PDS. The off-take of cereals under the PDS may not be high where the percentage of BPL beneficiaries to total BPL persons is high, and vice versa.

Table 8.6: Percentage of Households with Access to PDS/TPDS Shops by Poverty Status

States	Above Poverty Line		Below Poverty Line		Total	
	1994	2000	1994	2000	1994	2000
Bihar	3.4	6.1	2.9	11.3	3.2	7.8
All-India	26.4	30.5	25.3	38.3	26.1	31.9

Note: APL and BPL classification based on official poverty line estimates.

Source: India DPR: Agricultural and Rural Development Table 3.1

The PDS allocation as well as off-take in the state has been extremely poor. For example, in 1992-93, the PDS allocation of foodgrains to Bihar was 926 thousand tonnes but if it were to be proportionate to the number of poor, the quantity should have been 2756 thousand tonnes (Parikh, 1997). This disparity is substantially due to the reluctance or inability of Bihar to effectively implement the PDS as an instrument of poverty eradication. Even out of the meagre allocations of cereals from the centre to the state, the off-take is much less at 67 per cent. Out of this low off-take, there has been extensive leakage out of the PDS, thus further reducing the quantity reaching the really poor (Table 8.7).

Table 8.7: Targeting Accuracy of PDS/TPDS in Bihar

	1993-94	**1999-00**
Under coverage (%)	97	89
Leakage (%)	58	46

Note:. Under coverage is the proportion of households without access to PDS/TPDS among all the BPL households.
Source: 'Bihar Towards a Development Strategy', World Bank., June 2005.

Access to PDS and the Poor

The poor record of allotment and off-take of foodgrains in Bihar vis-à-vis other states has restricted the impact of the PDS on the poor. Table 8.8 shows the poor performance of the PDS in Bihar in contrast to Kerala, which has been a long standing model of improved quality of life in the rural areas, despite relatively low growth rates and high unemployment. The PDS in Bihar, on the other hand, has become an example of total mismanagement. In Bihar, less than 2 per cent of the total cereal purchase is covered through the PDS as against approximately 48 per cent in Kerala and 15 per cent in India as a whole. For the very poor category, the proportion of purchase from the PDS in Kerala is as high as 90 per cent. In fact the proportion of purchase of cereals from the PDS is the lowest in Bihar among all the states except for Punjab and Haryana. Even in the case of the poorest Indian state of Orissa, the overall proportion of PDS purchase is 13 to 14 per cent. In States like West Bengal, Assam, Madhya Pradesh, etc, though the overall coverage of the PDS is low, it is at least relatively well-targeted towards the poor.

Table 8.8: Percentage of Cereals Purchased from PDS, 1999-2000

State	**Very Poor**	**Moderately**	**Poor**	**Non Poor**	**All**
Bihar	2.51	1.91	2.09	1.72	1.83
Kerala	89.37	71.92	72.46	46.70	47.83
India	12.55	11.43	11.86	15.82	15.46

Source: NSSO, 1999-2000 (calculated from Unit Level data).

The Government of Bihar has made some major reforms in the public distribution system during recent years by introducing food coupons in place of ration cards. The new system has considerably improved the situation, which is amply brought out by an evaluation study carried out by the Institute for Human Development (IHD, 2009). Some of the important gains from the reformed system are:

l   Specification of the Quantity, price, month and year information on the coupon have reduced complaints against the dealers, made the system more transparent and have increased awareness among beneficiaries.

l   It has reduced pressure from some beneficiaries on dealers to give more quantity than allotted.

Box 8.2: TPDS and Food Coupon System in Bihar

The Public Distribution System comprises one of the crucial interventions within the overall context of access to food, especially for the more vulnerable sections of the population, since it ensures that food is available to them at highly subsidized prices. The Government of Bihar has introduced some important reforms to improve the functioning of the PDS in the State. While ration cards are the most common documents of entitlement under this system, the State Govt. has gone ahead and introduced the Food Coupon System to supplement the ration card as a document of entitlement. These coupons have been given to the individual beneficiaries and they can get their foodgrains from the PDS dealer only after presenting them to him. In turn, the PDS dealer can lift foodgrains from the State Food Corporation (SFC) godowns only against these coupons that s/he would have collected from the beneficiaries. The quantity of foodgrains that a person can buy is clearly printed on these coupons. Therefore, the dealer cannot lift from the SFC godown more foodgrain than s/he has actually distributed. This ensures that the leakage of foodgrains, taking place between the SFC godown and the PDS shop is minimized to the maximum extent, if not completely eliminated.

The system followed for distribution of these coupons also ensures involvement of the community, thereby imparting a certain level of transparency to the whole exercise. These coupons are distributed annually through the Gram Sabha where, apart from the elected members like the *Mukhiya* and the *Sarpanch*, the secretary of the Gram Panchayat is also supposed to be present. The involvement of Panchayati Raj Institutions thus ensures that the correct beneficiaries are identified by the local community. It merits mention that identification of correct benedificaries has been fraught with several hurdles which the State Government has been attempting to overcome in the last couple of years. While a list of persons below the poverty line (BPL) existed earlier, it was fraught with errors of inclusion and exclusion. The exercise has not been without its own errors of inclusion and exclusion. However, a mechanism has been put in place for the aggrieved parties to file objections to the list and seek a revision thereto.

Thus, while addressing the issue of leakage and diversion of foodgrains, the introduction of Food Coupons has also brought about a significant element of transparency and accountability in the system. The tangible improvements can be listed as under:

l   Since the quantity, type and price of foodgrains is clearly printed on the coupons, there is less conflict between the dealer and beneficiaries regarding these now.

l   The beneficiaries, especially from the more vulnerable sections like the Annapurna category, feel a greater sense of empowerment about their entitlements and rights.

l   Since the PDS dealer cannot lift more grains than he has actually distributed, he is under much less pressure from influential groups to deliver in excess of anybody's entitlement.

l   This is only one side of the story. It has to be remembered that there was considerable resistance from the PDS dealers to the introduction of the coupon system since it clearly strikes at their sources of illegal profit. Most dealers were not in the business for reasons of philanthropy and treat this business as their sole source of income. Therefore, while expecting them to adhere to higher norms of transparency and accountability, it has also been ensured that their profit margins are better rationalized to ensure that they do not shy away from performing their tasks in the absence of any reasonable incentive to do so.

The State Govt also recognizes that no vigilance on any system can be better than that which is performed by the citizens involved in the system themselves. While vigilance committees for PDS have always existed on paper in the Panchayati Raj system, these committees were either too partisan or highly unrepresentative. Therefore, vigilance committees have been revamped to include not only the elected PRI functionaries but also those who were their nearest rival in the election. Besides, representatives of all recognized political parties have been included in the committee.

There are several other operational issues like the availability of food grains in the godowns of the Food Corporation of India (FCI) in time to service the PDS requirements. These issues were not addressed very rigorously in the past resulting in defaults relating to the quantum of offtake. Through continuous coordination and monitoring this issue has also been addressed significantly in the recent past so as to ensure that all the linkage required to operate the coupon system are in place.

Source: Based on inputs derived from the interview with
Mr. Tripurari Sharan, Secretary, Department of Food and Civil Supplies, Government of Bihar.

- The conflicts between dealers and beneficiaries regarding quantity, price, etc. have also been reduced.

- The coupon system has given significant help to the economically weak, old and disabled people, particularly with respect to accessing food under Annapurna.

- The most important aspect of the coupon system is that even the poor feel empowered about their food entitlements (also See Box 8.2)

The efforts of the Government of Bihar with regard to the revision of the BPL list has also reduced the errors of enumeration. This should work as a check on the deliberate errors/bias that creep in through exclusion of the genuinely poor and inclusion of the non-poor.

Notwithstanding the improvements, there are still several shortcomings in the system which need to be addressed. Some of them are:

- Given the widespread deprivation in the state, the number of poor identified by the BPL census is much larger than the number of poor as counted by the Planning Commission. Hence, a very significant percentage of the deserving households are excluded from the BPL list, which is creating huge discontent and frequent law and order problems. As such, there is urgent need to change the procedure of BPL emuneration and widen the number of below poverty line households.

- The doubts of dealers about the efficiency of the State Food Corporation (SFC) to release grain in time seem to be genuine. The SFC goodown should remain open more frequently to make grains available to the dealers.

- The GoB/Food Corporation of India (FCI) should also look into the real difficulty of dealers in transporting the ration quota to the village. If required, the dealer may be compensated for such additional costs.

Mid-day Meal Scheme (MDMS)

Serving of Mid-day Meals (MDM) in the schools is a very potent means of enhancing nutrition levels of the children and goes to improve food security. The scheme was started in Bihar in January 2005 and is applicable to all elementary schools under the Bihar Government. The nutritional objective of the programme acquires a great significance in Bihar since 55.5 per cent of children are malnourished according to NFHS-III, 2005-06. About 9.8 million children in primary and upper primary schools in the age group 6-14 years are currently being benefited by the Scheme. Initially, foodgrains were lifted by the PDS dealers from SFC godowns and then supplied to the schools. But in view of certain evils of this system which came to light, Block Level Education Officers have been directly entrusted this responsibility.

Box 8.3: Improved Targeting in the Public Distribution System

The Targeted Public Distribution System (TPDS) is perhaps the largest food safety net in the world. Yet, as surveys have revealed, its success is tarnished by several shortcomings. A pilot project launched by WFP in collaboration with the state government in Orissa seeks to address these through the use of new technologies. The project aims to strengthen the identification and verification process and comprehensively plug the loopholes in the TPDS. The project is being implemented in Rayagada district of Orissa.

The project involves the following:

(a)   Biometric ration cards (iris and finger print): To ensure that all ghost and duplicate cards are removed from the system.

(b)   Distribution of new ration cards against biometric validation: To remove the problem of shadow ownership at the ration card distribution stage.

(c)   Bar-coded coupons: To prevent recording of off-take without the beneficiary's agreement and also check shadow ownership of coupons.

(d)   Installation of smart cards with a point of sale device (PoS): To prevent incorrect off-take recording and shadow ownership of ration cards.

(e)   Strong management information system: To improve governance and enhance effectiveness of monitoring by providing more relevant and real-time information.

(f)   Web-based interface: To track and monitor progress.

At the same time there are a number of problems facing the MDM Scheme which have been highlighted by the Government of India in its Appraisal Note in March, 2008. The main point it highlighted are:

Lifting of Foodgrains: An analysis of the lifting of foodgrains during 2007-08 showed huge quantities of unspent stock in March, 2007 and irregular and erratic month-wise lifting of foodgrains. The districts should have lifted at least 85 per cent of the foodgrains allocation but actual state level lifting was 68 per cent, including huge unspent balance as on 31 March 2007.

An analysis of district-wise unspent balance (USB), shows that the 5 districts had very high amount of unspent balance as on end March 2007 (Table 8.9).

Table 8.9: Unspent Food Stocks (Foodgrains in MTs)

Sl. No.	Districts	Unspent as on 31.3.07	Annual requirement	USB as % of Annual requirement
1.	Bhojpur	15295	2847	537
2.	Nalanda	6772	3343	203
3.	East Champaran	8214	7767	106
4.	Jamui	4740	3181	150
5.	Rohtas	7287	8388	87

Source: Govt. of India, "Appraisal Report of the Mid-Day Scheme", New Delhi (2008).

In Bhojpur district, the food stock has been lying unutilized for the last five years. In order to make MDM an effective means of raising nutritional level of children thereby reducing the very high amount malnutrition among children in Bihar, these major defects will have to be addressed.

8.2.2 Improving Performance

One of the main avenues of enabling the poor to access food is through the Public Distribution System (PDS). The role of the PDS becomes particularly important in a situation of rising food prices. There are numerous inadequacies in the PDS – inadequate coverage of the poor with BPL ration cards, insufficient grain acquired through the PDS, and so on (see also Box 8.3).

In Rajasthan, the Right-to-Food Movement has used the Right to Information Act (RTI) for bringing into the open information about government programs. In what are called *Jan Sunvais* (public hearings) with the slogan '*Hamara Paisa, Hamara Hisaab*' (Our Money, Our Account), details of the schemes have been brought into the open. This can be useful in building public opinion and mobilizing the community against corruption in government schemes.

The relatively low reach of food-based programmes to the poor, as revealed by the NSSO figures, should be contrasted with the generally high reach shown by official government figures. The reach of the ICDS and Mid-day Meals Scheme in schools is routinely reported by government agencies to be close to 100 per cent.

There is an important role for political mobilization of the poor in improving implementation of the ICDS, MMS, NREGS and other such schemes. Implementation of these schemes has generally been decentralized down to the panchayat level. But panchayats can be corrupt and dominated by the local power-brokers. A pilot social audit held in Bolangir in November 2001 showed substantial and relatively open corruption at the panchayat level (de Haan and Dubey 2005, fn. 39, p. 2329). Studies in other states have shown that when women are in panchayats, or lead panchayats, the panchayats perform better in administering food-related interventions. In IFAD projects in Andhra Pradesh too, it was observed that women's SHGs performed better in undertaking small infrastructure projects than those managed by men, and saved more money for the community than the latter.

The contribution of the PDS in promoting food security is well covered in the extensive literature on the subject. But a study by Jos Mooij points out that the supply of cheap grain for BPL households has made running PDS highly profitable, as cheap grain can easily be diverted into the open market or sold to APL (above poverty-line) households. More recently, the Central Government is reported to have pointed out to the West Bengal government that there has been diversion of cheap PDS grain to the Bangladesh market. Many newspaper reports point out that even in the midst of starvation, the Food Corporation of India's godowns remain full of grains. If there is insufficient purchasing power with the poor in a district, even the supply of grain at subsidized prices is unlikely to be accessed by

the poor, and there will inevitably be a tendency for this grain to flow to markets, whether within the locality or outside, where prices are higher (Jos Mooij, 2001).

The problem of diversion of foodgrains increases when there is a partial subsidy, such as with the PDS. Grain is supplied at a lower than market price, but the buyer has to have the money to buy the lower-priced grain. If the person just does not have the required money, or does not have it at the time the grain is made available, the person cannot benefit from the subsidy.

The above situation points to two critical points in the functioning of the PDS: First, the dual price system that it brings about, encouraging diversion of foodgrain from the lower BPL price to the higher open market price. Second, the inability of many poor households to utilize their quotas because of inadequate purchasing power.

The abolition of dual pricing would reduce the usual diversion problems, but there would still be the problem that now exists of the poor not being able to utilize the subsidy. A direct transfer would make sure that the person/household actually benefited, since it is not conditional on the beneficiary having to provide some collateral amount.

Another way of enabling the poor to acquire their public entitlement of grain would be to provide work, such as through the NREGS, which allows the poor to acquire the money needed for purchase of food. A combination of a coupon system with the NREGS could improve the functioning of the PDS. Such a system would have the added benefit of increasing the monetization of the rural economy and improving the functioning of the bank and/or post office systems.

The above-mentioned food-based schemes are meant to meet the needs of shorter-term or even transient (seasonal) food insecurity. By increasing the quantities of public entitlements to food they can deal, to an extent, with immediate problems of hunger. If these foods are fortified, or supplements given as in the ICDS schemes, some nutritional gaps can be addressed. Any solution to food insecurity requires an increase in the regular access to food in sufficient quantity and quality. This requires an increase in the production and earning capacity of the households and individuals too, given that there are gender-based discriminations in the distribution of food and allied health-care services within households. It is important, therefore, that food schemes be linked with development activities.

8.2.3 Increasing Wages and Employment

The critical importance of wage incomes in ensuring access to food is demonstrated dramatically through the experience of Kalahandi. The district of Kalahandi in Orissa, notorious for persistent and acute hunger, was a net exporter of paddy all through the 1980s and 1990s (Bob Currie, 2000), as people were too poor to afford to purchase it. Another study shows that Uttar Pradesh is a food surplus state, but malnutrition rates are high. The abundance of food does not translate into access to food for all, because widespread poverty constrains the purchasing power of the poor and other vulnerable sections (Srivastava, N., 2003:257).

Provided that areas are not cut off from the markets, the supply of foodgrains, even in deficit areas, can be taken care of by market forces, supplemented by the PDS. What are needed are interventions to reduce transport and other transaction costs, and thus improve the functioning of markets and the PDS and, most of all, measures to increase incomes. In particular, the food insecure often have to operate in inter-linked markets (e.g. selling in advance in order to secure grain on credit), and intervention is needed to help the poor break the inter-linking of the credit and product markets.

Performance of National Rural Employment Guarantee Scheme (NREGS)

Providing income security by generating employment for poorer strata is one of the powerful means of providing food security since the poor families spend a substantial share of their budget on food. In this context, the National Rural Employment Guarantee Scheme (NREGS) which was devised as a public works programme by the Government of India under the National Rural Employment Guarantee Act (NREGA, 2005), provides a legal guarantee of 100 days of wage employment in a year in the rural areas at a minimum wage rate prescribed in the state. Thus, it has a key role to play in improving access to assured employment to those who volunteer to take up unskilled manual work. This can improve access to income and thereby ensure better levels of food security. The major objectives of this scheme are to provide income security through employment guarantee; reduce/ check distressed migration from rural to urban areas; and, in this process, also create durable assets for the community in villages, leading to overall development of the rural economy.

A study by the IHD (2008) to evaluate NREGA's performance in Bihar and Jharkhand indicates that most of the beneficiaries of the scheme are spending nearly 67 per cent of the earning from NREGS on food items (See Table 8.10). However, in case of Scheduled Tribes and Scheduled Castes, who are generally more vulnerable to food insecurity because of low and irregular income, the spending on food from earnings received through the NREGS work undertaken is higher than the state average (IHD, 2008). Given the finding of the study, one can suggest that the NREGA can be a safety valve to the food insecure population, particularly in districts which generally face the problem of food insecurity.

Moreover, a large proportion of beneficiaries under the NREGS have been those from the less well-

Table 8.10: Percentage Income from NREGA Spent on Food and Related Items

	Bihar	**Jharkhand**	**Total**
Upper Caste	51.29	89.16	73.31
OBC I	62.62	68.13	63.34
OBC II	72.62	68.69	71.28
SC	68.7	75.68	69.65
ST	84.94	66.24	66.85
Total	67.3	71.31	68.6

Source: *IHD (2008).*

Table 8.11: NREGA Statistics for Bihar and All-India (in million)

	Bihar	All-India
Employment provided to households:	3.13	31.1
Employment provided to households	3.13	30.8
Persondays [in Lakh]		
Total	65.25	1268.5
SCs	29.06 [44.54%]	334.0 (26.33%)
STs	1.90 [2.91%]	367.4 (28.96%)
Women	14.96 [22.93%]	979.7 (69.35%)
Others	34.29 [52.55%]	567.1 (44.71%)

off segments of the population. Comparative statistics of the proportion of beneficiaries from worse-off sections – the SCs, STs and women –are given for Bihar and India as a whole in Table 8.11. As may be seen, in respect of employment to SCs, the proportion of SCs who demanded jobs and were provided employment is substantially higher in Bihar (44.54 per cent) than for the country as a whole (26.33 per cent). However, in case of STs, the employment provided is abysmally low at 2.91 per cent vis-à-vis the country average (28.96 per cent). The proportion of the ST population, however, is very low in Bihar. In case of women also, the proportion is very low in Bihar as compared to the all-India figure (22.93 per cent versus 69.35 per cent). District-level information is not available to draw conclusions about relative district-wise performance of NREGA.

8.2.4 Improving Gender Relations

The result of our analysis shows that female literacy in rural areas is the most significant factor determining food security of the rural population. As we have seen in Chapter 5, the rural female literacy is pathetically low in Bihar. It is imperative that girls' literacy be prioritized and all barriers to their access to education be effectively tackled, taking care to see that girls from the poorest and most marginalized communities get priority treatment. This should be coupled with the provision of quality education (see Box 8.4) and ownership of land in land distribution schemes.

Historically, other than in China, land reform has excluded women. But in some second-generation

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Box 8.4: Female Literacy: The Pivot for Reducing Food Insecurity and Child Mortality

Recent research findings from 35 demographic and health surveys have brought out that children of mothers with no education are more than twice as likely to die or to be malnourished compared with children of mothers who have secondary or higher education. Further, mothers with limited literacy and educational skills are much less likely to receive trained support during pregnancy and childbirth. In Nigeria, for instance, only 15 per cent of births amongst uneducated women are assisted by trained medical personnel, compared to 56 per cent of births among women with primary education and 88 per cent among women with higher education.

Source: UNICEF, 2007a.

land reform movements in India (e.g. the Bodh Gaya movement of the 1980s) women raised the demand for land to be allotted in their names. "We had tongues but could not speak; we had feet but could not walk. Now that we have land, we have the strength to speak and walk" (Poor peasant women of Bodh Gaya, 1987); and, "We were there in harvesting the fields. We were there in carrying ploughs and snatching arms from the *zamindar's* goondas. Why, when the land is distributed, do we not get our independent rights to land?" (*Dalit* women's meeting, village Basuhari, Bihar, 3 September 1990, both in Kelkar, 1992). It is now recognised that women's ownership of land is necessary to stimulate their labour and investment, and use their managerial talents (Agarwal, 1994). More particularly, in a situation of high male out-migration, as is characteristic of Nepal, Uttarakhand and the dry regions of India and China, women's ownership of land becomes a necessary condition for adequate use of credit and necessary flexibility in management of farm resources.

8.2.5 Scheduled Castes

Another policy implication from the indicators used for enhancing food security is the betterment of the plight of the vulnerable populations, Scheduled Castes. Most of the food insecure districts in Bihar are dominated by a higher proportion of Scheduled Castes who form the most vulnerable section. They are also largely landless.

8.2.6 Agricultural Labourers

One important category of the food insecure in Bihar is agricultural labourers. A large proportion of them are also likely to be *dalits*. Agricultural wages and the number of days of employment can be influenced by a number of factors – including transfer of land and resources to the landless and creation of other avenues of employment. The object of distributing land to the landless is not one of creating "viable" farms, but of enabling a reduction of food insecurity among the currently landless. In the current scenario where there is a lot of migration from the countryside, there could be scope for a market-mediated land reform programme.

The National Commission on Farmers points out that land reform is the first task for agrarian renewal. The issues in the currently needed round of land reform are not the same as in the earlier rounds of the 1950s and 1960s. The abolition of intermediary tenures is not any more an issue. What is important is: a) security of tenancy; b) redistribution of ceiling surplus land to the landless; and c) land rights of women. The last two are directly important for food security. One can also include the reduction of land ceilings in order to restrict ownership to the size of a family farm.

At the production level, the case for these kinds of land reform rests on three main propositions: that owner-operated family farms are in general more efficient in use of land and other inputs than large farms operate with supervised wage labour; that secure tenancy rights promote longer-term investment in enhancing productivity and conservation, compared to insecure rights; and that securing women's land rights too increases agricultural productivity. Land reform then qualifies as productivity-

enhancing asset redistribution, something that is an important consideration in a globalised situation (Bowles and Gintis, 1998).

Redistribution to the landless is both difficult to implement, and important in India, where the former untouchable castes (*dalits*) are largely landless. It is well known that the *dalits* are concentrated among the agricultural labourers in most of the Indian states. Traditionally in the caste system, the *dalits* have been excluded from ownership of land. It is thus a major step in ending this age-old social exclusion for the *dalits* to gain ownership of land. This issue remains relevant for the *dalits* all over India.

Studies point out that ownership of even a tiny plot of land increases the bargaining power of the agricultural labourers. In Andhra Pradesh, "...the policy of allowing landless to encroach government waste land and housing sites [along with cheap credit, asset subsidies and food subsidies...together with state funded employment creation ...significantly tightened the labour market...(da Corta and Venkateshwarlu, 1997). For Uttar Pradesh, "The growth of non-agricultural opportunities, the more limited public works employment, as well as other factors – such as some increase in land and asset ownership among the rural poor have increased reservation wages in agriculture" (Srivastava, 1997, p. 47).

The transfer of property rights to the landless and land poor increased their bargaining power in the wage market. But the study from Andhra Pradesh (da Corta and Venkateshwarlu, 1997) points out that women agricultural labourers, whose families got some wasteland, did not share in the improved bargaining position. The responsibility of women for household maintenance, and the diversion of men's incomes into liquor and other channels of personal consumption, left women with lower reservation wages than men and forced women to accept various onerous conditions of work, conditions that men refused to accept. This shows that it is not enough to increase the bargaining power of men in the name of the household. Specific attention has to be paid to increasing the bargaining power of women as agricultural labourers by allotting them individual land rights too.

The political coalition now existing does not favour an implementation of a forcible land distribution from large owners to landless and marginal owners, as was done in China, south Korea and Taiwan. Market assisted land reform, which attempts to accomplish land reallocation by 'voluntary' land market transactions, has been touted as an alternative to redistributive land reform. However, 'voluntary' land market cannot function without deliberate policy interventions in support for the purchase of land by the poor households. Such intervention can be justified not only on the equity ground but also by the generalisable proposition that small farms are more efficient than large farms.

Thus, a way of redistributing good quality land is through government purchase of designated lands and their subsequent transfer to the poor. Large landowners, anxious to migrate to urban locations with better education and more economic opportunities, may be keen to sell their lands. Without adequate political mobilisation, the landless could be by-passed in yet another round of land reform. For the success of such market-mediated land reforms what is needed is to link up with movements of the landless in the various stages of identification, take-over and redistribution.

Is it likely that there would be enough land available on a "willing seller, willing buyer" basis for the majority of the land-aspiring poor to gain access to it? As pointed out above, with larger landowners, and particularly their children, keen to migrate to urban areas with their superior educational facilities and their new economic opportunities, there could be land available for such market-mediated transfers. There is a growth of fallow lands, not all of which may be for the above reason.

The role of employment and food-based programmes comes in for supporting those newly-acquiring land to invest labour in improving their lands. Employment schemes could be directed towards this end.

8.2.7 Micro-credit

The food insecure are usually thought to be non-bankable or not credit-worthy. But they do access credit from moneylenders, at what are very high effective rates of interest of above 10 per cent per month. They frequently end up in inter-linked market transactions, selling their advance labour or non-timber forest products (NTFP) for much less than market prices, with implicit interest rates for credit far above those in the credit market alone. Such inter-linked market transactions often occur at times of acute distress, such as when medical emergencies require immediate credit, or when drastic falls in the ability to acquire food lead to a need for credit. In such situations, if credit were available, these inter-linked market transactions could be avoided.

It hardly needs to be repeated that financial services for the poor, both savings and credit, are required, both to enable consumption smoothening and to utilize market opportunities. Whether through the Indian Self Help Group (SHG) model or the Bangladesh Grameen Bank model, micro-financial services need to be provided. Through an increased use of educational facilities and credit to utilize growing market opportunities, micro-finance programs can link increased food security with development. The food security impact of micro-finance is also increased by its contributing to enhancing women's agency in the household.

8.3 Enhancing Absorption

Increasing the nutrient intake of the poor is not the end of the story of food security. It is also necessary that the body be able to utilize the increased intake of nutrients. This depends closely on complementary measures, such as access to safe drinking water and hygienic sanitation and access to health centres. These two inputs would substantially reduce exposure to water-borne and gastro-intestinal diseases, such as diarrhoea and cholera, which often destroy the benefits of the food consumed. We discuss below measures to improve access to clean drinking water and promote hygiene and sanitation.

8.3.1 Clean Drinking Water: Rural Water Supply

Accelerated Rural Water Supply Programme (ARWSP)

The main objective of the ARWSP is to provide potable drinking water by way of installing tube wells, sanitary wells and piped water supply projects in rural areas. The Government of India provides funds under the ARWSP for implementation of Rural Water Supply Schemes.

Swajaladhara

The Rural Drinking Water Supply Programme was launched in the state on 25 December 2002. The purpose of this scheme is to ensure community participation and to shift from a supply-driven to a demand-driven approach. The scheme envisages 10 per cent of the capital cost of the project to be borne by the community along with the responsibility for the operation and maintenance of the water supply projects, and the remaining 90 per cent of the capital cost to be borne by Central Government through the District Water Supply and Sanitation Mission.

Bharat Nirman: Rural Water Supply

Rural water supply is one of the six components of *Bharat Nirman*.

The norms for coverage under Rural Drinking Water supply are:

1. 40 litres per capita per day of safe drinking water for human beings.

2. One hand pump or stand post for every 250 persons.

**Figure 8.2: Total Habitations Covered under Bharat Nirman Programme (Rural Water)
in Bihar: Targets and Achievements 2005-2008**
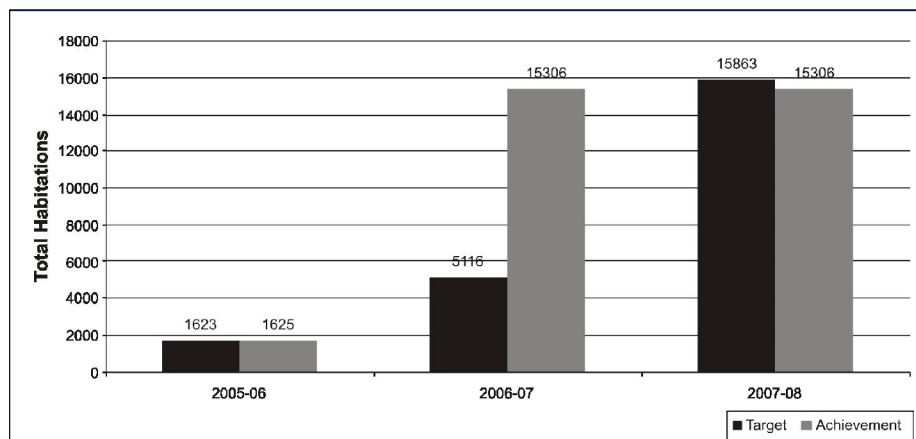
Source: Ministry of Rural Development, Government of India.

3. The water source should exist within a distance of 1.6 kms in the plains and within 100 meters elevation in the hilly areas.

Total habitation covered under Bharat Nirman Programme in Bihar has fallen short in achieving the targets during 2007-08. However, in 2006-07 the achievement was far more than that of the target (see Figure 8.2).

Box 8.5: Innovative Schemes for Ensuring Nutritional Security

The Department of Women and Child Development is the nodal agency for the formulation and execution of programmes directed towards the holistic development of women and children. The department also aims at implementing different social welfare schemes meant for persons with disabilities, the old, infirm and indigent persons. Within the purview of the Department, a number of innovative schemes are being executed under the larger aegis of the Integrated Child Development Services programme:

1. *Kishori Shakti Yojana:* The scheme aims at improving the nutritional, health and development status of adolescent girls (11-18 years), promote awareness of health, hygiene, nutrition and family care, link them to opportunities for learning life skills, going back to school, help them gain a better understanding of their social environment and take initiatives to become productive members of the society. The scheme is currently being executed in all the states of the country covering a total of 6118 blocks of which 326 blocks are in Orissa.

2. *Udisha:* In technical collaboration with UNICEF, the scheme envisages a spectrum of locally relevant training interventions for achieving development goals for women and children - rather than training only ICDS functionaries. It lays new emphasis on decentralized quality improvement processes, through state and district training plans of action, guided by inter-sectoral national/state training task forces.

3. *Swayamsiddha:* This is an integrated project for the empowerment and development of women based on the formation of women into Self Help Groups (SHGs) with emphasis on converging services, developing access to micro-credit and promoting micro-enterprises.

8.3.2 Nutritional Practices

One factor in food absorption, besides the above-mentioned factors of improved water and health facilities, is that of nutritional practices. Nutritional practices here refer to those inputs (for example, proteins or micro-nutrients) that are both available and accessible, but not consumed in desirable quantities; it also refers to behavioural practices (for example, breastfeeding) that are not practiced as required. But as the widespread problem of under-nourishment in India shows, nutritional problems affect not just the category of those with severe problems of food security, but also those with reasonable levels of food security, in terms of their consumption of adequate food and sufficient nutrition. The Indian experience of the last 15 years shows that despite the reduction in the incidence of poverty, there may not be a corresponding improvement in the nutritional indicators of a large section of the population.

It is interesting to note that Vietnam during the period 1992-93 to 1997-98 had a similar experience: a sharp fall in poverty without a corresponding reduction in under-nourishment. This, however, changed during the period 1997-98 to 2003-04, when there were sharp declines in both poverty and under-nourishment. This, as argued in Vinod Mishra and Ranjan Ray (2007), was brought about by a

combination of policy intervention through information campaigns to promote desired changes in dietary patterns, and direct nutrient enhancing programs. All this took place in a situation of increasing literacy and educational attainment, which would be expected to generally increase nutritional awareness (see also Box 8.5).

India has programmes of providing nutrition supplements, for example through ICDS programmes of nutritional supplements. Adequate diversification of food to include superior calories such as proteins can be promoted through information campaigns along with providing supplements in processed foods, such as *atta*. There is clearly need for an improvement in nutritional practices even among those who can afford to acquire the right types of food.

8.4 Priorities for District-wise Executive Action

In this section, an attempt is made to work out for each special category district the order of importance of each of the eleven selected Food Policy Variables from the point of view of district level authorities (generally, District Collectors, District Magistrates or Deputy Commissioners) who are responsible for overseeing executives concerned with execution of food security policy.[1] The guiding principle on the basis of which district level priorities have been derived is that the lower the level of a district in terms of a policy variable (say, variable X_m) affecting food security as compared to other SC districts, the higher should be the importance of that district (say, Y_n) among the twelve SC districts from the point of view of that variable (X_m). Thus, at the first stage, one has to examine the position of a district in terms of this variable (X_m). For this purpose, instead of taking the original value of this variable in different districts, we shall consider the gap of this value in relation to state level average value of this variable, Xm for each of the twelve SC districts. In this manner, one can determine the gap for all the twelve SC districts in case of each of the eleven policy variables. This will give the hierarchy of districts within each variable.

At the next stage, the objective is to devise a methodology for assigning a sequence of priorities to the eleven variables in case of a district (say, district Y_n) on the basis of gaps between state level average and the district level value of all eleven policy variables in case of that district (Y_n). One approach for this purpose could be to work out the absolute level of gaps, that is, the original value of variable Xm in a district (Y_n) minus the state level average for that variable (X_m), for each variable in case of that district (Y_n) and decide the priority on the basis of absolute magnitude of gap for each policy variable. But this approach will give invalid results because the absolute gap will always be higher in case of those variables which are measured in terms of units that have a high value, and vice versa. Therefore, the methodology has to be based on a measure which makes the gaps unit-free. This can be done in case gaps are measured not in terms of absolute but relative level of gaps between state level averages of variables and corresponding district level values of the variables. The relative magnitude of gaps can be expressed either in terms of ratios or percentages, preferably the latter, since there are of larger and more easily comparable figures. There is one problem with this approach arising out of the fact that some of our variables, for example literacy, are already in percentage form and division of one percentage by another percentage is not a very good measure.

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1. This attempt was the result of a suggestion of Abhijit Sen, Member, Planning Commission, made at the Technical Advisory Group meeting of the project.

Table A. Original Values of Policy Variables (V_m)

Districts	Policy Variables										
	Directly Amenable Policy Variables					Indirectly Amenable Policy Variables			Independent Policy Variables		
	Irrigation Percentage	Access to Paved Roads	Female Literacy	Drinking Water Availability	Access to PHCs within 5 kms	Agri-Output	Per capita Consumption Expenditure on Food	Agricultural Wage	Proportion of SC/ST	Non-dependency Ratio	% of Non Agri Workers
Southern Bihar											
Banka	65.75	22.03	27.87	49.42	26.11	66.3	31.2	45.44	82.68	1.061	47.79
Jamui	39.44	23.67	23.9	36.31	14.9	28.6	31.2	49.28	77.11	1.089	66.43
Aurangabad	69.57	25.61	39.91	82.53	30.92	10.94	28.2	33.69	75.48	1.066	56.02
Kaimur	92	35.71	37.88	74.18	25.54	14.07	30.9	47.25	74.61	1.024	50.53
Lakhisarai	51.28	35.33	31.24	53.63	26.78	52.5	38.4	53.53	82.62	1.001	54.12
Northern Bihar											
Kishanganj	15.13	25.07	15.39	90.43	24.93	74.0	30.7	36.93	90.02	1.014	38.97
Araria	34.44	35.28	20.44	98.65	25.18	70.8	30.7	45.44	84.71	1.009	35.31
Katihar	54.42	25.3	19.69	96.85	22.48	69.7	34.3	47.02	85.22	0.972	35.69
Madhepura	73.88	43.32	20.57	96.57	31.55	86.8	45.1	43.7	82.05	1.031	42.63
Purnia	49.75	26.06	19.63	98.18	25.41	67.8	38.6	42.2	82.94	1.005	33.69
Sheohar	42.86	36.17	23.55	98.01	31.38	56.6	38.4	41.28	85.61	1.056	37.8
Sitamarhi	45.65	43.22	24.28	98.02	35.05	43.3	38.4	41.36	88.01	1.054	42.7
State Average	61.10	38.29	29.61	86.11	32.90	68.5	34.2	44.82	82.65	1.031	48.95

Table B. Relative Gaps for Policy Variables (G_m)

Districts	Directly Amenable Policy Variables					Indirectly Amenable Policy Variables			Independent Policy Variables		
	Irrigation %	Access to Paved Roads	Female literacy	Drinking Water Availability	Access to PHCs Within 5 kms	Agri - Output	Per capita Consumption Expenditure on Food	Agricultural Wage	% of Non-SC/ST	Non-Dependency Ratio	% of Non-agri Workers
Southern Bihar											
Banka	1.076	0.575	0.941	0.574	0.794	0.968	0.912	1.014	1.000	1.029	0.976
Jamui	0.645	0.618	0.807	0.422	0.453	0.418	0.912	1.100	0.933	1.056	1.357
Aurangabad	1.139	0.669	1.348	0.958	0.940	0.160	0.825	0.752	0.913	1.034	1.144
Kaimur	1.506	0.933	1.279	0.861	0.776	0.205	0.904	1.054	0.903	0.993	1.032
Lakhisarai	0.839	0.923	1.055	0.623	0.814	0.766	1.123	1.194	1.000	0.971	1.106
Northern Bihar											
Kishanganj	0.248	0.655	0.520	1.050	0.758	1.080	0.898	0.824	1.089	0.984	0.796
Araria	0.564	0.921	0.690	1.146	0.765	1.034	0.898	1.014	1.025	0.979	0.721
Katihar	0.891	0.661	0.665	1.125	0.683	1.018	1.003	1.049	1.031	0.943	0.729
Madhepura	1.209	1.131	0.695	1.121	0.959	1.267	1.319	0.975	0.993	1.000	0.871
Purnia	0.814	0.681	0.663	1.140	0.772	0.990	1.129	0.942	1.004	0.975	0.688
Sheohar	0.701	0.945	0.795	1.138	0.954	0.826	1.123	0.921	1.036	1.024	0.772
Sitamarhi	0.747	1.129	0.820	1.138	1.065	0.632	1.123	0.923	1.065	1.022	0.872

Table C. Policy Variable-wise Prioritized Districts of Bihar

Policy Variables	Most Prioritized Districts		Second Most Prioritized Districts	
	Central Bihar	Northern Bihar	Central Bihar	Northern Bihar
Irrigation percentage	Jamui	Kishanganj and Araria	Lakhisarai	Purnia, Sheohar, Sitamarhi and Katihar
Access to Paved Roads	Banka, Jamui and Aurangabad	Katihar, Purnia and Kishanganj	_	_
Female Literacy	_	Kishanganj, Purnia and Katihar	_	Araria and Madhepura
Drinking Water Availability	Jamui, Banka	_	Lakhisarai and Kaimur	_
Access to PHCs within 5 kms	Jamui	Katihar	Kaimur and Banka	Kishanganj, Araria and Purnia
Agricultural Output	Aurangabad and Kaimur	Sitamarhi and Sheohar	Jamui	Purnia
Per Capita Consumption Expenditure on Food	Aurangabad	Kishanganj and Araria	_	_
Agricultural Wage	Aurangabad	Kishanganj	_	_
% of Non-SC/ST	Aurangabad, Kaimur and Jamui	Madhepura	_	_
Non-dependency Ratio	Lakhisarai	Katihar	Kaimur	Purnia, Araria, and Kishanganj
% of Non agricultural Workers	_	Purnia, Araria and Katihar	Banka	Sheohar and Kishanganj

However, many a time, as in the present instance, this can not be avoided.

Once the relative size of gaps have been estimated, the highest priority within a district (Y_m) would have to be given to the variable which shows the highest magnitude of relative gap (P_1) and so on downwards (P_2, P_3...), down to the variables which yield the lowest magnitude of relative gap (P_{11}). Similarly, priorities can be assigned in case of all the twelve SC districts.

For illustrative purposes, Table A gives a notation for the original values of all eleven policy variables (X_1..........X_m...X_{11}) in each of the twelve SC districts (Y_1, Y_2..Y_n...Y_{12}). On the basis of these, Table B indicates the relative gap ($G_{m,n}$) between original district level values of a policy variable (X_m) and state average for that variable ($\overline{X}_m$) i.e. $G_{m,n} = X_{n,m} / \overline{X}_m$, for all the districts (Y_1..Y_{12}). Similarly, the relative gaps have been worked for all the food policy variables considered in this chapter (X_1. X_{11}).

Once this has been done, the order of priorities P_m (P_1, P_2,...P_{11}) for any district, say Y_n, can be specified on the basis of descending values of the relative gaps ($G_{m,n} = X_{n,m} / \overline{X}_m$) in case of all the policy variables. Obviously, the execution of policies, either simultaneously or successively in case of a fund

crunch, can be guided by the descending order of priorities. However, the effectiveness of food policy is likely be greater if the policies are executed simultaneously, on the basis of same logic as Rosenstein's 'Big Push' theory.

On the basis of the methodology outlined above, Table C gives the order of priorities for the eleven policy variables in case of the twelve SC districts of Bihar. The first five policy variables are the Directly Amenable Policy Variables, followed by Indirect Amenable Policy Variables and Independent Policy Variables, which would essentially be welfare oriented variables.

Table C is constructed based on the findings of Table B. It organizes twelve special category districts with respect to eleven policy variables. Districts are arranged region-wise in two separate cells namely 'most prioritized districts' and 'second most prioritized districts'.

More or less each special category district from Central Bihar is to be taken under consideration where policy is concerned. The table suggests Jamui is highly deficient all four directly amenable policy variables, percentage of the area irrigated, access to paved roads, availability of safe drinking water and access to PHCs within 5 kms. Banka is mostly deficient in two directly amenable policy variables namely access to paved roads and safe drinking water. Aurangabad also suffers highly from lack of proper connectivity (paved roads) but it is mainly deficient for all three indirectly amenable policy variables i.e. agricultural output, per capita consumption expenditure on food and agricultural wage. For independent policy variables, the table suggests Kaimur, Aurangabad and Jamui contain inhabitants from SC/ST communities. The lowest non–dependency ratio (that is, which implies highest dependency ratio) is found in Katihar district of northern Bihar, followed by Lakhisarai, Purnia and Kaimur.

On the other hand, if we consider seven special category districts from Northern Bihar, the table suggests out of five directly amenable policiy variables, Kishanganj is deficient for first three variables i.e. percentage of area irrigated, access to paved roads and female literacy rate. Purnia and Katihar are the two other districts from Northern Bihar that lack female literacy. Katihar is also deficient in access to paved roads and PHCs within 5 kms. Non-dependency ratio is as also found to be less (meaning dependency ratio is relatively higher) in this district.

Araria district suffers from areas without irrigation and lower per capita consumption expenditure on food. Percentage of non-agricultural workers is found to be lower in Purnia, Araria and Katihar. Of the seven SC districts, Sheohar and Sitamarhi experience low agricultural output and Madhepura contains SC/ST communities which require special attention from the policy perspective.

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There are two ways in which one could go about addressing food insecurity, particularly in the context of meeting the MDGs of reducing by half the incidence of child malnutrition, defined as children under five who are underweight. One could target those who are just below the international weight norm, and undertake special interventions to bring them up to the norm. In this manner, the state could meet its MDG target of reducing by half the incidence of child malnutrition.

Another approach would be to target the most severely under-nourished populations, both by region and by social class, including their gender characteristics. This would be amply justified on moral grounds – that those who are the most deprived should receive the most attention in any use of public money. It would also be justified on economic grounds – that at the lowest levels of nourishment, the very ability of adults to work and of children to learn, are most adversely affected. An improvement in nutritional status would increase the productivity of working adults (or working persons, given that children also work), thus yielding an immediate economic benefit. An improvement in the nutritional status of school-going children would increase their learning capacity and thus be an investment in the future. Finally, an improvement in the nutritional status of the most undernourished mothers is a gain not only for them but would also have inter-generational benefits in reducing the incidence of low-weight births.

The analysis in this report shows that ensuring food security and improving nutritional status is a challenge for the state as a whole. The identification of certain districts for priority action does not mean that either resources or efforts to bring up all districts can slacken, but only draws attention to the need for more inclusive growth efforts and the special efforts needed to bridge the divides between different regions and districts of the state.

9.1 Linking Food Programmes and Development

How can food-based schemes be linked with development? In the case of the Mid-day Meals Scheme in schools, there is already a link with development. Improved school attendance is of benefit to the individual and her household in terms of an increase in potential future earnings. A reduction in illiteracy also provides a social benefit to the village or relevant area, as the quality of the workforce goes up and the health and hygiene behaviour of the villagers improves, causing improvement in absorption of food. Improved school attendance is also beneficial in enabling migration to better urban livelihoods than would be available to illiterates.

At very low levels of nutrition, any improvement in nutrition would increase the productivity of the individual. With regard to mothers there is the substantial future benefit of reducing the incidence of low birth-weight babies. For those with severe malnutrition, supplementary feeding programmes have a considerable role in improving production capabilities.

But, as mentioned earlier, the implementation of such programmes, including issues of reaching those with severe malnutrition, depends very much on the demand from the affected persons for these services. In the absence of such demand from the most malnourished, the benefits of such programmes are very likely to be captured by the better-off in the village. Decentralization of the implementation of programmes has to be combined with enhancing the voice of the malnourished in order that the benefits reach the desired persons.

Securing the 'Right to Food' is very much a matter of mobilizing of the concerned persons to secure their rights. The Right to Information (RTI) provides a means that can be used to reveal corruption at different levels. But what is important is the mobilization and organization of the poor or food insecure themselves. Their voice is necessary to make the ending of hunger a part of the political platform of various political parties and civil society organizations, NGOs and Community-based Organizations (CBOs), including traditional tribal organizations.

Improvements in rural connectivity can improve the terms of access to markets. Security of tenure creates conditions favourable for investment to enhance production or to take up new forms of cultivation. But bringing about changes in production systems also requires an enhancement of capabilities of both women and men. Enhancing capabilities, through rights, access to resources and training, will open the road for building capacity to aspire – the aspirations for a better life exist, but the means or capacity to realize those aspirations is lacking.

Improved communication will also enable rural producers to produce for the wider market, whether regional, national or global. In a relatively open economy, there need not be sole reliance on agriculture as the engine of rural growth. Non-agricultural production for wider markets is also an option. But along with better communications, this also requires a more educated workforce. A higher level of education would both enable producers to take up opportunities available through connections with the wider economy and also improve the types of jobs they can try to get on migrating. As we have seen earlier, consumption in the better-off districts is probably related to income from non-farm development and to migrants' remittances. This is not to deny the importance of increasing farm productivity in the food insecure districts, but to point out that options are not limited to agricultural development.

NREGA and other food-for-work schemes can be channelized to improve key areas of village road connectivity and small-scale irrigation. Village approach roads to main roads, and small irrigation schemes (eg. check dams in valleys, or moisture retention works on sloping lands) can increase both economic opportunities and productivity. Improved roads would also provide better access to both health and educational facilities. Improved roads, including the building of culverts, have a clear impact in improving girls' attendance at schools. Post-primary schooling often involves some travel outside the village, and boys seem to be able to overcome communication problems in attending school; but good roads increase girls' attendance at schools.

The linking of food schemes with infrastructure works for development, however, can be a two-fold process. The manner of implementation of standard infrastructure schemes by line departments can be changed so that the benefiting communities are involved in the implementation of these works. Involving SHGs as contractors of small schemes (minor irrigation, school buildings, approach roads) has been found to result in substantial income benefits for the concerned village. There can also be an improvement in the quality of the work, as the beneficiaries are themselves the implementers of the construction works. Construction with local labour through SHGs will provide substantial income from the implementation of small infrastructure works, besides increasing the knowledge and management capabilities of the communities.

The implementation of infrastructure and related schemes (school feeding) through the community could be expected to provide additional income, particularly in lean periods. Some of it could be used to carry out investments on private lands.

While security of tenure would allow an increase in investments on land and thus higher incomes, complementary steps need to be taken to enhance women's agency in the household and community. Besides literacy and education, there is also the matter of women's land rights. Among the food insecure, women have high labour force participation, but they do not have ownership rights over the lands on which they work. Women's ownership of land could have a double effect. It could lead to greater productivity and investment by women in land improvement by enhancing their standing in the household; it could also pave the way for women to have more of a say in the disposition of household income – away from wasteful areas (for example, alcohol and cigarette consumption) and towards more expenditure on food.

Given women's general responsibility for food security in the rural areas of developing countries, and given the pervasive gender bias in these societies, the enhancement of agency of the poor, translates particularly into the enhancement of the agency of poor women. Consequently, food security approaches increasingly pay attention to the elimination of gender inequality and to women's empowerment as important preconditions.

Agency of poor women, or of the poor as a whole, is not only a mater of individuals (which itself might be dependent on collective mobilization) but also of the poor putting their stamp on economic policies. This is necessary in order to bring the much-needed political will that is often referred to as the missing element for bringing adequate attention to food security policies. Without adequate political pressure for reform, proper food security policies are unlikely to be adopted. At a country level, when there are adequate supplies of food to ensure food security for all, why are such policies not implemented? There can be no question that the political mobilization of the poor, through a combination of community-based and civil society organizations, is required for such a food security policy to be adopted and implemented.

9.2. Main Conclusions

1. There are five dimensions of the Bihar economy which have a direct bearing on food security in the state. After bifurcation of erstwhile Bihar, much of the forest and mineral wealth of the state and therefore royalties from these resources, went to the share of Jharkhand, thus reducing the financial capabilities of Bihar to finance food security measures. The main strength of the Bihar economy now lies in its rich agricultural soil and water resources. But the flipside of the coin is the proneness of North Bihar to flood disasters on account of fast-flowing rivers which originate in Nepal. Secondly, the incidence of poverty in rural Bihar is one of the highest in the country although the pace of its decline during 1994-2005 was higher than at the all-India level. Thirdly, in terms of its infrastructure, rural road connectivity which is essential to support agricultural growth is very poor. Fourthly, variability of agricultural growth rate was more than three times higher in Bihar. Fifthly, female literacy in Bihar (33.6 per cent) is well below the all-India level (54.2 per cent). These features exercise an adverse impact on food security in the state. Per-capita cereal intake has declined. Nearly two-thirds of agricultural labour households do not get sufficient food around the year.

2. The primary focus of the second part of the report is on estimating food security at the district level in Bihar, identifying those districts which are at the lowest level and need specific policy interventions. Food security is dependent, in the first place, on availability of food. But in case adequate purchasing power is not available, household level access to food gets curtailed even if physical availability exists. Thus, access to food is the second most important determinant of food security. However, even in the presence of these two determinants, unless adequate health status prevails at the household level, body absorption of food and its nutritional impact will suffer for the households concerned. Thus the third basic component of food security is taken to be the body absorption of food. All these three, measured in terms of eleven indicators, are taken to form inputs into food security. Over the long run, inadequate food security in terms of these factors result in harmful outcomes in terms of morbidity, high mortality rates and low BMI. But in view of the long lag involved, there can be a deviation between the overall outcome and input indices of food security.

3. If one examines the correlations, Outcome and Input Indices of Food Security are insignificantly related (r = +0.306). Secondly, the relationship of Availability and Access Indices to both Input and Outcome Indices of Food Security is significantly positive, although much less strong in case of the Outcome Index than in case of the Input Index of Food Security.

    In terms of the relationship of the Input Food Security Index (FSI) to individual indicators, seven variables emerge to be of prime importance, viz: (i) irrigation (ii) agricultural output per capita, and (iii) approach to a paved road, all of which are Availability Indicators; (iv) female literacy and (v) proportion of non-agricultural workforce, which are Access Indicators; (vi) Availability of safe drinking water and (viii) easy accessibility to public health centres (PHC), which are Absorption (Utilisation) Indicators.

From the point of view of policy interventions, the relationship of Food Security to individual indicators is much more relevant than the relationship of FSI to Overall Availability, Access or Absorption Indices, since policy can address individual variables, not their composite.

4. In terms of Food Security Index, there are six districts in the Secure category (S), eleven in the Moderately Secure category (MS), thirteen in the Moderately Insecure category (MIS), six in the Severely Insecure category (SIS) and one in the Extremely Insecure category (EIS). The two lowest Food Security categories (SIS & EIS) are taken to be in need of concerted attention. According to the outcome approach, there are nine districts belonging to the two lowest categories (SIS & EIS). However, these nine do not include all the seven districts according to input approach. In our view, the list of districts needing specific attention should include all those districts which appear in the two lowest categories according to Input as well as outcome approaches to food security. If one follows this approach, the following twelve can be designated as the Special Category Districts that need specific attention:

   (i) Kishanganj;(ii) Araria; (iii) Jamui; (iv) Katihar; (v) Madhepura; (vi) Purnia; (vii) Sheohar; (viii) Aurangabad; (ix) Kaimur; (x) Sitamarhi; (xi) Lakhisarai; (xii) Banka.

5. The Food Security policy outlined in this chapter follows two directions. The first approach stems from the view that the eleven variables which are taken to be determinants of food security themselves indicate the channels through which food security can be enhanced. But among these eleven determinants, all the variables are not equally capable of being influenced by the government's policy measures. We have categorized these eleven variables into three categories: There are five variables, viz. irrigation, roads, female literacy, provision of safe drinking water and public health centres which are, by and large, directly amenable to state policy. There are three variables, namely, agricultural output, consumption expenditure and agricultural wage rate which are at most indirectly amenable to state policy. Finally are the three variables, namely, percentage of SC/STpopulation, dependency rate and proportion of agricultural workforce, which are not amenable to policy instruments. These three can only be improved through welfare measures, an enhanced pace of development, etc. It is suggested that in case of each of the variables, where the district already stands in a high or medium position, the district level policy should devote relatively lower attention and resources than in cases where the variable concerned has a low food security score (EIS or SIS).

6. The second direction of food security interventions discusses the status of the state in terms of five types of food security interventions, namely, the status of TPDS, NREGA, National Food Security Mission, Rural Road Connectivity and Mid-day Meal Scheme. The percentage of BPL covered by the PDS is less than one-third of the all-India level. Moreover, in case of six of Special Category Districts, the percentage of BPL beneficiaries to total BPL belonged to the High or Medium Categories. An IHD (2008) study on the functioning of the PDS introduction of food coupons under

TPDS has drawn attention to five problems facing TPDS in Bihar. In order to overcome these, three specific suggestions have been made: (i) SFC godowns should open more frequently; (ii) in view of difficulties of transportation, dealers may be compensated for additional cost; (iii) the public needs to be educated about the their new thier entitlements. However, even if the PDS system becomes efficient, a large percentage of the poor are left from the BPL list because of the narrow definition of the poor. Hence, the cut-off point of the BPL should be expanded considerably in case of a poor state like Bihar.

The NREGA is a powerful means of providing income and hence access to food security. Moreover, nearly 67 per cent of the income generated is spent on food in Bihar, which indicates its key role in providing food security. Further, while the proportion of SCs provided employment is much higher in case of Bihar than in India as a whole, the reverse is the position in case of women and STs.

When we consider the NFSM, an important point to remember is that it primarily addresses the Food Availability dimension of food security, but ignores the Access to Food dimension. Moreover, it covers only a very limited number of Special Category Districts.

In terms of rural road connectivity, the proportion of villages connected by roads is well below the all-India proportion. Moreover, the progress of providing rural connectivity under PMGSY has been lower than that at the All-India level. In respect of future steps for connecting villages to main roads, it needs to be borne in mind that simply provision of link roads cannot achieve the objective unless through roads already exist. Thus construction of link roads needs to be appropriately coordinated with provision of through roads.

The Mid-day Meal Scheme is a potent means of enhancing food security in the state. But it was introduced in the state only in January 2005. An assessment of the scheme in Bihar shows some good practices co-existing with some weak spots. The main defects in the functioning of the programme are inadequate and erratic lifting of food stocks by the state resulting in accumulation of unspent food stocks. Moreover, utilization of cooking cost was inadequate. Only 46 per cent of the cooking cost allocated was utilized. Both the above defects will have to be eliminated through a streamlined system for cooking of Mid-day Meals in schools in order to permit it to achieve its objective of enhancing food security in the state, particularly in the formative years of a child's life.

In our view, the first set of policy measures is no less important than the specific food security interventions which have just been outlined. In case of the first set of measures which aim at a variable-specific approach, food security measures coincide with general developmental measures for each of the policy amenable variables. For example, in case of irrigation percentage, the measures are all covered by the irrigation policy. This is also the position in respect of the other seven directly and indirectly policy amenable variables.

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Appendix I: The Right to Food

Along with the change in understanding of the meaning of food security, there has been much discussion on whether there is a right to food. The kind of economic growth that the world has been undergoing has been seen to not automatically 'trickle down' in benefits to all. Even a reasonably high rate of growth, like India's 6 per cent or so over the period 1995-2004, has been seen to not bring about a commensurate reduction in the proportion of those who are undernourished. The existence or acceptance of a right to food would make the exertion of pressure to adopt and implement a policy that secures this right more likely. But is there a right to food?

The right to food or 'freedom from hunger' figures in the Universal Declaration of Human Rights (1948). Subsequently the UN General Assembly adopted two covenants in 1966, one on Civil and Political Rights and the other on Economic, Social and Cultural Rights. Besides these covenants, the Convention on the Rights of the Child and the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) both considerably strengthened the place of the right to food and adequate nutrition in international law on human rights.

A two-fold distinction is often made between the civil and political rights, on the one hand, and economic, social and cultural rights, on the other (Eide 1999). The first set is said to be 'absolute', and 'immediate', while the second set is considered something relative and to be realized gradually, over time. In a sense this distinction coincides with the Indian Constitution's distinction between its 'core' provisions, which are to be realized immediately, and its 'Directive Principles of State Policy', which are programmatic and to be realized over time.

It can well be argued that the civil and political rights are also something that can only be realized over time. Merely putting them into the statute books does not result in their being realized. On the other side, if civil and political rights are held to be the foundation of democracy, one can as well argue that economic and social rights are equally important to democracy. Without economic rights, and not just the right to property, political democracy itself would be a mere shell. The realization of political and economic rights is inter-twined and one set does not have any *a priori* precedence over the other.

A related distinction is between rights that are respected through non-interference and those that require resources to be realized. The first is like the freedom of religion, or of association, while the right to food would require resources to be realized. Jean Zeigler, the UN Special Rapporteur on the Right to Food, questioned the whole distinction between those freedoms that require resources to be realized and those freedoms that do not. The whole machinery of the state, of administration, police, courts, etc. all need to set up, and involve costs, to enable citizens to realize the freedom to religion, or freedom of association, and associated rights. '*Even implementing civil and political rights does in fact imply resources. The cost of setting up and training the police force, military and judiciary to implement international human rights law is not insignificant.* '(Jean Zeigler, 2002, quoted in FAO, WFS-fyl, Focus on Issues, What is the right to food? www.fao.org)

Thus, rights require state action with regard to the obligations to respect, protect and fulfil them.(Shue, 1980 in Gaiha 2003), which require setting up of administrative, police, and judicial structures to enable

rights to be realized. Consequently all rights have a cost in their being realized. And the costs of the right to food may not be as much as they seem, since it is only in certain circumstances that it involves state provision of food (Gaiha, 2003, 4270).

What the acceptance of the right to food does is to focus attention on the necessity of economic and social policy paying attention to the poorest and most marginal. It also takes the debate on rights inside the 'private sphere' to raise the question of women's rights in assuring food to themselves and their children and families. 'The 'right to adequate food' may be as much a question of the full realization of the rights of women as of ensuring a bundle of nutrients handed over through food supplement schemes.' (Asbjorn Eide, 1999, 'The right to adequate food and to be free from hunger,' Study on the Right to Food submitted to the ECOSOC, Commission on Human Rights, 28 June, United Nations, New York.

Right to Food in India

Earlier, we looked at the status of the right to food and its embodiment in various international covenants. Food policies, however, are critically formulated and implemented at the level of the national state. It is, perhaps, only in the case of 'failed states' that the international covenants can themselves be the basis for action by international agencies. For the most part, and certainly in India, it is through the national state that actions on the right to food are carried out. Of course, this does not mean that some actions cannot be carried out at the international level, as, for instance, by groups representing women or indigenous peoples taking their case for redressal of grievances to their respective international forums in the manner that trade unions also take their case to the ILO.

The establishment of a 'right to food' in India was substantially carried forward by the April 2001 petition of the People's Union for Civil Liberties (PUCL), Rajasthan, (PUCL vs Union of India and Others, Writ Petition (Civil) 196 of 2001) and the orders of the Supreme Court of India in response to this and subsequent petitions. In the context of the then-prevailing drought in Rajasthan, the argument of the PUCL[1] was simple – that Article 21 of the Constitution of India guarantees the 'right to life' and imposes on the state the duty to protect this right to life. In elaborating the right to life, the Supreme Court in past decisions had held that this right also includes the right to live with dignity and all that goes to make this up, including the right to food.

The petition argued that in the context of the drought in Rajasthan, the actions or inactions of the Governments of India and of the State of Rajasthan constituted a violation of this right to food and, thus, of the right to life. Specifically, the violation of the right to food was seen in two aspects. First, was the failure of the Public Distribution System (PDS), in terms of the exclusion of various Below Poverty Line (BPL) households from its scope. Second, was the inadequacy of the quantities delivered through the PDS as the monthly quota could not meet the household's nutritional standards set by the Indian Council of Medical Research (ICMR).

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1. This account of the PUCL's petition and related matters is based on Legal Action for the Right to Food: Supreme Court Orders and Related Documents, January 2004, downloaded from www.righttofood.org now replaced by the website *www.righttofoodindia.org*

The PUCL petition also pointed to the inadequacy of government relief works in the Rajasthan drought condition. Thus, it linked the right to access relief works in a drought condition as to of the meaning of the right to food. As the Supreme Court pointed out in a later order, while agreeing with the High-Level Committee on Long-Term Grain Policy (Abhijit Sen Committee), employment generation should be distinct from food delivery: 'This should not, however, undermine the importance of employment and income generation in eliminating hunger and malnutrition' (Supreme Court Order of 2 May 2003).

The different orders of the Supreme Court:

l   Established a Constitutional basis for the right to food in terms of the right to life;

l   Drew attention to the serious plight of the aged, destitute, etc;

l   Stated that where the hungry are not able to buy grain, even at the subsidized price, the relevant governments should consider giving them the grain free;

l   Pointed out that 'Plenty of food is available, but distribution of the same amongst the very poor and destitute is scarce and non-existent leading to mal-nourishment, starvation and other related problems';

l   Identified the various schemes to operationalize the right to food;

l   Changed the status of those who received food or income through these schemes from 'beneficiaries' to 'rights-holders';

l   Made the Government of India and the State Governments responsible for securing the right to food through these schemes;

l   Placed responsibility on specified government officials (Chief Secretary of the State Governments, District Magistrates) as being answerable for the implementation of the schemes that concretize the right to food, and thus being accountable for failures, like starvation deaths; and

l   Established Food Commissioners who would report on and monitor implementation of schemes constituting the right to food.

At the level of rights, this is a reasonably comprehensive scheme with rights, ways of achieving them, responsibilities for achieving them, all fairly well specified. Given the fact that there is a clear perpetuation of both endemic starvation and frequent bouts of acute starvation, it is necessary to see how to link food security measures with development. Rights are critical in establishing the obligation of the state to provide a means of realizing those rights. But the measures that realize the right to food also need to be connected and contribute to development objectives, such as to improve productive capacities of small and marginal farmers, increase employment opportunities for agricultural labour, and empower women so as to increase the access to food through their normal economic activities. Measures relating to the above have all been discussed in various sections of this report. They need to be drawn together into a comprehensive package.

Appendix II: Food Security Index (FSI) – A Methodological Note

At the outset we must state that the Food Security Index is calculated for rural areas only. All variables constructed in this section are for rural areas, unless otherwise specified.

Here we have attempted to construct a Food Security Index (FSI) at the sub-state level, that is, the district level. The district having a higher index value is considered as relatively more food secure as compared to a district with a lower index value.

Broadly, we have adopted Range Equalization Method (REM) approach, adopted by UNDP (HDR 2005); and Principal Component Analysis (PCA). One of the objectives of the district FSI is to show the district's position in various dimensions of food security.

The FSI is a composite index covering three dimensions, i.e. Availability factors, Access factors, and Absorption factors. Besides these three groups of factors, an additional component i.e. public entitlement has been used to explain how this influences food security. But the public entitlement factor is not included in the indices of food security. The public entitlement policy is based on various parameters which are supposed to be directly linked with food insecurity; the lower the level of food security, the greater should be public intervention. In such a scenario, the direction of public interventions should run counter to the FSI, though it need not be so.

Table A 2.1: Choice of Indicators, Sources, Reference Year and Calculating Procedure in Bihar

Name of Variable and Description	Sources	Ref. year
(a) Availability		
1. Proportion of net irrigated area to net sown area	Department of Planning, Government of Bihar http://planning.bih.nic.in/	1998-99
2. Per capita value of agricultural output. In order to take account of the cyclical nature of agricultural production the variable uses an average of three to five years depending on the availability of data. The value of each food and non-food item is derived by multiplying the amount of production with its price obtained from all-India prices of these items at constant 1993-94 prices. Adding the value of each and every food and non-food item, gives the overall value of agricultural output for a year. The per capita value of agricultural output is calculated by dividing the average value of agricultural output by total population in the midpoint year.	Department of Planning, Government of Bihar downloaded from http://planning.bih.nic.in/	1997-98 to 1999-2000
3. Percentage of inhabited villages having access to paved roads. This is calculated as a share of total number of villages in the district.	Census of India, 2001	2001
(b) Access		
1. Percentage of agricultural labour to total workers. Agricultural labour comprises both main and marginal workers*	Census of India, 2001	2001

Name of Variable and Description	Sources	Ref. Year
2. Proportion of ST and SC population to total population*	Census of India, 2001	2001
3. Non-Dependency ratio (Ratio of Working Age Population). This is calculated as rural population in the age group (15-59) divided by the sum of (0-14) child population and 59+ population.	Census of India, 2001	2001
4. Per capita monthly consumption expenditure (inequality adjusted). The formula for inequality adjusted monthly per capita consumption expenditure (MPCE) is: MPCE*(1-Gini).	61st NSS Round	2004-05
5. Rural casual wage rate. This is calculated as average daily wage rate for the age group 15-59	61st NSS Round	2004-05
6. Women's literacy rate (7+). Total female literate as proportion of total female population for 7 years and above.	Census of India, 2001	2001
(c) Utilization		
1. Percentage of households having access to safe drinking water. Here rural households with access to three sources of drinking water, such as tube well, tap and hand pump have been considered.	Census of India, 2001	2001
2. Percentage of inhabited villages having access to PHC (PHC facility within the village or within 5 kms from the village)	Census of India, 2001	2001
(d) Public Entitlement		
1. Percentage of PDS beneficiaries to total BPL household	Department of Rural Development, Govt. of Bihar	2007

Note.:*The direction of these variables has been reversed to have a positive association with food security.

For each of the dimensions, as discussed earlier, some relevant variables have been chosen.

Max-Min Approach

Using the Range Equalisation Method adopted by the UNDP for computing Human Development Index, an index has been constructed for each variable. This is calculated by applying the following formula:

$$\text{Index} = \frac{(X_i - \min X)}{(\text{Max } X - \text{Min } X)}$$

where X_i- Value of the variable

min X- Minimum value of X in the scaling

max X- Maximum value of X in the scaling

In undertaking the scaling procedure, desirable norms have been adopted for each indicator. In some cases, the scaling of indicators is self-selecting, and for some others there is an element of value judgment.

Construction of the Food Security Index

Different indicators included in the three components of the FSI have been scaled and normalized (to make them unidirectional) to take a value on a scale ranging from 0 to 1. The scaled least achievement corresponds to zero, whereas the best achievement corresponds to 1. For three selected variables, viz. percentage of agricultural labour to all labour, proportion of ST and SC population, and percentage of forest area to total geographical area, we have used the reverse figure (per cent of non-agricultural labour to total workers; per cent of non-ST and SC to total population; and per cent of non-forest area to total area). Likewise, the variable dependency ratio has also been reversed.

After calculating the index of each variable, we have averaged them to give each of the three dimensions of food security. The composite Food Security Index is again derived by averaging all the selected indicators.

Principal Component Analysis (PCA)

The PCA is a data reduction technique. Sometimes, there is a high correlation between variables. In such cases, it is useful to transform the original data set into a new set of uncorrelated variables called principal components. It is quite likely that the first few components account for most of the variability in the original data set. The PCA can be applied either to the original values of variables or to the normalized values of the variables. In general, normalization can be done by three methods, that is, by deviation of the variables from their respective means (i.e. $x - \overline{x}$) by dividing the actual values by their respective means (i.e. $x / \overline{x}$) and by the deviation of the value of a variable from the mean which is then divided by standard deviations (i.e. $x - \overline{x}$)/σ. We have applied the second method. The basic objective of using PCA is to find the factor loading of each and every variable. Factor loading gives us the amount of total variation explained by a particular variable.

We have used PCA in the Food Security Index for those states where the correlation between indices derived through the RE method and PCA method is highly correlated.

Food Security Outcome (FSO)

To crosscheck the validity of the Food Security Index for the three AAA (Availability, Access and Absorption) components, we have used the Food Security Outcome (FSO) index. The nutritional status of an individual can be considered as the outcome of food security. Although intake of food is not the only factor that affects nutritional status, it is definitely the prime one. The outcome index calculated

here is based on two child-related variables: under-five mortality rate and child malnutrition (weight for age -2SD). Child malnutrition – 2SD includes children who are below-3SD from the International Reference Population median. The district-wise figure relating to the above two variables are taken from the Reproductive and Child Health (RCH) 2002 Survey.

The food security outcome (FSO) against which the input variables are considered here as explanatory indicators should ideally be a composition of morbidity, mortality and under-nutrition among the entire rural population, which includes adults. However, due to inadequacy of data on adults, especially at the district level, we have resorted to using the child-related variables to construct the FSO. In order to validate the use of this, we have undertaken a simple correlation exercise at the state level between the Body Mass Index (BMI) for adults and the FSO.

The State level Body Mass Index (BMI) for men and women has been used from NFHS III. The NFHS calculates BMI as weight in kilograms divided by the square of height in meters and the resulting value is again divided by the number of men/women in the 15–49 age group. Here we have taken the number of men and women with BMI below 17.0 which tells us the number of men /women moderately and severely thin. The composite adult BMI has been calculated by aggregation of BMI for men and women using the population share of men and women in the sample as weights.

We have calculated the state level Food Security Outcome index (for 29 states) from DLHS and NFHS child-related variables (the same two variables taken for the district-level FSO). We have adopted the RE method for finding out the state-level FSO. The correlation among the DLHS and NFHS child-related indicators as well as NFHS-based BMI adult indicators shows a very high correlation across 29 states, thereby justifying the use of the child FSO as the outcome measure. However, it can be argued that inter-district variations within different states can be quite dissimilar.

Grouping of Districts

For each variable, component and index, the districts have been divided into five classes: Secure to Moderately Secure, Moderately Insecure, Severely Insecure and Extremely Insecure. The method used for making class intervals is the 'equal intervals' method, that is, the difference between all upper and lower class intervals for an indicator is the same. This method takes into account the range of the indicator's values and divides the range into five equal classes. The number of districts in different classes can be different.

The **Food Security Atlas of Rural Bihar** is one of a series of eight Atlases produced by the Institute for Human Development (IHD) and the UN World Food Programme (WFP). The other states covered in this series are: Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, and Uttar Pradesh. The Atlases carry out a district-level analysis of food security for each of these states.

The purpose of the Atlas is to identify regions and districts within the state that require priority attention in order to improve their food security status. This is followed by an identification of the characteristics that differentiate the better-off from the worse-off districts. These characteristics of food insecure regions and districts are used to put forward a set of recommended interventions that could be expected to improve food security.

It is hoped that the Atlas will stimulate further analysis, action and advocacy for reducing the incidence of hunger.

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