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FOOD SECURITY ATLAS OF RURAL ODISHA 2018

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Sunil Kumar Mishra

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Maps not to scale.

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FOREWORD

The hunger estimates released by the Food and Agriculture Organisation (FAO) in the recent past have consistently thrown up worrisome data pertaining to undernourishment and lack of food and nutrition security across the world. The figures are particularly alarming for India, which has been ranked as low as 103 as per the latest FAO estimates among all countries, for meeting the hunger target for their respective populations. Although India has ostensibly attained self-sufficiency in food, and has been recording high rates of economic growth over the past decades, these achievements have not been translated into a substantial reduction of malnourishment. It is thus time to sit back and examine the reasons and to lay down a roadmap for ameliorating the widespread prevalence of hunger and undernutrition in the country.

Several studies have shown that those afflicted by hunger in the country primarily comprise the marginalised populations including the Scheduled Castes (SCs) and Scheduled Tribes (STs), women and children. Responding to the need for focused research in this area, the Institute for Human Development (IHD) and Indira Gandhi Institute of Development Research (IGIDR) with support from Bill & Melinda Gates Foundation as part of the project on ‘System of Promoting Appropriate National Dynamism for Agriculture and Nutrition (SPANDAN)’ have prepared the district level food security atlas of Odisha derived from a range of key indicators like access to and availability of food for the needy populations while zeroing in on the state requiring the maximum intervention in this sphere. The Food Security Atlas of Odisha, 2018 thus represents a significant step in the hugely challenging task of identifying viable means for ensuring food security for the people of Odisha at district level. Towards this end, the main objectives of the Atlas are to analyse the dynamics of food security in the state, to isolate the most affected regions and districts, and to suggest practical and sustainable policy measures for improving the status of nutrition and food sufficiency in these areas.

The study concludes by highlighting and assessing the specific policy measures that have been introduced by both the Central and the state governments for augmenting food security and targeting the malaise of hunger in the state. It is hoped that the efforts of the research team will make a constructive contribution to the literature on the issue as well as to the process of policy making with regard to food security in Odisha. We would therefore like to congratulate the principal researchers of this study, Dr Sunil Kumar Mishra and Dr Swati Dutta, for producing this critical report. We are quite hopeful that this work will be useful for policymakers and other stakeholders.

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LIST OF ABBREVIATIONS

AAV	Antyodaya Anna Yojana
ADI	Average Daily Intake
AHS	Annual Health Survey
ARWSP	Accelerated Rural Water Supply Programme
ASA	Above State Average
BMI	Body Mass Index
BPL	Below Poverty Line
BSA	Below State Average
CED	Chronic Energy Deficiency
DFID	Department for International Development
DW	Drinking Water
EIS	Extremely Insecure
FAO	Food and Agricultural Organization
FLR	Female Literacy Rate
FNS	Food and Nutrition Security
FSI	Food Security Index
FSO	Food Security Outcome
GHI	Global Hunger Index
GSDP	Gross State Development Product
HDI	Human Development Index
HSD	High Speed Diesel
ICDP	Integrated Cereal Development Programme
ICDS	Integrated Child Development Services
IFAD	International Fund For Agricultural Development
IFPRI	International Food Policy Research Institute
IMR	Infant Mortality Rate
ISOPOM	Integrated Scheme on Pulses, Oilseeds and Maize
JLG	Joint Liability Groups
KBK	Kalahandi-Balangir-Koraput
KMO	Kaiser-Meyer-Olkin
LFP	Labour Force Participation Rate

MDG	Millennium Development Goal
MDM	Mid Day Meals
MFI	Microfinance Institutions
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MIS	Moderately Insecure
MMR	Maternal Mortality ratio
MPCE	Monthly Per Capita Consumption Expenditure
MS	Moderately Secure
MSM	Mean Standardization Method
MSSRF	MS Swaminathan Research Foundation
NAGLA	Non Agricultural labourer
NAMI	Normalized Adult Malnutrition Index
NBJK	Nav Bharat Jagriti Kendra
NCEUS	National Commission for Enterprises in the Unorganised Sector
NCMI	Normalized Child Malnutrition Index
NFHS	National Family Health Survey
NFSA	National Food Security Act
NFSM	National Food Security Mission
NGO	Non Government Organization
NIA	Net Irrigated Area
NRDWP	National Rural Drinking Water Programme
NSS	National Sample Survey
NSSO	National Sample Survey Organization
OBC	Other Backward Caste
PCA	Principal Component Analysis
PCI	Per Capita Income
PCVAO	Per capita Value of Agricultural Output
PDS	Public Distribution System
PHC	Primary Health Centre
PHI	Poverty and Hunger Index
PMGSY	Pradhan Mantri Gram Sadak Yojana
PRI	Panchayati Raj Institutions

RDA	Recommended Dietary Allowance
REM	Range Equalization Method
RWAP	Ratio of Working Age Population
S	Secured
SBL	SHG Bank Linkage
SDG	Sustainable Development Goal
SECC	Socio-Economic And Caste Census
SHG	Self Help Group
SIS	Severely Insecure
SOFI	State of Food Insecurity
SRS	Sample Registration System
ST	Scheduled tribes
SUN	Scaling - Up Nutrition
TPDS	Targeted Public Distribution System
U5MR	Under five mortality rate
UDHR	Universal Declaration of Human Rights
UNDP	United Nation Development programme
UNICEF	United Nations International Children's Emergency Fun
WFP	World Food Programme
WFS	World Food Summit
WHO	World Health Organization
WODC	Western Odisha Development Council
BRGF	Backward Region Grant Fund
IAP	Integrated Action Plan

EXECUTIVE SUMMARY

Odisha is one of the most economically backward states of the country with lowest per capita income and the highest incidence of poverty. A large proportion of its population (83 percent) resides in rural areas where agriculture and related activities are the main source of livelihood. Keeping the high dependence on agriculture as its focus, the Institute for Human Development had prepared a Food Security Atlas of Rural Odisha with support from World Food Programme (WFP) in 2008-09. The Report had identified 12 districts as either severely or extremely food insecure. The present report revisits the issue of food security in Odisha with the primary focus of identifying the extremely food insecure districts with main objectives of :

- Analyzing the nature and dynamics of the food security situation at district level in Odisha.
- Identifying the most food insecure regions.
- Carrying out inter-district comparisons in terms of a food security index for the period 2008-09 to 2016-17
- Bringing forth appropriate policy interventions to tackle the issue in the highly food insecure regions of the state.

Food security is dependent, in the first place, on the availability of food. In the absence of adequate purchasing power, the access of households 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, the bodily absorption of food as well as its nutritional impact suffers. Thus, the third basic component of food security is absorption or utilization of food. These three imperative components of food security are measured using eleven indicators, taken to comprise the inputs into food security. Over the long run, inadequate food security in terms of these factors results in harmful outcomes such as morbidity, high mortality rates and low BMIs. It needs to be kept in mind that given the long lag involved between inputs and perceived benefits in terms of outcomes, there can be a deviation between the overall input and outcome indices used to measure food security.

Methodology

The study broadly adopts Max-Min (Range Equalization Method, REM adopted by UNDP) method to estimate the index value for food security. Further, the Principal Components Analysis (PCA) is used to study the importance of various variables in explaining the food security status of the districts. The Food and Nutrition Security (FNS), a composite index of food security is calculated and it covers the three dimensions of availability, access and utilization of food. One of the objectives of estimating the district level FNS indicator is to show the district's position in the various dimensions of food and nutrition security considered. Another important dimension of food security is food stability but this indicator could not be used in calculating the final FNS index as district level data for the same was not available. Further, based on the index values, the districts have been categorized into five groups: extremely insecure, severely insecure, moderately insecure, moderately secure, and secure.

Status of Districts of Odisha

In terms of food availability index, the study identifies Kandhamal and Malkanagiri as the extremely insecure districts in Odisha followed by Gajapati, Nayagarh, Rayagada, Anugul, Sundargarh and Khordha as severely insecure district in Odisha. On the other hand, Bargarh, Ganjam, Bhadrak, Sambalpur, Jagatsinghapur, Puri and Sonapur are identified as the food secure districts. Four moderately food secure districts include Kendrapara, Baleswar, Baudh and Cuttack.

In terms of the food access index, Nabarangapur, Koraput, Malkanagiri, Gajapati, Rayagada, Kandhamal, Kalahandi and Nuapada fall in the extremely food insecure category. Five coastal districts, Kendrapara, Puri, Cuttack, Jagatsinghapur and Khordha are food secure.

In terms of food utilization index, Kandhamal, Gajapati and Debagarh are the extremely food insecure district while Dhenkanal, Nayagarh, Anugul, Mayurbhanj, Jajapur and Sonapur districts fall in severely insecure. On the other hand, Jharsuguda, Bargarh and Nabarangapur emerged as the secure district.

Further, in terms of outcome index, the food secure group comprises 4 districts, followed by 6 districts in the moderately secure group, 7 districts in the moderately insecure group, 8 districts in the severely insecure group, and 5 districts in the extremely insecure group. The four most food secure districts are Jagatsinghapur, Jajapur, Kendrapara and Nayagarh. On the other hand, districts Ganjam, Kandhamal, Balangir, Malkanagiri and Rayagada are in the extremely insecure group, hence these districts need special targeted policies to improve food security outcomes.

In terms of overall food security index, five districts are identified as extremely insecure namely, Kandhamal, Gajapati, Malkanagiri, Koraput and Rayagada. Seven districts which are severely insecure are Nabarangapur, Debagarh, Mayurbhanj, Nuapada, Kalahandi, Balangir and Baudh. These districts need urgent attention in terms of improvements in the food security input indicators. On the other hand, the most food secure districts are Kendrapara, Khordha, Cuttack, Bhadrak, Puri and Jagatsinghapur.

Priority Districts

The districts in the two lowest categories, that is, the extremely and severely food insecure need to be prioritized for developmental interventions for enhancing food security. A total of 12 districts, (7 from 10 KBK districts) are identified as priority districts. The districts which fall under the food insecure category for both the input and output approach are identified as alarming districts. These districts include Balangir, Gajapati, Kalahandi, Kandhamal, Koraput, Malkanagiri, Nabarangapur, Rayagada and Nuapada. Other priority districts which need high attention include Mayurbhanj, Baudh and Debagarh. These districts are insured in either input or output approach.

Comparison of the Food Security Index between 2008-09 and 2016-17

The status of districts in FSI and its changing status over the period of time shows eighteen districts out of 30 districts are remained in the same position from 2007-08 to 2015-16. The districts Koraput and Malkanagiri which are the part of KBK region are slide down from severely insecure to extremely insecure. On the other hand the Nabarangapur district shows the sign of improvement from extremely insecure to severe insecure status. The district Sundargarh, Kendujhar and Anugul improved from severe insecure to moderate insecure. The district Sambalpur shifted from insecure status to secure status. The district Ganjam and Jharsuguda also transformed from insecure to secure zone. The coastal districts Khordha, Cuttack and Kendrapara marked a progress from moderately secure to secure status.

Policy Implications and the Wayforward

- The priority variables which are important in policy prescription in the priority districts. The literacy, dependency, domination of social category and the proportion of agricultural labour largely explained the variation. On the other hand the variable like safe water, per capita value of agricultural output, access to PHC are the variables which are not capture a large variation. These are the important policy variables for the overall food security of the state which need high attention
- To improve the food security scenario in the mostinsecure districts, the state government and policy makers need to put into place direct or indirect policy instruments or adopt special welfare programmes for the target groups such as SC/ ST or dependent people.
- The exclusion and inclusion error by social category and by different region in Odisha for the year 2011-12 shows that of the total Antodaya and BPL card holders about half of them are above poverty line calculated in terms of MPCE. On the other hand of the total APL card holders 17 percent of them are below poverty line in terms of MPCE. The social categorywise analysis indicates that exclusion error for ST and SC is extremely higher as compared to OBC and other category of household. On the other hand inclusion error for OBC and other household is high.
- The study clearly shows that the coastal belt which consists of developed districts and lower poverty shows a high higher inclusion error of about 69 percent of population. On the other and 9 percent of population in coastal belt are excluded from the benefit of TPDS programme due to wrong identification. On the other hand the Southern belt consists of one of the poorest region shows a high prevalence of exclusion error of 44 percent of APL card holders fall under BPL on the MPCE criteria. In Northern region the inclusion error is higher than exclusion error.
- The NREGA is a powerful means of providing income and hence access to food security. The average mandays generated per households hovers around 35 to 45 days per household in Odisha. The average wage received is Rs 172/-. It is interesting to find that the percentage of women participation is about 41% in 2016-17 up from 36% in 2008-09.
- The MDM programme has improved school attendance that intern benefit 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.
- For those with severe malnutrition, supplementary feeding programmes have a considerable role in improving the health status. But, as mentioned above, 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.
- Rural Road connectivity is a vital component of rural development by promoting access to economic and social services and there-by generating increased agricultural incomes and productive employment opportunities.
- The food security impact of micro-finance is also increased by its contributing to enhancing women's agency in the household. The recent IHDS data 2011-12 shows that 98 percent of eligible women (15-

49 age) have cash-in-hand for household expenditures if they involved in any SHG activities as against 81 percent women when they do not have any SHG link. This clearly shows a 17 percentage point gap between women with and without SHG in terms of cash in hand for household expenditure. The National Rural Livelihood Mission (recently the name changed to Deen Dayal National Rural Livelihood Mission) is one of the important programme which facilitate to access to the affordable cost-effective reliable financial services to the poor through the self help groups.

- In order to improve the food security of the poorest districts in Odisha, it is important to improve the food security policy variables along with other food security intervention programme. The state also has an important role in improving the welfare development programmes of the districts

1

INTRODUCTION

The latest hunger estimate ranked India in the 103rd place, which clearly indicates that the issue of food and nutrition security in India represents a serious concern. The hunger estimates of the Food and Agriculture Organization (FAO) shows that an estimated 821 million people in the world are undernourished, of which 195.9 million are from India. This measure also highlights that 14.8 percent of the population in India is undernourished (FAO, 2018). Another worrisome finding in the report is that the absolute number of undernourished people across the world is estimated to have increased from 804 million in 2016 to 821 million in 2017. These findings clearly point to the difficulty of achieving the SDG target of hunger eradication by 2030. Despite having achieved a high economic growth rate, India faces a constant failure in translating this growth into an actual reduction of poverty and malnutrition in India. The attainment of food security is a matter of prime importance for India as more than one-third of its population is estimated to be absolutely poor, and as many as one half of its children have been suffering from malnourishment over the last three decades. The right to food is about freedom from hunger. The narrow meaning of 'freedom from hunger' may be understood as the right to have two square meals a day, while its broader meaning would also include the right to be free from under-nutrition. The right to be free from under-nutrition, in turn, would mean and include other entitlements such as clean water, healthcare, and even elementary education. The evolution of the human right to food derives from the larger human right to an adequate standard of living as specified in the Universal Declaration of Human Rights (UDHR), 1948. All human beings, regardless of their race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth

or other status have the right to adequate food and the right to be free from hunger.

Access to adequate food and proper nutrition is one of humanity's basic needs. In spite of the significant progress India has made in food production and sufficiency over the last sixty years, most of the people in the country have had to deal with uncertainties pertaining to food security on a daily basis. One-fifth of the population of developing countries, that is, around 800 million people, were reported to be suffering from chronic under-nutrition by the Food and Agriculture Organization of the United Nations, FAO (1992). Malnourishment leads to a vicious cycle of hunger and poor health indicators, preventing the patient from leading a normal, active life. The concept of food security has been evolving over the last few decades with academics, policymakers and activists of Non-Governmental Organisations (NGOs) contributing substantially to the debates on the components and determinants of food security, and how it can be ensured at the global, national, state, regional, household, and individual levels. In 2000, the world community pledged to cut the number of the world's hungry people to half between 1990 and 2015, as the mandate in one of the Millennium Development Goals (United Nations, 2008). While SDG 2 focuses explicitly on food by seeking to "end hunger, achieve food security and improved nutrition and promote sustainable agriculture", multiple other goals relate to challenges in the food system, such as SDG 1, which focuses on poverty reduction, for which agriculture and food security have a key role to play.

An important fact about the issue of hunger and food insecurity in India is that the growth of malnourished people is seen in absolute terms rather than as a

percentage. One in every four hungry persons in the world is an Indian. The State of Food Insecurity in the World 2015” (SOFI) points out that India is home to the highest number of undernourished people on Earth, and it tops the list with an estimated 194.6 million people surpassing China’s 138.8 million. There has, however, been a significant reduction in the proportion of undernourished people in India—by 36 per cent—over the figure in 1990-92. While India’s smaller neighbour, Nepal, has achieved both the MDG and the World Food Security (WFS) targets, India has failed miserably in attaining both. The number of undernourished in India was 210.1 million in 1990-92, 189.9 million in 2010-12, and 194.6 million in 2014-16.

Although India’s achievements in reducing poverty and hunger, among other developing nations, are impressive, a lot more still needs to be done to ensure a hunger-free India. Recent studies indicate that the Scheduled Caste (SC) and Scheduled Tribe (ST) groups, children and women are mainly affected by malnutrition and starvation in different parts of the country (Desai et al., 2009; Ackerson et al., 2008). The World Food Programme (WFP) and the MS Swaminathan Research Foundation (MSSRF) prepared food security atlases at different levels, including the Food Atlas in Rural India, 2001; Food Insecurity Atlas in Urban India, 2002; and the Atlas of Sustainability of Food Security, 2004; which mainly analysed the food security prevalent across states. These studies also highlighted the need for analysing the food and nutrition security at the sub-state level. The WFP and IHD also collaborated with each other in preparing district level food security atlases in rural areas in eight states in the country. These state reports undertook district level analyses of food security based on a range of identified indicators such as access to, and availability and utilisation of food. The reports also identified the districts that are insecure in terms of food security indicators. Odisha was one of the states where this exercise was performed.

The present report thus aims to update and carry forward the previous exercise undertaken at the district level.¹ Towards this end, this report documents the food security situation in Odisha with the following underlying objectives:

- To analyse the nature and dynamics of the food security situation at the district level in Odisha;
- To identify the regions which are most affected by food insecurity in Odisha;
- To compare the status of the districts in the state with regard to the food security index between 2008-09 and 2015-16; and
- To suggest policy interventions appropriate for improving food security in those regions in Odisha.

1.1 CONCEPTUAL FRAMEWORK

The concept of food security originated in the mid-1970s, during the time of the global food crisis (FAO, 2003). Initially, this concept was largely confined to the problem of food supply (supply side). During this period, the issues of food availability and price stability of basic food products were the main focus at both the national and international levels. The initial definition of food security, which thus reflected the global concerns of the 1974 World Food Summit, was as follows: “the 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”. Further, Sen (1981) highlighted that food security was caused not only by food production and agriculture-related activities but also by economic and social structures. The most recent definitions of food security are multi-faceted. They go beyond economics and physical availability, and include social, health, and nutritional aspects. The World Food Summit of 1996 adopted a more complex definition to include these aspects:

¹ For details, see the report ‘Food Security Atlas of Rural Orissa 2008’, <https://www.wfp.org/content/india-food-security-atlas-rural-odisha-2008>

“Food security, at the individual, household, national, regional, and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”. This definition was further amended as follows by the FAO in 2001 to stress the significance and importance of the social aspects of food security: “Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets

their dietary needs and food preferences for an active and healthy life.” This widely accepted definition points to various dimensions of food security as indicated in Figure 1.1.

Food security is thus a multi-dimensional concept and extends beyond the production, availability, and demand for food. Food insecurity is determined by various factors such as the domestic production of food, import and export of food, purchasing power of people to access food as well as factors that influence the absorption of food in the body.

Figure 1.1: Dimensions of Food Security



Source: FAO-ESA, (2006)

Nutrition Security

A person is considered nutrition-secure when she or he has a nutritionally adequate diet and the food consumed is biologically utilised such that adequate performance is maintained in growth, resisting or

recovering from disease, pregnancy, lactation and physical work” (Frankenberger et al., 1997, p.1). As per the Roadmap for Scaling Up Nutrition (2010),² nutrition security is deemed to be achieved when secure access to an appropriately nutritious diet is coupled with a sanitary environment, adequate health

² *Scaling Up Nutrition (SUN) is a collaborative process that began in 2009 with the development of the Scale Up Nutrition Framework. This framework was developed by a group of stakeholders from governments, donor agencies, the civil society, the research community, the private sector, intergovernmental organisations, and development banks. The goal of the Road Map for SUN is to reduce hunger and under-nutrition and contribute to the achievement of all the Millennium Development Goals (MDGs), particularly MDG 1, the objective of which was to halve poverty and hunger by the year 2015.*

services and care, to ensure a healthy and active life for all household members.

Food and Nutritional Security

The term food security and nutrition emphasises the importance of the complementarity and any overlaps between food security and nutrition. Food and nutrition security is a condition when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food, which meets their dietary needs and food preferences for an active and healthy life. Weingärtner (2010) further developed a definition of food and nutrition security as a condition under which adequate food (quantity, quality, safety, socio-cultural acceptability) is available and accessible for, and satisfactorily utilised by all individuals at all times to live a healthy and happy life. Since the term 'food and nutrition security' combines the concepts of both food and nutrition security in a more integrated way as a single goal of policy, this term is more widely used.

1.2 FOOD AND NUTRITION SECURITY: A REVIEW

1.2.1 Status of Food Security in India

In India, chronic food inadequacy was initially widespread at the national, regional and household levels among the poor segments of the population. Such poverty and inability to purchase adequate food leading to under-nutrition and micronutrient deficiencies persist even today among the poor segments of population. Even though there is overwhelming evidence that a very large share of the population does not have adequate access to food, quantifying the extent of the problem remains problematic in both developed and developing countries (for example, Barrett, 2010; Nord, et al., 2007). The progress towards food security in India has been reviewed by using various indicators such as: (i) the per capita food grain availability assessed

at the national level, (ii) access to foodgrains at the household level as assessed by hunger rates, (iii) health as assessed by infant and under-five mortality, and (iv) nutrition as assessed by under-five underweight children and low Body Mass Index (BMI) in adults, which shows that in terms of food production and access to food by households, India has fared well, (ii) in the under-five mortality rate (U5MR), India compares well with developing countries with similar health profiles, and (iii) in under-five children who are underweight, India fares poorly with rates being comparable to those of sub-Saharan Africa. The available data from India indicate that only about one-sixth of the Indian preschool children have low BMI for age (Ramachandran, 2013).

Further, nearly 40 percent of the world's food-insecure population was in India (Shapouri et al., 2009). This estimate is corroborated by the high prevalence of a number of anthropometric indicators, which accompany food insecurity, such as stunting (Deaton and Dreze, 2009).

India ranks 80th among 104 countries covered in the Global Hunger Index (GHI), 2015. GHI is a multidimensional measure using three equally weighted indicators, viz., the proportion of undernourished population for 2004-06, the proportion of underweight children below the age of five for 2003-08, and mortality rate of under-five children for 2008. With a GHI value of 23.7, the situation is considered alarming for India. What is more, a similar calculation for 17 major states indicates that the situation is serious in four, alarming in 12, and extremely alarming in one state (Menon et al., 2009).

Sharma et al. (2012) classified the various Indian states based on two indices of malnutrition, namely, the Normalised Adult Malnutrition Index (NAMI), and the Normalised Child Malnutrition Index (NCMI), and found that all the eastern states fell in the top two categories of malnutrition, with Odisha faring the worst among them. A similar study conducted by the MS Swaminathan Research Foundation (MSSRF, 2008) classified various Indian states based on a

composite index of food insecurity based on seven indicators,³ and found that the eastern states such as Chhattisgarh and Jharkhand fell under the category of ‘very high’ food insecurity, while Bihar and Odisha were classified under ‘high’ food insecurity. West Bengal was relatively better off with moderate levels of food insecurity. The prevalence of such levels of food insecurity and malnutrition in eastern India is a stark reminder that the various government-sponsored measures to alleviate food deficiency in the poverty-ridden pockets have actually not reached the targeted population.

Rahman (2015) studied the role of consumer food subsidies in improving nutritional intake and diet quality by evaluating expansion of the coverage of the government food assistance programme coverage in the hunger-prone state of Odisha in India. He found that after the intervention of the government programme, the proportion of households consuming below the recommended dietary allowance of calories, fats and proteins had declined significantly. Kochar (2005) examined the outcome of greater consumer subsidy or implicit income transfer to the Below the Poverty Line (BPL) households owing to the change in the Public Distribution System (PDS) from a universal to a targeted scheme in 1997. She finds that allocation of a greater wheat subsidy to the BPL households did not lead to any improvement in their overall calorie intake. Kaushal and Muchomba (2013) also evaluate the impact of the transition from a universal to a targeted PDS on the nutritional intake using nationally representative data for the period 1993-94 and 2009-10. However, over time, a variety of criticisms were made against the function of the PDS, including cost ineffectiveness, its marginal impacts, and the percentage of leakages (Swaminathan, 2001; 2003; Niwani, 1994; Radhakrishna and Rao, 1993). The

performance of the PDS, which has been successful elsewhere in India, have been the worst⁴ in states like Bihar, Odisha, and Jharkhand, among others. There is reportedly a very high prevalence of targeting errors (errors of exclusion and inclusion), and unauthorised diversion of PDS foodgrains in most of the above states (Khera, 2011a; 2011b, Kaushal and Muchomba (2011) study whether this improvement in PDS led to greater consumption of nutrients. They find no significant relationship between higher nutritional intake and PDS participation. Krishnamurthy et al. (2014), on the other hand, find that improvements in the PDS delivery system in Chhattisgarh did lead to a higher nutrient intake and diet quality.

1.2.2 Approaches to Food Security: Cross-Country Experience

The achievement of improved food security continues to be a serious issue across the globe. Some countries have made progress in reducing hunger: Latin America as well as the Eastern and South-eastern regions of Asia have all achieved the MDG 1c hunger target. On the other hand, Central Africa and Western Asia are moving away from the hunger targets, with a higher proportion of undernourished people in the population now than in 1990–92. The countries which have achieved the MDG 1 hunger target have done so due to the prevalence of stable political conditions and economic growth, accompanied by sound social protection policies targeted towards vulnerable population groups. On the other hand, as regards the countries that have failed to achieve the MDG 1 goal, the main reason is the occurrence of natural and human-induced disasters or political instability, which have constrained the protection of vulnerable population groups and the promotion of income

³ The seven indicators used for constructing the food insecurity index in the study are the: (i) percentage of women with any anaemia, (ii) percentage of women with CED, (iii) percentage of children with any anaemia, (iv) percentage of stunted children under three, (v) percentage of population consuming less than 1890 Kcal of energy per day, (vi) percentage of households without access to safe drinking water, and (vii) percentage of households without a toilet within their premises.

⁴ The state of Chhattisgarh is an exception, where recent attempts to revitalise the PDS have brought about inspiring results. The state embraced a near universal PDS in the year 2005 and is highly successful in providing subsidised foodgrains with negligible levels of unauthorised leakages.

opportunities for all. Further, the benefits of economic growth have failed to reach the poor population, due to the lack of effective social protection and income redistribution policies (FAO, 2015).

In addition, the cross-country experiences of Mexico, Brazil, Nigeria, and Malaysia suggest that supporting smallholder farming could be one of the most effective ways to alleviate poverty and hunger at the household level, and to improve food security at the local, regional and national levels. Hence investments and differential public policies are required for enhancing technological, financial and marketing support to small-holder farmers, which can improve the productivity of small farmers, improve their livelihoods, and contribute to overall food security (Sharma et al, 2012).

Finally, an increase in and regular fluctuations in food prices have put millions of people at risk of becoming food-insecure and being pushed into poverty across the globe (IFPRI et al., 2009; DFID, 2009; UN, 2008; Ivanic and Martin, 2008a). The poorest households that spend nearly four-fifths of their incomes on food remain the most vulnerable to a sharp rise in the prices of staple food items. Studies including those on Pakistan suggest that the sharp rise in food prices would increase poverty in many developing countries (Ivanic and Martin, 2008b; Wodon and Zaman, 2008).

1.2.3 Existing Food and Nutrition Security Indicators

Numerous indicators of food and nutrition security are used at the global, national, household and individual levels. These have been discussed in detail below.

■ **Undernourishment**

The FAO's measure of food deprivation reflects the proportion of the population with per capita dietary energy consumption below the standard minimum energy requirement, that is, the proportion of the population considered as 'undernourished'. The FAO indicator comprises three parameters, namely, the mean quantity of calories available for human consumption; the

inequality in access to those calories among the population; and the mean minimum amount of calories required by the population (de Haen et al., 2011). However, estimates based on the mean quantity of calories are found to be unsatisfactory in several ways (Svedberg, 2000). First, calorie availability is a poor predictor of nutritional development, mortality, and productivity. Second, the cut-off point by aggregating sex and age-specific minimum dietary requirements is intensely debated as it might result in a large under-estimation of under-nutrition (Dasgupta, 1993; Svedberg, 2002).

■ **The Global Hunger Index**

The Global Hunger Index (GHI) is designed by the International Food Policy Research Institute (IFPRI) to capture the multidimensionality of food insecurity. The index is constructed by equally weighing three indicators: the proportion of the population who are food energy-deficient, that is, the FAO undernourishment indicator (based on dietary energy supply); the proportion of children who are underweight, measured by the proportion of children below the age of five who are underweight; and the under-five mortality rate of children (Wiesmann, 2006). Although, the GHI provides a unique insight by combining three aspects of hunger, these three elements of hunger are correlated, and consequently, the issue of double counting has been raised among critics (Masset, 2011).

■ **The Poverty and Hunger Index**

The Poverty and Hunger Index (PHI) is used as one of the instruments for achieving the Millennium Development Goals (MDGs). Gentilini and Webb (2008) identified the indicators for the PHI as follows: the proportion of the population living on less than a dollar per day, the poverty gap, the share of the poorest quintile in national income or consumption, the prevalence of underweight children, and the proportion of undernourished population calculated by the FAO. The statistical

methodology of the PHI follows the UNDP's Human Development Index (HDI) (Gentilini and Webb, 2008). However, the PHI also has various limitations. Firstly, the correlation between poverty and hunger is not always high, thereby decreasing the redundancy between the elements. On the other hand, the correlation between the poverty rate and poverty gap indicators is very high (close to one), suggesting that these indicators are redundant (Gentilini and Webb, 2008). Secondly, the data are mostly derived from national data, and therefore the quality and topicality of the data are major concerns (Masset, 2011).

■ **Anthropometric Indicators**

While the previous indicators focus on the macro level, the anthropometric indicators such as stunting (low height-for-age), underweight (low weight-for-age), and wasting (low weight-for-height) measure nutritional outcomes at the individual level.

Low weight-for-height, also known as wasting, captures the short-term substantial weight loss resulting from health problems or acute food shortage. Wasting is strongly associated with child mortality. Stunting reflects low height-for-age, and is an indicator for chronic malnutrition. Stunted children fail to reach their potential cognitive and physical development. The 'underweight' indicator reflects low weight-for-age and results from a combination of short-term weight loss and long-term growth problems. All the indicators are calculated by comparing the weight and height of a child with a reference population of well-nourished and healthy children (Shetty, 2003).

The nutritional outcome is influenced by beyond the availability of and accessibility to food, such as the interactions between food losses, intra-household food distribution, and individual health and activity levels, among other indicators. Svedberg (2011) pointed out the advantage of anthropometric indicators, which is that they directly reflect the imbalances between energy

intakes and expenditures. Poor anthropometric outcomes are associated with higher morbidity and mortality (Deaton and Dreze, 2009).

Anthropometric data are collected from household surveys like the Demographic and Health Survey. They have the advantage of being disaggregated by regions, thereby enabling spatial analysis. Another advantage of anthropometric norms, particularly for children under five, is that they are universal as the genetic potential growth for children is uniform (Svedberg, 2011).

Nevertheless, anthropometric measures are also subject to measurement errors including technical error of measurement, and the exact age of children is sometimes not known. Further, for nutritional outcomes at the macro level, the anthropometric indicators are generally expressed as a percentage or prevalence, that is, frequencies (for example, the prevalence of an underweight status in children). The reference cut-off points can be based on statistical indicators, and the risk of dysfunction and prescriptive criteria may vary from country to country (Pelletier, 2008). Anthropometric indicators are available for all countries though the series are not uniform in some countries since the data are not collected annually.

■ **Household Diet Diversity**

Smith and Subandoro (2007) propose two indicators of food insecurity, which measure diet diversity, particularly in terms of the following outcomes:

- (i) As constructed by classifying food into seven categories, including cereals, roots and tubers; pulses and legumes; dairy products; meats, fish, seafood and eggs; oils and fats; fruits; and vegetables, and by summing up the number of different food categories consumed by the household during the reference period; and
- (ii) As an indicator of food security by assessing the share of calories from staple

foods out of the total calorie intake at the household level.

The motivation behind this approach is that poor households will have a high marginal utility of calories, and hence choose a diet achieving the maximum possible calories within the existing budget constraints. Since staple foods are usually the cheapest source of calories, poor households will get a higher share of their calories from staples. As households expand their budgets, they will increasingly try to get their calorie intake through consumption of foods which are relatively more expensive and also have a higher level of other preferred attributes, such as taste (D' Souza and Jolliffe, 2010). Further, according to Hodinott and Yohannes (2002), diet diversity scores are meaningful indicators of FNS for four reasons. First, dietary diversity scores correlate with measures of food consumption and are a good measure of household food access and caloric availability. Second, greater variety in diet is associated with a number of improved outcomes, particularly in-birth weight (Rao et al., 2001), child anthropometric status (Hatloy et al., 1998), improved haemoglobin concentration (Bhargava et al., 2001), reduced risk of mortality from cardiovascular disease (Kant et al., 1995) and the incidence of hypertension (Miller et al., 1992). Third, diet diversity scores can be collected through household surveys and can be used to examine FNS at the individual and intra-household levels.

1.3 METHODOLOGY

Most of the variables chosen for the food and nutrition security index (FNS) are developmental variables. In order to calculate food and nutrition security, we have arranged all the variables in the same direction. Here, the FNS index has been calculated only for the rural areas. It has also been constructed for various districts, and the districts having a higher FNS index value are considered to be more food-secure as compared to the districts with a lower index value.

Broadly, we have adopted two methods to find out the index value, that is: (1) the maximum–minimum (Range Equalization Method, REM) adopted by UNDP as well as the Mean Standardisation Method. Further, Principal Component Analysis (PCA) has been used to calculate the overall food and nutrition security index. One of the objectives of the district level FNS is to show the position of the concerned district in terms of various dimensions of food and nutrition security. The FNS is thus a composite index covering three dimensions, that is, access to, and the availability and utilisation of food. Another important dimension is stability, which, however, could not be used in calculating the final FNS index as the district level data pertaining to this indicator are not available.

Methodology I: Maximum–Minimum Approach

Under the maximum-minimum approach, an index has been constructed for each variable that is calculated by applying the following general Range Equalization Method (REM) formula adopted by UNDP:

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

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 has been self-selected, while some others entail an element of value judgment.

Construction of the Food and Nutrition Security Radar

The different indicators included in the FNS have been scaled and normalised (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.

After calculation of the index of each variable, each dimension of the index has been calculated by taking the average of each variable index. The composite food and nutrition security index (FNSI) is thereafter derived by taking the average of the three dimensions.

Methodology 2: Mean Standardisation

Method

In this method, the index value of each variable is constructed by dividing the actual value of the variable by its mean value.

$$\text{Variable Index} = \frac{X_i}{\bar{X}}$$

Each dimension index is calculated by adding the index value of each variable. Further, the overall FNSI index is derived by adding all the index values of the variables.

Methodology 3: Principal Component

Analysis

The Principal Component Analysis (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 the variables or to the normalised values of the variables. In general, normalisation can be done by three methods, that is, by deviation of the variables from their respective means (*i.e.* $X - \bar{X}$); by dividing the actual values by their respective means; and deviation of value of a variable from the mean which is then divided by standard deviation $\{i.e. (X - \bar{X})/\sigma\}$. We have applied the second method. In the PCA, the first component explained most of the variance.

Food Security Outcome Index

In order to cross-check the validity of the FNS for the 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 and nutrition 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: the under-five mortality rate (U5MR) and child underweight (weight for age -2SD). These two variables will be collected from Annual Health Survey. We have calculated the district level FSO index by using the Range Equalization methodology. Finally, we will arrive at a correlation between the food and nutrition security index, on one hand, and the food security outcome index, on the other.

Grouping of Districts on the Basis of the FSO and FNS Range

All the districts of the selected state have been grouped into five broad categories, that is, highly secure, secure, moderately secure, insecure, and highly insecure on the basis of the composite FSO and FNS indices.

Why the Need for a District Level Analysis

An index, even a carefully constructed one, is only a tool. If it analyses conditions at the state level, it necessarily misses much of the local context as a result of which it fails to fully capture the important cultural and political dimensions, and risks simplifying complex issues. However, that said, it also allows for the adoption of a bottom-up approach for understanding the risks to food and nutrition security by reducing the major food security themes to their core elements. Most importantly, the index is meant to spur dialogue about the drivers of food insecurity and to suggest where the districts and other stakeholders should focus their efforts in order to ensure the greatest impact.

1.4 STRUCTURE OF THE REPORT

This report is an effort to provide a district level profile of food security in Odisha and compare the

status of food security in the districts of Odisha during two time periods, that is, around 2008-09 and 2016-17. Chapter 1 analysed the basic issue of food and nutrition security, approach and methodology of the study. Chapter 2 provides an overview of the state in terms of its socio-economic indicators, including education, health, employment, and physical infrastructure. Chapter 3 presents the food availability, access and utilisation index as well as a composite index of food security outcomes. Chapter 4 analyses the overall food security input index (FSI),

which is a composite index of the factors critical to the attainment of food security in Odisha, and also identifies the priority districts. Chapter 5 delineates a comparison of the food security situation in the districts of Odisha between 2008-09 and 2016-17. Chapter 6 discusses strategies for action that emerge from the analysis in this study, and lays down the policy initiatives that may be considered for implementation in the most food-insecure districts in Odisha to help improve their food insecurity. Chapter 7 presents the conclusions and recommendations.

2.1 BACKGROUND OF THE ODISHA ECONOMY

Odisha is located in the eastern part of India along the Bay of Bengal. Geographically, the state of Odisha extends from 17.49N latitude to 22.34N latitude, and from 81.27E longitude to 87.29E longitude. It is bounded by the states of Andhra Pradesh and Telangana in the South, West Bengal in the North, Jharkhand and West Bengal to the North and North-East, and Chhattisgarh in the West. The state has 30 districts and the official language of the state is Odisha. The state is broadly divided into four natural divisions, that is, the Northern Plateau, the Eastern Ghats, the Central tracts, and the coastal plains. The northern plateau is an extension of the forest comprising the mineral-rich Chotanagpur Plateau, which is centred in Jharkhand. The Eastern Ghats, extending roughly parallel to the coast, are remnants of an ancient line of hills in eastern peninsular India. The Central tracts comprise a series of plateau and basins located in the inland area to the west and north of the Eastern Ghats. The coastal plains are formed of alluvial soils deposited by a number of rivers flowing into the Bay of Bengal.

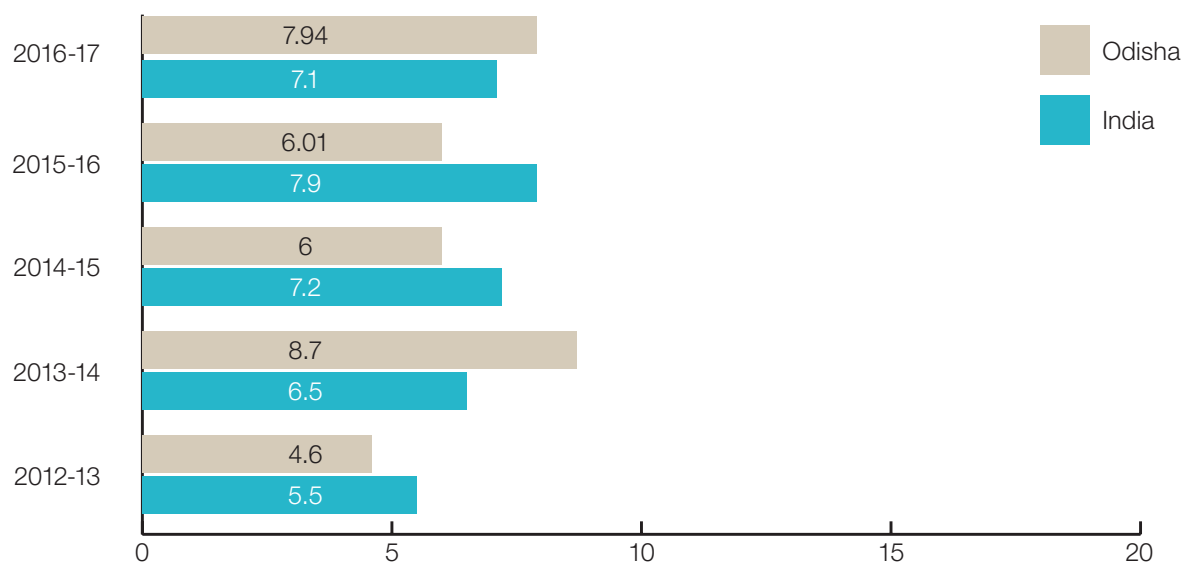
The state covers an area of 1,55,707sq. km. It is the ninth largest state in the country in terms of area and the eleventh largest in terms of population. The state of Odisha accounts for 4.74 per cent of India's landmass, and 3.5 percent of the total population of the country. The state has 30 districts and three revenue divisions, that is, the North, South and Central divisions, with their headquarters situated in Sambalpur, Berhampur, and Cuttack, respectively. Each division is comprised of 10 districts. The state has 58 sub-divisions, 316 tehsils, 314 blocks, and 51,527 villages.

As per the 2011 Census, Odisha has a population of 41.9 million, which went up from 36.8 million in the 2001 census. The total population growth in the state during the period 2001–11 was about 14 percent, as compared to a corresponding growth of 20 per cent achieved during the previous decade. The population density of the state also increased from 236 persons per sq. km in 2001 to 269 in 2011, as compared to the all-India population density of 324 per sq. km in 2001. Almost 69 percent of the population in the state lives in rural areas.

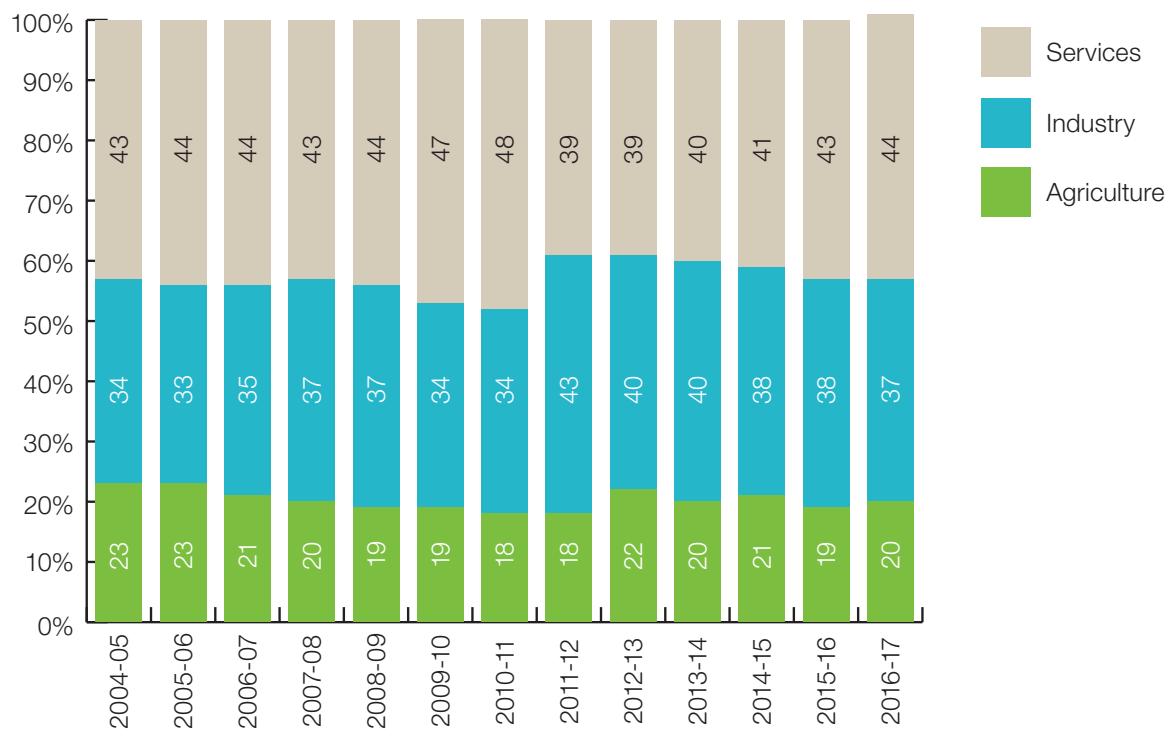
2.2 BASIC ECONOMIC INDICATORS

The Gross State Domestic Product (GSDP) is one of the important indicators for measuring the development of the state. The economy of Odisha registered a growth rate of 7.94 percent in 2016-17 as against the national average of 7.1 percent at the base price of 2011-12 (as per the Economic Survey 2016-17). The increase in the growth rate of the state in 2016-17 over the preceding year's corresponding figure of 6.01 percent has been attributed to good agricultural production resulting from an improved monsoon (Figure 2.1).

As per the 2011-12 price, the real per capita income of Odisha was Rs. 61,678 in 2016-17 as against the all-India average of Rs. 81,805. At factor cost at 2011-12 prices, the per capita income of Odisha was Rs. 54,926. The per capita income of the states which registered a lower GSDP than Odisha in 2014-15 are Madhya Pradesh, Uttar Pradesh, and Bihar, which recorded 75 percent, 64 percent, and 49 percent of Odisha's GSDP, respectively. On the other hand, states that registered a higher per capita GSDP than Odisha included Kerala, Uttarakhand, and Haryana, which recorded 210, per capita, 220 per capita, and 226 per capita of Odisha's GSDP, respectively.

Figure 2.1: Real Growth Rates of GSDP at Market Prices, Odisha and All-India, 2012–17

Source: Economic Survey of Odisha, 2016–17.

Figure 2.2: Sectoral Composition of the GSDP in Odisha, 2011–16

Source: Various issues, Economic Survey of Odisha.

Figure 2.2 shows the composition of the GSDP in Odisha based on the agriculture, industrial and service sectors. The figure shows that between 2004-05 and 2016-17, the share of the agriculture sector in the state's GSDP declined. The share of agriculture fell from 23 percent in 2004-05 to 20 percent in 2016-17. The share of the service sector, on the other hand, has remained stable at around 44 percent over the last decade. The share of the service sector was the highest in 2011-12. The contribution of the industrial sector was 37 percent in 2016-17, showing an increase of 3 percentage points, from 34 percent in 2004-05 to 37 percent in 2016-17. The growth rate of the primary sector in Odisha was about 2.2 percent as compared to a corresponding all-India growth of 4 percent during the period 2005-06 to 2013-14. Both the Odisha and all-India growth rates of the secondary sector stood at around 7 percent whereas the all-India growth rate of 9.07 per cent for the tertiary sector was comparatively half a percent higher than the corresponding figure of 8.57 per cent for Odisha.

Odisha is primarily an agricultural economy, with agriculture contributing about one-fifth of the total GSDP in the state. As per the 2011 Census, this sector absorbed about two-fifths of the total workforce in the state, including 23.4 percent cultivators and 38.4 percent agricultural labourers. The cultivated land area has remained more or less fixed, whereas with an increase in the population, the land-man ratio in the state has worsened over time. Odisha records low agricultural productivity due to the prevalence of traditional agricultural practices, inadequate capital formation, low irrigation status, and uneconomic size of landholdings. The household industrial sector constitutes only 4.5 per cent of the total workforce whereas the other sectors contribute about 37 percent of the total workforce.

The per capita availability of cultivated land was 0.39 ha in 1950, which was drastically reduced to 0.17 ha in 1999, and further to 0.14 ha in 2009-10. The per capita foodgrain production in the state also declined from 230.44 kg to 181.23 kg per annum for the time period 1950 to 2009-10. Small and marginal farmers account for 83 percent of the farming community, or more than three-fourths of the total operational holdings. These

farmers live the below poverty line and do not have any appropriate means of investment. The technology and irrigation network is confined to limited areas. The total net sown area in the state in 2015-16 was 56,08,000 hectares.

The decadal growth of the net irrigated area has not much changed over the periods of last six decades, going up from 18.3 percent in 1960-61 to 15.3 per cent in 2011-12. The net irrigated area to the net sown area in Odisha, at 29.5 per cent, is much lower than the corresponding all-India figure of 48 percent ('Agricultural Statistics at a Glance', 2014, Ministry of Agriculture, Government of India). The gross cropped area in the state is 81,80,000 hectares. The cropping intensity of the state is 146 (Economic Survey of Odisha, 2016-17). The cropping pattern is dominated by cereals. While rice the production accounts for 76 percent of the gross cropped area, pulses are grown in only 5 percent of the gross cropped area.

2.3 SOCIO-ECONOMIC STRUCTURE

Poverty in Odisha

The percentage of the population living below the poverty line (BPL) in both the rural and urban areas of the state was extremely high as compared to the corresponding all-India figures during the period 1973-2012 (Table 2.1). The acuteness of poverty gradually decreased for India in all the five phases during the period 1973-2011. In contrast, in Odisha, the extent of poverty increased from 67.28 per cent of the BPL population in 1973-74 to 72.38 per cent in 1977-78. Since 1977-78, the extent of poverty has, however, declined in the state. The occurrence of two major calamities in Odisha, in the recent past, namely, the 1999 cyclone and the 2000 drought, aggravated the problem of poverty in the state. The available figures for Odisha indicate that the ratio of combined rural and urban poverty was 32.6 percent in 2011-12, as compared to the corresponding all-India figure of 21.9 percent.

Table 2.1: People Living below the Poverty Line (%) in Odisha and India (1973-74 to 2011-12)

Year	Odisha			India		
	Rural	Urban	Combined	Rural	Urban	Combined
1973-74	67.28	55.62	66.18	56.44	49.01	54.88
1977-78	72.38	50.92	70.07	53.07	45.24	51.32
1983	67.53	49.15	65.29	45.65	40.79	44.48
1987-88	57.64	41.63	55.58	39.09	38.20	38.86
1993-94	49.72	41.64	48.56	37.27	32.36	35.97
1999-2000	48.01	42.83	47.15	27.09	23.62	26.10
2004-05	46.80	44.30	46.40	28.30	25.70	27.50
2011-12	35.69	17.29	32.59	25.70	13.70	21.92

Source: Compendium of Environment Statistics, pp. 17173, CSO, GoI, 1998; data collected from the Planning Commission.

In general, the poverty rate in Odisha is very high. This study attempts to understand the poverty situation in the state by two factors of marginalisation, that is, by social groups and by the different regions in the state as categorised in the National Sample Survey (NSS). Among the total BPL population in Odisha, the highest incidence of poverty is witnessed among those living in the southern region, followed by those inhabiting the northern region. In contrast, the incidence of poverty in the coastal region is quite low. In 2011-12, the proportion of BPL rural population in the southern, northern, and coastal regions was 48 per cent, 40 per cent, and 22 percent, respectively. The proportion of poverty in Odisha is far higher than that in the other states of the country. Interestingly, the poverty rate

by social category also shows a high level of disparity in the state. The Scheduled Tribe (ST) population in the state accounts for as high as 64 percent of the state's BPL population, followed by the Scheduled Castes (SCs) and Other Backward Castes (OBCs). The poverty rates by social category in the different regions of Odisha also throws up some intriguing insights. The southern region records the highest degree of poverty by social categories. The study also clearly shows a positive correlation between female literacy and the incidence of poverty.

The north and south together account for almost 77 percent of the state's poor. It is clearly seen that the coastal belt, which comprises 46 percent of the state's

Table 2.2: Percentage of Poor by Social Category in Rural Odisha, 2005-2012

Year	Region	STs	SCs	OBCs	Others	Total
2004-05	Coastal	68	33	34	19	27
	Southern	83	67	65	44	73
	Northern	74	64	5	34	59
	Rural Odisha	76	50	37	24	47

Year	Region	STs	SCs	OBCs	Others	Total
2011-12	Coastal	53	33	17	13	22
	Southern	69	59	28	23	48
	Northern	59	35	29	9	40
	Rural Odisha	64	41	24	14	36

Source: Calculated from the NSS 61st and 68th Rounds.

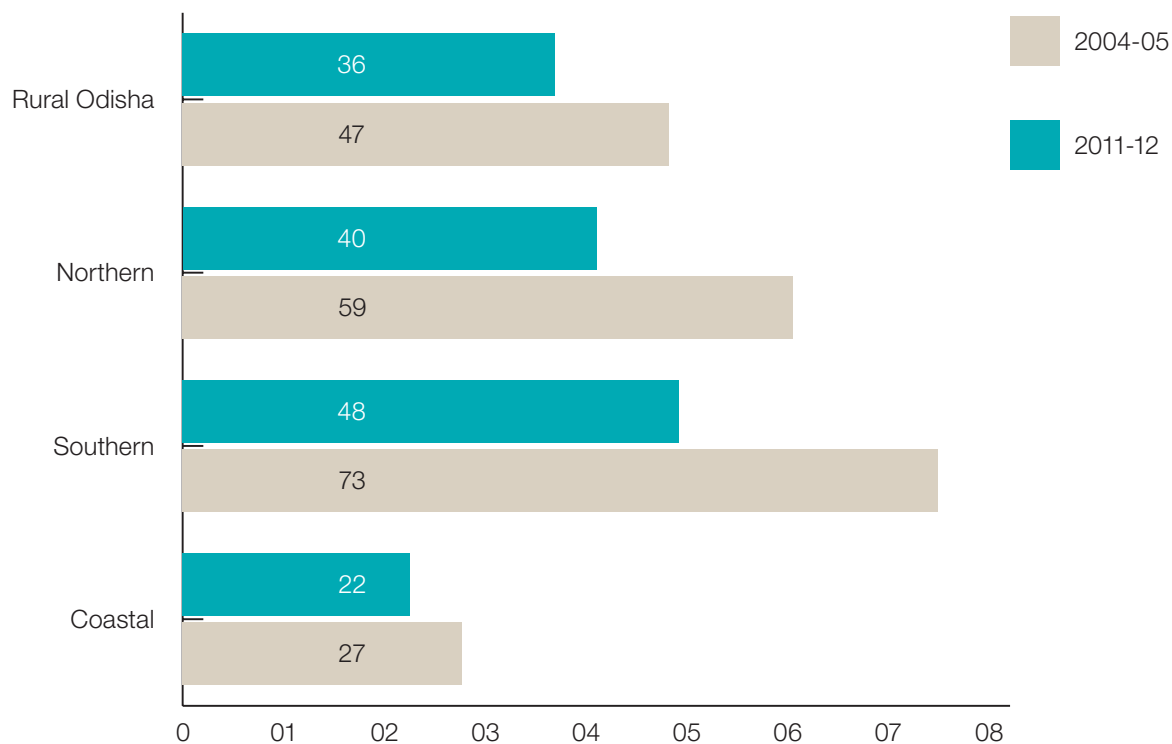
population, accounts for only 23 percent of the state’s poor. On the other hand, the southern and northern regions, which together comprise 54 percent of the state population, account for 77 per cent of its poor. Thus, the incidence of poverty in the state shows both a regional as well as a social dimension, with the SCs/STs accounting for a larger share of the poor.

Figure 2.3 shows the region-wise poverty rate in Odisha based on the NSS. It may be seen that the

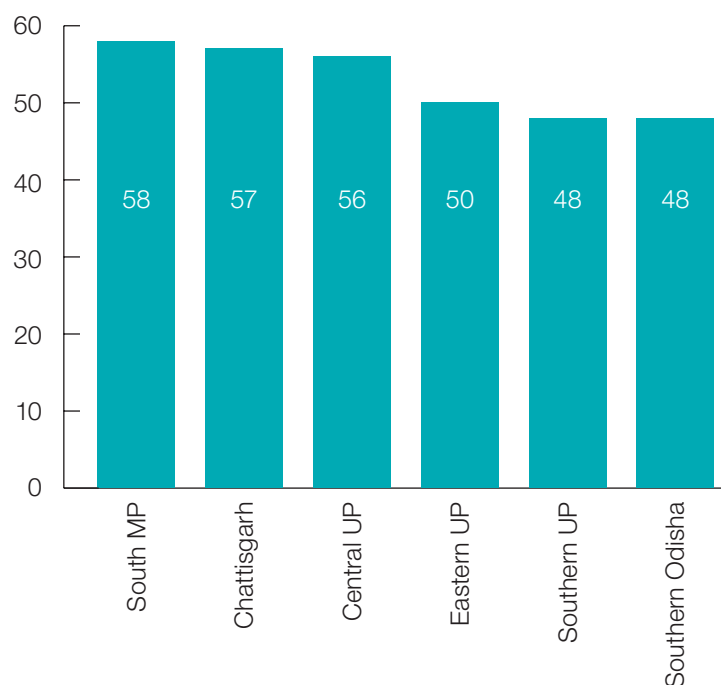
southern region of Odisha has the highest poverty rate, which is higher than the average poverty rate of rural Odisha. Further, Figure 2.4 identifies the six highest poverty regions across India, indicating that southern Odisha is one of the regions most severely afflicted by poverty in India.

Studies also show a high poverty rate for the larger land-cultivating groups among the STs, which accounts for the low productivity of hill agriculture. At the all-India

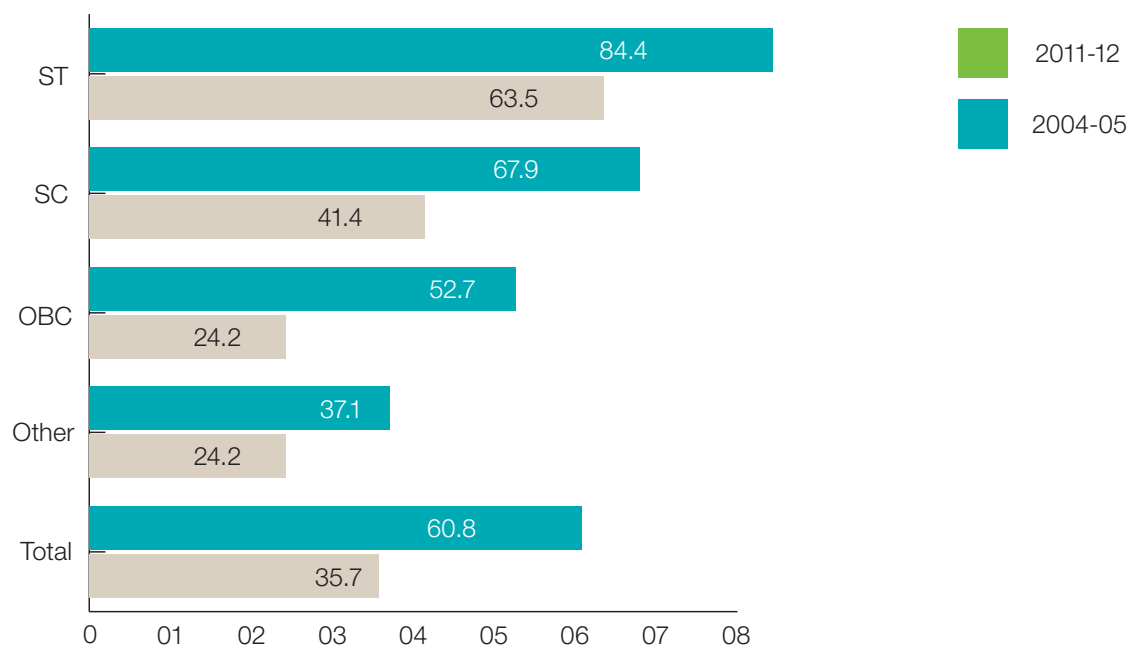
Figure 2.3: Region-wise Poverty Rate in Odisha



Source: Calculated from the NSS, 2004-05, 2011-12.

Figure 2.4: Regions with the Highest Poverty Rates in Rural India, 2011-12

Source: Calculated from the NSS 68th Round.

Figure 2.5: Poverty Rate by Social Category in Rural Odisha

Source: Calculated from the NSS 61st and 68th Rounds.

level, even STs belonging to the highest landowning class (or those owning more than 4 hectares of land) exhibit an incidence of poverty as high as 34.85 percent. Similar land owning classes among the rest of the populations exhibit much lower levels of poverty (Sarkar, et al., 2006).

The poverty rate by social category is a major concern for policymakers. The incidence of poverty among the STs was the highest in Odisha in 2011-12, with about two-thirds of the total tribal population living below the poverty line. Over the last seven years, however, the poverty rate among STs has declined by a whopping 24 percentage points. As regards the SCs, about two-fifths of them were living below the poverty line in 2011-12, which signified a decline of 27 percentage points in the SC BPL population over 2004-05. Among the OBCs also, the poverty rate declined from 53 per cent in 2004-05 to 24 per cent in 2011-12. The incidence of poverty among the population categorised as 'Others' was the lowest at 24 per cent in 2011-12 (Figure 2.5). Significantly, therefore, Odisha exhibits not only an overall high poverty rate but also the specifically high poverty rates among the SC, ST, and OBC populations.

Education and Literacy Rate

The scenario pertaining to the literacy rate in Odisha has shown some improvement in recent years. In 2011, the literacy rate in Odisha was 72.9 per cent (including 70.2 per cent rural and 85.7 per cent urban). The literacy rate was the highest in the Khordha district, at 86.9 per cent, and the lowest in the Malkangiri district, at 48.5 per cent (Appendix Table 1.1). The percentage point increase in the literacy rate in 2011 over the 2001 Census is thus 10 percent overall and 13.5 per cent for women. The rural-urban gap in literacy has also narrowed down over the decade 2001-11. The rural-urban gap in literacy, which stood at 21 per cent in 2001 (59.8 per cent in rural areas and 80.8 per cent in urban areas), reduced to 15.5 per cent in 2011 (70.2 per cent in rural areas and 85.7 per cent in urban areas) in 2011. The gender gap in the literacy rate also fell to a large extent over the decade 2001-11. The gender gap in 2001 stood at 31 per cent (81.6 per cent for males and 50.5 per cent for females), which declined to 11.3 per cent in 2011 (75.3 per cent for males and 64.0 per cent for females) in 2011.

Table 2.3: Literacy Rate in Odisha and India, 2001-2011

		2011		2001	
Area		Odisha	All-India (AI)	Odisha	All-India (AI)
Rural	Male	72.9	77.2	79.6	70.7
	Female	60.7	57.9	46.7	46.1
	Total	70.2	67.8	59.8	58.7
Urban	Male	87.9	88.8	90.7	86.3
	Female	80.4	79.1	72.9	72.9
	Total	85.7	84.1	80.8	79.9
Total	Male	81.6	82.1	75.3	75.3
	Female	64.0	65.5	50.5	53.7
	Total	72.9	74.0	63.1	64.8

Source: Census 2001, 2011.

Disparities among social categories with regard to literacy remain an area of concern for the state. The SC and ST communities had relatively lower literacy rates of 69.02 per cent and 52.24 per cent, respectively, in 2011 (Economic Survey 2015-16). In addition, there is a high gender gap in literacy among the SC and ST communities. While Nabarangpur district exhibits a very low literacy rate of 46.43 per cent while Khorda was highly literate, at 86.88 per cent, as per the 2011 Census. The districts of Jagatsinghpur and Khurda, on the other hand, registered the highest literacy rate.

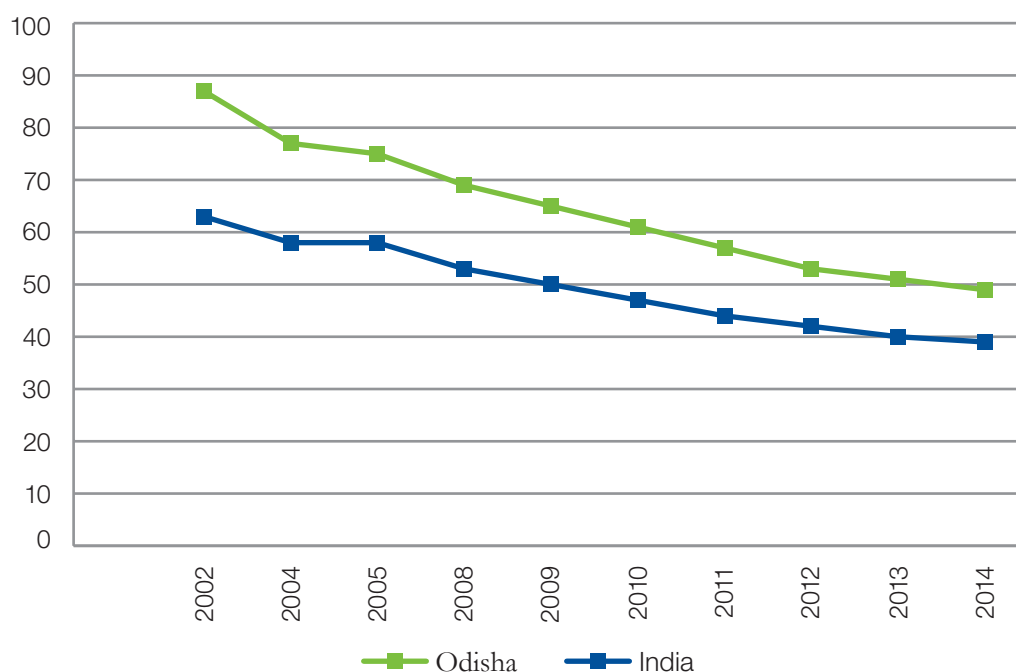
The Gross Enrolment Rate (GER) at the primary level was high in Odisha in 2013-14. The GER in Odisha at upper primary level is 104.4. Among districts, the GER for the Khurda district was the highest at 125.06 while it was the lowest for Malkangiri at 92.3. Over the given period, the dropout rate shows a marked decline. The dropout rate at the upper primary level declined from 28.4 per cent in 2005-06 to 2.4 per cent in 2013-14. The dropout rate at the secondary school

level, which stood at 62 per cent in 2005-06, fell to 16.5 per cent in 2013-14 (*Economic Survey of Odisha 2014-15*).

Health and Nutritional Status

The health status of an individual is directly related to his/her economic status. The reverse is also true in view of the fact that a healthy person has a higher capacity to work. The goal of economic activity is to achieve well-being for humanity, an important, even elementary, component of which is health. Health and nutritional status can be measured through a number of indicators. While mortality is an indicator of the prevalence of poor reproductive health facilities and antenatal care, mortality under age five is closely linked with immunisation and overall poverty levels. Figure 2.6 shows the infant mortality rate for Odisha and India. The IMR of Odisha decreased to 49 in 2014 from 87 in 2002 whereas during the same period, the IMR at the all-India level decreased from 63 to 39. The gap between the Odisha and all-India mortality rates

Figure 2.6: Infant Mortality Rate Odisha and India, 2002-2014



Source: SRS Bulletins,– July 2016.

fell to 10 in 2014 (49 and 39, respectively) from 24 in 2002 (87 and 63, respectively) (Figure 2.6).

Table 2.4 shows the comparative health as well as nutritional status for women and children for Odisha during the two time periods under study, that is, 2005-06 and 2015-16. The under-five mortality rate in Odisha was 49 in 2015-16 as compared to 91 in 2005-06. Similarly, the IMR in the state came down from 65 in 2005-06 to 40 in 2015-16. The proportion of stunted children in Odisha reduced to 11 percentage points (from 45 per cent to 34 per cent) between the last two National Family Health Survey (NFHS) rounds. The proportion of wasted children hovers at around 20 percent over the last two NFHS rounds.

The proportion of underweight children in Odisha also showed progress, as indicated by a decrease of 6 per cent in this figure, from 40.7 per cent to 34.4 per cent over the last one decade. High malnutrition levels, coupled with high mortality among children, also provide evidence of poor feeding practices. Lack of access to adequate quantity of food due to poor economic conditions is the prime reason for such a situation. The proportion of anaemic children in the age group of 6-59 months fell by almost 20 percentage points, from 65% per cent in 2005-06 to 45 per cent in 2015-16, but the proportion is still high. The proportion of anaemic women aged 15-49 years was almost half of the total women in 2015-16 whereas it was about three-fifth (61 per cent) in 2005-06.

Table 2.4: Health and Nutrition Status among Women and Children, 2005-06 and 2015-16

Indicators	2015-16			2005-06		
	Urban	Rural	Total	Urban	Rural	Total
1. Infant mortality rate (IMR)	21	43	40	40	69	65
2. Under-five mortality rate (U5MR)	25	53	49			91
3. Mothers who had at least 4 antenatal care visits (%)	69.7	60.6	62			36.9
4. Mothers who consumed iron folic acid for 100 days or more when they were pregnant (%)	40.8	35.8	36.5			22.5
5. Mothers who had full antenatal care(%)	27.1	22.3	23.1			12.3
6. Institutional births (%)	89.7	84.7	85.4			35.6
7. Children aged 12-23 months fully immunised (BCG, measles, and 3 doses each of polio and DPT) (%)	75	79.2	78.6	52.7	51.8	51.8
8. Children under age 3 years breastfed within one hour of birth (%)	67.6	68.8	68.6	54.3	54.1	54.4
9. Children under 5 years who are stunted (height-for-age) (%)	27.2	35.3	34.1			45
10. Children under 5 years who are wasted (weight-for-height) (%)	17	20.9	20.4			19.6

Indicators	2015-16			2005-06		
	Urban	Rural	Total	Urban	Rural	Total
11. Children under 5 years who are underweight (weight-for-age) (%)	26.2	35.8	34.4			40.7
12. Women whose Body Mass Index (BMI) is below normal (BMI < 18.5 kg/m ²) (%)	15.8	28.7	26.4	24.1	43.7	41.4
13. Children aged 6-59 months who are anaemic (<11.0 g/dl) (%)	38.1	45.7	44.6			65
14. All women aged 15-49 years who are anaemic (%)	47.6	51.8	51			61.1

Source: NFHS 2015-16.

Table 2.5 delineates the five best and five low performing districts in terms of health and nutrition indicators in Odisha for the year 2015-16. It is clear from the table that in terms of the nutrition status of the child, as measured in terms of stunted, wasted, and underweight children, the KBK districts remained in the lowest strata of development whereas the coastal districts exhibited better performance. The high-performing coastal districts include Cuttack, Puri, Jagatsinghapur, Khordha, and Kendrapara, whereas the low-performing ones include Rayagada, Nabarangpur, Malkangiri, and Gajapati, among others. There is a large difference between the highest and lowest performing districts in terms of child nutrition outcome. As regards stunting of children below the age of 5 years, the difference between the high performers and low ones is 34.8 per cent, wherein Malkangiri accounts for 47.2 per cent of the stunted children, and Cuttack accounts for 12.4 per cent of the total. As regards the incidence of wasting among children, the percentage point difference between the high- and low-performing states is 28, (Cuttack at 7.9 per cent as compared to Nabarangpur at 36 per cent), whereas is 37, with Cuttack at 15.5 per cent and Malkangiri at 52.5 per cent.

In terms of low BMI, the KBK districts like Nabarangpur, Koraput, Rayagada, Malkangiri and

Kalahandi recorded a high proportion of thin women, whereas the coastal districts like Puri, Nayagarh, Jagatsinghapur and Cuttack recorded a low proportion of thin women. Here too, in terms of low BPM the difference is 30 per cent between the high- and low-performing districts with Malkangiri recording 47.5 per cent and Puri, 16.9 per cent of thin women. As regards the incidence of anaemia, the southern and northern districts recorded a high proportion of the population suffering from anaemia (Table 2.5).

Table 2.6 provides an interesting picture of the consumption and intake of calories and proteins among rural and urban households in Odisha. In terms of the intake of calories and proteins, rural Odisha performs worse than the all-India level but in terms of the consumption of vitamins, the prevalent figure in Odisha is higher than the corresponding all-India average.

It is also well-known that sustained access to safe drinking water, sanitation and hygiene are critical for a healthy living. Odisha has done rather well in terms of the coverage of rural and urban habitations having access to safe sources of drinking water, including piped water supply, tubewells, and closed wells. The proportions of households in the state using tap water, tubewell water and well water were 13.8 percent, 61.5 percent, and 19.5 percent, respectively,

Table 2.5:

Highest and Lowest Five Districts in Terms of Health and Nutrition Indicators, 2015-16

Status	Institutional births (%)	Children aged 12-23 months fully immunised	Children under 5 years who are stunted (height-for-age)12 (%)	Children under 5 years who are wasted (weight-for-height)12 (%)	Children under 5 years who are underweight (weight-for-age)12 (%)	Children whose Body Mass Index (BMI) is below normal (BMI < 18.5 kg/m ²)14 (%)	Children aged 6-59 months who are anaemic (<11.0 g/dl) (%)	All women age 15-49 years who are anaemic (%)								
									Jharsuguda	Anugul	Puri	Cuttack	90.1	12.4	Cuttack	7.9
Best 5 districts	Jajapur	94.7	Puri	16.7	Puri	11.2	Jagatsinghapur	16.8	Nayagarh	16.9	Bhadrak	22.4	Cuttack	36.5		
	Cuttack	96.0	Balangir	91.8	Jagatsinghapur	19.4	Kendrapara	12.5	Puri	17.7	Jagatsinghapur	18.0	Jagatsinghapur	22.7	Nayagarh	39.9
	Jagatsinghapur	97.4	Sambalpur	92.6	Khordha	24.8	Jagatsinghapur	12.6	Khordha	19.8	Khordha	19.2	Khordha	24.6	Kendujhar	40.4
	Puri	97.4	Baudh	94.2	Kendrapara	27.2	Khordha	12.7	Ganjam	23.0	Cuttack	22.0	Nayagarh	26.7	Dhenkanal	40.8
	Gajapati	61.2	Gajapati	47.0	Mayurbhanj	44.6	Koraput	29.3	Koraput	46.3	Rayagada	35.6	Nabarangapur	72.7	Jharsuguda	71.3
Worst 5 districts	Nabarangapur	63.4	Ganjam	56.2	Rayagada	46.5	Sambalpur	30.4	Balangir	46.8	Kalahandi	36.1	Koraput	73.1	Malkangiri	71.4
	Koraput	63.7	Koraput	64.8	Nabarangapur	46.6	Malkangiri	33.0	Sambalpur	51.3	Nabarangapur	37.2	Sambalpur	73.7	Nabarangapur	71.5
	Malkangiri	67.2	Debagarh	68.0	Sambalpur	47.1	Sundargarh	34.4	Nabarangapur	51.6	Koraput	37.4	Subarnapur	75.3	Sundargarh	72.8
	Rayagada	69.0	Nabarangapur	71.5	Malkangiri	47.2	Nabarangapur	36.0	Malkangiri	52.5	Malkangiri	47.5	Sundargarh	80.3	Sambalpur	75.6

Source: NFHS, 2015-16.

Table 2.6: Status of Consumption in Rural Odisha and Rural India, 2004-2012

	Odisha		India	
	2004-05	2011-12	2004-05	2011-12
Per capita per day intake of calories (kcal)	2023	2215	2047	2233
Per capita per day intake of proteins (gm)	48.3	53.4	57.0	60.7
% given vitamin A supplements in last 6 months (children < 5 years)	25.9	68.1	20.4	59.1

Source: NSS 61st and 68th rounds and NFHS-III and NFHS-IV.

in 2011 as compared to corresponding figures of 8.7 percent, 55.5 percent, and 28.6 percent in 2001. In rural areas, 7.5 percent, 66.9 percent, and 19.8 percent of the households used tap water, tubewell water, and well water, respectively, in 2011. Similarly in urban areas, 48 percent, 31.7 percent, and 18.4 percent of the households had access to tap water, tubewell and well facilities, respectively, in 2011. Khurda, Cuttack, Sambalpur, Ganjam, and Gajapati are the leading districts in Odisha for the use of tap water, with more than 20 percent of the households in these districts using tap water as a major source of safe drinking water in 2011. The corresponding coverage of households using tap water in Bhadrak, Boudh, Kandhamal and Kalahandi districts remained less than 5 percent. However, about 22 percent of the households were found to have safe drinking water facilities within their premises. In many pockets, the quality of the available water is a serious issue. In some areas such as Nuapada, the content of fluoride in the ground water is higher than the recommended safe level. The frequent breakdown of tub wells and rural piped water supply units is another issue of concern in the state.

The sanitation status of people across the state is generally poor. As per the 2011 Census estimates, only 15 percent of the total households in rural Odisha had access to basic sanitation facilities like toilets within the premises (Table 2.7). Out of the remaining households, only 1.4 percent were found to be using public latrines while the rest were defecating in the open. Consequently, the incidence of diarrhoea in the interior regions of Odisha is generally high, which is a major

source of deaths among infants and others. Table 2.7 shows the low level of access to basic toilet facilities in the state of Odisha, and in the western districts of the state, not even 10 percent of the households have access to this facility.

Tables 2.8 delineates details of access to different amenities for rural households in Odisha that directly or indirectly relate to the health status of these households. The level of nutrition insecurity of households is directly linked to the water and sanitation related variable. About one-fourth of the rural households in Odisha do not have access to potable water. Kerosene and firewood are the major sources of lighting and cooking for a large proportion of the households. Four out of five households in rural Odisha also practise open defecation, and more than four-fifths of the rural households do not have bathing facilities and drainage facilities in their homes.

As per the recent Annual Health Survey, 41 percent of the children in Odisha are underweight. The same survey shows that 762 persons per population of one lakh suffering from acute illness diarrhoea/dysentery. About 81 percent of the women in rural Odisha receive antenatal care. An interesting finding is that a very low proportion (31 per cent) of rural mothers did not consume iron folic acid (IFA) tablets for 100 days. The survey also shows that 19 per cent of the total households did not go in for institutional deliveries while 80 per cent of the total mothers availed of financial assistance for childbirth under the Janani Suraksha Yojana. Further, only 68.2 per cent

of the total children aged 12-23 months were fully immunized. Odisha also lags behind the other states in terms of some other health indicators. For instance, one in every four children aged 6-35 months in the rural areas received IFA tablet/syrup during the three months preceding the survey whereas one in every five children in rural Odisha had birth weight below 2.5 kg. The incidence of childhood disease is also high in rural Odisha. Diarrhoea is one of the most commonly

occurring diseases in Odisha, as 14 percent of the total children are found to be suffering from it, and of the total children suffering from diarrhoea, 13 percent receive neither HAF nor ORS. Further, one in every four children was found to be suffering from acute respiratory infection. Three in every 10 children aged 6-35 months were exclusively breastfed for at least six months. These figures clearly indicate the poor status of Odisha with regard to nutrition-related indicators.

Table 2.7: Percentage of Households with Access to Toilet Facility, 2011

District	% HHs with Access to Toilets	District	% HHs with Access to Toilets	District	% HHs with Access to Toilets
Baleswar	24.4	Puri	16.7	Sundargarh	10.0
Cuttack	23.3	Mayurbhanj	16.2	Koraput	9.5
Jagatsinghapur	22.8	Dhenkanal	15.2	Sambalpur	9.4
Jajapur	21.6	Gajapati	14.0	Subarnapur	9.4
Ganjam	20.5	Nuapada	13.5	Kalahandi	9.0
Khordha	19.5	Bargarh	13.2	Rayagada	8.2
Anugul	18.1	Balangir	11.4	Kandhamal	7.4
Bhadrak	18.1	Baudh	10.3	Malkangiri	7.3
Kendrapara	17.0	Jharsuguda	10.3	Nabarangapur	7.3
Nayagarh	17.0	Kendujhar	10.2	Debagarh	6.3
Odisha	15.3				

Source: Census of India, 2011.

Table 2.8: Percentage of Rural Households Having Access to Facilities that Relate to Health in Odisha, 2011

Facilities	Access Percentage
Dilapidated house	9%
Unsafe water	24%
Main source of lighting—kerosene	63%
Fuel cooking—firewood	71%

Facilities	Access Percentage
Open defecation	85%
No bathing facility	89%
No drainage facility	88%

Source: Census of India, 2011.

Employment and Work Status

The labour force participation rate in rural Odisha is low primarily due to the lower participation rate of women in the workforce. As per the NSS 68th Round, the LFP rate (usual status, principal and subsidiary) in 2011-12 in Odisha was 38.4 percent, including 61.4 per cent for males, and 14.9 per cent for females. Interestingly, workers in the rural areas are mostly self-employed and casual labourers. Only 7 percent of them are engaged in regular wage/salaried work in urban areas as compared to a corresponding figure of 2.6 percent in rural areas. The unemployment

rates in rural and urban Odisha are 1.3 per cent and 1.8 per cent, respectively (Table 2.9).

In Odisha, the bulk of the workforce is engaged in the primary sector, at 61.8 percent of the total workforce, as compared to the all-India average of 54.6 percent in 2011. However, dependency on the primary sector for employment has declined in Odisha since 2001. On the other hand, employment in the secondary and tertiary sectors increased in 2011 as compared to 2001 in Odisha. Though the state still lags behind the all-India average in terms of the dependence of the workforce on the secondary and tertiary sectors for employment (Table 2.10).

Table 2.9:

Percentage Distribution of Persons by Considering Usual Principal and Subsidiary Activity (UPSS) Together in Rural and Urban Odisha, 2011-12

UPSS	Rural			Urban		
	Male	Female	Persons	Male	Female	Persons
Self-employed	35.9	6.7	21.5	25.8	1.9	14.3
Regular wage/salaried	4.4	0.8	2.6	16.9	2.0	9.7
Casual labourer	19.2	6.6	13.0	11.6	2.8	7.4
All workers	59.5	14.1	37.1	54.3	6.7	31.3
Unemployed	1.9	0.8	1.3	2.0	1.6	1.8
In labour force	61.4	14.9	38.4	56.3	8.4	33.1
Not in labour force	38.6	85.1	61.6	43.7	91.6	66.9
Total	100	100	100	100	100	100

Source: 'Employment and Unemployment Situation in Odisha', Directorate of Economics and Statistics, Government of Odisha, <http://www.desorissa.nic.in/pdf/nss-68-emp-unemp.pdf>

Table 2.10: Percentage Distribution of Workers by the Category of Workers, 2001-2011

Category of Workers	2011		2001	
	Odisha	India	Odisha	India
Agricultural Labourers	38.4	30.0	35.0	26.5
Cultivators	23.4	24.6	29.8	31.7
Household Industry Workers	4.5	3.8	4.9	4.2
Other Workers	33.7	41.6	30.3	37.6

Source: Population Census 2001, 2011.

2.4 PHYSICAL INFRASTRUCTURE

The availability of physical infrastructure is an important component of development in a region, and this includes both economic infrastructure and social infrastructure. While economic infrastructure includes roads, energy, irrigation facilities, transport, finance, and communication, social infrastructure includes health and educational facilities.

Transport and Communication

The development of a good road network is a necessary condition for accelerating the pace of development. The density of roads in Odisha is comparatively well developed as compared to the corresponding all-India average. In Odisha, the road density was 178 km per 100 sq km as compared to 159 km per 100 sq km in India in 2012-13 (*Economic Survey Odisha 2016-17*). However, the railway density in the state is 16 km per 1,000 sqkm, which is below the national average of 20 km per 1,000 sq km. The Government of Odisha has taken up some new railway projects through state funding, including construction of the Daspatha-Bolangir segment of the Khurda-Bolangir line, and the Jaypore-Malkangiri and Jaypore-Nawrangpur rail links. The tele density has increased significantly in Odisha, But it is still lower than the national level—while the tele density in Odisha was 69.09 percent

during the fiscal year ending March 2016, the corresponding all-India average was 83 percent.

Power

Economic growth depends upon the availability of adequate, reliable and high-quality power at a competitive rate. It is the key for acceleration of economic growth, generation of employment, elimination of poverty, and human development. Odisha was the first state to introduce power reform in the country. Since then, the power sector has developed significantly in the state, and presently, about 92 percent of the villages are electrified. The per capita power consumption in Odisha increased from 665 kWh in 2007 to 1146 kWh in 2012 (Union Ministry of Power, 2015).

Irrigation

The potential for irrigation is a key for agricultural development in the state. The irrigation potential of the state is 108 lakh hectares. Out of the gross cropped area of 78.82 lakh hectares, the area under assured irrigation is about 45.60 lakh hectares. Tubewell is a major source of irrigation, as it irrigates 63 percent (28.3 lakh hectares) of the area under assured irrigation. The area under canal irrigation is 13.7 lakh hectares (30 percent).

3

DIMENSIONS AND DETERMINANTS OF FOOD AND NUTRITION SECURITY IN ODISHA

Many factors are responsible for the food and nutrition security of a particular region. While the indicators sometimes make a clear distinction between food-secure and food-insecure districts, at times, it is difficult to establish a causal relationship between a particular indicator and its food security outcome.

Food security is the ability of a household to access food (in terms of its food entitlements), generally acquired through the net result of its livelihood activities (plus any other non-livelihood-based entitlements), which are crucial in determining the food requirements of the household. From the point of view of food security, these livelihood activities are valued not only for the food they might directly produce, if at all they produce food, but also from the level of access to 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 more broadly, agricultural production, then enters as a part, even the

main part, of rural livelihood activities which offer a household command over food.

Within a household, there are inevitable gender differences in entitlements. Consequently, it is necessary to deal with not just the 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 the 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 the nutritional shortfalls observed among women. Entitlements are not only based on the economic attainments of an individual or household. There are also government or community-based entitlements. The operation of various schemes, such as the Mid-Day Meal Scheme in schools, do have some, even though substantial, impact on the access

Table 3.1: Choice of Indicators Used to Analyse Food and Nutrition Security in Odisha

Name of Variable	Ref. Year	Source
(a) Availability		
1. Proportion of net irrigated area to net sown area	2012-13	Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi
2. Per capita value of agricultural output	2011-12 to 2013-14	Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi
3. Percentage of inhabited villages having access to paved roads.	2011	Census of India 2011

(b) Access

1. Percentage of agricultural labour to total workers.	2011	Census of India 2011
2. Proportion of ST and SC population to total population (Rural)	2011	Census of India 2011
3. Ratio of working age Population (Rural)	2011	Census of India 2011
4. Monthly per capita consumption expenditure (inequality adjusted)	2011-12	68th NSS round 2011-12
5. Rural casual wage rate	2011-12	68th NSS round 2011-12
6. Female literacy rate (7+) (Rural)	2011	Census of India 2011

(c) Utilization

1. Percentage of households having access to safe drinking water.	2011	Census of India 2011
2. Percentage of inhabited villages having access to Primary health centre in Rural Areas within 5 km range	2011	Census of India 2011

Outcome indicator

1. % of children underweight (0-5 years) under 2SD	2015-16	NFHS 4, 2015-16
2. BMI among women	2015-16	NFHS 4, 2015-16

to food enjoyed by children, including both girls and boys, to food. The performance of these schemes depends very substantially on the demand from below for the 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. The food and nutritional security index for Odisha has been calculated by taking into consideration 11 variables under the three main dimensions of food security (Table 3.1).

3.1 FOOD AVAILABILITY: DATA AND VARIABLES, INTER-DISTRICT VARIATION

The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid) is important for ensuring food and nutrition security. Cereals and pulses are the staple foods that cannot be perfectly substituted. For the income-poor class, foodgrain is the cheapest source of energy and hence indispensable for poor. In our analysis, the indicators delineated below have been chosen to determine the magnitude of food availability in the various districts of Odisha.

3.1.1 Per Capita Value of Agricultural Output

Agricultural output is an indicator reflecting the availability of food. Since agriculture is dependent on climate, it is advisable to take an average of 3–5 years' data of agricultural production to take into account the variability of production. Further, in order to account for variations in population across districts, the per capita value of agricultural production has been used. The position of each district between the triennium ending at two average time periods, that is, 2002-05 and 2012-15, is shown in Table 3.2.

A district-wise analysis of the value of agricultural output (in Rs.) for the triennium average of the period 2012-13 to 2014-15 indicates that in comparison to

the consolidated figure for Odisha (Rs. 996), Sonapur (Rs. 2957), Bargarh (Rs. 2480), Debagarh (Rs. 1544) and Balangir (Rs. 1444) are the four districts with the highest value of agricultural output. On the other hand, the districts of Kandhamal (Rs. 405), Gajapati (Rs. 482), and Khordha (Rs. 582) are the districts with a low value of agricultural output. The per capita value of agricultural output over the period 2002 to 2012 shows some changes. The districts of Balangir, Bargarh, Debagarh, Kalahandi, Koraput, Malkangiri, Mayurbhanj, Nuapada, Sambalpur and Sonapur marked an increase whereas the rest of the districts exhibited no change or a decrease in the figures from those prevalent in 2002. The status of the agricultural output all the districts in the state for the period 2012–15 is depicted in Map 3.1.

Map 3.1: Status of Districts in Terms of Value of Agricultural Output, 2012-15

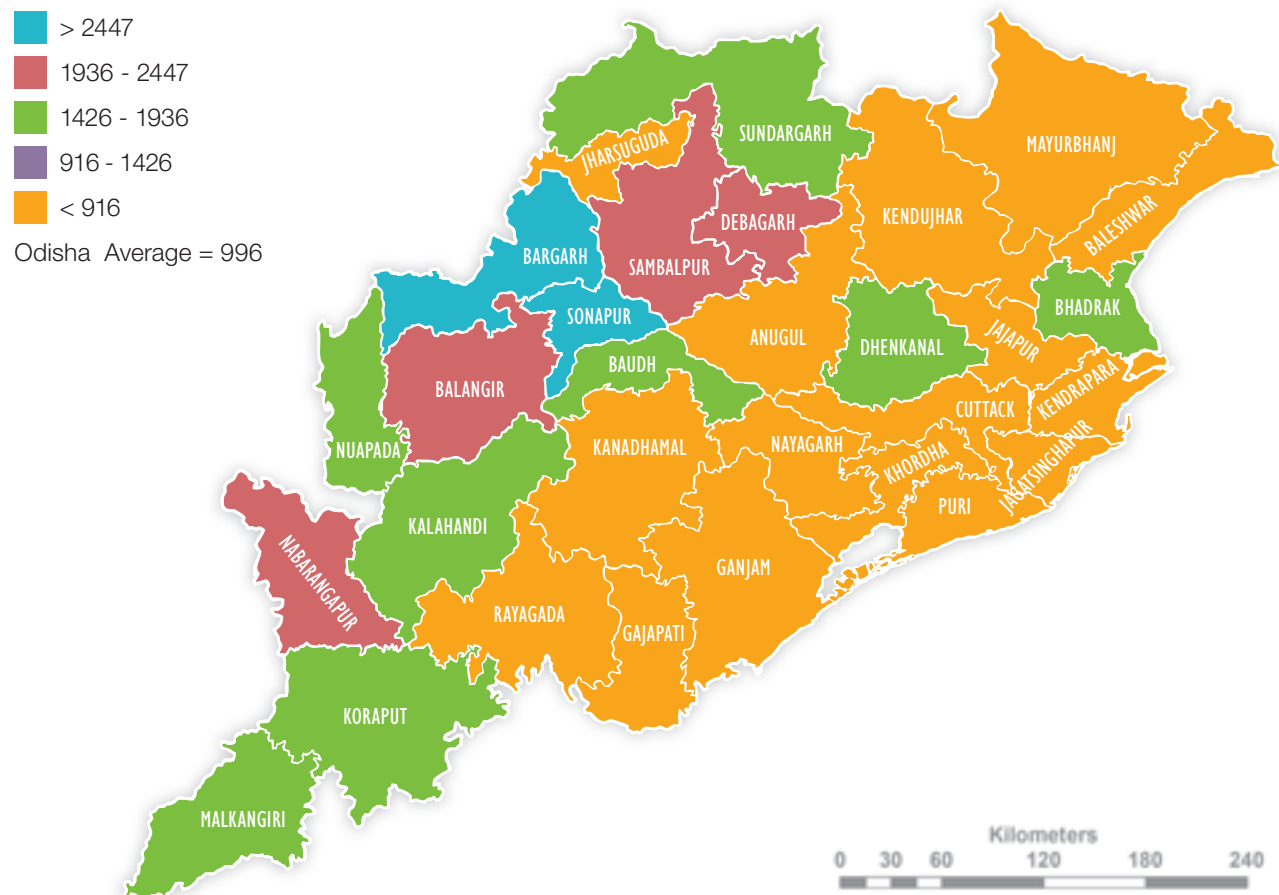


Table 3.2:**District-wise per Capita Value of Agricultural Output, 2002-05 and 2012-15 in Odisha (in Rs.)**

2012-15			2002-05		
District	Value	Rank	District	Value	Rank
Anugul	620	25	Anugul	625	25
Balangir	1444	6	Balangir	925	10
Baleshwar	793	19	Baleshwar	820	14
Bargarh	2480	2	Bargarh	1967	1
Bhadrak	951	14	Bhadrak	1037	7
Baudh	1038	12	Boudh	1089	5
Cuttack	610	26	Cuttack	712	23
Debagarh	1544	4	Debagarh	913	12
Dhenkanal	978	13	Dhenkanal	809	15
Gajapati	482	29	Gajapati	594	28
Ganjam	701	22	Ganjam	630	24
Jagatsinghapur	895	15	Jagatsinghapur	729	22
Jajapur	522	28	Jajapur	592	29
Jharsuguda	793	20	Jharsuguda	1043	6
Kalahandi	1352	7	Kalahandi	919	11
Kandhamal	405	30	Kandhamal	604	27
Kendrapara	650	24	Kendrapara	734	21
Kendujhar	809	18	Kendujhar	804	16
Khordha	568	27	Khordha	621	26
Koraput	1224	9	Koraput	931	9
Malkangiri	1319	8	Malkangiri	1109	4
Mayurbhanj	861	16	Mayurbhanj	871	13
Nabarangapur	1477	5	Nabarangapur	1020	8
Nayagarh	662	23	Nayagarh	742	19
Nuapada	1200	10	Nuapada	778	17
Puri	822	17	Puri	759	18
Rayagada	761	21	Rayagada	564	30

2012-15			2002-05		
District	Value	Rank	District	Value	Rank
Sambalpur	1740	3	Sambalpur	1526	2
Subarnapur	2957	1	Subarnapur	1526	3
Sundargarh	1188	11	Sundargarh	738	20
Odisha	996			857	

Source: Ministry of Agriculture, Government of India downloaded from <https://aps.dac.gov.in/APY/Index.htm>

3.1.2 Proportion of the Net Irrigated Area to the Net Sown Area

Improving irrigational facilities helps in stabilising agricultural production and reduces income variability by mitigating the impact of drought. The position of each district between the years 2001-02 and 2012-13 is shown in Table 3.3.

The extent of irrigation represented by the ratio of the net area irrigated to the net sown area is very low in Odisha, at less than 30 per cent. This is 15 percentage points below the national average. Regional variation is also observed in irrigation patterns in the state. The irrigation intensity in the coastal belt is twice of that in the other two regions. A large part of the state is chronically drought-prone. A district-level analysis of

Table 3.3: Percentage of Net Irrigated Area to Net Sown Area, 2001-02 and 2012-13

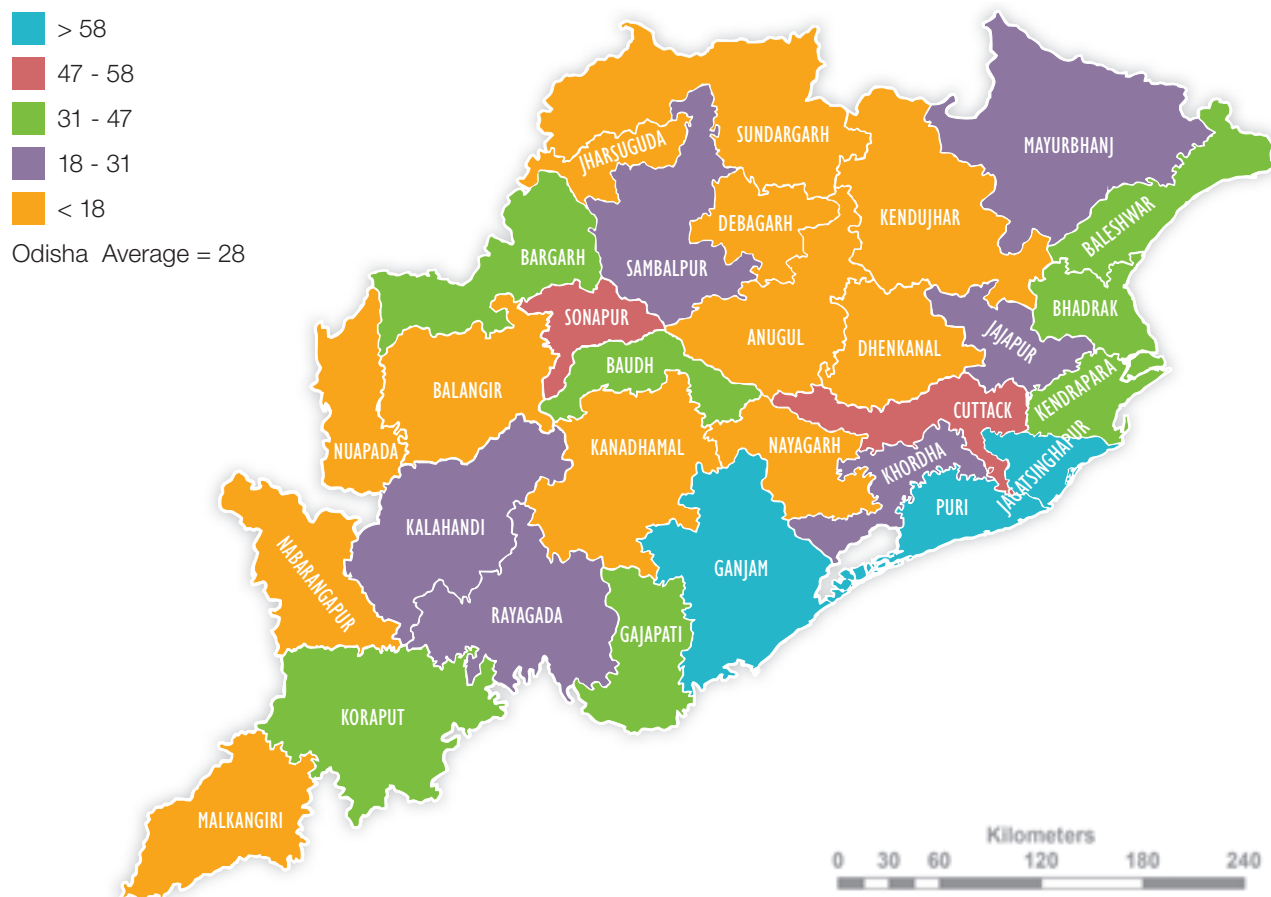
2001-02			2012-13		
District	Percentage	Rank	Percentage	Rank	
1. Anugul	21.4	21	14.7	20	
2. Baleshwar	16.7	26	40.1	9	
3. Bhadrak	44.9	7	44.3	7	
4. Balangir	13.5	28	5.1	29	
5. Baudh	37.1	10	40.3	8	
6. Bargarh	38.2	9	34.1	11	
7. Cuttack	57.1	3	46.3	5	
8. Debagarh	20.2	23	13.8	21	
9. Dhenkanal	17.6	25	10.0	24	
10. Gajapati	22.6	19	44.5	6	
11. Ganjam	61.2	2	71.2	1	
12. Jagatsinghpur	54.9	5	65.1	3	

District	2001-02		2012-13	
	Percentage	Rank	Percentage	Rank
13. Jajapur	26.4	14	19.8	17
14. Jharsuguda	11.7	29	6.5	26
15. Kalahandi	26.8	13	29.2	14
16. Kendrapara	49.9	6	33.2	12
17. Kendujhar	23.5	18	14.9	19
18. Khordha	39.3	8	26.8	15
19. Koraput	27.3	12	36.2	10
20. Malkangiri	26.4	15	10.2	23
21. Mayurbhanj	19.3	24	18.5	18
22. Nuapada	20.9	22	8.4	25
23. Nabarangapur	9.5	30	4.8	30
24. Nayagarh	24.1	17	11.3	22
25. Kandhamal	14.0	27	5.8	27
26. Puri	68.5	1	71.0	2
27. Rayagada	24.3	16	29.9	13
28. Sambalpur	28.3	11	22.9	16
29. Subarnapur	55.3	4	50.8	4
30. Sundargarh	21.5	20	5.7	28
Odisha	30.0		28.4	

Source: Ministry of Agriculture, Government of India.

the percentage of the net irrigated area to the net sown area in 2012-13 indicates that 16 out of 30 districts are placed below the state level average of 28.4 percent. As Table 3.3 indicates, like the western and northern districts, Nabarangapur accounted for just 4.8 percent of the net irrigated area to the net sown area in the year 2001-02. On the other hand, in the eastern districts of Ganjam and Puri, almost 71 percent of the net sown area was irrigated during the same period. Some of the districts in the Eastern Ghats, in particular, have

extremely low levels of irrigation. The districts which showed a decrease in irrigated area in 2011-12 over 2001-02 include Baleswar (recording a decrease of more than half the irrigated area in 2002), Gajapati (decrease of more than half), Ganjam (decrease of 10 percentage points), Jagatsinghapur, and Koraput, which showed marginal declines in their respective irrigated areas. On the other hand, the districts of Kendrapara, Khordha and Nayagarh showed a marked increase in irrigation during the period under study.

Map 3.2: Status of Districts in Terms of the Proportion of the Net Irrigated Area, 2012-13

3.1.3 Percentage of Inhabited Villages Having Access to Paved Roads

The roads in rural areas act as feeder roads, serving those areas where agriculture is the predominant occupation, and providing them with outlets to urban market centres. These roads also play a significant role in opening up the backward areas and accelerating local socio-economic development. The position of each district between 2001 and 2011 is shown in Table 3.4, whereas the percentage status of the districts having access to paved roads in 2011 is depicted in Map 3.3.

Most of the districts in the coastal plains, except Gajapati (which is adjacent to the Eastern Ghats region)

have good rural connectivity, with an average of more than 70 percent of the villages having access to paved roads. Although this figure in itself is not sufficient to ensure rural connectivity, it is much better when compared to the corresponding figures in districts like Gajapati and Malkangiri where only about half of the villages are connected to pucca roads (see Table 3.4). The percentage point difference for villages with access to paved roads is highest in the Baudh, Bhadrak, Kendrapara, and Sambalpur districts, which exhibited a change of over 50 per cent in the access to paved roads during the period of one decade. Overall in Odisha, a change of 32 percent in rural access to paved roads was observed during the period under study.

Map 3.3:

Status of Districts in Terms of the Percentage of Villages Having Access to Paved Roads, 2011

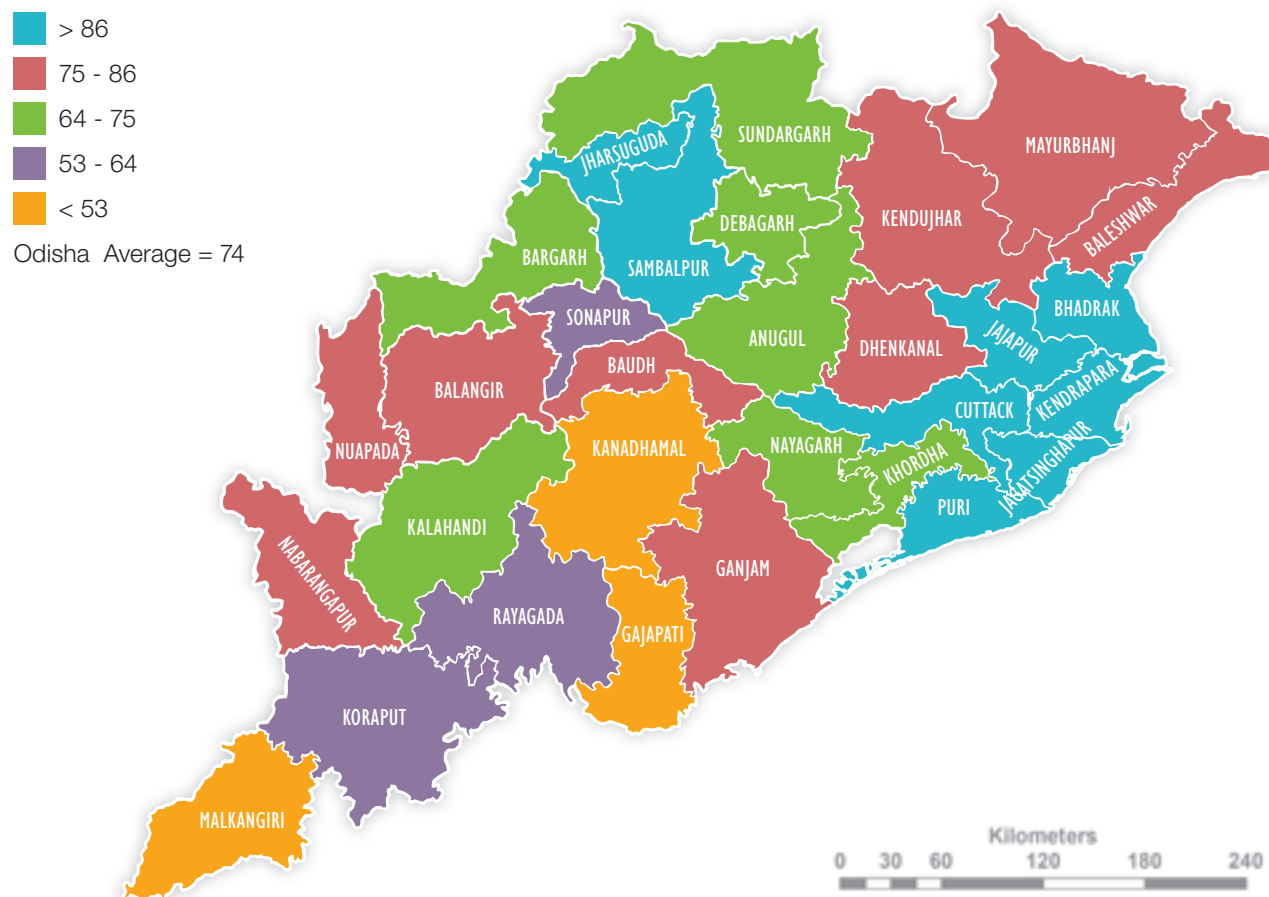


Table 3.4:

Percentage of Villages Having Access to Paved Roads, 2001-11

District	Percentage		Rank		Percentage Point Change
	2001	2011	2001	2011	2011-2001
Anugul	28.31	75.1	26.0	18.0	46.8
Balangir	40.58	75.8	18.0	17.0	35.2
Baleshwar	41.05	80.2	17.0	11.0	39.1
Bargarh	45.15	70.3	11.0	23.0	25.2
Baudh	25.87	76.5	27.0	15.0	50.7

District	Percentage		Rank		Percentage Point Change
	2001	2011	2001	2011	2011-2001
Bhadrak	43.12	96.3	14.0	2.0	53.2
Cuttack	62.72	88.1	2.0	6.0	25.4
Debagarh	60.12	75.1	5.0	19.0	14.9
Dhenkanal	38.80	79.6	19.0	12.0	40.9
Gajapati	29.27	49.5	25.0	29.0	20.2
Ganjam	43.27	79.2	13.0	13.0	35.9
Jagatsinghapur	57.30	92.3	6.0	3.0	35.0
Jajapur	61.93	86.7	3.0	8.0	24.7
Jharsuguda	47.08	87.9	9.0	7.0	40.8
Kalahandi	41.52	70.9	16.0	22.0	29.4
Kandhamal	20.53	52.8	30.0	28.0	32.3
Kendrapara	35.24	88.3	22.0	5.0	53.0
Kendujhar	46.49	83.6	10.0	9.0	37.1
Khordha	64.11	69.6	1.0	24.0	5.5
Koraput	22.20	59.2	28.0	26.0	37.0
Malkangiri	21.16	42.3	29.0	30.0	21.2
Mayurbhanj	42.14	82.9	15.0	10.0	40.7
Nabarangapur	45.13	77.4	12.0	14.0	32.3
Nayagarh	52.86	74.6	7.0	20.0	21.7
Nuapada	61.20	76.2	4.0	16.0	15.0
Puri	49.38	91.2	8.0	4.0	41.8
Rayagada	33.54	57.6	23.0	27.0	24.0
Sambalpur	30.64	97.2	24.0	1.0	66.5
Subarnapur	36.34	63.4	21.0	25.0	27.1
Sundargarh	38.04	73.2	20.0	21.0	35.2
Odisha	42.17	74.4			32.2

Source: Census of India, 2001,2011.

3.1.4 Status of the Availability Index

Table 3.5 presents the status of the districts in terms of the availability index by using the range equalisation technique. Kandhamal and Malkangiri are the districts which have been identified as extremely insecure districts of Odisha in terms of the food availability index calculated on the basis of the range equalisation method.

As seen in Table 3.5, six districts fall in the category of ‘severely insecure’ districts based on range equalisation method. Sonapur emerged as the most food-secure district whereas four districts, including Kendrapara, Baleshwar, Baudh, and Cuttack emerged as ‘moderately secure’ districts based on the range equalisation method.

Eleven districts fall in the ‘moderately insecure’ category in terms of the availability index based on the range equalisation method. These include the districts of Dhenkanal, Nuapada, Jharsuguda, Balangir, Nabarangapur, Kendujhar, Jajapur, Koraput, Mayurbhanj, Debagarh, and Kalahandi.

Surprisingly, the districts of Kalahandi, Nabarangapur, Balangir and Koraput fare reasonably well on the Availability Index (see Table 3.5). We can thus conclude that the eastern states and the northern plateau in the state are the worst-off on the Availability index.

The central tableland in the state falls in between, while the coastal plains are better-off.

Map 3.4: Status of Districts in Availability Index

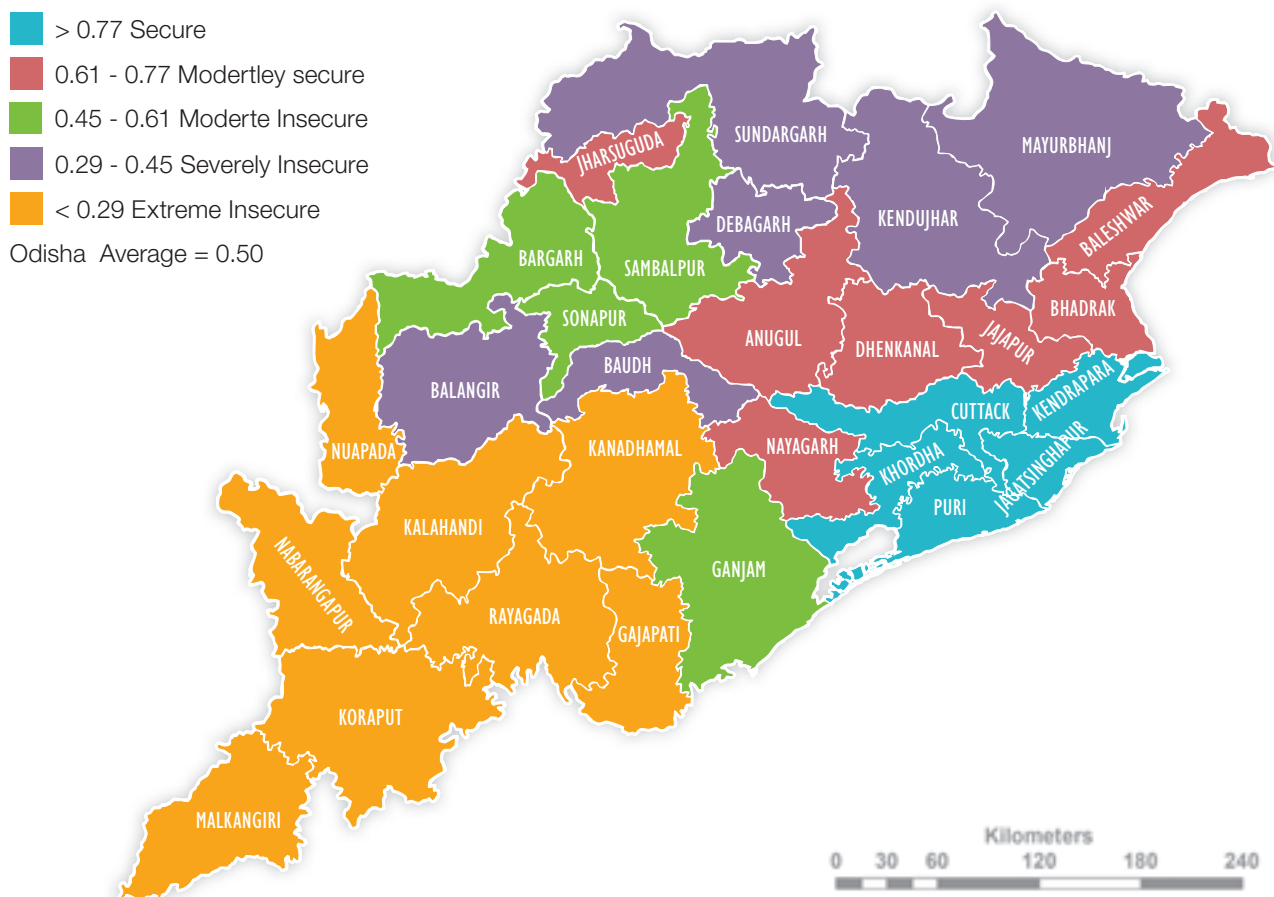


Table 3.5:

Status of Districts in Terms of the Availability Index (Based on the Range Equalisation Method) 2015-16

Extreme Insecure Districts	Severely Insecure Districts	Moderate Insecure Districts	Moderately Secure Districts	Secure Districts
Kandhamal	Gajapati	Dhenkanal	Kendrapara	Bargarh
Malkangiri	Nayagarh	Nuapada	Baleshwar	Ganjam
	Rayagada	Jharsuguda	Baudh	Bhadrak
	Anugul	Balangir	Cuttack	Sambalpur
	Sundargarh	Nabarangapur		Jagatsinghapur
	Khordha	Kendujhar		Puri
		Jajapur		Subarnapur
		Koraput		
		Mayurbhanj		
		Debagarh		
		Kalahandi		

3.2 FOOD ACCESS: DATA AND VARIABLES, INTER-DISTRICT VARIATION

The criticality of access to food has been famously imprinted on the public mind by Sen's description of the Bengal famine, where people 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, the 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, 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.

The historic injustice and discrimination faced by the Scheduled Castes (SCs) and Scheduled Tribes (STs), and by women and other marginalised groups have been 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 enabling them to avail of those opportunities.

Here, for creating the access to food index, we have taken six important variables, including the proportion of agricultural labour, proportion of the SC/ST population, ratio of the working age population,

monthly per capita consumption expenditure, and the rural casual wage rate.

3.2.1 Percentage of Agricultural Labourers to Total Workers

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, that is, the higher the number of agricultural labourers in a district, the worse will be the food security situation. Agriculture provides the major source of livelihood and income for a large number of districts but the involvement of household in agriculture takes place in the form

of casual labour. The position of each district with regard to the ratio of agricultural labourers to the total labourers in the state between 2001 and 2011 is shown in Table 3.6.

The proportion of agricultural labours to total workers in the Kalahandi-Balangir-Koraput (KBK) regions is high. The proportion of agricultural labour in the western districts Kalahandi and Nabarangapur is also high, with more than half the total workforce in these districts engaged as agricultural labour whereas the proportion of agricultural labour to the total workers is low in the coastal districts. The proportion of agricultural labour to total workers over the last one decade shows that except Khordha, all the districts witnessed an increase in proportion.

Map 3.5: Status of Districts in Proportion of the Agricultural Labour, 2011

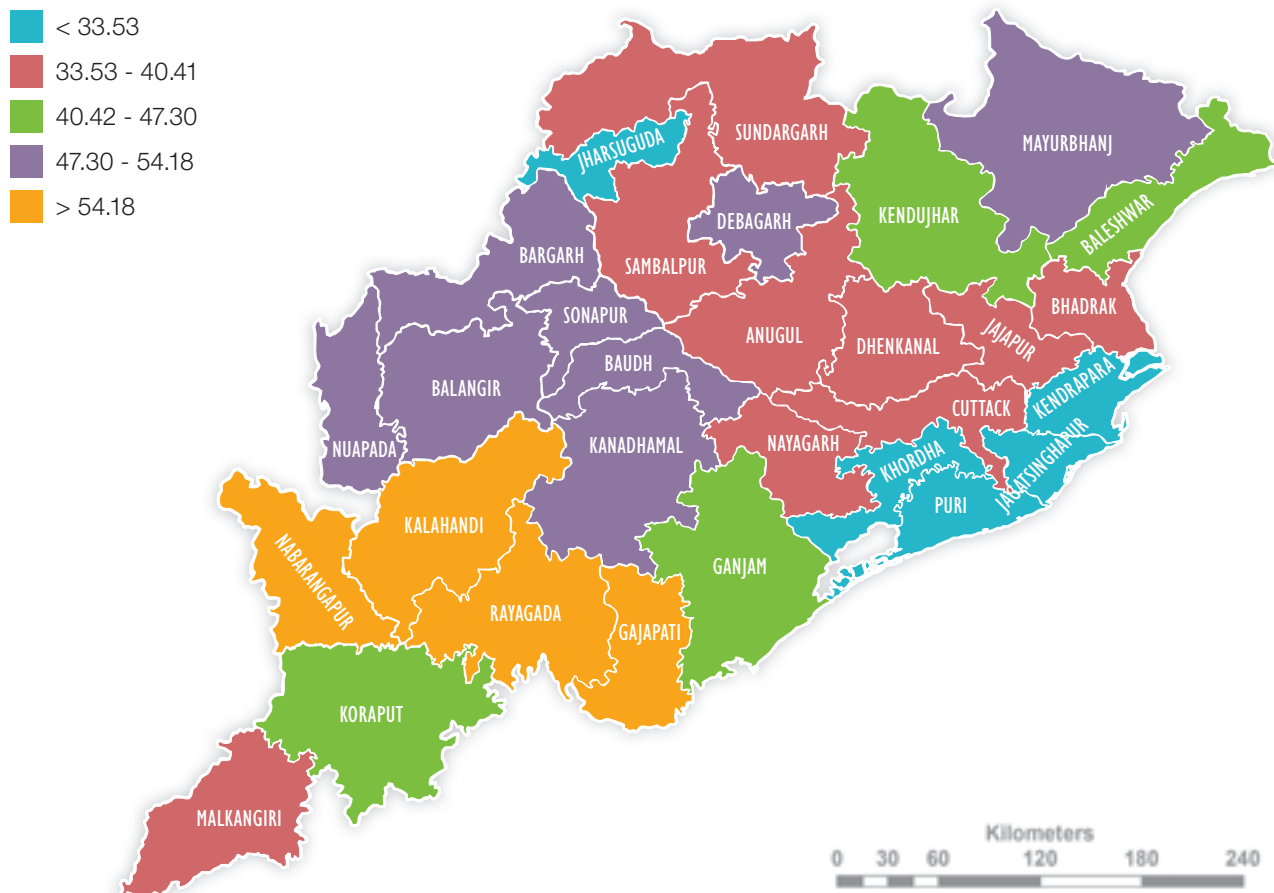


Table 3.6: Percentage of Agricultural Labourers to Total Workers, 2001-11

District	Percentage		Rank		Percentage Point Differences
	2001	2011	2001	2011	2011-2001
Anugul	31.20	37.2	23	21	6.0
Balangir	43.27	49.6	10	9	6.3
Baleshwar	35.38	41.1	19	16	5.7
Bargarh	43.56	50.6	9	8	7.0
Baudh	40.80	49.2	12	10	8.4
Bhadrak	30.16	34.8	25	25	4.6
Cuttack	30.36	35.5	24	24	5.2
Debagarh	45.97	51.9	7	5	5.9
Dhenkanal	36.36	40.2	18	17	3.9
Gajapati	47.61	56.2	5	3	8.6
Ganjam	43.16	44.3	11	15	1.1
Jagatsinghapur	27.89	29.8	28	29	1.9
Jajapur	31.35	35.6	22	23	4.3
Jharsuguda	32.47	32.6	21	26	0.1
Kalahandi	52.54	61.1	2	1	8.5
Kandhamal	37.58	48.9	17	11	11.3
Kendrapara	26.21	32.1	30	27	5.9
Kendujhar	39.82	44.9	14	14	5.1
Khordha	28.15	26.7	27	30	-1.5
Koraput	44.93	47.2	8	13	2.2
Malkangiri	26.80	35.9	29	22	9.1
Mayurbhanj	40.06	48.8	13	12	8.8
Nabarangapur	54.06	56.2	1	4	2.1
Nayagarh	33.82	37.3	20	20	3.5
Nuapada	47.83	50.8	4	7	3.0
Puri	28.39	30.3	26	28	1.9

District	Percentage		Rank		Percentage Point Differences
	2001	2011	2001	2011	2011-2001
Rayagada	49.92	59.1	3	2	9.2
Sambalpur	38.24	40.1	16	18	1.9
Sonapur	46.43	51.0	6	6	4.6
Sundargarh	38.77	40.0	15	19	1.2
Total	39.10	43.8			4.7

Source: Census of India, 2001,2011.

3.2.2 Proportion of ST and SC population to total population

Almost 26 percent of the total population in rural Odisha is tribal. This is more than twice that of the national level, and only below the other tribal states of Jharkhand, Chhattisgarh, and Madhya Pradesh. Odisha has the maximum number of tribal communities (62 tribes including 13 primitive tribes). These are mostly concentrated in the southern and western parts of the state. Half the total rural tribal population in Odisha resides in the northern part of the state, and one-third in the southern part. The SCs form the other large marginalised community, particularly in the rural areas. While the STs are marginalised mostly on account of their location, the SCs have faced historical discrimination, which accounts

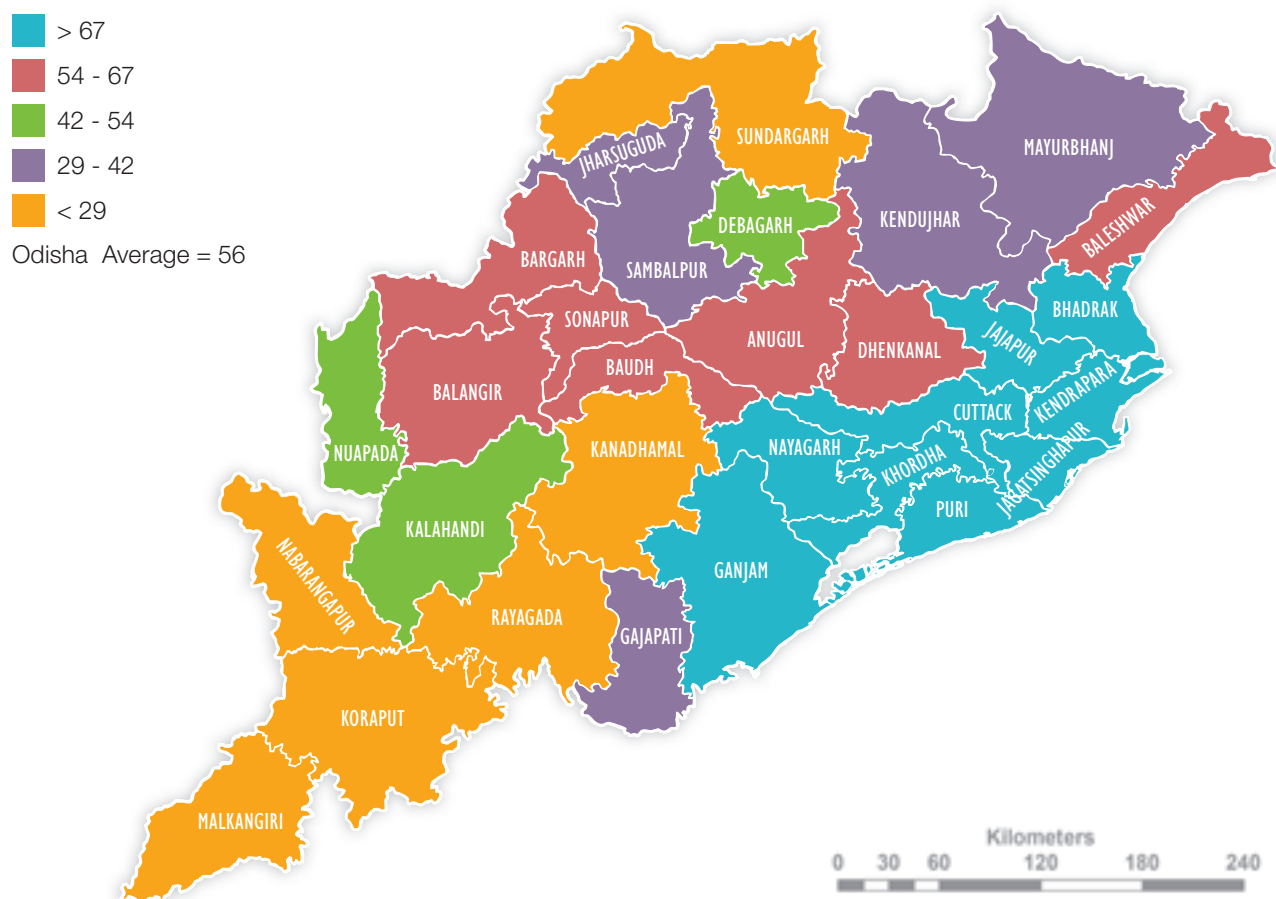
for their marginalised and vulnerable status. The SCs constitute more than 18 percent of the rural population in Odisha. The coastal part constitutes half of the total SC population of the state. Thus, the SCs and STs together account for more than 43.5 percent of the rural population in the state. The proportion of the 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. This indicator is used to capture the dimension of social access. The district-wise SC/ST population in the KBK districts is extremely high, with the highest being in Malkangiri, at 83 per cent of the total. The ratios of the SC/ST population and the total population in each district of the state between 2001 and 2011 are shown in Table 3.7.

Table 3.7: Percentage of SC/ST Population to the Total Population in Odisha, 2001-11

District	Percentage		Rank	
	2001	2011	2001	2011
Anugul	29.86	34.4	22	20
Balangir	39.76	41.2	16	15
Baleshwar	31.39	34.0	20	21
Bargarh	39.95	40.6	15	16

District	Percentage		Rank	
	2001	2011	2001	2011
Baudh	34.86	36.7	17	17
Bhadrak	24.68	25.8	24	24
Cuttack	25.65	25.9	23	23
Debagarh	49.68	52.8	12	12
Dhenkanal	32.26	34.6	19	19
Gajapati	62.72	66.7	8	8
Ganjam	23.24	24.6	25	25
Jagatsinghapur	22.75	23.1	27	26
Jajapur	31.13	32.8	21	22
Jharsuguda	58.12	60.0	11	11
Kalahandi	48.14	48.5	14	13
Kandhamal	71.33	72.8	5	5
Kendrapara	21.11	22.3	28	27
Kendujhar	59.07	60.2	10	10
Khordha	22.77	22.0	26	28
Koraput	69.38	71.4	6	6
Malkangiri	81.54	83.3	1	1
Mayurbhanj	66.98	68.9	7	7
Nabarangapur	71.41	72.9	4	4
Nayagarh	19.92	20.8	30	30
Nuapada	49.63	48.5	13	14
Puri	19.96	21.0	29	29
Rayagada	76.74	77.8	2	2
Sambalpur	60.65	61.8	9	9
Subarnapur	33.78	35.5	18	18
Sundargarh	74.96	75.6	3	3
Total	41.80	43.5		

Source: Census of India, 2001, 2011.

Map 3.6: Status of Districts by the Proportion of Other than the SC/ST Population, 2011

3.2.3 Ratio of the Working Age Population (Rural)

The proportion of the 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 (aged 15–59 years) and the dependent population (aged less than 15 years and more than 59 years of age). The demographic transition from high fertility and mortality to low fertility and mortality has several phases. With development, and declines in fertility rates, the proportion of the 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). A ratio higher than unity represents a positive scenario, with a more productive population as compared to the dependent population. The position of each district in terms of the ratio of the working age population between 2001 and 2011 is shown in Table 3.8.

A district-wise analysis of Odisha shows high disparity between the agriculturally developed and backward areas (see Table 3.8). For instance, the agriculturally developed districts like Jagatsinghpur, Bargarh, Cuttack and Puri have a high working age group ratio, while the KBK region has very low values, followed by the northern tribal belt, which has still lower values.

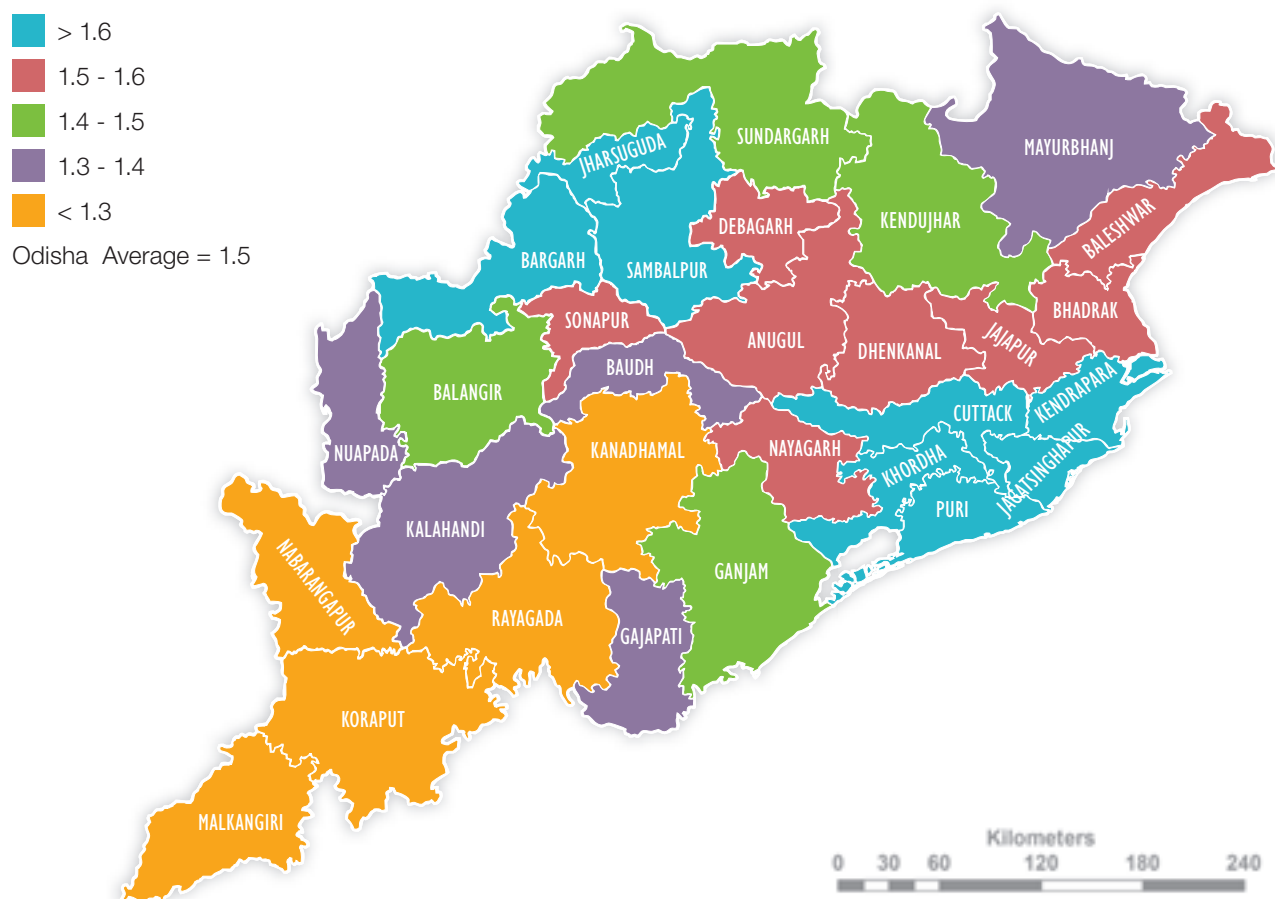
Table 3.8: Ratio of Working Age Population by District in Odisha, 2001-11

District	Non-dependency Ratio		Rank	
	2001	2011	2001	2011
Anugul	1.40	1.62	11	10
Balangir	1.35	1.47	16	20
Baleshwar	1.35	1.59	15	13
Bargarh	1.47	1.78	3	2
Baudh	1.36	1.38	12	23
Bhadrak	1.34	1.61	19	11
Cuttack	1.44	1.74	7	5
Debagarh	1.34	1.57	20	16
Dhenkanal	1.44	1.66	6	9
Gajapati	1.20	1.32	29	24
Ganjam	1.26	1.50	25	19
Jagatsinghapur	1.48	1.79	2	1
Jajapur	1.42	1.67	10	8
Jharsuguda	1.42	1.78	9	3
Kalahandi	1.34	1.39	18	22
Kandhamal	1.19	1.27	30	27
Kendrapara	1.32	1.59	22	14
Kendujhar	1.36	1.50	13	18
Khordha	1.46	1.71	4	6
Koraput	1.35	1.24	17	29
Malkangiri	1.23	1.19	27	30
Mayurbhanj	1.28	1.43	24	21
Nabarangapur	1.22	1.24	28	28
Nayagarh	1.46	1.60	5	12
Nuapada	1.26	1.32	26	25
Puri	1.49	1.75	1	4
Rayagada	1.29	1.28	23	26

District	Non-dependency Ratio		Rank	
	2001	2011	2001	2011
Sambalpur	1.42	1.71	8	7
Subarnapur	1.36	1.57	14	15
Sundargarh	1.33	1.54	21	17
Total	1.36	1.53		

Source: Census of India, 2001, 2011.

Map 3.7: Status of the Working Population in the Districts in Odisha, 2011



3.2.4 Monthly per Capita Consumption Expenditure (Inequality-adjusted)

The NSS estimates of per capita consumption expenditure, adjusted for inequality, are 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 the availability of food as measured in terms of the value of agricultural output. For instance, a district with a low value of agricultural output along with a high value of consumption would mean that

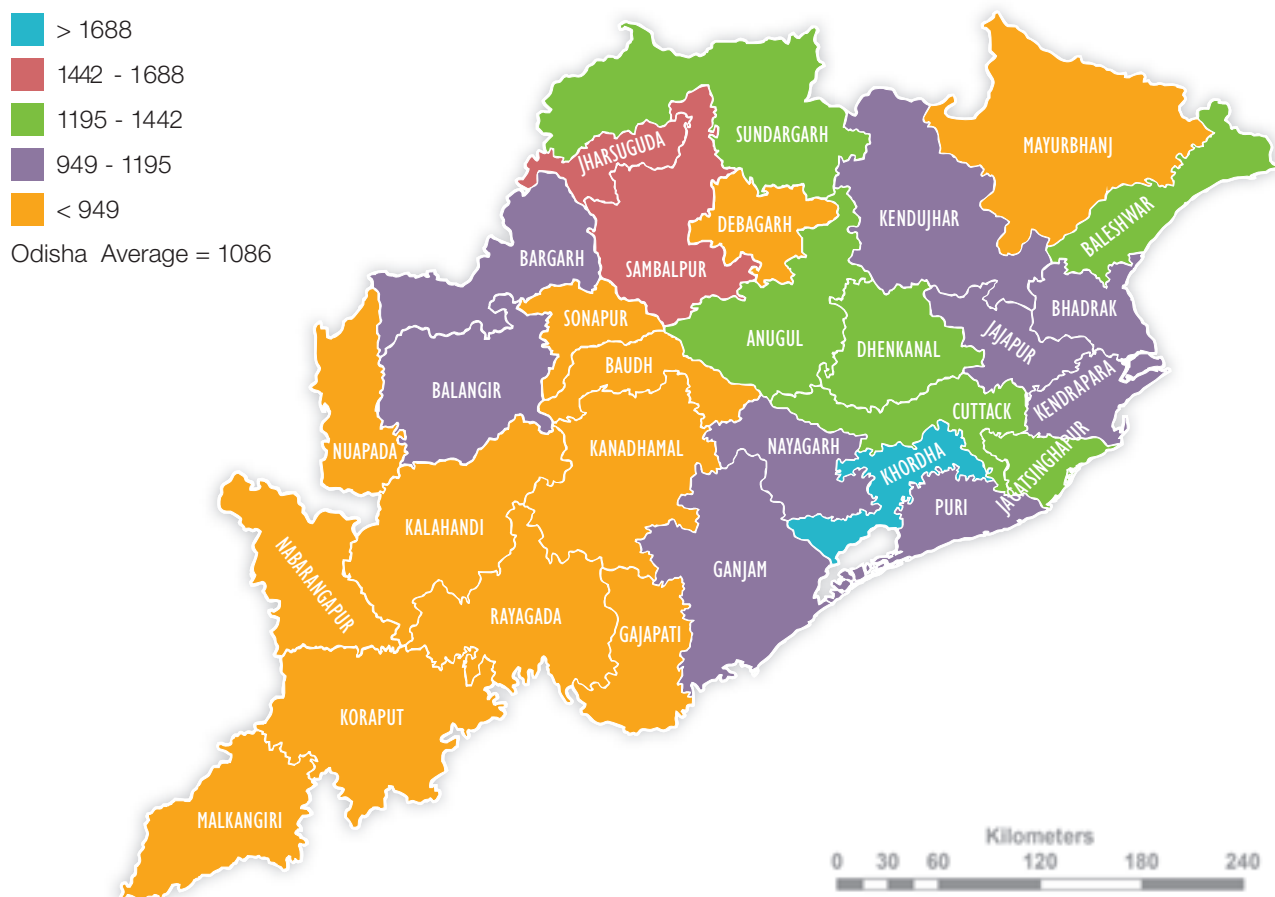
non-agricultural income, including remittances from migrants, plays a role in making consumption to be higher than agricultural production. This is the only way in which we can indirectly bring migration, which is such a crucial component of the households' food security strategies, into the picture.

Low income levels directly affect consumption. The per capita consumption expenditure in absolute terms is a good indicator of food security in the rural areas. Odisha again lies at the bottom in terms of consumption expenditure. The value of per capita consumption expenditure is substantially lower than the national average (Rs.1430) and less than half that of Kerala (Rs. 2669). However, an analysis of MPCE by social groups shows some interesting results. There has been a marginal increase in the MPCE for all the

social groups taken together, while the MPCE for the STs has, in fact, declined. Although the state as a whole has very low consumption levels, there are stark disparities in consumption levels within the state.

The coastal plain districts except Gajapati have an average per capita consumption expenditure ranging from Rs. 1025 to Rs. 1935 per month. The corresponding figures in the southern part of the state range from Rs. 703 to Rs. 888. In the northern parts of the state, districts like Sambalpur, Anugul, and Dhenkanal have comparatively higher MPCE figures as compared to the other districts whereas Malkangiri has recorded the lowest MPCE. In all, 18 districts have MPCE values that are below the state average, and 27 districts have values that are below the national average (Rs.1430). The position of each district between 2004-

Map 3.8:

Status of Districts in Terms of the Consumption Expenditure, 2011-12

05 and 2011-12 is shown in Table 3.9. Since the MPCE figures in the table are for two periods of time at the current price, they cannot be directly comparable. However, the ratio of the MPCE between two periods will give some indication of the changes taking place

over time. It is seen that the ratio is high in the districts of Anugul, Jharsuguda, Khordha, and Sundargarh, which show some industrial growth over time. Map 3.8 depicts the status of districts in terms of their respective consumption expenditures.

Table 3.9: Monthly per Capita Consumption Expenditure by District (in Rs.) 2004-12

District	MPCE (Rs.)		Rank		Ratio MPCE
	2004-05	2011-12	2004-05	2011-12	2011/2004
Anugul	280	1392	12	5	5.0
Balangir	280	950	12	17	3.4
Baleshwar	331	1304	1	7	3.9
Bargarh	280	949	12	18	3.4
Baudh	201	720	23	29	3.6
Bhadrak	331	1025	1	15	3.1
Cuttack	331	1427	1	4	4.3
Debagarh	280	791	12	26	2.8
Dhenkanal	280	1349	12	6	4.8
Gajapati	331	922	10	19	2.8
Ganjam	331	1156	10	10	3.5
Jagatsinghapur	331	1230	1	9	3.7
Jajapur	331	1132	1	11	3.4
Jharsuguda	280	1634	12	3	5.8
Kalahandi	201	770	23	28	3.8
Kandhamal	201	888	23	21	4.4
Kendrapara	331	1110	1	12	3.4
Kendujhar	280	1015	12	16	3.6
Khordha	331	1935	1	1	5.9
Koraput	201	877	23	22	4.4
Malkangiri	201	703	23	30	3.5
Mayurbhanj	280	791	12	27	2.8
Nabarangapur	201	867	23	23	4.3

District	MPCE (Rs.)		Rank		Ratio MPCE
	2004-05	2011-12	2004-05	2011-12	2011/2004
Nayagarh	331	1066	1	13	3.2
Nuapada	201	834	23	25	4.2
Puri	331	1059	1	14	3.2
Rayagada	201	857	23	24	4.3
Sambalpur	280	1641	12	2	5.9
Subarnapur	280	894	12	20	3.2
Sundargarh	280	1301	12	8	4.6
Total	278	1086			3.9

Source: NSS 61st and 68th Rounds.

3.2.5 Rural Casual Wage Rate

Casual wage rate is an important indicator, which shows the standard of living of a rural household. The higher the wage rate, the greater is the likelihood of the household enjoying a better standard of living and, hence, of being more food-secure. The NSS defines a 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. 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 regard to the earnings of agricultural labour. The position of each district pertaining to the rural casual wage rate between 2004-05 and 2011-12 is shown in Table 3.10.

Table 3.10: Rural Casual Wage Rate by District in Odisha (in Rs.), 2004-12

District	Average Wage Rate		Rank		Wage Ratio
	2004-05	2011-12	2004-05	2011-12	2011/2004
Anugul	35	120	22	12	3.4
Balangir	30	83	28	28	2.8
Baleshwar	40	125	11	11	3.1
Bargarh	29	101	29	23	3.5
Baudh	37	96	16	25	2.6
Bhadrak	49	169	6	1	3.4

District	Average Wage Rate		Rank		Wage Ratio
	2004-05	2011-12	2004-05	2011-12	2011/2004
Cuttack	48	144	8	8	3.0
Debagarh	37	81	15	30	2.2
Dhenkanal	50	143	4	9	2.9
Gajapati	34	96	23	24	2.8
Ganjam	43	113	9	15	2.6
Jagatsinghapur	48	158	7	3	3.3
Jajapur	40	134	12	10	3.4
Jharsuguda	39	111	13	18	2.9
Kalahandi	36	120	20	13	3.3
Kandhamal	36	102	19	22	2.8
Kendrapara	53	161	1	2	3.1
Kendujhar	34	111	24	17	3.3
Khordha	52	155	2	5	3.0
Koraput	40	92	10	27	2.3
Malkangiri	36	104	21	21	2.9
Mayurbhanj	31	117	26	14	3.8
Nabarangapur	37	105	18	19	2.9
Nayagarh	49	157	5	4	3.2
Nuapada	28	105	30	20	3.8
Puri	51	145	3	7	2.9
Rayagada	37	146	17	6	3.9
Sambalpur	39	94	14	26	2.4
Subarnapur	31	112	27	16	3.6
Sundargarh	32	82	25	29	2.6
Total	39	119			3.0

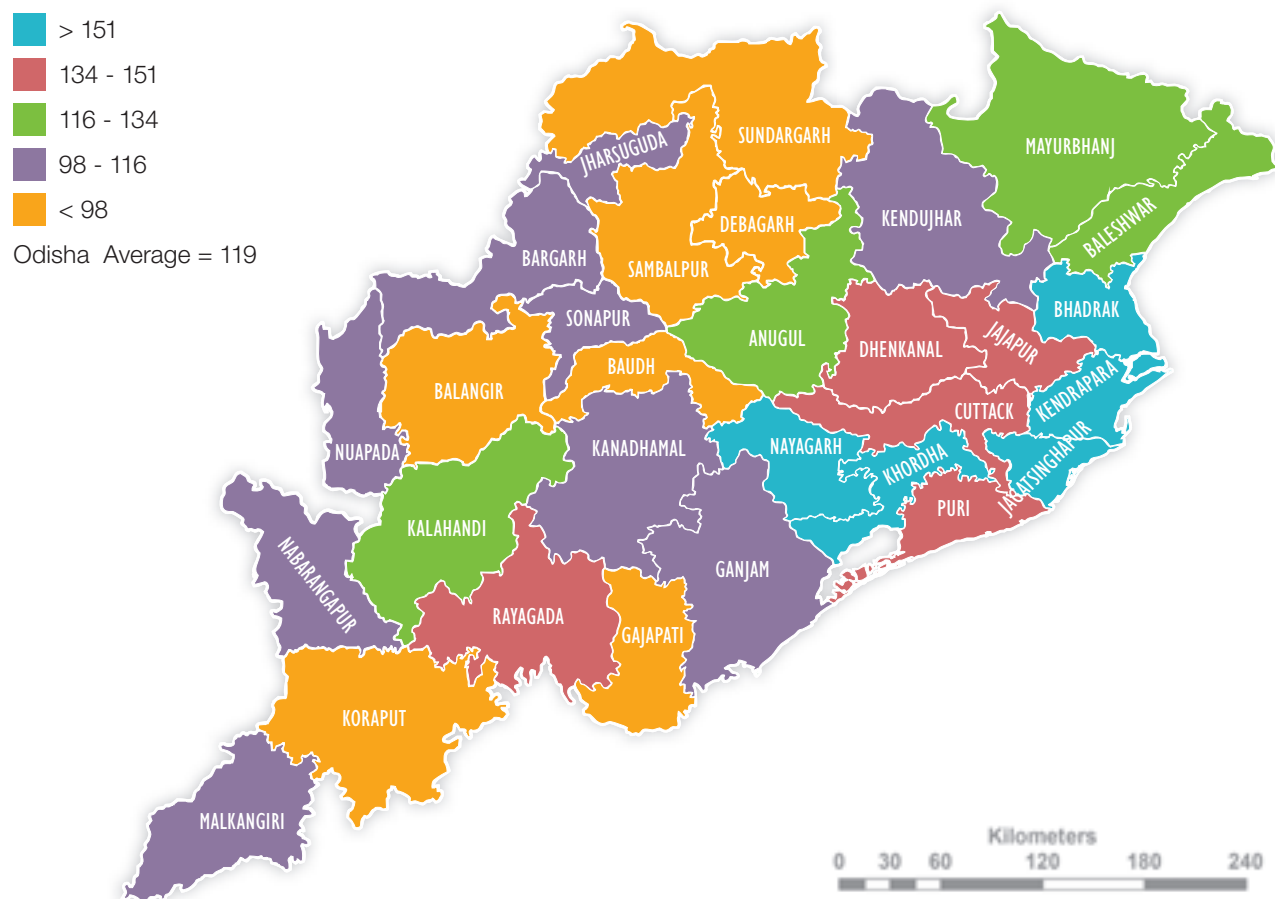
Source: NSS 61st and 68th Rounds.

Note: the Average Wage Earning (in Rs.) is the amount received per day by casual labourers aged 15-59 years in specified works for 2011-12.

It can be seen that Odisha has one of the lowest rural casual wage rates in the country for both male and female workers (Rs.87.86 for females as compared to Rs. 123.57 for males) as compared to the all-India average (Rs.103.28 for females and Rs. 149.3 for males). The wage rate in Kerala for male and female workers are about twice the corresponding rates for Odisha. The rural casual wage rates closely follow

the level of agricultural development in the state. For instance, districts with better agricultural performance like Bhadrak, Cuttack and Jagatsinghapur, have higher wage rates as compared to the rest of the state. While the wage rates in the northern parts of the central tableland are low, the KBK region, barring the districts of Rayagada and Kalahandi, is the worst-performing.

Map 3.9: Status of Districts in Terms of the Casual Wage, 2011-12



3.2.6 Female Literacy Rates

The low literacy levels of Indian women have been one of the major impediments to women's empowerment. Poor educational achievement limits their ability to participate in decision-making processes at the family, community, and national levels. It also adversely affects access to information and technology. The progress in improving female

literacy has serious implications for the food and nutrition security in a particular region. Women's education has a positive impact on the food and nutrition security of a household. Educated women will not only be more productive but will also bring up better educated and healthier children. Here, we have taken the effective women's literacy rate from Census 2011. The position of each district between 2001 and 2011 is shown in Table 3.11.

Table 3.11: District-wise Female Literacy in Rural Odisha (%), 2001-11

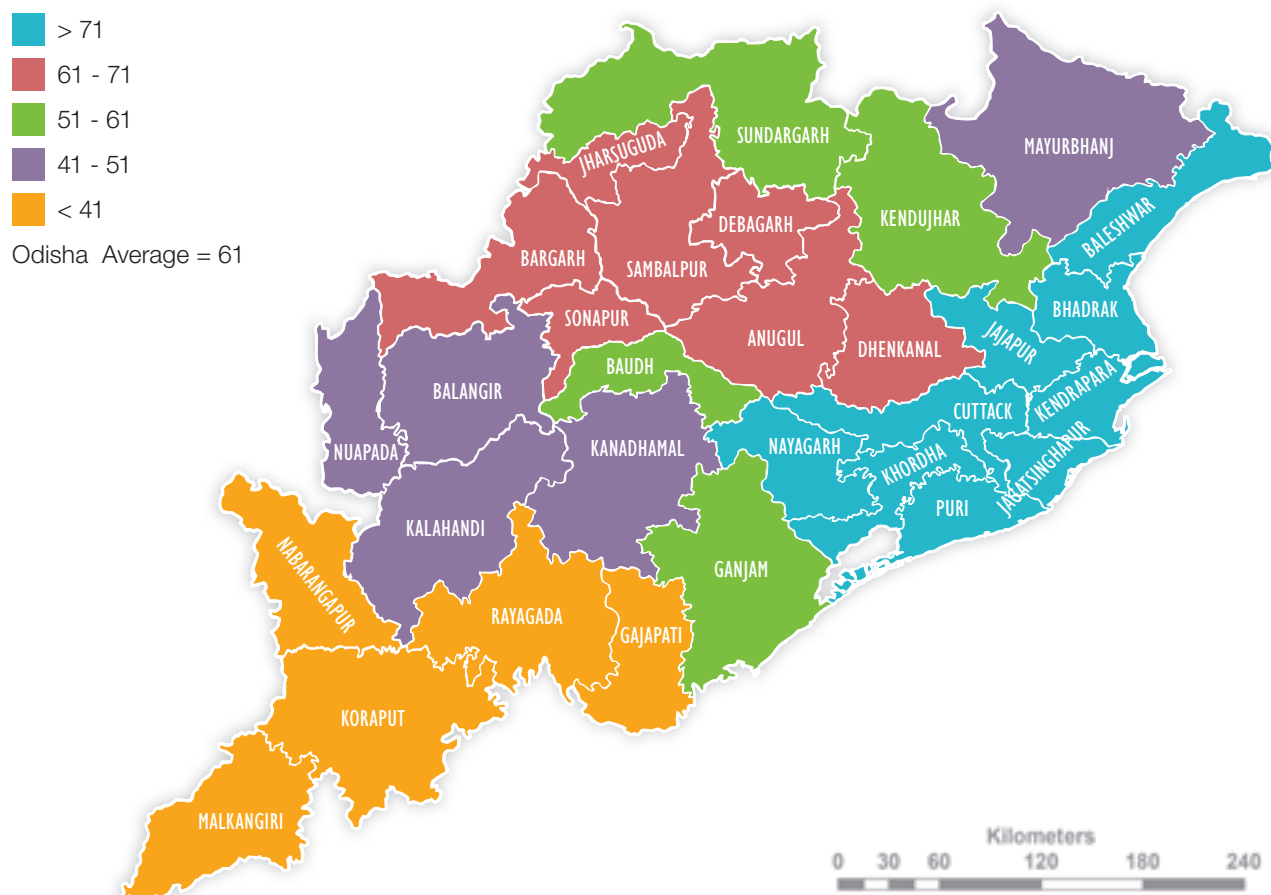
District	Female Literacy Rate		Rank		Gap
	2001	2011	2001	2011	2011-2001
Anugul	52.0	66.3	12	12	14.3
Balangir	35.8	50.3	21	22	14.6
Baleshwar	57.4	71.3	8	8	13.9
Bargarh	48.6	63.8	14	13	15.1
Baudh	37.4	58.8	20	17	21.4
Bhadrak	63.0	76.1	4	6	13.1
Cuttack	62.5	76.5	6	4	14.0
Debagarh	45.6	62.0	15	16	16.4
Dhenkanal	56.1	69.5	10	10	13.4
Gajapati	24.5	39.2	25	26	14.7
Ganjam	41.3	56.8	19	19	15.5
Jagatsinghapur	68.8	80.4	1	1	11.6
Jajapur	60.1	72.7	7	7	12.5
Jharsuguda	53.6	66.6	11	11	13.0
Kalahandi	26.5	44.3	24	24	17.8
Kandhamal	32.8	48.8	23	23	16.0
Kendrapara	66.3	78.7	3	2	12.4
Kendujhar	43.6	56.3	17	20	12.7
Khordha	63.0	76.3	5	5	13.3
Koraput	15.6	31.3	30	30	15.7
Malkangiri	18.4	36.0	27	27	17.5
Mayurbhanj	35.0	50.3	22	21	15.3
Nabarangapur	18.0	33.0	29	29	15.0
Nayagarh	56.7	71.1	9	9	14.4
Nuapada	23.8	43.2	26	25	19.4
Puri	66.3	77.3	2	3	11.0

District	Female Literacy Rate		Rank		Gap
	2001	2011	2001	2011	2011-2001
Rayagada	18.3	33.5	28	28	15.3
Sambalpur	49.5	63.4	13	14	13.8
Subarnapur	44.7	63.1	16	15	18.4
Sundargarh	43.1	57.7	18	18	14.6
Total	46.7	60.7			14.1

Source: Census of India, 2001, 2011.

Map 3.10:

Status of Districts in Terms of the Female Literacy Rate, 2011



Although the overall literacy rate is not very high in the state of Odisha, the western districts of Koraput, Nabarangapur, and Rayagada, among others, fare even worse as not even 50 percent of the rural females in these districts are literate. Enhancing female literacy has been recognised as the single most important factor contributing to an increase in food security and decline in malnutrition and mortality levels (Save the Children, 2008; Government of Orissa, 2004). Although in the case of rural female literacy, Odisha has marginally better figures than the national average (60.7 per cent as compared to 57.9 percent), they are still far below those in many other states. There are large disparities in literacy rates, as also in the female literacy rates, across the state. As expected, the southern region is much worse-off in terms of literacy attainment, and has figures that are 20 percentage points below the all-India rural literacy rate. In some of the tribal districts in the KBK region, like Rayagada, Nabarangapura, Koraput, and Malkangiri, one-third of the rural females are literate, which is an alarming situation. This figure is less than half of the corresponding figures in the coastal districts. Barring Gajapati, in the other

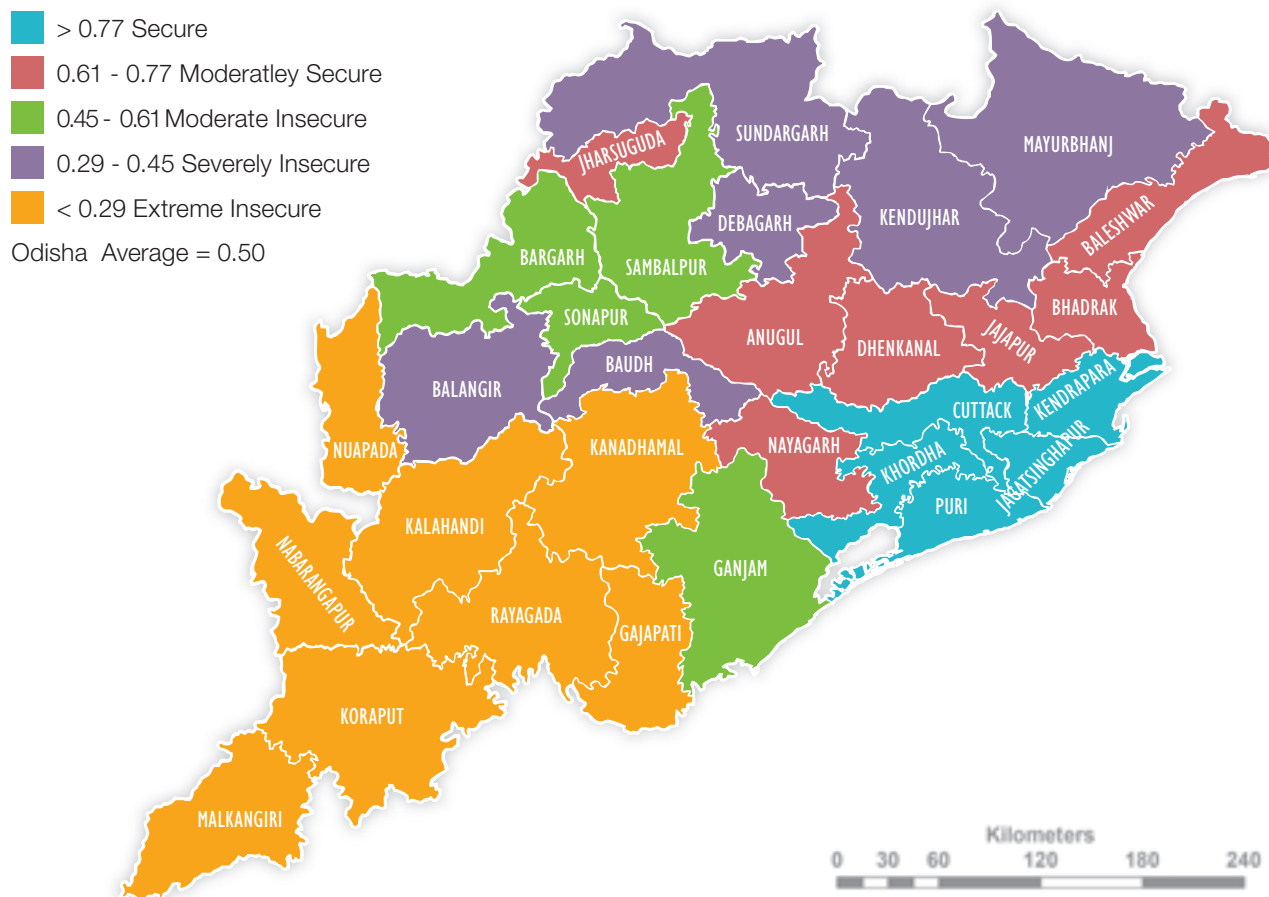
coastal districts about three-fourths of the female populations are literate. The literacy rates for the SC and ST communities in the state are even worse than those for the other communities. Map 3.10 depicts the status of all districts in the state with regard to their respective female literacy rates in 2011.

3.2.7 Status of the Access Index

Table 3.12 shows that eight districts, including Nabarangapur, Koraput, Malkangiri, Gajapati, Rayagada, Kandhamal, Kalahandi and Nuapada, fall in the lowest ‘extremely food-insecure’ category in the food access index. Of these eight districts, six are located in the KBK regions, whereas the districts of Gajapati and Kandhamal, which are both highly tribal-dominated, fall in the lowest category. There are six districts which are severely food-insecure, namely, Mayurbhanj, Debagarh, Balangir, Baudh, Sundargarh, and Kendujhar. On the other hand, only the coastal districts, that is, Kendrapara, Puri, Cuttack, Jagatsinghapur and Khordha are in the food-secure zone. Map 3.11 depicts the status of districts in Odisha in terms of the Access Index.

Table 3.12: Status of Districts in Terms of Access Index (Range Equalisation Method)

Extreme Insecure	Severely Insecure	Moderate Insecure	Moderately Secure	Secure
Nabarangapur	Mayurbhanj	Subarnapur	Baleshwar	Kendrapara
Koraput	Debagarh	Bargarh	Anugul	Puri
Malkangiri	Balangir	Ganjam	Jharsuguda	Cuttack
Gajapati	Baudh	Sambalpur	Jajapur	Jagatsinghapur
Rayagada	Sundargarh		Dhenkanal	Khordha
Kandhamal	Kendujhar		Nayagarh	
Kalahandi			Bhadrak	
Nuapada				

Map 3.11: Status of Districts in Terms of the Access Index

3.3 FOOD UTILISATION: DATA AND VARIABLES, INTER-DISTRICT VARIATION

There are persistent gaps in human resources and infrastructure, which disproportionately affect the less developed rural areas. The rural area suffer from not only a lack of education and health institutions but also account for a significant proportion of hospitals that do not have adequate personnel, diagnostic and therapeutic services and drugs. In a state like Odisha, with a high burden of communicable and non-communicable diseases because of persisting

poverty, the availability of effective primary health infrastructure at the village level assumes huge significance. However, a large number of villages in the state are not adequately covered by a Primary Health Centre (PHC), the most critical health facility in rural areas.

3.3.1 Percentage of Households Having Access to Safe Drinking Water

Diseases caused by the contamination of drinking water constitute a major burden on health. Improvement in the quality of drinking water significantly benefits the health and well-being of people. The position of

each district with regard to access to safe drinking water between 2001 and 2011 is shown in Table 3.13. The seventh Millennium development Goal (MDG) mentions reduction in the proportion of people without access to safe drinking water by half. Polluted and contaminated water undermines the safety and the nutritional well-being of individuals. Ensuring clean and safe water supply is an essential element for achieving food security and good nutrition.

It has been observed that water and sanitation account for a substantial portion of the difference in infant and child mortality rates of the rich and the poor (Leipziger, et al., 2003). In terms of access to safe drinking water, the picture appears to be somewhat better in the Eastern Ghats region, on an average, followed by the coastal plains. The districts

adjoining Jharkhand have low access to potable water, whereas the villages in some districts like Dhenkanal and Anugul in the central tableland have very low corresponding figures. However, the lowest status is again seen in an Eastern Ghats district, viz., Kandhamal, where less than one-third of the rural households have access to potable water (see Table 3.13). However, secondary data cannot be used to adequately assess the contamination of safe sources of water. For example, a closed well is usually considered as a safe source of water but it may be possible that the water quality in the closed well is not of good quality, which can be ascertained only through actual inspection of the well on the ground. Map 3.12 depicts the status of households in various districts having access to safe drinking water in 2011.

Map 3.12:

Status of Districts in Terms of the Proportion of Households Having Access to Safe Drinking Water, 2011

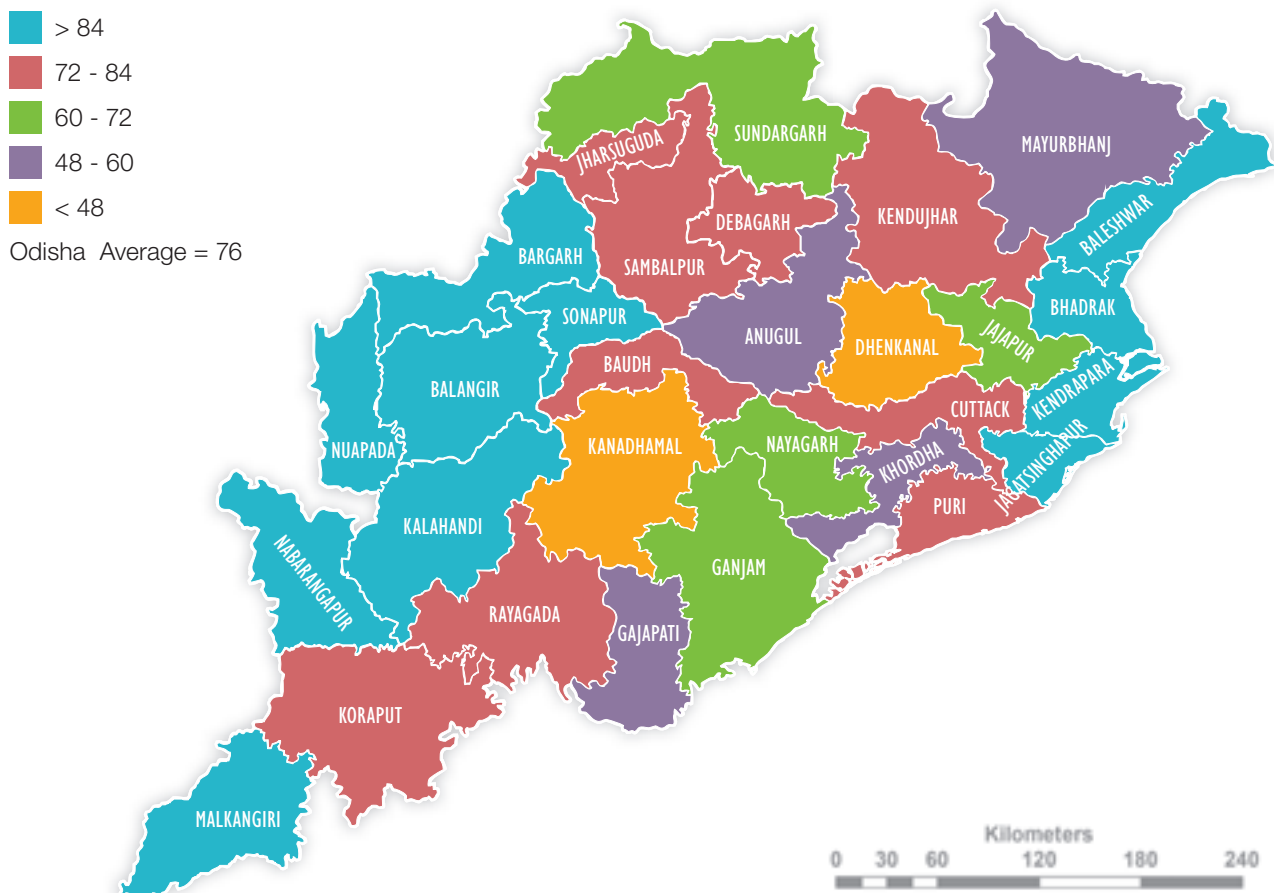


Table 3.13: Access to Safe Drinking Water in Rural Odisha (%), 2001-11

District	% Households Having Access to Safe Drinking Water		Rank		Gap
	2001	2011	2001	2011	2001-2011
Anugul	39.35	56.2	28	27	16.9
Balangir	73.87	86.6	12	10	12.7
Baleshwar	86.33	93.5	2	3	7.1
Bargarh	83.26	92.2	4	5	9.0
Baudh	64.31	79.0	15	15	14.7
Bhadrak	88.63	96.6	1	1	7.9
Cuttack	50.05	73.6	23	19	23.5
Debagarh	56.16	75.9	20	17	19.8
Dhenkanal	31.34	42.6	30	29	11.2
Gajapati	43.29	55.3	25	28	12.1
Ganjam	57.89	68.5	17	22	10.6
Jagatsinghapur	77.98	93.6	9	2	15.6
Jajapur	42.37	67.3	27	23	24.9
Jharsuguda	62.81	80.9	16	14	18.1
Kalahandi	81.23	88.7	6	7	7.5
Kandhamal	32.03	35.5	29	30	3.5
Kendrapara	73.74	92.7	13	4	19.0
Kendujhar	52.39	72.9	21	20	20.5
Khordha	42.97	56.8	26	26	13.8
Koraput	67.26	76.8	14	16	9.5
Malkangiri	82.06	86.2	5	11	4.1
Mayurbhanj	43.90	58.1	24	25	14.2
Nabarangapur	80.37	89.9	7	6	9.5
Nayagarh	51.47	65.0	22	24	13.5
Nuapada	84.29	87.9	3	9	3.7
Puri	75.59	83.8	11	13	8.2

District	% Households Having Access to Safe Drinking Water		Rank		Gap
	2001	2011	2001	2011	2001-2011
Rayagada	78.11	84.0	8	12	5.9
Sambalpur	56.48	75.3	19	18	18.9
Sonapur	76.28	88.7	10	8	12.4
Sundargarh	56.98	71.3	18	21	14.3
Total	62.88	76.1			13.2

Source: Census of India, 2001, 2011.

3.3.2 Percentage of Villages having access to Primary Health Centre

Access to health services is very critical for level of the food and nutrition security of rural households. Inability to treat morbidity, and the frequent occurrence of ailments and diseases can hamper the absorption of food intake and consequently of nutrients into the body. In order to capture this element, the percentage of villages having public health centres (within a distance of 5 kilometres) has been used as an indicator. The position of each district between 2001 and 2011 is shown in Table 3.14.

As per the 2011 Census village directory, only one PHC has been provided for as many as 355 villages. Again there is an acute shortage of doctors in the state, with about one-fourth of the posts of doctors lying vacant in rural Odisha. The lack of primary public health facilities forces the vulnerable populations to depend on private health services, often leading to indebtedness in rural areas. For creating the food security index, we have taken the percentage of villages having PHCs within a range of 5 km. Table 3.14 shows that the percentage of villages having access to PHCs has increased in almost all the districts. The proportion of villages having access to primary health facilities is very low in the tribal areas. For instance, Rayagada in the Eastern Ghats, Kendujhar in the northern plateau and Debagarh in the central tableland have

extremely low figures. On the other hand, the districts of Nabarangapur and Sundargarh have the highest proportion of villages having PHCs within a range of 5 km. The percentage point difference between two points of time is high for the districts of Boudh (22.9 per cent) and Kendujhar (21.8 per cent). Map 3.13 depicts the status of districts in terms of the proportion of their respective populations having access to PHCs in 2011.

The prevalence of diarrhoea among children is a clear indication of the lack of adequate access to basic facilities like safe drinking water. However, as Figure 3.1 shows, access to basic essential medication for children suffering from diarrhoea is available to more than 80 percent of the children in each of the districts, excluding Gajapati and Koraput, which is clearly a good sign of the availability of medical facilities for combating the disease. It is clearly seen in the figure that even some KBK districts like Malkangiri, Rayagada and Balangir perform well on this front.

Hygiene and sanitation are important indicators of the utilisation of food. Access to sanitation is better captured in terms of the access to basic toilet facilities, which is very low in the state of Odisha, especially in its western districts, where not even 10 percent of the households have access to this facility (see Figure 3.2). Map 3.14 illustrates the status of districts in terms of the access to toilet facilities for households in these districts.

Table 3.14:**Percentage of Villages Having Access to PHCs within a Five Km Distance, 2001-11**

District	Percentage of Villages Having Access to PHCs within a 5 km Range		Rank		Gap between
	2001	2011	2001	2011	2011 and 2001
Anugul	16.3	32.3	23	20	16.0
Balangir	24.3	36.1	12	14	11.8
Baleshwar	33.9	30.8?	5	24	-3.1
Bargarh	47.6	43.2?	1	4	-4.4
Baudh	6.8	29.6	30	26	22.9
Bhadrak	28.5	34.6	7	16	6.0
Cuttack	22.8	38.7	14	5	15.9
Debagarh	9.0	19.9	29	30	10.9
Dhenkanal	23.4	37.8	13	7	14.5
Gajapati	19.7	28.9	20	27	9.2
Ganjam	18.7	35.6	22	15	17.0
Jagatsinghapur	36.2	36.2	4	12	0.1
Jajapur	27.1	32.7	10	19	5.6
Jharsuguda	31.9	43.8	6	3	11.9
Kalahandi	21.0	29.8	18	25	8.8
Kandhamal	19.2	31.6	21	23	12.4
Kendrapara	22.2	31.7	16	22	9.5
Kendujhar	14.8	36.6	25	10	21.8
Khordha	39.2	38.2	3	6	-1.0
Koraput	22.3	31.7	15	21	9.4
Malkangiri	16.1	36.8	24	8	20.6
Mayurbhanj	21.4	36.2	17	13	14.8
Nabarangapur	28.4	47.6	8	1	19.2
Nayagarh	20.0	27.8	19	28	7.9
Nuapada	25.6	36.3	11	11	10.7

Percentage of Villages Having Access to PHCs within a 5 km Range

Rank

Gap between

District	2001	2011	2001	2011	2011 and 2001
Puri	39.6	33.4	2	18	-6.1
Rayagada	13.2	33.9	28	17	20.7
Sambalpur	13.5	36.8	27	9	23.3
Sonapur	14.1	23.2	26	29	9.1
Sundargarh	28.0	45.1	9	2	17.1
Total	23.3	34.4			11.1

Source: Census of India, 2001, 2011.

Map 3.13:

Status of Districts in Terms of the Proportion of Villages Having Access to PHCs, 2011

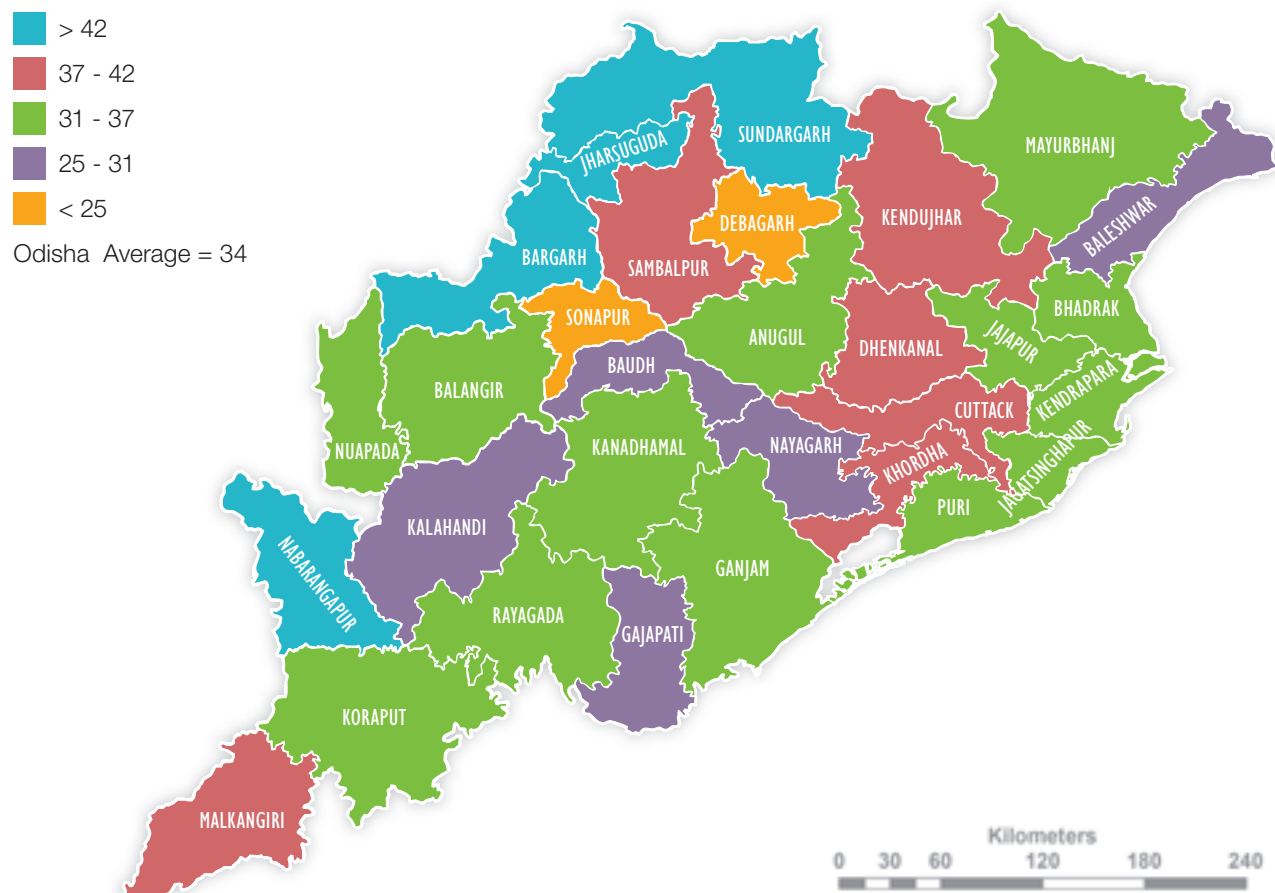
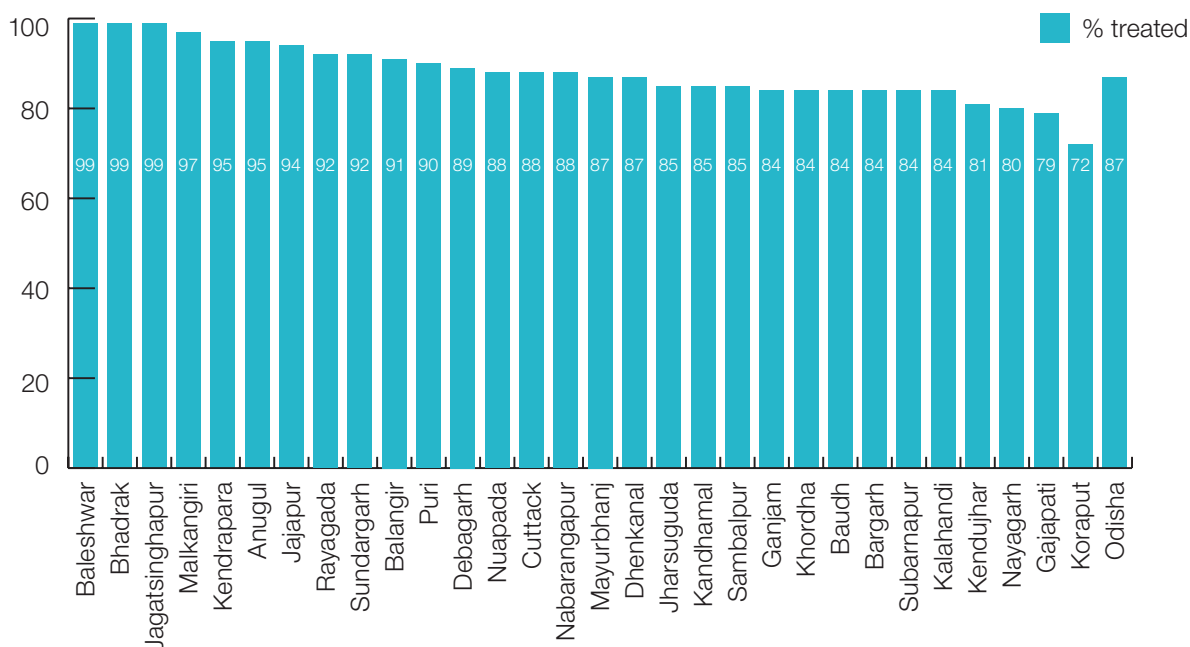
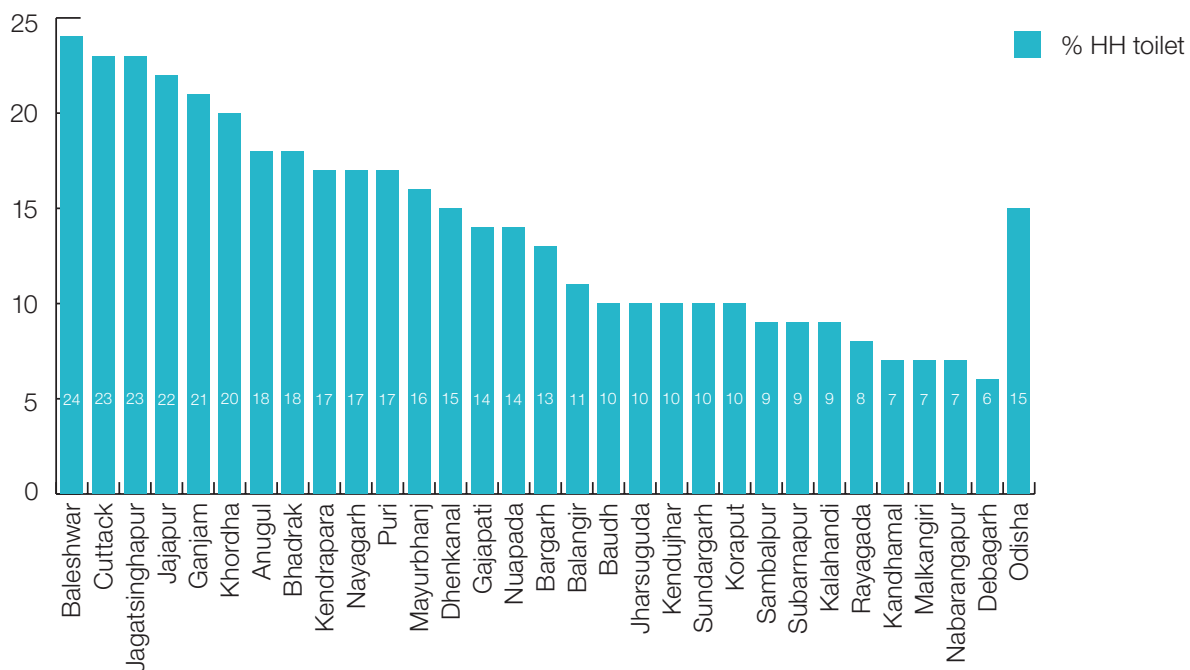


Figure 3.1: Children Suffering from Diarrhoea Who Received HAF/ORS/ORT in Odisha (%), 2015-16



Source: NFHS, 2015-16.

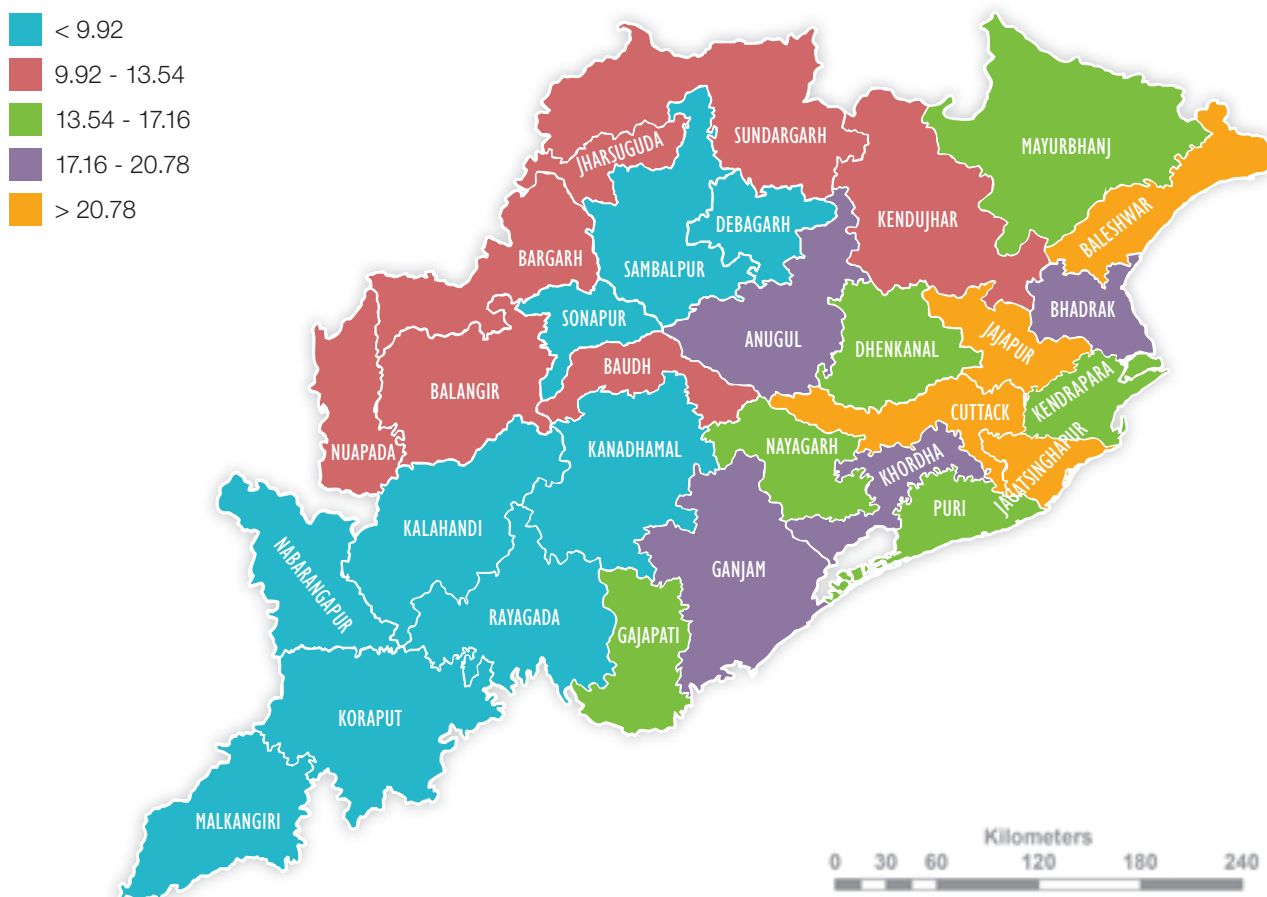
Figure 3.2: Percentage of Households with Access to Toilet Facility in Odisha, 2011



Source: Census of India, 2001, 2011

Map 3.14:

Status of Districts in Terms of the Proportion of Households having Access to Toilet, 2011



3.3.3 Status of Utilisation Index

Based on the two indicators discussed above, namely, safe drinking water and access to PHCs, a utilisation index has been created and presented in Table 3.15. The table shows that the coastal plain districts are

relatively better placed in terms of utilisation as compared to the northern plateau and the central districts. Although the districts in the Eastern Ghats perform better in terms of access to drinking water infrastructure, they exhibit very poor performance in terms of health facilities and sanitation. Primary

Table 3.15:

Status of Districts in Terms of the Utilisation Index (Range Equalization Method)

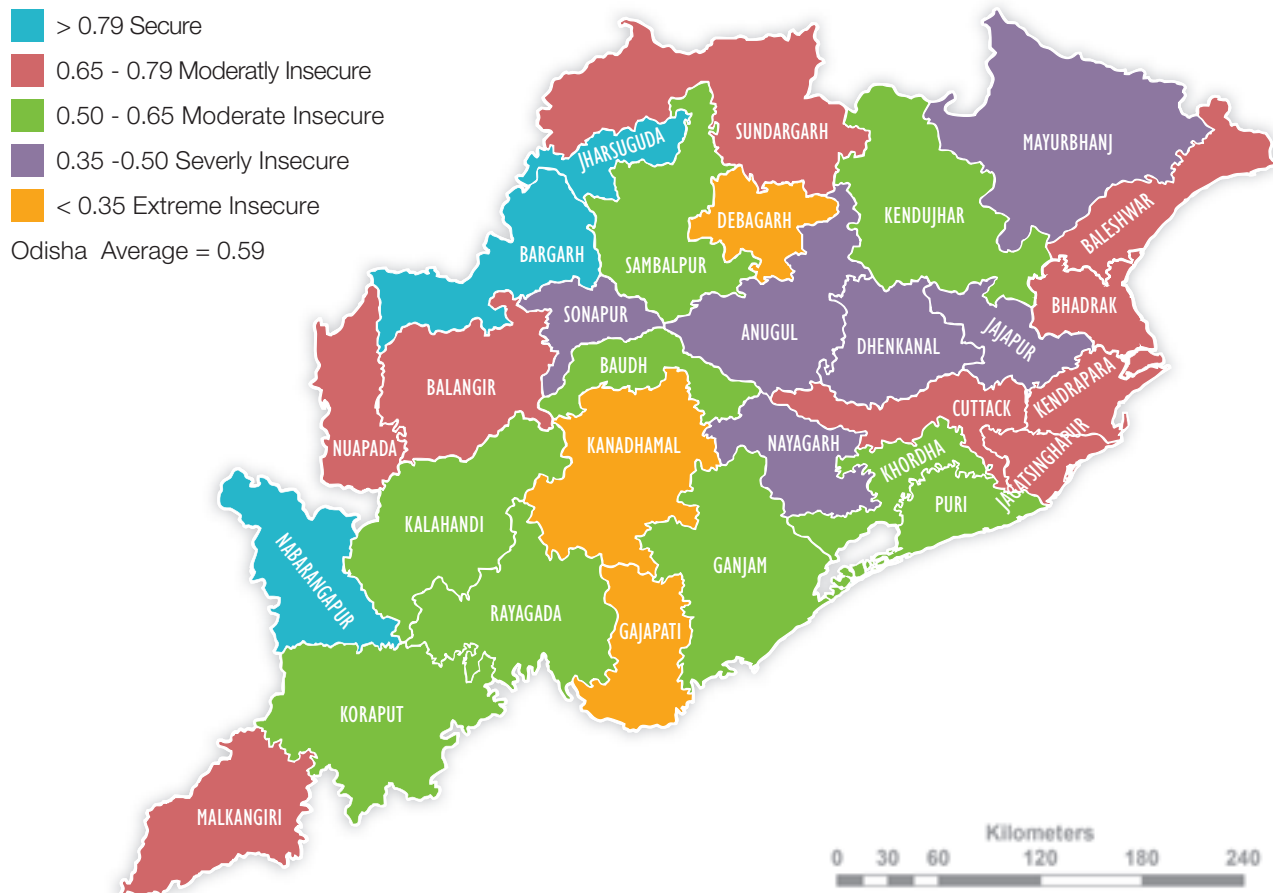
Extremely Insecure	Severely Insecure	Moderately Insecure	Moderately Secure	Secure
Kandhamal	Dhenkanal	Khordha	Cuttack	Jharsuguda
Gajapati	Nayagarh	Boudh	Baleswar	Bargarh
Debagarh	Anugul	Koraput	Kendrapara	Nabarangapur

Extremely Insecure	Severely Insecure	Moderately Insecure	Moderately Secure	Secure
	Mayurbhanj	Ganjam	Balangir	
	Jajapur	Kendujhar	Malkangiri	
	Subarnapur	Kalahandi	Nuapada	
		Sambalpur	Sundargarh	
		Puri	Bhadrak	
		Rayagada	Jagatsinghapur	

health facilities, in particular, are found to be in very poor shape in most parts of the state. In terms of the food utilisation index, the eastern coastal districts like Baleshwar, Bhadrak, Jagatsinghapur, Cuttack, and Kendrapara and western districts like Bargarh and Jharsuguda are either secure or moderately

secure. On the other hand, the two southern districts of Kandhamal and Debagarh and the one coastal district of Gajapati in Northern region are found to be most food-insecure districts. Map 3.15 depicts the status of various districts in terms of the utilisation index.

Map 3.15: Status of Districts in Terms of the Utilisation Index



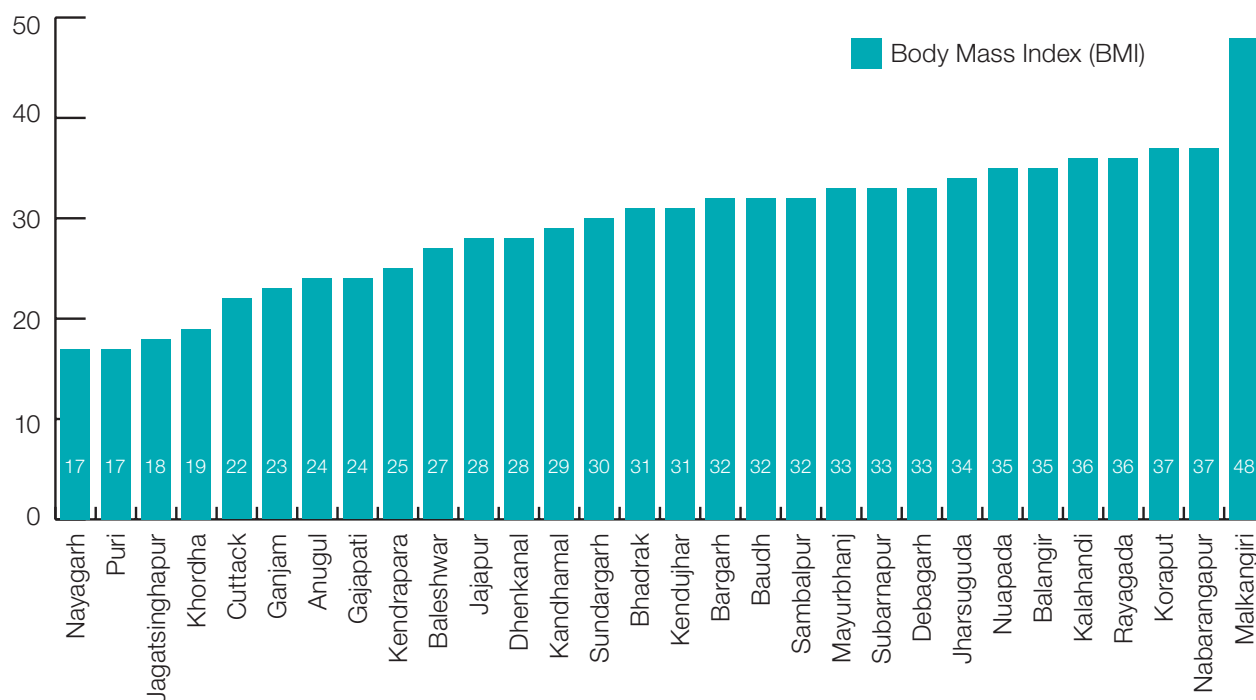
3.4 OUTCOME INDICATORS: DATA AND VARIABLES, INTER-DISTRICT VARIATION

Food security is a combination of both access to food as well as the absorption of the nutrients in the food by the body, which depend on many non-food factors like health, water, sanitation, and hygiene behaviour. The nutritional status of an individual can be considered as the outcome of food and nutrition security. Although the intake of food is not the only factor that affects nutritional status, it is definitely the primary one. The outcome index has been calculated here on the basis of child underweight (weight for age -2SD). The rural population, particularly children, are badly affected by malnutrition due to their low dietary intakes, lack of appropriate care, and the inadequate distribution of food among the members of the households. The variable ‘underweight’ captures both chronic and acute

under-nutrition. Malnutrition among children weakens the immune system and makes the child more prone to diseases while diminishing his/her ability to fight for infection. Studies show that the chance of dying of a child is ten times higher if he/she is severely underweight (Black, et al., 2008). The second variable we have taken is BMI for adult females. The BMI is one of the important indicators for the general health status of an adult. The BMI can be measured by taking both thin and obese status of the adult. Here, we have taken the number of women with BMI below 18.5 to indicate women who are moderately or severely thin, and those with a BMI above 25 to indicate women who are moderately or severely obese.

There is a wide variation in BMI among districts as per NFHS-4 (2015-16). Figure 3.3 clearly indicates that the highest percentage of thin women is observed in the district of Malkangiri, whereabout half the total women were found to be thin. The other districts which show a high proportion of thin women are

Figure 3.3: Percentage of Women whose Body Mass Index (BMI) is Below Normal (BMI < 18.5 kg/m²), 2015-16



Source: NFHS 2015-16.

Koraput, Nabarangapur, Kalahandi, Rayagada, Nuapada, and Balangir, where about one-third of the total women are thin. All the districts which remained in the lower strata are the districts that belong to the KBK regions. On the other hand, the districts which record a lower number of thin women, that is, Puri, Nayagarh, Jagatsinghapur, and Khordha belong to the coastal region.

Child mortality is also one of the important indicators for measuring the nutrition levels as one of the reasons for it is under-nutrition, but we have not taken this variable for the outcome index as recent data pertaining to this variable have not been released.

Table 3.16 provides the proportion of children (below five years of age) who are underweight, the mortality prevalent among children and the occurrence of abnormal BMI among women across the districts of Odisha. There is a large district-wise variation in terms

of these indicators. Two-fifths of the total children in rural Odisha are underweight. Malkangiri (69 percent), Kalahandi and Rayagada (55 per cent) are the districts that have the lowest proportions of undernourished children while the coastal districts like Jagatsinghapur, Jajapur, Nayagarh, and Cuttack have registered the lowest percentage of underweight children. Child mortality is also one of the important indicators of child development. The districts of Kandhamal and Balangir top the child mortality rated. Interestingly, the districts of Puri and Cuttack have registered the highest child mortality percentage. On the other hand, the coastal districts of Baleshwar and Jajapur registered the lowest mortality rate. More than half of the total women in the age group of 18-59 years have abnormal BMI in Odisha. Interestingly, the KBK districts like Balangir and Kalahandi registered a low proportion of women having abnormal BMI.

Table 3.16:

Percentage Children Underweight and Percentage of Women with Abnormal BMI in Rural Odisha, 2015-16

District	Below -2 SD Underweight (Weight for Age) (%)		Under Five Mortality Rate (U5MR)		BMI <18.5 to >24.0 for women age 18-59 year (%)	
	Percentage	Rank	Percentage	Rank	Percentage	Rank
Anugul	30.8	22	62	26	41.3	26
Balangir	44.8	12	114	2	66.0	2
Baleshwar	43.4	14	52	30	39.7	29
Bargarh	47.6	10	70	19	45.8	16
Baudh	49.4	8	88	8	46.3	15
Bhadrak	33.6	21	58	27	45.3	17
Cuttack	25.0	24	100	6	44.3	20
Debagarh	42.8	15	81	11	44.9	18
Dhenkanal	27.8	23	79	13	43.2	22
Gajapati	42.6	16	84	10	41.0	27
Ganjam	50.6	6	97	7	42.4	24
Jagatsinghapur	14.4	30	66	24	39.4	30
Jajapur	23.6	26	57	28	40.2	28

Jharsuguda	36.9	19	53	29	49.7	12
Kalahandi	54.7	3	78	14	68.0	1
Kandhamal	23.5	27	146	1	42.1	25
Kendrapara	21.1	29	67	22	43.2	22
Kendujhar	48.2	9	70	19	51.4	10
Khordha	24.5	25	110	3	54.8	4
Koraput	53.6	4	68	21	53.8	6
Malkangiri	68.9	1	74	17	53.1	8
Mayurbhanj	40.8	18	64	25	44.3	20
Nabarangapur	53.1	5	85	9	50.6	11
Nayagarh	22.6	28	72	18	53.7	7
Nuapada	50.2	7	80	12	54.7	5
Puri	33.7	20	106	4	47.7	14
Rayagada	54.9	2	105	5	56.9	3
Sambalpur	47.0	11	77	16	52.0	9
Subarnapur	42.6	16	78	14	48.3	13
Sundargarh	43.5	13	67	22	44.7	19
Odisha	40.1		80		44.3	

Source: NFHS 2015-16.

3.4.1 Status of Outcome Index

As may be observed from Table 3.17, the extremely insecure group contains six districts, followed by seven in the severely insecure group, eight in the moderately insecure group, five in the moderately secure group, and four in the secure group (based on the range equalisation method).

Out of the six extremely insecure districts, four belong to the KBK region while the remaining two districts, that is, Ganjam and Kandhamal are highly tribal dominated. On the other hand, the coastal districts of Jagatsinghapur, Jajapur, Kendrapara, and Nayagarh are the most secure districts in Odisha. Map 3.16 illustrates the status of various districts in terms of the outcome index.

Table 3.17:

Status of Districts in the Food Security Outcome Index Based on the RE Method

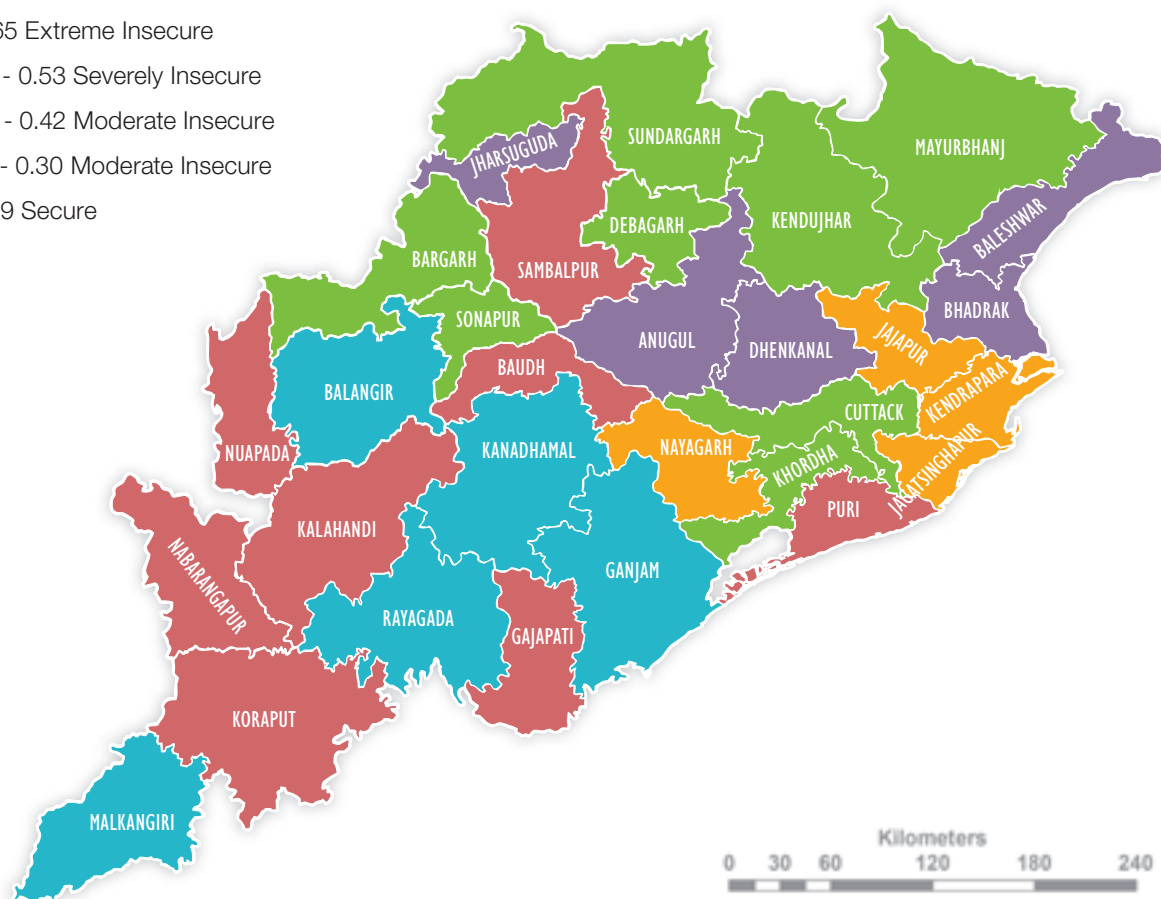
Extremely Insecure	Severely Insecure	Moderately Insecure	Moderately Secure	Secure
Ganjam	Gajapati	Sundargarh	Anugul	Jagatsinghapur
Kandhamal	Sambalpur	Cuttack	Bhadrak	Jajapur
Balangir	Koraput	Subarnapur	Jharsuguda	Kendrapara

Extremely Insecure	Severely Insecure	Moderately Insecure	Moderately Secure	Secure
Malkangiri	Puri	Bargarh	Baleshwar	Nayagarh
Rayagada	Nuapada	Khordha	Dhenkanal	
	Kalahandi	Kendujhar	Mayurbhanj	
	Baudh	Debagarh		
	Nabarangapur			

Note: The composite index has been arrived at by taking the Underweight (Below -2 SD) and Under-five Mortality Rate (%).

Map 3.16: Status of Districts in Terms of the Outcome Index

- > 0.65 Extreme Insecure
- 0.42 - 0.53 Severely Insecure
- 0.30 - 0.42 Moderate Insecure
- 0.19 - 0.30 Moderate Insecure
- < 0.19 Secure



3.5 CONCLUSIONS

The primary focus of this chapter is on the estimation of food security at the district level in Odisha. The food security index has synthesised the three dimensions of food security, viz., availability, access, and utilisation. The selected indicators have been taken to develop the food security index. In this chapter, mainly the indicators have been aggregated by dimensions. The range equalisation method has been used to identify the districts that are severely insecure or secure with respect to each dimension. As regards the food availability dimension, the eastern states and the northern plateau are the worst-off regions. The central tableland falls in between, while the coastal plains are better-off.

In terms of the access index, eight districts, including Nabarangapur, Koraput, Malkangiri, Gajapati, Rayagada, Kandhamal, Kalahandi, and Nuapada, fall

in the extremely food-insecure category. Among these eight districts, six belong to the KBK region while the remaining two districts are dominated by the ST population. In terms of the food utilisation index, the eastern coastal districts like Baleshwar, Bhadrak, Jagatsinghapur, Cuttack, and Kendrapara, and the western districts like Bargarh and Jharsuguda are either secure or moderately secure. On the other hand, the two southern districts of Kandhamal and Debagarh, and Gajapati, the coastal district of Northern region are found to be the most food insecure districts.

In terms of the outcome index, the two most food-insecure districts either fall in the KBK region or are tribal-dominated. On the other hand, the coastal districts like Jagatsinghapur, Jajapur, Kendrapara, and Nayagarh are the most food-secure districts in Odisha in terms of the outcome index.

4

ADDRESSING FOOD INSECURITY IN ODISHA

Chapter 3 developed indices to show the ranks of districts by availability, access, utilisation, and outcomes of food insecurity. In this chapter, all these factors have been taken together to explain food security across districts and have been combined to form a single composite index, called the Food Security Index (FSI). Table 4.1 explains the status of districts in terms of the FSI and the ranks of the districts. 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, the factors or indicators that have been included in the composite FSI do indeed contribute to food insecurity, and therefore, any strategy to improve the food security status must address these factors (Table 4.2).

4.1 FOOD SECURITY INDEX (FSI)

In this section, we bring together all the indicators chosen to explain food insecurity. The indicators that had earlier been clubbed into three sets – availability, access and utilisation – 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, a comparison with the individual sets of indices would reveal their relative significance in the FSI. Table 4.1 shows the positions of the districts in terms of range equalisation method.

It may be seen that in the FSI, food availability index, the five worst districts are Kandhamal, Malkangiri, Gajapati, Nayagarh, and Rayagada. These districts are from the North-East, Central-North, South and South-East, and the Central-South regions.

In terms of the access index, of the five worst districts, four are from the KBK regions, including Nabarangapur, Koraput, Malkangiri, Rayagada, and Gajapati. While the first four districts belong to the KBK region, the fifth is one of the most underdeveloped coastal districts.

In terms of the utilisation index, the worst five districts are Kandhamal, Gajapati, Debagarh, Dhenkanal, and Nayagarh. This provides a mixed ranking status of districts. An analysis of the Food Security Outcome Index indicates that Nabarangapur, Kandhamal, Ganjam, Balangir, Malkangiri, and Rayagada are the ‘extremely food-insecure’ districts. On the other hand, the four coastal districts such as Jagatsinghapur, Jajapur, Kendrapara, and Nayagarh are the most secure districts in terms of the outcome index.

Table 4.1:

Ranks of Districts on the Composite Food Security Index and Components (RE Method)

District	Availability		Access		Utilisation		Overall		Outcome	
	Index	Rank	Index	Rank	Index	Rank	Index	Rank	Index	Rank
Anugul	0.277	25	0.651	11	0.393	25	0.502	16	0.204	5
Balangir	0.341	19	0.348	20	0.710	9	0.412	20	0.609	28

District	Availability		Access		Utilisation		Overall		Outcome	
	Index	Rank	Index	Rank	Index	Rank	Index	Rank	Index	Rank
Baleshwar	0.458	10	0.642	12	0.671	11	0.597	9	0.266	8
Bargarh	0.589	7	0.509	15	0.885	2	0.599	8	0.400	14
Baudh	0.469	9	0.361	19	0.532	20	0.421	19	0.513	24
Bhadrak	0.598	5	0.759	6	0.765	5	0.716	3	0.208	6
Cuttack	0.514	8	0.798	3	0.652	12	0.694	4	0.353	12
Debagarh	0.393	13	0.347	21	0.331	28	0.357	24	0.415	17
Dhenkanal	0.328	22	0.697	8	0.382	27	0.539	13	0.267	9
Gajapati	0.253	28	0.192	27	0.325	29	0.233	29	0.429	18
Ganjam	0.596	6	0.532	14	0.554	18	0.553	12	0.571	26
Jagatsinghapur	0.670	3	0.863	2	0.771	4	0.794	1	0.074	1
Jajapur	0.360	16	0.690	9	0.491	23	0.564	11	0.111	2
Jharsuguda	0.336	20	0.666	10	0.803	3	0.601	7	0.212	7
Kalahandi	0.420	12	0.276	24	0.615	16	0.377	21	0.508	23
Kandhamal	0.069	30	0.237	25	0.211	30	0.186	30	0.583	27
Kendrapara	0.454	11	0.781	5	0.681	10	0.674	6	0.141	3
Kendujhar	0.355	17	0.412	17	0.608	17	0.432	17	0.406	16
Khordha	0.298	23	0.934	1	0.505	21	0.683	5	0.401	15
Koraput	0.368	15	0.158	29	0.551	19	0.287	27	0.445	20
Malkangiri	0.147	29	0.181	28	0.720	8	0.269	28	0.617	29
Mayurbhanj	0.375	14	0.308	22	0.479	24	0.357	23	0.306	10
Nabarangapur	0.353	18	0.140	30	0.945	1	0.345	25	0.531	25
Nayagarh	0.262	27	0.725	7	0.384	26	0.537	15	0.182	4
Nuapada	0.328	21	0.282	23	0.725	7	0.375	22	0.477	22
Puri	0.684	2	0.797	4	0.640	14	0.737	2	0.464	21
Rayagada	0.265	26	0.203	26	0.650	13	0.301	26	0.653	30
Sambalpur	0.598	4	0.563	13	0.631	15	0.585	10	0.432	19
Subarnapur	0.692	1	0.475	16	0.496	22	0.538	14	0.397	13
Sundargarh	0.295	24	0.393	18	0.749	6	0.431	18	0.347	11
Odisha	0.391		0.509		0.594		0.492		0.385	

The status of the districts in terms of the FSI calculated on the basis of the range equalisation method shows that five districts, including Kandhamal, Gajapati, Malkangiri, Koraput, and Rayagada are extremely insecure while seven districts, including Nabarangapur, Debagarh, Mayurbhanj, Nuapada, Kalahandi, Balangir, and Baudhare severely-insecure

districts. These districts need urgent attention in terms of improving the food security input indicators.

On the other hand, the most food-secure districts are Kendrapara, Khordha, Cuttack, Bhadrak, Puri, and Jagatsinghapur, as per the range equalisation method (Table 4.2). Map 4.1 illustrates the status of the districts in terms of the outcome index.

Map 4.1: Status of Districts in Terms of the Food Security Index

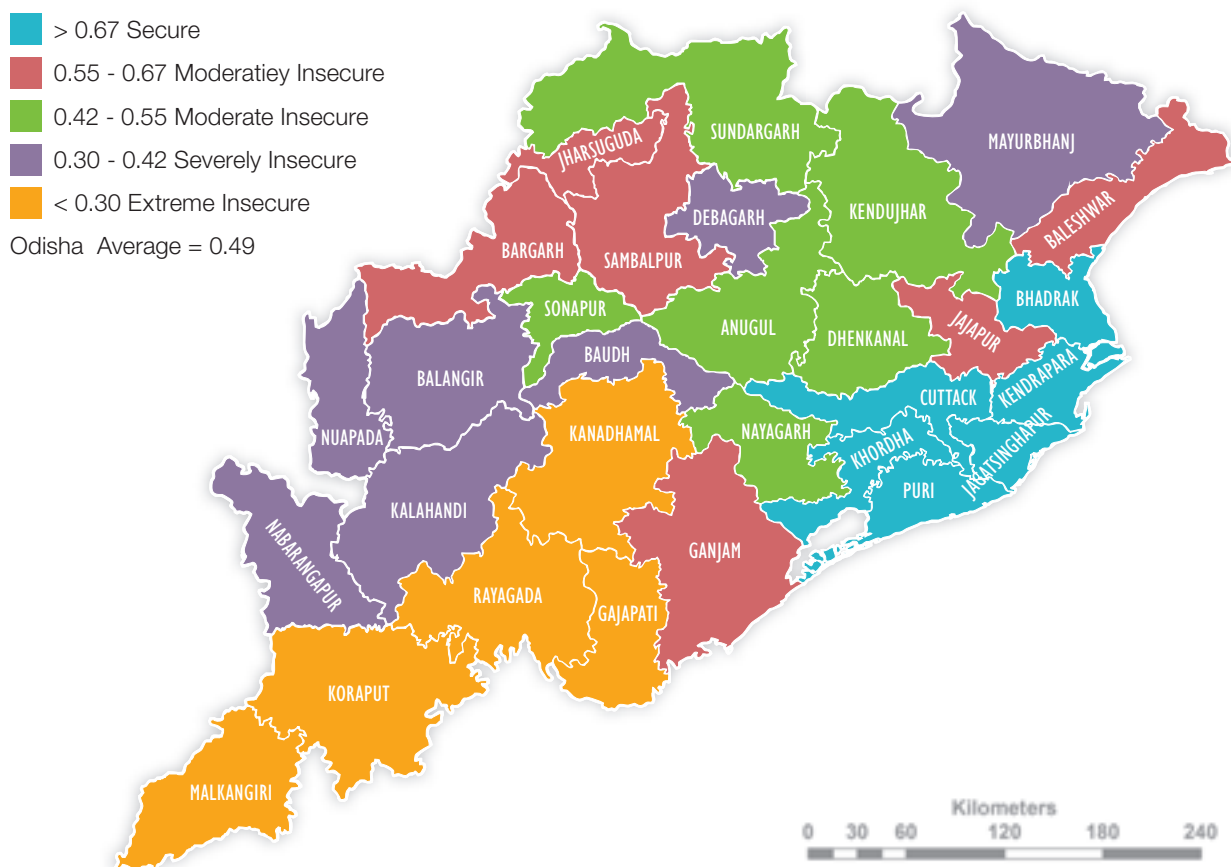


Table 4.2:

Status of Districts in Terms of Food Security Index (FSI), Based on the Range Equalisation Method

Extremely Insecure	Severely Insecure	Moderately Insecure	Moderately Secure	Secure
Kandhamal	Nabarangapur	Sundargarh	Ganjam	Kendrapara
Gajapati	Debagarh	Kendujhar	Jajapur	Khordha

Extremely Insecure	Severely Insecure	Moderately Insecure	Moderately Secure	Secure
Malkangiri	Mayurbhanj	Anugul	Sambalpur	Cuttack
Koraput	Nuapada	Nayagarh	Baleshwar	Bhadrak
Rayagada	Kalahandi	Subarnapur	Bargarh	Puri
	Balangir	Dhenkanal	Jharsuguda	Jagatsinghapur
	Baudh			

4.1.1 Status of Districts in Terms of the Overall Food Security Index

In order to find out the status of the overall FSI, we have also applied Principal Component Analysis (PCA) method. As discussed earlier, the FSI was calculated on the basis of the range equalisation method by taking the average index value of three dimensions, that is, availability, access, and utilisation. In the PCA technique, we take the first principal components in order to calculate the overall index by taking into account all the indicators in the three dimensions.

Table 4.3 explains the status of the districts in terms of the FSI as found through the PCA methods. The six coastal districts, including Cuttack, Puri, Bhadrak, Jagatsinghapur, Kendrapara, and Khordha are found to be the most food-secure districts followed by the districts of Ganjam, Baleshwar, Nayagarh, Dhenkanal, and Anugul, which are moderately secure. On the

other hand, the five districts of Rayagada, Koraput, Malkangiri, Kandhamal, and Gajapati fall in the most food-insecure zone. Of these, the first three belong to the KBK region, while the remaining two belong to the coastal and central regions, respectively.

4.2 Identifying the Priority Districts

The FSI described earlier provides the option of prioritising the developmental efforts in the most food-insecure districts. The districts in the two lowest categories, that is, the extremely food-insecure and severely food-insecure districts, should be prioritised for developmental intervention for enhancing their respective food security situations.

Table 4.3 combines the extremely food-insecure and severely food-insecure districts identified in terms of three indices—the range equalisation, Principal Component Analysis (PCA) and outcome index.

Table 4.3: Status of Districts in Terms of Food Insecurity Index: An Analysis of Three Indices

Range Equalisation	Principal Component analysis	Outcome Index
Kandhamal	Malkangiri	Ganjam
Gajapati	Nabarangapur	Kandhamal
Malkangiri	Kandhamal	Balangir
Koraput	Koraput	Malkangiri
Rayagada	Rayagada	Rayagada
Nabarangapur	Gajapati	Gajapati
Debagarh	Nuapada	Sambalpur

Range Equalisation	Principal Component analysis	Outcome Index
Mayurbhanj	Debagarh	Koraput
Nuapada	Kalahandi	Puri
Kalahandi	Balangir	Nuapada
Balangir	Sundargarh	Kalahandi
Baudh	Mayurbhanj	Baudh
		Nabarangapur

From the list of food-insecure (including extremely food-insecure and severely food-insecure) as per all the three methods, we have selected the insecure districts, which fall in all the three methods, and identified the districts that show alarming outcomes. The districts identified through any of the two methods, range equalisation and PCA, have been termed as the districts in which priority-wise intervention is needed. Table 4.4

clearly indicates that a total of 12 districts fall in this category of which three districts have been identified as priority and nine as alarming. Of the nine alarming districts, seven are from the KBK region whereas the other two are the Gajapati and Kandhamal districts. The high-priority districts are Mayurbhanj, Baudh, and Debagarh, which fall in the insecure zone based on any of the two methods—FSI range equalisation, PCA

Table 4.4:

Status of Priority Districts with Regard to the Outcome and Overall Food Insecurity Indices

Status	District	Range Equalisation	Principal Component Analysis	Outcome Index
Alarming	Balangir	Y	Y	Y
	Gajapati	Y	Y	Y
	Kalahandi	Y	Y	Y
	Kandhamal	Y	Y	Y
	Koraput	Y	Y	Y
	Malkangiri	Y	Y	Y
	Nabarangapur	Y	Y	Y
	Nuapada	Y	Y	Y
	Rayagada	Y	Y	Y
Need High Attention	Mayurbhanj	Y	Y	
	Baudh	Y		Y
	Debagarh	Y	Y	

Note: The alarming districts are those which fall in the insecure zone in all the three input/outcome indices, while the high-priority districts are those which fall in at least two indices.

method. Having identified the ten most food-insecure districts in terms of the FSI and outcome index, we will analyse the status of these **priority districts** with

regard to the Availability Index, Access Index, and Utilisation Index, as also the variables used to construct the FSI (Tables 4.5, 4.6, and 4.7).

Table 4.5: Priority Districts Ranked by the FSI Availability Index (Input Variables)

Priority Districts	Availability Index	Net Irrigated Area (%)	Per Capita Value of Agricultural Output	Villages with Access to Paved Roads
Balangir	MS	I	I	S
Gajapati	I	HI	HI	HI
Kalahandi	MS	MS	MS	MS
Kandhamal	HI	HI	HI	HI
Koraput	MS	I	I	I
Malkangiri	HI	I	I	HI
Nabarangapur	MS	MS	MS	S
Nuapada	MS	I	I	S
Rayagada	I	HI	HI	I
Mayurbhanj	MS	I	I	S
Baudh	S	I	I	S
Debagarh	MS	I	I	MS

Note: HI-Highly Insecure, I-Insecure, MS-Mediocre Secure, S-Secure, HS-Highly Secure

It is seen that though the districts of Balangir, Kalahandi, Koraput, Nabarangapur, Mayurbhanj, and Debagarh, which are identified as the priority districts in terms of the FSI have been identified as moderately secure with regard to the availability dimensions. Baudh district is found to be secure in terms of the availability index. However, in terms of the individual variables, it is seen that most of the districts happen to be extremely insecure, moderately insecure, and

severely insecure. In terms of the net irrigated area, three districts are highly insecure, seven are insecure, and two are moderately secure. In terms of access to paved roads, three districts are highly insecure, two are insecure, and two are moderately insecure. Interestingly, in terms of the per capita value of the agricultural output, three districts, that is, Gajapati, Kandhamal, and Malkangiri are in the highly insecure secure category whereas the Koraput and Rayagada districts are insecure.

Table 4.6: Priority Districts Ranked by the FSI Access Index (Input Variables)

District	Access Index	Agricultural-Labour	SC/ST Population	Dependency	MPCE	Wage	Literacy
Balangir	I	I	S	MS	I	HI	I

District	Access Index	Agricultural-Labour	SC/ST Population	Dependency	MPCE	Wage	Literacy
Baudh	I	I	S	I	HI	HI	MS
Debagarh	I	I	MS	S	HI	HI	S
Gajapati	HI	HI	I	I	HI	HI	HI
Kalahandi	HI	HI	MS	I	HI	MS	I
Kandhamal	HI	I	HI	HI	HI	I	I
Koraput	HI	MS	HI	HI	HI	HI	HI
Malkangiri	HI	S	HI	HI	HI	I	HI
Mayurbhanj	I	I	I	I	HI	MS	I
Nabarangapur	HI	HI	HI	HI	HI	I	HI
Nuapada	HI	I	MS	I	HI	I	I
Rayagada	HI	HI	HI	HI	HI	S	HI

Note: HI-Highly Insecure, I-Insecure, MS-Mediocre Secure, S-Secure, HS-Highly Secure.

Of the twelve priority districts, eight are highly insecure whereas the remaining four are insecure in terms of the access index. In terms of the variables used in the access index, many of the districts fall in the either extremely insecure or severely insecure categories. In terms of agricultural labour, four of the priority districts fall in the highly insecure and another in the insecure zones. In terms of the SC/ST population, five of the districts fall in the most insecure and two in

the insecure zones. In terms of the dependency ratio, all the districts excluding Balangir and Debagarh are either most insecure or insecure. In terms of MPCE, all the districts excluding Balangir are most insecure. In terms of the wage rate, five of the 12 priority districts are most insecure and four are insecure. In terms of the female literacy rate, about half of the priority districts remained in the highly insecure category while the other half are in the severely insecure zone.

Table 4.7: Priority Districts Ranked by the FSI Utilisation Index (Input Variables)

District	Utilisation Index	Access to Safe Drinking Water	Access to PHCs
Balangir	S	HS	MS
Baudh	MS	S	I
Debagarh	HI	S	HI
Gajapati	HI	I	I
Kalahandi	MS	HS	I
Kandhamal	HI	HI	MS

District	Utilisation Index	Access to Safe Drinking Water	Access to PHCs
Koraput	MS	S	MS
Malkangiri	S	HS	S
Mayurbhanj	I	I	MS
Nabarangapur	HS	HS	HS
Nuapada	S	HS	MS
Rayagada	MS	S	MS

Note: HI-Highly Insecure, I-Insecure, MS-Mediocre Secure, S-Secure, HS-Highly Secure.

Table 4.7 explains the status of the priority districts in terms of the utilisation index and variables. In terms of the utilisation index, it is clear from the table that eight of the twelve priority districts are either mediocre secure, secure, or highly secure. Only four districts, that is, Debagarh, Gajapati, Mayurbhanj, and Kandhamal are either insecure or highly insecure. The two variables used for the utilisation index, that is, access to safe drinking water, and access to PHCs, shows that many of the districts are either moderately secure, secure, or highly secure. In the variables related to water, only two districts, Gajapati and Mayurbhanj, are insecure. The other ten districts are in the secure zone. Likewise in the case of PHCs, barring the three districts of Baudh, Gajapati, and

Kalahandi, all the other districts are secure. Table 4.8 explains the priority variables which are important for policy prescriptions in the priority districts. The Eigen vector shows the importance of a particular variable explaining food security. The near the Eigen vectors towards 1 indicate the variations in these variables. Where the Eigen vector is near zero, it shows that the variation explained by the variable is low. Here, the table shows that the variables of literacy, dependency, domination of social category, and the proportion of agricultural labour largely explain the variation. On the other hand, variables like safe water, per capita value of the agricultural output, and access to PHCs are the variables that do not capture a large variation.

Table 4.8: Priority Variables in Principal Component Analysis

Variables	Eigen Vector
Female literacy rate	.946
Dependence rate	.883
Percentage of SC/ST population	.819
Percentage of Agricultural Labour to total workers	.818
Percentage of villages having access to pucca roads within a 5 km range	.740
Average casual wage rate	.704
Monthly per capita consumption expenditure	.698
Percentage of net irrigated area to net sown area	.407

Variables	Eigen Vector
Percentage of village access to PHCs within 5 kms	.088
Percentage of households with access to safe drinking water	.060
Per capita value of agricultural output	-.279

4.3 Comparative Significance of Food Security Policy Variables

Table 4.9 presents the comparative analysis of the findings obtained from the RE, MS and PCA methods and their relation with the FSI. The correlation between the availability index and outcome index is negative and does not show much relation with both the results. The negative correlation is obvious as both the output variables taken are negative in dimensional and the availability index is positive directional. The second correlation between the access index and outcome index is -0.690 at a 5 percent degree of significance. This

indicates a high correlation between the two. The third correlation between the utilisation index and outcome index is 0.108, which is low. The correlation between FSI and FSO is -0.597 at 5% level of significance. This shows a high correlation between the two. Also, the correlation of the FSI arrived at by using the PCA and the outcome index is very high (-0.933), which shows a high degree of correlation between the two. The correlation between the PCA FSI index and availability is high (0.558) at a 5 per cent level of significance. Again, the correlation between the access index and the PCA FSI index is very high (0.964), at a 5per cent level of significance.

Table 4.9: Inter-correlation Matrix of Input and Output Components of Food Security

	Range Equalisation Method			FSI PCA Method	Outcome	
	Availability	Access	Utilisation	FSI		
Availability RE	1					
Access RE	.452*	1				
Utilisation RE	.361*	.046	1			
Overall RE	.697**	.934**	.327	1		
Index PCA	.558**	.964**	.048	.933**	1	
Outcome	-.234	-.690**	.108	-.597**	-.654**	1

Note: * 1 percent level of significance ** 5 percent level of significance.

We now focus on the inter-relationship of the individual food security variables to the aggregate index of different dimensions of the FSI as well as the outcome index in order to assess the strength of the relationships of these variables to the food security indices. These are shown in Table 4.10. It is seen that excluding three variables, that is, the percentage of

agricultural labourers to total workers, access to safe drinking water, and access to PHCs, all other variables show a strong positive correlation of variables and FSI. The correlation between the outcome variable is arrived at by using different variables in calculating the FSI, including agricultural labour (0.292), irrigated area (-0.155), access to drinking water (0.112), and

access to PHCs (0.040), which show a low correlation. Two variables, that is, access to safe drinking water and PHCs, show a high degree of correlation. The other variables show a low correlation.

We have also looked at the correlations among the individual variables to the three component composite Indices in order to assess the importance of the variables in constructing the indices.

Table 4.10: Correlation Matrix of the Food Security Index and Components

	Availability Index	Access Index	Utilization Index	Food Security Index-RE	Food Security Index-PCA	FSOI
Percapita value of agricultural output	.421*	-.255	.314	-.033	-.325	.292
% net irrigated area to net sown area	.751**	.357	.065	.498**	.552**	-.155
% of villages having access to paved road	.608**	.655**	.323	.751**	.684**	-.522**
Percentage of agricultural labourers to total workers	.184	.829**	.099	.736**	.767**	-.607**
MPCE	.113	.713**	.048	.615**	.629**	-.418*
Percentage of SC and ST populations	.558**	.827**	-.042	.805**	.865**	-.494**
Ratio of working age population	.557**	.883**	.119	.882**	.819**	-.639**
Rural casual wage rate	.235	.719**	.041	.650**	.733**	-.498**
Female literacy rate	.496**	.951**	-.020	.894**	.912**	-.736**
% of households with access to safe drinking water	.538**	.015	.787**	.307	.064	.112
% of villages having PHCs within a distance of 5 km	-.062	.055	.673**	.159	.000	.040

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

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

4.3.1 The Availability Index

The three variables which have been used to develop this Index are the per capita value of agricultural output, the percentage of the % net irrigated area to net sown area, and the percentage of villages having access to paved roads. All these three reveal a very

strong correlation and, in fact, a much stronger correlation with the Availability Index than with the FSI. The percentage of SC/ST population shows the strong correlation ($r=+0.558^{**}$) with the Food Security Availability Index. The per capita value of agricultural output ($+0.673^{*}$), ratio of the working population (0.557^{**}), female literacy rate ($+0.496$),

and access to safe drinking water (+0.538) show a very strong correlation to the Availability Index.

4.3.2 The Access Index

We now look at the correlation of the Food Security Access Index with the six variables taken for the access dimension. Among these, all the six variables reveal a strong and statistically significant correlation, namely, the proportion of agricultural labourers to total workers ($r=0.829^*$), female literacy rate ($r=0.951^*$), ratio of the working age population (0.883**), and the rural casual wage rate ($r=+0.719^*$), MPCE (0.713**), proportion of SC/ST (0.827**). Besides, the proportion of villages having access to paved roads, which is a variable in the availability dimension, also has a high correlation with the access index. 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. Further, the female literacy rate, casual wage rate, and

ratio of the working age population also play important roles in case of access to food security. Hence, we need to take into account these variables in the policy support to raise the food security level of various districts in the state.

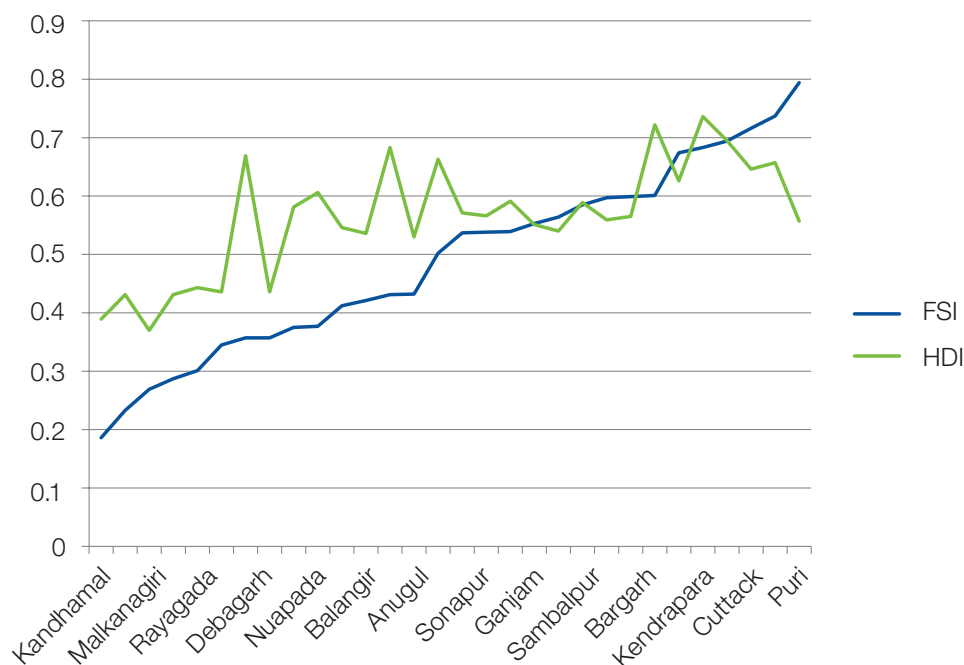
4.3.3 The Utilisation Index

The Food Security Absorption Index is composed of only two variables, namely, the availability of safe drinking water and access to PHCs. Therefore, their separate correlations with the composite index would be expected to be quite high and they emerge to be very strong ($r=+0.787^{**}$ and $r=0.673^{**}$, respectively).

4.3.4 A Comparative Analysis of FSI and Human Development Index at District Level

The relation between food security and human development is very complex. In Figure 4.1 (Appendix Table 4.1), we illustrate the relationship between the

Figure 4.1:A Comparison between the Food Security Index and Human Development Index



Source: Human development index, Planning Commission, 2004. http://planningcommission.gov.in/plans/stateplan/sdr_pdf/shdr_ori04.pdf

human development index and the FSI for districts in Odisha. It may be observed that a very strong positive relationship exists between the FSI and the human development index, meaning thereby that the developed districts in terms of human development are also districts enjoying higher food security. The Pearson's correlation of both the variables is high at 0.700.

Table 4.11 narrates the status of the priority districts in

terms of the eleven indicators taken to construct the FSI. This clearly shows that the out of the ten priority districts, irrigation facilities available in the six districts are below average. In terms of the per capita value of agricultural output, only four districts are below the state average. In terms of the access to pucca roads, six of the ten priority districts are below the state averages. A majority of the priority districts remain below the state average in terms of the variables taken to construct the access index.

Table 4.11: Status of Priority Districts by Food Security Variables

District	Percentage of Net Irrigated Area to Net Sown Area	value of agricultural output (rupees)	% pucca road	% Other than agl lab to total worker	% other then SC/ST to total popn	ratio of working age popn to non working age popn	MPCE	Casual rural wage rate	Female literacy rate	% HH safe drinking water	percentage villages having phc within 5 km
Balangir	BSA	ASA	ASA	BSA	ASA	BSA	BSA	BSA	BSA	ASA	ASA
Baudh	ASA	ASA	ASA	BSA	ASA	BSA	BSA	BSA	BSA	ASA	BSA
Debagarh	BSA	ASA	ASA	BSA	BSA	ASA	BSA	BSA	ASA	BSA	BSA
Gajapati	ASA	BSA	BSA	BSA	BSA	BSA	BSA	BSA	BSA	BSA	BSA
Kalahandi	ASA	ASA	BSA	BSA	BSA	BSA	BSA	ASA	BSA	ASA	BSA
Kandhamal	BSA	BSA	BSA	BSA	BSA	BSA	BSA	BSA	BSA	BSA	BSA
Koraput	ASA	ASA	BSA	BSA	BSA	BSA	BSA	BSA	BSA	ASA	BSA
Malkangiri	BSA	ASA	BSA	ASA	BSA	BSA	BSA	BSA	BSA	ASA	ASA
Mayurbhanj	BSA	BSA	ASA	BSA	BSA	BSA	BSA	BSA	BSA	BSA	ASA
Nabarangapur	BSA	ASA	ASA	BSA	BSA	BSA	BSA	BSA	BSA	ASA	ASA
Nuapada	BSA	ASA	ASA	BSA	BSA	BSA	BSA	BSA	BSA	ASA	ASA
Rayagada	ASA	BSA	BSA	BSA	BSA	BSA	BSA	ASA	BSA	ASA	BSA
Odisha	28.4	996	74.4	56.2	56.5	1.53	1086	119	60.7	76.1	34.4

Note: BSA-Below state average, ASA- Above state averages.

4.4 COMPARISON OF THE FOOD SECURITY INDEX BETWEEN 2008-09 AND 2016-17 [OR 2007-08 AND 2015-16]

In the year 2008, the Institute for Human Development (IHD) had prepared a state-specific food security atlas with a comprehensive analysis at the district and regional levels in collaboration with the World Food Programme (WFP). This atlas, which was prepared at the district level, showed the status of the districts in terms of the three dimensions as well as the overall food

security index. This section provides a comparative analysis of the food security index, dimension of food security index, and the outcome index at two points of time, that is, 2007-08 and 2015-16. This section tries to identify the change in status of the districts in terms of both the dimensional as well as the overall food security status.

It is seen that Spearman Rank Correlation between the 2008-09 and 2016-17 food security and dimensional indices, which shows that the district's status in the outcome and availability indices has changed to a large extent whereas in the case of access, utilisation, and the overall index, a minimal change is seen from Table 4.12. It is interesting to observe the transition of the

Table 4.12: Rank Correlation of Food Security Index and Dimensional Index in Two Time Periods, 2007-08 and 2015-16

Dimension	Rank Correlation between 2008 and 2016
Availability	0.721
Access	0.949
Utilization	0.815
Overall	0.907
Outcome	0.670

districts from food-insecure to food-secure and vice versa. The dimension-wise comparative picture is given in Tables 4.13 to Table 4.16.

Table 4.13 (next page) explains the status of the districts with regard to the availability index over the period 2007-08 to 2015-16. It is clearly seen that 13 districts retain the same position that they had occupied in 2008. In terms of the availability index, the district of Gajapati, which was a severely insecure district, became an extremely insecure district. The districts of Malkangiri, Koraput, and Rayagada, which were moderately insecure in 2007-08, slid down to extremely insecure status in 2015-16. The districts of Debagarh, Mayurbhanj, Nuapada, Balangir, and

Baudh, which were moderately insecure, slid down to severely insecure status whereas the district of Kalahandi, which was moderately secure in 2007-08, shifted to the severely insecure zone. The districts of Sundargarh and Anugul marked a slight improvement over the period under study, from severely insecure status in 2008 to moderately insecure status in 2015-16. The district of Sambalpur moved from insecure to secure status over this period. The coastal district of Khordha, which was moderately secure in 2007-08, improved to the status of a secure district. Likewise, the district of Kendrapara also showed an improvement from moderately insecure to secure status.

Table 4.13:

Status of Districts in Terms of the Availability Index (Range Equalisation Method) 2007-08 and 2015-16

		2007-08				
		Extremely Insecure	Severely Insecure	Moderately Insecure	Moderately Secure	Secure
2015-16	Extremely Insecure	Kandhamal	Gajapati	Malkangiri Koraput Rayagada		
	Severely Insecure		Nabarangapur	Debagarh Mayurbhanj Nuapada Balangir Baudh	Kalahandi	
	Moderately Insecure		Sundargarh Anugul	Kendujhar Nayagarh Dhenkanal		Subarnapur
	Moderately Secure			Sambalpur	Ganjam Jajapur Baleshwar Jharsuguda	Bargarh
	Secure			Kendrapara	Khordha	Cuttack, Bhadrak Puri Jagatsinghapur

In terms of the access dimension also, the conditions of 18 out of 30 districts in Odisha remained the same in 2015–16 as they were in 2007-08. The districts of Malkangiri, Gajapati, Kandhamal, Kalahandi, and Nuapada which were severely insecure in 2007-08, became extremely insecure in 2015-16. The district of Kendujhar, which was moderately secure in 2007-08, also became severely insecure. The district which showed some improvement over time is Sambalpur, which improved from moderately insecure

to moderately secure status. The districts of Jajapur, Nayagarh and Bhadrak slipped slightly from secure to moderately secure status (Table 4.14).

However in terms of the utilisation dimension, comparatively good progress has been achieved as compared to the access dimension. A total of 13 districts have remained in the same group of insecure districts as were in 2007-08. The districts that show improvements over time are Dhenkanal, Anugul, and Mayurbhanj, which moved to the severely insecure

Table 4.14:

**Status of Districts in Terms of the Access Index (Range Equalisation Method)
2007-08 and 2015-16**

		2007-08				
		Extremely Insecure	Severely Insecure	Moderately Insecure	Moderately Secure	Secure
2015-16	Extremely Insecure	Koraput Nabarangapur Rayagada	Malkangiri Gajapati Kandhamal Kalahandi Nuapada			
	Severely Insecure		Debagarh Mayurbhanj Balangir Baudh Sundargarh	Kendujhar		
	Moderately Insecure		Sambalpur	Bargarh Subarnapur	Ganjam	
	Moderately Secure			Jharsuguda	Baleshwar Anugul Dhenkanal	Jajapur Nayagarh Bhadrak
	Secure					Khordha Kendrapara Puri Cuttack Jagatsinghapur

from the extremely insecure status. The other districts of Baudh, Kendujhar, and Sambalpur improved from the extremely insecure to moderately insecure status. The districts that show some improvements are Ganjam, Cuttack, Jharsuguda, and Nabarangapur. Only Puri and Baleshwar recorded a deterioration in status in 2016-17 as compared to 2008-09 in the utilisation dimension. While Puri showed a slide down from moderately secure to moderately insecure status,

the district of Baleshwar fell from secure to moderately secure status.

Table 4.16 explains the status of districts in the FSI and its changing status over a period of time. Eighteen of the thirty districts have remained in the same position from 2007-08 to 2015-16. The districts of Koraput and Malkangiri, which are the part of the KBK region, show a slide from the severely insecure to extremely insecure

Table 4.15: Status of Districts in Terms of Utilisation Index (RE) 2007-08 and 2015-16

		2007-08				
		Extremely Insecure	Severely Insecure	Moderately Insecure	Moderately Secure	Secure
2015-16	Extremely Insecure	Gajapati Kandhamal Debagarh				
	Severely Insecure	Dhenkanal Anugul Mayurbhanj	Nayagarh Jajapur	Subarnapur		
	Moderately Insecure	Baudh Kendujhar Sambalpur	Ganjam	Khordha Koraput Kalahandi Rayagada	Puri	
	Moderately Secure		Cuttack	Kendrapara Balangir Malkangiri Sundargarh	Nuapada Bhadrak Jagatsinghapur	Baleshwar
	Secure			Jharsuguda	Nabarangapur	Bargarh

status. On the other hand, the district of Nabarangapur shows an improvement from the extremely insecure to severely insecure status. The districts of Sundargarh, Kendujhar, and Anugul improve from the severely insecure to moderately insecure status. The district of Sambalpur shifts from the insecure status to secure status. The districts of Ganjam and Jharsuguda also

move from the insecure to the secure zone. The coastal districts of Khordha, Cuttack, and Kendrapara mark a progress from the moderately secure to secure status. In conclusion, it can be said that some districts have shown an improvement in the FSI over time.

Table 4.17 delineates the status of districts in terms of the outcome index and the change in the position of districts

Table 4.16: Status of Districts in Terms of the Food Security Index (FSI)

		2007-08				
		Extremely Insecure	Severely Insecure	Moderately Insecure	Moderately Secure	Secure
2015-16	Extreme Insecure	Kandhamal Gajapati Rayagada	Koraput Malkangiri			
	Severely Insecure	Nabarangapur	Debagarh Mayurbhanj Nuapada Kalahandi Balangir Baudh			
	Moderate Insecure		Sundargarh Kendujhar Anugul	Dhenkanal Nayagarh Subarnapur		
	Moderately Secure		Sambalpur	Ganjam Jharsuguda	Jajapur Balেশwar Bargarh	
	Secure				Khordha Cuttack Kendrapara	Bhadrak Puri Jagatsinghapur

over a period of time. The districts of Nabarangapur, Ganjam, and Balangir slide down from a severely insecure to an extremely insecure status whereas the districts of Gajapati and Nuapada improve from the extremely insecure to the severely insecure status. The coastal district of Bhadrak shows an improvement from

the severely insecure to the moderately secure status. The districts of Jajapur and Kendrapara also show an improvement and shift from the insecure to a secure status. The districts of Puri, Cuttack, and Jharsuguda, on the other hand, show a deterioration in the food outcome status over a period of time.

Table 4.17:

Status of Districts in Terms of the Food Security Outcome Index, 2007-08 and 2015-16

		2007-08				
		Extremely Insecure	Severely Insecure	Moderately Insecure	Moderately Secure	Secure
2015-16	Extremely Insecure	Kandhamal Malkangiri Rayagada	Nabarangapur Ganjam Balangir			
	Severely Insecure	Gajapati Nuapada	Sambalpur Boudh Koraput Kalahandi	Puri		
	Moderately Insecure		Sundargarh Subarnapur Bargarh, Kendujhar	Mayurbhanj Khordha Debagarh	Cuttack	
	Moderately Secure		Bhadrak	Anugul Dhenkanal	Baleshwar	Jharsuguda
	Secure		Jajapur	Kendrapara	Nayagarh Jagatsinghapur	

Note: The composite index has been arrived at by taking the Underweight (Below -2 SD) and Under-Five Mortality Rate (%).

4.5 SUMMING UP

The primary focus of this chapter has been on estimating the overall FSI at the district level in Odisha, by identifying the districts at the lowest level, which need specific policy interventions. The districts which need special attention are the districts lying in the KBK region such as Kalahandi, Nuapada, Balangir, Sonapur, Jajapur, Nabarangapur, and Malkangiri, in addition to other districts like Boudh, Debagarh, and Kandhamal. These districts also face a geographical disadvantage as they lack of good infrastructure and are inhabited by people belonging to the lower social and marginalised classes. A specific state intervention policy is thus needed to improve the food security

pattern of these districts. This makes it imperative to introduce the necessary policy instruments for promoting the development of the region in the first place and then improving the various aspects of food security. The state needs to directly focus on irrigation, roads, female literacy, provision of safe drinking water, and public health facilities in these regions as well as in all the food-insecure districts. Further, the state can indirectly intervene in the areas of agricultural output, consumption expenditure, and the agricultural wage rate. Further, the proportion of the SC/ST population, dependency rate, and proportion of the agricultural workforce can be improved through the initiation of welfare development programmes.

5

FOOD SECURITY REVISED INDEX

5.1 INTRODUCTION

In Chapters 3 and 4, we analysed the Food Security Index (FSI) and outcome index based on the variables used in the Food Security Atlas of rural Odisha for 2008. Based on the literature as well as discussions with experts,⁵ we found that sanitation and health behaviour play an important role in determining the

food security/insecurity in a district. In this chapter, some of the variables have been revised or interchanged within the dimensions and a new FSI and FSO have been developed based on these revisions.

Table 5.1 shows a comparison of the variables used in the three main dimensions of food security, that is, the availability index, access index, utilisation index, as well as outcome index. Appendix Table 5.1 gives the sources of the respective variables.

Table 5.1: Comparison of the Variables Used

Dimensions	Old Variables	New Variables ⁶
Availability Index	1. Per capita value of agricultural output	1. Per capita value of agricultural output
	2. Proportion of net irrigated area to net sown area	2. Proportion of net irrigated area to net sown area
	3. Percentage of inhabited villages having access to paved roads	3. Percentage of village access to town within 10 km distance
Access Index	1. Percentage of agricultural labour to total workers.	1. Percentage of agricultural labour to total workers
	2. Proportion of ST and SC population to total population	2. Proportion of ST and SC population to total population
	3. Ratio of working age population	3. Ratio of working age population
	4. Monthly per capita consumption expenditure	4. Monthly per capita consumption expenditure
	5. Rural casual wage rate	5. Rural casual wage rate
	6. Female literacy rate (7+)	6. Percentage of inhabited villages having access to paved roads.

⁵ At the review meeting held at the Institute for Human Development and Indira Gandhi Institute for Research and Development for discussing the methodology used and findings reported in this atlas.

⁶ List of new variables and sources given in Appendix Table 5.1 at the end of this chapter.

Dimensions	Old Variables	New Variables ⁶
Utilization Index	1. Percentage of households having access to safe drinking water.	1. Percentage of households having access to safe drinking water.
	2. Percentage of inhabited villages having access to Primary Health Centre in rural areas within 5 km range	2. Percentage of inhabited villages having access to Primary Health Centre in rural areas within 5 km range
		3. Female literacy rate (7+) (rural)
		4. Disease and health behaviour (100-Prevalence of diarrhoea (reported) in the last two weeks preceding the survey (%))
		5. Percentage of households with access to toilets
Outcome Index	1. % of children underweight (0-5 years) under 2SD	1. Children under 5 years who are underweight (weight-for-age) (%)
	2. Body Mass Index (BMI) among women	2. Women whose BMI is below normal (BMI < 18.5 kg/m ²) (%)
		3. Children age 6-59 months who are anaemic (<11.0 g/dl) (%)
		4. Micronutrient (percentage of household not satisfying recommended calorie, protein and fat all three)

5.2 THE AVAILABILITY INDEX

Three important variables have been taken into account in the availability index. The first and second variables are the per capita value of agricultural output and proportion of net irrigated area to net sown area, respectively, which have also been used in the previous index, with a detailed description given in Chapter 3. The third variable used in the availability index is the percentage of villages having access to towns within a distance of 10 km.

The access of villages to towns is an important indicator of food security. Proper access to urban areas ensures efficient marketing of rural agricultural products. On the other hand, people staying in villages

that are far from towns face a hard time in marketing their produce, thereby losing out to market-based opportunities (Krishna, et al., 2011). Also, villages located closer to towns have better access to both agricultural inputs meant for rural areas, as well as opportunities for employment in the non-agricultural sector. This helps to reduce disguised unemployment in rural areas, while ensuring a high wage rate.

Table 5.2 presents the district-wise percentage of villages having access to towns within a range of 10 km. It clearly shows that the districts located in the KBK regions have a very low proportion of villages having access to towns within a distance of 10 km. On the other hand, the districts in the coastal areas have a large proportion of villages located close to towns within a 10 km distance. Of the total of 30 districts, 17

have a lower proportion of villages with such access, as compared to the corresponding figure for Odisha as a whole.

The availability index has been formed by taking into account three variables including the proportion of the net irrigated area to the net sown area, the per capita value of agricultural output, and the proportion of villages having access to towns within a distance of 10

km. Table 5.3 and Map 5.1 present the status of the districts in terms of the availability index by using the range equalisation method.

Table 5.3 shows the status of districts as per the availability index. The correlation of the index value of availability index between old and new variables is 0.740. Map 5.2 depicts the revised availability index based on the range equalisation method.

Map 5.1: Percentage of Villages with Access to Towns, 2011

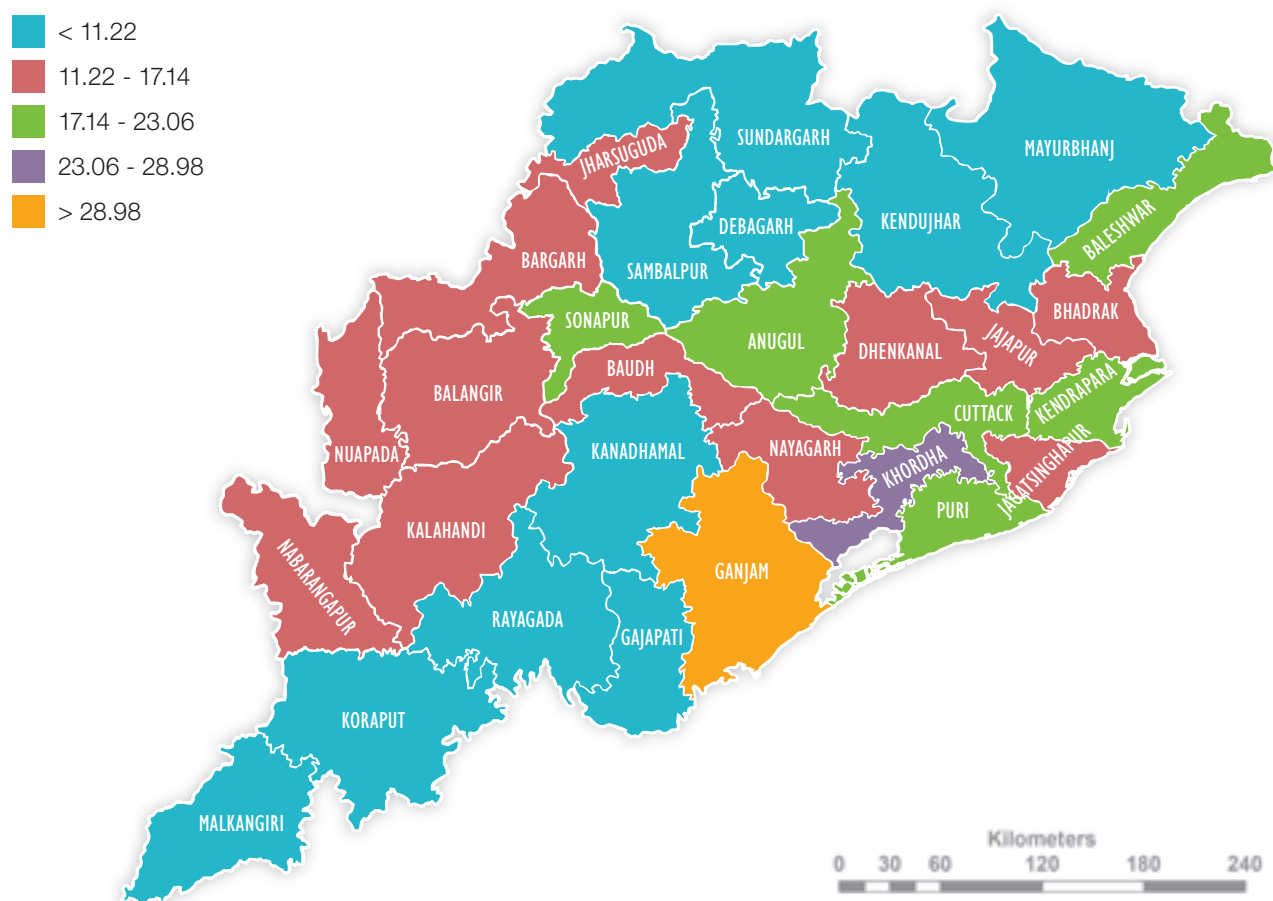


Table 5.2: Percentage of Villages with Access to Towns within a Distance of 10 km, 2011

District	% Villages	District	% Villages	District	% Villages
Kandhamal	5.3	Bargarh	11.4	Nuapada	16.6
Rayagada	5.7	Baudh	12.0	Jagatsinghapur	17.1
Sundargarh	6.5	Jharsuguda	12.4	Kendrapara	17.2

District	% Villages	District	% Villages	District	% Villages
Debagarh	6.5	Nabarangapur	12.7	Subarnapur	17.8
Koraput	7.0	Nayagarh	12.9	Baleshwar	19.2
Malkangiri	8.3	Bhadrak	13.4	Anugul	19.6
Gajapati	9.3	Balangir	13.8	Cuttack	21.7
Kendujhar	10.2	Kalahandi	15.5	Puri	22.6
Sambalpur	10.3	Jajapur	16.0	Khordha	28.3
Mayurbhanj	11.2	Dhenkanal	16.5	Ganjam	34.9
Odisha			14.7		

Source: Census of India.

Map 5.2: Revised Availability Index (Range Equalisation Method)

- < 0.16 Extreme Insecure
- 0.16 - 0.31 Severely Insecure
- 0.31 - 0.45 Moderate Insecure
- 0.45 - 0.60 Moderately Insecure
- > 0.60 Secure

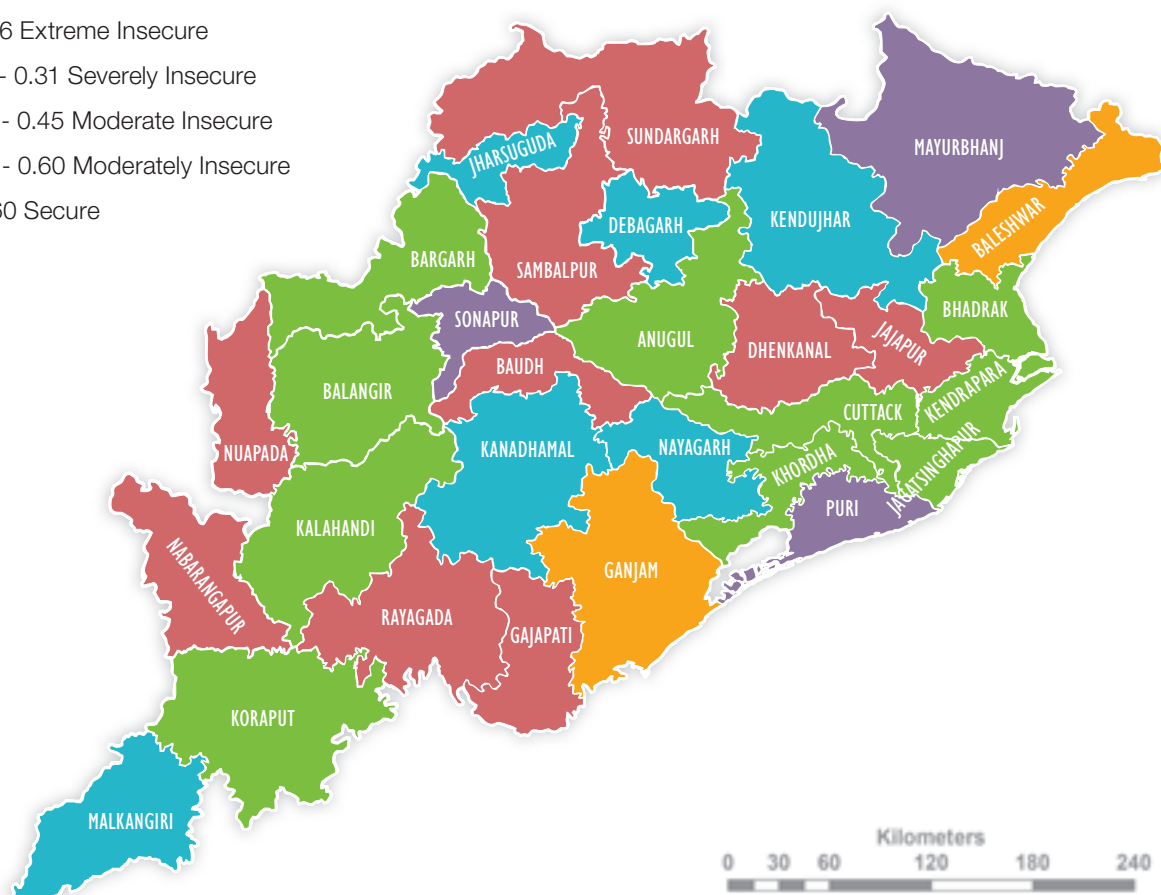


Table 5.3: Revised Availability Index (Range Equalisation Method)

Extremely Insecure		Severely Insecure		Moderately Insecure		Moderately Secure		Secure	
District	Index	District	Index	District	Index	District	Index	District	Index
Kandhamal	0.014	Rayagada	0.190	Anugul	0.321	Mayurbhanj	0.462	Baleshwar	0.620
Debagarh	0.076	Dhenkanal	0.211	Balangir	0.328	Subarnapur	0.515	Ganjam	0.753
Malkangiri	0.103	Sundargarh	0.226	Kendrapara	0.334	Puri	0.570		
Jharsuguda	0.118	Jajapur	0.228	Koraput	0.338				
Nayagarh	0.146	Nuapada	0.238	Bhadrak	0.350				
Kendujhar	0.152	Sambalpur	0.245	Khordha	0.368				
		Gajapati	0.250	Kalahandi	0.390				
		Nabarangapur	0.258	Bargarh	0.393				
		Baudh	0.264	Jagatsinghapur	0.433				
				Cuttack	0.453				

5.3 THE ACCESS INDEX

The access dimension comprises six variables including the percentage of agricultural labourers to the total workers, the proportion of the ST and SC population to the total population, ratio of the working age population (rural), monthly per capita consumption expenditure (inequality-adjusted), and the rural casual wage rate. The difference between the previous and revised access indices is that the percentage of villages with access to paved roads was previously included in

the availability index whereas now it has been included in the revised access index. Another variable is the female literacy rate, which was previously included in the access index but has now been shifted to the utilisation index. A detailed description of the importance of each variable used to construct the revised access index has been given in Chapter 3.

Table 5.4 and Map 5.3 show that a total of twelve districts, including Malkangiri, Gajapati, Koraput, Kandhamal, Nabarangapur, Rayagada, Kalahandi, Debagarh, Baudh, Nuapada, Mayurbhanj, and Balangir,

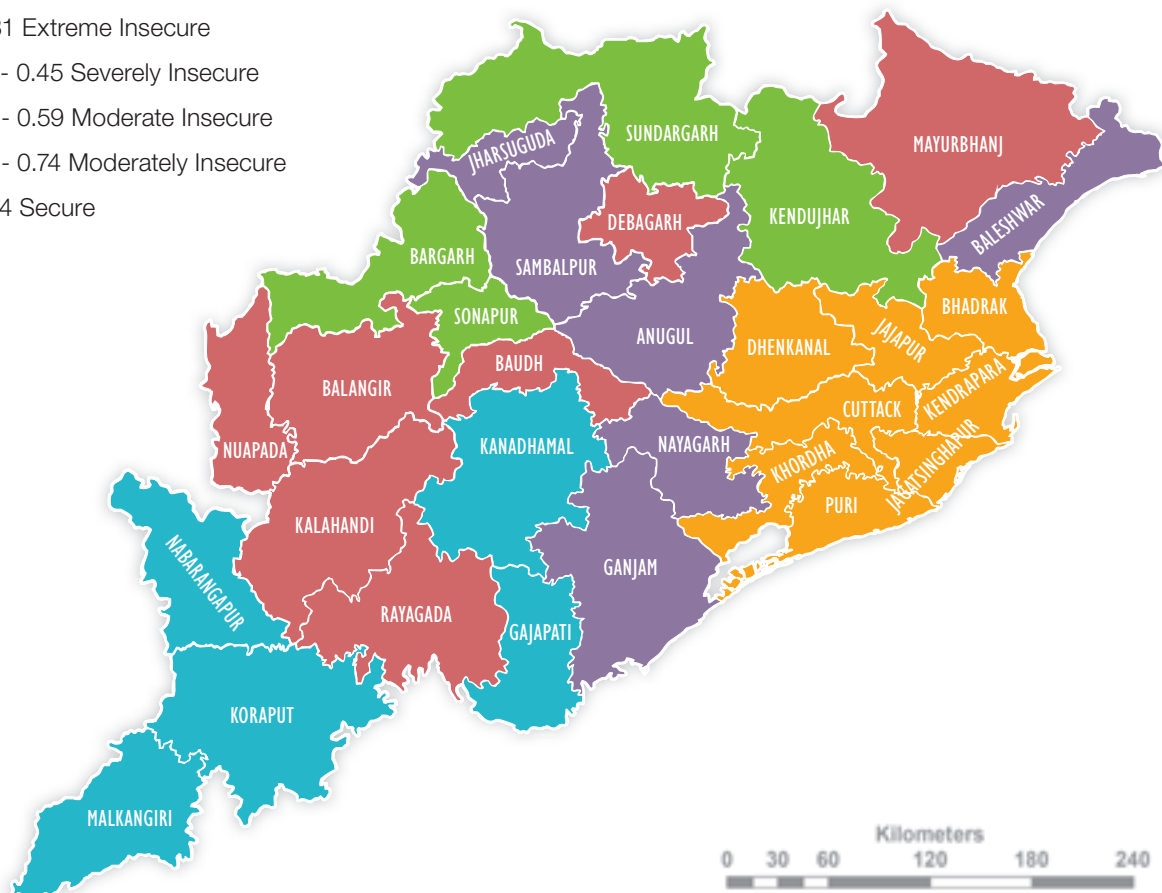
Table 5.4: Revised Access Index (Range Equalisation Method)

Extremely Insecure		Severely Insecure		Moderately Insecure		Moderately Secure		Secure	
District	Index	District	Index	District	Index	District	Index	District	Index
Malkangiri	0.165	Rayagada	0.329	Kendujhar	0.468	Sambalpur	0.604	Dhenkanal	0.745
Gajapati	0.190	Kalahandi	0.355	Sundargarh	0.469	Ganjam	0.640	Jajapur	0.761

Extremely Insecure		Severely Insecure		Moderately Insecure		Moderately Secure		Secure	
District	Index	District	Index	District	Index	District	Index	District	Index
Koraput	0.214	Debagarh	0.373	Subarnapur	0.470	Baleshwar	0.685	Khordha	0.807
Kandhamal	0.241	Baudh	0.390	Bargarh	0.535	Jharsuguda	0.704	Cuttack	0.808
Nabarangapur	0.288	Nuapada	0.407			Anugul	0.705	Bhadrak	0.816
		Mayurbhanj	0.409			Nayagarh	0.736	Kendrapara	0.849
		Balangir	0.436					Puri	0.866
								Jagatsinghapur	0.888

Map 5.3: Revised Access Index (Range Equalisation Method)

- < 0.31 Extreme Insecure
- 0.31 - 0.45 Severely Insecure
- 0.45 - 0.59 Moderate Insecure
- 0.60 - 0.74 Moderately Insecure
- > 0.74 Secure



fall in the two lowest categories, severely insecure and extremely insecure, of the food access index. Among these districts, seven belong to the KBK region. On the other hand, almost all the coastal districts fall in the secure zone. The correlation between the access index containing the new group of variables and the old variables is 0.976, which shows that the status of the district is almost the same in both groups of variables.

5.4 THE UTILISATION INDEX

The revised utilisation index contains a total of five variables including the percentage of households having access to safe drinking water, percentage of inhabited villages having access to a PHC in rural areas within a distance of 5 km, the female literacy rate (7+) (rural), disease and health behaviour (100-prevalence of diarrhoea (reported) in the last two weeks preceding the survey (%), and percentage of households with access to toilets. The first two variables have been taken for constructing the utilisation index in Chapter

3 while the variable, female literacy rate, had previously been taken in the access index. Chapter 3 also contains a detailed explanation of the importance of and reason for taking the variables relating to literacy, access to PHCs, and safe drinking water in the revised utilisation index whereas the remaining two variables have been included in the construction of this index only now.

Prevalence of diarrhoea: There is a clear association between morbidity and severe food insecurity. Gubert, et al., 2016, found a high degree of association between severe food insecurity and the prevalence of common morbidities. They also show that severely food-insecure children had a greater likelihood of experiencing cough and of being hospitalised for diarrhoea.

The other variable is sanitation or access to toilets. Lack of access to proper sanitation and proper hygiene increases the chances of contamination of food. This, in turn, can cause diarrhoea and other intestinal diseases, and eventually under-nutrition. It is thus a vicious cycle—intestinal diseases lead to under-

Table 5.5:

Prevalence of Diarrhoea (Reported) in the Last Two Weeks Preceding the Survey (%), 2015-16

District	Percentage	District	Percentage	District	Percentage
Bargarh	2.2	Jagatsinghapur	8.2	Malkangiri	9.9
Koraput	2.5	Sambalpur	8.5	Baudh	10.5
Sundargarh	4.9	Subarnapur	8.8	Rayagada	11.2
Ganjam	4.9	Kalahandi	8.8	Bhadrak	12.1
Anugul	5.5	Cuttack	9.2	Debagarh	13.6
Nuapada	5.5	Jajapur	9.3	Kendrapara	14.6
Gajapati	6.4	Dhenkanal	9.3	Mayurbhanj	16.6
Nabarangapur	6.8	Khordha	9.4	Nayagarh	17.0
Puri	6.9	Kandhamal	9.4	Baleshwar	19.9
Jharsuguda	8.0	Balangir	9.6	Kendujhar	21.9
Odisha			10.2		

Source: NFHS Factsheet, 2015-16.

nutrition through decreased nutrient absorption, while under-nutrition reduces the body's ability to fight off further infections. Lack of sanitation among children thus puts them at a high risk of diarrhoea. Table 5.6 shows that access to toilets as per the

2011 Census is as low as 15 percent in rural Odisha. While in the coastal districts, about one-fifth of the total households have access to toilets, in the KBK districts, a much lower proportion of the households have access to toilets.

Table 5.6: Percentage of Households with Access to Toilets, 2011

District	Percentage	District	Percentage	District	Percentage
Debagarh	6.3	Kendujhar	10.2	Nayagarh	17.0
Malkangiri	7.3	Jharsuguda	10.3	Kendrapara	17.0
Nabarangapur	7.3	Baudh	10.3	Bhadrak	18.1
Kandhamal	7.4	Balangir	11.4	Anugul	18.1
Rayagada	8.2	Bargarh	13.2	Khordha	19.5
Kalahandi	9.0	Nuapada	13.5	Ganjam	20.5
Subarnapur	9.4	Gajapati	14.0	Jajapur	21.6
Sambalpur	9.4	Dhenkanal	15.2	Jagatsinghapur	22.8
Koraput	9.5	Mayurbhanj	16.2	Cuttack	23.3
Sundargarh	10.0	Puri	16.7	Baleshwar	24.4
Odisha			15.3		

Source: Census of India, 2011.

Table 5.7 and Map 5.4 show the utilisation index based on the new set of variables. In the utilisation index, the extremely insecure districts are Kendujhar, Kandhamal, and Debagarh, whereas most of the

KBK districts fall in the severely insecure category. On the other hand, four districts from the coastal region and Bargarh from western Odisha fall in the secure category.

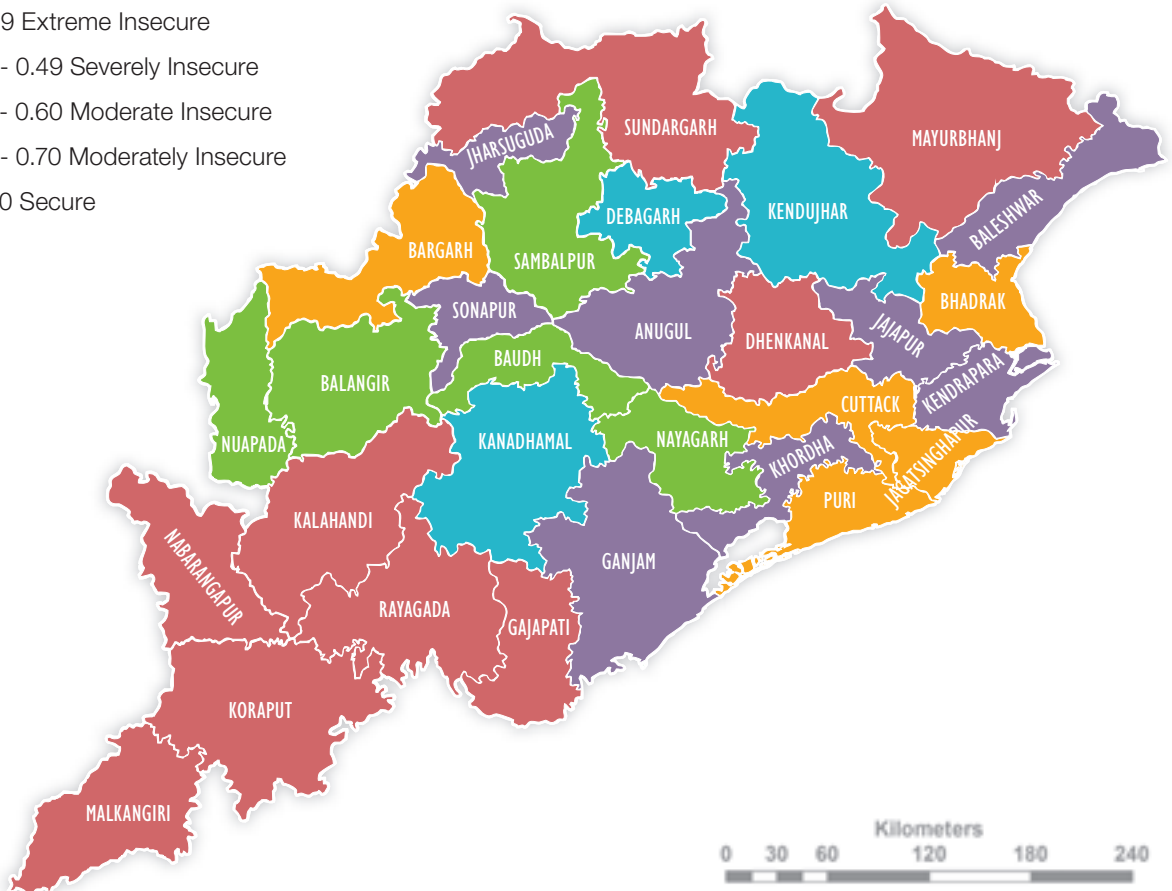
Table 5.7: Percentage of Households with Access to Toilets, 2011

Extremely Insecure		Severely Insecure		Moderately Insecure		Moderately Secure		Secure	
District	Index	District	Index	District	Index	District	Index	District	Index
Kendujhar	0.286	Rayagada	0.397	Sambalpur	0.519	Subarnapur	0.604	Bargarh	0.713
Kandhamal	0.304	Mayurbhanj	0.430	Baudh	0.519	Jharsuguda	0.607	Puri	0.732
Debagarh	0.340	Malkangiri	0.439	Nayagarh	0.535	Anugul	0.622	Cuttack	0.740
		Gajapati	0.450	Balangir	0.543	Khordha	0.631	Jagatsinghapur	0.808

Extremely Insecure		Severely Insecure		Moderately Insecure		Moderately Secure		Secure	
District	Index	District	Index	District	Index	District	Index	District	Index
		Sundargarh	0.456	Nuapada	0.566	Ganjam	0.651	Bhadrak	0.813
		Dhenkanal	0.464			Jajapur	0.680		
		Koraput	0.471			Baleshwar	0.696		
		Nabaran-gapur	0.476			Kendrapara	0.700		
		Kalahandi	0.496						

Map 5.4: Revised Utilisation Index (Range Equalisation Method)

- < 0.39 Extreme Insecure
- 0.39 - 0.49 Severely Insecure
- 0.49 - 0.60 Moderate Insecure
- 0.60 - 0.70 Moderately Insecure
- > 0.70 Secure



5.5 THE OVERALL FOOD SECURITY INDEX

The overall FSI based on the range equalisation method has been calculated by taking the sum of the averages of all the three-dimensional indices, that is, the Availability Index, the Access Index, and the Utilisation Index. All the districts have been grouped into five broad categories ranging from ‘extremely food-insecure’ to ‘extremely food-secure’ status. Table 5.8 and Map 5.4 identify the status of the districts in terms of the food security index based on the range equalisation method.

The three extremely insecure districts include Kandhamal, Malkangiri, and Debagarh, while the seven severely-insecure districts include Gajapati, Kendujhar, Rayagada, Nabarangapur, Koraput, Sundargarh, and Baudh. There is an urgent need to improve the food security input indicators in these states. On the other hand, the most food-secure districts in the state are Kendrapara, Bhadrak, Baleswar, Cuttack, Ganjam, Jagatsinghapur, and Puri. The food security status of all the districts derived from the range equalisation method is illustrated in Table 5.8 and Map 5.4.

Map 5.5: Revised Food Security Index Based on the Range Equalisation Method

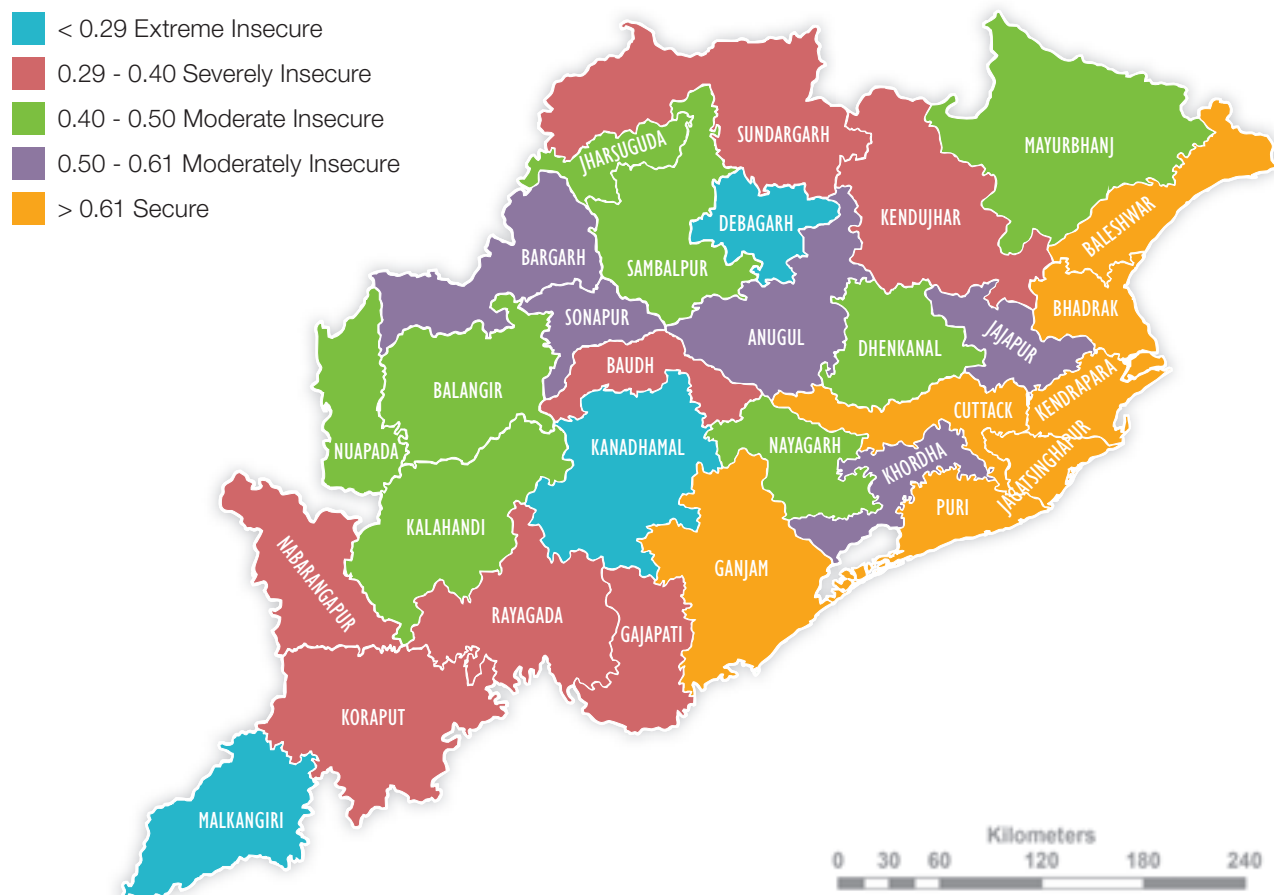


Table 5.8: Revised Overall Food Security Index Based on the Range Equalisation Method

Extremely Insecure		Severely Insecure		Moderately Insecure		Moderately Secure		Secure	
District	Index	District	Index	District	Index	District	Index	District	Index
Kandhamal	0.186	Gajapati	0.297	Nuapada	0.404	Subarnapur	0.530	Kendrapara	0.627
Malkangiri	0.236	Kendujhar	0.302	Kalahandi	0.414	Bargarh	0.547	Bhadrak	0.660
Debagarh	0.263	Rayagada	0.305	Mayurbhanj	0.434	Anugul	0.549	Baleshwar	0.667
		Nabarangapur	0.341	Balangir	0.435	Jajapur	0.556	Cuttack	0.667
		Koraput	0.341	Sambalpur	0.456	Khordha	0.602	Ganjam	0.681
		Sundargarh	0.384	Nayagarh	0.472			Jagatsinghapur	0.710
		Baudh	0.391	Dhenkanal	0.474			Puri	0.722
				Jharsuguda	0.477				

Further, the Principal Component Analysis Method, which is one of the most important techniques for analysing the status of food security, has been used to construct the overall FSI. This method is used to compute the factor loading and weights of the indicators relevant for the FSI. The objective of Principal Component Analysis is to reduce the dimensionality (or number of indicators) of the

data set while simultaneously retaining most of the original variability in the data. The first Principal Component accounts for as much of the variability in the data as possible, and each succeeding component accounts for as much of the remaining variability as possible. The first component of the selected variables explains 43 percent of the total variation.

Table 5.9: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.656
Bartlett's Test of Sphericity	Approx. Chi-Square	289.881
	df	91
	Sig.	.000

The KMO statistics vary between 0 and 1. In the result, the KMO is 0.656, which shows that the pattern of correlation is compact while the factor analysis gives a distinct and reliable factor. According to Hutcheson Sofro, 1999, if the KMO value is between 0.7 and 0.8, the results are good. Hence, it can be said that factor analysis will produce a good result. Bartlett's measure tests the null hypothesis that the original correlation matrix is an identity matrix. For the factor analysis to work, we need to establish some relationship among the variables, and if the R-matrix is an identity matrix, then all the correlation coefficients would be zero. The result shows that the R matrix is not an identity matrix, which implies that there are some relationships among the variables. The result shows that Bartlett's Test is highly significant as the significance level is $P < 0.001$,

which indicates that the factor analysis is appropriate.

Table 5.10 identifies the status of all the districts in Odisha in terms of the FSI based on the Principal Component Analysis method. The six extremely insecure districts include Rayagada, Malkangiri, Kandhamal, Gajapati, Koraput, Debagarh, and Nabarangapur, while six other districts including Kendujhar, Baudh, Sundargarh, Kalahandi, Nuapada, and Sambalpur are severely insecure districts. There is a need to improve the food security input indicators in all these districts. On the other hand, the most food-secure districts are Kendrapara, Anugul, Puri, Jagatsinghapur, Cuttack, Ganjam, Khordha, and Baleshwar. Six of these eight food-secure districts lie in the coastal region while four of the six most food-insecure districts are located in the KBK regions.

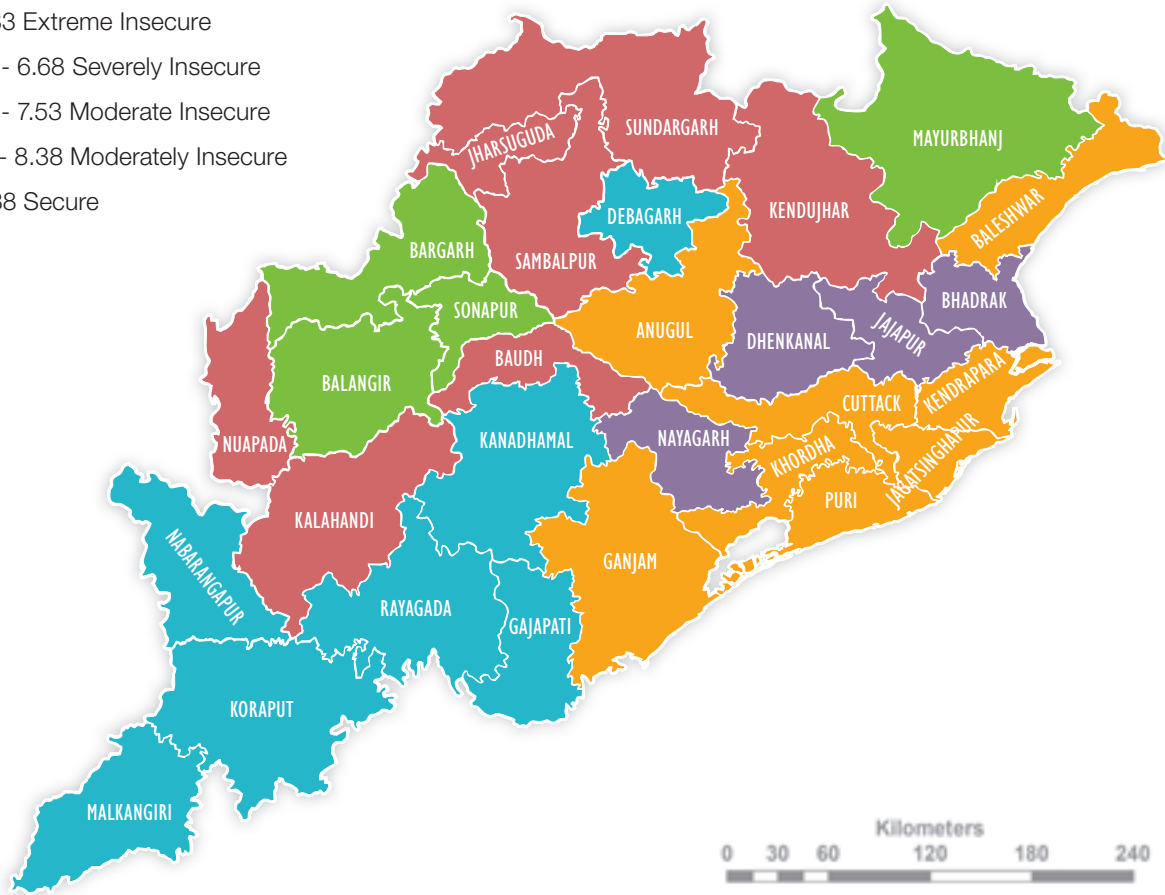
Table 5.10:

Overall Food Security Index Based on the Principal Component Analysis Method (PCA)

Extremely Insecure		Severely Insecure		Moderately Insecure		Moderately Secure		Secure	
Rayagada	4.986	Kendujhar	6.049	Subarnapur	6.915	Dhenkanal	7.734	Kendrapara	8.463
Malkangiri	5.038	Baudh	6.320	Mayurbhanj	7.069	Nayagarh	7.770	Anugul	8.482
Kandhamal	5.047	Sundargarh	6.375	Jharsuguda	7.078	Jajapur	8.207	Puri	8.558
Gajapati	5.353	Kalahandi	6.433	Balangir	7.098	Bhadrak	8.282	Jagatsinghapur	8.603
Koraput	5.383	Nuapada	6.674	Bargarh	7.230			Cuttack	8.715
Debagarh	5.412	Sambalpur	6.674					Ganjam	8.773
Nabarangapur	5.808							Khordha	8.842
								Baleshwar	9.238

Map 5.6: Revised Food Security Index (PCA Method)

- < 5.83 Extreme Insecure
- 5.83 - 6.68 Severely Insecure
- 6.68 - 7.53 Moderate Insecure
- 7.53 - 8.38 Moderately Insecure
- > 8.38 Secure



5.6 THE OUTCOME INDEX

The outcome of food security can be taken to be the nutritional status of an individual based on the assumption that food intake is the basic, though not the only, factor that influences the nutritional status of populations. In the developing countries, the rural populations, particularly children, are vulnerable to malnutrition because of their low dietary intake, lack of appropriate nutritional care, and inequitable distribution of food within the household. The four major variables taken as the outcome indicators are as follows:

1. Children under 5 years who are underweight (weight-for-age) (%);
2. Women whose Body Mass Index (BMI) is below normal (BMI < 18.5 kg/m²) (%);
3. Children aged 6-59 months who are anaemic (<11.0 g/dl) (%); and
4. Consumption of micronutrients or the percentage of households not showing the recommended intake of the three basic nutrients, that is, calories, proteins and/or fat.

Underweight (Weight-for-Age)

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 an indicator for capturing the incidence of malnutrition among children. The primary reason for this is that weight-for-age is a composite measure that takes into account both chronic and acute under-nutrition. Studies

have found that in Ethiopia, the incidence of stunting, wasting, and being underweight among children in food-insecure households is higher as compared to that for children of the food-secure households. Of the food-insecure children, the proportions of children who are stunted, wasted, and underweight are 38.9 per cent, 22.6 per cent, and 12.9 per cent, respectively, as compared to corresponding figures of 31.3 per cent, 7.6 per cent, and 11.8 per cent, respectively, among the food-secure households (Mulu, et al., 2016). Among children, household food insecurity was associated with being underweight, and with wasting and stunting in South Africa (Kruger, et al., 2006), Colombia (Hackett, et al., 2009), and Pakistan (Baig-Ansari, et al., 2006). Singh, et al. (2014) also found a strong interlinkage between food insecurity and the high prevalence of stunting and being underweight among children. They found that in severely food-insecure households, 51 per cent and 40 per cent of the children were stunted and underweight, respectively (Singh, et al., 2014).

Body Mass Index

There is a significant linkage between Body Mass Index (BMI) and food security. Research studies show a clear link between low BMI and low dietary intake. Hence, low BMI is an indicator of food insecurity (Ramachandran, et al., 2013). Studies have also found that among the severely food-insecure households, 27 per cent of the married women had BMI below 18.5 kg/m² as compared with a corresponding figure of only 13 per cent for women from the food-secure households (Singh, et al., 2014). Women from severely food-insecure households were 1.50 (95 per cent CI, 1.17 to 1.92) times as likely as women from food-secure households to have a BMI below 18.5 kg/m² (Singh, et al., 2014).

Anaemia

Anaemia is one of the outcome indicators taken for comparison and validation with the food security index. A number of well-researched studies have found a close link between the anaemia levels and food security status

of households. Anaemia is also reported to be the most prevalent nutritional deficiency affecting pregnancy outcomes, as it poses a threat to the lives of both the mother and the foetus (Oslo, 2010). Household food insecurity has a depressing impact on food consumption and eventually an adverse impact on the health status of the household members (Miller, et al., 2009). There are fewer chances of the occurrence of iron deficiency anaemia among households enjoying better living conditions (Zang, et al., 2008). Here, we have taken the anaemia of women in the age group of 15-49 years as the outcome indicator. It has also been found that women who reported food insecurity were about 1.6 times more likely to suffer from anaemia as compared to their food-secure counterparts. The relation between food security and anaemia is more pronounced among women of reproductive age, especially for pregnant women (Scholl, 2005). A study among women in Bangladesh found that apart from the high burden of anaemia, women in this category are also vulnerable to under-nutrition (Ahmed et al., 2012).

Micronutrients

The problems of poor nutrition and food insecurity are intertwined. The prevalence of chronic malnutrition among Indian children is low in India as compared to that in other developed countries. However, the incidence of children being stunted, wasted, and underweight is very high in India, particularly in Odisha. These poor nutritional outcomes are closely linked to the food security status in India. A large part of the Indian population cannot meet the basic calorie, protein, and fat requirements for a healthy individual. A large proportion of the population consumes a diet that lacks adequate dietary diversity, which affects their micro-nutrient intake. Moreover, the problem of food insecurity gets compounded in the lean seasons. Here, the fourth variable used in the outcome index is the proportion of population not fulfilling the recommended dietary requirement comprising 2110 calories, 57.5 proteins, and 7.5 fats. We have compiled the list of households whose members do not fulfil the minimum requirement for the consumption of

these nutrients. This information has been calculated from the NSS 68th Round consumption expenditure survey, 2011-12.

Table 5.13 and Map 5.7 show that four districts fall in the food-secure category followed by five in the moderately secure group, seven in the moderately

insecure group, eleven in the severely insecure group, and three in the extremely insecure group based on the outcome index. There is need for specially targeted policies for districts in the final category in order to improve their outcomes of food security.

Map 5.7: Revised Outcome Index Based on the Range Equalisation Method

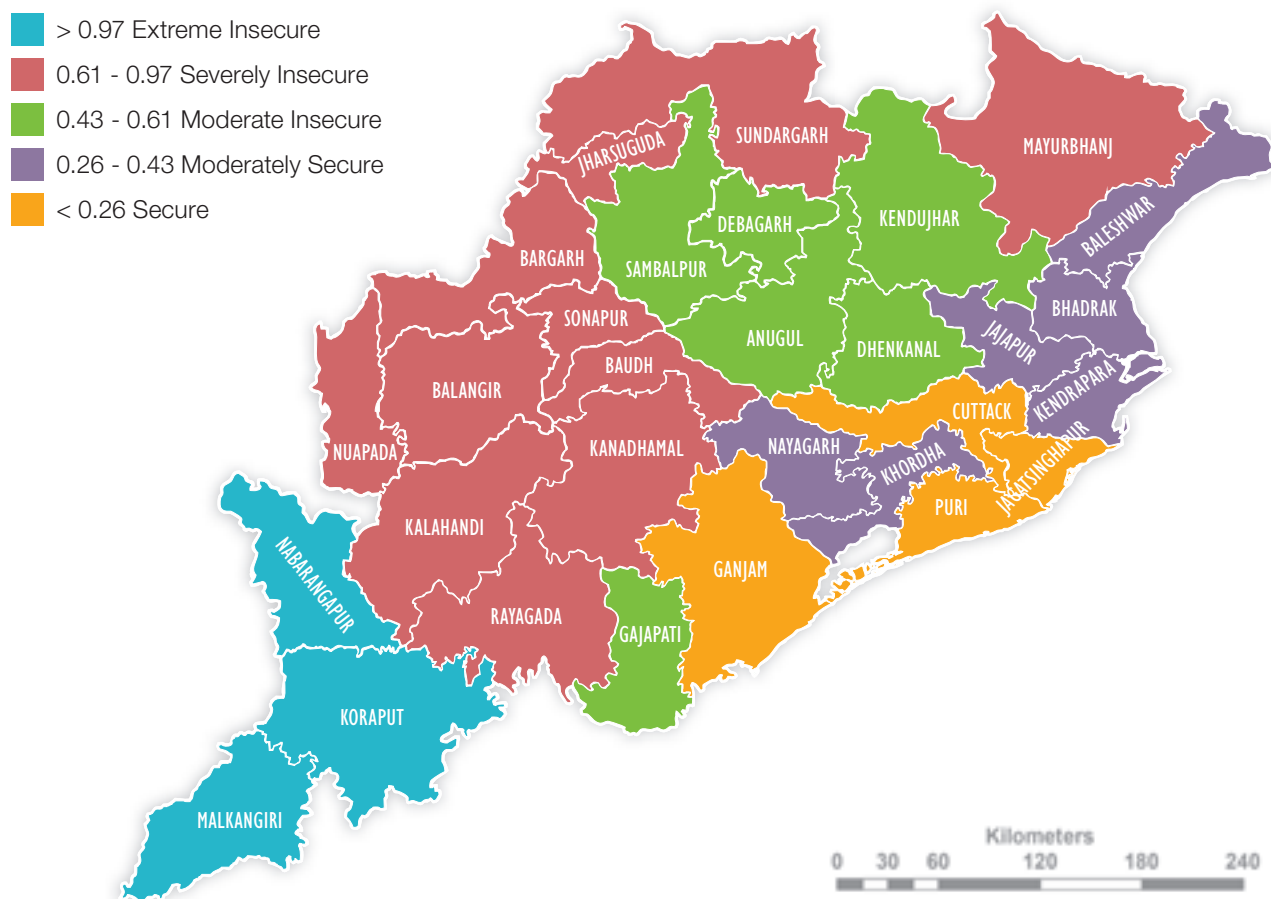


Table 5.13: Revised Outcome Index (Range Equalisation Method)

Extremely Insecure		Severely Insecure		Moderately Insecure		Moderately Secure		Secure	
District	Index	District	Index	District	Index	District	Index	District	Index
Malkangiri	0.970	Kalahandi	0.766	Sambalpur	0.598	Baleshwar	0.433	Puri	0.254

Extremely Insecure		Severely Insecure		Moderately Insecure		Moderately Secure		Secure	
District	Index	District	Index	District	Index	District	Index	District	Index
Nabarangapur	0.860	Nuapada	0.741	Debagarh	0.575	Bhadrak	0.424	Ganjam	0.237
Koraput	0.845	Rayagada	0.732	Gajapati	0.512	Nayagarh	0.346	Jagatsinghapur	0.215
		Balangir	0.726	Dhenkanal	0.485	Khordha	0.290	Cuttack	0.083
		Bargarh	0.724	Kendujhar	0.484	Kendrapara	0.266		
		Sundargarh	0.688	Anugul	0.468				
		Mayurbhanj	0.654	Jajapur	0.437				
		Baudh	0.650						
		Kandhamal	0.641						
		Jharsuguda	0.624						
		Subarnapur	0.617						

Table 5.14: Insecure Districts found on the Basis of Use of Three Methods in Odisha

Common in All the Three Methods	Common in Two Methods	Any One Method
Rayagada	Gajapati	Sambalpur
Nabarangapur	Kendujhar	Balangir
Koraput	Kalahandi	Mayurbhanj
Sundargarh	Nuapada	Subarnapur
Baudh		Jharsuguda
Kandhamal		
Malkangiri		
Debagarh		

5.7 SUMMING UP

This chapter presents a revision of the existing variables used in the food security atlas report and a reconstruction of the new food security/outcome index using the Range Equalisation and Principal Component Analysis methods. Based on the new index which uses all the three methods, eight districts, including Rayagada, Nabarangapur, Koraput, Sundargarh, Baudh, Kandhamal, Malkangiri, and Debagarh have been found to show alarming results, as they fall in the insecure zone based on food security index in both Range Equalization Method and Principal Component Analysis Method. These districts also fall in insecure zone in terms of outcome index.

On the other hand, four districts, including Gajapati, Kendujhar, Kalahandi, and Nuapada are commonly found to be insecure based on two methods out of the three used for analysis in this study. Another five districts have been found to fall in the insecure zone based on the use of any one of the methods.

There is an urgent need to improve the food security input indicators in the districts found to be food-insecure based on the three methods. Based on the old variables described in Chapter 4, the districts identified as the most insecure districts are more or less the same as those found to be food insecure districts in this chapter based on the revised variables. The analysis indicates that after the revision of our indicators, the status of the districts is almost the same. Hence the variables used for the analysis are robust.

6

SPECIFIC POLICY INTERVENTIONS FOR ENHANCING FOOD SECURITY IN ODISHA

This chapter looks at some of the policies and acts introduced at the national level by the Centre or at the state level by the Government of Odisha to enhance food security in the state. This includes assessment of some of the old policies in terms of their impact and success in achieving their pre-specified targets and objectives. The chapter also discusses some of the new policies introduced in this direction. These interventions have been classified into three broad sections: Enhancing the availability of food, enhancing access to food, and enhancing absorption of nutrients.

6.1 ENHANCING THE AVAILABILITY OF FOOD

Although the share of the primary sector in the total composition of the GSDP decreased significantly from 56 per cent in 1950-51 to 15 percent in 2014-15, based on the national trends, it still remains a crucial sector in terms of its employment- and income-generating activities, environmental sustainability, and the dependency of the rural populations for livelihood. Increasing agricultural production and productivity is necessary for ensuring food security, livelihood security, and nutritional security. There is a need to improve agricultural production and productivity through land and water management, rain-fed agriculture, agricultural markets, introduction of advanced technology, higher public and private investments, and effective implementation of ongoing programmes in the agriculture and allied sectors.

6.1.1 The National Food Security Mission

The National Development Council (NDC), in its 53rd meeting held on 29th May, 2007, adopted

a resolution to launch a Food Security Mission, comprising paddy, wheat, and pulses to increase the production of paddy by 10 million tonnes, wheat by 8 million tonnes, and pulses by 2 million tonnes by the end of the Eleventh Plan (2011-12). Accordingly, a Centrally Sponsored Scheme, the National Food Security Mission (NFSM), was launched in October 2007 for five years (during the Eleventh Five Year Plan) to increase the production and productivity of wheat, paddy, and pulses on a sustainable basis so as to ensure the food security of the country. This was aimed at bridging the yield gap in respect of these crops through the dissemination of improved technologies and farm management practices. This mission focuses on three components in the Eleventh Five-Year Plan: (i) NFSM-Paddy; (ii) NFSM-Wheat; (iii) NFSM-Pulses.

The mission is being continued during the Twelfth Five Year Plan with the introduction of new targets for the additional production of 25 million tonnes of foodgrains, comprising 10 million tonnes of paddy, 8 million tonnes of wheat, 4 million tonnes of pulses, and 3 million tonnes of coarse cereals by the end of the Twelfth Five-Year Plan. During the Twelfth Five-Year Plan, the NFSM will have the following five components: (i) NFSM-Paddy; (ii) NFSM-Wheat; (iii) NFSM-Pulses; (iv) NFSM-Coarse Cereals, and (v) NFSM-Commercial Crops.

The state of Odisha has been identified for enhancing the production and productivity of commercial crops like cotton, jute, and sugarcane. Under this scheme, the task of imparting training and transfer of technology to farmers through demonstrations has been provisioned in the scheme. In order to increase devolution to the states on account of the recommendation of the Fourteenth Finance Commission, the NFSM is being

implemented on a sharing basis for all-India and the states on a ratio of 60:40 for the general category of the states. Odisha has been identified as one of the states in this regard for incentivising the production of cash crops like jute, cotton, and sugarcane. The mission has been operating at multiple levels ranging from the national, to state to district levels. At the grassroots level, the Panchayati Raj Institutions (PRIs) have an active role to play, and would be involved in the selection of beneficiaries and identification of priority areas and local initiatives.

Background of the NFSM in Odisha

A Centrally Sponsored Scheme, the NFSM was launched in Odisha in 2007-08 in the State with the objective of increasing the production of rice and pulses through the area expansion and enhancement of productivity in a sustainable manner in the identified districts. From the financial year 2011-12, the NFSM-Rice mission has been implemented in 15 districts, namely, Balangir, Jajapur, Dhenkanal, Anugul, Kalahandi, Nuapada, Kendujhar, Malkangiri, Nabarangapur, Kandhamal, Baudh, Nayagarh, Debagarh, Jharsuguda, and Sundargarh, while the NFSM-Pulses mission has been launched in all the 30 districts of the state. In addition, a special scheme titled, the Accelerated Pulse Production Programme (A3P), was implemented from 2010-11 till 2013-14.

Subsequently, during 2014-15, the Government of India have revised the guidelines for NFSM and as

per the revised guidelines, the NFSM has five major components, including NFSM-Rice, NFSM-Pulses, NFSM-Coarse Cereals, NFSM-Commercial Crops, and NFSM-Wheat. Barring NFSM-Wheat, all the other components of the NFSM are being implemented in the state from the financial year 2014-15 onwards. The NFSM-Rice component covers 14 districts of the State, including Anugul, Balangir, Baudh, Ganjam, Jajapur, Kendrapara, Kendujhar, Malkangiri, Mayurbhanj, Nuapada, Nabarangapur, Nayagarh, Sambalpur, and Sundargarh. The NFSM-Pulse component covers all the 30 districts of the state. Similarly, the NFSM-Coarse Cereals component covers six districts namely, Gajapati, Ganjam, Kendujhar, Koraput, Nabarangapur, and Rayagada since the financial year 2014-15 onwards. The NFSM-Commercial Crops component has been covering the cotton, jute, and sugarcane crops in the state since 2014-15.

Table 6.1 provides the current list of districts under the NFSM-Rice, NFSM-Pulses and NFSM-Coarse Cereals components as of 2016-17. The table clearly shows that all the 30 districts are covered under NFSM-Pulses, eight districts under NFSM-Rice, and six districts under the NFSM-Coarse Cereals components. In order to increase production of rice and to popularise the use of hybrid rice, demonstration were held in eight selected districts. During 2015-16, assistance was also provided for the use of micro-nutrients in over 4232 hectares of land.

Table 6.1: NFSM Districts in Odisha

NFSM Component	List of Districts
NFSM-Rice	Anugul, Dhenkanal, Jharsuguda, Kandhamal, Kendujhar, Malkangiri, Nuapada, Sundargarh
NFSM-Pulses	Anugul, Balangir, Baleshwar, Bargarh, Baudh, Bhadrak, Cuttack, Debagarh, Dhenkanal, Gajapati, Ganjam, Jagatsinghapur, Jajapur, Jharsuguda, Kalahandi, Kandhamal, Kendrapara, Kendujhar, Khordha, Koraput, Malkangiri, Mayurbhanj, Nabarangapur, Nayagarh, Nuapada, Puri, Rayagada, Sambalpur, Sonapur, Sundargarh
NFSM-Coarse Cereals	Gajapati, Ganjam, Kendujhar, Koraput, Nabarangapur, Rayagada

Source: National Food Security Mission (2016-17).

Besides the above-mentioned initiatives, the Government has also popularised the production of commercial crops like cotton, jute, and mesta. During 2015-16, total amount of Rs. 161.94 lakh was spent on popularising commercial crops. The scheme concentrated on irrigated crops but some parts of rainfed agricultural crops were ignored. Crops like various types of millets, which are produced in the dry land areas, should be given more importance. There should be greater stress on increasing productivity in the rainfed areas, which face persistent food scarcity.

6.1.2 Odisha's Agriculture Policy

The Government of Odisha notified a State Agriculture Policy in 1996. This policy was revised in 2008 with a widened scope and coverage in the state's agriculture sector. The state's agriculture policy stimulated the growth of private lift irrigation and agro industries, as more than 1,00,000 lift irrigation points were established in the state, which witnessed the growth of many new agro-based industries. Farm mechanisation achieved new heights, and the number of tractors sold to farmers increased from less than 200 tractors in 1999-2000 to more than 5,000 in 2011-12. Odisha is one of the states having a larger consumption of power tillers. In the year 2008-09, the total number of power tillers in the state was 5,280, which increased to 9,166 in 2015-16.⁷

The State Agricultural Policy, 2013, is another step towards widening the scope and coverage of the state's agriculture sector. The policy aims to inspire a fresh generation of farmers who will look forward to facing the challenges of the new century with confidence. Considering the high GDP growth in the recent past, a major reorientation in the policy is necessary to make this growth more inclusive. The decline in agricultural growth, coupled with declining profitability in the agriculture sector, and rapid growth of the non-farm sector, is one of the major concerns of the Government. The National Policy of Farmers, 2007, has envisaged focusing more on the

economic well-being of the farmers rather than just on augmenting production. There is need for greater public investment in agriculture in the state as private investment in agriculture would concomitantly a longer due to the slow evolution of appropriate policies in this sphere. There have been many significant changes in recent times in the realm of agricultural development, more so in the post-WTO regime. Therefore, it is essential to assess the changing situation and bring out a policy to meet the present challenges in the sector. The new State Agriculture Policy is expected to serve this purpose the state while following the same broad contours laid down in the State Agriculture Policy, 2008.

The main objectives of the State Agriculture Policy, 2013, are to:

- Instill a shift from the present level of subsistence agriculture to profitable commercial agriculture;
- Promote sustainable agricultural development;
- Enhance the productivity of important crops by enhancing seed replacement, availability of quality planting materials, INM, IPM, water management, farm mechanisation, and technology transfer;
- Encourage crop substitution, particularly in the uplands and medium lands;
- Focus on horticultural crops including dry land horticulture;
- Focus on poultry, dairy, and fisheries to augment the income of the farmers;
- Encourage the use of the modern farming system approach;
- Promote organic farming;
- Enhance water use efficiency through peoples' participation; and
- Facilitate increased long-term investment in the agricultural sector (both on-farm as well as

⁷ Directorate of Agriculture and Food Production, Odisha, as quoted in the Economic Survey, Government of Odisha, 2016-17.

off-farm) by the private sector, public sector, and public—private partnerships (PPPs), particularly for post-harvest management, marketing, agro-processing, and value addition.

The latest agricultural policy has given the right direction by provisioning the diversification of high-value crops as well as horticultural crops. The high-value crops and cash crops are used to advance the process of accumulation of physical and human capital. However, the decision to diversify traditional crops to high-value crops should be taken judiciously.

6.1.3 Rural Road Connectivity

A plethora of programmes are being implemented to improve the road connectivity. Odisha essentially has a rural-oriented economy, with approximately 83 percent of its population living in rural areas. Rural road connectivity is a vital component of rural development as it promotes access to economic and social services, thereby generating increased agricultural incomes and productive employment opportunities. It is a key ingredient to ensure poverty reduction. The road density of Odisha was 178 sq.km per 100 km in 2012-13 as compared to 159 km at all-India averages. The state has made remarkable progress in terms of increasing the road network through two major programmes, that

is, the Pradhan Mantri Gram Sadak Yojana and Bharat Nirman Yojana to provide an all-weather road network.

6.1.4 Pradhan Mantri Gram Sadak Yojana

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 PMGSY is a 100 per cent Centrally Sponsored Scheme and 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 all-weather roads (with necessary culverts and cross-drainage structures, which are operable throughout the year).

Odisha has also been identified as one of the most backward states in terms of poor connectivity, and the Ministry of Rural Development (MoRD) has envisaged in its plans a number of roads under PMGSY covering all the 30 districts of the state to be taken up in phased manner so as to ensure accessibility to all the habitations by way of providing all weather roads. Table 6.2 shows the progress of PMGSY in Odisha since its inception.

Table 6.2: Progress of PMGSY in Odisha, 2000-01 to 2016-17

Year	Target Length (in km)	Completed Length (in km)	%age of Target Achieved in Road Length	Target Habitations (No.)	Affected Habitations (No.)	Expenditure (Rs.Lakh)
2000-01	1069	1053	98.5	805	805	16,758
2001-02	1693	1657	97.9	844	844	34,366
2003-04	2000	1913	95.7	1158	1143	44,651
2004-05	1638	1588	96.9	756	748	38,779
2005-06	1916	1797	93.8	751	733	55,542
2006-07	1411	1326	94.0	689	677	61,437

Year	Target Length (in km)	Completed Length (in km)	%age of Target Achieved in Road Length	Target Habitations (No.)	Affected Habitations (No.)	Expenditure (Rs.Lakh)
2007-08	6606	6032	91.3	2954	2801	2,71,618
2008-09	7117	6389	89.8	2378	2244	2,77,833
2010-11	586	517	88.2	223	194	36,356
2011-12	5144	4408	85.7	2027	1763	1,88,502
2012-13	5189	4386	84.5	1950	1564	2,11,017
2016-17	10,110	313	3.1	4200	5	33,534
Total	44,478	31,379	70.5	18,735	13,521	12,70,392

Source: <http://omms.nic.in/StateProfile/StateProfile/Ex:StateProfile>

Till 2016-17, about 70 per cent of the target length was completed. The year-wise proportion of the completed length to targeted length shows that excluding 2016-17, in all the years, the achieved proportion ranged from a low of 84 per cent in 2012-13 to a high of 98 per cent in 2001-02. The total expenditure incurred in the scheme since its inception is Rs. 12,70,392 lakhs. Again the proportion of affected habitation to targeted habitation is 72 percent.

6.1.5 Biju Setu Yojana (Rural Bridges)

Besides funding from NABARD for the construction of bridges, Ministry of Rural Development, Government of India, is also providing funds for the construction of bridges on PMGSY roads, permissible under the guidelines of the scheme. Bridges are also being constructed out of the allocated funds to the Rural Development Department under Western Odisha Development Council (WODC), Biju KBK (Kalahandi Bolangir Koraput), Integrated Action Plan (IAP), and Backward Region Grant Fund (BRGF), among others. But the existing schemes are unable to cater the requirements of the state. Hence, the Government of Odisha has embarked upon a new initiative for formulating and launching the ambitious Biju Setu Yojana (BSY) to bridge all the

missing links on the roads of the R.D. Department. The Biju Setu Yojana was launched on 9th October, 2011 for construction of new bridges on R.D. roads and important P.S. roads to provide all-weather connectivity to the rural areas of the state. In addition, the programme will also cover the construction of bridges on strategic important Panchayat Samitee roads belonging to the P.R. Department. The BSY has thus been formulated to provide an effective all-weather road network across the length and breadth of the state, so as to cost-effectively meet the transportation needs of every sector. A total of 600 bridges were targeted for construction during 2011-12, 2012-13, and 2013-14. And in 2016-17, an amount of Rs. 400 crore was provided for the construction of new (157) bridges on rural roads for providing all-weather connectivity (Economic Survey, Government of Odisha, 2016-17).

6.1.6 Mukhya Mantri Sadak Yojana

As on 1st April, 2000, the total number of unconnected habitations in Odisha was 29,020. In the meantime, the Government of India launched the PMGSY during the year 2000 to provide all-weather connectivity to the unconnected habitations having populations of up to 500 in the non-IAP districts, of up to 250 in the scheduled blocks and in IAP districts (excluding 38

LWE blocks), and of up to 100 in LWE blocks. Out of 29,020 unconnected habitations, 20,150 are eligible under the PMGSY. Approximately 8,874 number of habitations are not eligible under the PMGSY as per the Core Network prepared for PMGSY work in Odisha. With the objective of meeting the connectivity requirements of the habitations that are not eligible under the PMGSY or any other connectivity programme, the State Government decided to implement the “Mukhya Mantri Sadak Yojana” in the State from 2014-15 onwards to provide all-weather connectivity to the unconnected habitations with populations of 100 and above. The state government targeted the construction of 407 new roads under the Mukhya Mantri Sadak Yojana during 2015-16. The budget for the first-phase construction of roads had been estimated at Rs. 907 crore.

6.2 IMPROVING ACCESS TO FOOD

Food insecurity results when a household is unable to access food. Hence, in order to improve the status of access to food security, the targeted interventions have been classified into the following three broad groups:

1. Enhancing access to food provided in government schemes;
2. Improving wages, incomes and employment opportunities; and
3. Improving the position of the most marginal sections including women, and SC/ST communities.

The NSS 68th Round survey on consumption expenditure shows the extent to which the programmes reach the households.

As Odisha is a most backward state, it gets a plethora of funds in terms of different schemes and programmes which are directly aimed at addressing the food and nutrition security in the region. Among these, the most significant programmes are PDS, MGNREGA, the Midday Meal Scheme, and ICDS.

6.2.1 The Public Distribution System

The Public Distribution Scheme (PDS) is one of the important programmes which safeguards the food needs of the poor. Initiated by the Ministry of Consumer Affairs, Food, and Public Distribution, Government of India, managed jointly by state governments in India, it distributes subsidised food and non-food items to India’s poor. This scheme was launched in India on June 1947. The major commodities distributed under the scheme include staple foodgrains, such as wheat, rice, sugar, and kerosene, through a network of fair price shops established in several states across the country. The Food Corporation of India, a Government-owned corporation, procures supplies for and maintains the PDS. The programme has changed its name as well as features over time. However, the basic objective of the programme, that is, the provision of foodgrains and other essential items to the vulnerable sections of the population at subsidised prices, remains the same. Another objective of the programme is that it moderates the influence of open market prices of cereals for ensuring its equitable distribution among the marginalised communities.

The government of Odisha took a remarkable step in TPDS reform to distribute rice at Re. 1 per kg under various Centrally Sponsored Schemes to mitigate poverty in the poorest of the poor households. This scheme started in February 2013. Table 6.3 shows the scale of PDS distribution in Odisha.

Table 6.3 shows the scheme-wise beneficiaries and their entitlement in Odisha. It clearly elaborates the extent of penetration of the programme among the households. Nearly 37 lakh BPL households in Odisha are obtaining rice at Re. 1 kg under the scheme. The government has also been distributing rice at this price to the APL households residing in the KBK region which is the most food-deprived region. Institutions like the SC/ST hostel and other vulnerable groups like disabled persons are also benefiting from the programme. Beside this, 11705 numbers of inmates from welfare institutions are also getting the BPL rice

Table 6.3: Total Number of PDS Beneficiaries and Entitlements

Sl.	Scheme	No. of Beneficiaries	Scale of Entitlement	Consumer Price per Kg(Rs.)
1	BPL	36,90,027	25 kg	1.00
2	KBK APL	5,32,133	25 kg	1.00
3	AAY	12,53,164	35 kg	1.00
4	ST/SC Hostel	4,15,357	15 kg	1.00
5	Rice for Differently abled person (RDP)	76,534	10 kg	1.00

Source: Odisha State Civil Supplies Limited downloaded from <http://ossc.in/schemes.html> on 13th February 2018.

of 15 kilogram at the rate of 6.30 rupees per kilogram from the programme⁸.

6.2.2 Annapurna Anna Yojana

The Annapurna Anna Yojana aims at providing food security to senior citizens of the country aged above 65 years, who are eligible but still not covered under the National Old Age Pension Scheme (NOAPS). Under the scheme, 10 kg of foodgrains (rice/wheat) per month are provided free of cost to the beneficiary selected. As per the information provided by Odisha State Civil Supplies Limited, the total number of beneficiaries under this scheme is 63759⁹.

6.2.3 APL Rice

Under this scheme, APL rice is distributed to three sets of beneficiaries, that is, prisoners in jails, SC/ST hostels managed by NGOs, and Adrut Child Homes. APL wheat is also supplied to 35,91,809 beneficiaries and the entitlement is 15 kg at a price of Rs. 9.30 per kg. Levy sugar is also distributed among households and the entitlement of each household is two kg of sugar at the rate of Rs 13.50 per kg.

In this context, it is important to reflect that the wrong identification of beneficiaries is also one of

the important reasons for high food insecurity in the state. The identification problem leads to exclusion and inclusion errors. Exclusion error is the result of geographical isolation and the marginal position of households in the social, economic and political sphere (Mahamallik, et al., 2011). Tables 6.4 and 6.5 attempt to find the exclusion and inclusion errors by social category and by different regions in Odisha for the year 2011-12. Interestingly, of the total Antyodaya and BPL cardholders, about 51 percent are above the poverty line as calculated in terms of MPCE. On the other hand, of the total APL cardholders, 17 percent are below the poverty line in terms of MPCE. It has been found in many studies that exclusion error is more dangerous than inclusion error. The social category-wise analysis indicates that exclusion error for STs and SCs is extremely high as compared to that for OBCs and other categories of households. On the other hand the inclusion error for OBCs and other households is high.

Table 6.5 explains the region-wise percentage of households excluded and included from the benefit of TPDS. It is clearly shown in the table that the coastal belt, which consists of developed districts and lower poverty regions, shows a higher inclusion error of about 69 percent of the population. On the other hand, 9 percent of the population in the

⁸ <http://ossc.in/schemes.html>

⁹ <http://ossc.in/schemes.html>

Table 6.4: Exclusion and Inclusion Error by Social Category, 2011-12

Scheme	STs		SCs		OBCs		Others		Total	
	BPL	APL	BPL	APL	BPL	APL	BPL	APL	BPL	APL
Antyodaya	80.6	19.4	80	20	40.1	59.9	19	81	59.9	40.1
BPL	73.0	27.0	44	56	35.0	65.0	29	71	48.0	52.0
Antyodaya+BPL	73.6	26.4	49	51	35.6	64.4	28	72	49.3	50.7
Other	50.6	49.4	21	79	12.4	87.6	6	94	16.8	83.2
Total	70.3	29.7	44	56	28.2	71.8	17	83	40.5	59.5

Source: Calculated from NSS Consumption Expenditure, 2011-12.

Table 6.5: Exclusion and Inclusion Error by NSS Region, 2011-12

Region	Districts	Scheme		Poverty MPCE	
		BPL	APL	BPL	APL
Coastal	Baleswar, Bhadrak, Kendrapara, Jagatsinghapur, Cuttack, Jajapur, Nayagarh, Khordha, Puri, Ganjam, Gajapati	Antyodaya		34.8	65.2
		BPL		31.1	68.9
		Antyodaya+BPL		31.5	68.5
		Other		8.9	91.1
		Total		23.2	76.8
Southern	Kandhamal, Baudh, Nuapada, Kalahandi, Rayagada, Nabarangapur, Koraput, Malkangiri	Antyodaya		80.1	19.9
		BPL		57.9	42.1
		Antyodaya+BPL		60.5	39.5
		Other		43.9	56.1
		Total		57.5	42.5
Northern	Bargarh, Jharsuguda, Sambalpur, Debagarh, Sundargarh, Kendujhar, Mayurbhanj, Dhenkanal, Anugul, Sonapur, Balangir	Antyodaya		64.1	35.9
		BPL		56.8	43.2
		Antyodaya+BPL		57.5	42.5
		Other		12.5	87.5
		Total		47.4	52.6

Source: Calculated from NSS Consumption Expenditure, 2011-12.

coastal belt is excluded from the benefits of the TPDS programme due to wrong identification. The Southern belt, which comprises e of the poorest regions, shows a high prevalence of exclusion error of 44 percent of APL cardholders falling under the BPL category as per the MPCE criteria. In northern region, the inclusion error is higher than exclusion error.

Over the years, different government agencies and international organisations have been working to strengthen the TPDS in different states in India. In 2008, the World Food Programme (WFP) did a pilot project in 2008, in collaboration with the Government of Odisha in Rayagada district of the state to find out ways of strengthening the TPDS. The pilot project found that infrastructure challenges such as lack of road connectivity, lack of electricity, and lack of suitable venues are the major issues confronting the TPDS in the district. The Rayagada pilot project was one of the first TPDS projects to enrol multimodal biometrics including ten fingerprints, iris (for a segment of the population) and individual facial photographs for beneficiaries across the district. Fingerprints were used for biometric de-duplication and for authentication of beneficiaries during transactions at a number of FPS using a smart card based Point of Sale (PoS) system. Again the Government of Odisha launched a unique scheme —the Odisha Modernising Economy, Government and Administration (OMEGA) with the support of DFID to modernise both the MGNREGA and TPDS programmes. It found significant improvement in the implementation of these programmes after the launch of OMEGA. The major objectives of the initiative are to:

- Identify areas for improving planning, implementation and delivery of NREGS and PDS at the state and district levels.
- Build capacity for improved planning, implementation and delivery of NREGS and TPDS at the state level;
- Support women's access to, participation in, and benefit from NREGS and TPDS at the state and district levels;
- Strengthen accountability and empowerment for improved TPDS and NREGS performance at the State level;
- Strengthen evidence-based TPDS and NREGS performance and ensure its effective communication at the district level.

Under the end-to-end computerised system, the following initiatives have been taken in PDS reforms. The reforms include creation of a departmental storage system, supply chain management system, model DSC at Panishiali in Subarnapur, model FPS Haridakhol GP in Subarnapur, digitisation of the ration card database, paddy procurement at Godbhaga, and social audit in PDS at Kandaraposhi GP in Kendujhar.

The TPDS has improved in recent years, which is clear from NSS data as well as from some research studies. A study by Mihika Chatterjee in Koraput shows that the pilferage or the diversion of PDS commodities to non-PDS households as well as to households having multiple BPL cards has been drastically reduced (Chatterjee, 2014). She also found that there is a regularity of PDS supply to the fair price. Another finding is that about 97 percent of cardholder in the district received their entitlement of rice during the three months preceding her survey. Khera (2011a) also found a high purchase-entitlement ratio in Odisha. She found that the purchase-entitlement ratio for BPL households ranged from 97-100 per cent and it is 100 percent for the Antyodaya households.

The efficient functioning of PDS is shown in a paper by Anjani, et al. (2016), which analysed four rounds of NSS data. This study shows that the percentage of households accessing PDS for cereals in Odisha increased from 6.4 percent in 1993-94 to 58.3 percent in 2011-12. On the other hand, the share of PDS to the total cereal consumption increased from 1.2 percent in 1993-94 to 27.2 percent in 2011-12 (Table 6.6).

It is interesting to find that the income transfer through PDS increased from Rs. 48 in 1993-94 to Rs. 468 in 2011-12. Over this period, the performance of Odisha was better than that of India as a whole. On the other hand, the share of PDS subsidy in expenditure increased from 1 percent in 1993-94 to 6 percent in 2011-12.

Table 6.6: Contribution of PDS in Household Consumption of Foodgrains in Odisha and India

Region	% Households Accessing PDS for Cereals				Share of PDS in Cereal Consumption			
	1993-94	2004-05	2009-10	2011-12	1993-94	2004-05	2009-10	2011-12
Odisha	6.4	19.4	49.9	58.3	1.2	6.0	22.3	27.2
All India	27.3	23.3	39.4	44.7	8.5	9.8	17.8	19.7

Source: NSS different rounds as taken from Anjani et al., 2016.

Table 6.7 explains the per capita calorie consumption and the PDS share in total calories consumed. The per capita calorie consumption fell from 2218 Kcal in 1993-94 to 2179 Kcal in 2011-12. The second part of the table shows that the share of PDS in calorie consumption increased from 2.4 percent in 1993-94 to 19.5 percent in 2011-12 whereas all-India's corresponding share was lower than that of Odisha.

The per capita calorie consumption in Odisha reduced slightly from 2218 Kcal in 1993-94 to 2158 Kcal in 2011-12. On the other hand, the share of PDS to the total calorie consumption in Odisha increased from 2.4 percent in 1993-94 to 19.5 percent in 2011-12. This shows a 17 percentage point change over the same period in Odisha as compared to an only 5 percentage point change (from 7.0 percent to 11.8 percent) in India over the same time period.

Table 6.7: Trends in Income Transfers through PDS in Odisha and India

Region	PDS Subsidy (Rs./Person) at 2004-05 Prices				Share of PDS Subsidy In Expenditure (%)			
	1993-94	2004-05	2009-10	2011-12	1993-94	2004-05	2009-10	2011-12
Odisha	43	60	399	468	0.8	1.0	4.6	5.6
India	101	113	310	286	1.4	1.3	2.5	2.2

Source: NSS different rounds as taken from Anjani et al., 2016.

Table 6.8: Per Capita Calorie Consumption and Share of PDS in Total Calorie in Odisha and India

Region	Per Capita Calorie Consumption (KCal/ Person/Day)				Share of PDS in Total Calorie Consumption (%)			
	1993-94	2004-05	2009-10	2011-12	1993-94	2004-05	2009-10	2011-12
Odisha	2218	2182	2288	2179	2.4	4.4	15.3	19.5
India	2152	2179	2233	2158	7	5.8	9.3	11.8

Source: NSS different rounds as taken from Anjani et al., 2016.

The major improvements in PDS functioning are due to (Jean Dreze, 2014)

- The PDS outlets have been de-privatised and the community institutions have taken over the responsibility.
- The PDS system is now computerised and its close monitoring has started.
- Transport agencies have been separated from distribution agencies.

In a study supported by ActionAid India, 44.5 per cent of the sample households in Odisha have BPL cards, 18.8 per cent have AAY cards, 8.3 per cent have APL cards, and 3 per cent of the households have Annapurna cards. In the KBK districts of Odisha, every household which has a ration card (AAY, BPL or APL) has effective access to PDS foodgrain, but, in the non-KBK districts, only the BPL and AAY cardholders have effective access to PDS foodgrain and APL cardholders hardly get any grain under the PDS. This study, which was a comparative assessment of PDS in Odisha and Uttar Pradesh, ended with a conclusion that Odisha had a better overall PDS coverage ratio than UP.

6.2.4 Mid-day Meal Scheme

With a view to enhancing enrolment, retention and attendance, and simultaneously improving nutritional levels among children, the National Programme of Nutritional Support to Primary Education (NP-NSPE) was launched as a Centrally Sponsored Scheme on 15th August, 1995. During 2015-16, in Odisha, everyday 51.89 lakh children of 62,660 schools are being provided hot cooked nutritious food. The ration cost has been enhanced from Rs.3.79 to Rs.4.31 for primary school children and to Rs.6.43 for an upper primary student. The calorific value of the meal is now 493.6 Kcalories and 13.8 gm. of protein for primary classes and 728.97. Kcalories and 20.5 gm for UP Classes (Economic Survey Odisha 2016-17). The government also organised awareness generation meals on MDM and eggs are served twice in a week under MDM in the State. The Government has sanctioned a budget for a smoke-free environment in the schools. Under this, 3300 schools have already been connected to LPG, and 10,000 more schools were proposed to be covered during 2016-17. In Odisha, the Government-

Table 6.9: Release and Expenditure under MDM Scheme to Odisha(in Rs Lakhs)

Year	Funds Allocated	Released	% Release
2007-08	38,294.23	1832.55	49.18
2008-09	33,103.28	24,503.04	74.02
2009-10	715.63	30,648.05	79.16
2010-11	38,959.13	24,341.30	62.48
2011-12	37,124.38	36,798.46	99.12
2012-13	49,162.77	50,094.47	101.90
2013-14	61,429.29	60,254.64	98.09
2014-15	57,901.99	49,303.55	85.15
2015-16	49,000.00	46,358.5	94.60
2016-17	51,113.84	43,841.08	85.77
2017-18	46,695.90	32,656.93	69.93

Source: <http://mdm.nic.in>.

approved outlay by the Programme Approval Board for the Mid-Day Meal Scheme (PAB-MDM) for the Year 2017-18 is Rs. 46,695.90 Lakh. The annual allocation of Central Assistance for FY 2016-17 for Odisha was Rs. 51,113.84 lakh (including Rs.4555.12 lakh for drought coverage). Table 6.9 shows the allocation and release of funds for the MDM scheme. This shows that in 2016-17 about 86 percent of the allocated funds have been released.

One of the major challenges of the MDM is that about 46 percent of the kitchen-cum-storerooms using LPG that have been slated under the project have not yet been constructed, and with a large proportion of the schools consequently using firewood instead of LPG for cooking the meals, it has an adverse environmental impact. Second, many of the schools still do not follow an automated or web-based monitoring system. However, where properly implemented in the state, the MDM programme also shows the use of some of the best practices. The Department of School and Mass Education (DS&ME) of the Government of Odisha (GoO) took the initiative to address several nutrition and health problems in school children by enhancing the MDM scheme in Gajapati, which showed a high prevalence of anaemia among school children. In this district, rice fortification technology was used to add iron to the school meal, which was consumed daily by most lower and upper primary school children in the district. The project ran from mid-2012 to end-2014. The GoO also informed the parents, children, and teachers about the fortification of the food served under the MDM scheme. The fortification project has been upscaled to a multi-micronutrient project from a single-micronutrient one in Dhenkanal district and at the centralised kitchen in Cuttack district. Further, the GoO provides an additional contribution from the State budget to meet the cooking cost, that is, Rs. 0.45 at the primary and Rs. 0.65 at the upper primary level for the provision of egg/banana twice a week and for the e-transfer of funds to all schools as well as a direct transfer of honorarium in Aadhaar-linked bank accounts. Table 6.9 delineates the proportion of funds received to the funds allocated. It is seen that

the proportion of funds released to the expenditure incurred is 70 per cent.

6.2.5 Increasing Wages and Employment

The importance of wage incomes in ensuring access to food is demonstrated dramatically through the experience of the district of Kalahandi, notorious for persistent and acute hunger, which was, ironically, a net exporter of paddy all through the 1980s and 1990s (Bob Currie, 2000), as the people were too poor to afford its purchase. Another study shows that Uttar Pradesh is a food-surplus state, but malnutrition rates in that state too 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 (Nisha Srivastava, 2003:257). To cite another example, the state of Kerala is highly deficient in food production relative to its consumption of food but that does not make it food-insecure. The Food Insecurity Atlas of Rural India (MSSRF/WFP 2001, Map No. 2.1) lists Kerala as the only 'extreme deficit' state of India in terms of the 'deficit of cereal production over consumption.' However, in the overall food insecurity map (Map 5.1) Kerala is listed as 'Moderately Secure'. It is a moot point whether the 'extreme deficit' in the cereal production status of Kerala is responsible for it being only 'moderately secure' and not 'secure.'

Districts with higher proportions of agricultural labour, such as Gajapati, Ganjam, Bhadrak, and Jajapur, are also the ones with higher food insecurity. This suggests that both employment schemes and distribution of land to the landless are relevant for improving food security in these districts. Employment schemes also provide immediate income, thereby improving food security. The main objective, however, should be to link these employment schemes with measures that will increase the productive capacity of the local economy. With most of the areas of the food-insecure districts being single-cropped, there is clearly room for using

employment schemes for building irrigation, water-retention structures, and infrastructure, in general.

6.2.6 National Rural Employment Guarantee Act

The National Rural Employment Guarantee Scheme (NREGS) is a landmark social security legislation that epitomises the right to employment on demand. It aims to enhance livelihood security in rural areas by providing at least 100 days of guaranteed wage employment in a year to every household.

NREGS has a rights-based framework, unlike earlier employment generation programmes. Its demand-based entitlements stem from the fundamental right “to live with dignity” and set it apart from other cash

conditional transfers, as well as a social safety net, dependent on Government benefaction.

Since its inception in September 2005, the programme has been instrumental in enhancing rural livelihood opportunities on a sustained basis, by developing need-based rural infrastructures. In Odisha, all the districts were covered under MGNREGA in three phases, with 19 districts being covered in the first phase.

Performance of MGNREGA in Odisha

Since its inception till the end of March, 2017, 63.66 lakh households in Odisha have been issued job cards. During 2016-17, about 4.46 lakh households were provided employment worth 776.39 lakh person-days. In the FY 2016-17, 35,872 households got employment

Table 6.10: Districts Covered in Three Phases of NREGA

Phases	Districts Covered
Phase I (total 19 districts)	Balangir, Baudh, Debagarh, Dhenkanal, Gajapati, Ganjam, Jharsuguda, Kalahandi, Kandhamal, Kendujhar, Koraput, Malkangiri, Mayurbhanj, Nabarangapur, Nuapada, Rayagada, Sambalpur, Sonapur, Sundargarh
Phase II	Bargarh, Anugul, Baleshwar, Bhadrak, Jajapur
Phase III	Nayagarh, Kendrapara, Jagatsinghapur, Puri, Cuttack, Khordha

Source: Ministry of Rural Development, Government of India.

Table 6.11: Performance of MGNREGA in Odisha

Year	2016-17	2015-16	2014-15
Approved labour budget(in lakhs)	800	760.06	633.13
Number of person-days generated so far(in lakhs)	776.39	894.46	535.4
Average days of employment provided per household	38.1	44.78	36.44
Average wage rate per day per person(Rs.)	171.51	188.02	161.46
Total number of households that completed 100 days of wage employment	35,872	1,97,460	82,022

Source: Ministry of Rural Development, MGNREGA.

for 100 days. Funds to the extent of Rs. 41.9 lakhs have been utilised out of the total available funds amounting to Rs.5.48 crore, showing that 71.15 percent of the allotted funds have been spent. The average number of man-days generated per household hovers at around 35-45. The average wage received was Rs. 172 in the Financial Year (FY) 2016-17 (Table 6.11).

Physical Progress of the MGNREGA Scheme

An analysis of the progress of MGNREGA in Odisha shows that about 10 lakh households demanded employment during the year 2016-17, of which about 4 lakh households were provided employment. Meanwhile, about 72 lakh person-days of employment generated during 2016-17. It has also been found that women spend more of their income than men on the essential consumption needs of the family, education

of children, and healthcare requirements, all of which are help in improving the nutritional status of their households. Interestingly, the proportion of female participation in the programme in the state in 2016-17 was about 41 per cent, up from 36 per cent in 2008-09 (Table 6.12).

Financial Outcome of the MGNREGA Programme

An assessment of the financial progress of the programme shows that in 2016-17, about 93 percent of the total funds available under the programme in the state were utilised. The expenditure incurred on wages in the state during the year was 72 percent. Further, the expenditure incurred on material during 2016-17 was 28 per cent, up from 23 percent in 2008-09 (Table 6.13).

Table 6.12: Physical Employment Generation in Odisha and India, 2008-09 and 2016-17

Indicators for Assessment of Progress of NREGA		2008-09		2016-17	
		Odisha	India	Odisha	India
No. of households that demanded employment		12,20,596	455,18,907	10,44,181	241,86,791
No. of households that were provided employment		11,99,006	451,15,358	4,08,863	126,57,288
Person-days In lakhs	Total	432.58	21632.86	71.67	1932.69
	SCs	87.55	6336.16	12.39	390.41
	% age of SC participation	20.24	29.29	17.29	20.2
	STs	154.9	5501.64	22.28	355.95
	% age of ST participation	35.81	25.43	31.09	18.42
	Women	162.58	10357.36	29.45	1098.44
	% age of female participation	37.58	47.88	41.09	56.83
	Others	190.13	9795.06	37	1186.33
Average person-days per household		36.08	47.95	17.53	15.27
Number of households that availed 100 days of employment		52,459	65,21,268	62	3372

Source: Ministry of Rural Development, Government of India.

Table 6.13: Financial Outcomes of the MGNREGA Programme, 2008-09 and 2016-17

States	2016-17		2008-09	
	Odisha	India	Odisha	India
Central Release (Rs. In lakhs)	57510.59	1666602.8	147941.1	3396883
Total funds available including O.B. (Rs. in lakhs)	58442.61	1890431.5	149642.7	3561616
Total expenditure (Rs. in lakhs)	54320.73	1195143.4	180271.3	4144991
% age of expenditure against total available funds	92.95	63.22	120.47	116.38
Expenditure on wages (Rs. in lakhs)	38821.63	991797.98	135069	3069690
% age of expenditure on wages	71.89	83.71	76.96	76.95
Expenditure on material (Rs. in lakhs)	15181.73	193013.97	40438.18	919682.5
% age of expenditure on material	28.11	16.29	23.04	23.05
Administrative expenditure (Rs. in lakhs)	317.37	10331.47	4764.09	155619
% age of administrative expenditure	0.58	0.86	2.64	3.75

Source: Ministry of Rural Development, Government of India.

Improving Gender Relations

Studies show that female literacy in rural areas is the most significant factor in determining the food security of the rural population (Food Security Atlas Orissa, 2008 IHD_WFP). The study also showed that all the districts in the most food-insecure category rank very poorly in terms of rural female literacy. Thus, it is important that girls' literacy be prioritised and all barriers to their access to education be effectively tackled, to ensure that girls from the poorest and most marginalised communities get priority treatment. This should be coupled with the provision of quality education.

NREGA Improving Gender Relations

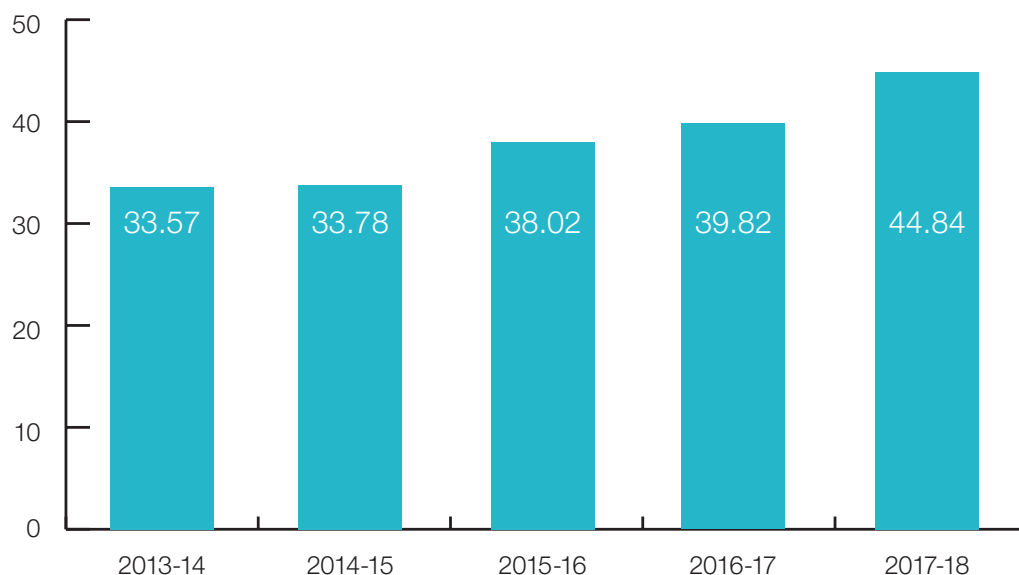
The official data indicates that an impressive number of women participating in MGNREGA contributes to its effectiveness. Figure 6.1 shows that there has been a constant, albeit slow, increase in the number of women person-days as a percentage of the total over the years in Odisha (Figure 6.1).

Importantly, a majority of the women workers under MGNREGA say that such employment has brought about a significant change in their communities and in their own lives; the MGNREGA wages are higher than the market wages, which has improved their spending capacity. Women are able to use their earnings for household food and consumption needs, healthcare and education of children. More importantly, earlier they “used to be dependent on their husbands for any expenses”, but now with some cash in their hands, women have a greater degree of economic independence and self-confidence, they “feel empowered”, as they are also earning members of the family (Jandu et.al, 2008). In many worksites, women have control rights over their wages in bank deposits. A 2008 MGNREGA survey showed that 79 per cent of the women employees in MGNREGA works collect their own wages, and 68 per cent keep their own wages (Frontline, 2009:13). A significant policy change from the earlier employment generation schemes in India is that the Act stipulates that women's wages are not lower than those of men in

MGNREGA employment. With the exception of a few reported cases, such gender wage parity has been noted in large-scale surveys. In the given system of

gender relations in India, this is no small achievement. As noted elsewhere, women's capital endowments do not determine gender wage differentials, which

Figure 6.1: Women Person-days Generated 2013-18



Source: Census of India, 2001, 2011

may be attributed more to discrimination favouring men (Kelkar and Wang, 2007). The gender wage differentials largely found in non-farm employment in rural areas of India, are largely due to gender discrimination which encourages women's engagement in low levels of occupation, like unskilled and semi-skilled work, low-level management work, and other related production work.

6.2.7 Micro Credit

The food-insecure populations are usually thought to be non-bankable or not credit-worthy. But they do access credit from moneylenders who charge exorbitant rates of interest. 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, including both savings and credit, are required, both to enable consumption smoothening and to utilise market opportunities. Micro-financial services need to be provided through either the Indian SHG model or the Bangladesh Grameen Bank model. By facilitating an increased use of educational facilities and credit for utilisation of growing market opportunities, micro-finance programmes can link increased food security with development. The food security impact of micro-finance also increases by its contribution towards enhancing women's agency in the household. Data from IHDS-II (2011-12) shows that 98 percent of the

eligible women in the age group of 15-49 years have cash-in-hand for household expenditures if they are involved in any SHG activities as against 81 percent of the women when they do not have any SHG link. This clearly shows a 17 percentage point gap between women with and without SHG linkages in terms of cash in hand for household expenditure.

The National Rural Livelihood Mission (recently renamed as the Deendayal Antyodaya Yojana—National Rural Livelihood Mission) is one of the important programmes which facilitates access to affordable and reliable financial services to the poor through the SHGs. The scheme provides a Vulnerability Reduction Fund (VRF) to SHG federations to address vulnerabilities like food security and health security. The SHG-bank linkage is an effective tool for reducing poverty and promoting livelihoods. During FY 2014-15, 44,867 women SHGs were linked with an amount of Rs. 527.48 crores. Many strategies have been implemented under the SHG-bank linkage programme in the state, including the positioning of bank sakhis, formation of bank linkages and recovery committees, training and capacity building of community, banker, and project staff, and organisation of sensitisation programmes such as financial literacy training programmes.

6.2.8 Outcomes for Scheduled Tribes/ Scheduled Castes

Another policy implication based on the indicators used for enhancing food security is the betterment of the plight of the vulnerable populations, that is, the SCs and STs. All the food-insecure districts in Odisha are dominated by a higher proportion of STs, who form the most vulnerable sections due to their location-specificity and remoteness from facilities and amenities.

It is clear from the mapping of the food-insecure districts that the districts facing food insecurity are also those with higher proportions of SC and ST populations. Among the food-insecure districts like Malkangiri, Rayagada, Nabarangapur, Kalahandi, Koraput, and Gajapati have more than or near

70 percent of SC/ST population. On the other hand, the coastal districts, which are the most food-secure districts, have proportionately lower SC/ST populations. For example, in the districts of Nayagarh, Puri, Khordha, Kendrapara, and Jagatsinghapur, which fall in the food-secure zone, only about one-fifth of the total population consists of SCs/STs. Due to their locational disadvantages, the ST-dominated districts are also the most prone to food insecurity. However, MGNREGA has worked in reducing economic disparities between the general and marginalised classes of the society—17.29 per cent of SC workers and 31.09 per cent of ST households have been provided employment under MGNREGA.

6.3 ENHANCING ABSORPTION

The task of ensuring food security does not end with increasing the nutrient intake of the poor. It is also necessary to ensure that the body is able to utilise the increased intake of nutrients. This depends closely on complementary measures such as access to safe drinking water and to hygienic sanitation. 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. Discussed below are measures for improving access to clean drinking water and promoting hygiene and sanitation. Access to safe water and sanitation thus has a direct bearing on the food security of a household.

6.3.1 Clean Water Supply

The rural drinking water supply sector started in 1972-73 with the launch of the Accelerated Rural Water Supply Programme (ARWSP) by the Government of India. This second-generation programme was launched in 1991-92 as the Rajiv Gandhi National Drinking Water Mission. With the involvement of the community in the planning, implementation and management of drinking water supply schemes, the Sector Reform Projects came up in 1999-2000 as a third-generation

Watershed Development under RLTA for KBK districts

During 2008-09, micro watershed projects were started under special plan for KBK (Revised Long Term Action Plan RLTA). These micro watershed projects are implemented under operational guide line of Wested Odisha Rural Livelihood Programme (WORLP) with a cost norm of Rs. 9,500/- per hectare. During 2013-14, an area of 8675 hectares was treated by utilizing Rs. 824.21 lakh. The project cost of 150 micro watershed projects was Rs. 71.25 Crore.

Source: Odisha Economic Survey, 2014-15

programme, which later became Swajaldhara in 2002. The fourth-generation programme, viz., the National Rural Drinking Water Programme (NRDWP) came into force on 1st April, 2009, with a vision to ensure the provision of safe and adequate drinking water supply through hand-pumps, and piped water supply, among other sources, to all rural areas, households, and individuals. The main aim of this programme is to emphasise the sustainability of water availability while ensuring its potability, adequacy, convenience of supply and access, affordability, and equity, through the decentralised approach of involving the panchayati raj institutions and community organisations. This programme was launched after merging the three erstwhile sub-programmes under the Accelerated Rural Water Supply Programme (ARWSP), Swajaldhara, and National Rural Water Quality Monitoring and

Surveillance. Under the NRDWP, even as the Union Ministry is laying special emphasis on piped water supply in rural habitations, the states are being asked to plan for the coverage of habitations with piped water supply through standposts or household connections. This measure will not only reduce the drudgery and time taken in the collection of water but also facilitate addressing the issue of quality of drinking water quality in the habitations affected with water issues. The NRDWP has the following six components: coverage, sustainability, water quality, desert development programme (DDP) areas, natural calamity, and support. The specific goals of this programme are to provide:

- 40 litres per capita per day (lpcd) of safe drinking water for human beings;
- One hand-pump or stand-post for every 250 persons;
- A water source within the habitation, within a distance of 1.6 km in the plains, and within an elevation of 100 m in the hilly areas.

Table 6.14 depicts the physical coverage of the NRDWP in Odisha during 2016-17. It shows that the total number of habitations covered under the programme, as on 01/04/2017, accounted for 88 percent of the total habitations in Odisha, whereas SC- and ST-dominated habitations accounted for 87 percent and 90 percent of the total habitations, respectively. By the end of April 2016, there were 10,438 PWS schemes and 4,32,309 spot sources were installed in the state, including 4,19,364 tubewells and

Table 6.14: Habitations Covered under NRDWP (as on 1st April, 2017)

	Number	Percentage
Total habitations covered	1,38,420	87.73
SC-dominated habitations covered	12,770	86.81
ST-dominated habitations covered	52,223	90.11
Other habitations covered	73,427	86.27

Source: NRDWP.

Evaluation of “Water and Sanitation Services” in the KBK Region of Odisha

A study was conducted by the Centre for Youth and Social Development (CYSD), Bhubaneswar, on behalf of the Government of Odisha, to evaluate the water and sanitation services in the KBK region. The principal objective of the study was to learn from the current practices in the rural water supply and sanitation sector and to suggest action points for improvement at the level of programme design and implementation, involving all stakeholders. All the eight districts of the KBK region have been included in the study and the respondents' were taken from rural areas. The findings of the study present a mixed picture on the rural water and sanitation scenario in KBK districts. Going by the coverage statistics, the performance of the rural water supply sub-sector is commendable. The imaginative design of the programme and its sincere delivery have addressed the needs of even very small habitations, taking advantage of the flexibility granted to SC/ST habitations on the application of standard norms on population per tubewell. However, the performance in the sanitation sector is not that impressive. While the practice of open air defecation continues, the goal of the Nirmal Gram Panchayat is yet to gain strength through ownership and participation at the level of key stakeholders. Perhaps, the age-old habit of open defecation, traditional worldview, and selective use of subsidies continue to create formidable roadblocks for total sanitation. There is also a need to assess the quality of the assets created and usage otherwise the massive investments may not yield desired results. One has to learn lessons from the first-generation sanitation programmes and bridge the gaps as well as weaknesses, thus making TSC a total success. One of the major concerns that still remains is the issue of operation and maintenance.

Source: Planning Commission, Government of Odisha.

12,945 sanitary wells. During 2015-16, a total of 391 piped water schemes were commissioned and a total of 21,126 spot sources were created.

6.3.2 Swachha Bharat Mission (SBM)

The Prime Minister of India has given a call for “Swachha Bharat” as a mass movement for realising Gandhiji’s dream of a clean India by 2019. As per the new guidelines, the new project implementation plan will be prepared to make India open defecation-free as well as guaranteeing a clean environment by 2019. This mission has two sub-missions, one for rural and the other for urban areas. The unit cost of Individual Household Latrine (IHHL) has been enhanced from Rs.10,000 to Rs.12,000 under the Mission. The entire funding for the incentive for construction of IHHLs will be from Swachha Bharat Mission with the share of both the Government of India and the Government of Odisha. Till October 2015, 4,21,442 IHHL sand

CSCs were completed under the SBM. As per the 2011 Census, only 22 percent of the households have access to latrine facilities within the household premises in Odisha, which is the lowest among all the states of India. This means that 78 percent of the households have no latrine facilities at all in Odisha, which underscores the importance of the Swachha Bharat Mission in the state.

6.3.3 Nutritional Practices

One factor that contributes to in food utilisation, 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 the desirable quantities; it also refers to behavioural practices (for example, breastfeeding) that may not be practised as required. But as the widespread problem of under-nourishment in India shows that

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. India has programmes for providing nutrition supplements, for example through the ICDS programmes of nutritional supplements. The Integrated Child Development Services (ICDS) scheme is a government initiative for ensuring all-round development (health, nutrition and education) of children under the age of six years. Its aim is to reduce infant mortality and child malnutrition, and to provide pre-school education.

Supplementary Nutrition Programme

Supplementary Nutrition is one of the six services provided under the Integrated Child Development Services (ICDS) scheme, which is primarily designed to bridge the gap between the Recommended Dietary Allowance (FDA) and the Average Daily Intake (ADI). Supplementary nutrition is given to children aged 6 months-6 years and pregnant and lactating mothers under the ICDS Scheme.

The provision of supplementary nutrition under the ICDS Scheme prescribed for various categories of beneficiaries is as follows:

- i. **Children in the age group of 6 months to 3 years:** Food supplement of 500 calories of energy and 12-15 gms of protein per child per day as Take Home Ration (THR) in the form of Micronutrient Fortified Food and/or energy-dense food marked as 'ICDS Food Supplement'.
- ii. **Children in the age group of 3-6 years:** Food supplement of 500 calories of energy and 12-15 gms of protein per child per day. Since a child of this age group is not capable of consuming a meal of 500 calories in one sitting, the guidelines prescribe provision of morning snacks in the form of milk/banana/seasonal fruits/micronutrient fortified food, etc. and a hot cooked meal.
- iii. **Severely underweight children:** Food supplement of 800 calories of energy and 20-

25 gms of protein per child per day in the form of micronutrient fortified and/or energy dense food as 'Take Home Ration'.

- iv. **Pregnant Women and Lactating Mothers:** Food supplement of 600 calories of energy and 18-20 gms of protein per day in the form of micronutrient fortified food and/or energy dense food as 'Take Home Ration'.

The anganwadi is the nodal point for delivery of these services, and the anganwadi worker and helper manage the centre that runs for at least four hours daily. They are supervised by a Supervisor. The Child Development Project Officer (CDPO) is in charge of the programme at the block level, while the District Social Welfare Officer (DSWO) manages the programme of the district. The anganwadi provides supplementary nutrition for children as well as for pregnant and lactating mothers, and also carries out growth monitoring of under-five children. Malnourished children are provided additional food as prescribed. The other services provided at an anganwadi include immunisation, health check-up, referral services, pre-school education, and health education.

ICDS in Odisha

Odisha is one of the states with the highest poverty levels in India, and a significant portion of it is in what are known as the 'chronic poverty regions' of the country. A large proportion of the tribal population living in scattered hamlets in forested, difficult-to-access areas makes service provision particularly difficult in this state. For many years, Odisha has had the poorest maternal and child survival indicators in the country. However, in recent years, the state has made commendable progress in health and nutrition indicators, with a strong political will and with the establishment of strong systems in the WCD and health departments, coupled with strong inter-departmental co-ordination. The basic nutritional indicators of rural Odisha are presented in Table 6.15.

Table 6.15: Basic Health and Nutrition Indicators in Odisha, 2015-16

Indicator	Rural 2015-16
Infant Mortality Rate (No. of deaths per 1000 live births)	43
Under-5 Mortality Rate	53
Total Fertility Rate	2.1
% of children aged 12-23 months who are fully immunised	79.2
% of children under 5 who are stunted	35.3
% of children under 5 who are wasted	20.9
% of children who are underweight	35.8
% of women (15-49 years) who are anaemic	51.8

Source: NFHS-4, 2015-16.

Table 6.16 provides a snapshot of the coverage of the programme on Odisha. During 2015-16, supplementary

nutrition was given to 45 lakh and health care check-ups done for 21 lakh children.

Table 6.16: Beneficiaries Covered under the ICDS Programme

	2015-16 (in Lakhs)	Immunisation	2015-16 (in Lakhs)
Supplementary nutrition	45.17	DPT	5.91
Health check-up	21.17	Polio	6.08
Nutrition and health education	9.19	BCG	4.85
Referral services	6.33	Measles	6.34
Pre-school education enrolled	17.35	TT	5.99

Source: NFHS, 2015-16.

6.3.4 Biju-KBK Plan

The Biju-KBK Plan, a state flagship programme under the State Plan, was launched in 2006-07 to create opportunities for socio-economic-human capital development of eight KBK districts, and to improve the quality of life of people of the region, in general, and the disadvantaged groups, in particular. The objectives of the Biju KBK Plan are as follows:

- i. Creating opportunities for economic, social and human development for the people in the region, especially the disadvantaged;
- ii. Accelerating poverty reduction and achieving millennium developmental goals; and
- iii. Improving the quality of life of the local people and bringing the region at par with other developed regions.

In order to achieve the aforesaid objectives, the following strategies are envisaged to guide the Plan:

- i. Building rural infrastructure (for example, critical roads and bridges, minor irrigation projects, tanks, watershed development, markets and afforestation);
- ii. Developing district-specific and sub-district-specific livelihood support programmes (for example, agriculture/horticulture development, animal resources, fisheries, afforestation and forest-based enterprises, micro credit support, agro-processing enterprises and other value addition initiatives);
- iii. Mobilising and empowering the rural poor through SHGs, Vana Samrakhan Samities, PaniPanchayats, and participatory planning;
- iv. Promoting quality education, employable skills and health programmes taken specially to the distant habitations;
- v. Strengthening social security systems (for example, food security, old age pensions, special nutrition programmes, houses for the rural poor, and other initiatives),

After the discontinuation of the Special Central Assistance (SCA) programme for the implementation of a Special Plan for the KBK Districts by the Government of India from the year 2015-16 onwards, the Biju KBK plan gathered strength with an enhanced outlay of Rs. 250 crore out of the State Plan allocation during 2015-16. The outlay was meant for district sector programmes (Rs. 120 crore) and state sector programmes (Rs 130 crore). The district sector programmes are related to the provision of Bijli (electricity), *Sadak* (roads), *Pani* (water), and Livelihood initiatives, that is, village electrification including street lighting, construction of concrete roads within the village, or provision of any other form of connectivity, creation of irrigation/drinking water sources, and support for sustainable income and employment-generating activities. The state sector programmes relate to the implementation of ongoing projects/programmes of the delinked

Special Plan for the KBK districts in the field of irrigation, electrification, welfare of STs and SCs, and connectivity. A total of 21,333 projects have been completed for providing Bijli, Sadak, Pani and other facilities out of the 26,311 approved projects by the end of October 2016. A provision of Rs. 30.00 crore was made for 2016-17 to complete the spillover projects taken up under the SCA for the KBK districts and to take up some new projects.

6.4 Priorities for District-wise Executive Action

In this section, an attempt has been made to work out for each special category district the order of importance of each of the fourteen selected indicators, using the indices method. The guiding principle on the basis of which district level priorities have been derived is the lower the level of a district in terms of policy variables affecting food security as compared to other special category districts. The indices method is used for calculating the status of development/underdevelopment of a district. In this method, we have to convert the district level figures by using the state level base figure as 100. The districts with the lowest indices for input indicators and the districts with the highest indices for outcome indicators are identified as the priority indicators for districts needing urgent intervention.

Table 6.17 presents the region-wise district-wise priority variables for intervention. The priority variables have been identified for the four regions in Odisha, that is, the Central Table, Coastal region, Northern Plateau, Southwestern Plateau and as well as for rural Odisha as a whole.

Table 6.18 suggests that in the Central Table region of Odisha, Debagarh district is one of the priority districts as it scores the lowest in eight out of the 14 FSI indicators. Balangir district is the second important district, which needs urgent attention and this district is deficient in three indicators, including irrigation, literacy, and the dependency ratio. In the coastal belt, Gajapati is the priority district for intervention, as it

Table 6.17: Regions in Odisha

Central Table	Coastal	Northern Plateau	Southwestern Plateau
Bargarh	Baleshwar	Sundargarh	Baudh
Jharsuguda	Bhadrak	Kendujhar	Nuapada
Sambalpur	Kendrapara	Mayurbhanj	Kalahandi
Debagarh	Jagatsinghapur	Kandhamal	Rayagada
Dhenkanal	Cuttack		Nabarangapur
Anugul	Jajapur		Koraput
Subarnapur	Nayagarh		Malkangiri
Balangir	Khordha		
	Puri		
	Ganjam		
	Gajapati		

scores the lowest in 11 out of 14 indicators. Other than the indicators of irrigation, access to PHCs, and the occurrence of diarrhoea, the district of Gajapati is deficient in all the remaining indicators. The Northern Plateau consists of four districts, that is, Sundargarh, Kendujhar, Mayurbhanj, and Kandhamal, of which Mayurbhanj and Sundargarh are high-priority districts as they score the lowest in five variables each. The district of Mayurbhanj is found to be deficient in non-agricultural labour, the dependency ratio, the monthly per capita consumption expenditure, access to safe drinking water, and female literacy. On the other hand, Sundargarh district has deficient irrigation, low casual wages, lack of access to paved roads and toilets, and a high concentration of SC/ST population.

The southwestern plateau is the most backward area in Odisha. The district of Kandhamal is deprived in terms of agricultural production, access of villages to towns, to safe water, and to PHCs whereas Malkangiri district exhibits low development in terms of consumption expenditure, wage rate, and access to paved roads.

6.5 SUMMING UP

This chapter highlights the major programmes related to food security and its performance in the context of Odisha. The chapter points to the importance of various programmes like PDS, MGNREGA, MDM, NFSM, rural road connectivity, and the rural drinking water programme. As far PDS are concerned there was the exclusion and inclusion error. However, the recent data shows that the proactive actions of the Government in the form of a number of measures as well as the decision to provide rice at a rate of Re. 1 per kg have spelt huge success for the scheme. The computerisation and linkage of beneficiaries with technology, particularly, the PDS and MGNREGA programmes, has made the new policies transparent and more effective.

Although MGNREGA is a powerful means of providing income and hence access to food security, the proportion of employment generation for women and STs is very small in Odisha. Further, NFSM is also important, though it primarily addresses the food availability dimension of food security, but

ignores the access to food dimension. To improve the food security of the poorest districts, the state needs to first identify the right policy variables along

with other food security intervention programmes so that the districts can achieve food-secure status.

Table 6.18: Priority Districts in Terms of Input Indicators

Variables	Central Table	Coastal	Northern Plateau	Southwestern Plateau	Odisha
Input Indicators					
Per Capita Value of Agricultural Output	Debagarh (23)	Gajapati (16)	Kendujhar (84)	Kandhamal (33)	Gajapati (16)
% of Net Irrigated Area to Net Sown Area;	Balangir (18)	Nayagarh (42)	Sundargarh (25)	Nabarangapur (16)	Nabarangapur (16)
% of village access to town within 10 km	Debagarh (45)	Gajapati (63)	Sundargarh (45)	Kandhamal (36)	Kandhamal (36)
% of Agricultural Labourers to All Labourers;	Debagarh (86)	Gajapati (78)	Mayurbhanj (91)	Kalahandi (69)	Kalahandi (69)
% SC and ST Population;	Sambalpur (68)	Gajapati (59)	Sundargarh (43)	Malkangiri (30)	Malkangiri (30)
Non-dependency Ratio	Balangir (96)	Gajapati (86)	Mayurbhanj (93)	Malkangiri (77)	Malkangiri (77)
Average Per Capita Consumption Expenditure	Debagarh (78)	Gajapati (77)	Mayurbhanj (83)	Malkangiri (64)	Malkangiri (64)
Average Casual Wage	Debagarh (68)	Gajapati (81)	Sundargarh (69)	Koraput (77)	Debagarh (68)
Percentage of villages with access to paved Roads	Subarnapur (84)	Gajapati (66)	Sundargarh (97)	Malkangiri (56)	Malkangiri (56)
Percentage of Households with Access to Safe Drinking Water;	Dhenkanal (56)	Gajapati (72)	Mayurbhanj (76)	Kandhamal (50)	Kandhamal (50)
Percentage of villages with access to PHCs within a distance of 5 km	Debagarh (13)	Jagatsinghapur (93)	Kendujhar (28)	Kandhamal (91)	Debagarh (13)
Female literacy rate	Balangir (83)	Gajapati (64)	Mayurbhanj (83)	Koraput (51)	Koraput (51)

Variables	Central Table	Coastal	Northern Plateau	Southwestern Plateau	Odisha
Input Indicators					
Prevalence of diarrhoea (reported) in the last two weeks preceding the survey (%)	Debagarh (96)	Baleshwar (89)	Kendujhar (87)	Rayagada (99)	Kendujhar (87)
Percentage of households with access to toilets	Debagarh (41)	Gajapati (91)	Sundargarh (65)	Nabarangapur (48)	Debagarh (41)

Note: The figures in brackets are the indices for the respective district, taking Odisha as 100.

7

CONCLUSIONS: TOWARDS A FOOD-SECURE ODISHA

The Sustainable Development Goal (SDG) indicated that by 2030, there would be an end to all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and addressing the nutritional needs of adolescent girls, pregnant and lactating women, and older persons. Another goal of the SDG relating to hunger is that by 2030, there will be an end to hunger and access to food would be ensured for all, particularly, the poor and vulnerable people, including infants, to safe, nutritious and sufficient food all the year round. These two indicators implied the food security or insecurity of a particular area and households in that area. For a food-secure Odisha, one could target those who are just below the international weightnorm, and undertake special interventions to bring them up to the norm. In this manner, the state could meet its SDG target of eliminating hunger and malnutrition by 2030. An approach for targeting the most severely under-nourished populations, both by region and by social class, including gender characteristics, is important. 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 potential 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 under-nourished

mothers is again not only for them but would also have inter-generational benefits in reducing the incidence of low-weight births.

The primary focus of the report is on estimating food security at the district level in Odisha, and on identifying those districts which are at the lowest level, and need specific policy interventions. Food security is dependent, in the first place, on the availability of food. However, in case adequate purchasing power is not available, household level access to food gets curtailed even if its 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, the body's absorption of food and its nutritional impact will suffer in the case of the households concerned. Thus, the third basic component of food security is the body absorption or utilisation of food. All these three components, 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 results 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.

The analysis in this report shows that ensuring food security and improving nutritional status is a challenge for the state as a whole. The study has identified certain districts for priority action, which should draw attention with more inclusive growth efforts for bridging the gap between different food-secure and food-insecure regions. The analysis of the report shows that districts such as Balangir, Gajapati, Kalahandi, Kandhamal, Koraput, Malkangiri, Nabarangapur, Nuapada, and

Rayagada, which exhibit alarming status in terms of food security, need urgent attention. On the other hand, the districts of Mayurbhanj, Baudh, and Debagarh require special attention for food security interventions as these three districts have appeared in the food insecurity zone based on two of the three methods used for arriving at the district food security status. All the districts in the Eastern Ghats region fall in the category of most food-insecure districts. The region largely comprises the erstwhile KBK districts. Some districts from the relatively better-off coastal region also show poor food security and have been included in the list of priority districts. Thus, food security measures need to be focused on in the region that forms a contiguous zone of food insecurity. Within this zone of food insecurity, there is a further group of four districts, which require even more focused attention, including the extremely insecure districts of Kandhamal, Malkangiri, Gajapati, and Rayagada.

Along with the above, our analysis reveals that areas with a high proportion of STs are more prone to being food-insecure. They are the forest areas and point to the importance of a development policy for forest-related populations. With a high proportion of agricultural labourers and SCs in Odisha, it is necessary to pay attention to increasing employment and wages, including through non-agricultural development. At the same time, the provision of even a small plot of land can substantially increase the access of the landless to food. The analysis of the FSI and the related Principal Component Analysis points to the following areas /sectors that require priority intervention:

1. Female literacy rate;
2. Dependency rate;
3. Percentage of SC/ST population;
4. Percentage of agricultural labourers to total workers;
5. Percentage of villages having access to pucca roads within a distance of 5 km;
6. Average casual wage rate; and
7. Monthly per capita consumption expenditure.

Based on the factor loadings, the above-mentioned variables are identified as priority variables which need further intervention in food insecure areas/districts. It is also necessary to explore how food-based schemes can be linked with development.

- The correlation between the dimensional index, food security index (FSI), and food security outcome index (FSO) shows some significant relation. The second correlation between access index and outcome index is 0.690 at 5 percent degree of significance. This indicates a high correlation between the two. There is a low correlation between utilization index and outcome index. (0.108). There is a strong association between the FSI and FSO with a correlation of 0.597 at a 5 per cent level of significance. Also, the correlation of FSI arrived at by PCA and the outcome index is very high (0.933), which shows a high degree of correlation between the two. The correlation between the PCA FSI index and availability is high (0.558) at a 5 per cent level of significance. Again the correlation between the access index and the PCA FSI index is very high at 0.964, at a 5 per cent level of significance. The inter-relationship between the individual food security variables to the aggregate index of different dimensions of the Food Security Index as well as the Outcome Index shows that excluding three variables, that is, the percentage of agricultural labourers to total workers, access to safe drinking water, and access to PHCs, all the other variables show a strong positive correlation of variables and FSI. The correlation between the outcome variable with different variables used in calculating the FSI, that is, agricultural labour (0.292), irrigated area (-0.155), access to drinking water (0.112), and access to PHCs (0.040), show a low correlation. Two variables, that is, access to safe drinking water, and access to PHCs, show a high degree of correlation. The other variables show a low correlation. The relation between food security and human development is noticed and a very

strong positive relationship exists between food security and the human development index, meaning thereby that the developed districts in terms of human development are also districts with higher food security. The Pearson's correlation of both the variables is 0.700, which is high.

- In terms of the FSI, and based on the range equalisation method, there are six districts in the Secure category (S), six in the Moderately Secure category (MS), six in the Moderately Insecure category (MIS), seven in the Severely Insecure category (SIS), and five in the Extremely Insecure category (EIS). An analysis of the status of the districts in terms of food security by using the PCA method shows that six coastal districts, such as Cuttack, Puri, Bhadrak, Jagatsinghapur, Kendrapara, and Khordha are found to be the most food-secure districts, followed by the districts of Ganjam, Baleswar, Nayagarh, Dhenkanal, and Anugul, which are moderately secure. On the other hand, the five districts of Rayagada, Koraput, Malkangiri, Kandhamal, and Gajapati fall in the most food-insecure zone; of these, the first three belong to the KBK region while the other two belong to the coastal and central regions, respectively.
- The Spearman rank correlation between the 2008-09 and 2016-17 FSI and the dimensional index shows that the status of districts status has changed, to a large extent, in the outcome index and availability index whereas in case of the access, utilisation, and overall indices, a minimal change has occurred. This indicates a transition in the status of the districts from food-insecure to food-secure, and vice versa. The status of the districts in the availability index shows that 13 districts have retained the same position that they occupied in 2007-08. As regards the availability index, the district of Gajapati, which was a severely insecure district, became an extremely insecure district. Further, the districts of Malkangiri, Koraput,

and Rayagada, which were moderately insecure in 2007-08, slid to extremely insecure status in 2015-16. The status of the districts of Debagarh, Mayurbhanj, Nuapada, Balangir, and Baudh, which were moderately insecure, also deteriorated to severely insecure whereas the district of Kalahandi, which was moderately secure in 2008, slid into the severely insecure zone. The districts of Sundargarh and Anugul showed a slight improvement over time, moving from severely insecure status in 2008 to moderately insecure. The district of Sambalpur, on the other hand, moved from insecure to secure status over the corresponding period. The coastal district of Khordha, which was moderately secure in 2007-08, showed an improvement by moving to become a secure district. Similarly, the district of Kendrapara also showed an improvement by moving from moderately insecure to secure status.

- In terms of the access dimension also, 18 of the 30 districts in Odisha have retained the same place that they occupied in 2007-08. The districts of Malkangiri, Gajapati, Kandhamal, Kalahandi, and Nuapada, which were severely insecure in 2007-08, became extremely insecure in 2015-16. The district of Kendujhar, which was moderately secure in 2007-08, has also become severely insecure. However, the district that has shown some improvement over time is Sambalpur, which moved up from moderately insecure to moderately secure status. The districts of Jajapur, Nayagarh, and Bhadrak, on the other hand, skipped from secure to moderately secure status. In terms of the utilisation dimension, most districts have shown comparatively good progress as compared to the access dimension. Although 13 districts have remained in the same category of insecurity as in 2007-08, the districts of Dhenkanal, Anugul, and Mayurbhanj improved from extremely insecure to severely insecure status. The districts

of Baudh, Kendujhar, and Sambalpur also improved from extremely insecure to moderately insecure status. The districts that show some improvement are Ganjam, Cuttack, Jharsuguda, and Nabarangapur. Only the districts of Puri and Baleshwar showed a deterioration in status in 2016-17 as compared to 2008-09 as per the utilisation dimension. While Puri slid down from moderately secure to moderately insecure status, Baleshwar deteriorated from secure to moderately secure status.

As per the FSI, eighteen out of thirty districts retained their positions from 2007-08 to 2015-16. The districts of Koraput and Malkangiri, which are the part of KBK region, slid down from severely insecure to extremely insecure status. The district of Nabarangapur, on the other hand, showed an improvement from extremely insecure to severely insecure status. The districts of Sundargarh, Kendujhar, and Anugul also improved from severely insecure to moderately insecure status whereas the district of Sambalpur shifted from insecure to secure status. The districts of Ganjam and Jharsuguda also moved from the insecure to secure zone. The coastal districts of Khordha, Cuttack, and Kendrapara marked progress from moderately secure to secure status.

As per the outcome index, the districts of Nabarangapur, Ganjam, and Balangir slid down from severely insecure to extremely insecure status whereas the districts of Gajapati and Nuapada improved from extremely insecure to severely insecure status. The coastal district of Bhadrak improved from severely insecure to moderately secure whereas the districts of Jajapur and Kendrapara also showed an improvement, moving up from insecure to secure status. The districts of Puri, Cuttack, and Jharsuguda, however, showed a deterioration in food outcome status over the period under study.

The food security interventions also need to be seen in terms of the status of the state with regard to various types of food security intervention programmes, namely, the Targeted Public Distributions System (TPDS),

the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), National Food Security Mission (NFSM), Rural Road Connectivity, and the Mid-day Meal Scheme. The region-wise percentage of household exclusion and inclusion shows that the coastal belt, which consists of the developed districts and regions with comparatively lower poverty than others, shows a high inclusion error of about 69 percent of the population. On the other hand, 9 percent of the population in the coastal belt is excluded from the benefits of TPDS due to wrong identification. Meanwhile, the Southern belt, which consists of one of the poorest regions, shows a high exclusion error, with 44 percent of Above the Poverty Line (APL) cardholders falling under the Below the Poverty Line category based on the MPCE criteria. In the northern region, the inclusion error is higher than the exclusion error.

It is interesting to note that of the total Antyodaya and BPL cardholders, about 51 percent are actually above the poverty line if calculated in terms of the MPCE. On the other hand, of the total APL cardholders, 17 percent fall below the poverty line in terms of MPCE. The social category-wise analysis indicates that the exclusion error for STs and SCs is extremely high as compared to OBCs and other household categories whereas for OBCs and other households, the inclusion error is high.

The Government stepped in through proactive intervention to strengthen the TPDS. In 2008, the World Food Programme (WFP) did a pilot project in the Rayagada district to enrol multimodal biometrics including ten fingerprints, iris (for a segment of the population), and individual facial photographs for beneficiaries across the district, which was found to be a good starting point for the efficient functioning of the programme. In this sphere too, the Government of Odisha launched a unique scheme—the Odisha Modernising Economy, Government and Administration (OMEGA)—with the support of DFID to modernise both the MGNREGA and TPDS programmes, which has reportedly help improve the implementation of both these programmes substantially.

The NREGA programme is a powerful means of providing income and hence access to food security. In the programme till the end of March, 2017, 63.66 lakh households were issued job cards and 4.46 lakh households were provided employment worth 776.39 lakh person-days. However, the average number of man-days generated per household hovers at around 35–45 days per household. The average wages received under the programme is Rs. 172/-. Interestingly, the proportion of female participation in NREGA was about 41 per cent in 2016-17, up from 36 per cent in 2008-09. The shares of SCs, STs, and women in the total person-days worked under NREGA were 12.4 per cent, 22.3 per cent, and 29.5 per cent, respectively, in 2016-17.

The MDM programme has improved school attendance that can, in turn, benefit both the individual and the household in terms of ensuring an increase in potential future earnings. A reduction in illiteracy also provides a social benefit to the village or relevant area, as it helps improve both the quality of the workforce and the health and hygiene behaviour of the villagers, thereby promoting better food absorption. Improved school attendance is also beneficial in enabling migration of students towards better urban livelihoods than would be available to illiterates.

For those suffering severe malnutrition, supplementary feeding programmes have a considerable role to play in improving the health status. However, as mentioned above, the implementation of such programmes, including for reaching those with severe malnutrition, largely depends on the demand for such interventions and services from the affected persons themselves. In the absence of such a demand from the most malnourished, the benefits of such programmes are highly likely to be captured by the better-off and those not in need of such interventions in the village.

The NFSM scheme has primarily addressed the food availability dimension. While it concentrates on irrigated crops, some parts of rainfed agricultural crops have been ignored. Crops like millets of different kinds, which are produced in the dryland area, should be given more

importance. Also, greater emphasis must be laid on increasing productivity in the rainfed areas, which suffer from persistent deprivation of food.

The latest agricultural policy of 2013 has also provided the right direction to the state by provisioning the diversification of both high-value as well as horticultural crops. The high-value and cash crops are used to advance the process of accumulation of physical and human capital. However, the policy of diversifying from traditional to high-value crops should be drafted and implemented judiciously keeping in mind the food requirements of the state.

Rural road connectivity is a vital component of rural development as it promotes access to economic and social services, thereby generating increased agricultural incomes and productive employment opportunities. The state has made remarkable progress in terms of increasing the road network through two major programmes, that is, the Pradhan Mantri Gram Sadak Yojana and Bharat Nirman Yojana to provide a motorable all-weather road network. The Government of Odisha has also embarked upon a new initiative for formulating and launching the ambitious Biju Setu Yojana (BSY) to bridge all the missing links on roads of the Rural Development (RD) Department. By providing all-weather connectivity to the rural areas of the state. In addition, the programme will also cover the construction of bridges on strategic important Panchayat Samitee roads belonging to the Panchyati Raj (PR) Department.

The food security impact of micro-finance also increases by contributing towards enhancement of women's agency in the household. The recent IHDS data of 2011-12 shows that 98 per cent of the eligible women in the age group of 15-49 years have cash-in-hand for household expenditures if they are involved in any SHG activities, as against 81 per cent women who do not have any SHG linkages. This clearly shows a 17 percentage point gap between women with and without SHG linkages in terms of holding cash in hand for household expenditure. The National Rural Livelihood Mission (recently renamed as the Deen

Dayal National Rural Livelihood Mission) is one of the important welfare programmes that facilitates access to affordable, cost-effective, and reliable financial services to the poor through SHGs. The scheme provides a Vulnerability Reduction Fund (VRF) to SHG federations for addressing vulnerabilities like food security and health security. The SHG-bank linkage is also an effective tool for reducing poverty and promoting livelihoods. Under this scheme, many strategies have been implemented under the SHG-bank linkage, including positioning of bank sakhis, formation of bank linkage and recovery committees, training and capacity building of community, banker and project staff, and organisation of sensitisation programmes including the financial literacy training programme, among others.

Besides ensuring sufficient nutrient intake for the body, it is also necessary to ensure optimal utilisation of these nutrients. This depends largely on complementary measures such as providing access to safe drinking water and hygienic sanitation. These two inputs would substantially reduce exposure to water-borne and gastrointestinal diseases, such as diarrhoea and cholera, which

often destroy the benefits of the food consumed. The National Rural Drinking Water Programme (NRWDP) has a vision to ensure the provision of safe and adequate drinking water supply through hand-pumps, and piped water supply, among other means, to all rural areas, households and individuals. Under this programme, states are being asked to plan for the coverage of habitations with piped water supply through stand posts or household connections. In this context, the 'Swachha Bharat Mission' (SBM) of the Central Government is an ambitious programme, which aims at ending the practice of open defecation as well as ensuring a completely clean environment by 2019. Till October 2015, 4,21,442 individual household latrine and Community Sanitary Complex were completed under the SBM.

In our view, in order to improve the food security of the poorest districts, it is important to bring about an improvement in the food security policy variables along with other food security intervention programmes. The State too has an important role to play in this exercise through the implementation of welfare development programmes in the various districts.

Appendix Table 1.1: District-wise Literacy Rates in Odisha

District	2001						2011					
	Rural		Urban		Total		Rural		Urban		Total	
	T	F	T	F	T	F	T	F	T	F	T	F
Anugul	66.1	52.0	85.1	77.5	68.8	55.4	75.7	66.3	86.8	81.0	77.5	68.6
Balangir	52.7	35.8	78.0	68.2	55.7	39.5	62.1	50.3	83.4	76.7	64.7	53.5
Baleshwar	69.5	57.4	78.8	71.2	70.6	58.9	79.2	71.3	84.7	80.1	79.8	72.3
Bargarh	62.7	48.6	79.2	70.1	64.0	50.3	73.4	63.8	85.8	79.9	74.6	65.4
Baudh	56.4	37.4	82.0	70.5	57.7	39.0	70.8	58.8	86.8	79.9	71.6	59.8
Bhadrak	74.3	63.0	70.4	61.4	73.9	62.8	83.2	76.1	79.5	73.9	82.8	75.8
Cuttack	73.6	62.5	84.7	78.9	76.7	66.9	83.5	76.5	90.6	87.4	85.5	79.6
Debagarh	59.0	45.6	76.3	67.7	60.4	47.2	71.7	62.0	83.4	77.3	72.6	63.0

District	2001						2011					
	Rural		Urban		Total		Rural		Urban		Total	
	T	F	T	F	T	F	T	F	T	F	T	F
Dhenkanal	68.0	56.1	84.1	76.7	69.4	57.9	77.6	69.5	89.3	84.9	78.8	71.0
Gajapati	37.6	24.5	71.1	61.1	41.3	28.4	49.9	39.2	77.9	70.9	53.5	43.2
Ganjam	56.5	41.3	79.7	70.6	60.8	46.4	67.6	56.8	83.3	76.9	71.1	61.1
Jagatsinghapur	78.7	68.8	82.2	74.5	79.1	69.3	86.5	80.4	87.3	82.7	86.6	80.6
Jajapur	71.0	60.1	81.7	74.3	71.4	60.8	79.7	72.7	86.0	81.1	80.1	73.3
Jharsuguda	66.7	53.6	77.5	67.4	70.7	58.5	75.5	66.6	83.9	77.2	78.9	70.7
Kalahandi	43.5	26.5	74.4	63.4	45.9	29.3	57.3	44.3	81.6	74.5	59.2	46.7
Kandhamal	50.1	32.8	85.4	76.6	52.7	35.9	61.5	48.8	86.8	80.3	64.1	51.9
Kendrapara	76.5	66.3	82.6	75.3	76.8	66.8	85.0	78.7	88.3	83.7	85.2	79.0
Kendujhar	56.9	43.6	73.7	63.6	59.2	46.2	66.5	56.3	78.6	70.8	68.2	58.3
Khordha	74.1	63.0	86.7	80.9	79.6	70.4	83.0	76.3	91.0	87.5	86.9	81.6
Koraput	27.3	15.6	74.9	65.9	35.7	24.3	42.4	31.3	81.8	74.9	49.2	38.6
Malkangiri	27.9	18.4	65.3	54.9	30.5	20.9	46.1	36.0	74.5	64.9	48.5	38.3
Mayurbhanj	49.5	35.0	82.6	75.2	51.9	37.8	61.2	50.3	85.9	80.8	63.2	52.7
Nabarangapur	31.3	18.0	73.7	63.5	33.9	20.7	43.9	33.0	77.9	70.7	46.4	35.8
Nayagarh	69.8	56.7	85.6	78.2	70.5	57.6	79.8	71.1	87.8	82.2	80.4	72.0
Nuapada	40.3	23.8	70.4	59.0	42.0	25.8	56.0	43.2	79.0	71.2	57.3	44.8
Puri	77.3	66.3	81.9	75.9	78.0	67.6	84.2	77.3	87.4	83.5	84.7	78.3
Rayagada	29.9	18.3	72.2	62.4	36.1	24.6	44.4	33.5	78.0	70.4	49.8	39.2
Sambalpur	62.8	49.5	79.0	70.6	67.3	55.2	72.6	63.4	84.8	79.0	76.2	67.9
Subarnapur	61.7	44.7	77.3	65.0	62.8	46.2	73.6	63.1	83.0	74.9	74.4	64.0
Sundargarh	55.3	43.1	82.5	75.0	64.9	53.9	66.6	57.7	85.3	80.0	73.3	65.5
Total	59.8	46.7	80.8	72.9	63.1	50.5	70.2	60.7	85.7	80.4	72.9	64.0

Note: T-Total, F-Female
Source: Census of India, 2001, 2011.

Appendix Table 4.1:**A Comparative Analysis of the Food Security Index, 2016 and Human Development Index, 2006**

District	Overall_RE	HDI*	District	Overall_RE	HDI*
Anugul	0.502	0.663	Kandhamal	0.186	0.389
Balangir	0.412	0.546	Kendrapara	0.674	0.626
Baleshwar	0.597	0.559	Kendujhar	0.432	0.530
Bargarh	0.599	0.565	Khordha	0.683	0.736
Baudh	0.421	0.536	Koraput	0.287	0.431
Bhadrak	0.716	0.646	Malkangiri	0.269	0.370
Cuttack	0.694	0.695	Mayurbhanj	0.357	0.436
Debagarh	0.357	0.669	Nabarangapur	0.345	0.436
Dhenkanal	0.539	0.591	Nayagarh	0.537	0.571
Gajapati	0.233	0.431	Nuapada	0.375	0.581
Ganjam	0.553	0.551	Puri	0.737	0.657
Jagatsinghapur	0.794	0.557	Rayagada	0.301	0.443
Jajapur	0.564	0.540	Sambalpur	0.585	0.589
Jharsuguda	0.601	0.722	Subarnapur	0.538	0.566
Kalahandi	0.377	0.606	Sundargarh	0.431	0.683

Note: * State Human Development Report, Orissa, 2004., RE- Range Equalization

Appendix Table 4.2: Rank of the Food-Insecure Districts in Food Security Variables

District	Malkangiri	Nabarangapur	Kandhamal	Koraput	Rayagada	Gajapati	Nuapada	Balangir	Mayurbhanj	Kalahandi
Percentage of Net Irrigated Area to Net Sown Area 2012-13	23	30	27	10	13	6	25	29	18	14
Value Of Agricultural Output (Rupees)	8	5	30	9	21	29	10	6	16	7
% Pucca Road	30	14	28	26	27	29	16	17	10	22
% Other than Agricultural Labourers to Total Workers	9	27	20	18	29	28	24	22	19	30
% Other than SC/ST To Total Population	30	27	26	25	29	23	17	16	24	18
Ratio of Working Age Population to Non-working Age Population	30	28	27	29	26	24	25	20	21	22
MPCE	30	23	21	22	24	19	25	17	27	28
Casual Rural Wage Rate	21	19	22	27	6	24	20	28	14	13
Female Literacy Rate	27	29	23	30	28	26	25	22	21	24
% Households with Access to Safe Drinking Water	11	6	30	16	12	28	9	10	25	7
% Villages Having PHCs within a distance of 5 km	8	1	23	21	17	27	11	14	13	25

Appendix Table 5.1:**New Indicators Used to Analyse Food and Nutrition Security:
Rural Odisha**

Name of Variable	Ref. Year	Source
(a) Availability		
1. Per capita value of agricultural output	2012-13 to 2014-15	Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi
2. Proportion of net irrigated area to net sown area	2012-13	Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi
3. Percentage of village access to town within 10 km distance	2011	Village Directory, Census of India, 2011
(b) Access		
1. Percentage of agricultural labour to total workers	2011	Census of India 2011
2. Proportion of ST and SC population to total population	2011	Census of India 2011
3. Ratio of working age population	2011	Census of India 2011
4. Monthly per capita consumption expenditure (inequality adjusted)	2011-12	68th NSS round 2011-12
5. Rural casual wage rate	2011-12	68th NSS round 2011-12
6. Percentage of inhabited villages having access to paved roads	2011	Census of India 2011
(c) Utilisation		
1. Percentage of households having access to safe drinking water	2011	Census of India 2011
2. Percentage of inhabited villages having access to PHC in rural areas within a distance of 5 km	2011	Census of India 2011
3. Female literacy rate (7+) (rural)	2011	Census of India 2011
4. Disease and health behaviour (100-prevalence of diarrhoea (reported) in the last two weeks preceding the survey (%))	2015-16	NFHS 4, 2015-16
5. Percentage of households with access to toilets	2011	Census of India, 2011

Name of Variable	Ref. Year	Source
Outcome indicator		
1. Children under 5 years who are underweight (weight-for-age) (%)	2015-16	NFHS 4, 2015-16
2. BMI among women	2015-16	NFHS 4, 2015-16
Women whose Body Mass Index (BMI) is below normal (BMI < 18.5 kg/m ²) (%)	2015-16	NFHS 4, 2015-16
Children aged 6-59 months who are anaemic (<11.0 g/dl) (%)	2015-16	NFHS 4, 2015-16
Micronutrient (percentage of household not satisfying the recommended calorie, protein and/or fat requirements)	2011-12	NSSO, 68th Round Consumption Expenditure, 2011-12

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