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WFP
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Food and Nutrition Security Analysis, India, 2019

Ministry of Statistics and Programme Implementation
&
The World Food Programme

Food and Nutrition Security Analysis, India

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Ministry of Statistics and Programme Implementation
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प्रवीण श्रीवास्तव
सचिव एवं भारत के मुख्य सांख्यिकीविद
PRAVIN SRIVASTAVA
Secretary & Chief Statistician of India

सत्यमेव जयते

150 YEARS OF CELEBRATING THE MAHATMA

भारत सरकार
Government of India
सांख्यिकी एवं कार्यक्रम कार्यान्वयन मंत्रालय
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Foreword

India is a signatory to the resolution adopted on 'Transforming our World: the 2030 Agenda for Sustainable Development' at the 70th Session of the United Nations General Assembly held on 25th September 2015. To monitor the Sustainable Development Goals (SDGs) and its associated targets, a National Indicator Framework has been developed by the Ministry of Statistics and Programme Implementation in consultation with the stakeholders. The Ministry is also the SDG Data Focal Point of the Country for coordination of data related activities for Global Indicator Framework for SDGs.

Achieving inclusive growth in general and, in particular, targets of SDG 2, that is, "End hunger, achieve food security and improved nutrition and promote sustainable agriculture" has been one of the main priorities of the Government of India which is implementing various programmes/schemes in this direction. To monitor the progress in this field, efforts are on at the conceptual level to establish methodologies and develop analytical tools and robust indicators to give a better picture on these complex and multi-dimensional aspects of food and nutrition security and sustainable agriculture.

With the active involvement and collaboration with UN World Food Programme (UNWFP), the Ministry of Statistics and Programme Implementation has taken up this exercise of Food and Nutrition Security Analysis. This report on "Food and Nutrition Security Analysis, India" will help develop a better understanding of the issues and facilitate dialogue. I am confident that this Publication will serve as a valuable input for policy makers, planners, administrators, researchers and other stakeholders.

I express my sincere gratitude to all the Ministries and Organizations that have provided data for this report and to the members of the Technical Advisory Group (TAG) for their active involvement and recommendations. I also compliment the team of officers in MoSPI engaged in this endeavour for their sincere efforts in bringing out this Publication. The UN WFP for has also provided valuable support for undertaking this exercise with immense effort, dedication and hard work. We welcome suggestions for improvement in this publication.

(PRAVIN SRIVASTAVA)

New Delhi
March, 2019

ज्योतिर्मय पोद्दार
महानिदेशक (ईएस)
JYOTIRMOY PODDAR
Director General (ES)

सत्यमेव जयते

एक कदम स्वच्छता की ओर

PREFACE

भारत सरकार
सांख्यिकी एवं कार्यक्रम कार्यान्वयन मंत्रालय
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To cater to the emerging data needs and for understanding phenomenon that emerges in dynamic socio-economic environment of the country, the Ministry of Statistics and Programme Implementation brings out various thematic statistical publications particularly on topics which are crosscutting to various domains, in addition to its regular publications. India's achievement in terms of economic growth and food production has been rather remarkable in recent years. However, this has not resulted in matching improvement of nutritional status of the population in general and children and women in particular which is a matter of concern. To understand the nitty-gritty of food production, availability of food stock, economic capacity of population to access food, physical capacity of population to absorb nutrition out of food and resultant impact on nutritional status of the population this exercise of Food and Nutrition Security Analysis (FNSA) has been taken up first time in collaboration with UN World Food Programme (WFP) under the overall framework of MoU between the Ministry of Agriculture and Farmers Welfare and the UN WFP. The subject covered under present FNSA coincides with the SDG-2. India is dedicated to achieve the ambitious SDG targets. While, several steps have been taken and are being taken up by the Government for achieving the targets under SDG2, methods and indicators to track and monitor the progress are still not adequate and robust to give clear picture on the food and nutrition security situation in the country. This report is one of the attempt to initiate efforts and discussions on having key performance indicators on the issue.

Food security is a very complex multidimensional phenomenon. Food security as a concept itself has evolved over time. This is influenced by whole lot of factors across various sectors. Despite its complexity and methodological and data limitations, the present exercise of FNSA will prove as base to develop a better understanding of the issues. I hope, this publication will be a useful reference to all the stakeholders and will enhance the national and state level capacity for FNSA to guide the policy level decisions. This will also help in identifying data gaps and improving methodology analytical tools. I wish to place on record my gratitude to all the Ministries/Organization who have co-operated by providing data for the report and members of Technical Advisory Group for their involvement, deliberations and guidance. I would like to express my deepest appreciation to the team of officers of Social Statistics Division lead by Smt. Shailja Sharma, Additional Director General and WFP research team for their immense effort, dedication and hard work to prepare this report. Suggestions to improve this publication in future are most welcome.

(JYOTIRMOY PODDAR)
Director General (ES)
Central Statistics Office

New Delhi
March, 2019

Message from Country Director

The Government of India (GoI) has been the frontrunner in shaping the Sustainable Development Goals (SDG) and its commitment in achieving the SDG agenda is commendable. Many ambitious steps have been undertaken by various agencies of the government to ensure an accelerated pace of implementation towards attaining the goals under Agenda 2030.

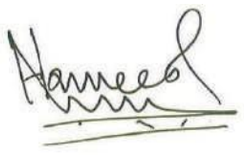
The UN World Food Programme (WFP) is the world's largest humanitarian organization fighting global hunger. With the mantra of 'Saving lives, Changing lives', WFP is committed to support governments in achieving their targets under SDG-2, by 2030 (end hunger, achieve food security and improve nutrition and promote sustainable agriculture). WFP promotes the core principles of "inclusive growth – leaving no-one behind and reaching the furthest first" for holistic development of a country or state.

Towards ensuring effective and efficient implementation of SDG targets, a robust system for review and monitoring of the progress towards achieving targets under SDG using a variety of food and nutrition security indicators is required. While the robust statistical systems do exist in India, a tool that comprehensively analyses the multi-dimensional aspects of food and nutrition security is lacking. This *"Food and Nutrition Security Analysis of India"* is an attempt by the Ministry of Statistics and Programme Implementation (MoSPI) and WFP to highlight the prevailing conditions of food availability, accessibility and utilization in India and present it in a simple way in order to facilitate easy understanding and action/steps that need to be taken. This report will provide a baseline to measure the progress made at the national and sub-national levels by putting the state and district level performances at the center of the development landscape of India. The *Food and Nutrition Security Analysis of India* has also highlights various information and data gaps and provides guidance on how to improve the methodology, frameworks and analyses.

WFP recognizes the various ongoing efforts in India in this direction, noting that NITI Aayog's SDG index is a laudable step that aims to rank states by their performance on various SDG targets. While noting that the work in this report is a first step towards improving assessments and understanding of the progress towards achieving SDG-2, the success lies in the follow-up steps of updating the analysis with newer, more robust data sets that provide more disaggregated information - not only geographically but by various social groups, disabilities, gender etc.- in order to respond to the principles of reaching the most vulnerable and leaving no one behind. WFP stands committed to such efforts by the government.

I would like to express my deepest appreciation to the MoSPI and the WFP research team for their immense effort, dedication and hard work to prepare this report. My sincere thanks to all the Technical Advisory Group (TAG) members for their involvement, recommendations and deliberations, which enabled the report to analyze the most relevant issues that could help in the policy decisions.

I hope this report, would be useful to policy makers, planners, academicians and researchers to better perceive the policy and facilitate in evolving better solutions towards achieving "Zero Hunger" and setting India on a strong, unwavering path towards achieving SDG2 targets by or even before 2030.



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सत्यमेव जयते

एक कदम स्वच्छता की ओर

भारत सरकार
सांख्यिकी एवं कार्यक्रम कार्यान्वयन मंत्रालय
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Message

The Sustainable Development Goals (SDGs) are a comprehensive list of goals integrating social, economic and environmental dimensions of the development. India as a nation is committed to achieve the SDG goals and Government of India is effectively working to meet the targets.

Ministry of Statistics and Programme Implementation (MoSPI) has been entrusted with the responsibility of developing National Indicator Framework (NIF) for monitoring the SDGs. SDG-2 specifically aims to end hunger, achieve food security and improved nutrition and sustainable agriculture. MoSPI, GoI has initiated many projects/programs to monitor the progress towards achievement of zero hunger, food security and sustainable agriculture.

Through an active collaboration with UN World Food Programme (WFP), the MoSPI has successfully attempted to analyze the food and nutrition security in India, using the most recent available secondary data sources. This report on "Food and Nutrition Security Analysis of India" has analyzed all the three dimensions of the food security *viz.* availability, accessibility and utilization of food. This publication will serve as a baseline report and would also help in monitoring the progress towards SDG-2.

I commend the collaborative efforts of MoSPI and WFP, members of Technical Advisory Group (TAG) and the research team for their active participation and valuable suggestions. I also wish to express my gratitude to the NSSO of MoSPI and Ministry of Agriculture and Farmers Welfare for providing the required data for the analysis. I compliment and congratulate the team of officers in SSD, MoSPI and in WFP for their efforts & hard work in bringing out this publication.

S. Sharma

(Dr. Shailja Sharma)

Date: March 2019
Place: New Delhi

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Acronyms

AAY	Antyodaya Anna Yojana
AE	Advance Estimates
ANC	Antenatal Care
ANM	Auxiliary Nurse Midwives
ARS	Adaptive Research Stations
AWC	Anganwadi Centre
AWW	Anganwadi Workers
BGREI	Bringing Green Revolution to Eastern India
BMI	Body Mass Index
CACP	Commission for Agricultural Costs and Prices
CAG	Comptroller and Auditor General of India
CAGR	Compound Annual Growth Rate
CDS	Current Daily Status
CED	Chronic Energy Deficiency
CFS	Core Food Security
CFSVA	Comprehensive Food Security and Vulnerability Analysis
CHCs	Community Health Centres
CIPHET	Central Institute of Post-Harvest Engineering and Technology
CPI	Consumer Price Index
CVD	Cardiovascular Disease
CWS	Current Weekly Status
DMEO	Development Monitoring and Evaluation Office
DSD	Doorstep Delivery System
e-PoS	Electronic Point of Sale
FAO	Food and Agriculture Organization
FCI	Food Corporation of India
FPS	Fair Price Shop
FSAU	Food Security Analysis Unit
FSSAI	Food Safety and Standards Authority of India
GDP	Gross Domestic Product
GHI	Global Hunger Index
GoI	Government of India
GPs	Gram Panchayats
GSDP	Gross State Domestic Product
GVA	Gross Value Added
HCR	Head Count Ratio
HH	Household
ICDS	Integrated Child Development Services
ICMR	Indian Council of Medical Research
IMR	Infant Mortality Rate
ISOPOM	Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize
IYCF	Infant and Young Child Feeding
JSY	Janani Suraksha Yojana
LFPR	Labour Force Participation Rates
MDG	Millennium Development Goals
MDM	Mid-Day Meals
MMR	Maternal Mortality Rate
MND	Micronutrient Deficiencies
MNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MoSPI	Ministry of Statistics and Programme Implementation
MoAFW	Ministry of Agriculture and Farmers Welfare

Acronyms

MMRP	Modified Mixed Reference Period
MRP	Mixed Reference Period
MPCE	Monthly Per Capita Consumption Expenditure
MSP	Minimum Support Price
MSSRF	M. S. Swaminathan Research Foundation
NACs	Notified Area Councils
NCO	National Classification of Occupations
NFHS	National Family Health Survey
NFSA	National Food Security Analysis
NFSM	National Food Security Mission
NHED	Nutrition and Health Education
NNM	National Nutrition Mission
NSSO	National Sample Survey Office
OBC	Other Backward Class
OPOLED	Odisha State Poultry Producers Co-operative Marketing Federation LTD
ORSAC	Odisha Space Applications Centre
OSSC	Odisha State Seed Corporation
PDS	Public Distribution System
PEO	Programme Evaluation Organization
PHCs	Primary Health Centres
PHDMA	Poverty and Human Development Monitoring Agency
PMKSY	Pradhan Mantri Krishi Sinchayee Yojna
PVTG	Particularly Vulnerable Tribal Groups
RCH	Reproductive Child Health
RCMS	Ration Card Management System
RDA	Recommended Dietary Allowance
RKVY	Rastriya Krishi Vikas Yojana
RRTTS	Regional Research and Technology Transfer Stations
SC	Scheduled Caste
SCs	Sub-Centres
SDG	Sustainable Development Goal
SOFI	State of Food Insecurity in the World
ST	Scheduled Tribe
TAG	Technical Advisory Group
TPDS	Targeted Public Distribution System
U5MR	Under-five Mortality Rate
ULB	Urban Local Bodies
UPS	Usual Principal Status
UPSS	Usual Principal & Subsidiary Status
UR	Unemployment Rate
URP	Uniform Reference Period
VAM	Vulnerability Analysis and Mapping
WFP	World Food Programme
WFS	World Food Summit
WHO	World Health Organization
WPR	Workers Population Ratio
WSHG	Women's Self-Help Group

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EXECUTIVE SUMMARY

INTRODUCTION

The Green Revolution in India which took place in the 1960's was responsible for increasing agricultural productivity and overall food production in the country. As a result, India had a surplus stock of cereals for the first time ever with a national focus on calorie support to all people, especially for those from lower income groups. In the following decades, as the economy continued to grow, the country experienced a significant decline in poverty levels. Despite this remarkable feat, the rate of malnutrition in India remains stubbornly high.

India has progressed positively on several health outcomes, but the state of food and nutrition security in the country still requires more work. The 2016 Millennium Development Goals (MDGs) Country Report noted that, despite India's significant progress during MDG era, more sustained efforts are required to accelerate achievement, particularly related to food and nutrition security.

The Government of India has undertaken many reforms of the country's social safety net programmes in order to improve delivery on nutrition and food security targets. They have launched ambitious schemes such as the National Food Security Act, the National Nutrition Strategy and the National Nutrition Mission, which have the aim of promoting convergent approaches that reflect the multidimensional nature of food and nutrition insecurity, and addressing inequalities related to gender, age, disability, income, caste and region. In such a positive policy environment, the Government's efforts to address malnutrition and food insecurity has the potential to accelerate progress towards reaching their targets under Sustainable Development Goal 2.

The comprehensive Sustainable Development Goals (SDGs) cover all the three dimensions of human development – social, economic

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and environmental. They were launched in 2016 with 17 goals and 169 targets which are meant to be achieved before 2030. One notable difference between the MDGs and the SDGs, is that the SDGs evolved through a series of grassroots consultations across the world, through which India contributed actively in shaping the final product.

India's performance on the MDGs was mixed and thus extra efforts must be made on achieving SDG targets. While the very first MDG was, 'To eradicate extreme poverty and hunger', the SDGs have a separate dedicated goal, SDG 2, which aims to 'End hunger, achieve food security and improved nutrition and promote sustainable agriculture'. Broadly, SDG 2 can be considered as consisting of three major components - food security, improved nutrition, and sustainable agriculture.

In supporting the monitoring of progress towards achieving the targets under SDG 2, the Ministry of Statistics and Programme Implementation (MoSPI) and WFP together conducted analyses of available food and nutrition security information.

Achieving food security requires that all the three separate dimensions such as availability, access and utilization are sufficient and stable over time. This means ensuring that aggregate availability of physical supplies of food from domestic production, commercial imports, food assistance and national stocks is sufficient and that household livelihoods, state policies and socio-cultural norms provide adequate access for all members of the household to those food supplies through home production, market purchases, or transfers from other sources. Utilization of those food supplies must also be appropriate to meet the specific dietary and health needs of individuals within a household.

This report has attempted to analyse data from all three dimensions to help the reader take stock of the food and nutrition situation in India over different periods of time. The analyses are expected to identify the key determinants and linkages that could be useful for decisions on policy, planning and monitoring of Government schemes. This may also help in location specific planning and resource allocation.

As a first step, data from various government sources were compiled, including: the latest rounds of data from the National Family Health Surveys (2005-06 & 2015-16), Consumption Expenditure Surveys from National Sample Surveys conducted between 1993-94 to 2011-12, Census of India (2001 & 2011) and other Government. of India departments and Ministry data sets. Various indicators in the report were translated into thematic maps with appropriate colour coding to be able to compare various indicators across states and, in some cases, against global or nationally accepted norms or benchmarks.

The mapping and analyses are restricted to state level, due to lack of data at district level for many indicators. However, some district level analyses have been performed on indicators where data is available. This report marks only the first step in understanding the food security and nutritional issues in a comprehensive way. However, new data should be used in the future, to enrich the analyses for a better understanding, stock-taking and policy recommendations.

Foodgrains Availability in India

Production: Over the last 20 years, total food grain production in India increased from 198 million tonnes to 269 million tonnes. Wheat and rice are the staple foods of Indians and are a major portion of food grain production, constituting around 75 percent of the total

food grain production and thus serving as a major source of income and employment to millions of people. The state of Uttar Pradesh leads in the production of wheat, cereals and Foodgrains, closely followed by Punjab and Madhya Pradesh. West Bengal is the 'rice bowl' of India, followed by Uttar Pradesh, Punjab and Bihar.

Net Availability: Since 1996, the per capita net availability of foodgrains has increased from 475 to 484 gm/capita/day in 2018, while per capita availability of pulses has increased from 33 to 55 gm/capita/day. Although there has been a huge increase in production of rice, wheat and other cereals, their per capita net availability has not increased at the same level, due to population growth, food wastage and losses, and exports.

Production Trends: Between 1996-99 and 2015-18, the annual growth rate for food grains was 1.6 percent. Production growth for other major crops are: 2.4 percent for pulses, 1.8 percent for wheat, 1.6 percent for other cereals, 1.4 percent for rice, and 0.9 percent for bajra. Maize had the highest growth, at 5.9 percent. Conversely, other crops had declines in annual growth rates such as: jowar (-2.26 percent), small millets (-1.71 percent) and ragi (-1.21 percent).

Farm Productivity: Though yields in food grains have increased by 33 percent in last two decades, it has been far less than desired. For instance, India has set a target of achieving yields of 5,018 kgs/hectare for rice, wheat and coarse grains by 2030, compared to the present combined yield of 2,509 kgs/hectare. While no state or Union Territory (UT) in India has achieved this target yet, the UT of Chandigarh is nearing the targeted productivity with current levels at 4,600 kgs/hectare, followed by yields of 4,297 kgs/hectare in Punjab.

Access to Nutritious Food

Food Expenditure: According to Engel's law, the share of income spent on food decreases, even as total food expenditure rises. A higher share of total monthly expenditure for food shows lower purchasing power and is related to food access, so it is a relative measure of food insecurity. On average, people of India allocate about 49 percent of their monthly expenditure on food in rural areas and 39 percent in urban areas. The share of food expenditure is highest among the poorest (lowest 30 percent) expenditure group. In rural and urban areas, the poorest 30 percent spend as much as 60 percent and 55 percent respectively, on food.

Food Expenditure Trends: Between 1972-73 and 2011-12, the share of expenditure on food has decreased around 33 percent in rural areas and 40 percent in urban areas whereas non-food expenditure and consequently, non-food expenditures have increased during the same period. Between 2004-05 to 2011-12, among the poorest, the share of expenditure on food has declined by 9 percent in rural and 8 percent in urban areas of India. Declining trends suggest that incomes have increased in both rural and urban areas and that food is

no longer the only predominant expenditure head for the people.

Food Consumption Pattern: In the food basket, it turns out that in both urban and rural areas, the share of expenditure on cereal and cereal substitutes has declined between 1972-73 and 2011-12, from 57 percent to 25 percent in in rural areas and from 36 percent to 19 percent in urban areas. For the same period, the relative importance of some items especially beverages, milk and milk products and fruits and nuts has shown a remarkable increase, indicating an increased diversity in consumption in the country. In the food basket, the energy and protein intake from cereals has decreased in both rural and urban India, largely because of increased consumption of other food items such as milk and dairy products, oils and fat and relatively unhealthy food such as fast food, processed food, and sugary beverages. Notably, the consumption of unhealthy energy and protein sources is much higher in urban areas. This has likely contributed to the emerging problem of obesity in India.

Nutritional Intake: Between 1993-94 to 2011-12, the average daily per capita consumption of both energy and protein decreased in rural India while in urban areas, there was no consistent trend. This decline has happened despite the increase in household income. For energy consumption alone, the trend suggests that despite increases since 1983, the overall energy intake is marginally lower than the minimum requirement. For protein intake, despite the declining trends, per capita consumption in both rural and urban areas is higher than the minimum daily requirement. However fat intake has increased steadily since 1983 and is much higher than the minimum daily requirement.

Nutritional Intake Among the Poor: Among the lowest 30 percent of the expenditure/ income class, the average per capita consumption of energy is 1811 kcal/day which is much lower than the Indian Council of Medical Research (ICMR) norm of 2,155 kcal/day. For protein, it is 47.5 grams/day compared to 48 grams/day norm while for fat it is 28 grams/day which is the same as the ICMR norm for rural India. For urban areas, per capita intake of energy is 1,745 kcal/day compared to 2,090/day norm from ICMR. For protein it is 47 grams/day compared to a norm of 50 grams/day and for fat it is 35 grams/day compared to the norm of 26 grams/day. The current intake level of nutrients such as the energy and protein were lower than the all-India average and the daily minimum consumption requirement. Only fat intake in rural and urban areas was at par or more than the daily minimum consumption requirement.

Public Distribution System (PDS) and Nutritional Intake: The Targeted Public Distribution System (TPDS) has provided a critical nutritional supplement to the people across all states in India. During 2011-12, the average per capita supplementation of energy from TPDS was 453 kcal/day in rural areas and 159 kcal/day in urban India. In terms of protein, the supplementation through PDS has averaged 7.2 grams/day in rural areas and 3.8 grams/day in urban areas. The PDS supplementation to the poorest 30 percent population has been around 339 kcal/day. It has been seen that poorest 30 percent of households had lower capacity to access food, and as a result, despite the PDS support, they were not able to reach the Recommended Dietary Energy (RDA) levels of energy and protein intakes.

Utilization

National Malnutrition Decadal Trends: The prevalence of malnutrition in children 6-59 months in India has declined between 2005-06 to 2015-16 with chronic malnutrition,

or stunting, decreasing from 48.0 percent in 2005-06 to 38.4 percent in 2015-16 and underweight decreasing from 42.5 percent in 2005-06 to 35.7 percent in 2015-16. The prevalence of acute malnutrition, or wasting, has marginally increased during the same period, from 19.8 percent to 21.0 percent. The prevalence of anaemia in young children has also decreased from 69.5 percent in 2005-06 to 58.5 percent in 2015-16.

Stunting Trajectories: Stunting has declined by one fifth during last decade with an annual decline of around one percent. The prevalence of stunting is > 30 percent across all states in India, except Kerala. The trajectories to reduce stunting in India highlight that, with the present rate of reduction in stunting (1 percent per year), by 2022, 31.4 percent children will be stunted. The Government of India has envisaged a challenging target for itself through National Nutrition Mission (NNM)with the target to reduce stunting by at least 2 percent per annum to reach 25 percent by 2022. Goa and Kerala have already achieved this level in NFHS-4 (2015-16). Four other states (Daman and Diu, Andaman and Nicobar, Puducherry and Tripura) have already accomplished mission 25 and Punjab (25.7 percent) is close to achieving it (NFHS-4).

Inter and Intra State Variations in Malnutrition: The prevalence of stunting in children under five is the highest in Bihar (48 percent), Uttar Pradesh (46 percent), Jharkhand (45 percent), and Meghalaya (44 percent) and lowest in Kerala and Goa (20 percent each). Jharkhand also has the highest prevalence of underweight (48 percent) and wasting (29 percent). District level mapping of malnutrition shows considerable intra-state variations. However, very few districts in Northern and North-Eastern states have shown 'Low' level of wasting (2.5-4.9 percent) and underweight (less than 10 percent).

Vulnerable Pockets and Sections in India: As mentioned, the highest levels of stunting and underweight are found in Jharkhand, Bihar, Uttar Pradesh, Madhya Pradesh, Gujarat and Maharashtra. Few states have a very high burden of malnutrition. The poorest quintile of the population is the most vulnerable in terms of stunting. In addition to the earlier mentioned states, the two poorest quintile groups in Haryana, Meghalaya, Karnataka, Rajasthan and Punjab have high levels of stunting. At the national level, among social groups, the prevalence of stunting is highest amongst children from the Scheduled Tribes (43.6 percent), followed by Scheduled Casts (42.5 percent) and Other Backwards Casts (38.6 percent). The prevalence of stunting in children from Scheduled Tribes in Rajasthan, Odisha and Meghalaya is high while stunting in children from both Scheduled Tribes and Scheduled Castes is high in Maharashtra, Chhattisgarh and Karnataka.

Prevalence of Multiple Types of Malnutrition among Children: Multiple burden of malnutrition is the coexistence of any two or all three measures of malnutrition: stunting, wasting and underweight. The analysis of NFHS-4 reveals 6.4 percent of children under five are both stunted and wasted and also are underweight, while 18.1 percent of children are both stunted and underweight and 7.9 percent of children are both wasted and underweight. This analysis helps in identifying the most vulnerable section where children are suffering from multiple forms of macronutrient malnutrition.

Micronutrient Malnutrition: Vitamin A, iron and iodine deficiency disorders are the most common forms of micronutrient malnutrition in the world. Supplementation and fortification are the main ways to deal with these deficiencies at a large scale. In India, only 60 percent of children aged 9-59

months received Vitamin-A supplements in 2015-16, and 13 out of 36 states are lagging behind the national average including some larger states and the north-eastern states. In terms of fortification, around 93 percent of households were using iodized salt in 2015-16 which is very positive.

Anaemia Prevalence: Iron deficiency anaemia remains a major public health concern in India where half of women 15-49 years of age are anaemic, regardless of age, residence or pregnancy status. In the last decade, anaemia among women of reproductive age decreased by only 2.3 percentage points; an annual decline of 0.4 percent. In 2015-16, the prevalence of anaemia is much higher among women (53.1 percent) than men (23.3 percent). In 2015-16, 58.5 percent children aged 6-59 months were anaemic compared to 69.5 percent in 2005-06. The prevalence of anaemia is highest among children in Haryana (71.7 percent), followed by Jharkhand (69.9 percent) and Madhya Pradesh (68.9 percent). Several union territories have even higher prevalence of anaemia: Dadra and Nagar Haveli (84.6 percent), Daman & Diu (73.8), and Chandigarh (73.1 percent). Mizoram was the only state in 2015-16 having 'mild' level of anaemia prevalence according to WHO thresholds, followed by Manipur. A district level analysis shows that almost all the districts fall in to the 'severe' (more than 40 percent) category, very few in 'moderate' (20-39.9) category and around 10 districts in 'mild' (5-19.9) category.

Double Burden of Malnutrition: For several decades India was dealing with only one form of malnutrition- undernutrition. However, in the last decade, the double burden which includes both over- and undernutrition, is becoming more prominent and poses a new challenge for India. From 2005 to 2016, prevalence of low (< 18.5 kg/m2) body mass index (BMI) in Indian women decreased from 36 percent to 23 percent and from 34 percent to 20 percent among Indian men. However, during the same period, the prevalence of overweight/obesity (BMI > 30 kg/m2) increased from 13 percent to 21 percent among women and from 9 percent to 19 percent. Children born to women with low BMI are more likely to be stunted, wasted, and underweight compared to children born to women with normal or high BMI.

Socio-Economic Determinants of Malnutrition among Children: Just over half the children born to mothers with no schooling are stunted, compared with 24 percent of children born to mothers with 12 or more years of schooling. The prevalence of underweight in children with uneducated mothers is 47 percent compared to 22 percent for those whose mothers have some education. By wealth quintile, the prevalence of malnutrition decreases steadily with increased wealth. Malnutrition is relatively more prevalent among Scheduled Tribes than Scheduled Castes at national level, while considerable variation exists between states. There is a strong negative correlation between stunting and improved sanitation.

Recommendations

Recommendations are grouped by the three pillars of food security: availability, access and utilisation.

Recommendations to improve availability

Agricultural Diversification: Farmers should be encouraged and incentivised to increase production of micronutrient-rich grains such as millets, as well as other nutritious foods such as soyabeans, vegetables and fruits. This may entail various support measures to the farmers such as establishing policies on price guarantees, subsidies and trade restrictions.

Sustainability of Food Productivity: Additionally, use of innovative and low-cost farming technologies, increase in the irrigation coverage and enhancing knowledge of farmers in areas such as appropriate use of land and water have high potential to improve the sustainability of food productivity. Further, there is also a need to encourage establishment of agro-processing units and improved supply chains. On the demand side, awareness campaigns about balanced diets should be implemented while more nutritious grains such as millets may also be introduced to poor families through several welfare schemes.

Policy Support: There is a need for promotion of farming, marketing and demand generation of traditional coarse cereals like maize, which are produced in abundance and are good source of energy. Enhanced coverage of Soil Health Card and Research and Development (R&D) extension to small holder farmers (especially women) and protection of farmers against price fluctuations and losses can be critical steps towards improving agricultural produce of such traditional crops in the country.

Improve Storage Capacity: Seasonal price fluctuations of food commodities are common. As agricultural production is seasonal, poor farmers are forced to sell their produce immediately after harvest as a due to lack of storage and other socio-economic constraints. Fruits, vegetables, and pulses apparently show high price volatility among all agricultural products which indicates that the availability of nutritious food items throughout the year, especially among the poor, is a challenge which could be addressed by increasing the storage capacity and preventing post-harvest losses.

Recommendations to improve access

Strengthened Safety Nets Programmes: Among the poorest population, the daily per capita consumption of energy is below RDA norms across almost all states. Therefore, it is imperative to improve the targeting efficiency of all food safety nets, especially that of the Targeted Public Distribution System (TPDS), to ensure that the poorest are included. In addition, fortification of government-approved commodities within the social safety net programmes can improve nutritional outcomes, such as the introduction of fortified rice which is a cost-effective way of increasing micronutrient intake of low-income families. It is encouraging that a rice fortification pilot programme is ongoing. In rural areas, there is evidence that suggests that a well-implemented Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) has provided significantly higher market wages. Therefore, for vulnerable landless labourer households, the best short-term policy option is to strengthen the MGNREGS.

Recommendations to improve utilisation

Improve Child Feeding Practices: In 2015-16, only 9.6 percent children 6-23 months were consuming a minimum acceptable diet in India despite 94 percent children receiving breast milk, milk or milk products. Only 22 percent children have minimum dietary diversity and 36 percent have minimum meal frequency in India. The highest percentage of children receiving adequate diet were in Puducherry (31 percent) and Tamil Nadu (31 percent), which is still quite low. Thus, there is much room for improving child feeding practices in the country, especially at the critical ages when solid foods are introduced to the diet. In fact, fortification, diversification and supplementation may be used as simultaneous strategies to address micro and macro nutrient deficiencies.

Food Supplementation Programmes:

The Take-Home Rations (THR) under the Supplementary Nutrition Programme (SNP) and which provided through Anganwadi to children under three years of age and pregnant and lactating mothers should be adapted to the local food habits in each state. Locally acceptable innovations to develop complementary foods should be prioritized. Opportunities to fortify the key commodities in THR should be explored to address micronutrient deficiencies amongst the beneficiaries. Key messages on nutrition and feeding should delivered at the time of distribution of THR to every mother.

Mother and Child Care: The low prevalence of exclusive breastfeeding, lack of use of full antenatal care (ANC), low consumption of iron folic acid (IFA) tablets and the extremely low percentage of children receiving the minimum acceptable diet in most of the states is alarming and must be addressed by increasing awareness and effective implementation of policies. According to NFHS-4 data, 62 percent children of age 12-23 months are fully immunized. Only seven states out of 36 have more than 80 percent of children fully immunized. In 2015-16, only 30 percent of pregnant women had consumed IFA for at least 100 days and 21 percent had received full ANC during their pregnancies. Better performance in all these areas has a far-reaching potential to improve the nutritional status of the entire society.

Prioritise Maternal Anaemia: The distribution (78 percent) and consumption (30 percent) of IFA tablets remains suboptimal all over the country, even in states where access to prenatal care has improved dramatically. This is an area of concern that needs to be addressed with utmost priority.

Focus on addressing the Increase in Wasting Prevalence: An increased prevalence in moderate and severe wasting are linked to increased risk of infant and child mortality. Further inquiry needs to be undertaken to identify factors associated with these increases with special focus on the states with the highest burden as well as Scheduled Tribes and Castes.

Improvement in Water, Sanitation and Hygiene Practices: Achieving India SDG target (NITI Aayog, 2018) for WASH by 2030 looks promising, with targeted efforts by the Government of India through various programmes such as the Poshan Abhiyan and Swachh Bharat Mission. In 2015-16, while about 90 percent households had access to improved drinking water, only 40 percent had access to improved sanitation. However, the access to sanitation has also shown significant improvement in the past four years.

Other recommendations

Monitoring Progress on SDG 2: While several steps are being taken by the government and other organizations on matters of food and nutrition security, methods and indicators to track and monitor progress are still not adequate to give a clear picture on the progress towards meeting SDG 2 targets in the country. This report is one such attempt to initiate efforts and discussions on having key performance indicators or a potential composite index on food security. However, this may not be achieved unless more disaggregated data with higher frequency is available. The SDG Index published by NITI is a step in the right direction. However, there's also a need for more robust measures that can take cognizance of all aspects of SDG 2.

Addressing Gender Issues: Women and children have been the target population for various welfare schemes, yet, they remain vulnerable due to various inequalities that exist in terms of opportunities, access to resources and having an equal voice in the

decisions that shape their households and communities. To address such inequalities, all the major programmes would need to be gender sensitive. The programme designs will also have to delve into matters such as the involvement of men in child care and feeding practices, and intra-household food insecurity. It has been observed in this study that evidence on such areas has been relatively less explored. Accordingly, the data collection should also aim at obtaining gender disaggregated data at various levels.

Knowledge on Consumption Patterns and Behaviours: A more targeted approach based on identified food consumption patterns and mapping at state level of the locally available nutritious food commodities is an area that has not been explored enough. Such knowledge can be further used to encourage balanced diets among vulnerable households.

Greater Use Of Technology: Use of technology at all levels can improve the flow of information at all levels for the various pillars of food and nutrition security. At the production stage: Increased use of Information Technology to better inform farmer in terms of crops, rainfall and soil health, especially through customized mobile apps and tools in local languages. This could also improve synergies between Kisan Call Centres, Krishi Mitras and mKisan Portal. Similarly, empowering local Self-Help Groups and Panchayats to make use of mobile apps will help them to provide regular feedback on the functioning of food-based safety nets schemes. Further, the use of technology has potential to encourage greater policy coherence and coordination across the food systems, agriculture and nutrition.


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CHAPTER **ONE**

INTRODUCTION

Food and Nutrition Security

The Sustainable Development Goals (SDGs) are a set of 17 global goals to improve the lives of all people around the world, by 2030. The second goal, SDG 2 – Zero Hunger – pledges to end hunger, achieve food security, improve nutrition and promote sustainable agriculture. An important component of this goal is to improve access to food for all, end all forms of malnutrition, including agreed targets on childhood stunting and wasting and improve agricultural income and sustainability. These goals represent an important progression from the Millennium Development Goals (MDGs) which ended in 2015, where food security was measured solely on the basis of the percentage of population below the minimum level of dietary energy consumption, and the prevalence of children under 5 years of age who are underweight. Thus, to achieve SDG 2 the focus is broadened beyond these two outcomes and includes a focus on nutritious dietary intake, all forms of malnutrition, support to smallholder farmers, strengthened food systems and improved biodiversity.

India is the world's second most populous country and third largest economy, in purchasing power parity. Despite the recent strong economic growth in the country, access to adequate nutritious food for about a fourth of the population is still a concern. In addition, despite improvements in the nutritional status of children, still too many are malnourished, and a significant number of pregnant and lactating women suffer from iron deficiency anaemia.

The Indian government has undertaken many reforms in the existing social safety-nets programmes to better deliver on nutrition and food security targets and have launched ambitious schemes such as the National Food Security Act (NFSA), the National Nutrition Strategy (NNS) and the National Nutrition Mission (NNM) that promote convergent approaches taking cognizance of the multi-

dimensional nature of food and nutrition security and addressing inequalities related to gender, age, disability, income, caste and region. With a positive policy environment, support to the Government's efforts to address malnutrition and food insecurity has the potential to accelerate the pace of progress towards achievement of SDG 2. While there is a realization of the problems, a focused investment of the resources to problem- specific geographies and interventions, based on evidence, is crucial in addressing the problem of food and nutrition security in the country. This Food and Nutrition Security Analysis (FNSA) study has therefore been undertaken with the purpose to establish a baseline for developing a better understanding of the issues, using available datasets over a period of time in order to achieve a more nuanced knowledge to facilitate action.

This chapter presents the background to the Food and Nutrition Security Analysis, the conceptual framework of food security, a review of indicators used for the food security analysis globally and in India, and the indicators used in the present analysis. It also highlights the data sources for each indicator and the methodology used for the analysis.

1.1 Background and Rationale of the Food and Nutrition Security Analysis

Government of India enacted the National Food Security Act (NFSA) in 2013 with the aim of ensuring food and nutrition security for the most vulnerable groups of the population, through its associated schemes and programmes, thus making access to food a legal right. The NFSA 2013 ensures affordable access to adequate quantity of quality food so all people can live a life with dignity. The Act provides for coverage of up to 75 percent of the rural and up to 50 percent of the urban populations to receive subsidized foodgrains under the Targeted Public Distribution System (TPDS). The eligible households are entitled to 5 kgs of foodgrains per person, per month at the subsidized prices of INR 3 per kg of rice, 2 per kg for wheat and 1 per kg for coarse grains. The existing *Antyodaya Anna Yojana* (AAY) households, which constitute the poorest of the poor, continue receiving 35 kgs of food grains per household, per month. The Act also has a special focus on the nutritional support to women and children and, as a women's empowerment measure, the Act designates the eldest woman, above 18 years of age, in a household, as the head of the household. The Act also provisions supplementary nutrition for pregnant women and lactating mothers, and children from 6 months to 6 years of age. During pregnancy and up to six months after childbirth, women are also entitled to receiving maternity benefits of not less than INR 6,000 in total. Children from 6 to 14 years of age are entitled to nutritious meal through the Mid-Day Meals (MDM) scheme. If supplies of entitled foodgrains or meals are not available, the beneficiaries receive a food security allowance. The Government of India's investment in other large agriculture, employment, health and sanitation, and education schemes also contribute to India's obligation to achieve food and nutrition security.

As a nation, India is committed to achieving their targets under the ambitious Sustainable Development Goals (SDG), and many concerted efforts are being implemented to reach this end. In order to develop needs-based interventions that can effectively achieve the SDG 2 targets by 2030, there is first a need to comprehensively measure the current status of food and nutrition security in the country and then monitor the progress on specific targets set under SDG 2 for India. This analysis hopes to facilitate these requirements.

The end-goal of FNSA is to enhance the understanding of food and nutrition security in India through identifying the most food insecure locations and population groups and describing the special characteristics of food insecurity and its underlying factors. The results of the analysis will also facilitate evidence-based targeting of the strategies, interventions and allocation of resources to enable timely corrective actions for achieving the desired impact of National Food Security Act (NFSA) 2013 and related SDG 2 targets. The report is also expected to enhance the national and state-level capacity for FNSA and ensure reliable and timely data analysis to guide national and state level policies and decisions. The report may also serve as a tool for benchmarking SDG 21 targets and thereby enabling the Government of India to report on the same at the global level.

1.2 Food and Nutrition Security

Conceptual framework[2]

Over the past several decades the concept of food security has undergone considerable changes. Up until the 1980s, the main approach to understand famine and its consequences focused on food availability and thus, achieving staple food self-sufficiency was thus accorded the highest priority by governments. India was successful in achieving food self-sufficiency and also improved its capacity to cope with year-to-year fluctuations through the Green Revolution in the late 1960s and early 1970s. Enhanced support from technological interventions and policies such as heavy public investment in the agricultural sector, establishment of a system of procurement and public distribution of foodgrains (mainly rice and wheat), institutional credit and subsidized inputs to farmers, also contributed to its success. Although these actions resulted in surplus food production, it did not solve the problem of food access and malnutrition in significant sections of the population.

In 1981, Amartya Sen[3] argued that famines were not always a result of shortage of food. He argued that famine is a case of people not being able to access enough to eat rather than a food availability issue. This gave rise to discussions on entitlement-based approach to food and famine. Sen argued that a person is reduced to starvation if some change in her/his endowment, such as access to land or loss of labour power due to ill health, or in her/his exchange entitlement mapping such as decreased wages or loss of employment, increased food prices, or a decrease in the price of the goods s/he produces and sells. This would result in the inability to acquire enough food. Thus, the entitlement approach emphasized the point that the mere physical availability of food does not ensure access to that food by all people, especially in an economic system dominated by market transactions. Sen's analysis has also paved the way for the examination of intra-household distribution and allocation of food and has resulted in a shift of focus from national and household level food security to individual level food and nutrition security. Following this approach, the definitions of food security in the 1980s reflected the dominance of the entitlement approach at that time. In 1983,

[1]*WFP's food insecurity framework in the context of vulnerability, in recent times, the Zero Hunger Challenge is a global initiative which aims to build support around the goal of achieving Zero Hunger. It was launched by the UN Secretary General Ban Ki-moon and calls on everyone – governments, the private sector, NGOs, the public – to do their part to achieve this goal. It is based on a shared conviction that hunger can be eliminated in our lifetimes. The Zero Hunger Challenge has been embraced by the United Nations Sustainable Goal (SDG - 2) which was adopted in the UN General Assembly in late 2015 and signed by all the member countries. The Millennium Development Goals (MDG-2) has a focus on reducing poverty and hunger by half, the targets on poverty has been achieved, the same on hunger represented by undernourishment among children was not achieved by many countries till 2015, the target date. The SDG-2, which uses the Zero Hunger framework aims at ending hunger, achieving food security, improving nutrition and promote sustainable agriculture. (See Annexure 2 for more information on Zero Hunger and SDG-2)*

[2]*WFP Comprehensive Food Security and Vulnerability Analysis guidelines (2009)*

[3]*Amartya Sen (1981): Poverty and Famines: An Essay on Entitlement and Deprivation*

the Food and Agriculture Organisation of the United Nations (FAO) stated that food security means "ensuring that all people at all times have both physical and economic access to the basic food they need". The World Bank took this definition forward in 1986 to assert that food security is "access by all people at all times to enough food for an active and healthy life".

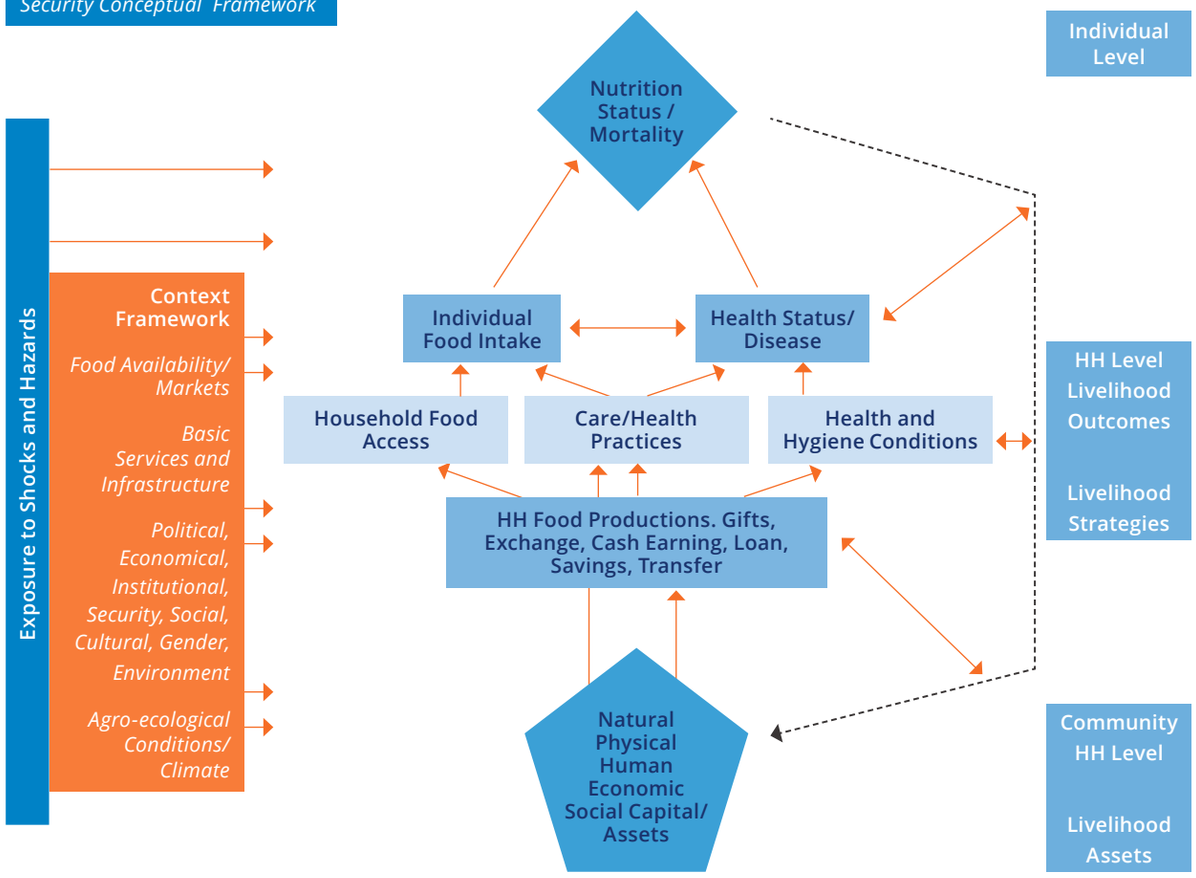
However, mere availability and access to food also did not translate into any significant reduction in undernourishment and malnutrition. It became clear that food security includes not only the problems of physical availability of food stocks and economic access to food by communities and households, but also the individual biological utilization of the food consumed, which is in turn, influenced by factors, such as health-seeking behaviour, age and gender appropriate nutritional requirements as well as access to safe drinking water and sanitation facilities.

Thus in the 1996 World Food Summit Plan of Action the definition was broadened so that "food security exists 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". Hence, the food security status of any household or individual is typically determined by the interaction among a broad range of agro-environmental, socio-economic and biological factors, recognizing the three pillars of food security: aggregate food **availability,** household food **access,** and individual food **utilization.** Achieving food security requires that all three of these pillars are sufficient and stable over time, noting that:

- Aggregate availability of physical supplies of food from domestic production, commercial imports, food aid and national stocks is sufficient;
- Household livelihoods provide adequate access for all members of the household to those food supplies through home production, market purchases, or transfers from other sources; and
- Utilization of food supplied is appropriate to meet the specific dietary and health needs of individuals within a household.

As shown in the framework below, the vulnerability of a household or community is also determined by their exposure to the risks posed by shocks such as droughts, floods, crop blight or infestation, economic fluctuations, and conflict, and by their ability to cope with the possible effects of such shocks. This ability is determined largely by household and community characteristics, most notably a household or community's asset-base and the livelihood and food security strategies it pursues.

Figure 1.1: *Food and Nutrition Security Conceptual Framework*



Source: *WFP, 2009*

The food and nutrition security framework developed by the World Food Programme (WFP), shows exposure to risk as determined by the frequency and severity of natural and man-made hazards, their socio-economic and geographic scope and the intensity of chronic food insecurity. The determinants of the means of livelihood of a household include household levels of natural, physical, economic, human, social, and political assets; levels of household production; levels of income and consumption, and, most importantly, the ability of households to diversify their income and consumption sources to mitigate the effects of any risks they face at any time, especially during disasters. All of these factors also influence the capacity to cope with a shock, be it transitory or chronic in nature. Coping behaviour includes activities such as the sale of land or other productive assets, the cutting of trees for sale as firewood and in extreme conditions, irreversible actions such as migration. These practices undermine not only the long-term productive potential of vulnerable households, but also important social institutions and relationships. The extent of reliance on negative coping strategies is an indicator of vulnerability before, during, and after a shock.

Food security analysis is not only a static snapshot of food availability, household access to and individual utilization of food, but also includes risk and vulnerability analysis. Risk and vulnerability analysis includes the study of risks that communities,

households and individuals face on a regular basis, in the context of food security and their capacity to respond to them effectively. In the end, there is a significant overlap between households that are currently food insecure and those at risk of fluctuations in food security that can threaten well-being. Conceptually, all households may be considered vulnerable to a certain degree, but the primary emphasis of vulnerability analysis should be on geographic and social analysis of those who are already food insecure or at risk of becoming food insecure.

1.3 Review of Global and Indian Food Security Analysis

There is no specific agreement globally on how to analyse food and nutrition security as various entities use different sets of indicators and varying methodologies. Selection of indicators and methodology is crucial in the FNSA, however, data availability is the biggest challenge for many countries including India.

1.3.1 Review of Global Studies

The State of Food Insecurity in the World (SOFI) report, published jointly by the Food and Agriculture Organization of the UN (FAO), the International Fund for Agricultural Development (IFAD), the United Nations Children's Fund (UNICEF), the World Health Organization (WHO) and the UN World Food Program (WFP), uses the framework of availability, access and absorption and provides latest data on several indicators in each dimension. However, the report does not convert the indicators into indices, nor does it combine them into any composite index. This framework allowed global comparison between countries but was found to be overly complex and not really applicable for the Indian context. The indicators and their data sources were debated for its reliability and relevance by academics in India (Chand R and Jumrani J. 2013).

One of the key outputs of the SOFI is the calculation of the percentage and number of undernourished people in each country and globally, through estimation of individual caloric intake. The SOFI analysis provides estimates on dietary energy supply (DES) and the share of DES coming from cereals and tubers under availability.

The report also provides purchasing power-related indicators such as gross domestic product in purchasing power parity, domestic food price index and the share of food expenditure among the poor. Physical access related indicators, such as the percentage of paved roads, are also included. The utilization (or absorption) dimension of food security is shown by direct nutritional outcomes such as anthropometric information for children, women and men, and prevalence of macro/micro nutrient deficiencies such as those of vitamin A and iodine. The SOFI also treats the stability of food grain production as an important dimension of food security and provides data on indicators such as cereal import dependency ratio, net irrigated area as percent of arable land, food price volatility, production and supply variability, water sources, and sanitation facilities.

The recent changes in methodology of SOFI analysis include exponential smoothing which

attributed higher weights to the more recent data, except for countries showing peculiar trends for which simpler models were used. According to some experts, this may have led to hiding the global levels of food insecurity to an extent (Thomas Pogge 2015).

The Global Hunger Index (GHI), is published by the International Food Policy Research Institute (IFPRI), and focuses on multidimensional aspects of hunger, which uses proxy indicators for measuring food security in countries as well as regions within countries. It broadly considers undernourishment as insufficient caloric intake (from the SOFI report), undernutrition represented by child wasting (height to weight) and child stunting (height to age), and child mortality as outcomes of inadequate nutrition plus underlying factors such as inadequate maternal health, child care practices, inadequate access to health services, safe water, and sanitation. Until 2014, IFPRI used only three indicators, one each from the dimensions of undernourishment, malnutrition among children and child mortality. In 2015, two indicators from the dimension of malnutrition – wasting and stunting - were used. When combining the GHI indicators, equal weights are given to each dimension, so that the levels of wasting and stunting are given one-sixth weight each. The specific advantages of GHI is that it is comparable across the globe and serves as a tool for monitoring the change in food security status of various countries. The GHI ranks countries on a 100-point scale in which zero means no hunger and 100 meaning complete hunger. Countries with a score of less than 5 are not included in the ranking, and differences between their scores are minimal.

The GHI is largely focused on outcome indicators (see figure 1.1 –Food Security Analysis Framework) and gives a picture of relative levels of food security among the countries and geographical locations within the countries by assigning ranks. But, it does not provide causal or underlying factor analyses, which are not necessarily food related, but affect these outcomes. This imposes limitations on its use as a policy tool.

Its methodology, including the weight assigned to each indicator and the varying number of countries included every year, is often debated by many of the countries included in the analysis every year. It can be argued that the inclusion of developed countries pushes down the relative ranking of developing countries. The choice of indicators, and inability to capture the multiple dimensions that contribute to global hunger has also been debated.

The Global Food Security Index (GFSI) published by the Economic Intelligence Unit of *The Economist* is a comprehensive report that combines more than 25 indicators to form an index. The index analyses the issue across three internationally designated dimensions- affordability, availability and utilization. It is a dynamic, qualitative and quantitative benchmarking model, which adjusts for the quarterly impact of global food prices, exchange rates and incomes on the countries' affordability scores[4]. The three category scores are calculated from the weighted mean of underlying indicators and range from 0 to 100, where 100 representing the most favourable. The overall score for the GFSI (varying from 0 to 100) is calculated from a simple weighted average of the category and indicator scores – hence the three dimensions have equal weights.

The main shortcoming of the GFSI is that it combines all categories of indicators such as outcomes and underlying factors without considering their interrelationships.

[4]*Global Food Security Index – 2015; published by the Economic Intelligence Unit of* ***The Economist***

The Zero Hunger Challenge is a global initiative which aims to build support around the goal of achieving Zero Hunger. It is based on a shared conviction that hunger can be eliminated in our lifetimes. The proposed indicators under the five pillars of the Zero Hunger Framework are (i) stunting among children below 2 years of age, (ii) percentage of undernourished population, (iii) percentage depletion of groundwater and percentage of forest cover, (iv) productivity among smallholder farmers, income among primary activity workers and self-employed and (v) percentage of food wasted. It is difficult to estimate data on all the indicators and therefore, a proxy indicator should be developed through expert consultation.

WFP's Comprehensive Food Security and Vulnerability Analysis (CFSVA) has been conducted in more than 30 countries worldwide and is typically based on available secondary data as well as primary data collected for the purpose. The CFSVA guidelines[5] describe 47 common key indicators in food security analysis, to guide the primary data collection. They include indicators on household demographics and gender, education, housing, household asset ownership, water and sanitation, shocks and coping strategies, livelihoods, agricultural production, income and expenditures, food stocks, household dietary diversity, as well as child health and nutrition, including anthropometry. In the analysis, other indicators, indices and classifications are constructed such as the food consumption score (FCS), which is a relative measure of household food security, based on the number of days in the past week that households have consumed various foods/food groups. The FCS is then categorised into three groups: acceptable consumption, borderline and poor. The Coping Strategies Index (CSI) which measures the ability of households to cope with lack of access to food, a wealth index and livelihood classifications.

[5]*Comprehensive Food Security & Vulnerability Analysis Guidelines, WFP, 2009.*

1.3.2 Review of Indian Studies

The Monitoring, Evaluation and Research team in WFP India works in close collaboration with many partners worldwide. Most of the activities are implemented jointly with the Government of India, state governments, national statistical systems, and other partners. Given the inequality arising out of the socio-economic and geographic diversity in India, it is important to analyze the regional patterns of poverty and food insecurity to identify the most vulnerable population groups which require urgent focus. To understand the status of food insecurity in India, WFP, in collaboration with the M. S. Swaminathan Research Foundation (MSSRF), published editions of "Food Insecurity Atlas of Rural India" in 2001 and 2008, the "Food Insecurity Atlas of Urban India" in 2002 and 2009 and the "Atlas of the Sustainability of Food Security in India" in 2004.

These atlases have used the 1996 World Food Summit (WFS) definition of food security in their analysis. The first edition of the Food Insecurity Atlas of Rural India (FIARI – 2001) used the three pillars of food security, using 19 indicators to construct an index of food and nutrition insecurity.

Five indicators of food availability were:

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

The eight access indicators included:

- Average per consumer unit, per day calorie intake (Kcal) of the lowest decile

- Percentage of population consuming less than 1,890 Kcal per consumer unit (cu), per day
- Percentage of the population BPL
- Percentage of persons in labour households to the total population
- Rural infrastructure index
- Juvenile Sex Ratio (females per thousand males in 0–9 years)
- Percentage of literate females to total female population and
- Percentage of Scheduled Caste and Scheduled Tribe population.

The six absorption related indicators in fact were food security outcome indicators:

- Life expectancy at birth
- Percentage of population with Chronic Energy Deficiency (CED)
- Percentage of severely stunted children under the age of five
- Percentage of severely wasted children under the age of five,
- Infant Mortality Rate (IMR) and
- Health infrastructure index.

After the release of FIARI-2001, it was debated that many of these indicators were interrelated and were a mix of outcome, output and underlying factors that influence the food and nutrition security of the population. As Deaton and Drèze (2008) have argued, outcome indicators may be better pointers of food security status than input indicators. Therefore, the second edition of the Food Security Atlas (2008), dropped a number of indicators used in FIARI-2001 and then focused on the following seven chronic food and nutrition insecurity indicators: Percentage of population consuming less than 1,890 Kcal/cu/day

- Percentage of households not having access to safe drinking water
- Percentage of households not having access to toilets within the premises
- Percentage of ever-married women (15-49 year) who are anaemic
- Percentage of women (15-49 year) with CED
- Percentage of children in the age group 6-35 months who are anaemic and
- Percentage of children in the age group 6-35 months who are stunted.

In both the editions of the Food Insecurity Atlases (rural and urban), all indicators carried the same weight.

The first Food Insecurity Atlas for Urban India was published in 2002 in which 17 indicators were used to calculate the status of food insecurity. These indicators were categorized into the major groups of affordability index, access index, discrimination index, housing index, sanitation and health index and nutritional outcome index. The second edition of the Food Insecurity Atlas of Urban India (2009) used 11 indicators of chronic food and nutrition insecurity and also included some analysis by size classes of the urban locations. The key indicators used in the analysis included:

- Percentage of urban population consuming less than 1890 Kcal per consumer unit per day
- Number per 1000 of urban male workers not regularly employed
- Number per 1000 of urban female workers not regularly employed
- Percentage of urban households without access to safe drinking water
- Percentage of urban households without access to toilets
- Percentage of ever-married women (15-49 years) with anaemia
- Percentage of ever-married women (15-49 years) with CED

- Percentage of children (6-35 months) with anaemia
- Percentage of children (6-35 months) who are stunted
- Percentage of children (6-35 months) who are underweight and
- Percentage of children (6-35 months) who are wasting.

While constructing the final index, 8 or 9 of the 11 indicators were used at a time to obtain different variants of a composite index of food and nutrition insecurity in urban India.

In all the editions of these food security atlases, the indicators were normalized to a common scale using the relative distance measure and combined using the simple average of the values of all the indicators with equal weights for all the indicators.

In 2004, WFP prepared the Atlas of the Sustainability of Food Security in India which included analysis of sustainability, which considered that the process of food production should not only be efficient and environmentally friendly, but should also conserve and enhance the natural resource base of crops, animal husbandry, forestry and inland and marine fisheries. Further, it must ensure physical, economic, social and environmental access to balanced diet for all including access to macro-micronutrients, safe drinking water, sanitation, environmental hygiene, primary health care and education. The atlas used the WFS definition and analysed 17 indicators which were grouped into (1) Indicators of Sustainable Food Availability (2) Indicators of Sustainability of Food Access and (3) Indicators of food absorption.

The first group consisted of two sub-groups, i.e., current production security (three indicators) and production sustenance (five indicators). The first group captured the size of the resource base for present production and the level of present production. The other subgroup measured the unutilized portions of natural resources representing production sustenance, which would be available for future use.

The second group was also further divided into two subgroups of Present (two indicators) and Future (five indicators) livelihood security indicators. The first subgroup measured the current scenario of livelihood and the other subgroup captured the population pressure on natural resources that determines the future sustenance of livelihoods. The third group had two key indicators representing the present status of food absorption, health care and basic amenities.

The process of indexing in the first group involved giving 0.25 or 1/4th weight to first sub-group (present production security) and the remaining 0.75 or 3/4th weight to second sub-group (production sustenance) to make a composite index of Sustainable Food Security. Similarly, in the second group, the process of indexing remained the same with 0.25 and 0.75 weightage for first and second sub-groups in building a composite index of Sustainable Food Access. In the third group, the percentages of two key indicators were aggregated together to calculate the index of food absorption.

Apart from these national attempts of FNSA, the sub-national food security analysis of rural India has also been carried out by WFP together with the Institute for Human Development (IHD) during 2009-2012. District level analysis were carried out for the rural areas of eight states: Bihar, Chhattisgarh, Jharkhand, Odisha, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh. District level indicators were selected through wide consultation and data availability on three dimensions of food security – availability, access and absorption. Range equalization methods were applied to create indices which were then represented on the maps of each state to show district level pattern of food security/insecurity. The report identified

regional pockets of food insecurity within each state and provided recommendations for policy interventions.

1.4 Indicators and Methodology Used in FNSA for India, 2018-19

The definition of food security proposed by the World Food Summit (WFS, 1996) clearly brought out the multidimensionality of food security, food security outcomes can be analysed at many levels. Spanning from global, national and regional levels of availability of food, food security can also be analysed at the individual level (nutritional outcomes), and household level where the focus is on access to food entitlements, exogenous and endogenous factors such as livelihoods, infrastructure and availability of markets, household and community assets, health, hygiene and care practices, water supply and sanitation.

1.4.1 Proposed Indicators for FNSA

Core and Underlying Indicators

Based on the review of global frameworks for food security analysis as well as previous experience on food security analysis in India, a Technical Advisory Group (TAG), constituted by the Ministry of Statistics and Public Information (MoSPI) used two sets of indicators: "core" and "underlying" (Table 1.1). Core indicators are those which directly influence the food and nutrition security of the population, while underlying factors are those which have an indirect (via core or other factors) influence. These indicators were further classified into the three dimensions of availability, access and utilization. The indicator selection was finalized by the TAG (Table 1.1).

1.4.2 Methodology

The analysis attempts to identify the key determinants of food and nutrition security and their linkages that could be useful for decisions on policy, planning and monitoring of governmental schemes. This may also help in location-specific planning and resource allocation. In this context, a descriptive analysis is also included on allocations and outreach of various food-based interventions, based on the status of food and nutrition security indicators.

The data was collected from various secondary sources and compiled for each indicator with the pertinent indicators being presented in thematic maps and/or figures. The maps were produced using a uniform colour pattern in shades of red, yellow and green (except agricultural production, where the same colour has been used).

The mapping and analysis are restricted to the state level, due to insufficient district level data for many of the indicators. However, some district level analysis was also performed for indicators where robust data was available.

1.5 Data Source

The analysis is based on triangulation of secondary data which is available in the public domain. Data for the majority of the indicators was obtained from the following sources:

1. **National Family Health Survey (NFHS):** The National Family Health Survey 2015-16 (NFHS-4), provided information on population, health and nutrition for India and each State/Union territory and, for the first time, provided district-level estimates for many important indicators. The Ministry of Health and Family Welfare designated the International Institute for Population Sciences (IIPS) in Mumbai as the nodal agency to conduct NFHS-4. The main objective of each successive round of the NFHS has been to provide essential data on health and family welfare and

emerging issues in this area. NFHS-4 data has been used in setting benchmarks and monitoring the progress in the country's health sector. Besides providing evidence for the effectiveness of the ongoing programs, the data from NFHS-4 helps in identifying new area-specific programmes.

2. **National Sample Survey (NSS), Consumer Expenditure Rounds:** Access to food is analysed using the data collected by the National Sample Survey Office (NSSO). The NSS was established in 1950 to collect socioeconomic data, employing scientific sampling methods. The NSSO conducts nationwide household consumer expenditure surveys every five years and conducted its 68th round between July 2011 - June 2012. This analysis has used the 61st (2004-05) and 68th rounds (2011-12) and for trend analysis, the analysis has also used previous rounds on consumer expenditure.

   The NSS consumer expenditure survey aims at generating estimates of average household monthly per capita consumption expenditure (MPCE), the distribution of households and persons over the MPCE range, and estimate of average MPCE by commodity group, separately for the rural and urban sectors of the country, for States and Union Territories, and for different socioeconomic groups. Two versions of Schedule 1.0, using different reference period systems, called Schedule Type 1 and Schedule Type 2, were canvassed in the last round in roughly equal numbers of sample households. The NSS data is available in three different sets of reference periods. Uniform Reference Period MPCE (MPCEURP: 'last 30 days' for all items), Mixed Reference Period MPCE (MPCEMRP: 'last 365 days' for selected items and 'last 30 days' for remaining items) and Modified Mixed Reference Period MPCE (MPCEMMRP: 'last 7 days' and 'last 365 days' for selected items and 'last 30 days' for remaining items).

   For graphical presentation expenditure data on food and non-food items and per capita per day intake of energy, protein and fat has mostly been taken from the published reports (of 61th and 68th rounds). The reference period (URP, MRP and MMRP) of expenditure and consumption has been changing over the last two decades as NSSO tried to estimate accurate consumption patterns. For the first time in 2009-10, NSSO started collecting data using the MMRP reference period, and the subsequent round (68th) in 2011-12 also used the same reference period in addition to URP. It is important to note that in 2004-05 NSSO collected data using the URP. Therefore, for the sake of comparison and trend analysis, URP is used as a reference period for both rounds. Thus, if we use URP as reference period in 2011-12, then the figures of per capita per day intake of energy, protein and fat are slightly lower than the MMRP reference period. Some estimations, namely per capita per day intake of energy, protein and fat by social group, livelihood group, and lowest 30 percent of MPCE class, are not available in the published report. Therefore, unit level analysis has been carried out to estimate the consumption patterns among different population groups.

3. **Data from Ministry of Agriculture and Farmers Welfare (MoAFW):** The Directorate of Economics and Statistics (DES) is an attached office of the Department of Agriculture, Cooperation and Farmers' Welfare, has been entrusted with of the task of collating and analysing data on various aspects of Indian

agriculture with a view to assist in policy formulation. Their annual "Agricultural Statistics at a Glance" is a rich source of data on a wide range of parameters, such as area, production and productivity of various crops across states, land-use statistics, price support and procurement, international trade, credit and insurance. The data on production, yield of various foodgrains, as well as information on livestock, fertilizers use, irrigation, arable land, storage facility is presented. A detailed time series analysis of data received from MoAFW was also used.

4. **Census of India:** The responsibility of conducting the decennial Census rests with the Office of the Registrar General and Census Commissioner, India, under the Ministry of Home Affairs, Government of India. The Indian Census is the largest single source information on various characteristics of the Indian population. The analysis has used data on population numbers, sex ratio, disability, Scheduled Caste (SC)/Scheduled Tribe (ST) population, literacy, work participation rate, and others from the 2001 and 2011 censuses.

Other data from the Economic Survey, Labour Bureau and Ministry of Health and Family Welfare were used in the analysis.

1.6 WFP and MoSPI Collaboration

Although there are many frameworks and sources of data available to analyse food and nutrition security, a comprehensive data source and single method is required to contribute towards decision making at the national and sub-national levels. Therefore, MoSPI, GoI and WFP have come together to develop this baseline analysis and report on food and nutrition security in India. This collaboration aims to:

- develop a Food and Nutrition Security Analysis of India report (Zero Hunger) with states/districts as the units of analysis; and
- enhance capacities within MoSPI through institutionalization of Food and Nutrition Security Analysis towards conducting regular FNSA in India.

Considering the fact that food and nutrition security analysis is a complex and multidimensional task and that a single internationally agreed approach is not yet available, this exercise has been undertaken as a baseline for future analyses. A follow-up will be required to establish the linkages between all the dimensions of food and nutrition security, using feedback received on this report and will lay the foundation for developing an approach for monitoring progress towards achieving SDG 2 targets in India.

This analysis of the food security and nutritional outcomes is carried out in the context of understanding core and underlying factors and linking exogenous and endogenous dimensions. This report can serve as a guide towards a better understanding of food and nutrition security in India through continued updated analysis and evidence.

The dimensions of food and nutrition

security and their core and underlying indicators used in the FNSA 2018-19 are presented in the table below.

Table 1.1: *Core and Underlying Indicators*

S.No.	Dimensions	Variables
Core Indicators		
1	Availability	Per capita availability of foodgrains
2	Access	Per Capita Quantity and Value of Consumption of Cereals including Cereal substitute, and Pulses by fractile class of MPCE
3		Per capita per day intake of Fat, Protein and Calorie intake by fractile class of MPCE
4		Share of food expenditure by fractile class of MPCE
5	Nutritional Outcome	Underweight (Weight-to-Age) among U-5 children
6		Stunting (Height-to-Age) among U-5 children
7		Wasting (Height-to-Weight) among U-5 children
8		Low BMI (Women)
9		Low BMI (Men)
10		Anemia prevalence among all women (15-49)
11		Anemia prevalence among children (6-59 months)
Underlying and Contextual Indicators		
12	Availability	Cereals and Pulses: Yield and Production
13		Production of eggs, meat, fish, milk.
14		Net sown area
15		Livestock Production (Animals and Birds)
16		Fertilizer use
17		Irrigation Extent
18		Arable land
19		Storage Facility
20	Access	Road Density
21		Consumer Price Index (CPI)
22		Dependency Ratio
23		Proportion of SC/ST population
24		Percentage of Forest Area
25		Investment on Roads/other infrastructure
26		Gender related indicators
27		Disability Indicators
28	Livelihood Access	Net State Domestic Product (NSDP) Per Capita
29		Wage Rates
Underlying and Contextual Indicators		
30	Health Care Facility	Consumption of Iodized Salt
31		Exclusive Breast Feeding (6 months)
32		IFA Tablet consumption
33		Vitamin A dose to Children aged 9-15 years in last 6 months
34		Child diet
35		Mothers having full ANC

Table 1.1: *Core and Underlying of Indicators*		
Core Indicators		
36		Full immunization
37		Diarrhoea
38		Acute Respiratory Infection (ARI)
39	Health/ Hygiene/ Infrastructure	Mortality indicators (IMR, U5MR)
40		Per capita expenditure on Health
41		Percentage households with access to improved source of water
42		Percentage households with access to improved source of sanitation
43	Human Capital	Literacy Rate among men and women
44		Girls' Enrolment Rate
45		Per capita expenditure on Education

CHAPTER TWO

PROFILE OF INDIA

2.1 Background

Over the seven decades since its independence, India has progressed remarkably well in many areas that contribute to food and nutrition security. The average life expectancy at birth has increased, literacy rates have quadrupled, and health conditions have improved significantly (MoHFW, 2018). During the same period, Indian agriculture has also undergone a major transformation, from dependence on food aid to self-sufficiency, and thereafter being a consistent net food exporter. This chapter presents a brief profile of India to contextualize the food and nutrition security situation.

2.2 Location and Administrative Set up

As the 7th largest country iin the world in terms of area, India is bound by the Great Himalayas in the north, and stretches southwards to the Tropic of Cancer, where it tapers off into the Indian Ocean between the Bay of Bengal on the east and the Arabian Sea on the west. India shares land borders with Afghanistan and Pakistan to the north-west; China, Bhutan and Nepal to the north and Myanmar and Bangladesh to the east. Sri Lanka is separated from India by a narrow channel of sea, formed by the Palk Strait and the Gulf of Mannar.

Table 2.1: ***Administrative set up in India***

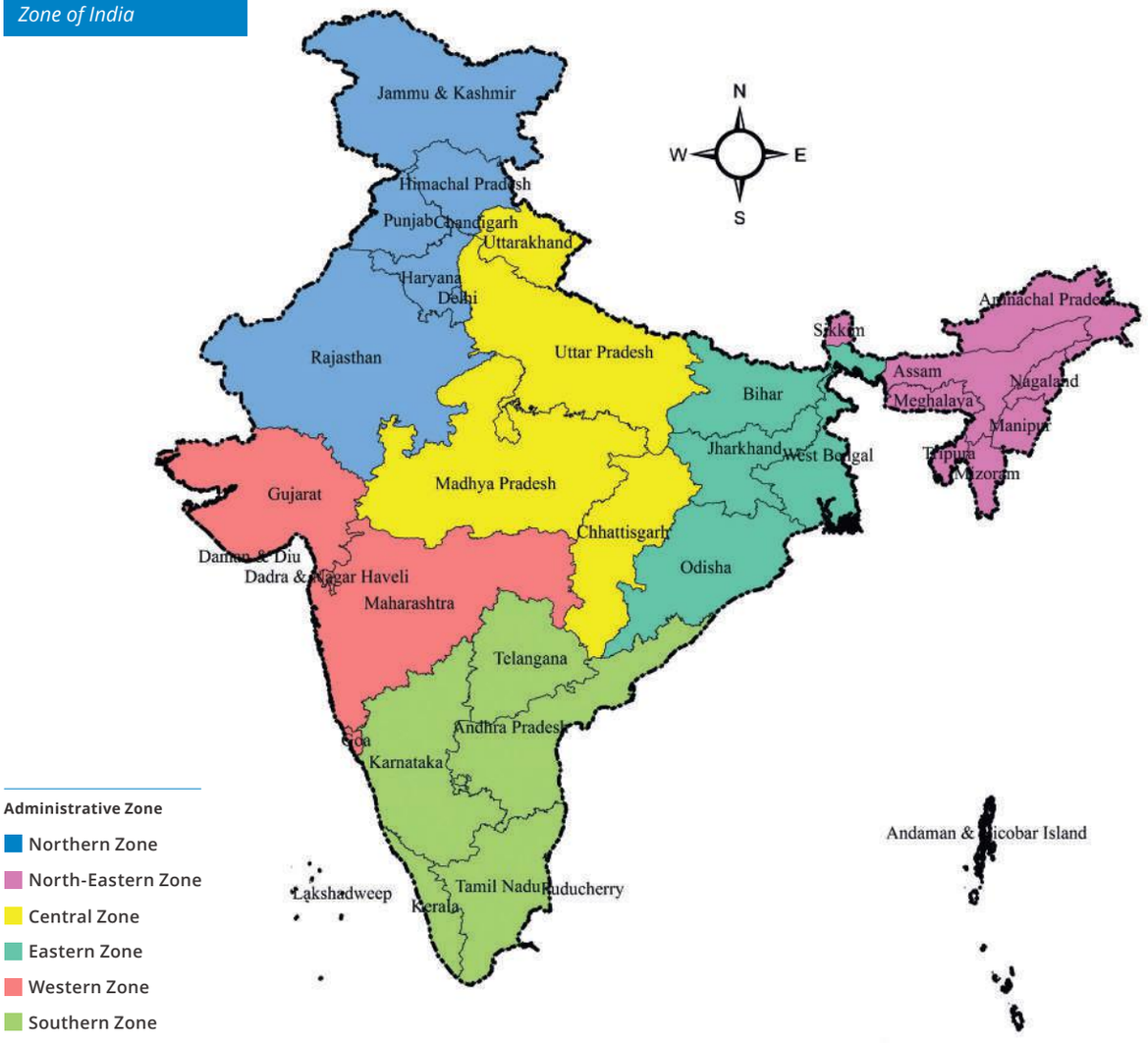
S.No.	Particulars	Value
1	Zones	6
2	States	29
3	Union territories (UTs)	7
4	Districts	716
5	Sub-division	5,924
6	Villages	640,932
7	Towns	7,935
8	Urban Agglomerations (UAs)	475

Source: Census of India, 2011

At sub-national level, India divided into 29 states and 7 Union Territories (UTs) (Table

2.1 and Map 2.1), which are further divided into districts. At the time of the 2011 Census there were 640 districts compared to 716 districts in 2018 (MoI&B, 2018). Each district is further divided into 5,924 sub-districts (Census 2011), which have different names in the various parts of the country: Tahsil, Taluka, Community Development (CD) Block, Police Station, Mandal, Revenue Circle, etc. The lowest primary administration units are the villages or Gram Panchayat in rural areas and Towns, Municipalities, Municipal Corporations, or Notified Areas in urban areas. In 2011, there were about 6.4 lakh villages of varying populations and 7,935 towns.

Map 2.1: *Administrative Zone of India*



2.3 Demography

As per the 2011 Census, the total population of India was 1.21 billion with the decadal growth rate from 2001 to 2011 of 17.7 percent. The population density is 382 people per square kilometer while the overall sex ratio is 943 females per 1,000 males yet the child (0-6 years) sex ratio is 919 girls per 1000 boys. The literacy rate has increased from 65 percent to 74 percent yet still shows discrepancies by gender as it is 82 percent for males and 66 percent for females. In 2012-16, the life expectancy at birth was 68.7 years (male: 67.4 years and female: 70.2 years) (Sample Registration System, 2012-16).

Table 2.2: *Demographic characteristics of India*

Characteristics	Year	Unit	Person
Total Population	2011	Number	1,210,854,977
Male Population	2011	Number	623,270,258 (51.5%)
Female Population	2011	Numbe	587,584,719 (48.5%)
Rural Population	2011	Number	833,748,852 (68.9%)
Urban Population	2011	Number	377,106,125 (31.1%)
SC Population	2011	Number	201,378,372 (16.6%)
ST Population	2011	Number	104,545,716 (8.6%)
Decadal growth rate	2011		17.7
Density	2011	Per square km	382
Sex Ratio	2011	Number of females per 1000 males	943
Birth rate	2015	Per thousand	20.8
Total Fertility Rate	2015	Per women	2.3
Death rate	2015	Per thousand	6.5
Infant mortality rate	2015	Per thousand	37
Life expectancy at birth	2012-16	Years	67.9
Work force participation rate	2011	Percent	39.8
Literacy	2011	Percent	74

Source: 1. Census of India, 2011; 2. Sample Registration System

2.4 Religion and Caste composition

India has a rich social composition with many religions originating in the country. Regional coexistence of diverse socio-religious groups in the country makes it unique for its 'unity in diversity'. According to Census 2011, nearly 80 percent were Hindu, 14.2 percent Muslims, 2.3 percent Christians, 1.7 percent Sikh, 0.7 percent as Buddhists and 0.4 percent were Jain. In addition, over 8 million people have reported practicing other religions and faiths including tribal religions.

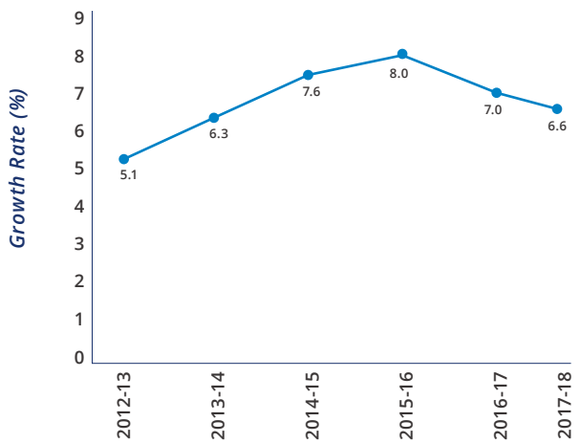
The Indian caste system embodies much of the social stratification. As of 2011, the total population of the Scheduled Castes (SC) and Scheduled Tribes (ST) in the country was 201 million and 104 million and constitute 16.6 percent and 8.6 percent of the total population respectively. The majority of SC and ST populations live in rural areas, making up 18.4 percent and 11.2 percent of the total rural population of the country.

2.5 Economy and Growth

India has emerged as the fastest growing major economy in the world as per the Central Statistics Organization (CSO) and International Monetary Fund (IMF). It is expected to be one

of the top three economic powers of the world over the next 10-15 years, backed by its strong democracy and partnerships. It is the world's sixth largest economy by nominal Gross Domestic Product (GDP) and the third largest by purchasing power parity (PPP). India's GDP was estimated to be at 6.6 percent in 2017-18 and is expected to reach 7.3 percent in 2018-19 (World Bank, 2018), mostly due to increased influence of digitization, globalization, favorable demographics, and reforms.

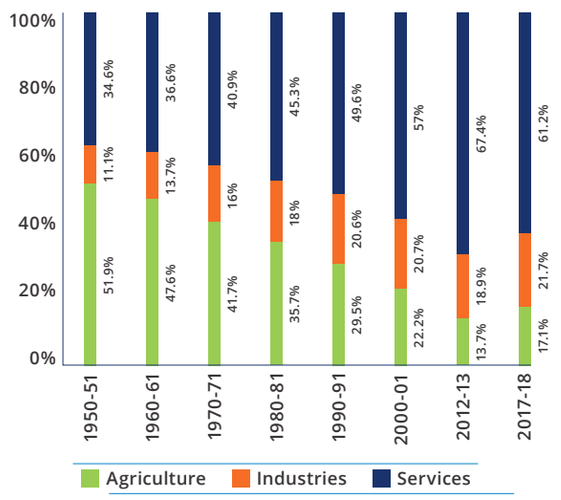
Figure 2.1: *Trend of real growth rate in India, 2012-18*



Source: *Reserve Bank of India (RBI), Government of India*

Analysis of the changing patterns of sectoral shares of economic activities in GDP is useful for understanding the process of economic transformation in the country. The sectoral contribution in GDP can be examined under three broad categories: agriculture, industries and services. In recent years, the service sector has emerged as the lead contributor to the GDP. In 2017-18, it had a share of 61.2 percent in the GDP, followed by 21.7 percent share from the industrial sector and 17.1 percent from the agriculture sector (Figure 2.2). The expansion of the service sector in India has been quite rapid over the past three decades, indicating a shift from the traditional agrarian economy towards a service dominated one.

Figure 2.2: *Trends of Sectoral Contribution to GSDP in India*



Source: *Planning commission (now NITI Ayaog), Government of India, and Reserve Bank of India*

The Government of India, under the Make-in-India initiative, is trying to boost the contribution made by the manufacturing sector and aims increase to 25[1]percent of the GDP from the current 17 percent (Figure 2.2). India's revenue receipts are estimated to reach INR 28-30 trillion (US$ 436- 467 billion) by 2019, owing to the measures by the Government of India to strengthen infrastructure and reforms like demonetization and Goods and Services Tax (GST).

As of March 2018, India's foreign exchange reserves were at US$ 422.5 billion (Reserve Bank of India, RBI) while in the 2018 the annual budget, the Government is committed to doubling farmers' income by 2022. A total of Rs. 14.3 lakh crore (US$ 225.4 billion) will be spent on creation of livelihoods and infrastructure in rural areas.

[1]***Make In India Initiative:*** *http://www.makeinindia.com/article/-/v/make-in-india-reason-vision-for-the-initiative*

2.6 Physiography

Due to the geographical complexities and geomorphological diversities in India, the views of various geographers on physiographic regions are as diverse as the diversities of landform itself. Some of the geographers follow the triple tectonic division such as the Himalayan Mountains, the Indo-Gangetic plains and the Indian Peninsula. However, India is divided into six physiographic divisions (Khullar, 2006 and Chatterjee, 1999).

1. The Himalayan Mountains
2. The Great Plains of North India
3. The Peninsular Plateau
4. The Indian Desert
5. The Coastal Plains
6. The Islands

2.7 Climate

India experiences a variety of climates ranging from tropical in the south to temperate and alpine in the Himalayan north with the elevated areas receiving sustained snowfall during the winter months. The Himalayas and the Thar desert strongly influence the climate of the country as the Himalayas serve as a barrier to the frigid katabatic winds, which blow down from Central Asia. The Tropic of Cancer passes through the middle of the country and this makes its climate more tropical. Based on the Koppen climate classification, the climates of India are mainly divided into four different groups - Tropical Wet, Tropical Dry, Sub-Tropical Humid and Mountain.

2.8 Land Use Classification

Land is a crucial natural resource and an important determinant of a country's socio-economic and ecological health and given its finite supply, the sustainable use and management of land resources is a necessity for the well-being of people. With rising rates of urbanization, more changes in land-use are taking place to supplement evolving demands and expectations. Statistics on land use are collected at present, in the form of a nine-fold classification on a yearly basis (Box 2.1).

Box 2.1: *Land use in India*
1. Forests (23.3 percent)
2. Area under non-agricultural uses (8.7 percent)
3. Barren and unculturable land (5.5 percent)
4. Permanent pastures & other grazing lands (3.3 percent)
5. Land under Misc. tree crops & groves (1.0 percent)
6. Culturable waste land (4.0 percent)
7. Fallow lands other than current fallows (3.6 percent)
8. Current fallows (4.9 percent)
9. Net area Sown (45.5 percent)
Source: *Directorate of Economics and Statistics, MoAFW, GoI, 2014-15.*

2.9 Soil

India has varied relief features, landforms, climatic realms and vegetation types which have contributed to the evolution of various types of soils in India. In ancient times, soils were classified into two main groups – Urvara and Usara, which were fertile and sterile, respectively. Now, soils are classified on the basis of their inherent characteristics and external features such as texture, color, slope of land and moisture content in the soil. There are mainly six types of soils found in India- Alluvial, Laterite, Black or Regur, Red, Desert, and Mountain.

2.10 Agro-Climatic Zones

Agro-climatic zone is a land unit in terms of major climates suitable for a certain range of crops and cultivars (FAO, 1983). The planning commission has divided the country into fifteen broad agro-climatic zones based on

physiography, soils, geological formation, climate, cropping pattern, and development of irrigation and mineral resources for agricultural planning and developing future strategies. The aim was to integrate plans of agro-climatic regions with state and national plans to enable policy development based on techno-agro-climatic considerations. The fifteen agro-climatic zones of India and the states which fall under each of them, according to Indian Council of Agriculture Research (ICAR) are presented in Table 2.4.

Table 2.3: ***Classification of various states by agro-climatic region of India***

Zones	Agro-Climatic Regions	States
Zone 1	Western Himalayan Region	Jammu and Kashmir, Himachal Pradesh, Uttarakhand
Zone 2	Eastern Himalayan Region	Assam, Sikkim, West Bengal, Manipur, Mizoram, Andhra Pradesh, Meghalaya, Tripura
Zone 3	Lower Gangetic Plains Region	West Bengal
Zone 4	Middle Gangetic Plains Region	Uttar Pradesh, Bihar, Jharkhand
Zone 5	Upper Gangetic Plains Region	Uttar Pradesh
Zone 6	Trans-Gangetic Plains Region	Punjab, Haryana, Delhi and Rajasthan
Zone 7	Eastern Plateau and Hills Region	Maharashtra Chhattisgarh, Jharkhand, Orissa and West Bengal
Zone 8	Central Plateau and Hills Region	Madhya Pradesh, Rajasthan, Uttar Pradesh, Chhattisgarh
Zone 9	Western Plateau and Hills Region	Maharashtra, Madhya Pradesh, Chhattisgarh and Rajasthan
Zone 10	Southern Plateau and Hills Region	Andhra Pradesh, Karnataka, Tamil Nadu, Telangana, Chhattisgarh
Zone 11	East Coast Plains and Hills Region	Orissa, Andhra Pradesh, Tamil Nadu and Pondicherry
Zone 12	West Coast Plains and Ghat Region	Tamil Nadu, Kerala, Goa, Karnataka, Maharashtra, Gujarat
Zone 13	Gujarat Plains and Hills Region	Gujarat, Madhya Pradesh, Rajasthan, Maharashtra
Zone 14	Western Dry Region	Rajasthan
Zone 15	The Islands Region	Andaman and Nicobar, Lakshadweep

Source: *Planning commission, 1989*

2.11 Availability of Food, Markets and Connectivity

Table 2.5 presents the position of Indian agriculture in the world where India ranks among the top three in production of many crops, fruits and animal products. India has occupied a remarkable position in global retail rankings. The country has high market potential, low economic risk and moderate political risk.

Table 2.4: ***Comparison of Agriculture in India and the World, 2014***

Items	India	World	% Share	India's Rank	Next to
Total Area (Million Hectare)	329	13467	2.4	Seventh	Russian Federation, Canada, USA, China, Brazil, Australia
Land Area	297	13009	2.3	Seventh	Russian Federation, China, USA, Canada, Brazil, Australia
Arable Land	156	1417	11	Second	USA
Population (Million)					
Total	1295	7266	17.8	Second	China
Rural	857	3364	25.5	First	
Crop Production (MT)					
Total Cereals	295	2819	10.5	Third	China, USA
Wheat	96	729	13.1	Second	China
Rice (Paddy)	157	741	21.2	Second	China
Total Pulses	20	78	25.8	First	
Groundnut (In shell)	7	44	14.9	Second	China
Rapeseed	8	74	10.7	Third	Canada, China
Sugarcane	352	1884	18.7	Second	Brazil
Tea	1.21	5.56	21.7	Second	China
Coffee (green)	0.3	8.79	3.5	Sixth	Brazil, Vietnam, Indonesia, Columbia, Ethiopia
Jute & Jute like Fibres	2.07	3.65	56.8	First	
Cotton (lint)	6.19	26.16	23.7	Second	China
Tobacco Unmanufactured	0.72	7.18	10	Third	China, Brazil
Fruits & Vegetables Production (MT)					
Vegetables & Melons	127	1169	10.8	Second	China
Fruits excluding Melons	88	690	12.8	Second	China
Potatoes	46	382	12.1	Second	China
Onion (Dry)	19	89	21.9	Second	China
Livestock (Million Heads)					
Cattle	187	1475	12.7	Second	Brazil
Buffaloes	110	194	56.6	First	
Camels	0.38	28	1.4	Twelfth	Somalia, Sudan, Kenya, Niger, Chad, Mauritania, Ethiopia, Pakistan, Mali, Yemen, UAE
Sheep	63	1196	5.3	Third	China, Australia
Goats	133	1011	13.2	Second	China
Chicken	725	21410	3.4	Seventh	China, USA, Indonesia, Brazil, Iran, Pakistan
Animal Products (In ' 000 MT)					
Milk Total	146314	801649	18.3	First	
Eggs (Primary) Total	3965	75524	5.3	Third	China, USA
Meat Total	6601	317855	2.1	Sixth	China, USA, Brazil, Russian federation, Germany

Source: Agricultural Statistics at a glance, 2011. Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, GoI. FAOOA Regional Office for Asia and Pacific.

2.12 Livelihood Activities

India is primarily an agriculture-based country and its economy largely depends upon agriculture. However, there are significant variations in livelihood activities across the country. The agriculture sector has a significant contribution in the national GDP and it also provides employment to about two-thirds of the population. Therefore, the development of the nation is largely dependent on the progress and growth of agriculture. But due to rapid increases in population, while the land area remains the same, people have started moving to other non-farm employment opportunities like service sector and industries. Main earning member of the household engaged in the occupation type is presented in Table 2.6.

Table 2.5: ***Percentage Distribution of Households by Household Types, India 2011-12***

Household types	Percentage
RURAL	
Self-employed in agriculture	**34.3**
Self-employed in non-agriculture	**15.5**
Regular wage/salary earning	**9.6**
Casual labour in agriculture	**21.0**
Casual labour in non-agriculture	**13.5**
Others	**6.1**
URBAN	
Self employed	**35.3**
Regular wage/salary earning	**41.7**
Casual labour	**11.8**
Other	**11.2**

Source: *NSS Employment and unemployment, 68th round (2011-12). Household type: main earning member of the household engaged in the occupation type.*

2.13 Risks and Natural Disasters

Natural disasters cause massive losses of human resources and infrastructure. India, being a net importer in foodgrains in the early sixties, has not only become self-reliant in food grain production, but have acquired sufficient resilience to tide over the adverse conditions such as natural disasters. Floods and droughts significantly impact the majority of the country, though they are most common in the northwestern and eastern regions. Geophysical hazards affect the Himalayan region in the north and northeastern portions of the country while cyclones influence coastal areas of the country.

2.14 Gender Inequality in India

Addressing issues around gender inequality is imperative for achieving food and nutrition security in the country, and thus important to integrate in the analysis and recommendations.

In 2018, India ranked 108 out of 149 countries in the Global Gender Gap score by the World Economic Forum (The Global Gender Gap Report, 2018). Gender inequality in India is a multifaceted issue that refers to economic, political and social inequalities between women and men. Gender inequality and its social causes, rooted in patriarchy, have impacted the child sex ratio as well as the overall sex ratio.

The participation rate of women in the workforce is less than half (26 percent) that of men (53 percent). However, in the agriculture sector 74 percent of the labour force are women, but only 13 percent of them own any land. Moreover, there is a significant wage gap between women and men across the Indian economy. A woman's work in her own household is not counted as an economic activity nor is it reported in the national income statistics.

Crime against women is a major concern. Another important aspect is their participation in decision-making processes. In the last Lok Sabha elections, only 11 percent of the total members were women (Election Commission of India, 2014). Representation of women in State Assemblies is even lower. In 2017, only 9 percent of the State Assembly members and 5 percent of the State Council members were women.

CHAPTER **THREE**

FOOD AVAILABILITY

Agricultural Crop Production in India

An important facet of Indian agriculture has been its remarkable progress from a food deficient to a self-sufficient nation. India is now a consistent net food exporting nation. Self-sufficiency in production of foodgrains is often advocated as a first step towards attaining food security for a country of India's size (9th Five-year Plan, Vol. 2, GoI). Moreover, increase in the per capita availability of foodgrains and its distribution can address the collective problem of extreme poverty, nutrition and hunger in a country like India, which is home to the largest number of food-insecure people in the world (FAO Reports 2008). Food production is still the major source of livelihood for a large section of cultivators and agricultural labourers in India. The process of production of foodgrains in the predominantly smallholding agricultural economy (with 67.1 percent land holding less than 1 hectare) is a source of employment and income, and leads to food security of farmers, agricultural labourers and their families.

The first step towards malnutrition free India is to ensure that food is adequately and consistently available for the population, as per their nutritional requirement and food preferences. One way of direct assessment of food availability at macro level, is the aggregation of production of various foodgrains in different parts of the country. However, from a food security point of view, it is also critical to assess the extent to which the produced foodgrains are available for consumption by the people. This chapter presents the first dimension (availability of food for population) of food and nutrition security analysis in detail.

3.1 Availability of Food: Background

Availability of food, as per the need and choice of an individual, is the first and very pertinent dimension of the food and nutrition security. Between trienniums 1996-99 and

2015-18, India achieved a Compound Annual Growth Rate (CAGR) of 1.6 percent per annum in foodgrains production. Although India is one of the top producers of foodgrains in the world, the country is facing high prevalence of hunger and food insecurity, especially among women and children. This clearly shows that the food availability at aggregate level has not translated into uniform food access and nutritional outcome and the pockets of vulnerability still exist.

Therefore, it would be interesting to analyse the trends and pattern of food availability in the states of India and various population sub-groups and also look at multitude of factors, covariates and relate it with other dimensions of food security in the subsequent chapters. An operational definition is required to measure food availability. This report has used the definition of food availability as provided in the CFSVA 2009 guidelines of WFP (Box 3.1).

Box 3.1: ***Food Availability***

Food Availability is the food that is physically present in the given area, through all forms of domestic production, commercial imports[1], reserves and food aid. This might be aggregated at the regional, national, district or community level.

(CFSVA Guidelines – WFP, 2009)

3.2 Net Availability and Production of Food-grain

Level and Trends of Various Crops

India is known for its diversity, which is well reflected in the variety of foodgrain production in different states of the country. The principal crops that are produced as well as consumed by Indians vary significantly across the states. Earlier, the food consumed by the people in a specific region was predominantly influenced by the production or availability of crops in that region and became the socio-cultural tradition and taste of the people. For example, south Indians are identified with the habit of eating rice, while in north-eastern parts of the country, pork consumption is common and in northern plains of Punjab, bread (initially made by coarse cereals but later by wheat) is staple food.

Ministry of Agriculture and Farmers Welfare (MoAFW), GoI, has estimated the per capita net availability of various foodgrains at national level (Box 3.2). Figure 3.1 shows the trend of per capita net availability of foodgrains, cereals, wheat, rice and pulses in gram per day during 1996-2018.

Box 3.2: ***Per capita net Availability of Food grain***

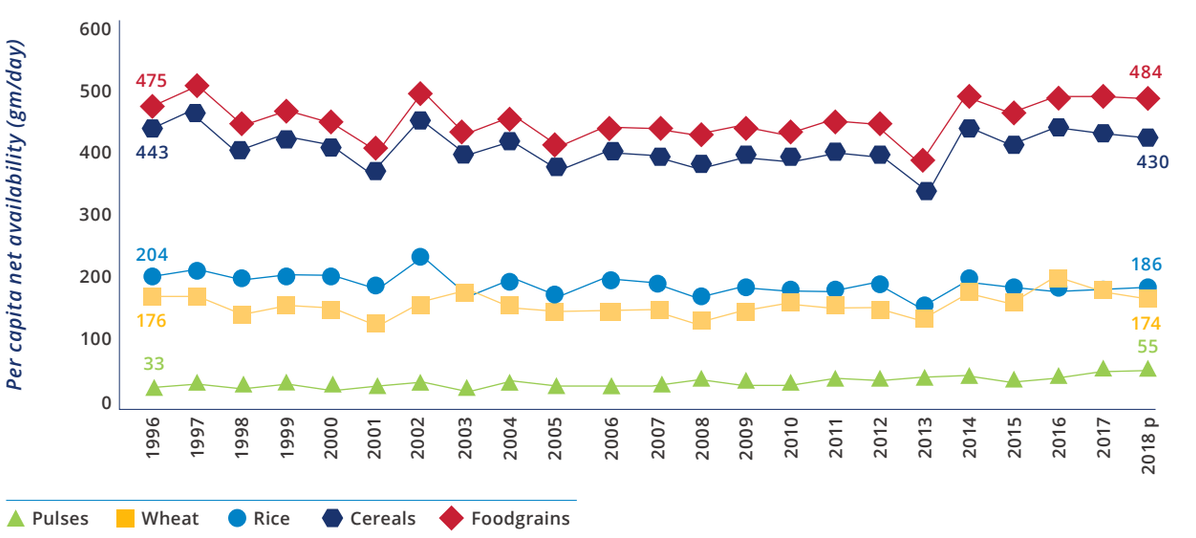
The net availability of foodgrains is estimated to be Gross Production (-) seed, feed & wastage, (-) exports (+) imports, (+/-) change in stocks. The net availability of foodgrains divided by the population estimates for a particular year indicate per capita availability of foodgrains in terms of kg/year. Net-availability, thus worked out is further divided by the number of days in a year i.e. 365 days which is taken as net availability of food-grains in terms of grams / day

(MoAFW, GoI).

[1] ***Make In India Initiative:*** *http://www.makeinindia.com/article/-/v/make-in-india-reason-vision-for-the-initiative*

Per capita net availability of total foodgrains has marginally increased from 475 gm/day to 484 gm/day during 1996-2018. Even though pulses have the lowest per capita net availability, it has shown an increasing trend (from 33 gm/day to 55 gm/day) during same period. Contrary to this, total cereals, wheat and rice have shown a declining trend in per capita net availability in last two decades, which constitute a major part of the total foodgrain. Net availability of foodgrains, however, has increased over time, which seems to be largely driven by enhanced level of production and import-export of pulses and significant increase in production of maize. Per capita net availability has declined for remaining crops in the last two decades. Despite record production of these crops in India, the declining trend of net availability of cereals is a matter of concern and needs to be further analysed. It is also important to critically look at the issues pertaining to food wastage, import-export and population growth.

Figure 3.1: *Per capita net availability of foodgrains (gm/day), India, 1996-2018*



Source: *Ministry of Agriculture and Farmers Welfare, GoI*

Note:

1. *Figures are presented in unit of 'Grams per day'*
2. *Cereals includes rice, wheat and other cereals; pulses include all Kharif and Rabi pulses; Foodgrains includes rice, wheat, other cereals and all pulses.*
3. *The net availability of foodgrains is estimated to be Gross Production (-) seed, feed & wastage, (-) exports (+) imports, (+/-) change in stocks. The net availability of foodgrains divided by the population estimates for a particular year indicate per capita availability of foodgrains in terms of kg/year. Net-availability, thus worked out is further divided by the number of days in a year i.e. 365 days which is taken as net availability of foodgrains in terms of grams/day.*
4. *Figures in respect of per capita net availability given above are not strictly representative of actual level of consumption in the country especially as they do not take in to account any change in stocks in possession of traders, producers and consumers.*
5. *For calculation of per capita net availability, the figures of net imports from 1981 to 1994 are based on imports and exports on Government of India account only. Net imports from 1995 onwards are the total exports and imports (on Government as well as private accounts).*

The production and yield of foodgrains is used as a proxy indicator of food availability at the state level, as data on net availability of foodgrains is available only at the national level. Due to lack of data on import, export, wastage and supply at desegregated level, it was not possible to estimate the net availability for states across India.

Figure 3.2 shows the changes in total foodgrains production and percentage share of various crops in the foodgrain production basket in 1996-99 and 2015-18 in India. Among four broad categories of foodgrains rice has the highest share of production followed by wheat, coarse cereals and pulses. Although the percentage share of production of rice is highest, it has declined from 42.1 percent to 40.4 percent and percentage share of coarse cereals have declined from 16.1 percent to 15.8 percent during 1996-99 to 2015-18.

Box 3.3: ***Highlights of Foodgrain Production***
Per capita net availability of total foodgrains and pulses have increased while it has declined for rice and wheat
Per capita net availability of pulse is 55 gm/day in 2015-18 (including import), higher than threshold of 40 gm/day recommended by ICMR
Production of foodgrains have increased from 198 Million Tons in 1996-99 to 269 Million Tons in 2015-18 (36 percent increase) in India
Share of the production of pulses and wheat have marginally increased by approx. 1 percent
Despite lowest use for human consumption, maize production increased substantially and constitutes 60 percent of total coarse cereals in 2015-18
States of Indo-Gangetic plains are rice bowl as well as top wheat producer in India
Madhya Pradesh produced highest share of pulses (27 percent) but ranked 15th in Pulse yield

Among production of various pulses, in 2015-18, percentage share of gram was the highest (44.0 percent, though it declined from 43.1 percent in 1996-99) followed by tur (17.2 percent; increased from 18.2 percent), urad (9.7 percent, increased from 12.6 percent), moong (8.2 percent; increased from 8.8 percent) and lentil (6.4 percent; declined from 5.8 percent).

Among production of coarse cereals, in 2015-18, percentage share of maize was the highest (34.2 percent), which increased from 59.2 percent in 1996-99, followed by bajra (23.4 percent; declined from 21.1 percent), jowar (28.0 percent; declined from 10.6 percent), ragi (7.3 percent; declined from 4.1 percent), barley (4.9 percent; declined from 3.9 percent) and small millets (2.1 percent; declined from 1.0 percent). Apart from highest share of maize production among coarse cereals, its share of production increased significantly (by 25 percent) during 1996-2018.

As detailed in chapter 2, India experiences various seasons across the year, which impacts the production of crops to a great extent. The Indian cropping season is classified into two main seasons: Kharif and Rabi. The Kharif cropping season is from July to October during the southwest monsoon and the Rabi cropping season is from October to March (winter).

Figure 3.3-3.5 represents the level and trend of production of various crops in Kharif and Rabi season in India during 1996-2018. The overall trend of production is increasing for food grain, coarse cereals, rice, wheat, bajra (millet), maize, pulses, arhar (peigeonpea), gram, urad (black lentil) and moong (green lentil), while the production of jowar (sorghum), ragi (finger millet) and small millets declined during 1996-2018. Annual fluctuations in the production of crops have been observed, which can be due to the changes in weather, Minimum Support Price (MSP), demand-supply gap or natural calamities. Production of many crops has been relatively more in the Kharif season as compared to Rabi season, except for pulses. There are certain crops which are produced

in only one of the seasons; for example, wheat and gram are produced in only Rabi season while ragi, bajra, small millets and arhar are produced in only Kharif season.

Figure 3.2: *Changes in the Total Foodgrains Production and Percentage Share of Various Food grains in Food Grain Production Basket in India, 1996-99 and 2015-18*

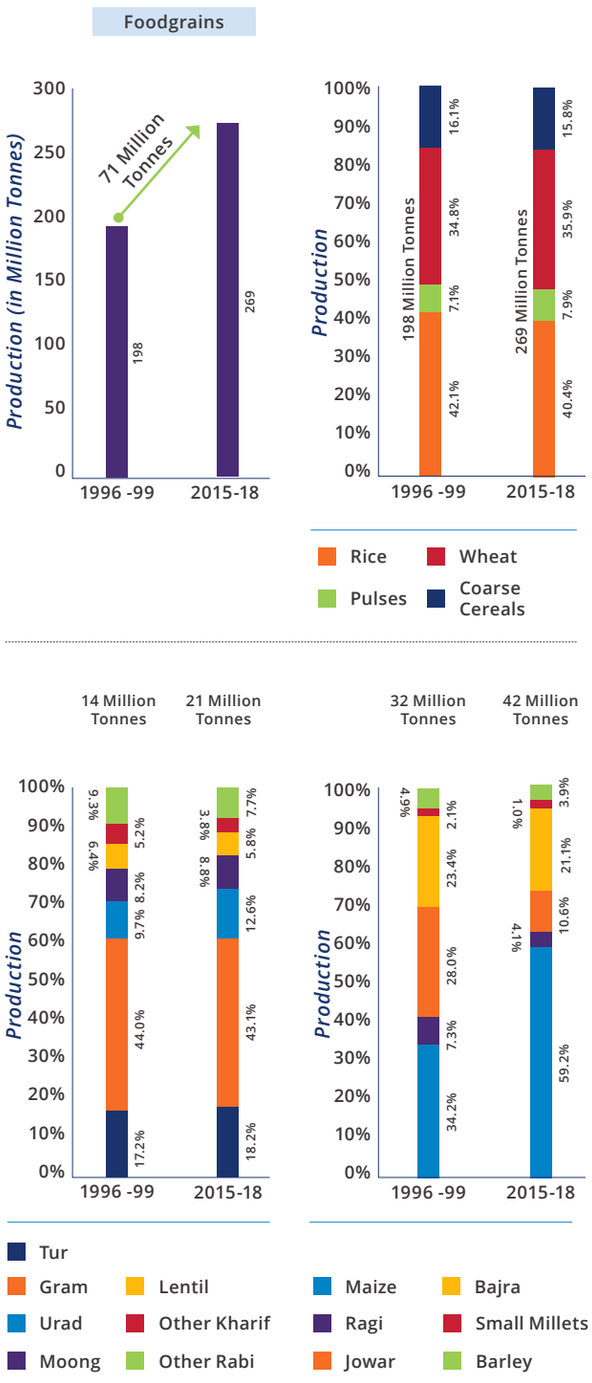
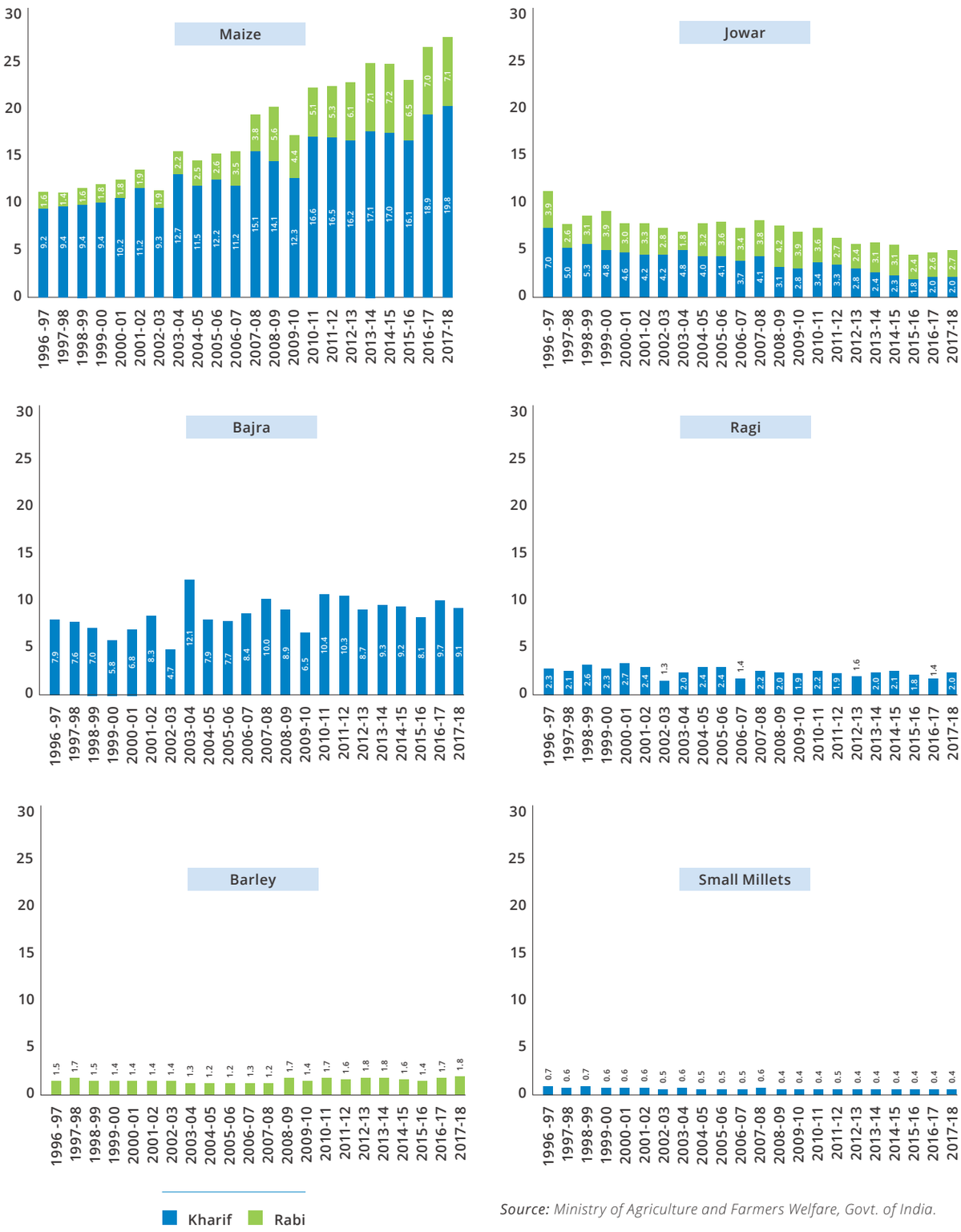


Figure 3.3: *Trends of Production of Total Foodgrains, Rice, Wheat, Coarse cereals and Pulses (in Million Tonnes) by season in India, 1996-2018*

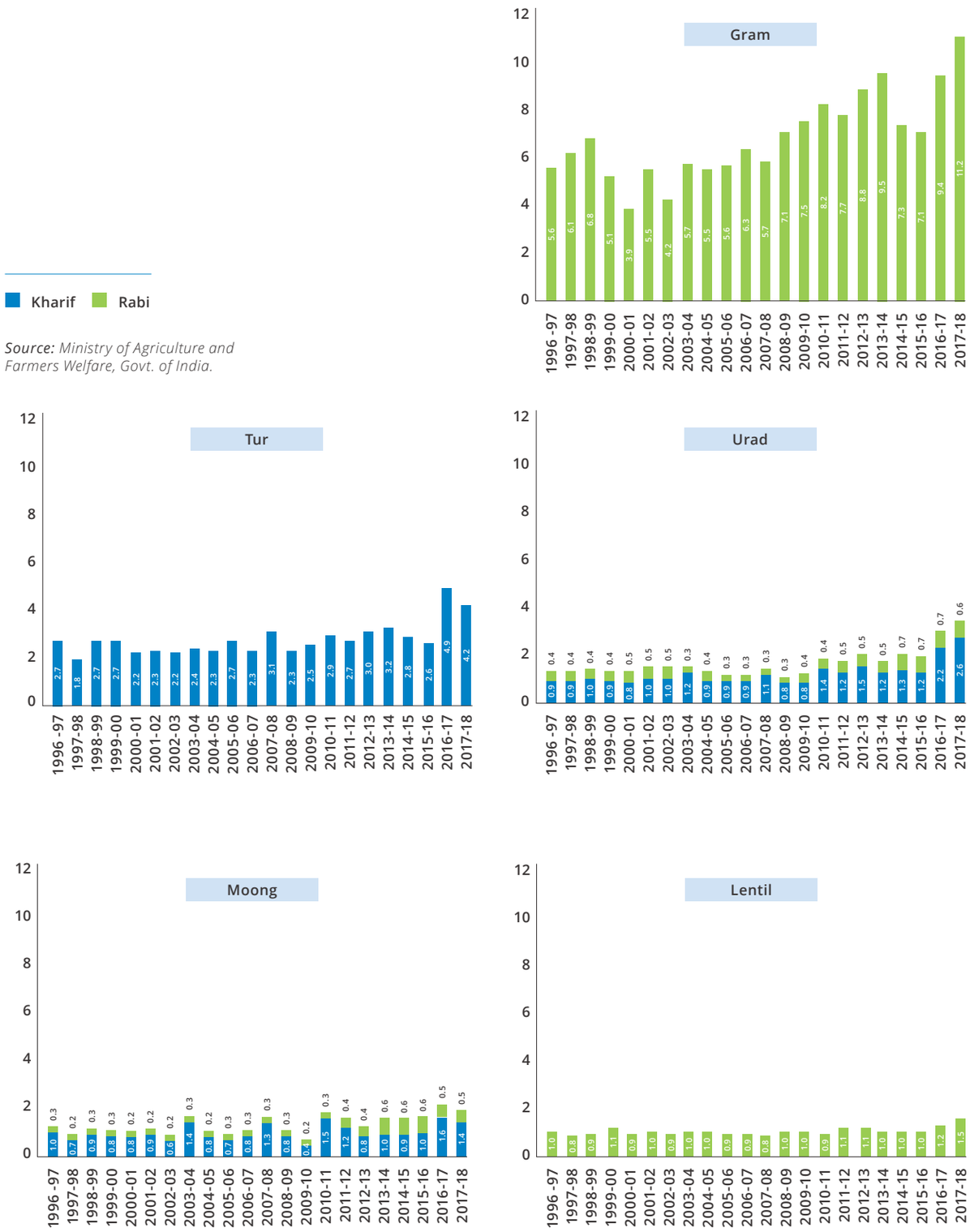
Source: *Ministry of Agriculture and Farmers Welfare, Govt. of India.*

Figure 3.4: *Trends of Production of Jowar, Bajra, Small Millets, Maize, Ragi and Barley (in Million Tonnes) by Season in India, 1996-2018*



Source: *Ministry of Agriculture and Farmers Welfare, Govt. of India.*

Figure 3.5: *Trends of Production of Pulses (in Million Tonnes) by season in India, 1996-2018*



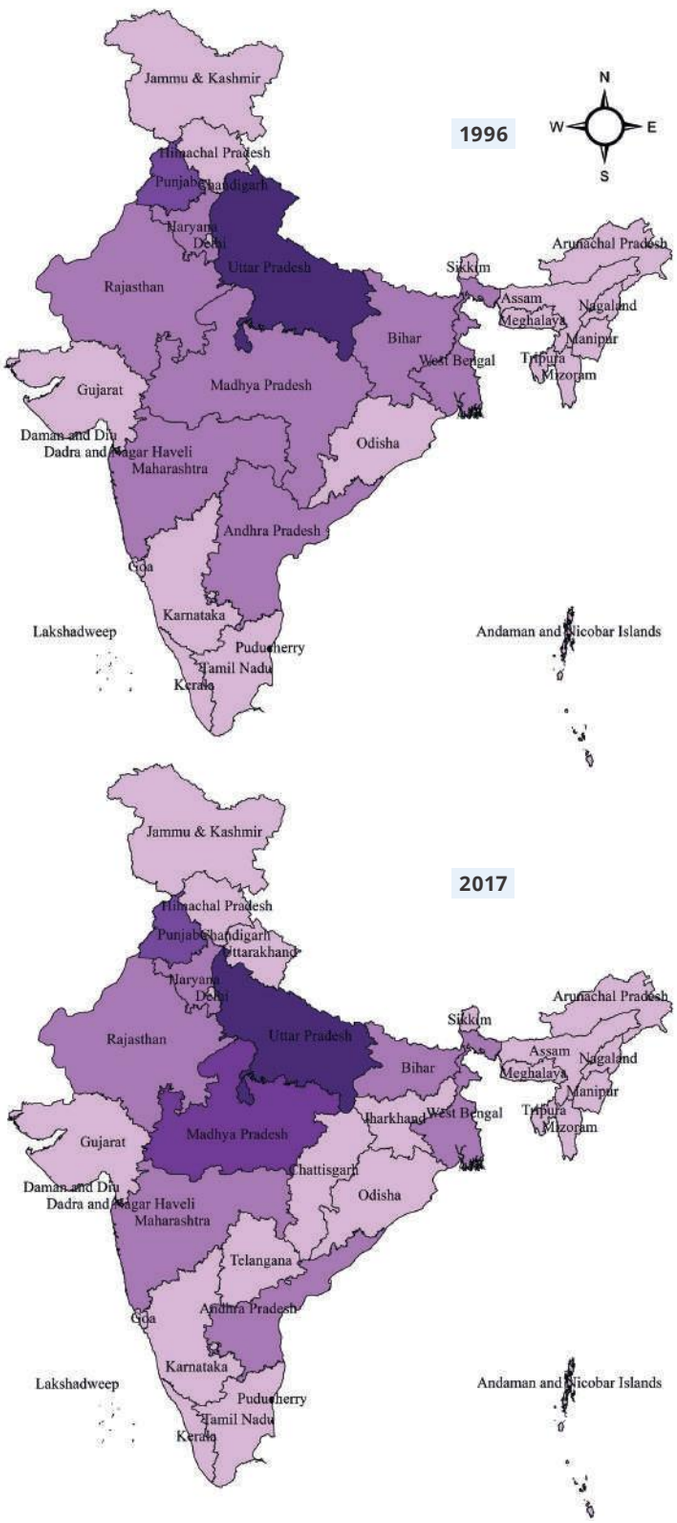
Source: *Ministry of Agriculture and Farmers Welfare, Govt. of India.*

Among the broad categories of crops, production of foodgrains increased from 199 million tonnes to 280 million tonnes (41 percent increase) during 1996-2018. Production of both coarse cereals and pulses increased by 11 million tonnes while both rice and wheat by 30 million tonnes and maize by 16 million tonnes during the same time period. Other crops like bajra, barley and specific type of pulses have witnessed nominal increase in the production. Contrary to this, production of jowar, ragi and small millets have declined in last two decades.

3.3 State-wise Trends and Patterns of Production

Map 3.1-3.6 represents the state-wise production of overall foodgrains, pulses, rice, wheat, coarse cereals and maize in 1996 and 2017. Production of foodgrains varies remarkably across the states. The Indo-Gangetic plains being the most fertile land in the country, Uttar Pradesh is the top producer of foodgrains, followed by Madhya Pradesh and Punjab. Similarly, West Bengal is the rice-bowl of India, followed by Uttar Pradesh, Bihar, Punjab and other states. Black soil of Madhya Pradesh and Maharashtra is most suited for pulses and Madhya Pradesh is the national leader in pulse production followed by Maharashtra, Rajasthan and Uttar Pradesh. Coarse cereals are also the main crop of Maharashtra, followed by Rajasthan, Karnataka and Madhya Pradesh. Although maize is not a main part of food-plate in India, it is a new attraction to farmers as a cash crop and is dominantly produced in Maharashtra, Madhya Pradesh, Karnataka, Chhattisgarh, Telangana and Andhra Pradesh. Statistics show that a major portion (63 percent) of maize is used in poultry and animal feeding and only 9 percent of maize production is used for human consumption (FICCI, 2018).

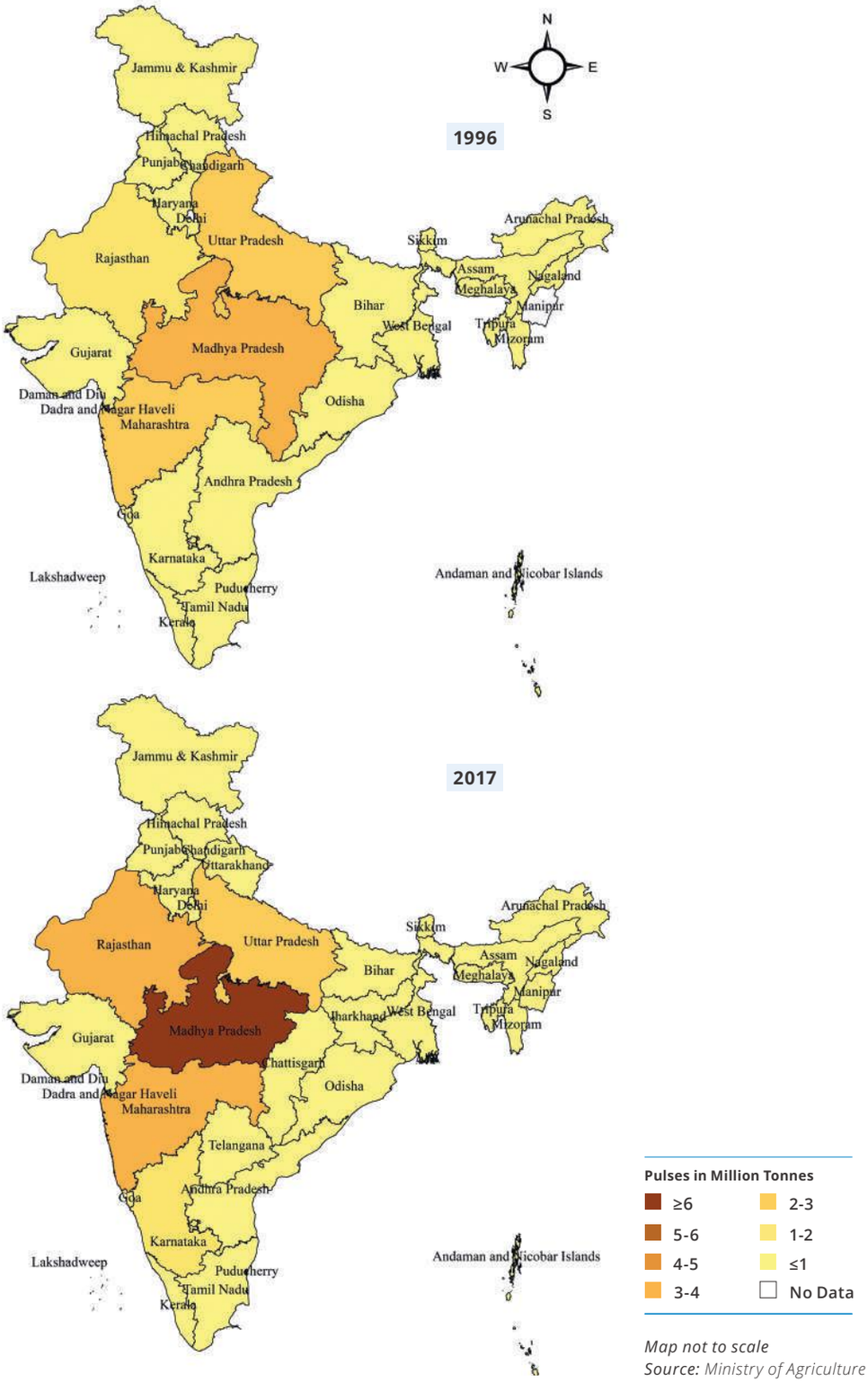
Map 3.1: *State-wise production of foodgrains, India, 1996 and 2017*



Map not to scale

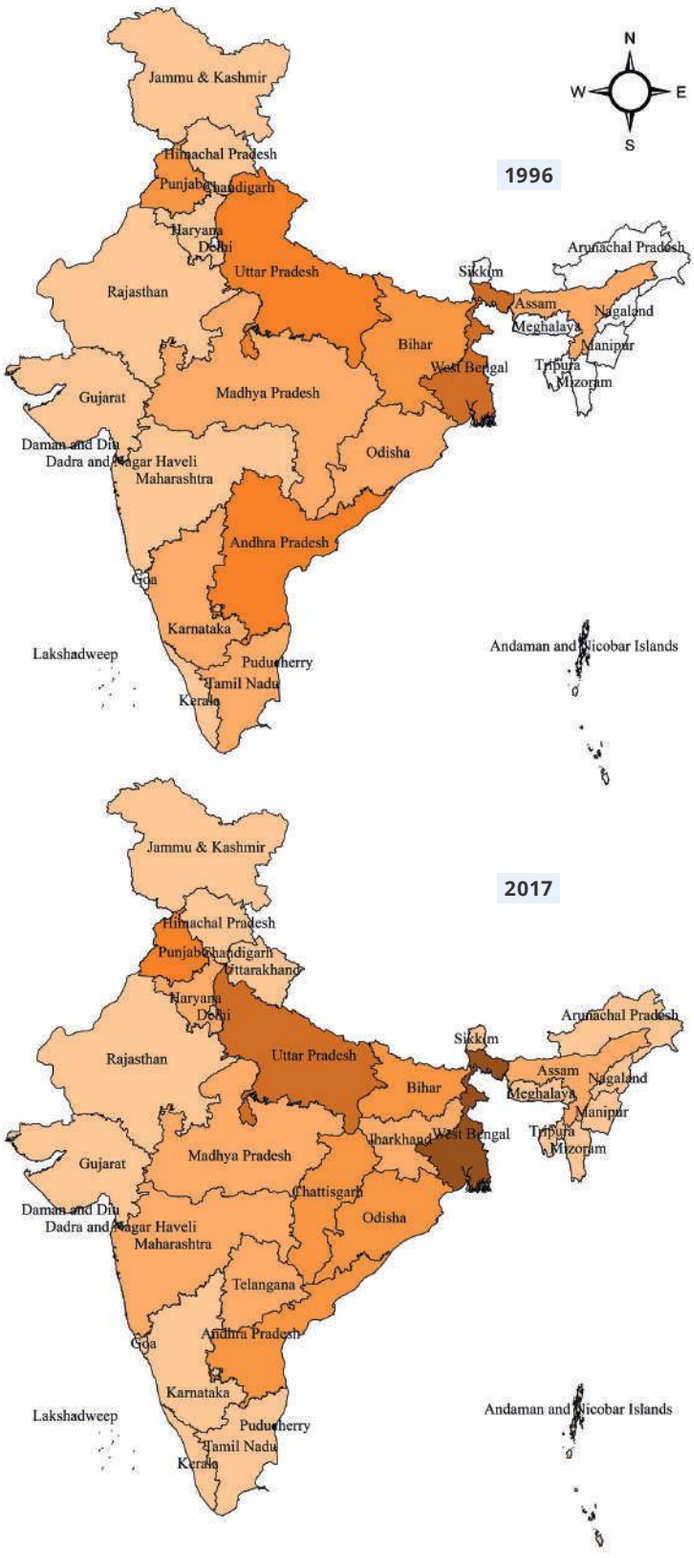
Source: *Ministry of Agriculture and Farmers Welfare, GoI*

Map 3.2: *State-wise production of Pulses, India, 1996 and 2017*



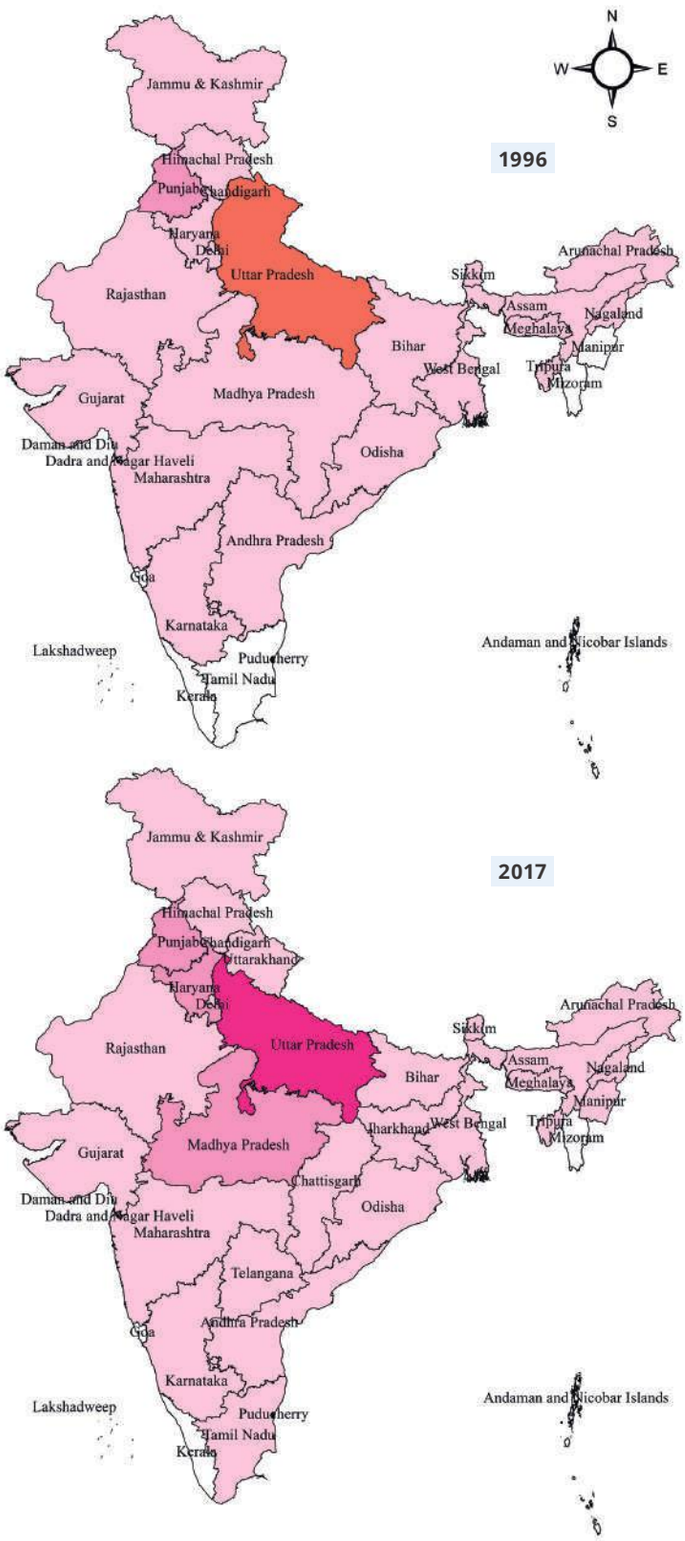
Map not to scale
Source: *Ministry of Agriculture and Farmers Welfare, GoI*

Map 3.3: *State-wise production of Rice, India, 1996 and 2017*



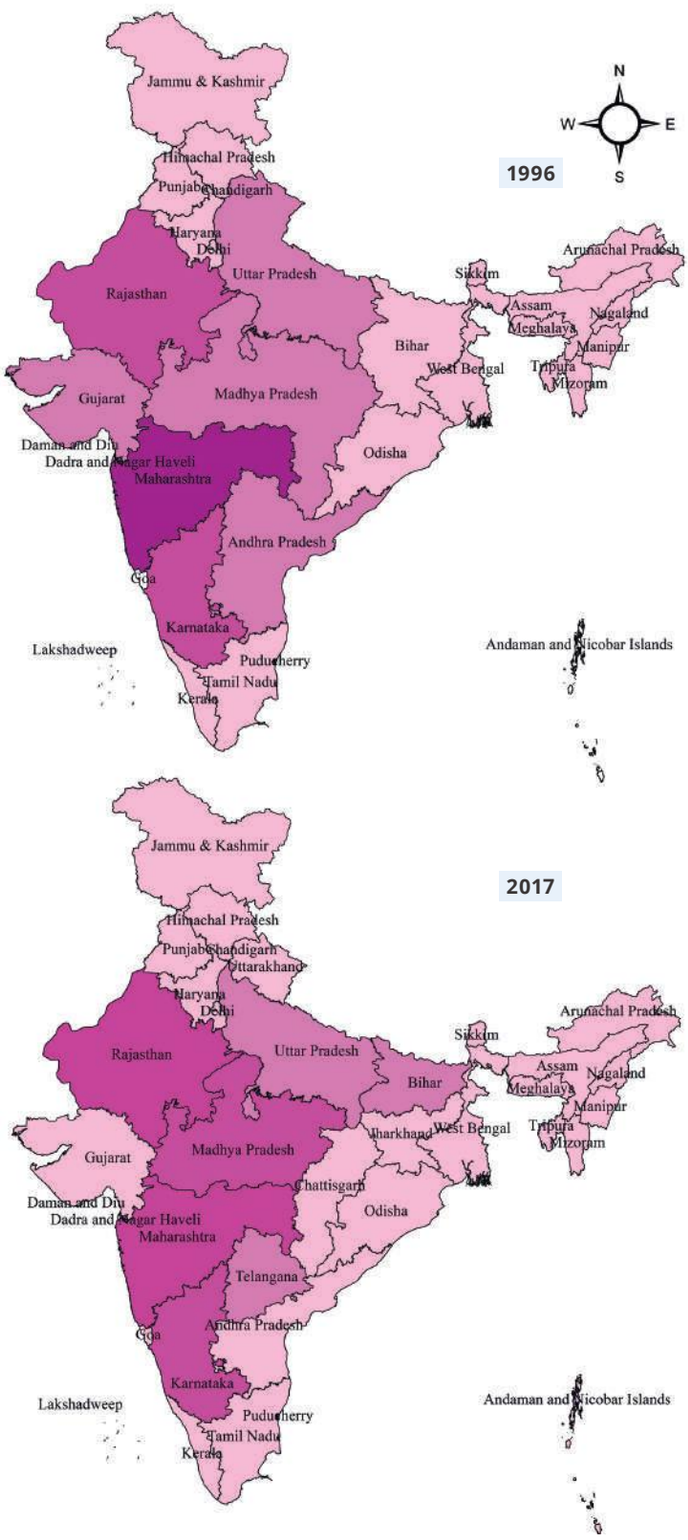
Map not to scale
Source: *Ministry of Agriculture and Farmers Welfare, GoI*

Map 3.4: *State-wise production of Wheat, India, 1996 and 2017*



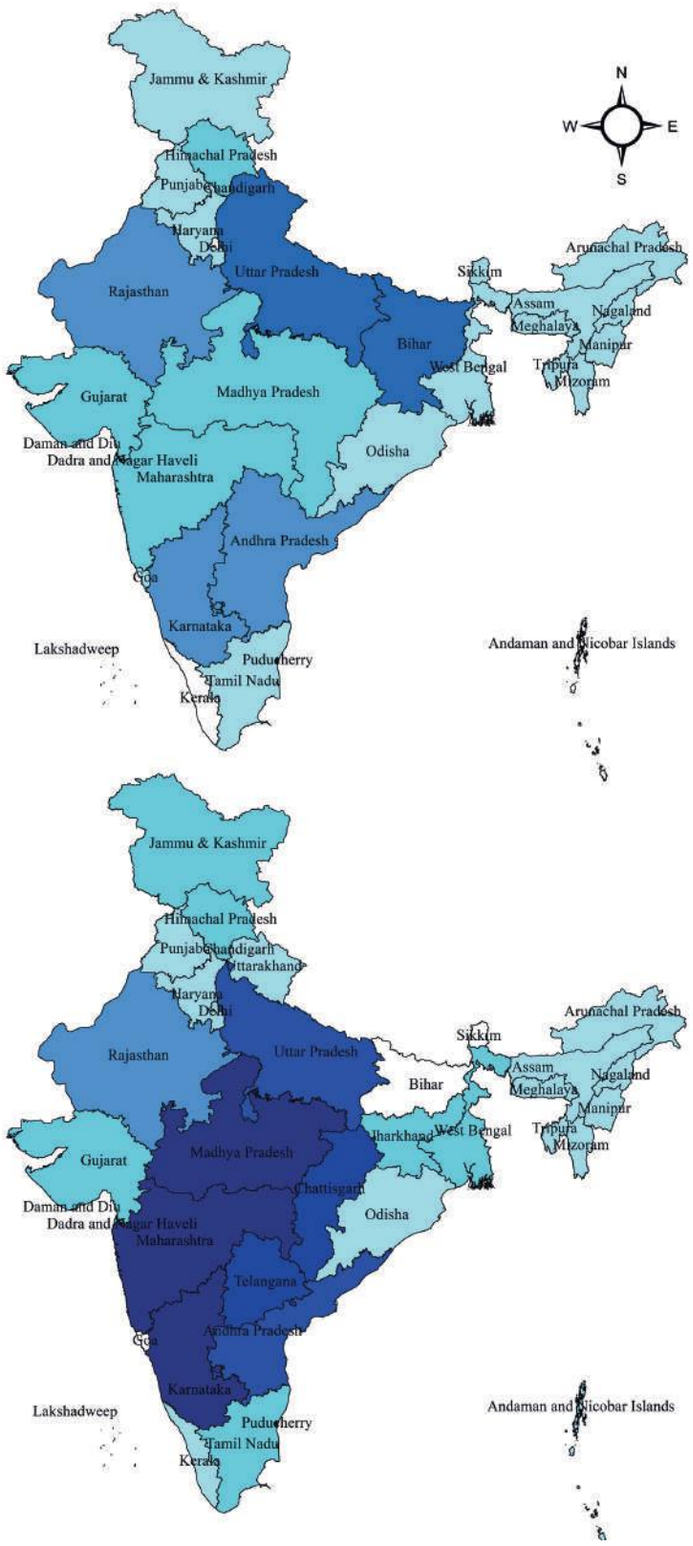
Map not to scale
Source: *Ministry of Agriculture and Farmers Welfare, GoI*

Map 3.5: *State-wise production of Coarse Cereals, India, 1996 and 2017*



Map not to scale
Source: *Ministry of Agriculture and Farmers Welfare, GoI*

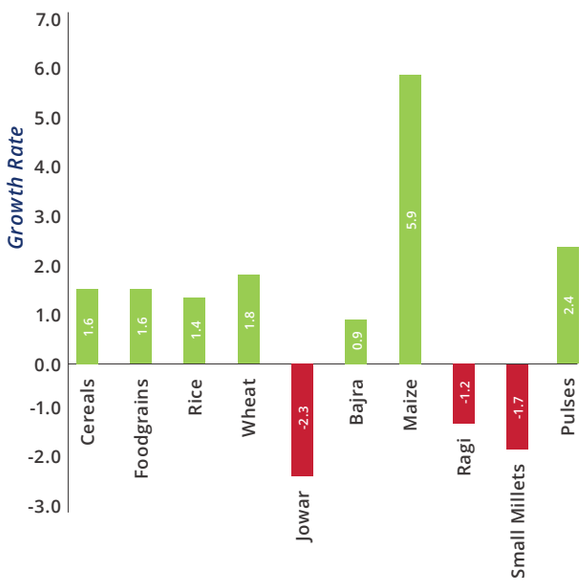
Map 3.6: *State-wise production of Maize, India, 1996-2017*



Map not to scale

Source: *Ministry of Agriculture and Farmers Welfare, GoI*

Figure 3.6: *Compound Annual Growth Rate (in percent) of Foodgrains Production During 1996-99 to 2015-18*



Source: *Ministry of Agriculture and Farmers Welfare, Govt. of India.*

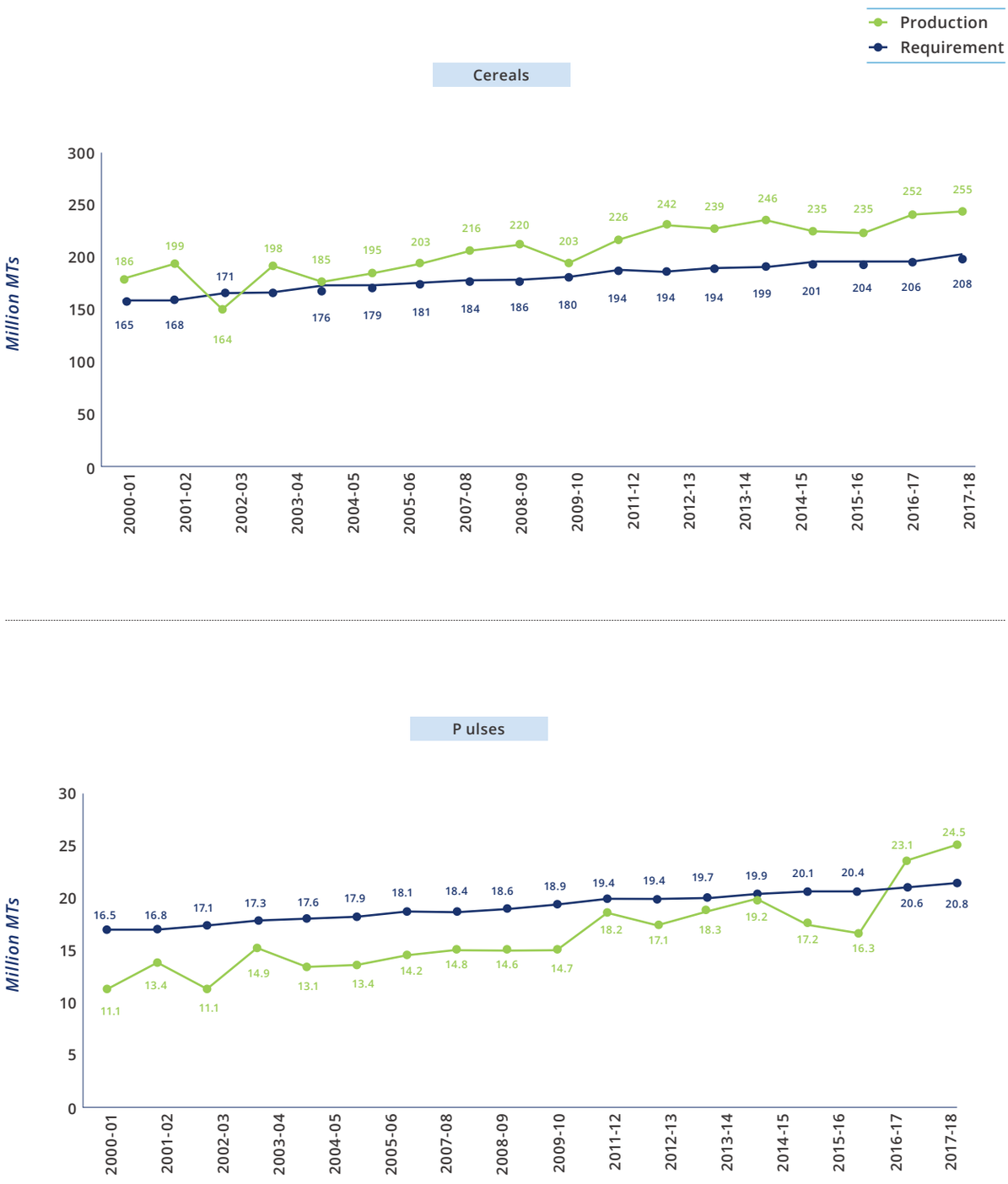
Note: *Compound Annual growth rate of production, calculated between 1996-99 and 2015-18*

Figure 3.6 shows the compound annual growth rate of production for major crops during 1996-99 to 2015-18. Three years' moving average of production has been used to estimate the annual growth rate to ensure smoothening of the annual fluctuations. It is interesting to note that the growth rate is exceptionally high for maize (5.9 percent) followed by pulses (2.4 percent), wheat (1.8 percent), cereals (1.6 percent), foodgrains (1.6 percent), rice (1.4 percent) and bajra (0.9 percent) from 1996-98 to 2016-18. On the other hand, jowar, small millets and ragi have negative growth rate of -2.3 percent, -1.2 percent and -1.7 percent respectively from 1996-98 to 2016-18.

3.4 Adequacy of Production and Consumption Requirement

The production of foodgrain will be adequate if it suffices the requirement of the population and is available for consumption. Sometimes, despite surplus production, food inadequacy exists among the population. This might occur due to food wastage, export or lack of access to the available food or demand-supply gap due to large population. Figure 3.7 presents the gap between production and requirement of the cereals and pulses over time. Production of cereals was higher than its requirement during 2000-2018, with an exception in 2002-03 where production had slightly declined. On the other hand, production of pulses was consistently lower than its requirement during 2000-2016, however, it increased after 2016 and surpassed the requirement at the national level. A shift in the focus towards targeted production would therefore, address the gap between production and requirement.

Figure 3.7: *Trends of Production and Requirement of Cereals and Pulses in India, 2000-2018*



Source: *Cereals and pulses production figures for India are obtained from the Ministry of Agriculture & Farmers Welfare, Government of India. Consumption requirement for cereals and pulses were estimated based on @ 500 gms/adult unit and @50 gms (dal)/adult unit per day respectively. Total population was converted into adult equivalent by adjusting with 88 percent of the total population.*

Table 3.1: ***Estimates on production of major livestock products, 2016-17***

States/UTs	Milk (In 000'Tonne)	Egg (In Lakhs Nos)	Meat (In 000'Tonne)	Fish (in 000' Tonnes)
Andaman and Nicobar Islands	16	1032	5	38
Andhra Pradesh	12178	158274	633	2333
Arunachal Pradesh	53	495	20	4
Assam	861	4771	47	292
Bihar	8711	11117	326	495
Chandigarh	36	154	1	0
Chhattisgarh	1374	16638	49	317
Dadra and Nagar Haveli*	8	73	0	0
Daman and Diu	1	18	1	28
Delhi*	279	0	66	1
Goa	51	292	7	115
Gujarat	12784	17940	33	826
Haryana	8975	52139	427	111
Himachal Pradesh	1329	959	4	11
Jammu and Kashmir	2376	2305	85	20
Jharkhand	1894	5103	55	118
Karnataka	6562	50671	209	696
Kerala	2520	23444	469	681
Lakshadweep	3	147	0	12
Madhya Pradesh	13445	16940	79	115
Maharashtra	10402	54774	845	621
Manipur	79	992	27	31
Meghalaya	84	1064	41	6
Mizoram	24	408	15	7
Nagaland	79	397	31	8
Odisha	2003	19745	177	470
Puducherry	48	116	15	70
Punjab	11282	47826	249	125
Rajasthan	18500	13633	180	44
Sikkim	54	68	4	0
Tamil Nadu	7556	166824	573	698
Telangana	4681	118186	591	264
Tripura	160	2294	40	64
Uttar Pradesh	27770	22889	1346	538
Uttarakhand	1692	4119	28	4
West Bengal	5183	65536	706	1632
India	**165404**	**881386**	**7386**	**10795**

Source: *State/UT Animal Husbandry Departments*

Apart from foodgrains, livestock products have been also consumed as well as imported and exported to a large extent and has been a source for livelihood. Table 3.1 shows the production pattern of milk, eggs, meat and fish in India and across states in 2016-17. Andhra Pradesh is among top producer of all the four livestock. Uttar Pradesh is the front-runner in milk and meat production, while Tamil Nadu and Telangana have exceptionally high production of eggs. Fish production is the highest in Andhra Pradesh and West Bengal.

3.5 Yield of Foodgrains:
Trends and Patterns

Yield is measured as the amount of crop produced per unit area of land, also known as productivity. Total yield of foodgrains has increased from 1597 Kg/ha in 1996-99 to 2124 Kg/ha in 2015-18 (Figure 3.8).

Figure 3.9-3.11 represents the level and trend of yield of various crops in India during 1996-2018. The yield of various crops has shown an increasing trend for all the crops during 1996-2018, except jowar. Seasonal variations are remarkable and unlike production, yield is relatively higher in Rabi season than Kharif.

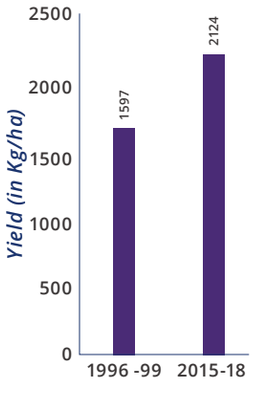
Box 3.4: *Highlights: Yield*
Yield of Foodgrains increased by 33 percent in last two decades.
Yield is highest in Punjab, followed by Haryana and Delhi
Yield of pulses increased by 32 percent
Yield of coarse cereals increased by 67 percent in last two decades
Jowar yield decreased (-2 percent) in last two decades
National SDG target to increase yield of wheat, rice, coarse cereals to 5018 Kg/ha against current 2509 Kg/ha by 2030. We are lagging and need to double the yield

During 1996-2018, yield of foodgrains increased from 1613 Kg/ha to 2201 Kg/ha (36 percent increase), cereals from 1831 Kg/ha to 2612 Kg/ha (30 percent increase) and coarse cereals from 1072 Kg/ha to 1871 Kg/ha (75 percent increase). Yield of rice, wheat, bajra, maize, ragi, small millets and barley increased by 658 Kg/ha (35 percent increase), 639 Kg/ha (24 percent increase), 439 Kg/ha (56 percent increase), 1195 Kg/ha (69 percent increase), 322 Kg/ha (25 percent increase), 374 Kg/ha (82 percent increase) and 711 Kg/ha respectively (37 percent increase).

The yield of pulses increased from 630 Kg/ha in 1996 to 835 Kg/ha in 2018 (32 percent increase). Among specific type of pulses, the highest increment is found in the yield of lentil (305 Kg/ha) followed by gram (242 Kg/ha), urad (204 Kg/ha), tur (180 Kg/ha) and moong (35 Kg/ha).

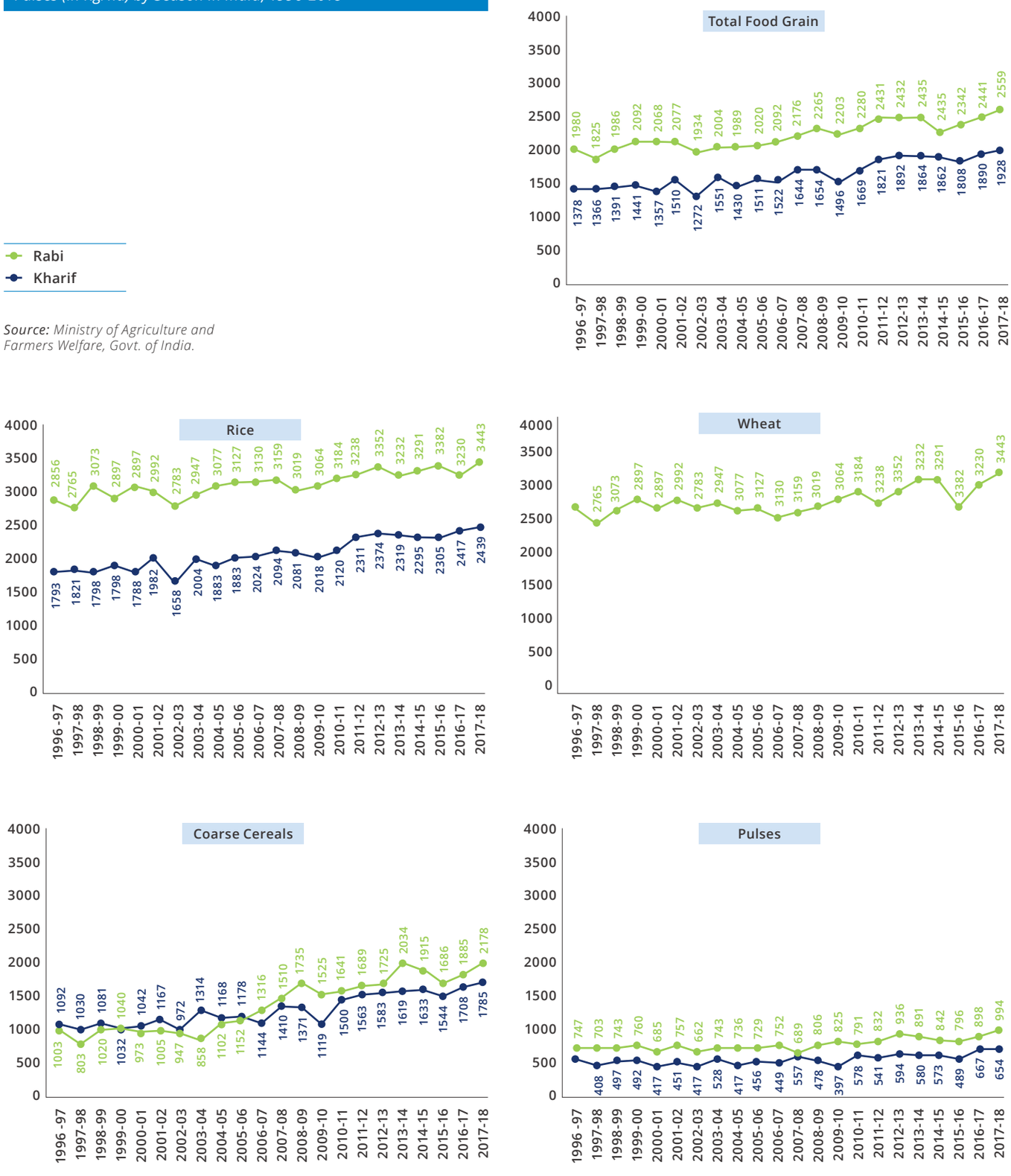
State specific mapping of yield of various foodgrains (Map 3.7-3.12) reveals an interesting story. Unlike absolute production of food grain, yield is highest in Punjab (4353 Kg/ha) followed by Haryana (3736 Kg/ha) and Delhi (3652 Kg/ha) holds the third rank.

Figure 3.8: *Change in Yield of Food grain, India, 1996-99 and 2015-18*



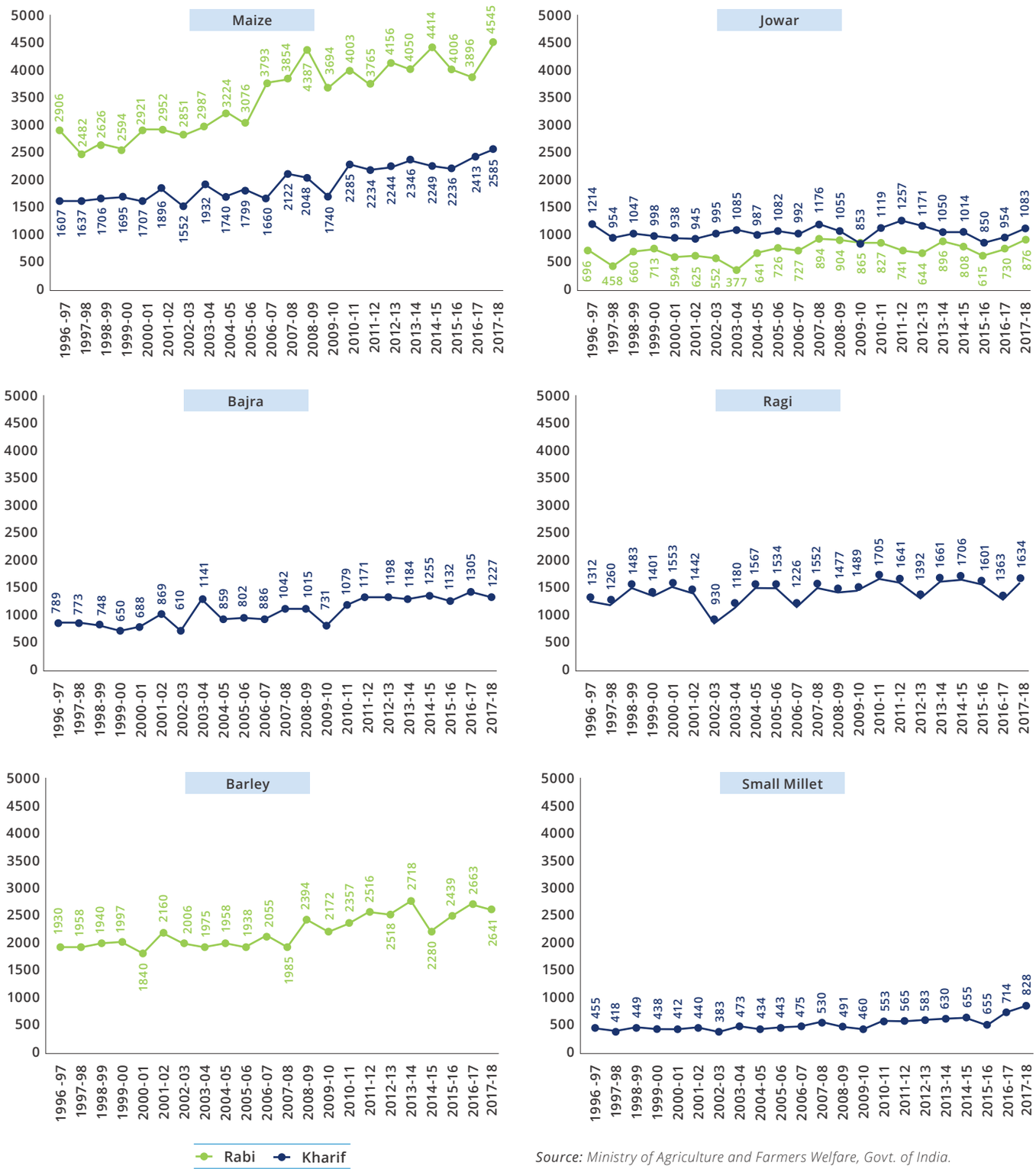
Source: *Ministry of Agriculture and Farmers Welfare, Govt. of India.*

Figure 3.9: *Trends of Yield of Rice, Wheat, Coarse cereals, and Pulses (in Kg/ha) by Season in India, 1996-2018*



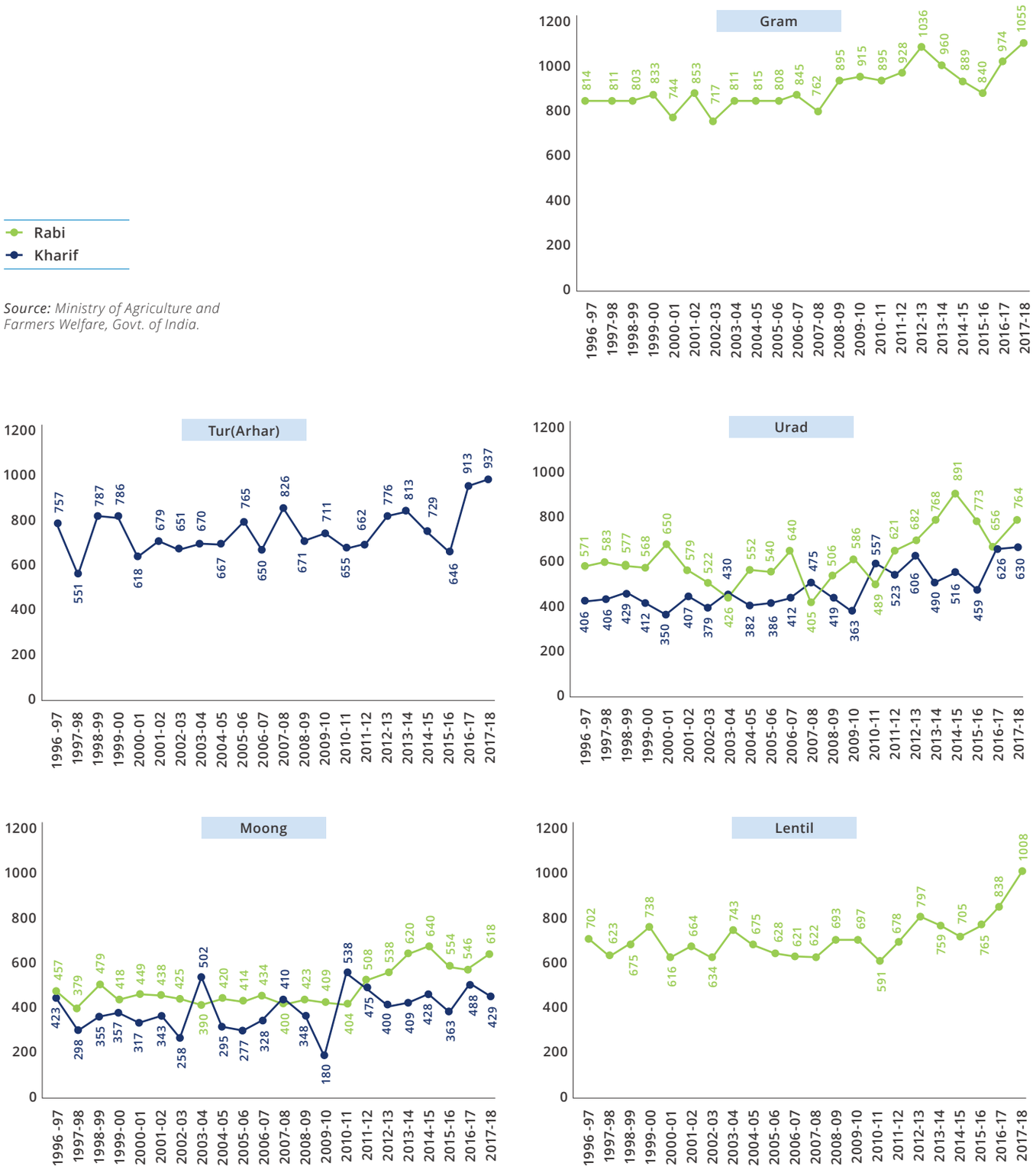
Source: *Ministry of Agriculture and Farmers Welfare, Govt. of India.*

Figure 3.10: *Trends of Yield of Jowar, Bajra, Small Millets, Maize, Ragi and Barley (in Kg/ha) by Season in India, 1996-2018*



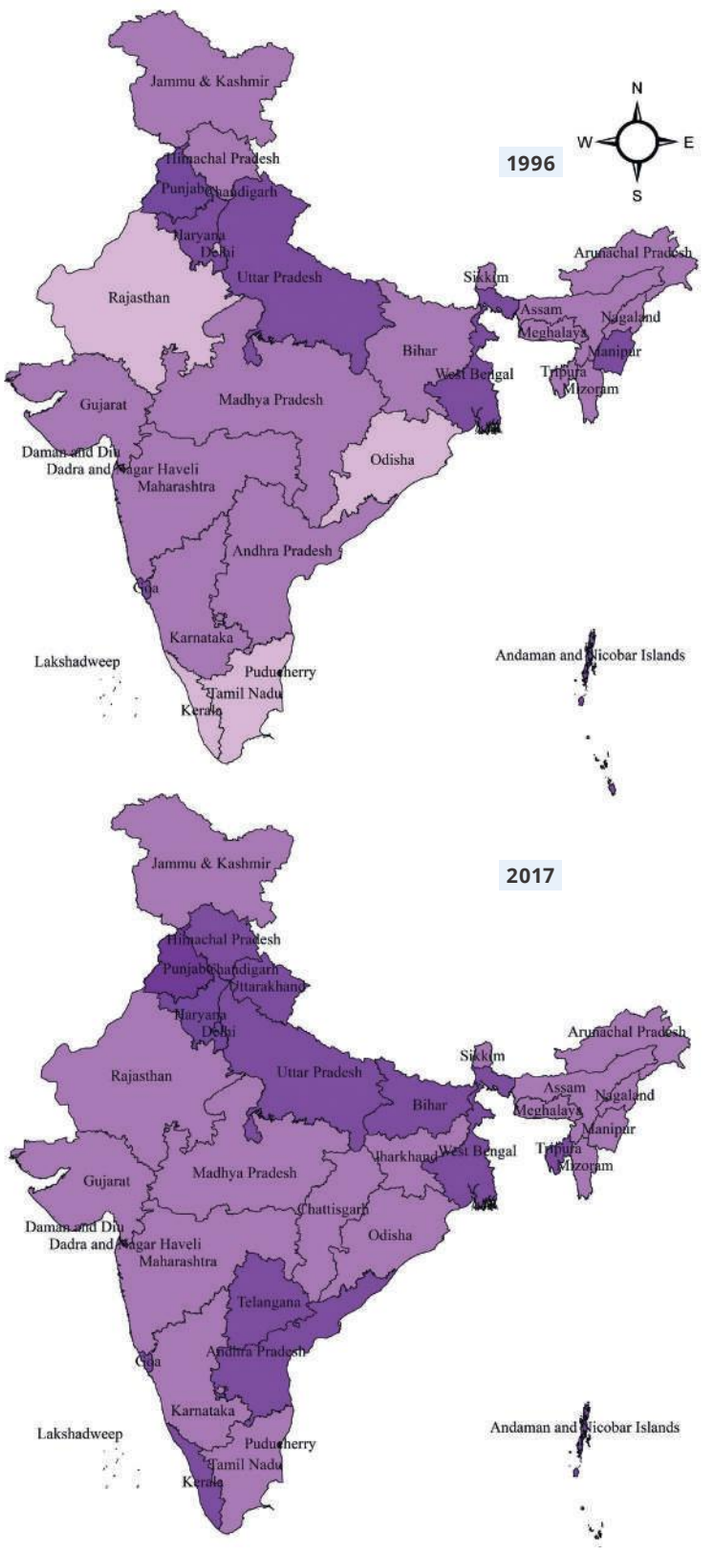
Source: *Ministry of Agriculture and Farmers Welfare, Govt. of India.*

Figure 3.11: *Trends of Yield of Rice, Wheat, Coarse cereals, and Pulses (in Kg/ha) by Season in India, 1996-2018*



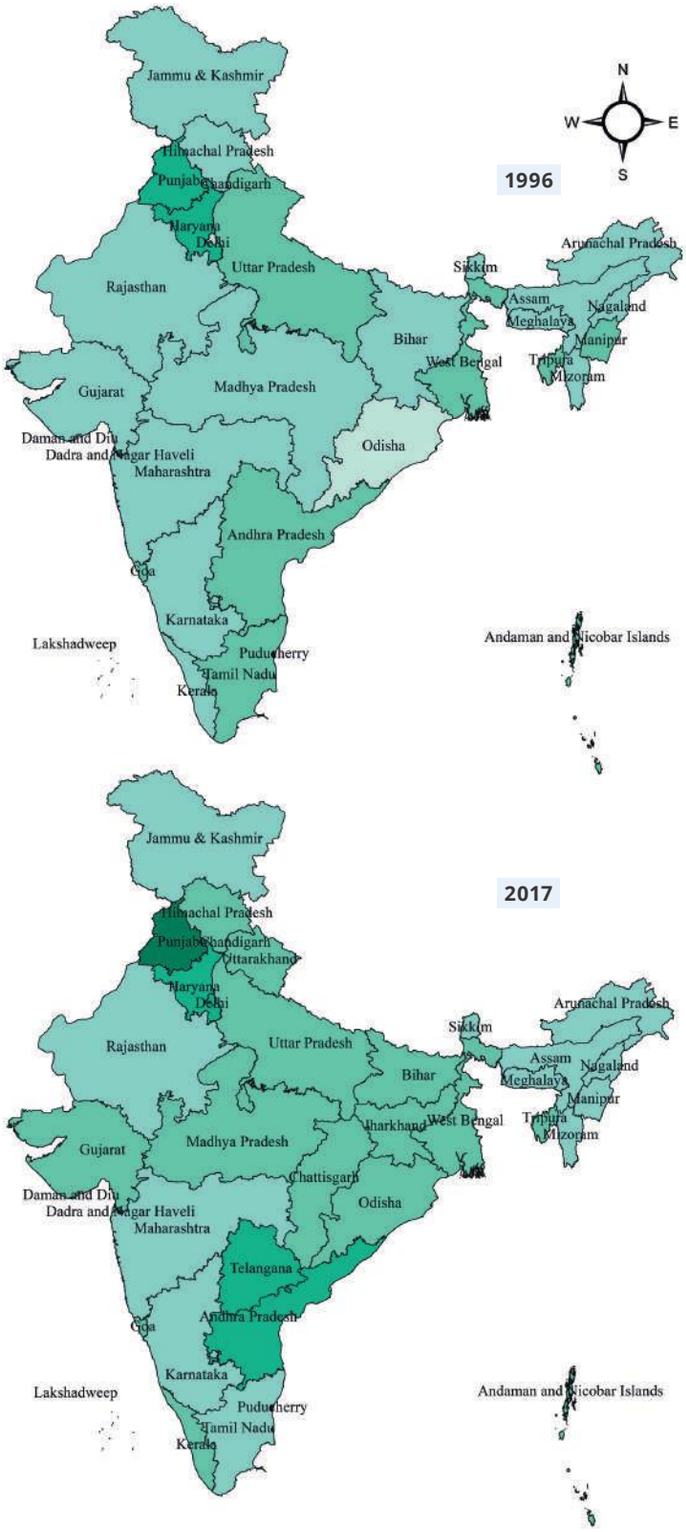
Source: *Ministry of Agriculture and Farmers Welfare, Govt. of India.*

Map 3.7: *State-wise yield (kg/ha) of Foodgrains, India, 1996 and 2017*



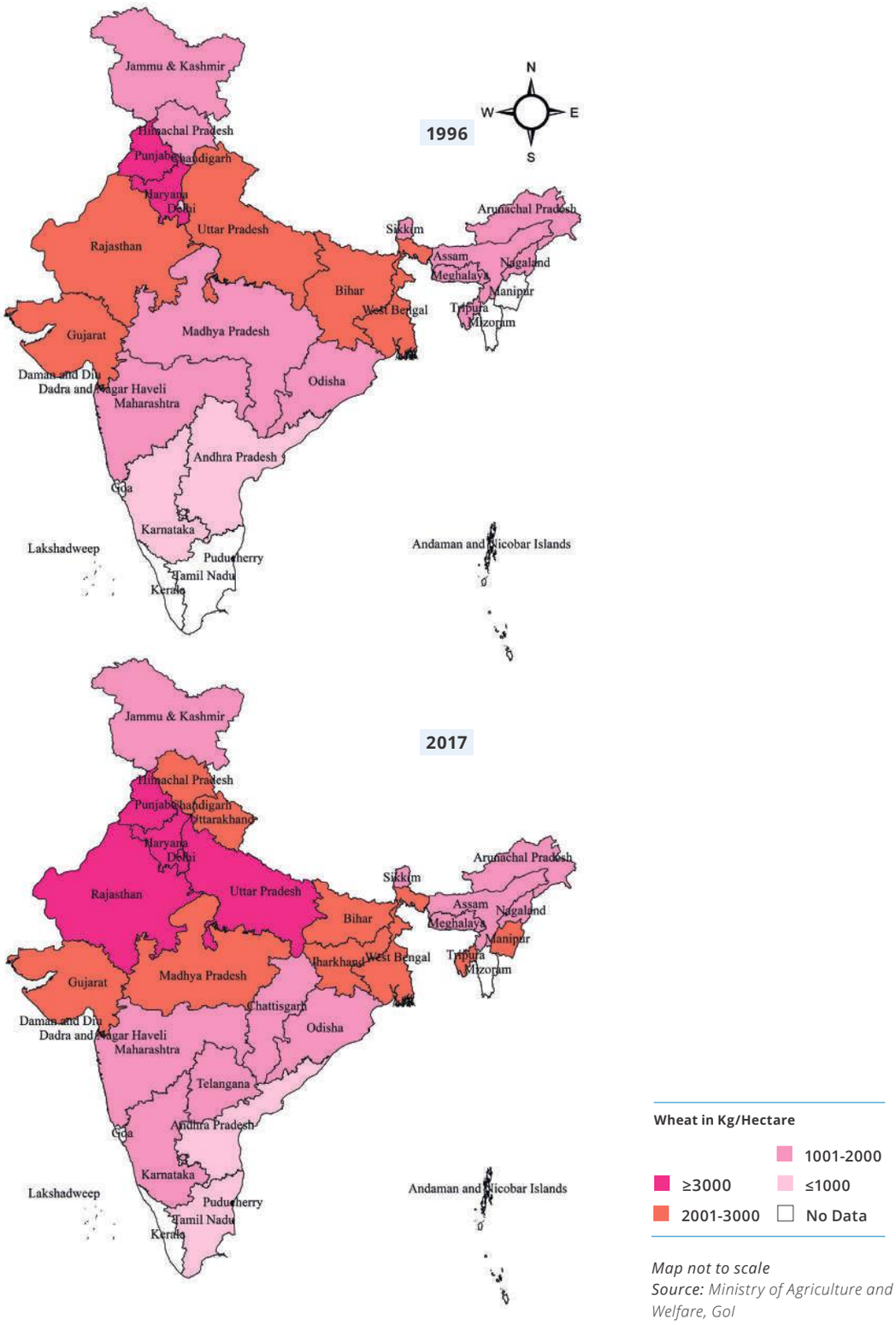
Map not to scale
Source: *Ministry of Agriculture and Farmers Welfare, GoI*

Map 3.8: *State-wise yield (kg/ha) of Cereals, India, 1996 and 2017*



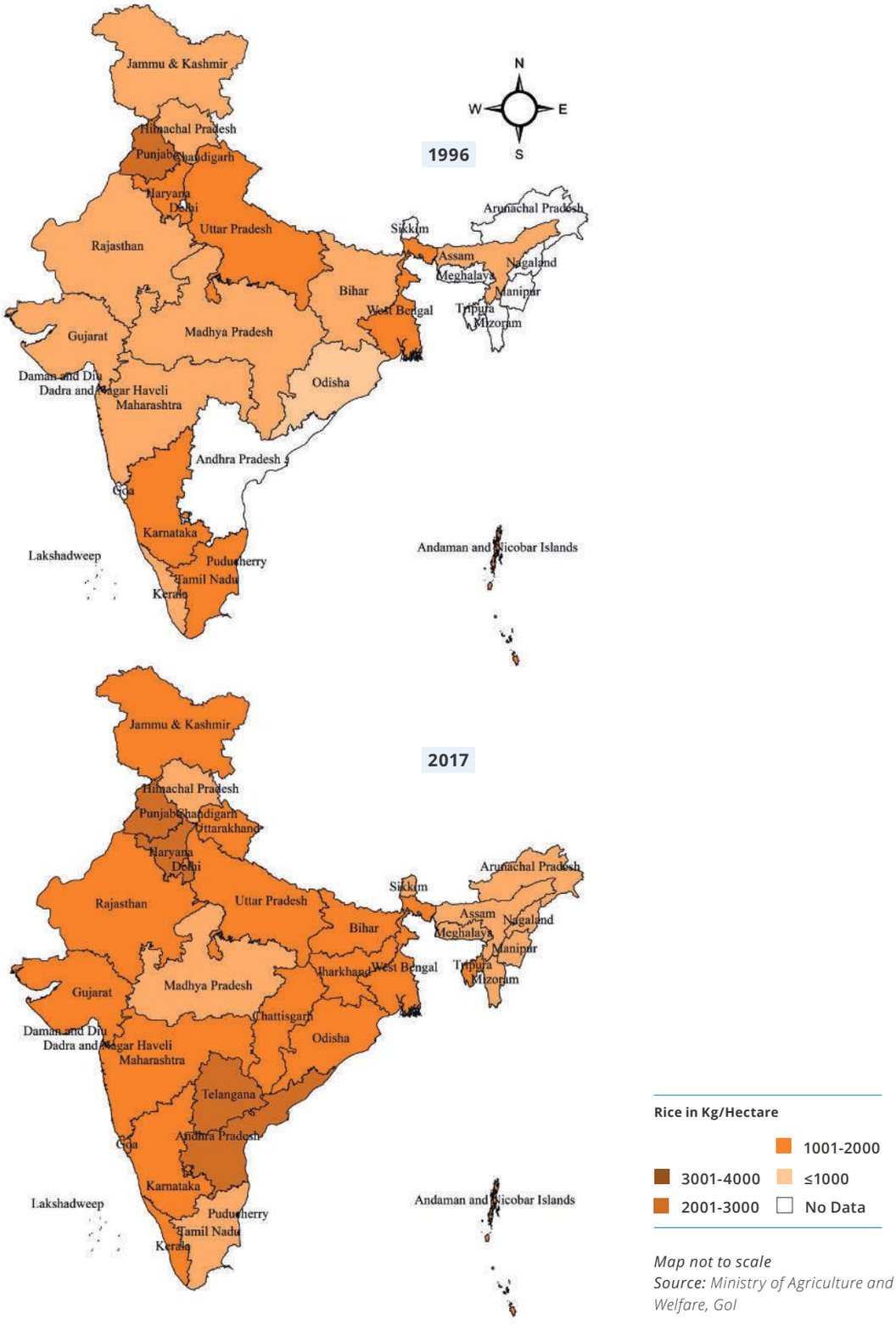
Map not to scale
Source: *Ministry of Agriculture and Farmers Welfare, GoI*

Map 3.9: *State-wise yield (kg/ha) of Wheat, India, 1996 and 2017*



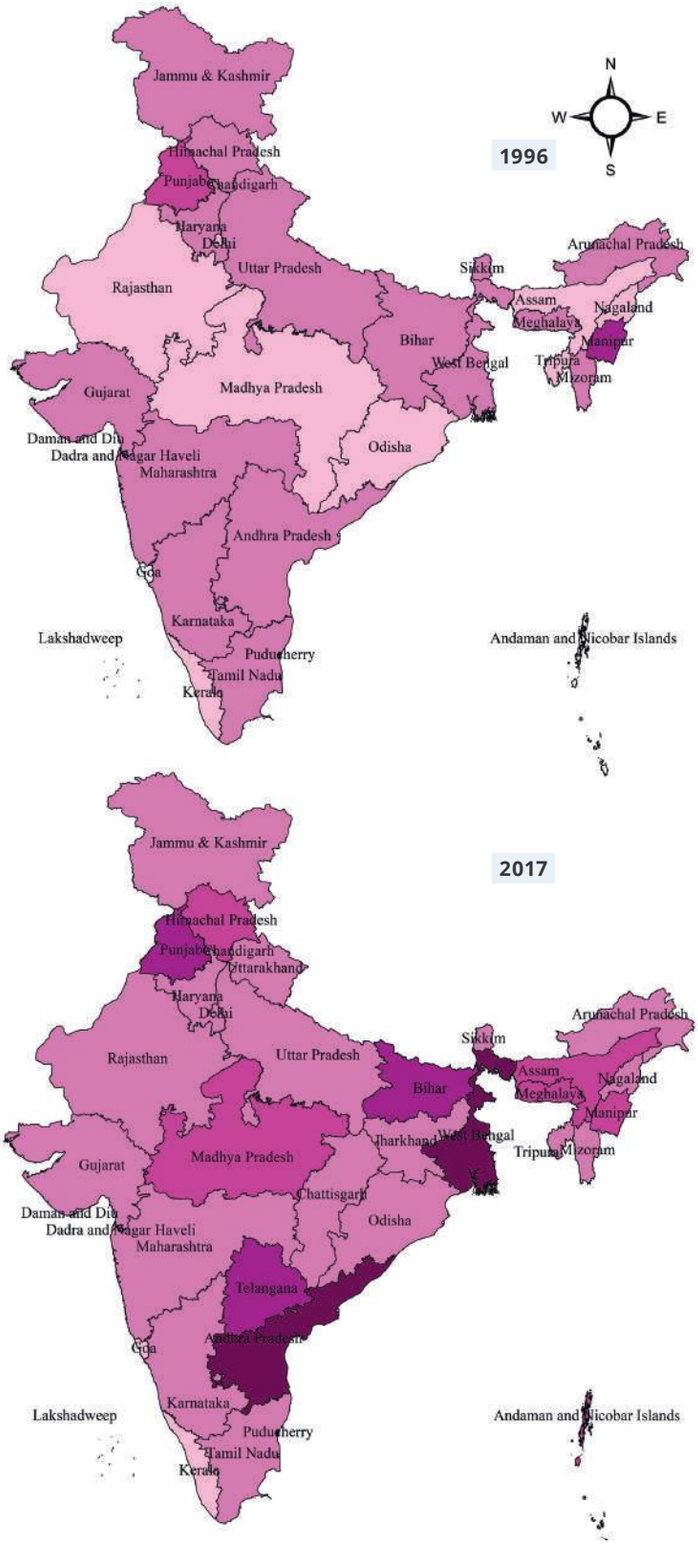
Map not to scale
Source: *Ministry of Agriculture and Farmers Welfare, GoI*

Map 3.10: *State-wise yield (kg/ha) of Rice, India, 1996 and 2017*



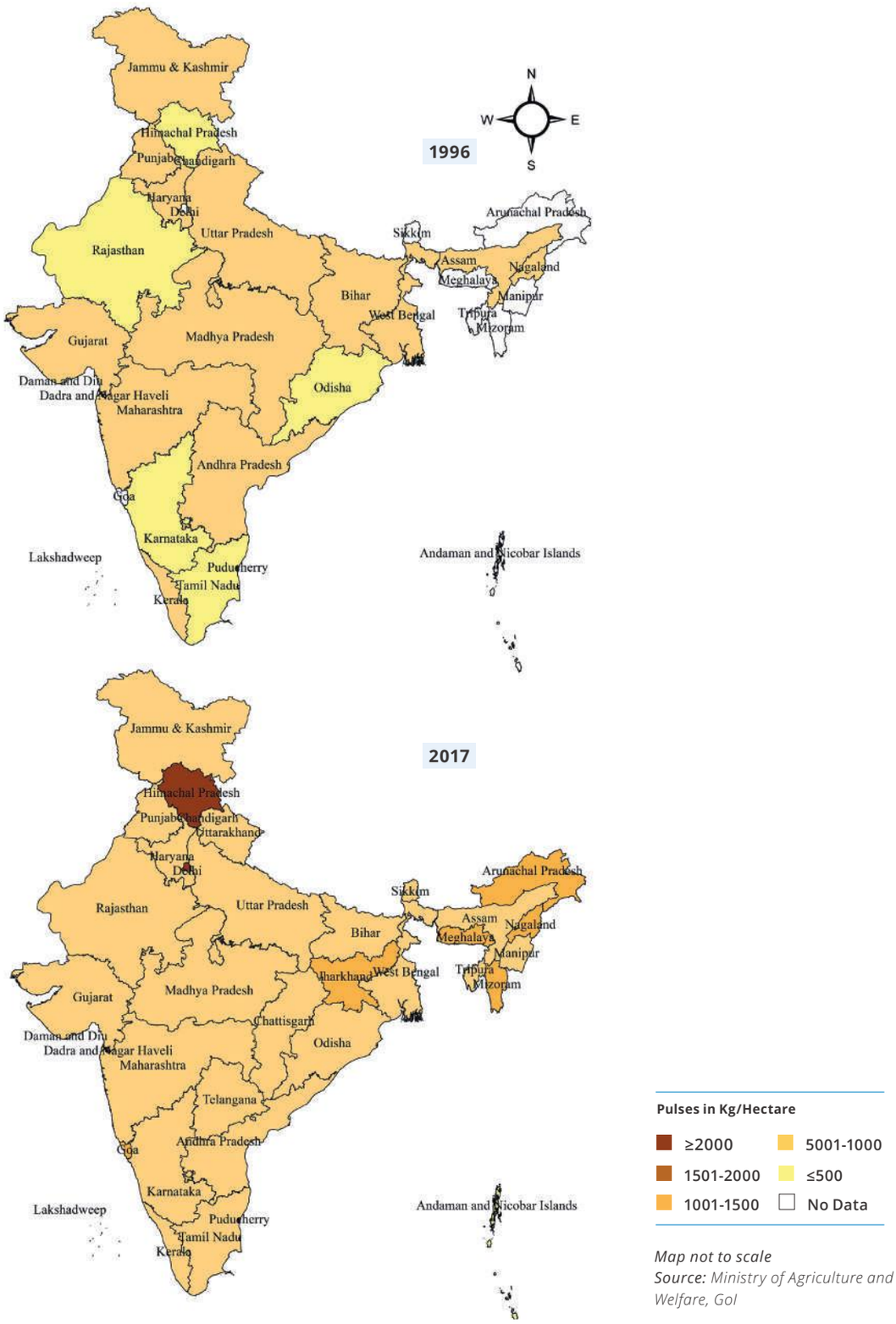
Map not to scale
Source: *Ministry of Agriculture and Farmers Welfare, GoI*

Map 3.11: *State-wise yield (kg/ha) of Coarse Cereals, India, 1996 and 2017*



Map not to scale
Source: *Ministry of Agriculture and Farmers Welfare, GoI*

Map 3.12: *State-wise yield (kg/ha) of Pulses, India, 1996-2017*



Map not to scale
Source: *Ministry of Agriculture and Farmers Welfare, GoI*

3.6 Ensuring Sustainable Production (or Availability) of Foodgrains

There is little scope for further expansion of the net sown area in the country, making land scarcity an acute bottleneck for the rural economy. Slowly but steadily agricultural land is being converted into homes and industrial land which would eventually impact the rural economy. Water is a precious resource and there are several concerns regarding water availability in the country. Reports suggest the ground water resources are rapidly depleting, especially in the Indo-Gangetic plains of India. Therefore, a judicious use of land and water resources will have to be the central theme for sustainability of agricultural growth.

Moreover, India is a nation which experiences almost all types of natural disasters (cyclone, flood, drought etc.) in different states, with grave implication on the growth and development system. This might be one of the key factors, that in spite of India being a food surplus nation, it is home to millions of hungry population. The SDG 12 emphasizes on sustainable consumption and production patterns. Hence, it is important to analyse the gap possibly due to natural disasters, food wastage and high population growth, and hence increase the productivity to meet the requirements over time.

3.6.1 Crop Diversification and Enhancing Productivity

Due to diverse agro-climatic conditions in the country, many agricultural crops are produced across the year. Crop diversification is intended to give a wider choice in the production of a variety of crops in a given area, to expand production related activities on various crops and also to avoid the risk. Crop diversification in India is generally viewed as a shift from traditionally grown less remunerative crops to more remunerative crops. The crop shift also takes place due to governmental policies and prioritize production of some crops over a given time, for example, creation of the Technology Mission on Oilseeds (TMO) emphasizes production of oilseeds as a national need for the country's requirement, to reduce dependency on imports. Market infrastructure development and certain other price related supports also induce crop shift. Often low volume high-value crops also aid in crop diversification. Higher profitability and resilience in production also induce crop diversification, for example, sugarcane replacing rice and wheat.

Box 3.5: *Highlights: Area under crop and MSP*
Over time, area under crop has increased for pulses and wheat, stagnated for rice and declined for coarse cereals
Rice has the highest share of area under crop among total foodgrains, gram among pulses and maize among coarse cereals
MSP is positively correlated with production and area under crop

Figure 3.12 shows the shift in area under selected crops during 1996-2018 in India. Time series analysis of area under crop shows that it has increased for wheat and pulses, while remained constant for rice and declined for coarse cereals in the last two decades. Area under crop for total foodgrain has increased by two million hectares during 1996-2018. The percentage share of area under crop for major crops reveals a similar pattern as that of percentage share of production. Rice has the highest percentage share of area under crop followed by wheat, coarse cereals and pulses. Percentage share of area under rice and coarse cereals have declined in the last two decades. Among coarse cereals, area under maize has significantly increased during 1996-2018, which is also reflected by the increase in production of maize (Figure 3.13).

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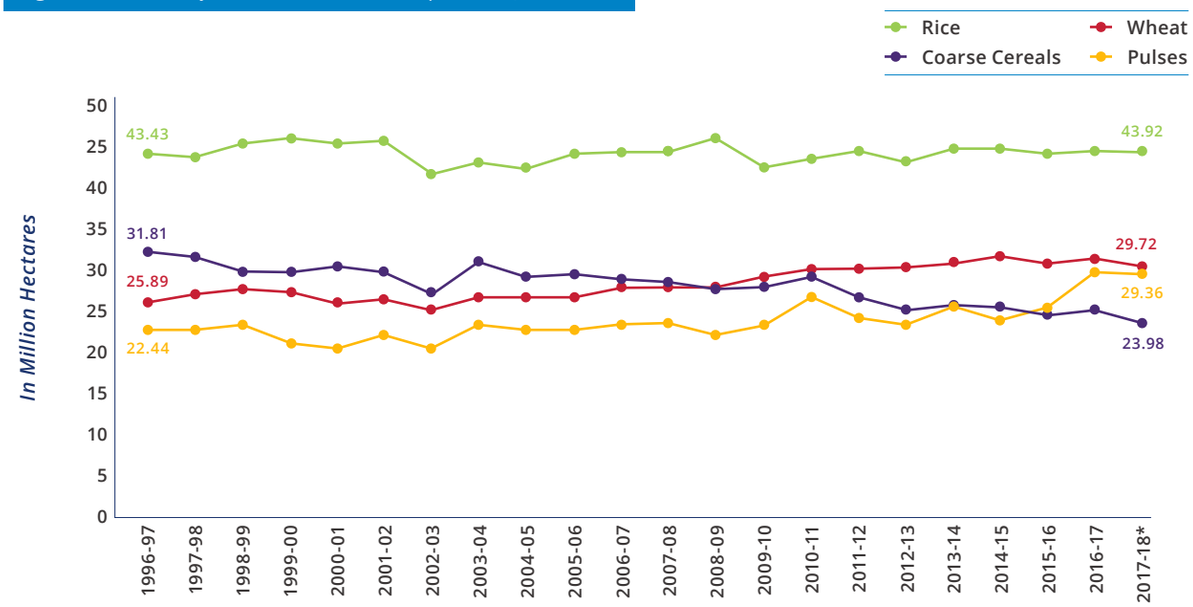
Yield or productivity of foodgrains has increased from 1626 Kg/ha in 2000-01 to 2129 Kg/ha in 2016-17 (31 percent increase) (Figure 3.14). In a condition where the real growth results more from productivity improvement than from area expansion, the increasing role that price related economic incentives play in crop choice can also pave the way for the next stage of agricultural evolution, where growth originates more from value-added production. Hence, the shift in area or crop diversification has a positive impact if it leads to improvement in the production of crops.

The Government of India is committed to accord high priority to water conservation and its management. To this effect Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) has been formulated with the vision of extending the coverage of irrigation ‘Har Khet ko Pani’ (water in every farm), and improving water use efficiency ‘More crop per drop' in a focused manner, with end to end solution on source creation, distribution, management, field application and extension activities.

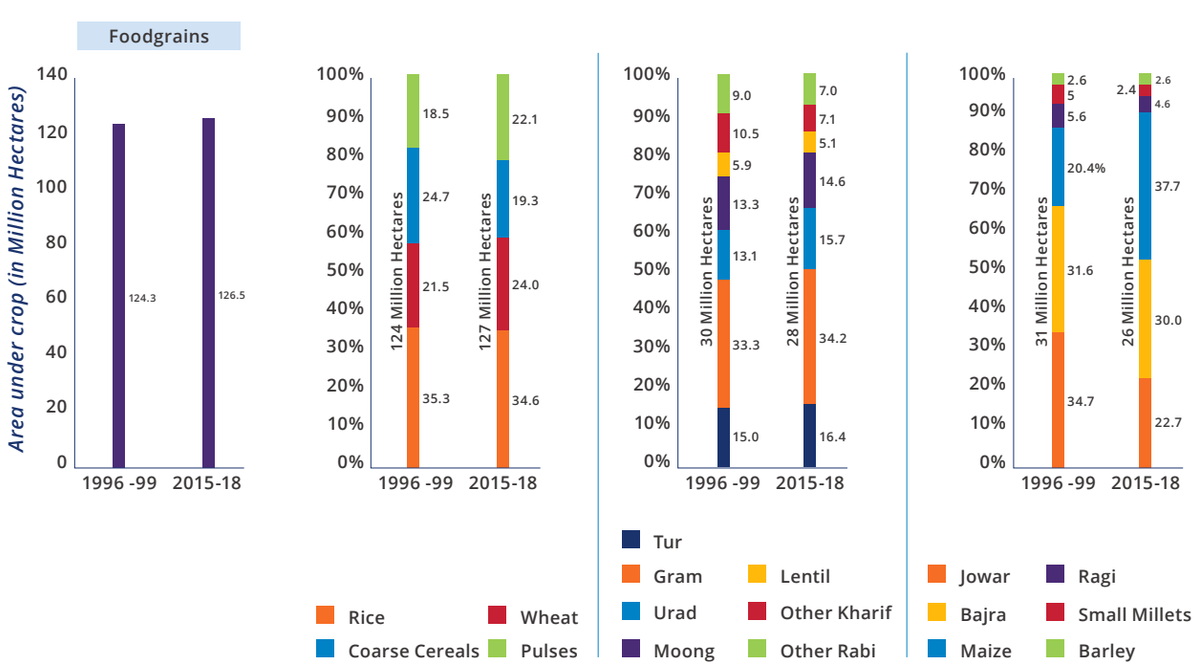
PMKSY has been formulated amalgamating ongoing schemes, viz., Accelerated Irrigation Benefit Programme (AIBP), River Development & Ganga Rejuvenation, Integrated Watershed Management Programme (IWMP) and the On-Farm Water Management (OFWM). PMKSY has been approved for implementation across the country.

Figure 3.12: *Trend of Area under Selected Crop in India, 1996-2018*



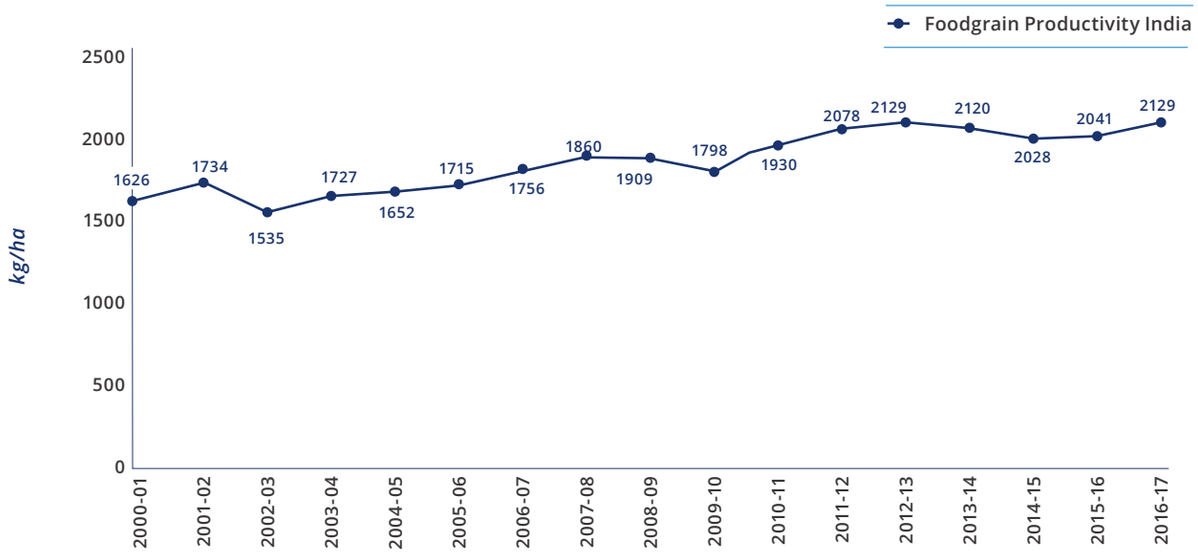
Source: *Ministry of Agriculture and Farmers Welfare, GoI*

Figure 3.13: *Composition of Area under selected crop, 1996-99 and 2015-18, India*



Source: *Ministry of Agriculture and Farmers Welfare, GoI*

Figure 3.14: *Trend of food grain productivity, India, 2000-2017*



Source: Ministry of Agriculture and Farmers Welfare, GoI

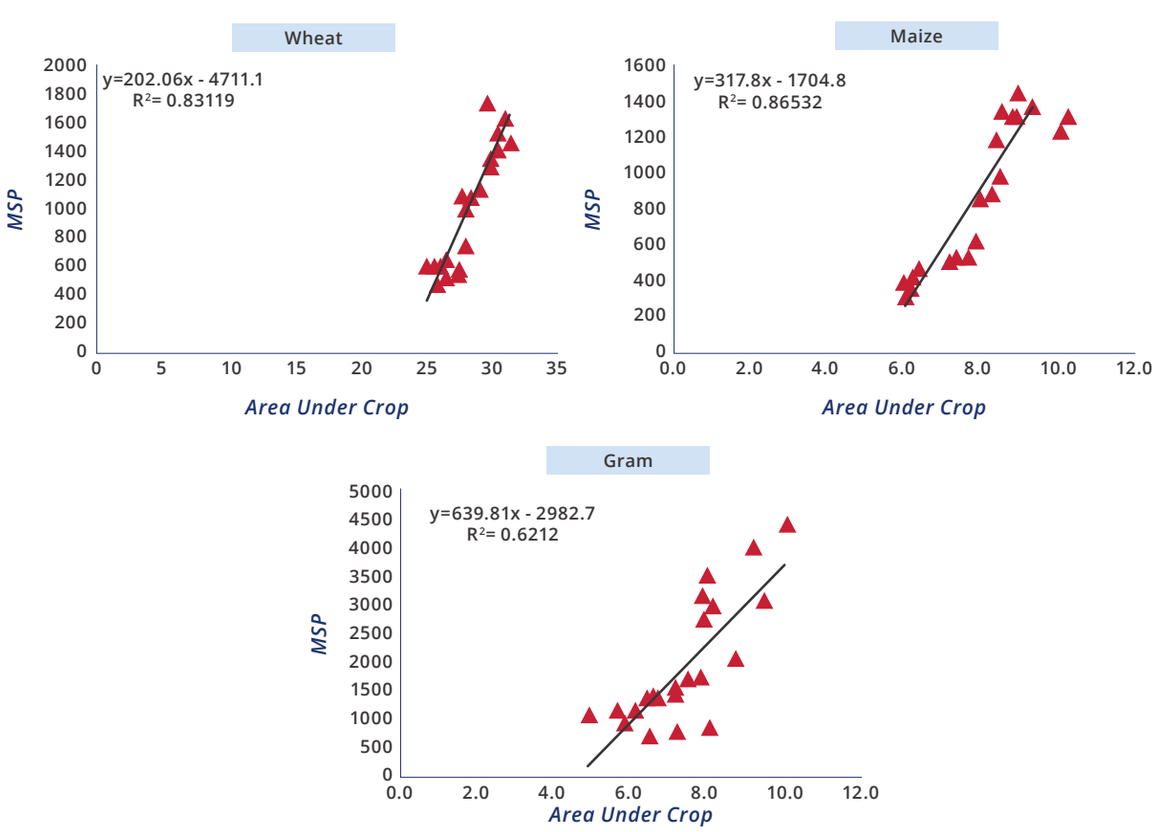
3.6.2 Minimum Support Price (MSP)

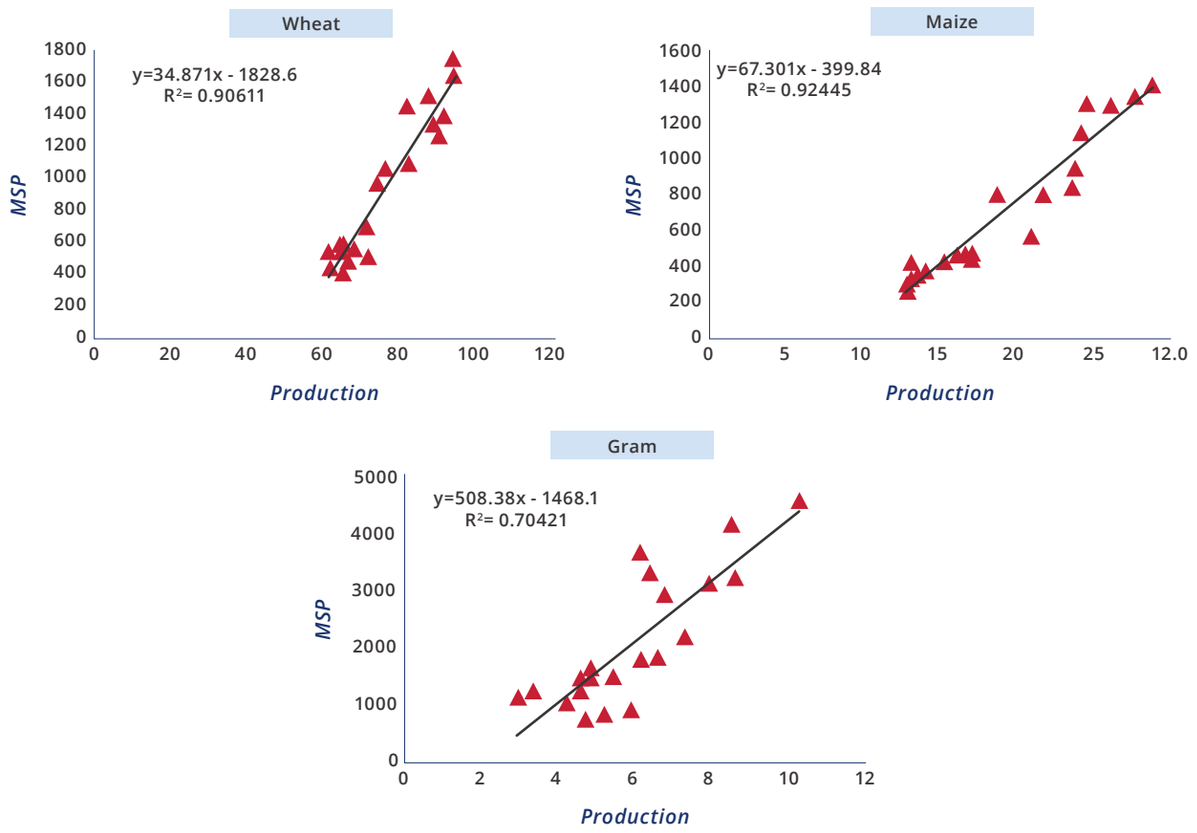
Based on the recommendations of the Commission for Agricultural Costs and Prices (CACP), the Department of Agriculture and Cooperation, Government of India, declares Minimum Support Price (MSP) for 22 crops before the sowing season. The MSP is expected to give guaranteed prices and assured market to the farmers, to save them from price fluctuations and encourage investments in agriculture. Given the relevance of MSP scheme, the erstwhile Programme Evaluation Organization (PEO), (now reformed to the Development Monitoring and Evaluation Office (DMEO), NITI Aayog), on a request from the Ministry of Agriculture, Government of India, has conducted an Evaluation Study on the Efficacy of MSP (2016). The evaluation states that, due to constraints such as the locations of procurement centres being far away, transportation charges being high, lack of awareness among the farmers about MSP and extreme poverty, small and marginal farmers were forced to sell their surplus foodgrains to the brokers or middlemen even

at a lesser price than MSP. Also, some other factors noted were delays in encashment of cheques, MSP fixed by the Government of India being less when compared to the increased cost of agricultural inputs such as labour, fertilizer, pesticides and manure. Figure 3.15 depicts how MSP is influencing area under crop and production of crops. Increase in MSP leading to enlarged area under crop and amplified production.

Additionally, addressing the challenges faced by smallholder farmers is critical because smallholders form a significant proportion of producers, and their low incomes and productivity inhibit overall socio-economic development. The Government has developed a plan for doubling farmers' incomes by 2022, including through increases in crop productivity, crop intensity and input efficiency, livestock integration, diversification towards high-value crops, improved price realization and a shift to non-farm employment. Average monthly income per agricultural household was Rs. 6426 per month (NSSO, 70th round 2012-13) of which 32 percent was from wages and 60 percent from cultivation and farming of animals.

Figure 3.15: *Minimum support price (MSP in Rs./Quintal), Area under crop (in Million Hectares) and Production (in Million Tonnes) for selected crops, India, 1996-2018*





3.7 Conclusions

This chapter focused on food availability, production and consumption of food in India, which is closely linked to SDG-2. The key findings from this chapter are as follows:

- Rice and wheat constitute around 80 percent of the total foodgrains production. Rice and wheat are the two main crops of India that provide food, income and employment to millions of people. The declining trend of net availability of these two crops reflect pressure on demand side. In a nation, continuous growth in demand over time magnifies food problems and hence it is essential to assess its impact on prospects of demand-supply balance (IFPRI, 2012).
- Production of coarse cereals, largely led by maize, has increased. however, only 9 percent maize is directly used for human consumption, 63 percent maize is used for animal and poultry feeding and 22 percent in starch and brewery industry (India maize Summit 2018, FICCI).
- India is the world's largest producer as well as importer of pulses. In 2018, per capita net availability of pulses was 55 gram/day, which is above the recommended daily requirement of 40 gram. But, it was only after including the import of around 7 million tonnes of pulses (FAO, 2018) that net availability has reached to this level. To encourage production of pulses, appropriate Minimum Support Prices (MSP) must be announced for all pulse crops in a timely manner. MSP is currently announced for only five pulse crops. Imports of pulses also need to be carefully calibrated. On the consumption side, distributing pulses

through the Public Distribution System can improve access to this nutritious food group for lower income households. A few states have started distributing pulses through the Public Distribution System, including Tamil Nadu, Andhra Pradesh, Telangana, Chhattisgarh and Himachal Pradesh. The production, consumption and distribution of less popular but nutritious pulses such as moth bean, horse gram and cowpea should be promoted.

The Government of India is aiming to reorient the agriculture sector by focusing on income centeredness. In order to realize net positive returns for the farmer, several schemes are being promoted and implemented in a major way through the states/UTs. Some of these include- Soil Health Card (SHC) scheme; Neem Coated Urea (NCU); Pradhan Mantri Krishi Sinchayee Yojana (PMKSY); Paramparagat Krishi Vikas Yojana (PKVY); National Agriculture Market scheme (e-NAM); Pradhan Mantri Fasal Bima Yojana (PMFBY);National Food Security Mission (NFSM); Mission for Integrated Development of Horticulture (MIDH); National Mission on Oilseeds & Oil palm (NMOOP); National Mission for Sustainable Agriculture (NMSA); National Mission on Agricultural Extension & Technology (NMAET) and Rashtriya Krishi Vikas Yojana (RKVY). In addition, schemes relating to tree plantation (Har Medh Par Ped), Bee Keeping, Dairy and Fisheries are also being implemented. All these schemes are implemented to enhance production and productivity of agriculture and thereby enhance income of farmers (MoAFW, 2018).

Giving a major boost for the farmers' income, the Government has increased the Minimum Support Prices (MSPs) of all Kharif crops for 2018-19 Season. This decision of the Government is a historic one, as it redeems the promise of the predetermined principle of fixing the MSPs at a level of at least 150 percent of the cost of production announced by the Union Budget for 2018-19.

India as a nation is committed to meet the Sustainable Development Goals in a timely manner. The key findings of this chapter may present a trajectory towards the status of achieving SDG-2 and its targets.

Box 3.6: *Agriculture and SDG-2*
SDG:2; aims to end hunger, achieve food security and improved nutrition and promote sustainable agriculture by 2030
SDG:2.3; focuses on doubling the agricultural productivity and incomes of small-scale food producers and farmers
SDG:2.a; focuses on increasing investment in rural infrastructure to enhance agricultural productive capacity

Indian agricultural household expenditure was Rs. 6426 per month (NSSO, 70th round 2012-13). Government of India have taken many steps to double the farmers income by 2022. If achieved, it will be a big achievement towards meeting the SDG targets.

CHAPTER **FOUR**

FOOD ACCESS

Out of Pocket Expenditure on Food and Nutritional Intakes of Energy, Protein and Fat in India

4.1 Access to Food: Background

India's rapid economic growth since 1990s has raised the per capita income and has significantly impacted its food consumption patterns. As discussed in Chapter 3, the production of foodgrains in India confirms that the country now has the capacity to meet the consumption requirements for all. It is now important to understand whether this capacity, in terms of food availability, can be translated into an increase in the consumption of nutritious food among the population. Therefore, this chapter conducts a comprehensive analysis of the nutritional intakes (of energy, protein and fat) among people from different states as well as vulnerable communities.

Box 4.1: ***Food Access***

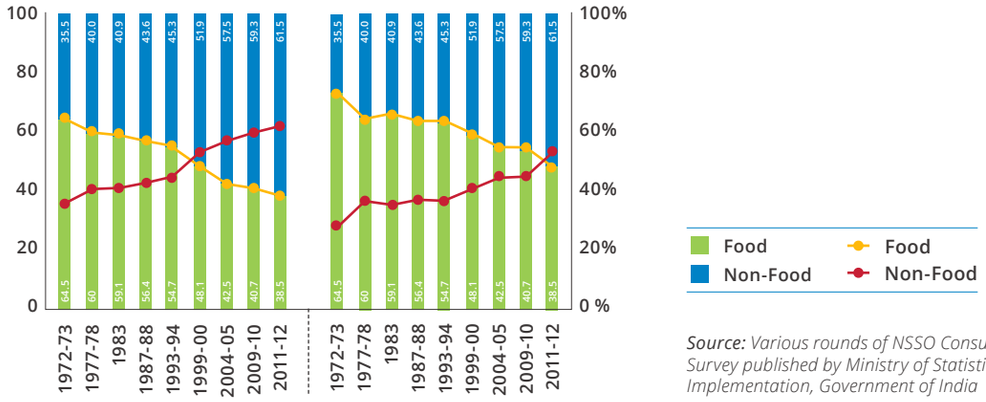
A household's ability to acquire food regularly through one or a combination of home production and stocks, purchases, barter, gifts, borrowing, and food aid.

(CFSVA Guidelines – WFP, 2009)

4.2 Patterns of Price and Share of Expenditure on Food in Total Household Expenditure

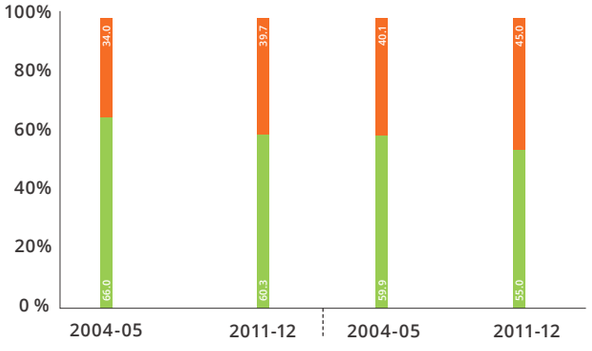
As per the latest NSSO consumer expenditure data (2011-12), on an average, rural and urban households in India spend about 48.6 percent and 38.5 per cent of their total monthly expenditure on food. (Figure 4.1). This share, however, increases to 60.3 percent and 55 percent among the poorest households in rural and urban areas respectively (Figure 4.2). The higher share of food expenditure, in the total household expenditure, is indicative of the stress that households experience to acquire food and hence is a relative measure of food insecurity. Households with higher share of food expenditure, against the total household expenditure are also highly susceptible to inflation.

Figure 4.1: *Percentage Share of Expenditure on Food and Non-food Items in India*



Source: Various rounds of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India

Figure 4.2: *: Percentage Share of Expenditure on Food and Non-food Items among the Poorest (Bottom 30 percent MPCE class) in India*



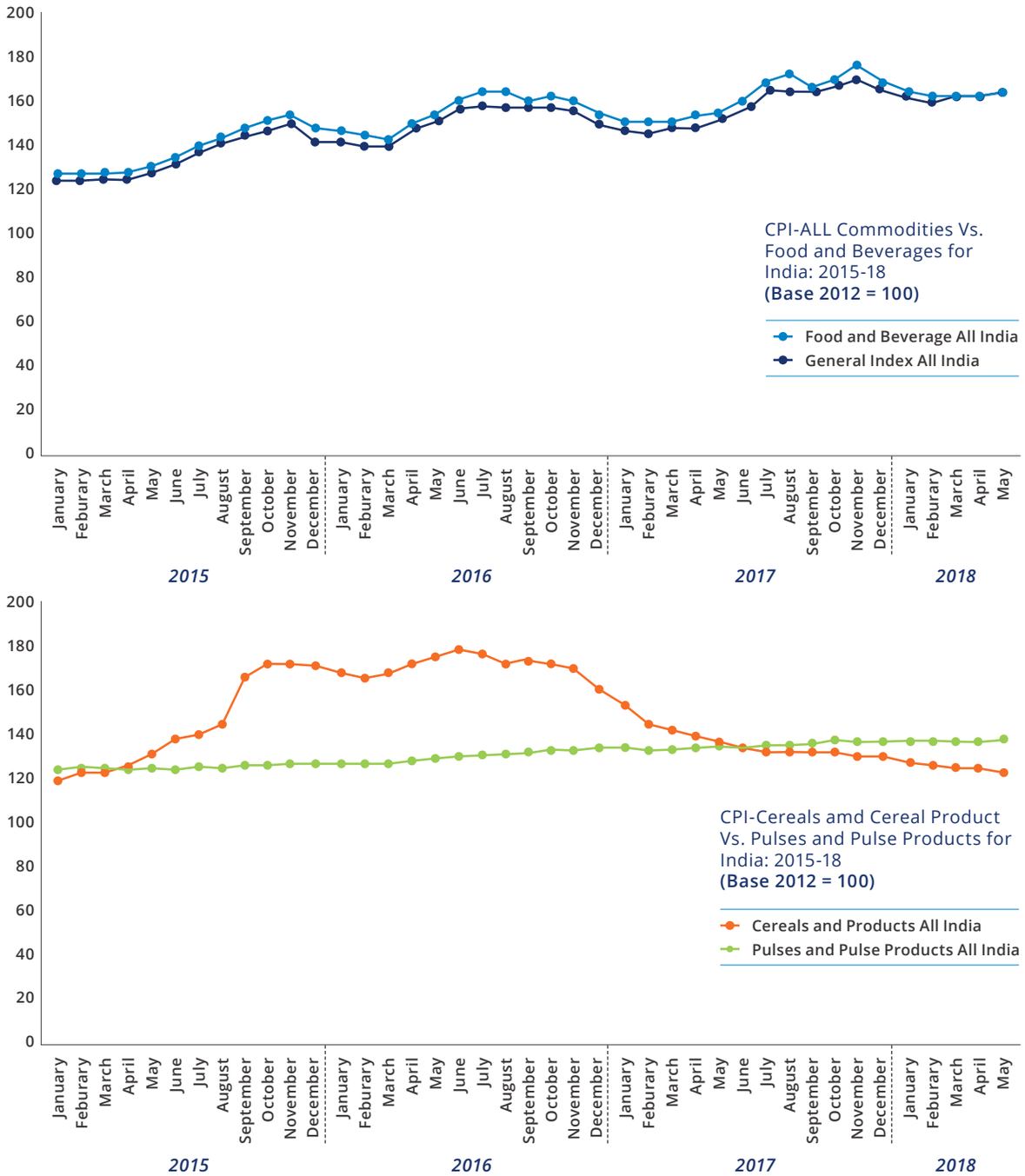
Source: 61st and 68th rounds of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India

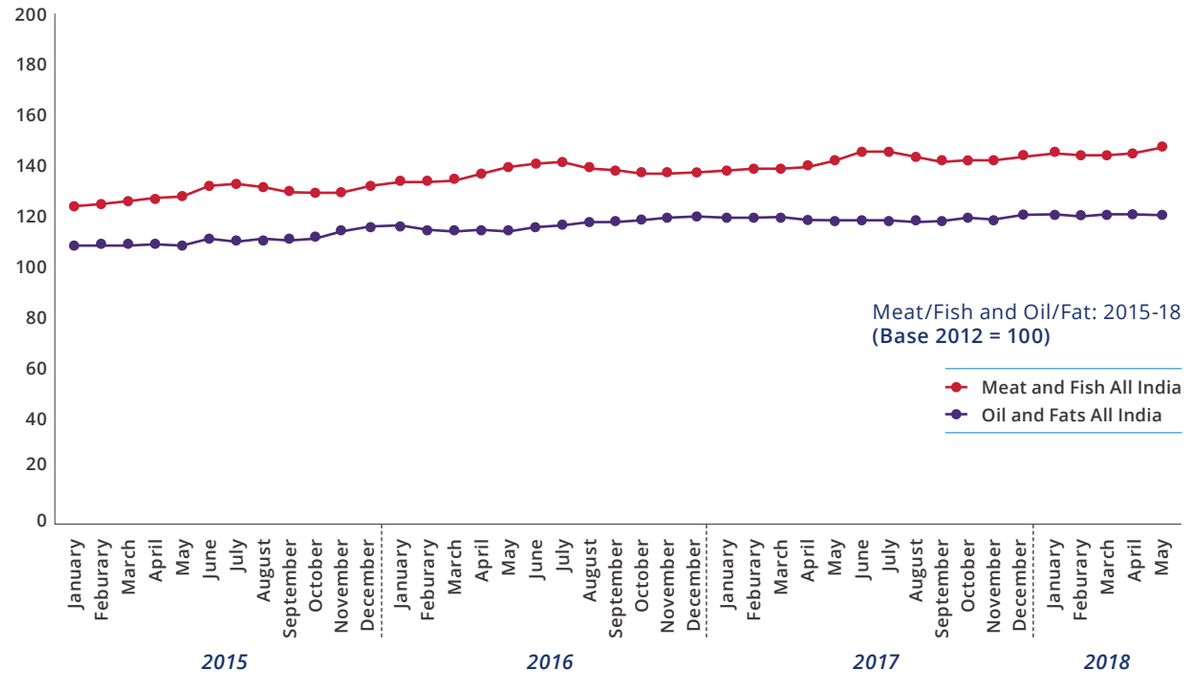
The Figure 4.3 on Consumer Price Indices (CPI) indicates that food inflation has been consistently higher than the general inflation in India, but in recent year (2018) the gap between these two has narrowed down. The CPI for food in general, shows a secular increase over the years and in particular, the CPI, for major sources of protein and fat such as, meat, fish, oil and fats have also been increasing over the years. The trend of inflation in the prices of pulses needs a special mention, as the CPI, with 2012 as the base year has increased significantly, accelerating during 2015-16, though it declined sharply during 2017-18 due to policy measures such as increase in Minimum Support Price (MSP) and bonus for pulses production.

Over time, there have been changes not only in the broader categories of food and non-food items, but also within the food basket. In rural areas, the expenditure on cereals & its substitutes declined from 56.5 percent in 1972-73 to 38.5 percent in 1993-94 and further to 24.8 percent in 2011-12 (Figure 4.4). For the same period, expenditure on milk and milk products increased from 10 percent to 15 percent and further to 18.7 percent. Expenditure on meat, egg, fish also

increased from 3.4 percent to 5.3 percent and to 7.3 percent during the same period. Expenditure on vegetables and fruits & nuts doubled from 4.9 percent and 1.4 percent in 1972-73 to 9.9 percent and 4 percent in 2011-12 respectively. Expenditure on beverages has shown a fourfold increase from 3.4 percent in 1972-73 to 12 percent in 2011-12. In rural areas, there were no significant change in the share of sugar, salt & spices and pulses for the aforementioned period.

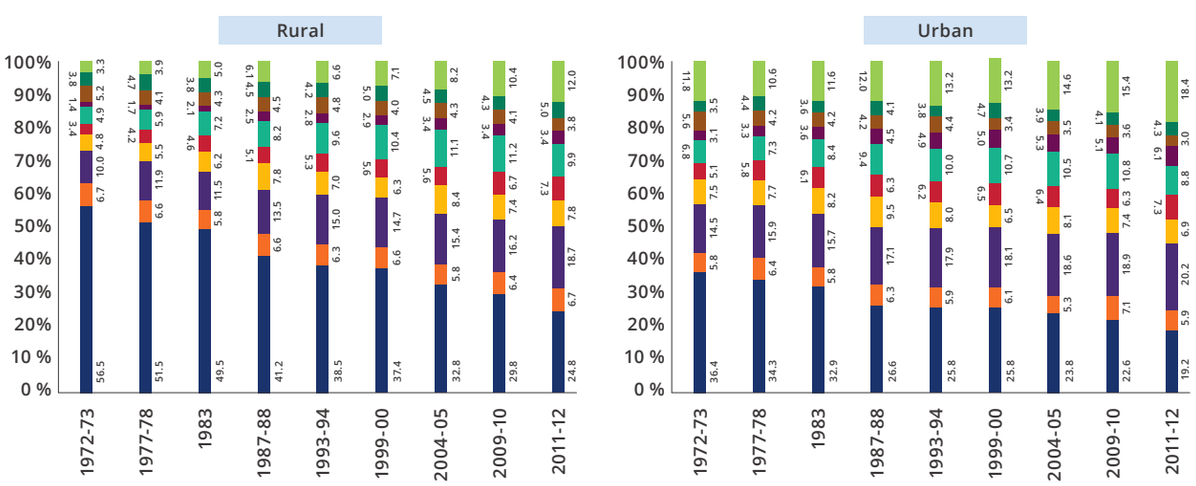
Figure 4.3: *Trends in Consumer Price Indices (CPI) in India, 2015-2018*





Source:The graphs are prepared using Sate/UT wise data on Consumer Price Indices for various year published by the National Accounts Division, Ministry of Statistics and Programme Implementation, Government of India

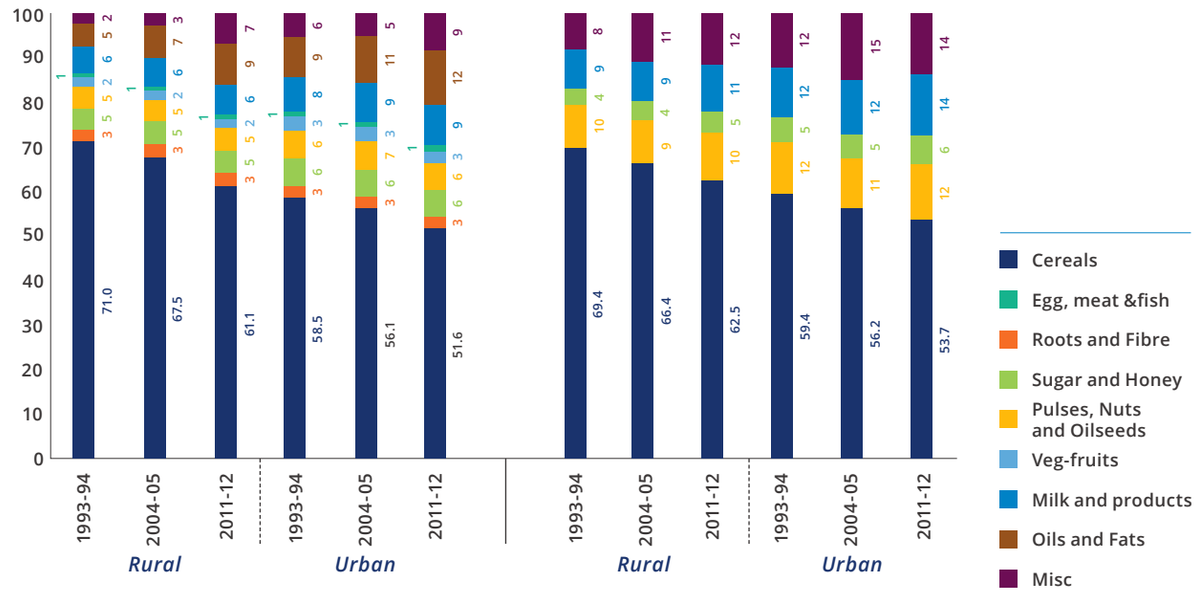
Figure 4.4: *Percentage of Expenditure of Various Food Items to Total Food Item in India, 1972-73 to 2011-12*



Source:Various rounds of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India

Akin to rural areas, the expenditure on cereals & substitutes has also declined in urban areas from 36.4 percent in 1972-73 to 25.8 percent in 1993-94 and to 19.2 percent in 2011-12 (Figure 4.4). Share of expenditure on sugar also declined from 5.6 percent in 1972-73 to 3 percent in 2011-12. In contrast, for the same period, share of expenditure

Figure 4.5: *Change in the food basket contributing to Energy and Protein Intake in India, 1993-94 and 2011-12*



Source:Various rounds of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India

on milk and milk products increased from 14.5 percent in 1972-73 to 17.9 percent in 1993-94 and further to 20.2 percent in 2011-12. Expenditure share on beverages rose from 11.8 percent (1972-73) to 13.2 percent (1993-94) and to 18.4 percent (2011-12). The expenditure share on fruits and nuts doubled from 3.1 percent in 1972-73 to 6.1 percent in 2011-12. Expenditure share on meat, eggs and fish also increased from 5.1 percent (1972-73) to 7.3 percent (2011-12). The share of expenditure on vegetables in total food consumption has increased from 6.8 percent in 1972-73 to 10 percent in 1993-94 and then slightly declined in 2011-12 to 8.8 percent. There was no significant change in the share of pulses, salt and spices and edible oil during the same time span.

Over the last 18 years, preceding 2011-12, the contribution of cereals to protein intake has fallen by about 7 percentage points in rural India and nearly 6 percentage points in urban India. The fall in the share of cereals has been substituted by slight rises in the share of the remaining rich foodgroups. The contribution of pulses has risen by less than 1 percentage point in both sectors and that of egg, fish and meat by more than 1 percentage point. Milk and milk products have seen a rise from 8.8 percent to 10.6 percent and from 11.7 percent to 13.6 percent in rural and urban sector respectively. Importantly, the other food category has registered a relatively large rise of over 3 percentage points in the rural sector and a little under 2 percentage points in the urban sector (Figure 4.5).

The percentage share of cereals in total energy intake of the households has declined in urban India over the 18-year period by 7 percentage points. The decline has been sharper in rural areas with the consumption share of cereals having reduced from 71 percent to 61 percent during the same period (Figure 4.5). The shift could also

be observed in favour of non-cereal foods as a source of energy consumption. The contribution of non-cereals in per capita per day energy intake increased from 29 percent to 39 percent in rural areas and 41 percent to 48 percent in the urban areas during 1993-94 to 2011-12. The contribution of oils and fats increased from 5 percent to 9 percent and 9 percent to 12 percent in rural and urban areas respectively. The share of milk and milk products has grown by about 1 percentage point in both sectors. The contribution of vegetables and fruits, as well as sugar and honey, appears to be falling over time, especially in urban India, while the contribution of meat, eggs and fish shows a slight rise in rural India.

It is evident from the above discussion that in general, the share of expenditure on food items in relation to total expenditure has declined in both rural and urban areas, but has increased for non-food items. In the last couple of decades, it is observed that in both urban and rural areas, the percentage expenditure on cereal and substitutes within the food basket, has declined significantly. On the contrary, it is observed that the relative importance of some non-cereal items especially beverages, milk and milk products, fruits and nuts, meat, egg, fish and vegetables has increased. In urban areas, the percentage share of sugar has decreased, whereas in rural areas there was no significant change in the share of sugar. There was no significant change in the share of edible oil in urban areas, whereas it increased marginally in the rural areas.

The monthly per capita consumption expenditure (MPCE) of persons below poverty line and their proportions in total population is presented in Table 4.1. The table is based on the Tendulkar method of mixed reference period and was calculated by the Planning Commission, Government of India. The rural and urban MPCE of the persons below poverty line in India is Rupees 816 and 1000 respectively. The total rural poverty in 2011-12 was 25.7 per cent and urban poverty was 13.7 per cent.

Table 4.1: *Poverty Line and Percentage of Population below poverty line by states, 2011-12*

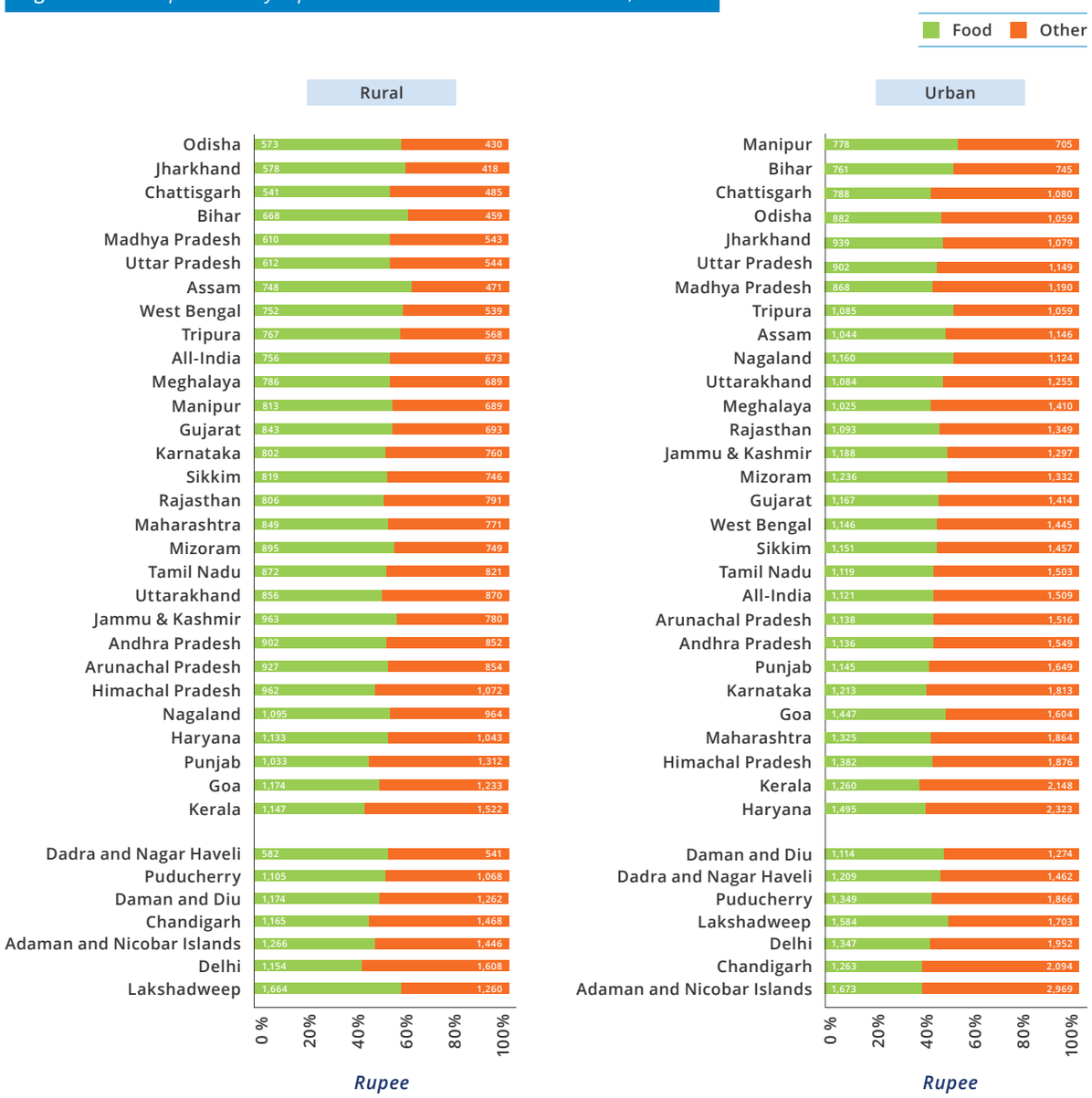
States/UTs	Rural		Urban	
	Monthly per capita (Rs.)	Percentage of person	Monthly per capita (Rs.)	Percentage of person
Andhra Pradesh	860	10.96	1,009	5.81
Arunachal Pradesh	930	38.93	1,060	20.33
Assam	828	33.89	1,008	20.49
Bihar	778	34.06	923	31.23
Chhattisgarh	738	44.61	849	24.75
Delhi	1,145	12.92	1,134	9.84
Goa	1,090	6.81	1,134	4.09
Gujarat	932	21.54	1,152	10.14
Haryana	1,015	11.64	1,169	10.28
Himachal Pradesh	913	8.48	1,064	4.33
Jammu & Kashmir	891	11.54	988	7.2
Jharkhand	748	40.84	974	24.83
Karnataka	902	24.53	1,089	15.25
Kerala	1,018	9.14	987	4.97
Madhya Pradesh	771	35.74	897	21
Maharashtra	967	24.22	1,126	9.12
Manipur	1,118	38.8	1,170	32.59
Meghalaya	888	12.53	1,154	9.26
Mizoram	1,066	35.43	1,155	6.36
Nagaland	1,270	19.93	1,302	16.48
Odisha	695	35.69	861	17.29
Punjab	1,054	7.66	1,155	9.24
Rajasthan	905	16.05	1,002	10.69
Sikkim	930	9.85	1,226	3.66
Tamil Nadu	880	15.83	937	6.54
Tripura	798	16.53	920	7.42
Uttarakhand	880	11.62	1,082	10.48
Uttar Pradesh	768	30.4	941	26.06
West Bengal	783	22.52	981	14.66
Puducherry	1,301	17.06	1,309	6.3
Chandigarh		1.64		22.31
Dadra & Nagar Haveli		62.59		15.38
Daman & Diu		0		12.62
Lakshadweep		0		3.44
All India	**816**	**25.7**	**1,000**	**13.7**

Source: Planning Commission (now NITI Aayog), GoI, 2013.

Note: 1. Computed as per Tendulkar method on Mixed Reference Period (MRP) 2. Population as on 1st March 2012 has been used for estimating number of persons below poverty line. (2011 Census population extrapolated) 3. Poverty line of Tamil Nadu has been used for Andaman and Nicobar Island. 4. Urban Poverty Line of Punjab has been used for both rural and urban areas of Chandigarh. 5. Poverty Line of Maharashtra has been used for Dadra & Nagar Haveli. 6. Poverty line of Goa has been used for Daman & Diu. 7. Poverty Line of Kerala has been used for Lakshadweep.

Expenditure on food and non-food items varies greatly across the states in India. Economically well-off and highly urbanized states like Kerala, Punjab, Haryana and Maharashtra have shown high monthly expenditure on food (though the share on food is low but in absolute rupee quite high) in both rural and urban areas (Figure 4.6).

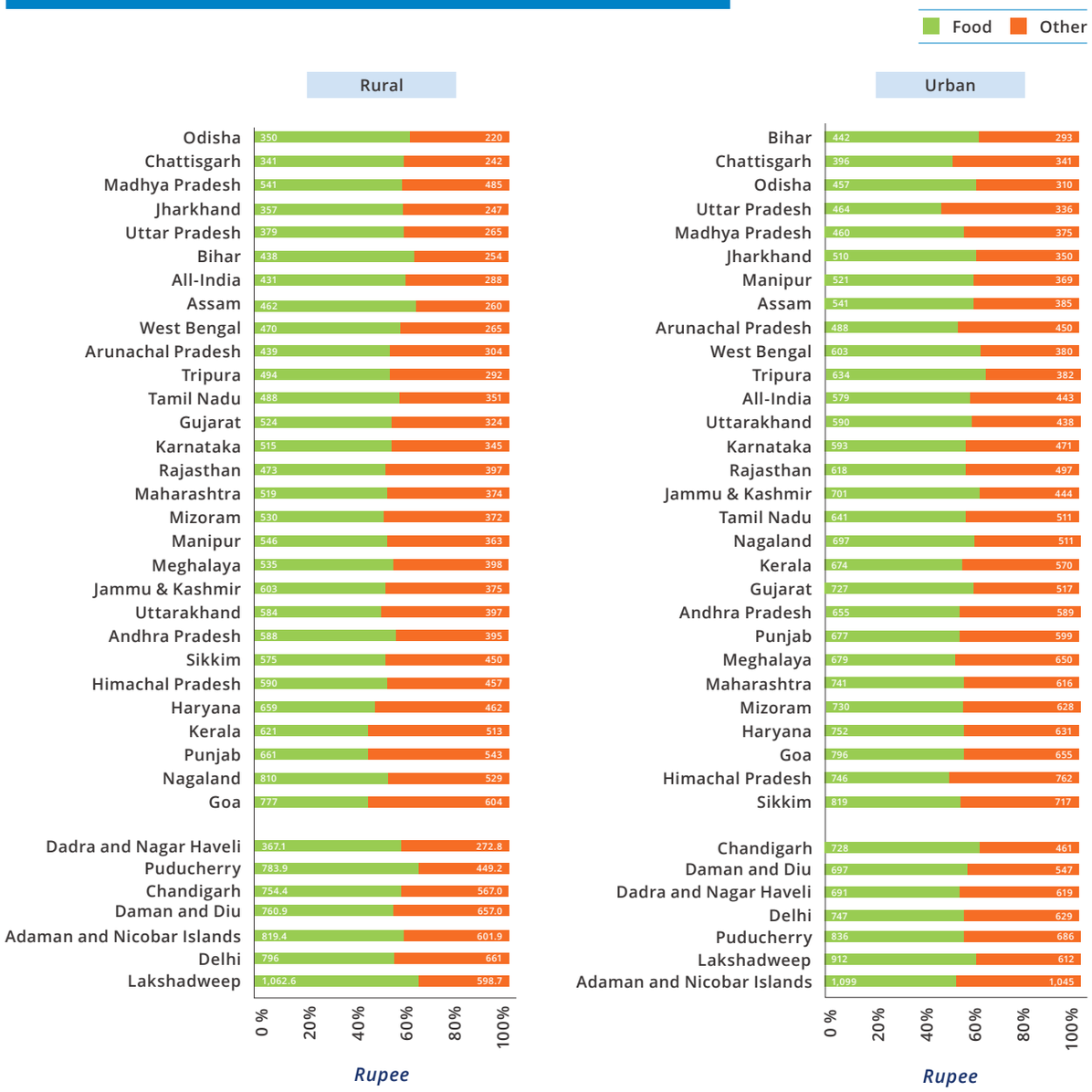
Figure 4.6: *Per Capita Monthly Expenditure on Food across States in India, 2011-12*



Source: *68th round of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India*

Among the poorest (lowest 30 percent MPCE class), Bihar, Chhattisgarh, Odisha, Madhya Pradesh and Uttar Pradesh show very low monthly expenditure, whereas these people have spent less than Rupees 500 per month (which is more than 60 percent of their total monthly expenditure) on their survival (Figure 4.7).

Figure 4.7: *Per Capita Monthly Expenditure on Food among (lowest 30 percent MPCE class) across States in India, 2011-12*



Source: *68th round of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India*

4.3 Dietary Intakes

Trends and Patterns

The remarkable achievements in economic growth, surplus production in foodgrains, (especially in cereals) and significant reduction in poverty seems to have improved the access to food among households in India. The per capita per day consumption of energy and of protein is falling in rural India; this is occurring against the increase in household per capita expenditure. A probable explanation is that the energy requirement has declined due to lower levels of physical activity or improvements in the health environment (Deaton & Dreze, 2009). Recently, Recommended Dietary

Box 4.2: ***Energy, Protein and Fat Norms: Expert Group on Poverty Measurement, 2014***

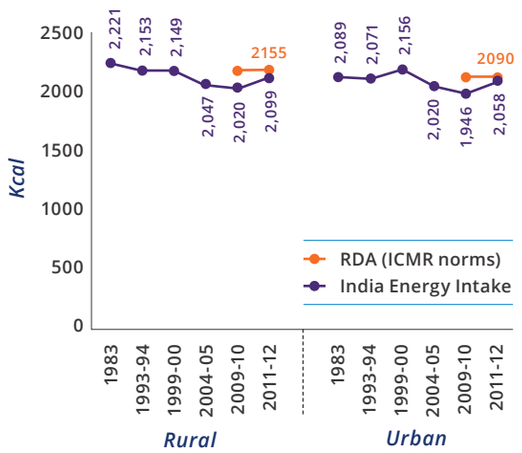
The energy norms based on which the Task Force (Alagh) poverty lines were derived, and which had been the basis for the poverty lines worked out by the Expert Group (Lakdawala), is 2,400 kcal per capita per day in rural areas and 2,100 kcal per capita per day in urban areas.

The Expert Group chaired by Dr. C. Rangarajan was appointed by the Planning Commission to review the methodology for estimation of poverty in India. The Expert Group (Rangarajan) took a considered view that deriving the food component of the Poverty Line Basket by reference to the simultaneous satisfaction of the all three nutrients (Energy, Protein and Fat), norms would be appropriate when seen in conjunction with the emphasis on a full range of policies and programmes for child-nutrition support and on public provisioning of a range of public goods and services, aimed at the improvement of the disease environment faced by the population. Accordingly, the Expert Group (Rangarajan) computed the average requirements of energy, protein and fat on ICMR norms (2009) differentiated by age, gender and activity for all-India rural and urban regions to derive the normative levels of nourishment and worked out the energy requirement as 2,155 kcal per person per day in rural areas and 2,090 kcal per person per day in urban areas. The protein and fat requirements were estimated on the same lines as for energy: these requirements are 48 grams and 28 grams per capita per day, respectively, in rural areas; and 50 grams and 26 grams per capita per day in urban areas.

Allowance (RDA) for energy was revised downwards for both rural and urban areas, (Box 4.2) based on the guidelines on RDA, published by the Indian Council of Medical Research (ICMR, 2010). This committee unveils the fact that the people in rural India consumed less energy than even the revised norms. However, between 2004-05 to 2011-12, the average energy intake has increased, and is now very close to the revised norms at national levels (Figure 4.8). In rural India, the per capita per day energy consumption was 2,221 Kcal in 1983, 2,153 in 1993-94, and had fallen to 2,099 Kcal per capita per day in 2011-12, a decline of 5.5 percent from 1983. Since 2004-05, the per capita per day consumption of energy increased from 2,047 Kcal to 2,099 Kcal in 2011-12.

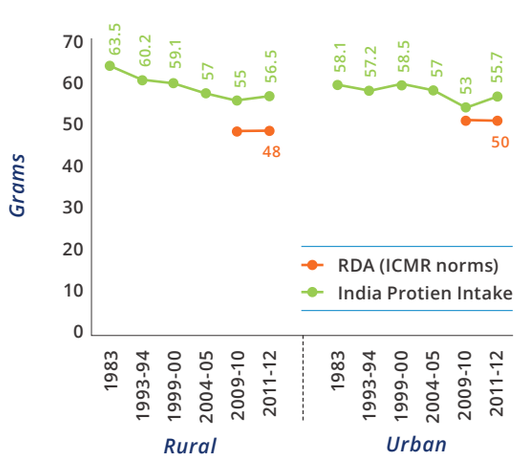
In urban India, the per capita per day energy consumption declined marginally by 31 Kcal (1.5 percent) during 1983 to 2011-12. The energy consumption trends suggest that though the per capita per day consumption of energy has marginally increased in the recent past, for all the periods since 1983, energy intake has been marginally lower than the minimum energy requirement estimated by ICMR (Figure 4.8).

Figure 4.8: *Trends of Per Capita Per Day Intake of Energy in India, 1983 to 2011-12*



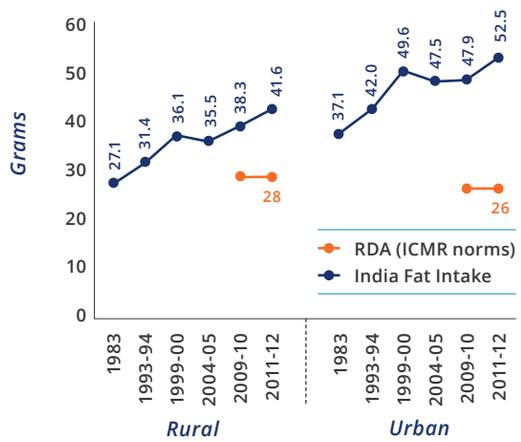
Source: *Various rounds of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India*

Figure 4.9: *Trends of Per Capita Per Day Intake of Protien in India, 1983 to 2011-12*



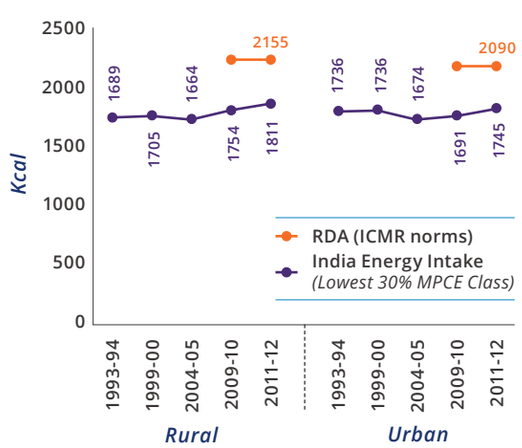
Source: *Various rounds of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India*

Figure 4.10: *Trends of Per Capita Per Day Intake of Fat in India, 1983 to 2011-12*



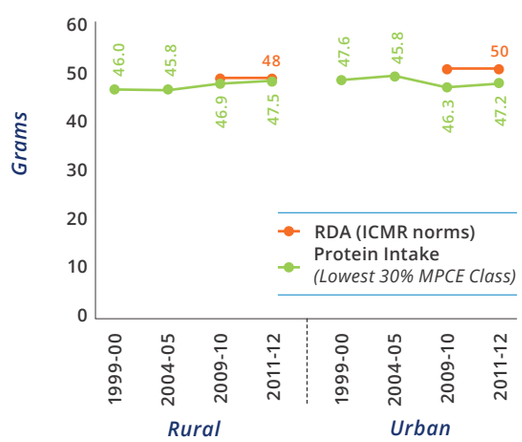
Source: *Various rounds of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India*

Figure 4.11: *Trends of Per Capita Per Day Intake of Energy among Poorest (Lowest 30 percent MPCE class) in India, 1983 to 2011-12*



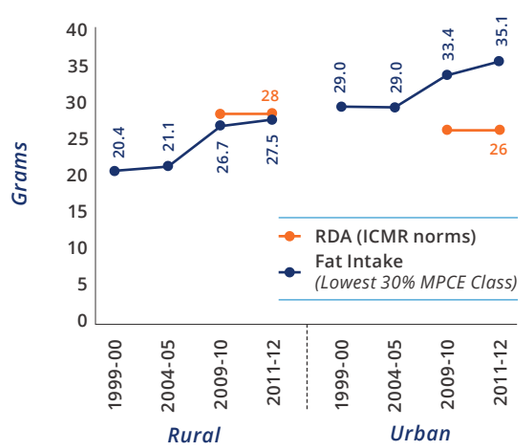
Source: *Various rounds of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India*

Figure 4.12: *Trends of Per Capita Per Day Intake of Protein among Poorest (Lowest 30 percent MPCE class) in India, 1983 to 2011-12*



Source: *Various rounds of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India*

Figure 4.13: *Trends of Per Capita Per Day Intake of Fat among Poorest (Lowest 30 percent MPCE class) in India, 1983 to 2011-12*



Source: *Various rounds of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India*

In rural India, the average protein intake has gone down from 63.5 grams per capita per day in 1983 to 57 grams in 2004-05 and further to 56.5 grams in 2011-12. Similarly, in urban areas, the per capita per day consumption of protein has declined from 58.1 grams in 1983 to 55.7 grams in 2011-12. Over the same period (from 1983 to 2011-12), the per capita per day protein consumption fell by 11 percent and 4.1 percent in rural and urban areas respectively. Despite the declining trends of protein intake, both in rural and urban areas, per capita consumption was higher than the daily minimum consumption requirement as per the RDA level.

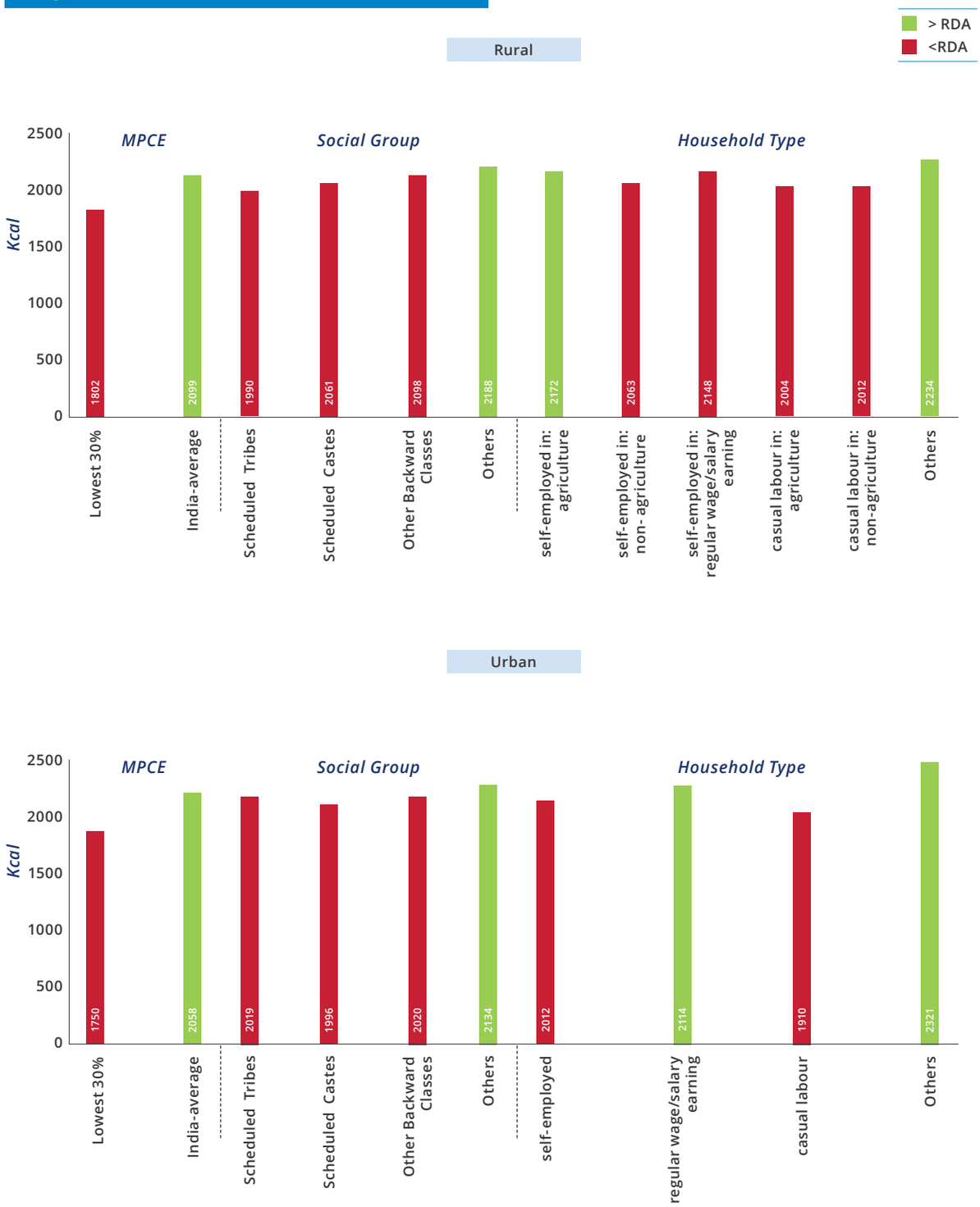
Among three nutrients, only per capita per day consumption of fat has shown an increasing trend since 1983. In rural India, per capita per day consumption of fat increased significantly by 34.8 percent. This figure was 29.3 percent in urban India during the same period and was much higher than the daily minimum consumption requirement as per the RDA level suggested by ICMR (2010) (Figure 4.10).

Among the poorest (lowest 30 percent MPCE class), per capita per day consumption of energy, protein and fat was 1811 Kcal, 47.5 grams and 27.8 grams, respectively in rural India. In urban India, these figures were 1745 Kcal of energy, 47.2 grams of protein and 35.1 grams of fat. The current level of intake of all three nutrients (energy, protein and fat) is much lower than the all-India average and the daily minimum consumption requirement as per the RDA level (Figure 4.11, 4.12 and 4.13). Only fat intake in urban areas is higher than the daily minimum consumption requirement. Over the last 30 years, there has been no significant change in the consumption of energy among poor people living in both rural and urban areas, but a secular increase is observed in per capita per day intake of protein and fat.

The deficit in energy intake was the highest among the SC, ST and OBC households in both rural and urban areas (Figure 4.14). The energy consumption of these three social groups was less than the minimum requirement. Moreover, per capita per day consumption was much lower than the RDA level. Consumption of other two nutrients (protein and fat) was higher than the RDA level in all population groups. Casual labour, in both rural and urban areas were the most vulnerable in terms of per capita per day consumption of energy. Like social group, per capita per day intake of protein and fat consumption was far better than the minimum requirement among households in all occupation groups.

Therefore, from the discussion, it can be concluded that the diversification in the sources of energy, protein and fat is also reflected in the food consumption basket of the households. The decline in the share of cereals in the total consumption of food in the households has largely been substituted by rich food items such as milk and its products, oils and fat and miscellaneous food products. It is important to note here that both in rural and urban areas, the share 'miscellaneous' category, which constitutes of relatively unhealthy food such as fast food, processed food, beverages, etc., has increased significantly. Moreover, the share of miscellaneous food in the energy and protein sources of people is very high in urban India as compared to rural India. This has implications on the emerging problem of obesity in India, as evident from National Family Health Survey (NFHS 4) 2015-16 data. The stark difference between rural and urban consumption patterns, is in terms of oils and fats and the miscellaneous food products, indicating preference for rich and ready to eat food and its affordability in urban areas.

Figure 4.14: *Per Capita Per Day Intake of Protein by Background Characteristics in Rural and Urban India, 2011-12*



Source: *68th round of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India*

4.4 RDA for Energy, Protein and Fat and Nutritional Intake

A Regional Pattern

In the preceding section, the trends in energy, protein and fat have been discussed in line with the calorific norms estimated by various expert groups appointed by the Government from time to time, such as the Alagh Task Force, Lakdawala Committee, Tendulkar Committee, Rangarajan Committee, etc. The latest expert group used the ICMR (2010) norms and estimated the Recommended Dietary Allowance (RDA) for not only energy (calories) but also for protein and fat. The RDA estimates calculated by the experts based on the ICMR (2010) norms are 2,155 Kcal energy, 48 grams protein and 28 grams fat per capita per day for rural India and 2,090 Kcal of energy, 50 grams of protein and 26 grams of fat per capita per day for urban India. The following section will discuss the regional and temporal pattern in the per capita per day intake of energy, protein and fat with respect to the estimated national RDAs. For the present discussion, seven Union Territories (UTs) have been excluded because of their small sample size. The state average per capita per day intake of energy, protein and fat figures are presented in the maps. At times even small state figures may be misleading due to small sample size.

4.4.1 Per Capita Per Day Energy, Protein and Fat Intakes against RDAs

Rural India

In 2011-12, across sates, the per capita per day intake of energy varied from 1,686 Kcal per capita per day in Meghalaya to 2,502 Kcal per capita per day in Himachal Pradesh. The Map 4.1 shows that there were 8 states where per capita per day energy intake was higher than the all-India RDA level. These states are Himachal Pradesh, Uttarakhand, Jammu & Kashmir, Punjab, Rajasthan, Tripura, Haryana and Andhra Pradesh. On the other hand, 20 states had per capita per day intake of energy lower than the RDA level. Meghalaya, Arunachal Pradesh, Nagaland, Gujarat, Tamil Nadu, Goa, Manipur, Kerala among others have shown much lower per capita per day intake for energy compared to the national level RDA. During 2004-05 and 2011-12, per capita per day energy intake increased in most of the states. On the contrary, there were 10 states such as Arunachal Pradesh, Mizoram, Manipur, Meghalaya, Nagaland, Uttar Pradesh, Assam, Kerala, Jammu & Kashmir and Gujarat that had shown declining trends of energy intake over the same period.

The per capita per day protein intake varied from 41.6 grams per capita per day in Meghalaya to 71.4 grams per capita per day in Himachal Pradesh in 2011-12. With reference to the national RDA level, per capita per day intake of protein shows a much more appealing picture. In twenty four states, protein intake was higher than the RDA level. While only four states namely, Meghalaya, Manipur, Arunachal Pradesh and Chhattisgarh exhibited per capita per day

intake of protein lower than the all-India RDA level of 48 grams. There were 15 states which had shown a declining trends in protein intake between 2004-05 and 2011-12. The highest decline was observed in Mizoram (29 grams) followed by Arunachal Pradesh (20 grams), Nagaland (14 grams) and Manipur (12.9 grams) during the above-mentioned period. Chhattisgarh was the only state where per capita per day intake of protein was lower than the RDA level in both 2004-05 and 2011-12.

As far as fat consumption is concerned, Punjab is at the highest position, with per capita per day intake of 64.7 grams followed by Haryana (62.7 grams), Himachal Pradesh (59.3 grams), Rajasthan (57.7 grams), Gujarat (56.5 grams), Jammu & Kashmir (54.9 grams), Uttarakhand (52.8 grams), Maharashtra (52.1 grams), Goa (51.1 grams), and Kerala (44.7 grams), among others. On the other hand, the lowest per capita per day fat intake was found in Nagaland (14.2 grams) followed by Manipur (15.5 grams), Arunachal Pradesh (18.2 grams), Meghalaya (21.6 grams), Odisha (24.4 grams), Mizoram (25.4 grams), Assam (26.1 grams), Tripura (27.4 grams) and Chhattisgarh (27.9 grams). These nine states also showed lower per capita per day intake of fat than the national average of RDA, while remaining 19 states showed higher fat intake than the RDA level. Between 2004-05 and 2011-12, all the states (except 6 north eastern states) had shown increasing trends in per capita per day intake of fat.

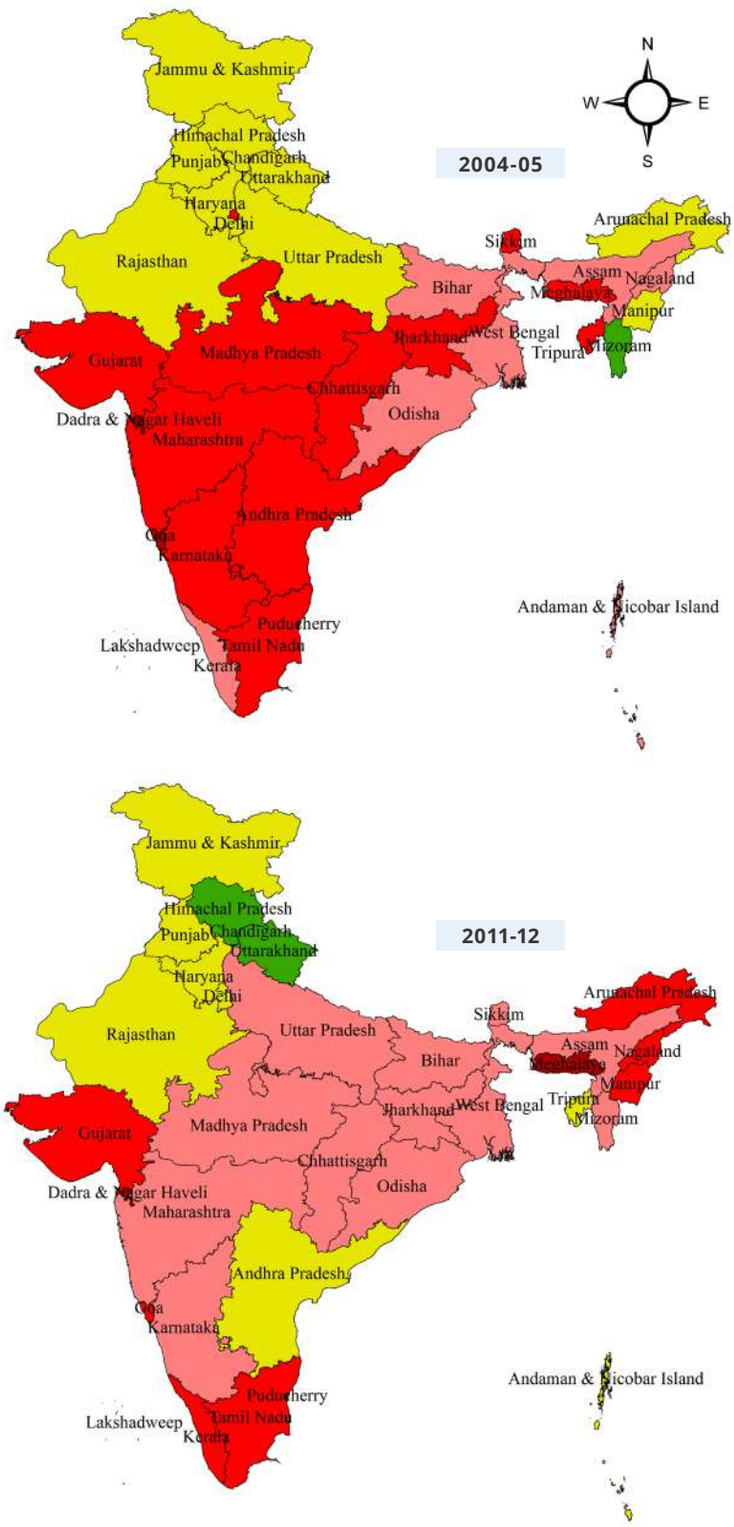
Table 4.2: ***Movement of States with Reference to RDA in Rural Areas***

	From <RDA in 2004-05 to >RDA in 2011-12	From >RDA in 2004-05 to <RDA in 2011-12
Energy	Tripura and Arunachal Pradesh	Uttar Pradesh, Arunachal Pradesh, Manipur and Mizoram
Protein	Tripura, Goa and Tamil Nadu	Meghalaya, Manipur, Arunachal Pradesh
Fat	West Bengal and Jharkhand	Mizoram and Arunachal Pradesh

Source: 61st and 68th round of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India

High food inflation may have had a larger implication on the poor households, as they spend higher shares of their household expenditure on food (60.3 percent and 55 percent in rural and urban areas respectively), in comparison to the all-India figures. Per capita per day intake of energy among the poorest (lowest 30 percent of MPCE class) increased in almost all the states in rural India between 2004-05 and 2011-12, while only three states, namely, Arunachal Pradesh, Bihar and Manipur, have shown declining trends of energy intake. Increasing trends of energy intake among poor is of course a welcoming phenomenon but only two states (Uttarakhand and Himachal Pradesh) have confirmed higher per capita per day intake of energy than RDA in 2011-12 and none of the states in rural India had met the minimum requirement of energy intake in 2004-05 for the poor households.

Map 4.1: *Per Capita Per Day Intake of Energy in Rural India between 2004-05 and 2011-12*



In kcal below RDA (2155)

- 1600-1800
- 1801-2000
- 2001-2154

Above RDA (2155)

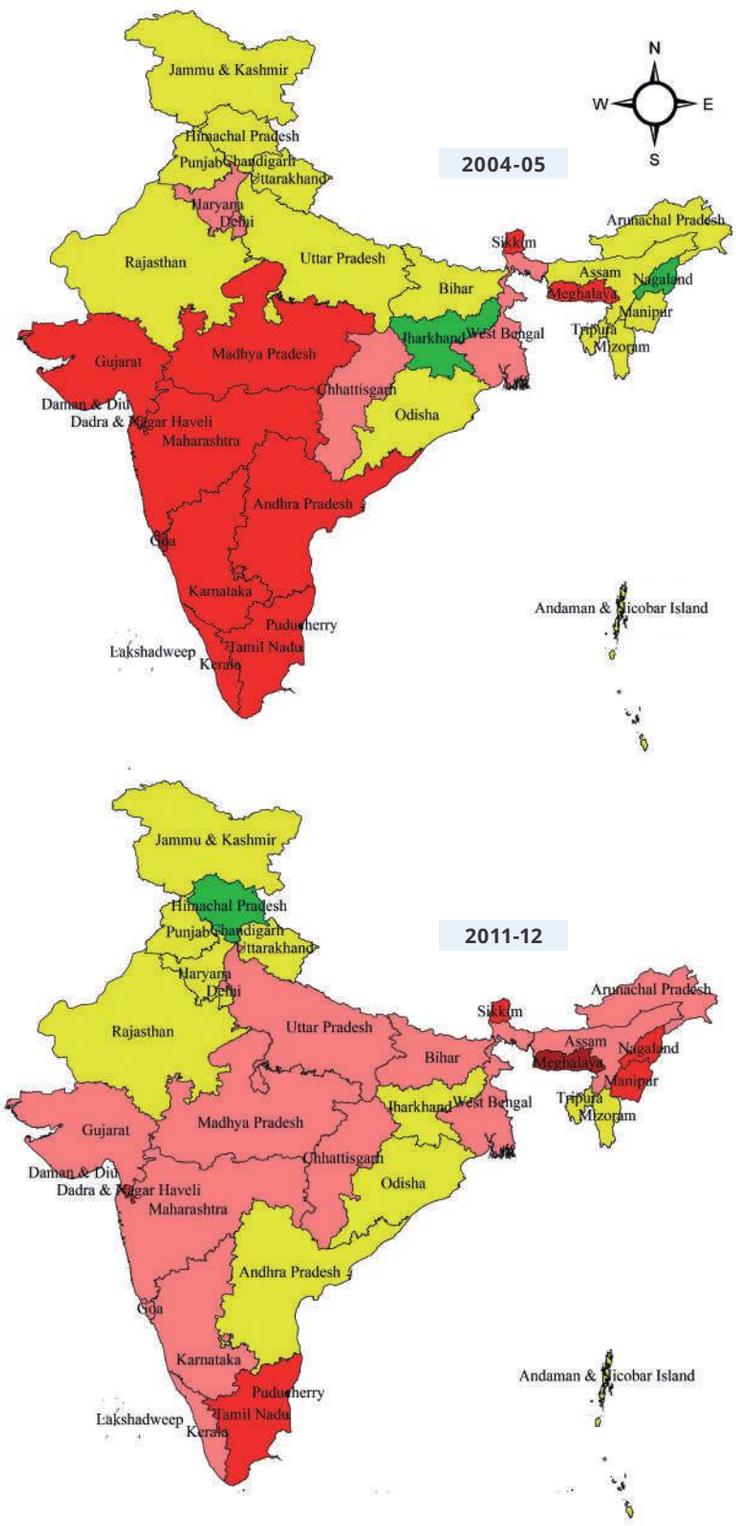
- 2154-2400
- 2401-2600
- 2601-2737

Disclamer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size

Map not to scale

Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

Map 4.2: *Per Capita Per Day Intake of Energy in Urban India between 2004-05 and 2011-12*



In kcal below RDA (2090)

- 1600-1800
- 1801-2000
- 2001-2154

Above RDA (2090)

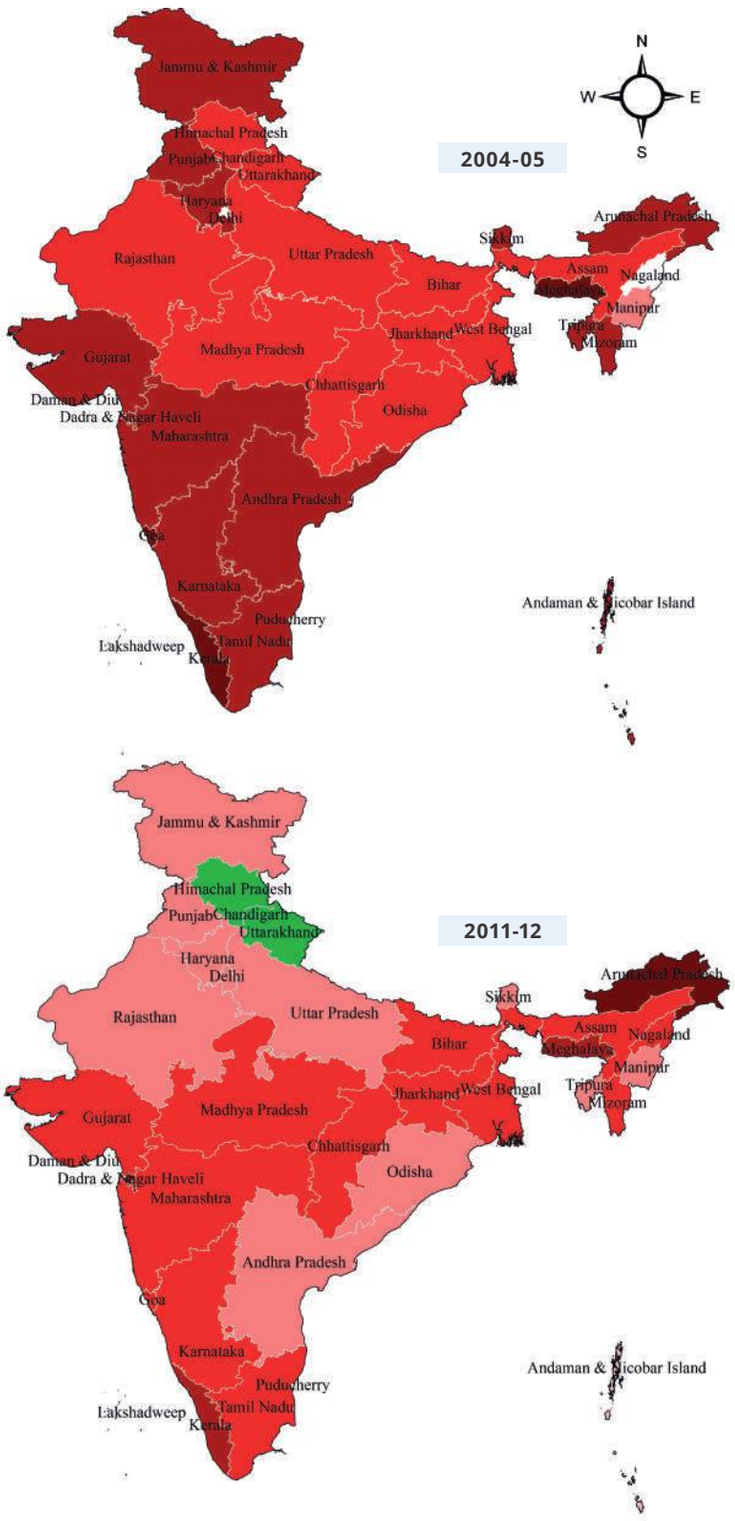
- 2154-2400
- 2401-2600
- 2601-2737

Disclamer: *Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size*

Map not to scale

Source: *National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)*

Map 4.3: *Per Capita Per Day Intake of Energy among the Poorest (bottom 30 percent MPCE class) in Rural India between 2004-05 and 2011-12*



In kcal below RDA (2155)

- No Data
- 1176-1400
- 1401-1600
- 1601-1800
- 1801-2000
- 2001-2154

Above RDA (2155)

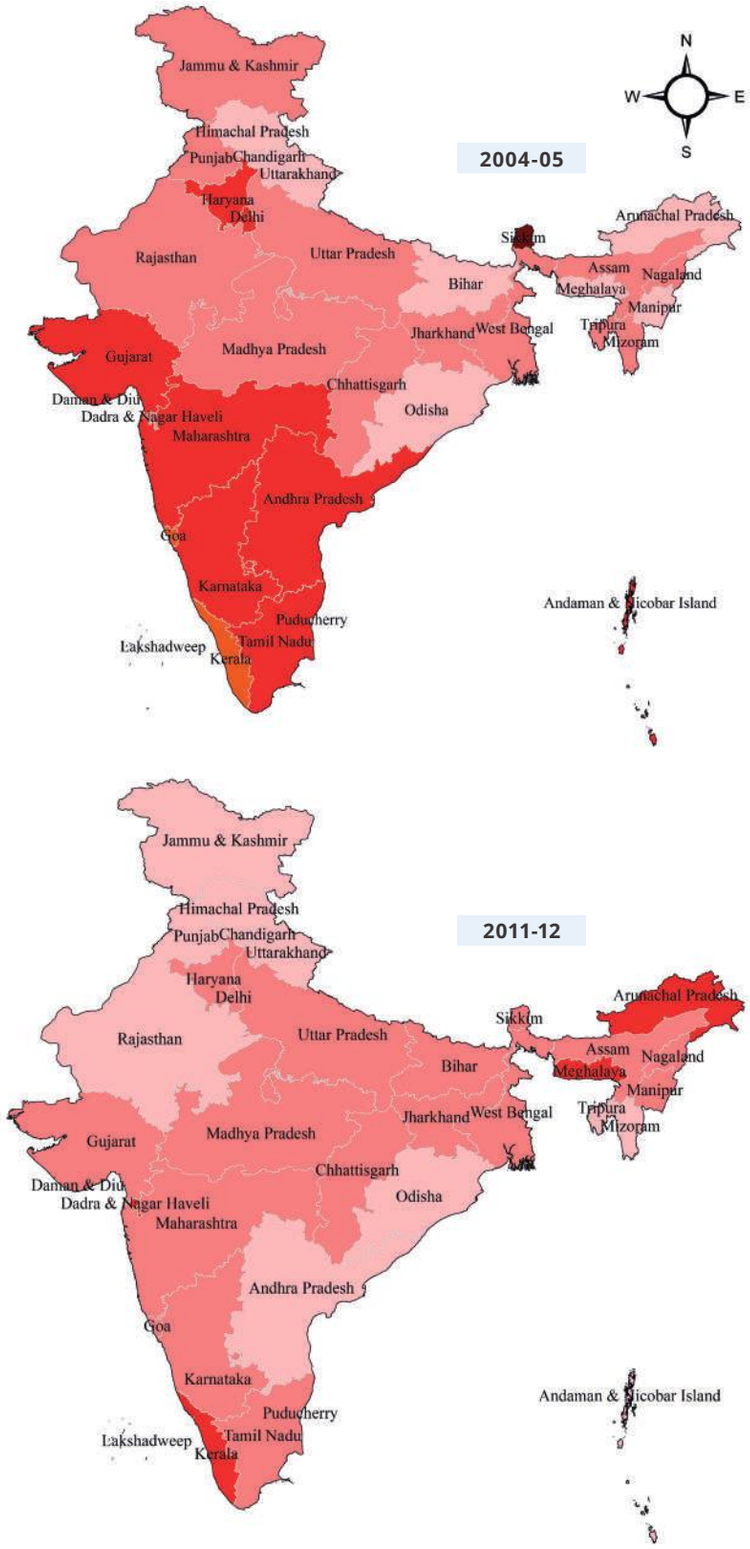
- 2155-2398

Disclamer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size

Map not to scale

Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

Map 4.4: *Per Capita Per Day Intake of Energy Among the Poorest (Bottom 30 Percent of MPCE Class) in Urban India between 2004-05 and 2011-12*



In kcal below RDA (2090)

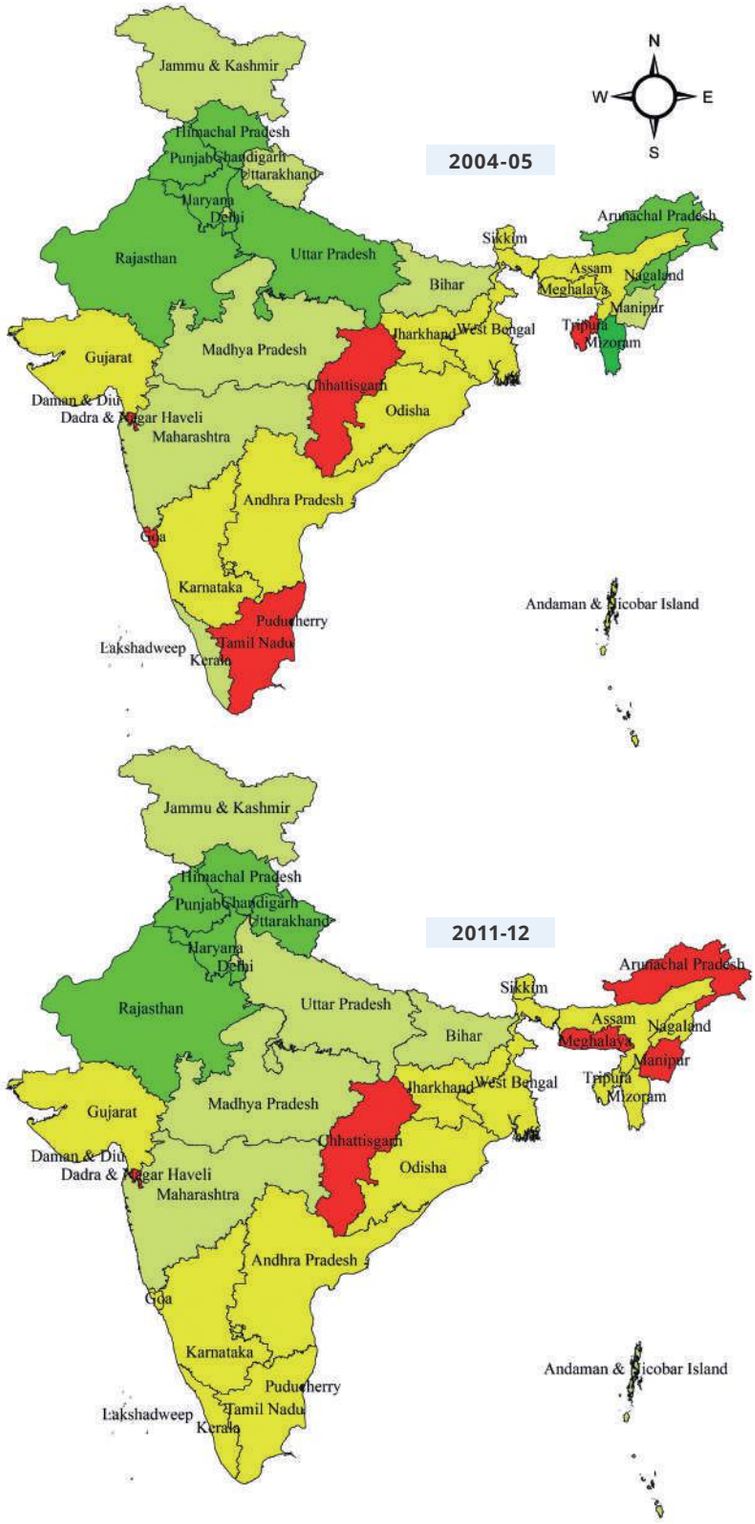
- 720-1000
- 1001-1200
- 1201-1400
- 1401-1600
- 1601-1800
- 1801-2040.4

Disclamer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size

Map not to scale

Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

Map 4.5: *Per Capita Per Day Intake of Protien in Rural India between 2004-05 and 2011-12*



In Grams below RDA (48)

- 39.6-48

Above RDA (48)

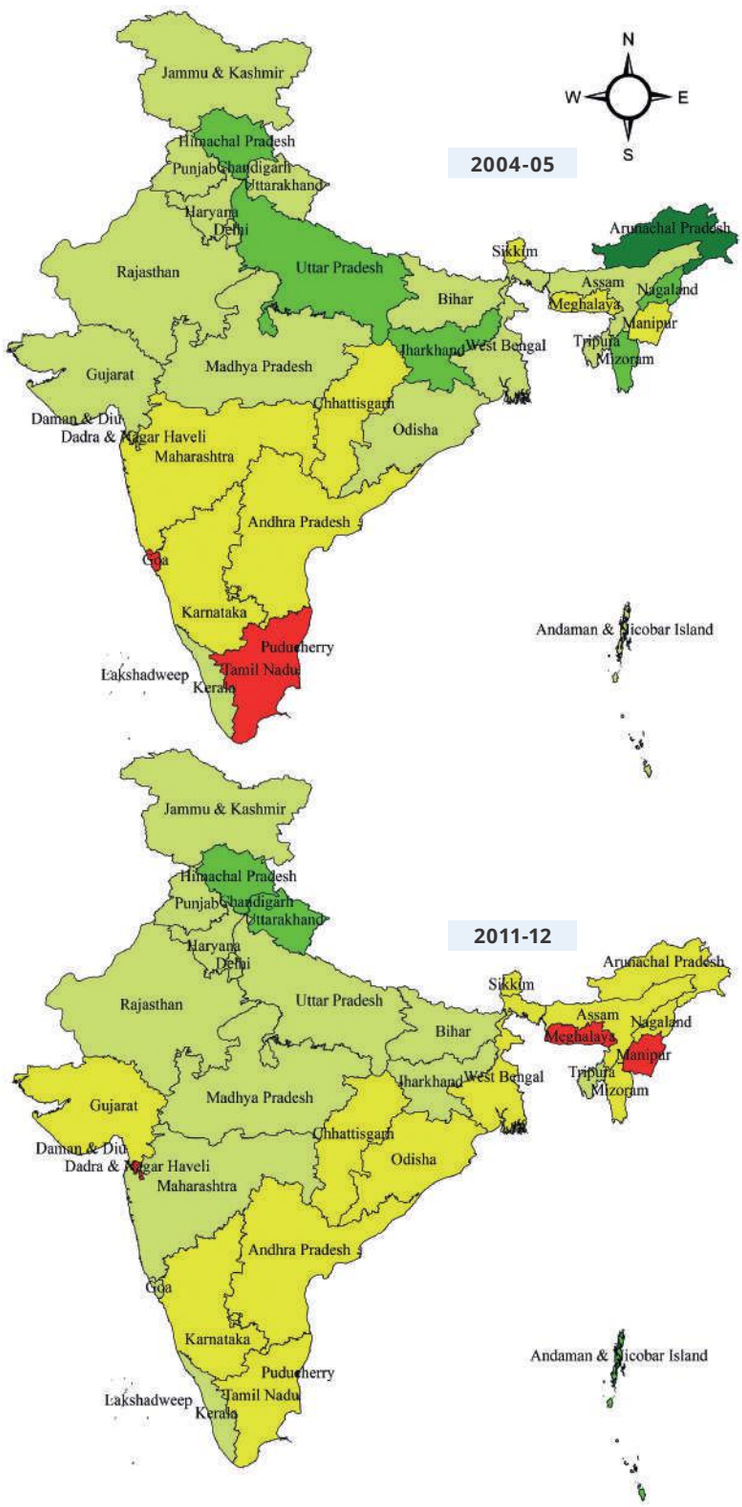
- 49-55
- 56-55
- 66-75
- 76-77.2

Disclamer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size

Map not to scale

Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

Map 4.6: *Per Capita Per Day Intake of Protien in Urban India between 2004-05 and 2011-12*



In Grams below RDA (50)

- 45.9-50

Above RDA (50)

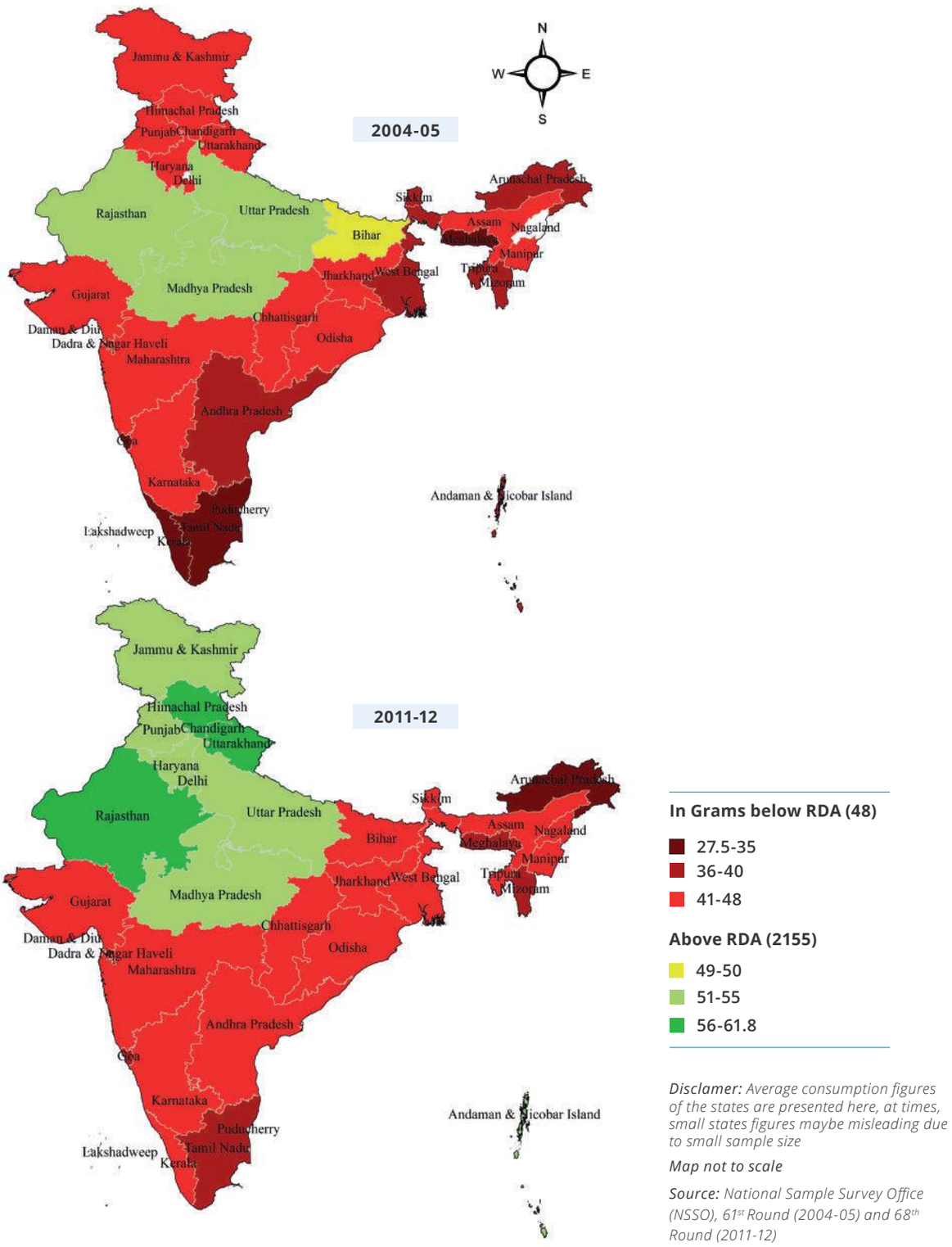
- 51-55
- 56-55
- 66-75
- 76-85
- 86-93.3

Disclamer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size

Map not to scale

Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

Map 4.7: *Per Capita Per Day Intake of Protien among the Poorest (bottom 30 percent MPCE class) in Rural India between 2004-05 and 2011-12*

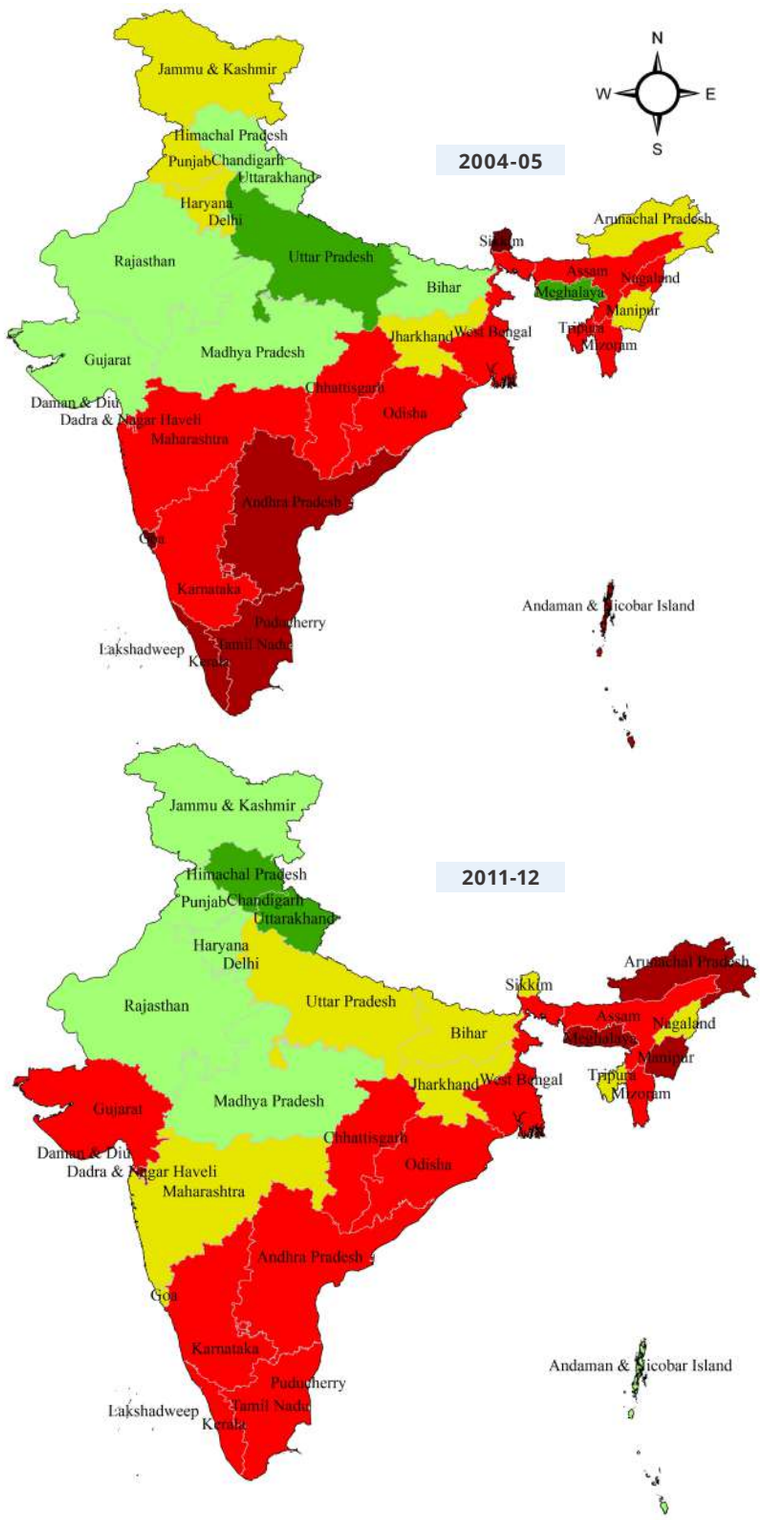


Disclamer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size

Map not to scale

Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

Map 4.8: *Per Capita Per Day Intake of Protien among the Poorest (bottom 30 percent MPCE class) in Urbanl India between 2004-05 and 2011-12*



In Grams below RDA (48)

- 20.6-35
- 36-40
- 41-48

Above RDA (2155)

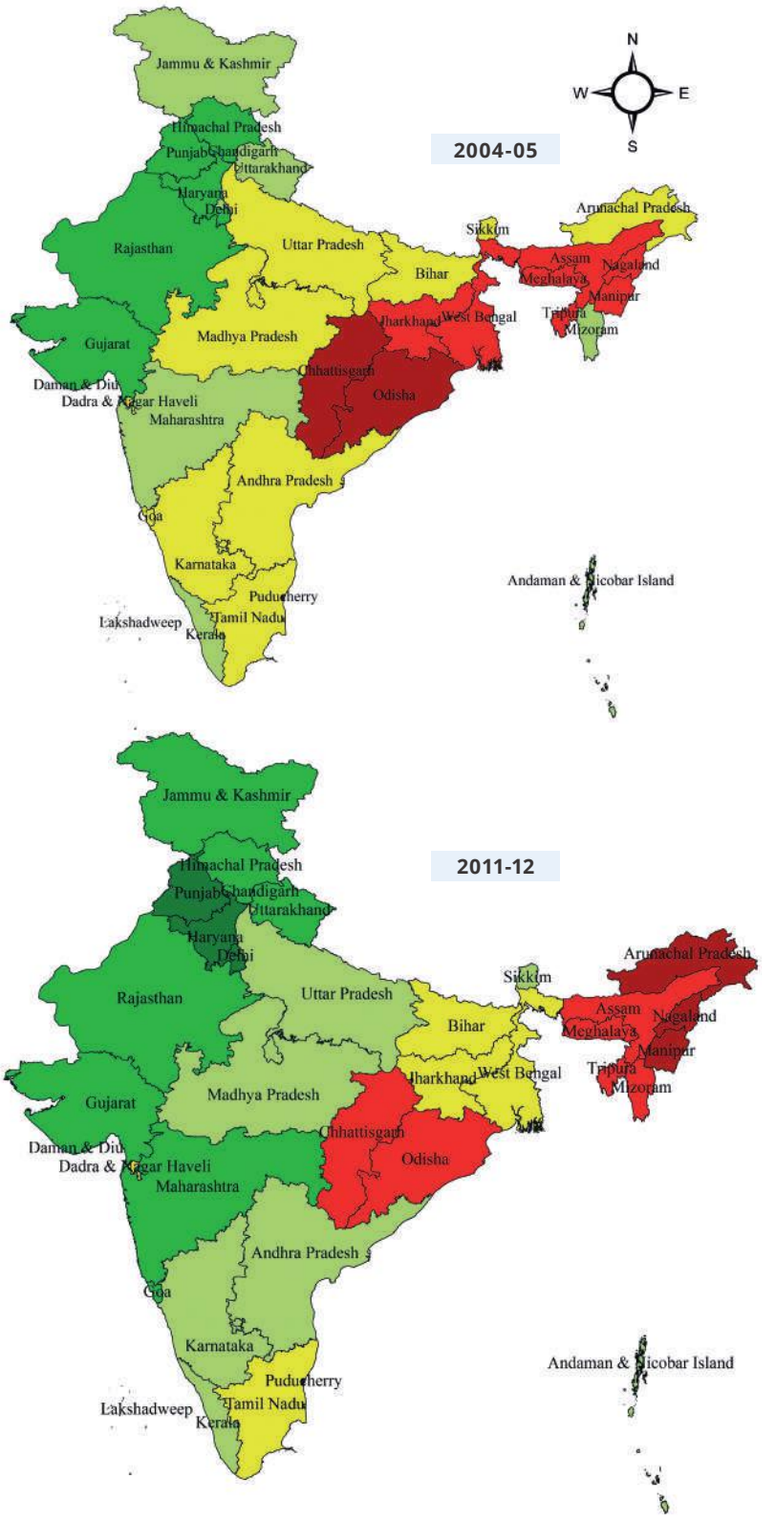
- 46-50
- 51-55
- 56-58.8

Disclamer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size

Map not to scale

Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

Map 4.9: *Per Capita Per Day Intake of Fat in Rural India between 2004-05 and 2011-12*



In Grams below RDA (28)

- 14.2-20
- 21-27

Above RDA (28)

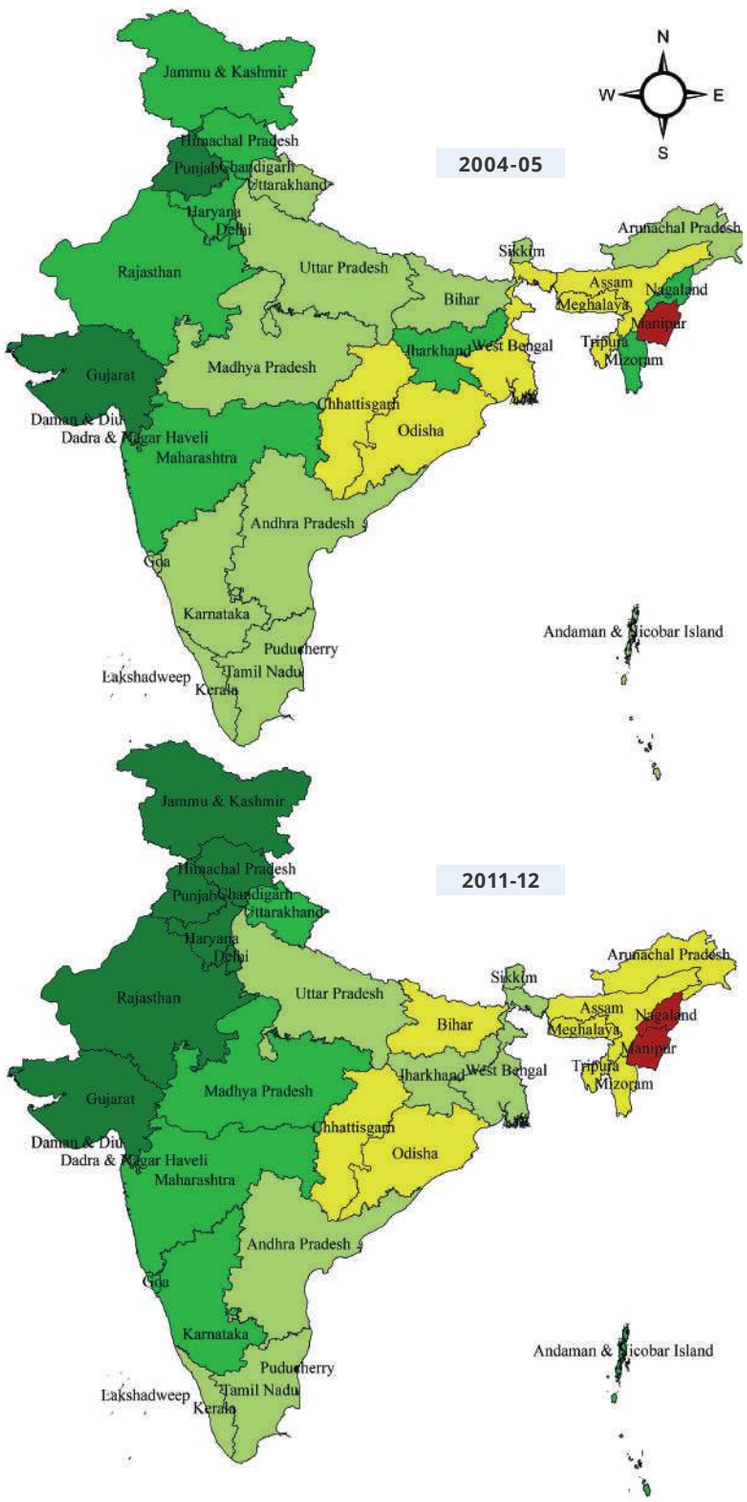
- 28-40
- 41-50
- 51-60
- 61-69.4

Disclamer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size

Map not to scale

Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

Map 4.10: *Per Capita Per Day Intake of Fat in Urban India between 2004-05 and 2011-12*



In Grams below RDA (28)

- 17.4-20
- 21-25

Above RDA (28)

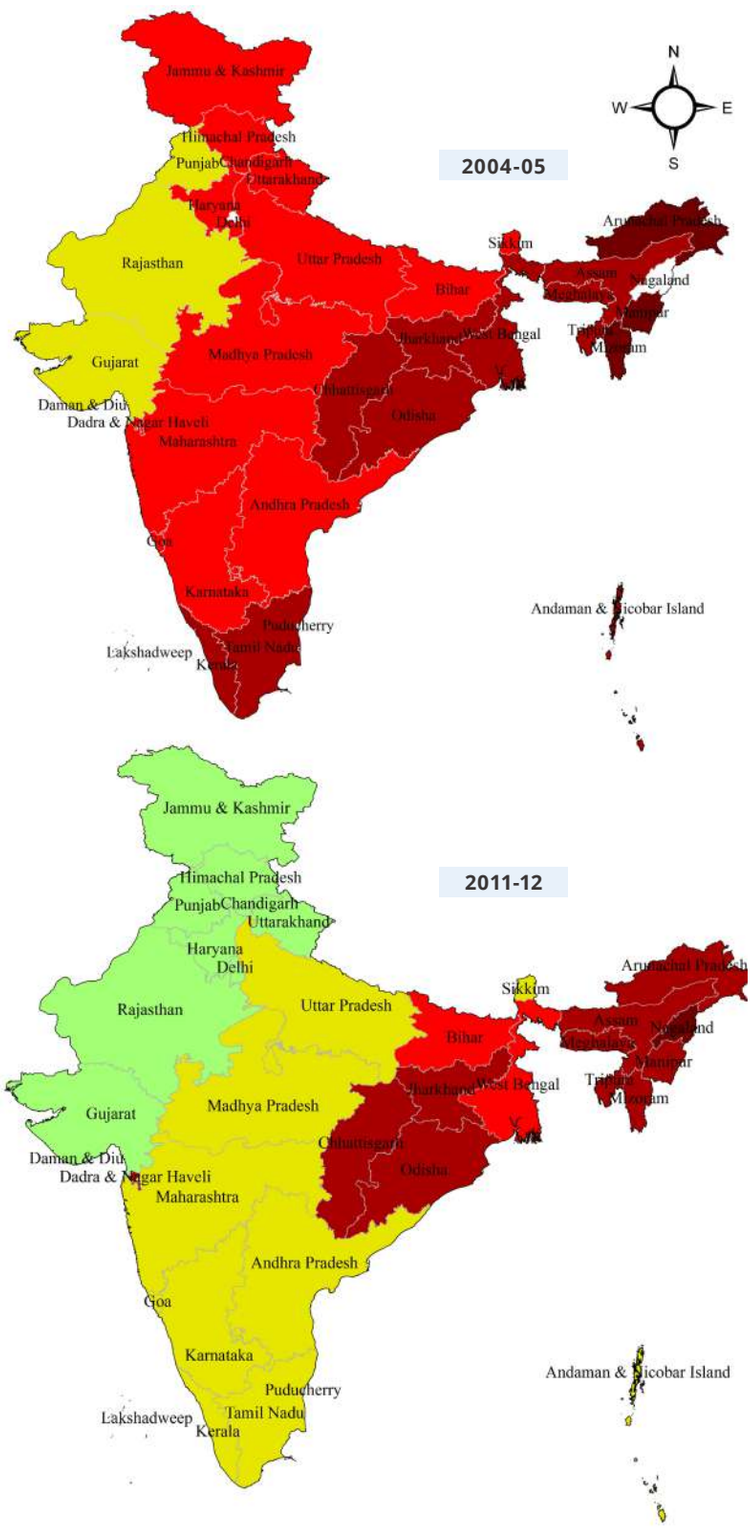
- 26-40
- 41-50
- 51-60
- 61-69.8

Disclamer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size

Map not to scale

Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

Map 4.11: *Per Capita Per Day Intake of Fat among the Poorest (bottom 30 percent MPCE class) in Rural India between 2004-05 and 2011-12*



In Grams

- NA

Below RDA (28)

- 8.49-10
- 11-20
- 21-27

Above RDA (28)

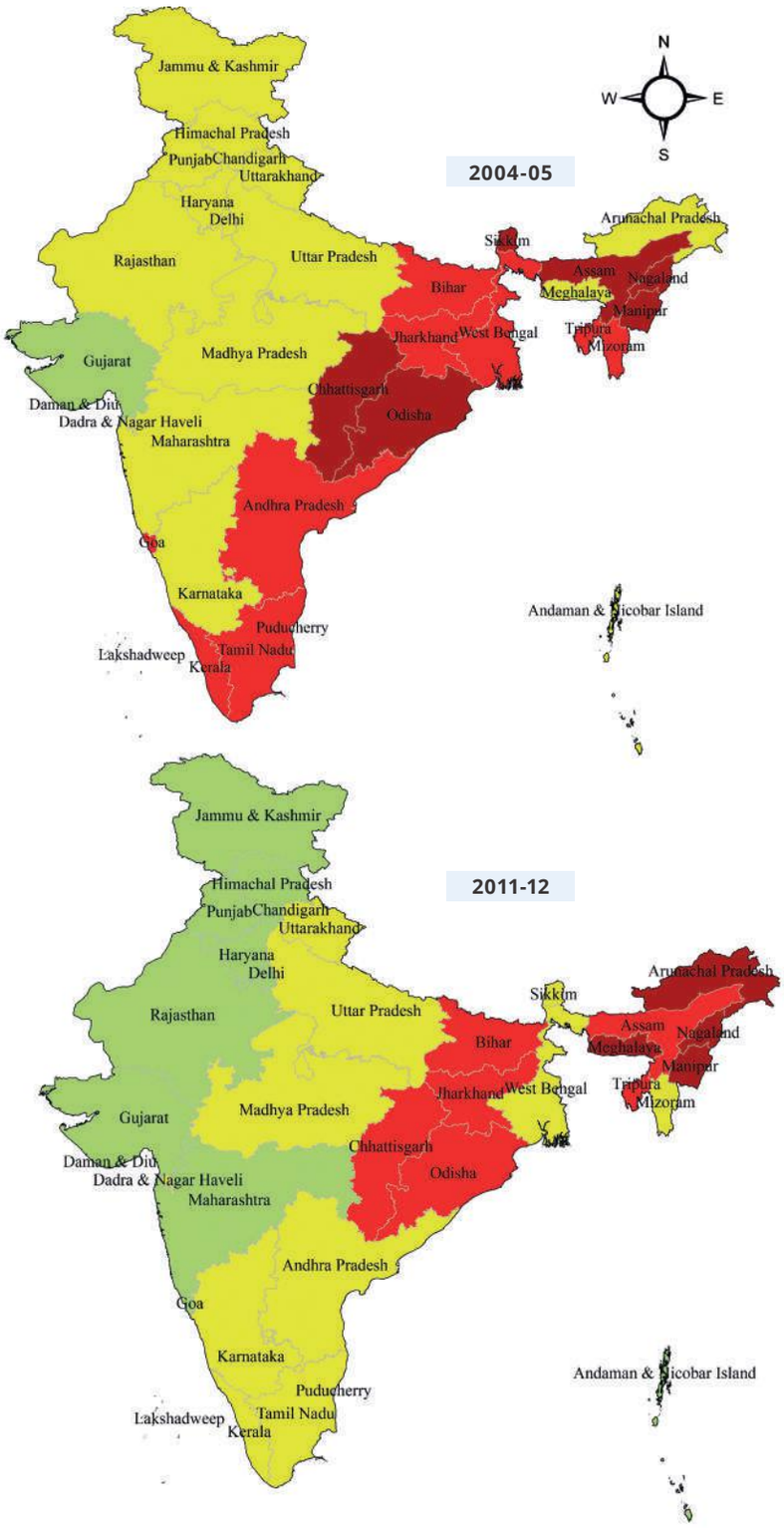
- 28-40
- 41-50
- 51-60.8

Disclamer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size

Map not to scale

Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

Map 4.12: *Per Capita Per Day Intake of Fat among the Poorest (bottom 30 percent MPCE class) in Urban India between 2004-05 and 2011-12*



In Grams below RDA (28)

- 11.7-20
- 21-25

Above RDA (28)

- 26-40
- 41-50

Disclamer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size

Map not to scale

Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

As far as protein intake among the poor households is concerned, eight states namely Arunachal Pradesh, Jharkhand, Uttar Pradesh, Bihar, Assam, Chhattisgarh, Karnataka and Madhya Pradesh have shown declining trends of protein intake between 2004-05 and 2011-12 in rural areas. There were only four states where per capita per day intake of protein among the poorest households was above the RDA level in 2004-05, and in 2011-12, eight states came under the category of above RDA. Only Bihar moved from above RDA level to below RDA level of protein intake during the above-mentioned period. In case of fat, the numbers were relatively better among the poorest compared to other two nutrients. In 2011-12, sixteen states had the per capita per day intake of fat higher than the RDA level, whereas only five states (Gujrat, Rajasthan, Panjab, Himachal Pradesh and Maharashtra) met the minimum requirement of fat consumption in 2004-05.

Urban India

NSSO (2011-12) data shows that in most states, the per capita per day intake of energy and protein is higher in rural India than urban India, but in case of fat intake urban India consumes more than rural India. This implies the changing food basket in urban areas, where people are consuming more rich food (especially fast food) rather than cereals, which is also reflected in the food expenditure shift.

In 2011-12, across states, the per capita per day intake of energy varied from 1,755 Kcal per capita per day in Meghalaya to 2,512 Kcal per capita per day in Himachal Pradesh. The Map 4.2 unveils that there are eleven states where per capita per day energy intake in urban areas was higher than the all-India level RDA. These states are Himachal Pradesh, Uttarakhand, Jammu &

Kashmir, Tripura, Punjab, Mizoram, Haryana, Rajasthan, Andhra Pradesh and Jharkhand. The remaining seventeen states had shown the per capita per day intake of energy lower than the RDA level. Between 2004-05 and 2011-12, the per capita per day energy intake had increased in most of the states of urban India. On the contrary, there were eleven states namely Nagaland, Jharkhand, Manipur, Mizoram, Arunachal Pradesh, Meghalaya, Uttar Pradesh, Bihar, Assam, Odisha and Chhattisgarh showing declining trends of energy intake over the same period.

In 2011-12, the per capita per day protein intake varied from 45.9 grams per capita per day in Manipur to 70.7 grams per capita per day in Himachal Pradesh in 2011-12. In terms of the national RDA level, per capita per day intake of protein in urban India was much better than in rural India. On a per capita per day basis in urban areas, almost all the states, except Meghalaya and Manipur consumed more protein than India level RDA. Though the per capita per day protein consumption was at comfortable level in the urban areas of all states in India, there were eighteen states that had shown declining trends in protein intake between 2004-05 and 2011-12.

Table 4.3: ***Movement of States with Reference to RDA in Urban Areas***

	From <RDA in 2004-05 to >RDA in 2011-12	From >RDA in 2004-05 to <RDA in 2011-12
Energy	Haryana and Andhra Pradesh	Nagaland, Arunachal Pradesh, Bihar, Manipur, Assam and Uttar Pradesh
Protein	Goa and Tamil Nadu	Meghalaya and Manipur
Fat	No state	Nagaland

Source: 61st and 68th round of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India

As far as fat consumption is concerned, between 2004-05 and 2011-12, urban areas of most of the states had made significant progress in per capita per day intake of fat. On the contrary, there were seven states namely, Nagaland, Arunachal Pradesh, Mizoram, Jharkhand, Meghalaya, Bihar and Manipur that had shown some declining trends in consumption of fat over same period. All the states, except Manipur and Nagaland show that per capita per day consumption of fat was much higher than that of RDA level for urban India.

Moreover, it is observed that per capita per day consumption of energy, protein and fat among the poorest households (lowest 30 percent of MPCE class) of urban India was much lower than the recommended level. In 2011-12, none of the states had shown that the consumption of energy among the poorest was higher than the RDA level. While only seven states in terms of protein intake and eighteen states in terms of fat intake have shown that the consumption of these two nutrients was higher than the minimum requirement.

4.5 Contribution of Food Safety Nets in Nutritional Intake of People in India: Analysis of Energy, Protein and Fat from Household Consumption and PDS

The nutritional intake from the Public Distribution System (PDS) has provided a significant safety cover to the people across the states in India by filling the nutritional gaps to attain the RDA levels of energy and protein. During 2011-12, per capita per day supplementation of energy from PDS was 453 Kcal in rural India and 159 Kcal in urban India. The per capita per day protein supplementation from PDS was 7.2 grams and 3.8 grams respectively in rural and urban areas. However, it is important to note that in 2011-12, though both rural and urban areas were heavily short of energy requirements, even after the energy support from PDS, people managed their protein requirements without PDS support in both the sectors. Higher meat and dairy intake in both rural and urban areas (even among poor people) is one of the reasons for fulfilling the minimum requirements of protein (Bowen et al., 2011). The per capita per day energy and protein supplementation through PDS was high among the poorest people both in rural and urban areas.

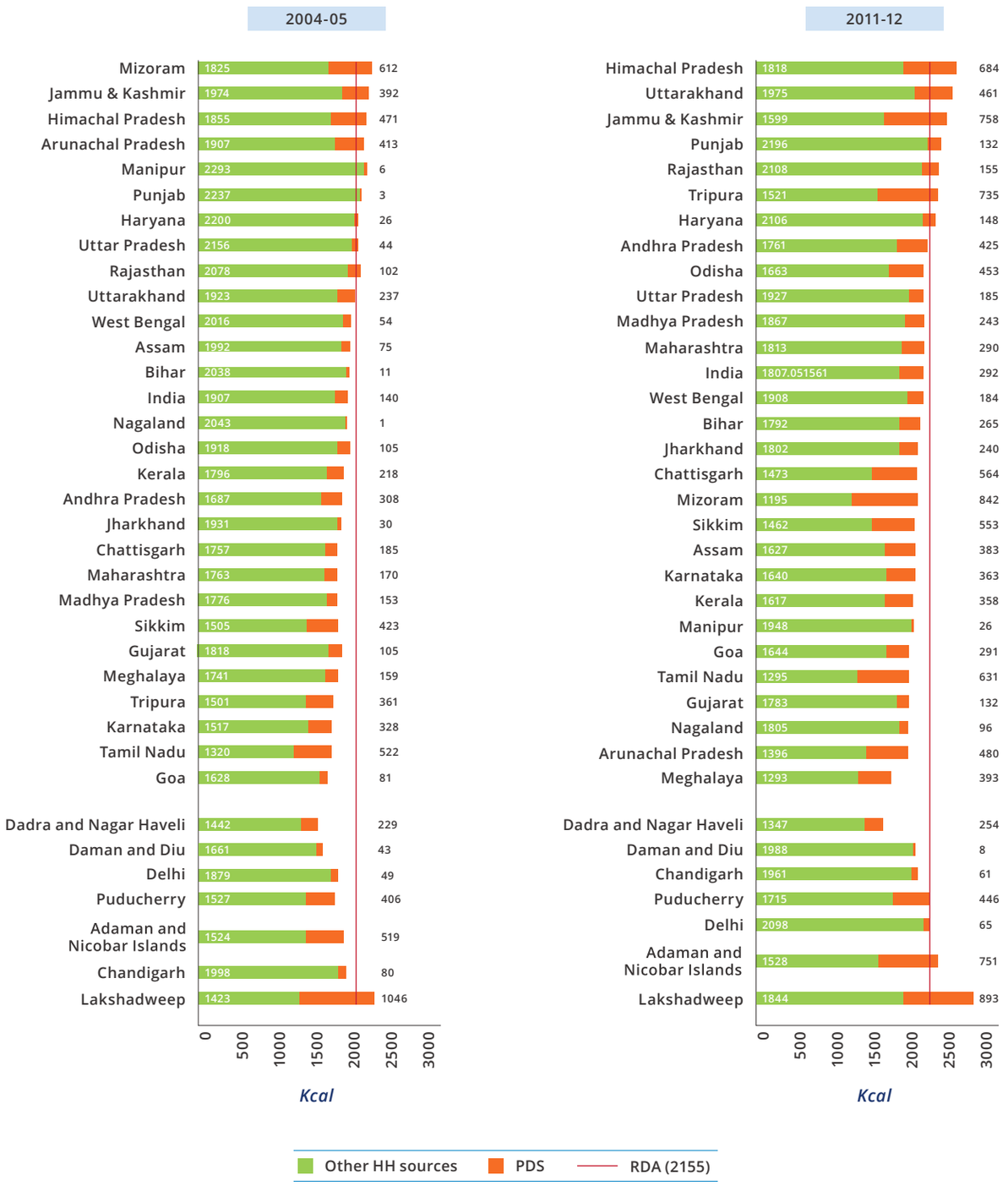
Most of the poor households consumed less than the RDA level. Though these poor households got a good share of the subsidized foodgrains through PDS (around 339 Kcal per capita per day), their household capability to access food was low, and as a result, despite the PDS support, they were not able to reach the RDA levels of energy and protein intake.

State level analysis suggests that PDS had a huge impact on energy and protein intake in both rural and urban India. Maps 4.13 and 4.14 unveil that only Punjab in rural India,

and three states in urban areas, namely, Himachal Pradesh, Uttarakhand and Punjab, have the required consumption of energy fulfilled by the out of pocket expenditure (other HH sources). Moreover, if we add up the PDS support in these states, then eight states in rural areas and eleven states in urban areas show higher consumption of energy per capita per day than the RDA level. The important point to note here is that in 2004-05, only four states in rural areas and eleven states in urban areas consumed energy sourced by only out of pocket expenditure (other HH sources). But in 2011-12, the number of states had gone down to one and three in rural and urban areas respectively, with reference to energy consumption without PDS supplementation, which suggests the increasing contribution of food supported by PDS to the total consumption (Figure 4.15 and 4.16). Among the poor households, all the states in urban areas fell heavily short of energy requirements even after energy support from PDS, while only Uttarakhand and Himachal Pradesh met minimum requirements of energy after adding up the PDS supports in rural areas (Map 4.15).

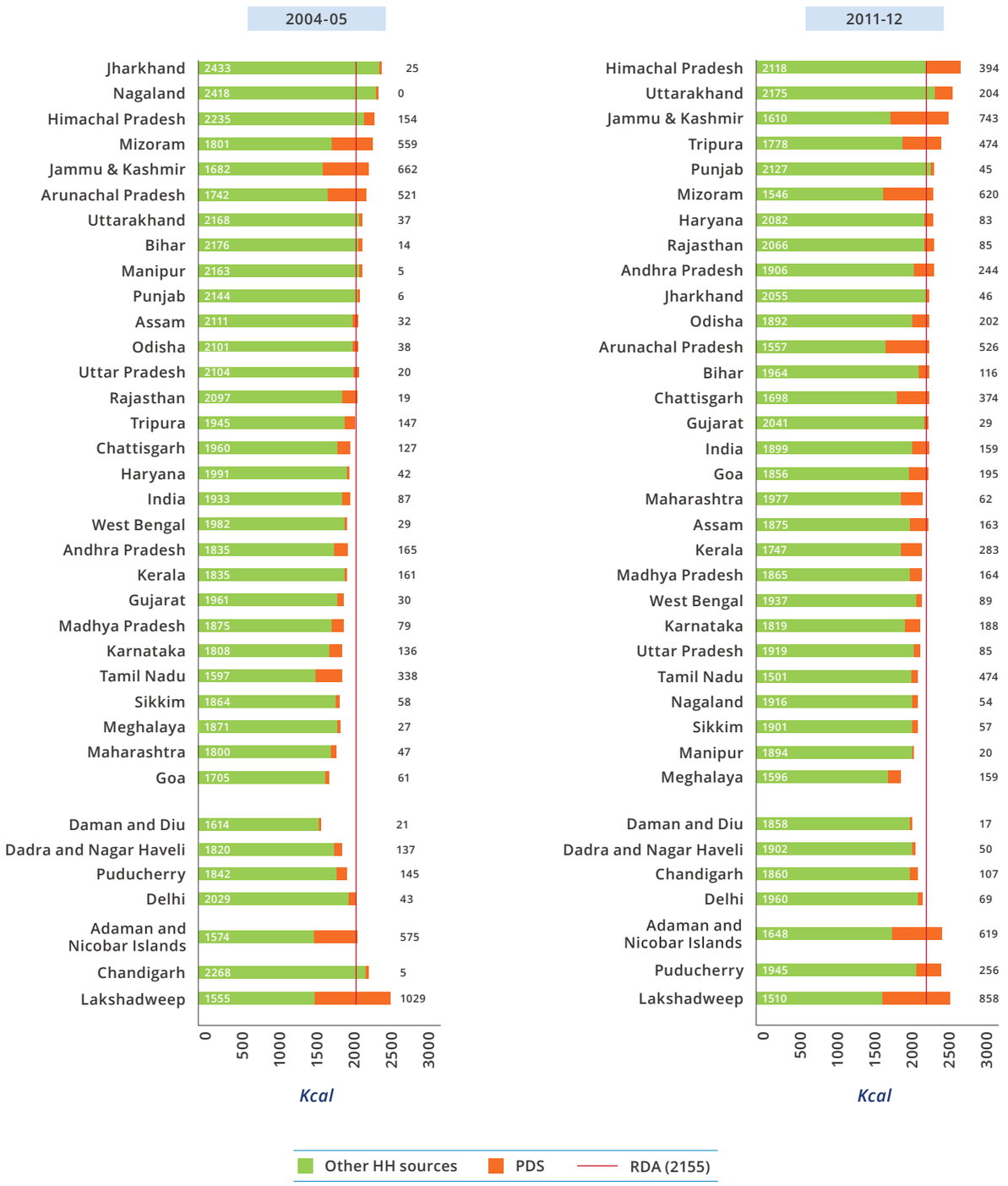
Rural areas of nine states had higher per capita per day consumption of protein than the requirement which is sourced from other HH sources, while in urban areas such states were eighteen in number (Figure 4.17 and 4.18). With the PDS coverage, only two states, Manipur and Meghalaya, could not fulfil the minimum requirement level of protein in both rural and urban areas respectively (Map 4.17 and 18). Moreover, there were eight states (Himachal Pradesh, Uttarakhand, Rajasthan, Punjab, Haryana, Jammu & Kashmir, Madhya Pradesh and Uttar Pradesh) in rural areas and seven states (Uttarakhand, Himachal Pradesh, Rajasthan, Jammu & Kashmir in urban areas, Haryana, Punjab and Madhya Pradesh) in urban areas ensuring minimum requirement of protein intake among poor people. However, without PDS support, all these states fell heavily short of protein requirements (Map 4.19 and 20). On the other hand, in 2004-05, there were three states in urban areas and six states in rural areas, that consumed higher than the required level of protein, which indicates the relative importance of PDS among the most economically vulnerable people.

Figure 4.15: *Per Capita Per Day Energy from Household Consumption and PDS Supplementation across States in Rural India, between 2004-05 and 2011-12*



Source: *61st and 68th rounds of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India*

Figure 4.16: *Per Capita Per Day Energy from Household Consumption and PDS Supplementation across States in Urban India, between 2004-05 and 2011-12*

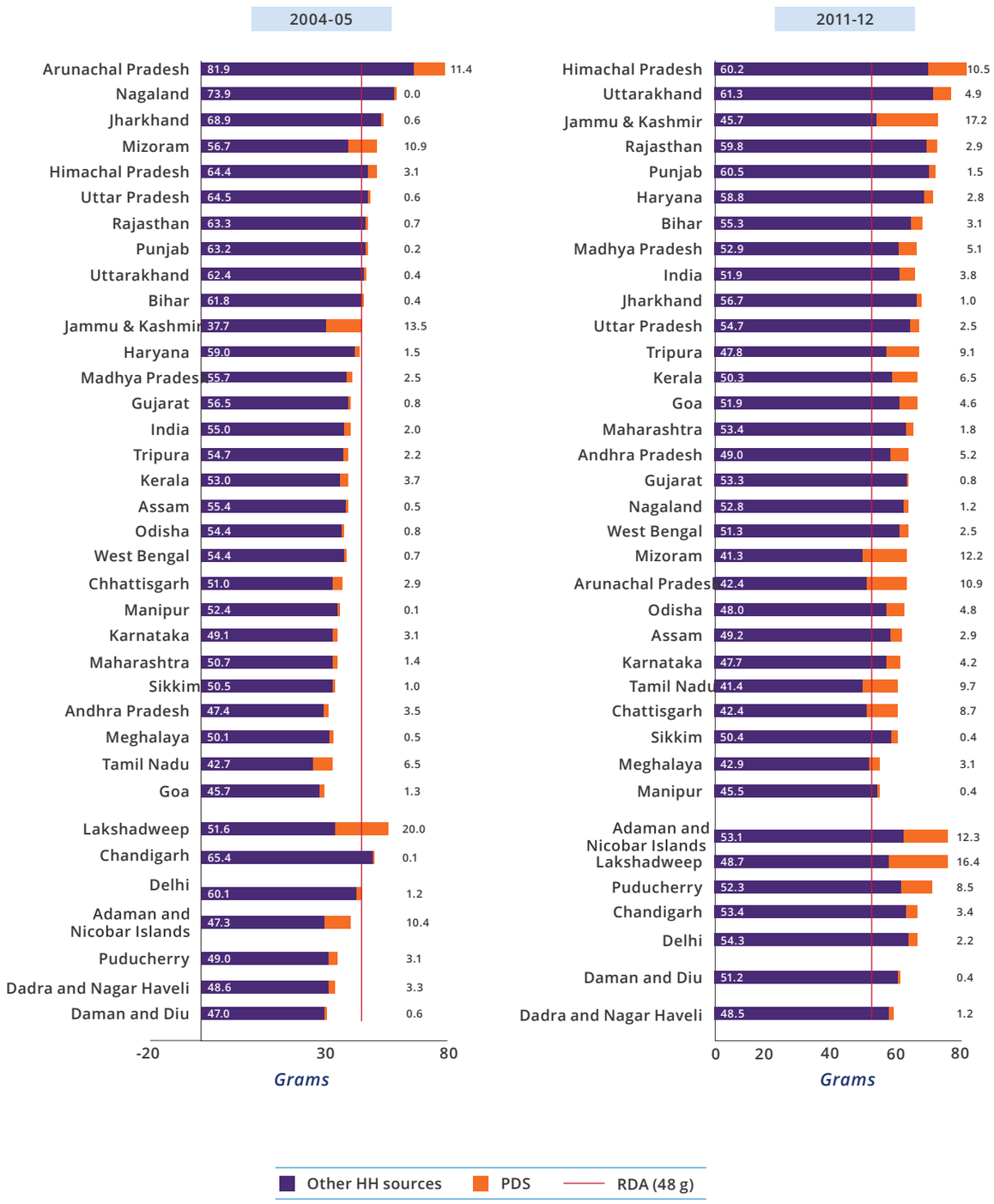


Source: *61st and 68th rounds of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India*

Figure 4.17: *Per Capita Per Day Protein from Household Consumption and PDS Supplementation across States in Rural India, between 2004-05 and 2011-12*

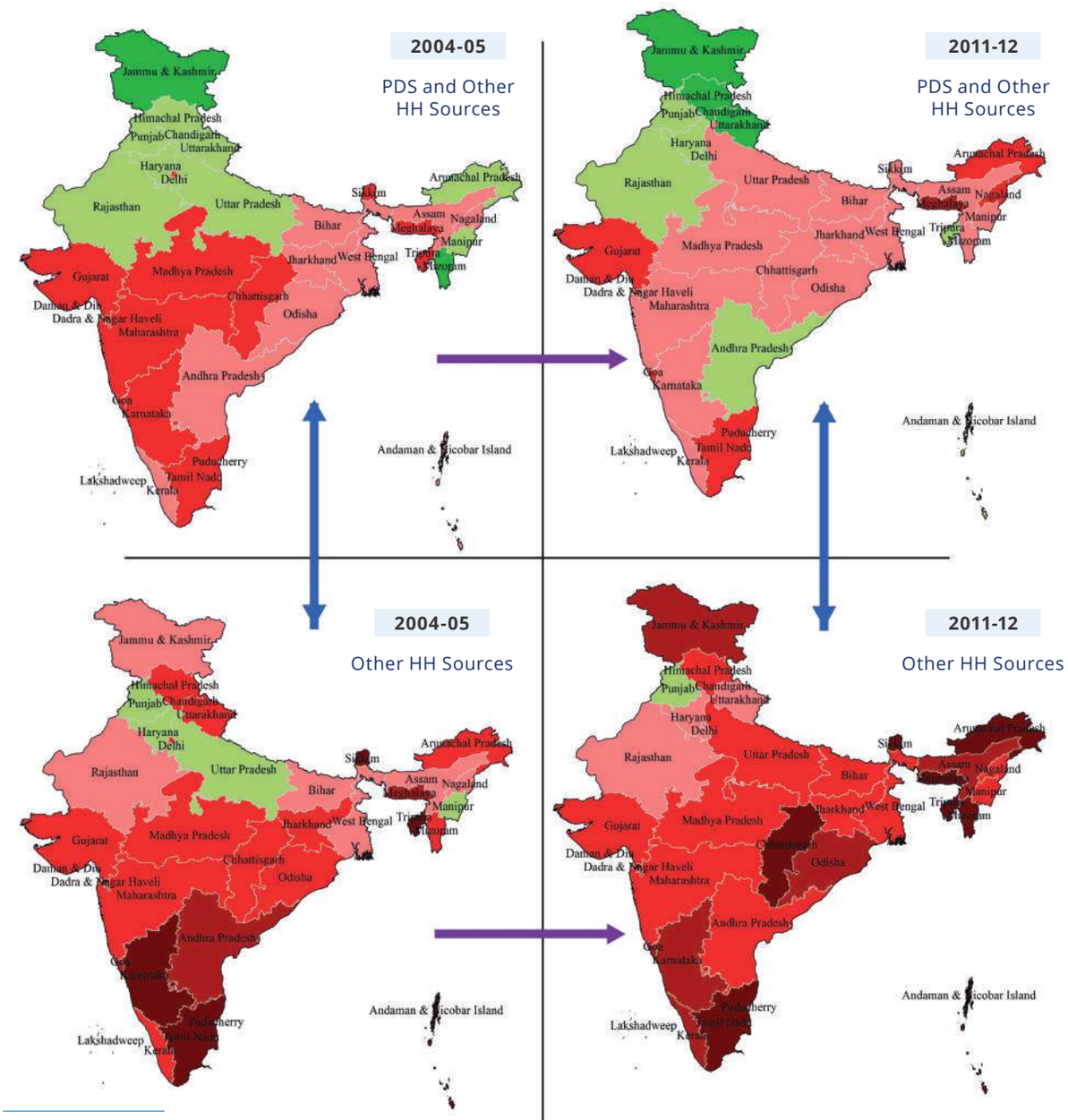
Source: *61st and 68th rounds of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India*

Figure 4.18: *Per Capita Per Day Protein from Household Consumption and PDS Supplementation across States in Urban India, between 2004-05 and 2011-12*



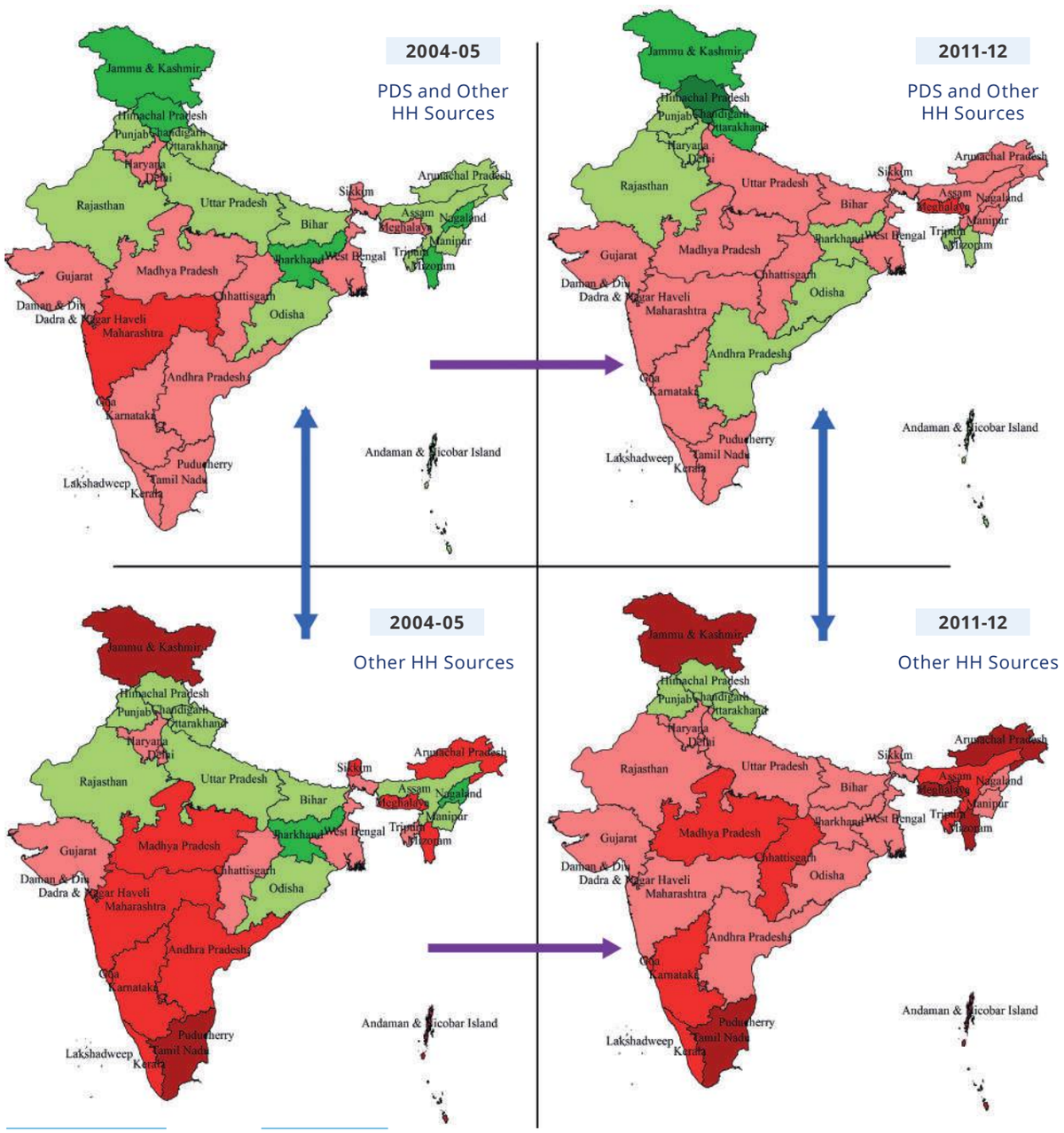
Source: *61st and 68th rounds of NSSO Consumer Expenditure Survey published by Ministry of Statistics and Programme Implementation, Government of India*

Map 4.13: *Surplus/Deficit Consumption of Energy Over RDA in Rural India between 2004-05 and 2011-12*



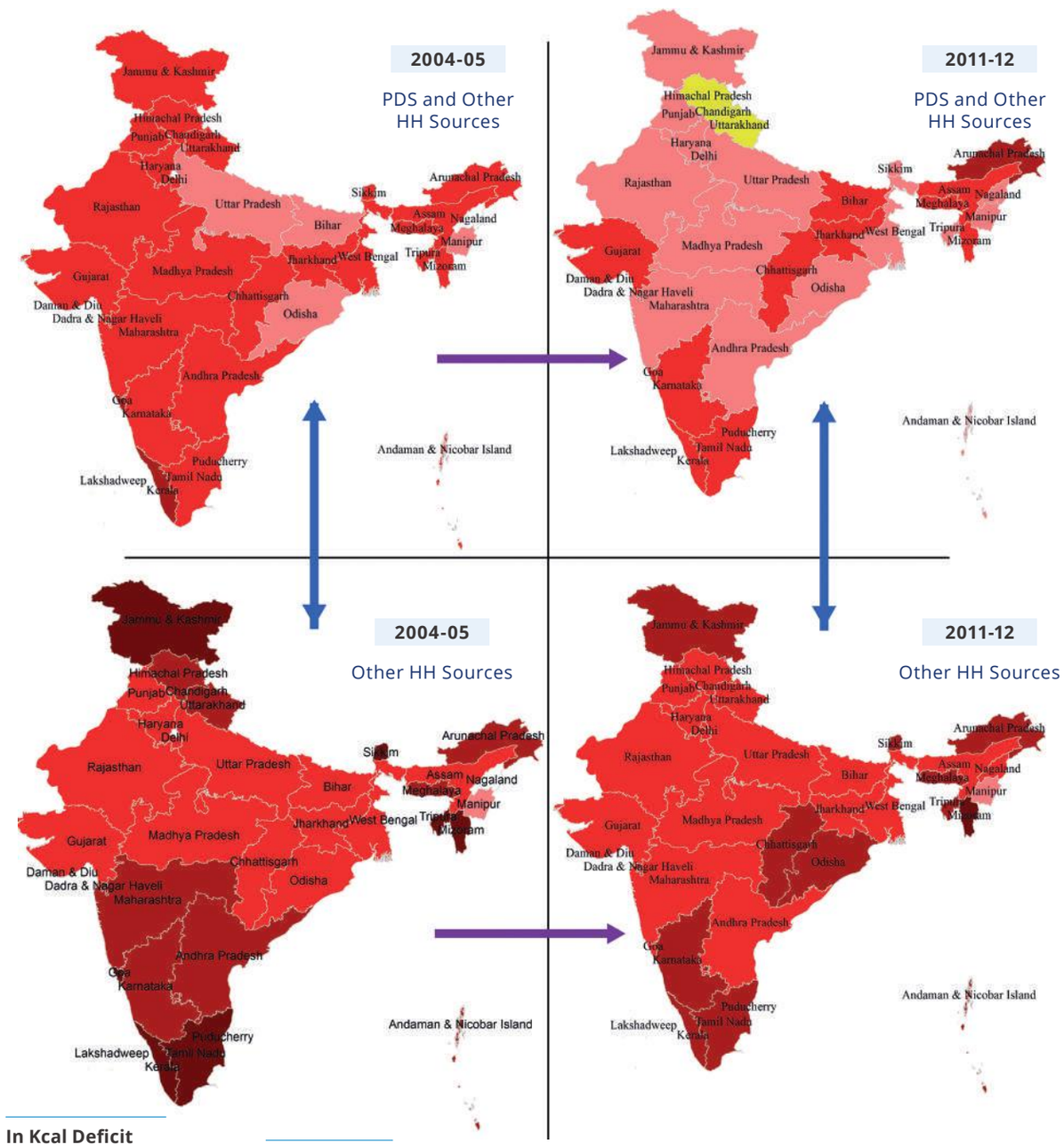
Disclamer: *Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size*
Map not to scale
Source: *National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)*

Map 4.14: *Surplus/Deficit Consumption of Energy Over RDA in Urban India between 2004-05 and 2011-12*



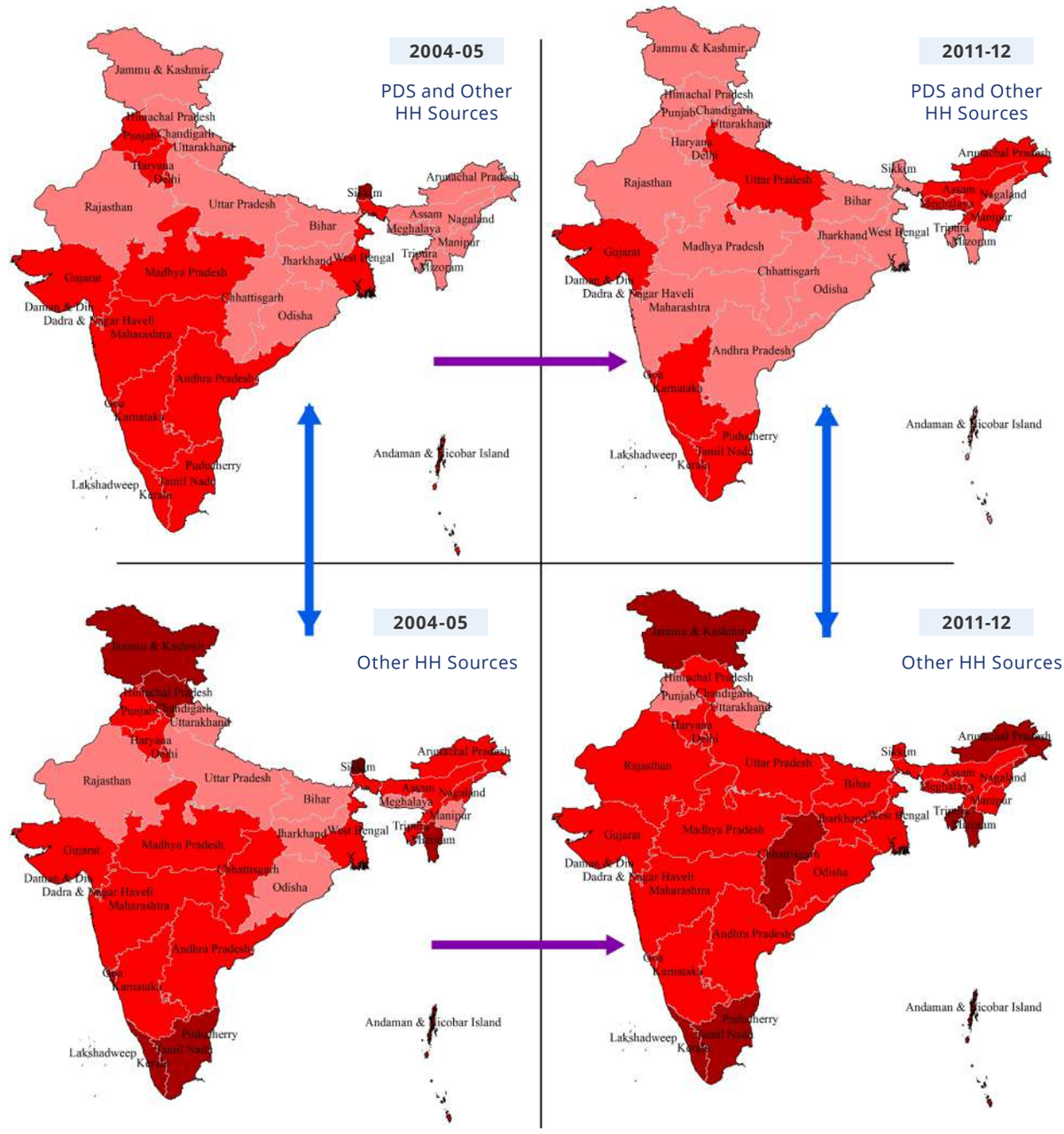
Disclamer: *Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size*
Map not to scale
Source: *National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)*

Map 4.15: *Surplus/Deficit Consumption of Energy Over RDA (among Lower 30% MPCE Class) in Rural India between 2004-05 and 2011-12*



Disclamer: *Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size*
Map not to scale
Source: *National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)*

Map 4.16: *Surplus/Deficit Consumption of Energy Over RDA (among Lower 30% MPCE Class) in Urban India between 2004-05 and 2011-12*



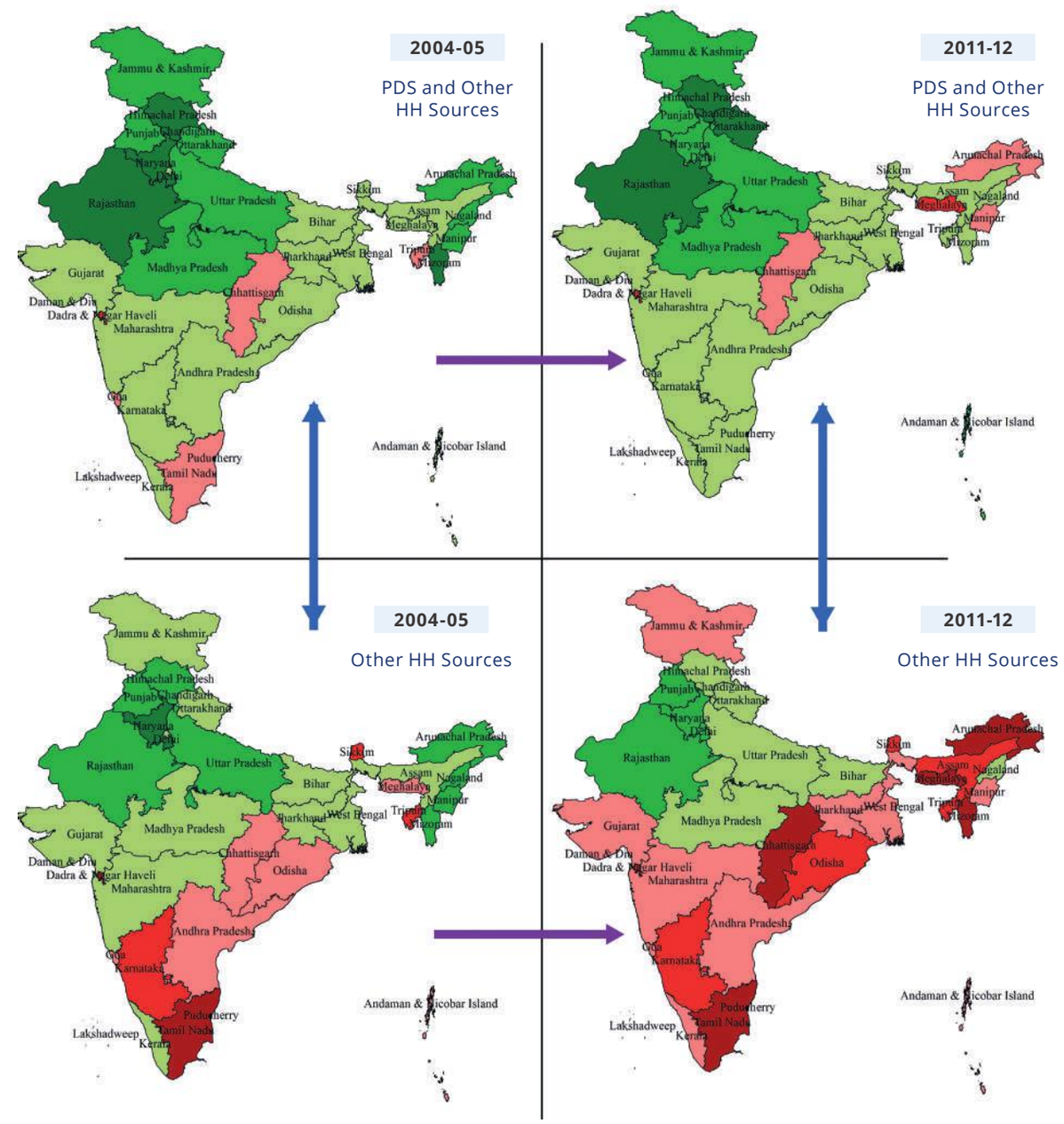
In Kcal Deficit

- (-) 1455.7 - (-) 1200
- (-) 1199 - (-) 800
- (-) 799 - (-) 400
- (-) 399-0

RDA
Energy: Rural - 2155 Urban - 2090
Actual Consumption - RDA Value = (+) Surplus
Actual Consumption - RDA Value = (-) Deficit

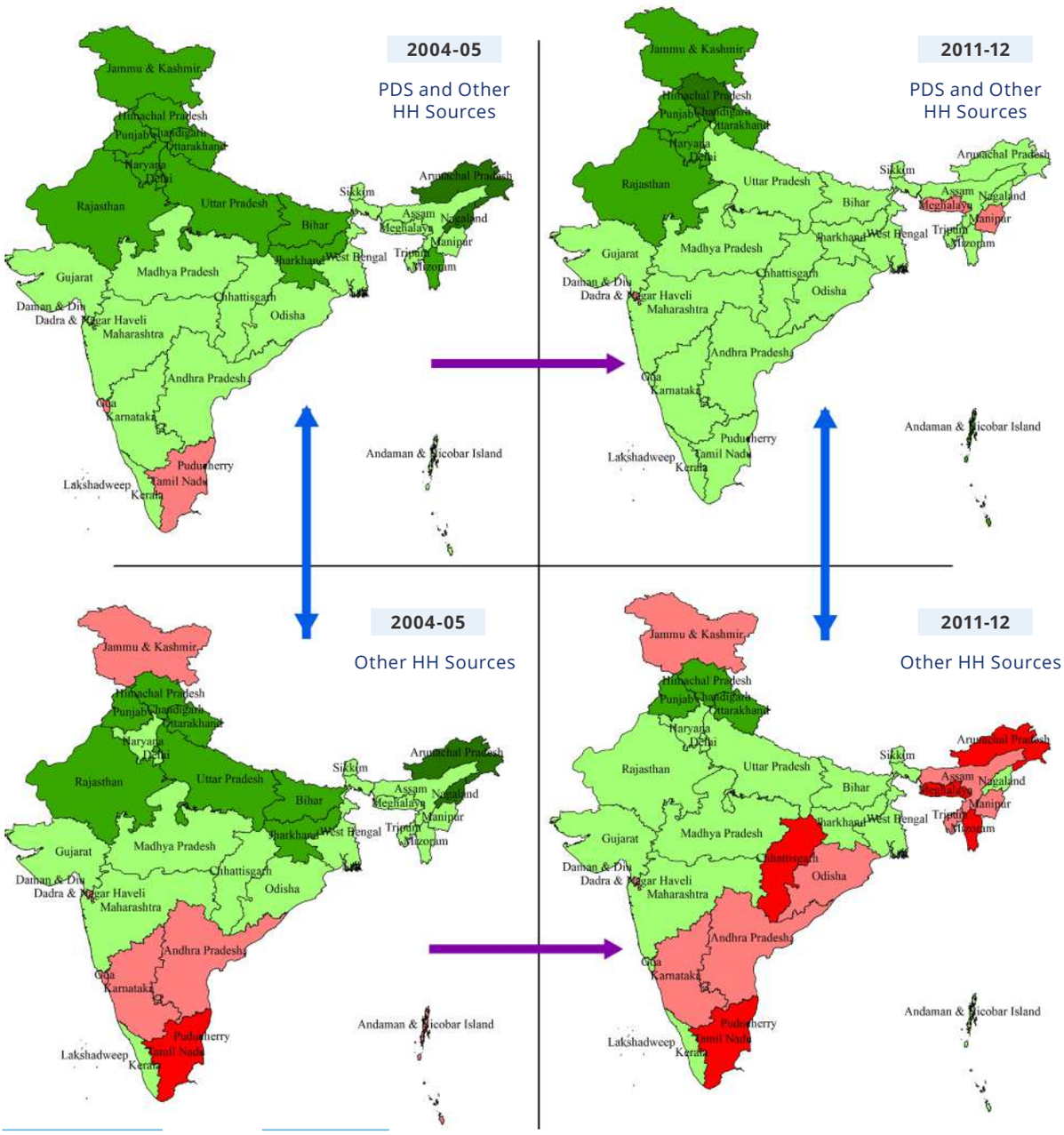
Disclamer: *Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size*
Map not to scale
Source: *National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)*

Map 4.17: *Surplus/Deficit Consumption of Protien Over RDA (among Lower 30% MPCE Class) in Rural India between 2004-05 and 2011-12*



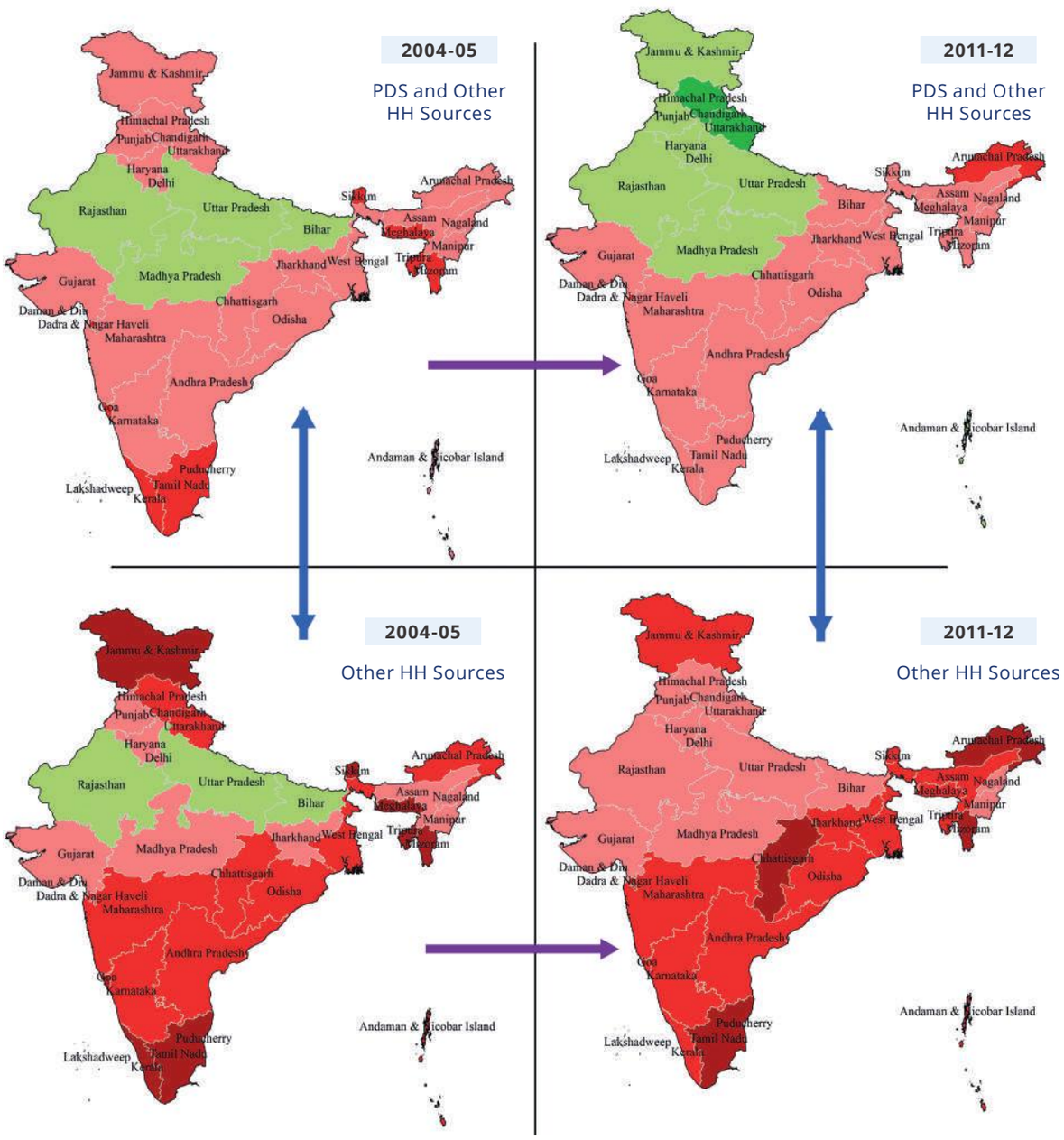
Disclamer: *Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size*
Map not to scale
Source: *National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)*

Map 4.18: *Surplus/Deficit Consumption of Energy Over RDA in Urban India between 2004-05 and 2011-12*



Disclamer: *Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size*
Map not to scale
Source: *National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)*

Map 4.19: *Surplus/Deficit Consumption of Protien Over RDA (among Lower 30% MPCE Class) in Rural India between 2004-05 and 2011-12*



In Grams Deficit

- (-) 28.6 - (-)20
- (-)19 - (-)10
- (-) 9-0

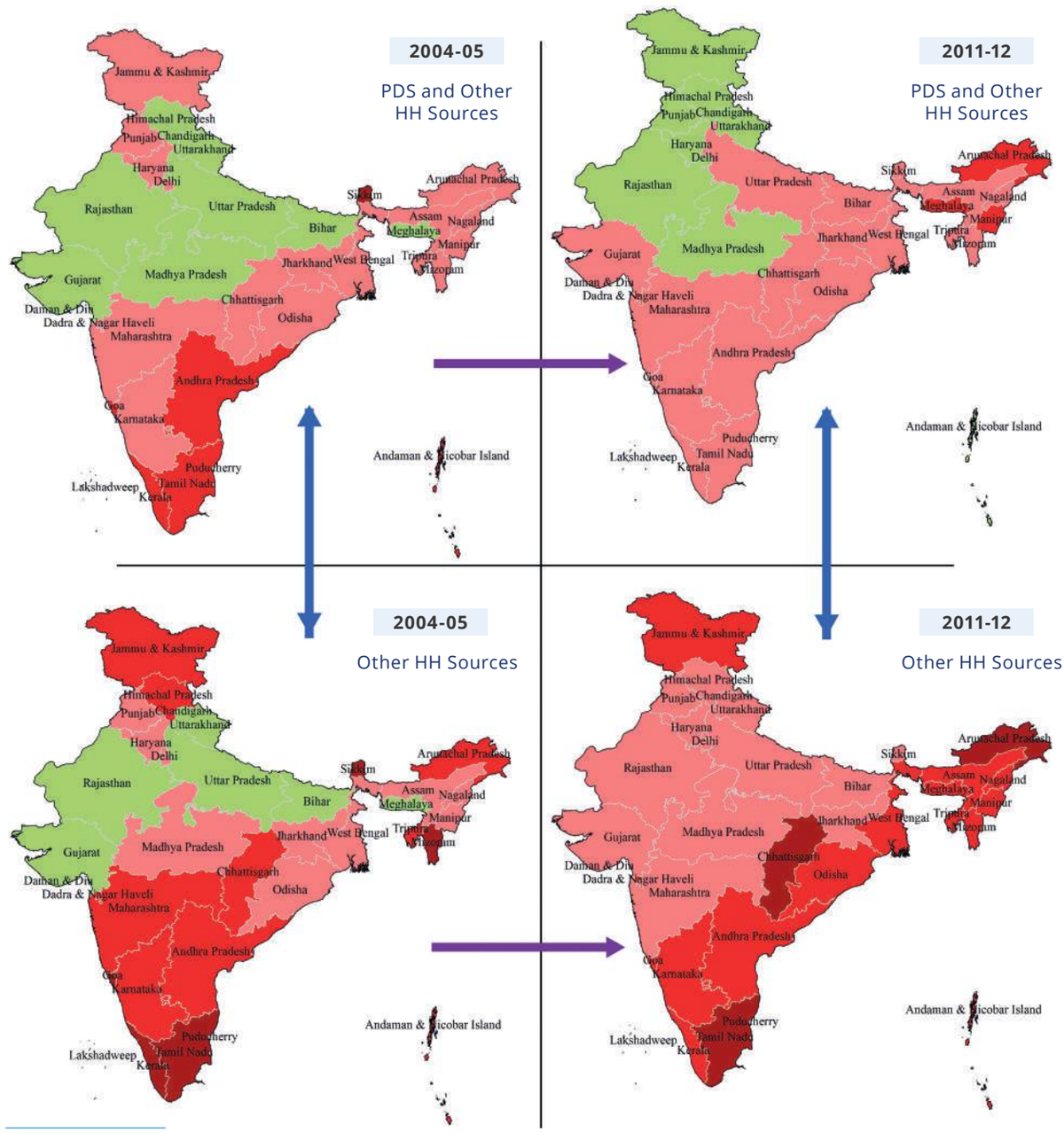
Surplus

- 1-10
- 11-13.8

RDA
Energy: Rural - 2155 Urban - 2090
Actual Consumption - RDA Value = (+) Surplus
Actual Consumption - RDA Value = (-) Deficit

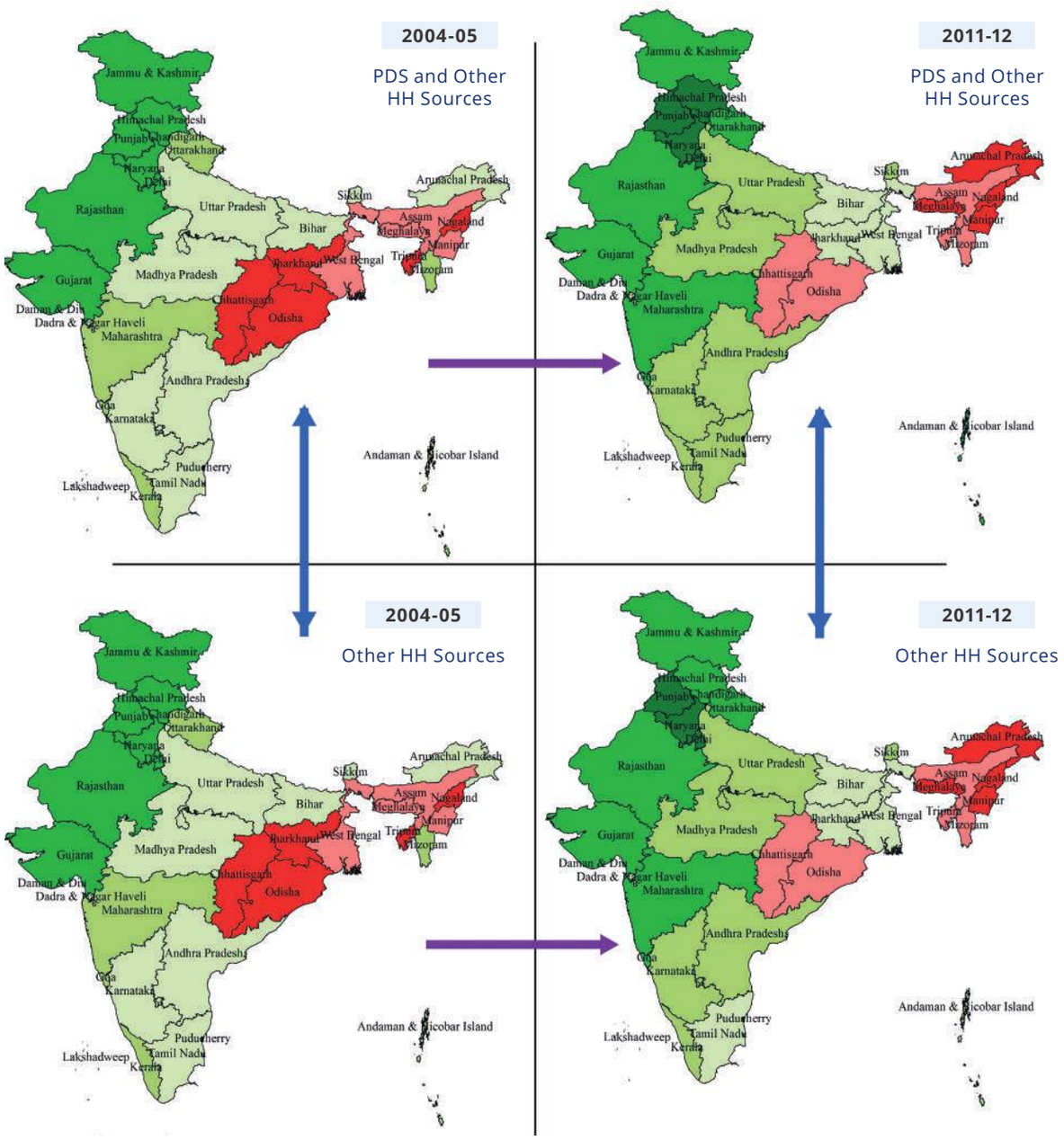
Disclaimer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size
Map not to scale
Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

Map 4.20: *Surplus/Deficit Consumption of Protien Over RDA (among Lower 30% MPCE Class) in Urban India between 2004-05 and 2011-12*



Disclamer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size
Map not to scale
Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

Map 4.21: *Surplus/Deficit Consumption of Fat Over RDA in Rural India between 2004-05 and 2011-12*



In Grams Deficit

- (-) 13.9 - (-)5
- (-) 4-0

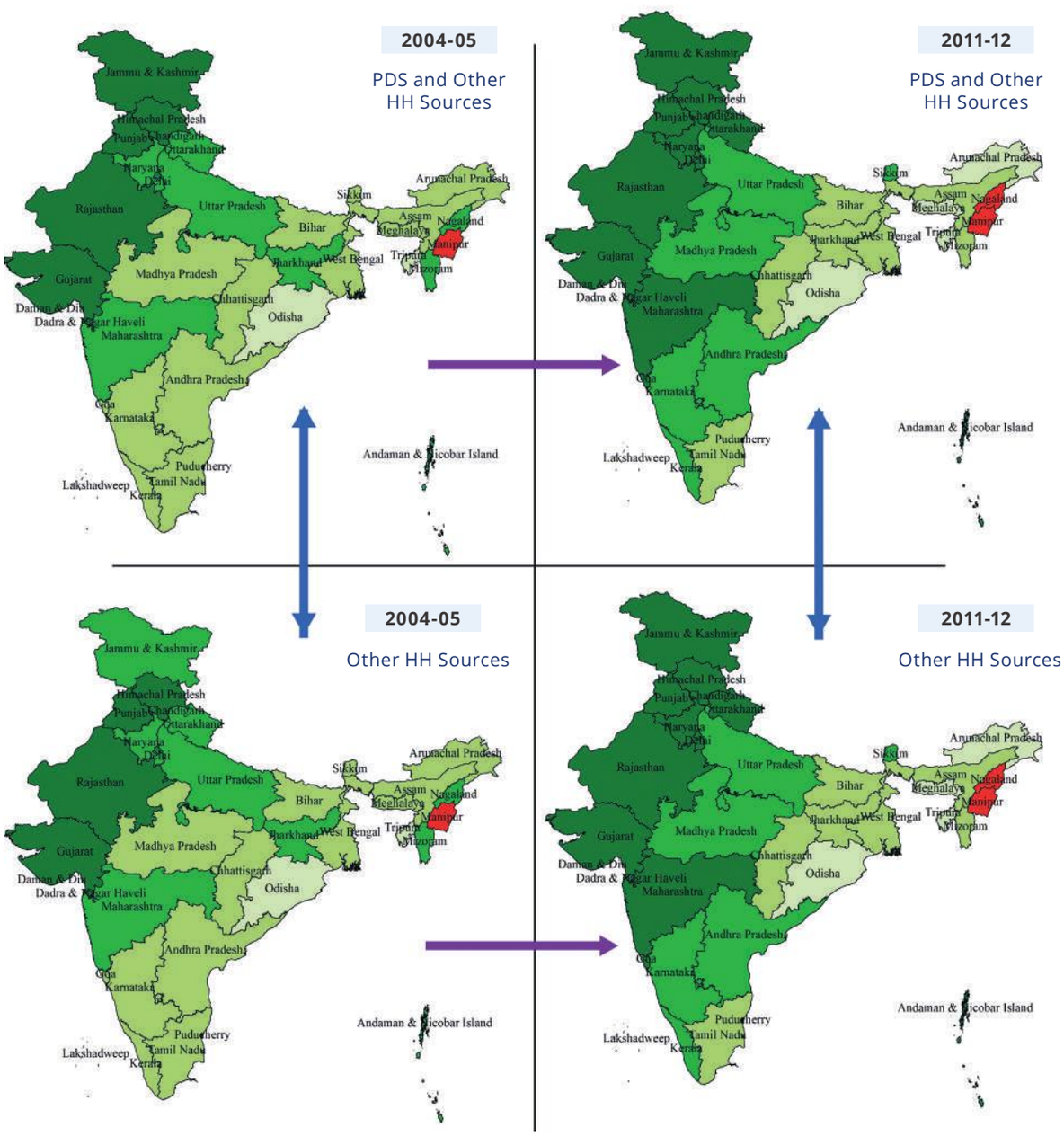
Surplus

- 1-10
- 11-20
- 21-29.2
- 31-41.4

RDA
Energy: Rural - 2155 Urban - 2090
Actual Consumption - RDA Value = (+) Surplus
Actual Consumption - RDA Value = (-) Deficit

Disclamer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size
Map not to scale
Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

Map 4.22: *Surplus/Deficit Consumption of Fat Over RDA in Urban India between 2004-05 and 2011-12*



Disclamer: Average consumption figures of the states are presented here, at times, small states figures maybe misleading due to small sample size
Map not to scale
Source: National Sample Survey Office (NSSO), 61st Round (2004-05) and 68th Round (2011-12)

4.6 Conclusions

This chapter discusses the out of pocket expenditure on food. It also explains nutritional intake of energy, protein and fat against the recommended dietary norms. The following key observations can be made from the analysis.

- It has been observed that the expenditure on food in both rural and urban areas has declined over time but are still very high particularly among poor households. Higher share of food expenditure in the total household expenditure is indicative of the stress that households experience to acquire food, hence this is a relative measure of food insecurity. Declining trend in the share of expenditure on food suggest that food is no longer the predominant expenditure for the people. Instead, the expenditures on other heads like transportation and health care now take a substantial share of the household's income.

- In the food basket, it is observed that in both urban and rural areas, the percentage share of cereal & substitutes expenditure has declined significantly over the last couple of decades. For the same period, the relative importance of some items, especially beverages, milk and milk products and fruits and nuts, among the group of food item expenditure, have shown a remarkable increase. This indicates a significant shift in consumption pattern in both rural and urban areas.

- The per capita per day consumption of energy and protein has fallen in rural India and shows no particular change in trend in urban India. This is occurring against the increase in household per capita expenditure. The energy consumption trends suggest that though the per capita per day consumption of energy has increased in recent past (2004-05 and 2011-12), energy intake has been marginally lower than the minimum energy requirement. In case of protein intake, despite the declining trends, both in rural and urban areas, per capita per day consumption shows higher than daily minimum consumption requirement. Among three nutrients, only fat intake shows an increasing trend since 1983 and has been much higher than the daily minimum consumption requirement.

- In the food basket, the contribution of cereals to energy and protein intake has fallen in both rural and urban India. The decline in the share of cereals in the total consumption of food has largely been substituted by rich food items such as milk and its products, oils and fat and miscellaneous food products (consisting of relatively unhealthy food such as fast food, processed food, beverages, etc.,). This has implications on the emerging problem of obesity in India.

- Casual labour among the occupation class and SC, ST and OBC in the social categories in both rural and urban areas are the most vulnerable in terms of per capita per day consumption of energy.

- In most states, the per capita per day intake of energy and protein was higher in rural India than urban India. In case of fat intake, it was observed that urban India consumed more than rural India. This implies the changing food basket in urban areas, people are consuming more rich food (especially fast food) rather than cereals which is also reflected in the food expenditure shift.

- In urban areas, eleven states consumed less energy, two states (Manipur and Nagaland) consumed less protein and two states (Meghalaya and Manipur) consumed less fat that the minimum requirement.

- The states that need immediate attention for nutritional interventions in case of all the three nutrients i.e. energy, protein and fat are north eastern states of Manipur, Meghalaya, Mizoram. Apart from these states, the other states that also need attention on account of high percentage of nutritional deprivation in terms of both energy and protein are Assam, Tamil Nadu, Arunachal Pradesh, Chhattisgarh, Uttar Pradesh and Bihar.

- The nutritional intake from the Public Distribution System (PDS) has provided a significant safety cover to the people across all states in India. Though both rural and urban areas were heavily short of energy requirements, even after the energy support from PDS, people are able to manage their protein requirements without PDS support in both areas. Higher meat and dairy intake in both rural and urban areas (even among poor people) is one of the reasons for fulfilling the minimum requirements of protein.

- As far as the poor households are concerned, most of them consumed less than the requirement. Their household capability to access food was also low and as a result, despite the PDS support, they were not able to reach the RDA levels of energy and protein intake.

- State level analysis suggests that PDS has had a huge impact on energy and protein intake. When energy is sourced from only household (HH) sources, only Punjab in rural areas and three states namely, Himachal Pradesh, Uttarakhand and Punjab in urban areas consumed above RDA level of energy. If we add up the PDS support in these states, then eight states in rural areas and eleven states in urban areas show higher consumption of energy per capita per day than the RDA level.

- There were only nine states with higher per capita per day consumption of protein than the requirement, sourced from other household sources, in rural areas, while in urban areas the number of states was eighteen. With the PDS coverage, rural Manipur and urban Meghalaya were not able to fulfil the minimum requirement level of protein in both rural and urban areas respectively.

Thus, there is a definite pattern of shift taking place from food to non-food expenditure of the household. Consumption pattern of energy, protein and fat has also observed marked change. The study also shows that the food-safety programme of government such as PDS has improved access to minimum energy and protein requirement among people particularly among the poor and the vulnerable across states and Union Territories.

CHAPTER FIVE

FOOD UTILIZATION

Nutritional Status of Men, Women and Children

5.1 Background

Food utilization is commonly understood as the way in which our body absorbs nutrients from the food we consume. Sufficient energy and nutrient intake by individuals is the result of good feeding practices, food preparation, diversity in the diet and intra-household distribution of food. This, combined with good biological utilization of food consumed. determines the nutritional status of individuals (FAO, 2008).

Box 5.1: ***Food Utilization***

(i) A household's use of the food to which they have access; and (ii) individual's ability to absorb and mobilize nutrients (i.e., the efficiency of food conversion by the body).

(CFSVA Guidelines – WFP, 2009)

5.2 Nutrition

Predictor Vs. Outcome

The impact of inadequate nutrition perpetuates not only at individual level but also affects the macro level outcomes. At the individual level, the cycle of intergenerational malnutrition sets in at an early stage of life. From an undernourished mother to low birth-weight babies, malnutrition perpetuates through childhood and adolescence and is compounded by inadequate feeding, limited access to health

facilities, early marriages and early and frequent pregnancies. Malnutrition restricts the cognitive and physical development, that consequently leads to poor educational and economic attainment perpetuating poverty[1]. This, creates a vicious cycle, which continues unless intervened at the right time. Higher proportion of inadequately nourished workforce leads to higher burden of morbidity and mortality, and adversely affects the overall income of a country. Various studies have estimated the economic cost of malnutrition ranging between 2 to 3 percent of the Gross Domestic Product (GDP) and as high as 16 percent in most affected countries[2].

A balanced and nutritious diet is vital for good health and well-being. Food is the primary source that provides the required essential nutrients - energy, proteins, fats, vitamins and minerals - to live, grow and lead an active and healthy life. A healthy and active population can transform the socio-economic scenario of a country. Nutrition is far more important in achieving the national and global targets of SDGs and is thus not just an outcome but also a predictor of a country's future. Increasing recognition of this, at the policy level is compelling higher attention and investments in nutrition.

5.3 Status of Nutritional Outcomes in India

Malnutrition is not just caused by the lack of adequate and nutritious food, but by many other factors including frequent illness, poor care practices and lack of access to health and other social services. These multifactorial determinants of health and nutrition have been classified into immediate, intermediate and underlying factors (UNICEF, 1990). This section presents the status of nutritional outcomes in terms of mortality, malnutrition and micronutrient deficiency in order to understand food utilization in the country.

5.3.1 Infant and Under-five Mortality

Despite significant reduction in infant and under-five mortality in India during last two decades, current mortality rates continue to be alarmingly high. During 2005-2016, Infant Mortality Rate (IMR) declined from 57 to 41 deaths per thousand live births and Under-five Mortality Rate (U5MR) reduced from 74 to 50 deaths per thousand live births in India (Figure 5.1). IMR and U5MR both are relatively high for boys (IMR: 29.3 & U5MR: 34.9) than girls (IMR: 27.7 & U5MR: 33.9). Infant and under-5 mortality rate has declined in all the states (except Mizoram) and UTs during 2005-2016; Arunachal Pradesh has recorded highest reduction in the IMR and U5MR, followed by Odisha and Jharkhand. In 2015-16, Uttar Pradesh had the highest level of IMR (64) and U5MR (78) followed by Madhya Pradesh and Chhattisgarh. Seven states have recorded IMR/U5MR above the national average, viz. Uttar Pradesh (IMR: 64 & U5MR: 78), Madhya Pradesh (IMR: 51 & U5MR: 65) , Chhattisgarh (IMR:54 & U5MR: 64), Bihar (IMR:48 & U5MR: 58), Assam

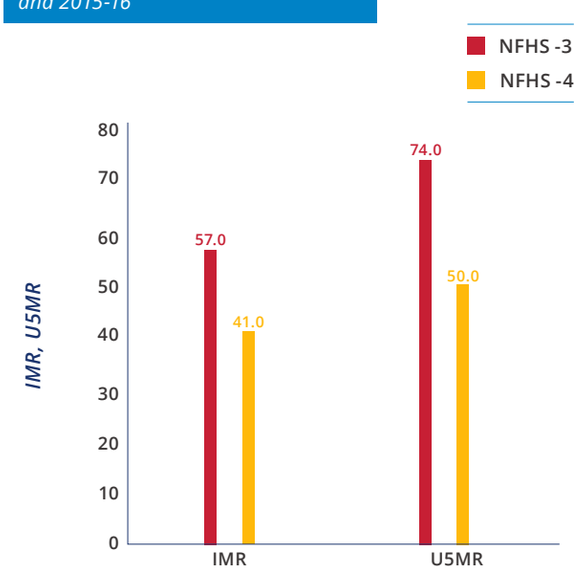
[1]*Repositioning Nutrition as Central to Development: A strategy for Large Scale Action, The World Bank, 2006*

[2]*Ibidem.*

(IMR:48 & U5MR: 56), Jharkhand (IMR:44 & U5MR: 54) and Rajasthan (IMR:41 & U5MR: 51) (Map 5.1 and 5.2).

While infant mortality is closely linked with maternal and child health facilities, antenatal care and newborn care; under-5 mortality is linked with factors such as immunization, poverty and childhood morbidity. Under-5 mortality is also an indicator of assessing social practices, public policies and their effectiveness- together, indicating the overall quality of life. About 45 percent of mortality among children under 5 years of age is attributable to maternal and child undernutrition (Black et al., 2013), most of them are preventable through effective nutrition interventions. Government of India has initiated the POSHAN Abhiyan (National Nutrition Mission, NNM) to improve child survival and reduce maternal and child malnutrition covering 315 districts during the first phase of its implementation in 2017-18 (Table 5.1).

Figure 5.1: *Infant mortality and under-five mortality, Inda, 2005-06 and 2015-16*



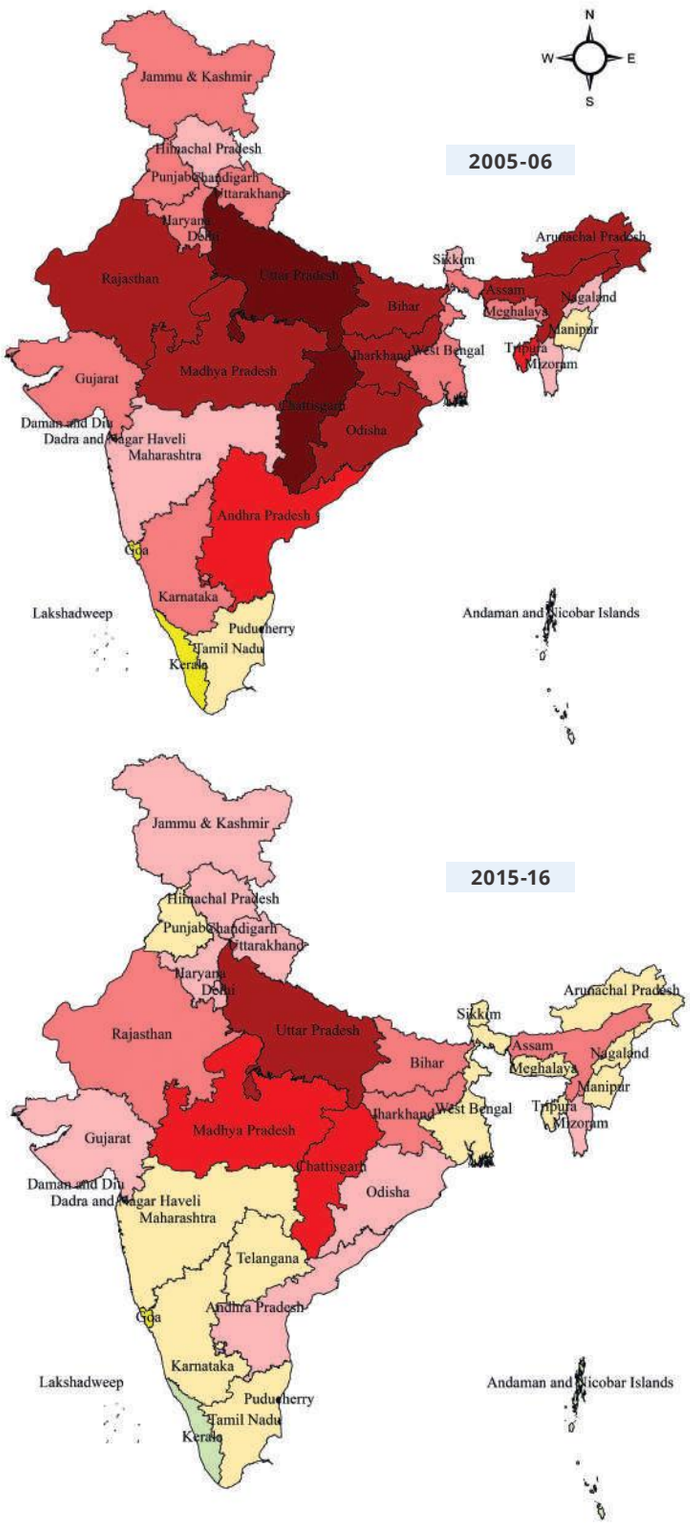
Source: *National Family and Health Survey (NFHS), 2005-06 and 2015-16*

Table 5.1: *States/UTs-wise Districts covered in Phase I of NNM, 2017-18*

S.No.	State / UT	Number of Districts
1	Andaman and Nicobar (UT)	1
2	Andhra Pradesh	10
3	Arunachal Pradesh	1
4	Assam	5
5	Bihar	37
6	Chandigarh (UT)	1
7	Chhattisgarh	12
8	Dadra and Nagar Haveli (UT)	1
9	Daman and Diu (UT)	1
10	Delhi (NCT)	2
11	Goa	2
12	Gujarat	10
13	Haryana	2
14	Himachal Pradesh	4
15	Jammu and Kashmir	1
16	Jharkhand	18
17	Karnataka	9
18	Kerala	3
19	Lakshadweep (UT)	1
20	Madhya Pradesh	37
21	Maharashtra	22
22	Manipur	2
23	Meghalaya	5
24	Mizoram	2
25	Nagaland	2
26	Odisha	11
27	Puducherry (UT)	1
28	Punjab	4
29	Rajasthan	24
30	Sikkim	1
31	Tamil Nadu	5
32	Telangana	3
33	Tripura	1
34	Uttar Pradesh	64
35	Uttarakhand	4
36	West Bengal	6
	Total	**315**

Source: *Ministry of Women and Child Development, GoI*

Map 5.1: *Infant Mortality Rate in India, 2005-06 and 2015-16*



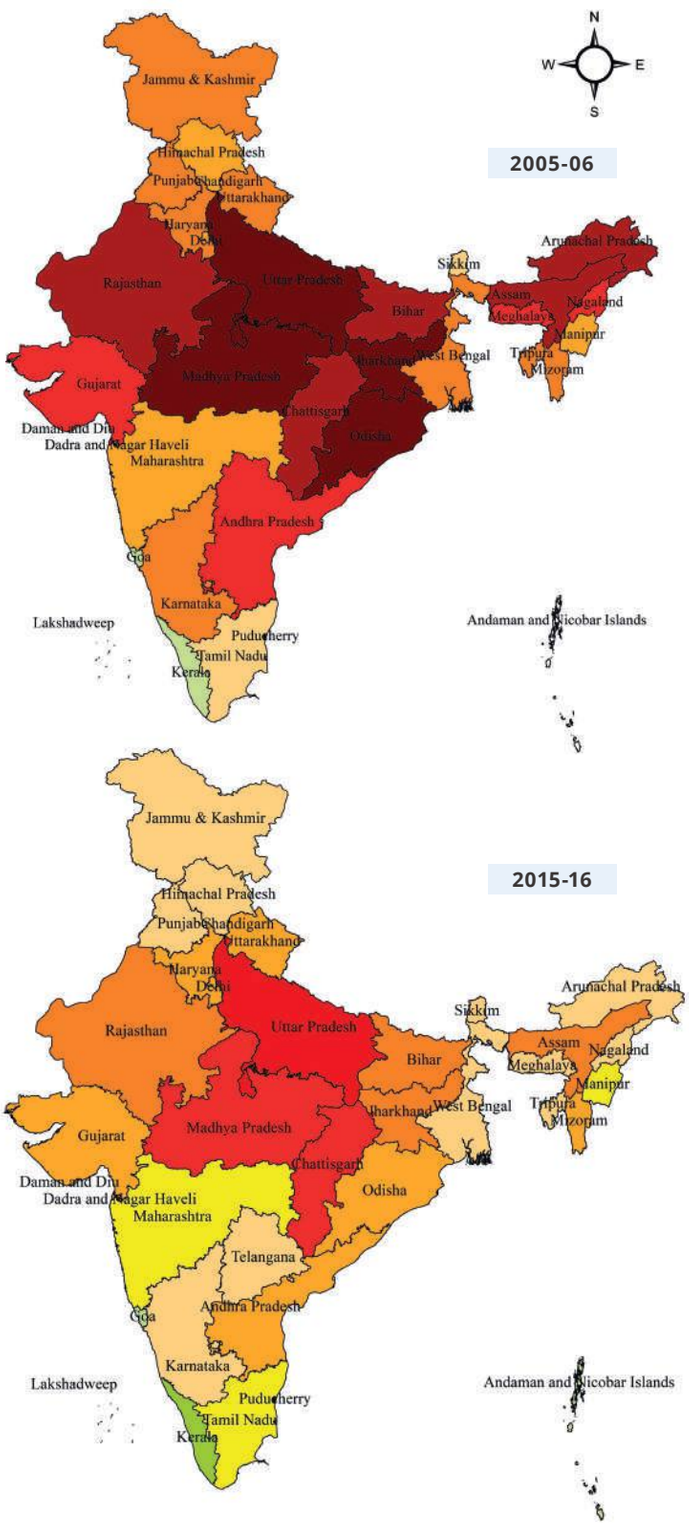
IMR (Per thousand live births)

- 70-80
- 60-70
- 50-60
- 40-50
- 30-40
- 20-30
- 10-20
- 0-10
- No Data

Map not to scale

Source: National Family and Health Survey, 2005-06 and 2015-16

Map 5.2: *Under-Five Mortality Rate in India, 2005-06 and 2015-16*



U5MR (Per thousand live births)

- 90-100
- 80-90
- 70-80
- 60-70
- 50-60
- 40-50
- 30-40
- 20-30
- 10-20
- 0-10
- No Data

Map not to scale

Source: National Family and Health Survey, 2005-06 and 2015-16

5.3.2 Malnutrition Among under-5 Children

Nutritional status among children is measured through three main indicators- height-for-age (stunting representing chronic malnutrition), weight-for-age (underweight- depicting inadequate food intake and poor health conditions) and weight-for-height (wasting –a result of recent period of starvation).

Figure 5.2 shows level and trend in prevalence of malnutrition among under-five children in India. Prevalence of stunting has declined from 48.0 percent in 2005-06 to 38.4 percent in 2015-16 and underweight has declined from 42.5 percent to 36.7 percent during same time-period. Contrary to this, prevalence of wasting and severe wasting has marginally increased during 2005-2016 which is a cause of concern.

Map 5.3, 5.5 and 5.7 shows the state-wise pattern of malnutrition in 2005-06 and 2015-16, using internationally accepted public health significance cut-offs (Box 5.3) for stunting, wasting and under-weight (UNICEF, WHO and World Bank, 2018).

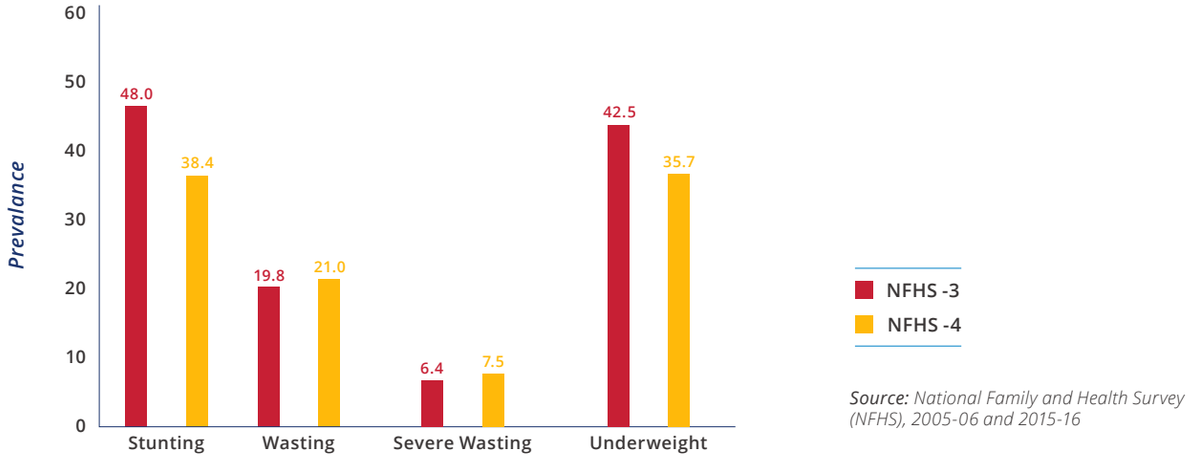
Box 5.2: *Measures of Malnutrition (Undernutrition)*
Stunting, wasting and underweight are indicators for various dimensions of malnutrition. Each index provides different information about growth and body composition, which is used to assess nutritional status.
Stunting (height-for-age) is an indicator of linear growth retardation and cumulative growth deficits. It reflects failure to receive adequate nutrition over a long period of time and is also affected by recurrent and chronic illness. Height-for-age, therefore, represents the long-term effects of malnutrition in a population and does not vary according to recent dietary intake.
Wasting (weight-for-height) measures body mass in relation to body length and describes current nutritional status and describes acute malnutrition. Wasting represents the failure to receive adequate nutrition in the period immediately preceding the survey and may be the result of inadequate food intake or a recent episode of illness causing loss of weight and the onset of malnutrition.
Underweight (weight-for-age) is a composite index of height-for-age and weight-for-height. It considers both acute and chronic malnutrition.
Each of the three nutritional status indicators are expressed in standard deviation units (Z-scores) from the median of the reference population. Children falling in -2SD and -3SD zones are classified into moderate and severe categories. These indicators are measured with reference to the WHO growth standards.
Source: *NFHS-4, 2015-16, International Institute for Population Science*

Box 5.3: *Classification of Malnutrition, given by UNICEF, WHO and World Bank*

Classification/ Indicators	Very Low	Low	Medium	High	Very High
Stunting	<2.5 percent	2.5- <10	10- <20	20- <30	≥30 percent
Wasting	<2.5 percent	2.5- <5	5- <10	10- <15	≥15 percent
Underweight		<10 percent	10- <19	20- <29	≥30 percent

Source: Levels and Trends in Child Malnutrition, UNICEF, WHO and World Bank, 2018

Figure 5.2: *Malnutrition among Under-five Children in India, 2005-06 and 2015-16*

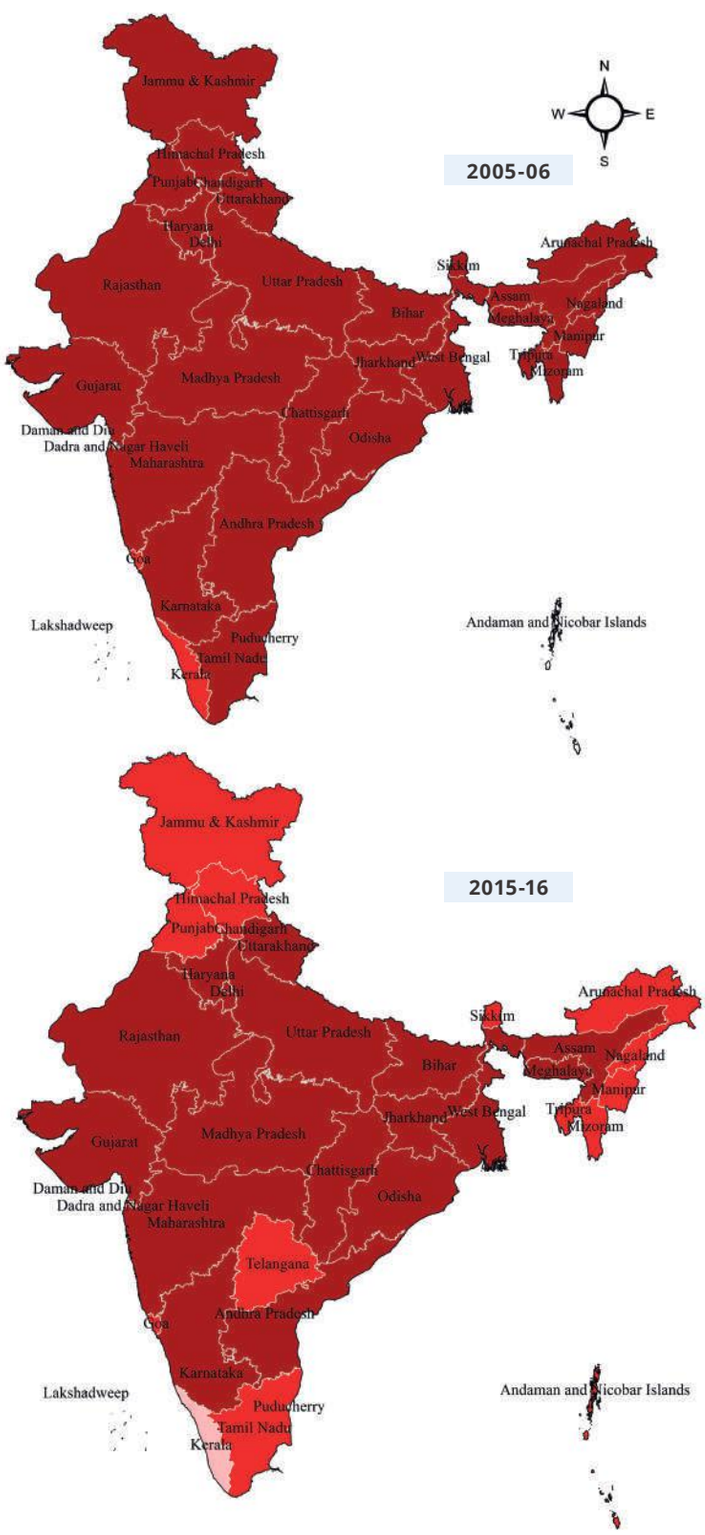


Source: National Family and Health Survey (NFHS), 2005-06 and 2015-16

Although states across India have shown reduction in the prevalence of malnutrition in the last decade, yet majority of the states fall in 'very high' category and few states in 'high' category. Kerala is the only state which has recorded medium level of stunting (19.7 percent). Mizoram (6.1 percent) and Manipur (6.8 percent) falls in medium category of wasting; and Mizoram (11.9 percent), Manipur (13.8 percent), Sikkim (14.2 percent), Kerala (16.1 percent), Jammu & Kashmir (16.6 percent) and Nagaland (16.8 percent) are in medium category for under-weight among under-5 children.

Highlights: *Child Malnutrition (0-5 years), NFHS-3 and 4*
Chronic malnutrition: In 2015-16, 38.4% of children were stunted against 48% in 2005-06.
Acute malnutrition: In 2015-16, 21.0% of children were wasted against 19.8% in 2005-06.
In 2015-16, 35.7% of children were underweight against 42.5% in 2005-06.
Place of residence have considerable impact on malnutrition. Almost no sex differential noticed in malnutrition.
Poorest wealth quintile has highest stunting, wasting and underweight prevalence (51.4%, 24.2%, 48.6%) against highest wealth quintile (22.2%, 17.9%, 20.1%).
Mothers having low BMI have higher prevalence of stunted, wasted and underweight children (45.8%, 26.7%, 47.8%), indicative of intergeneration malnutrition cycle.
Children of higher birth order (6+) have higher prevalence of stunting, wasting and underweight (55.0%, 22.6%, 49.7%)
Children of illiterate mothers have higher chances of stunting, wasting and underweight

Map 5.3: *Prevalence of Stunting among Under-five Children in India (using WHO Classification), 2005-06 and 2015-16*



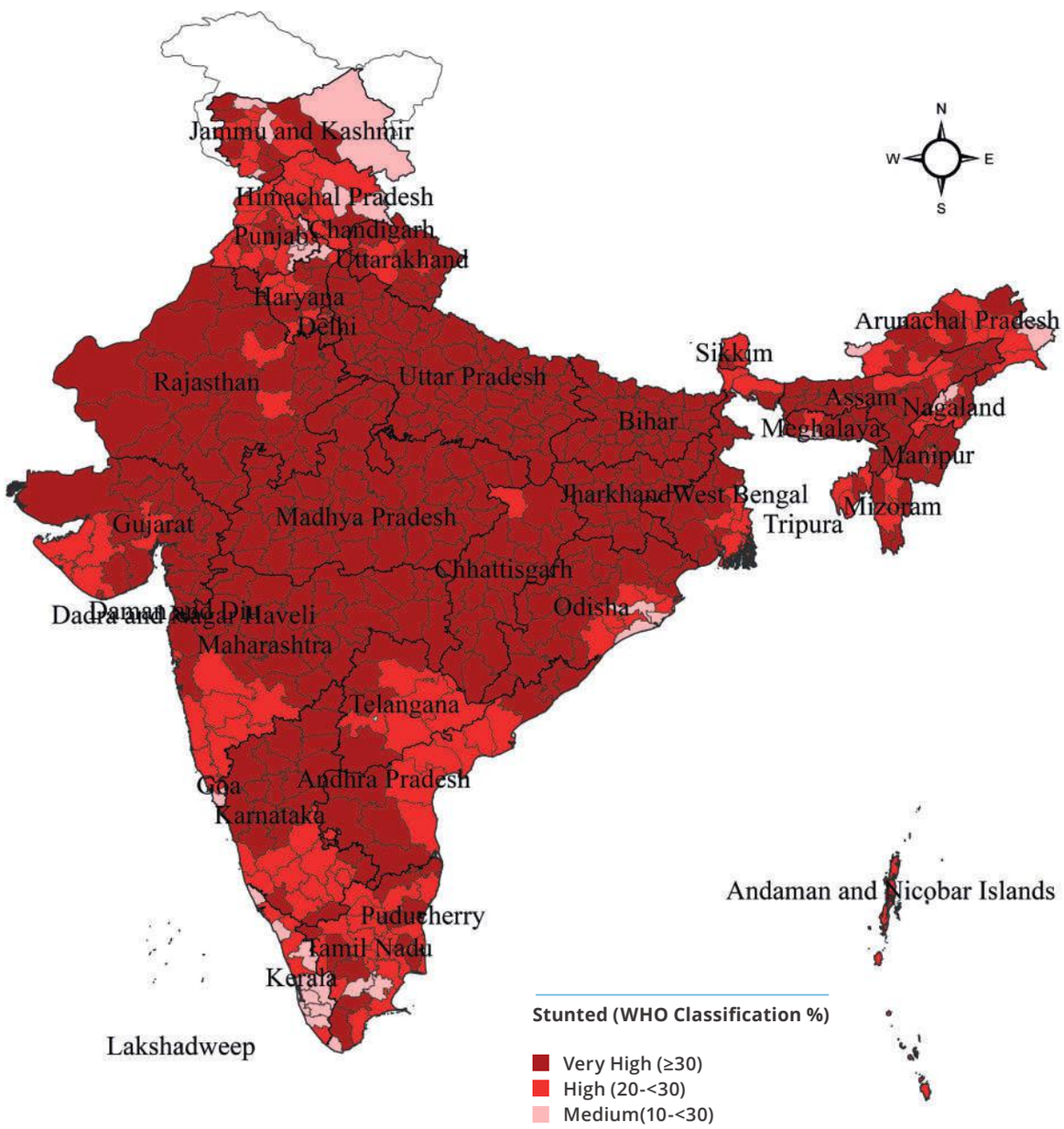
Stunted (WHO Classification %)

- Very High (≥30)
- High (20-<30)
- Medium(10-<30)
- Low (2.5-<10)
- Very Low (<2.5)
- No Data

Map not to scale

Source: *National Family and Health Survey, 2005-06 and 2015-16*

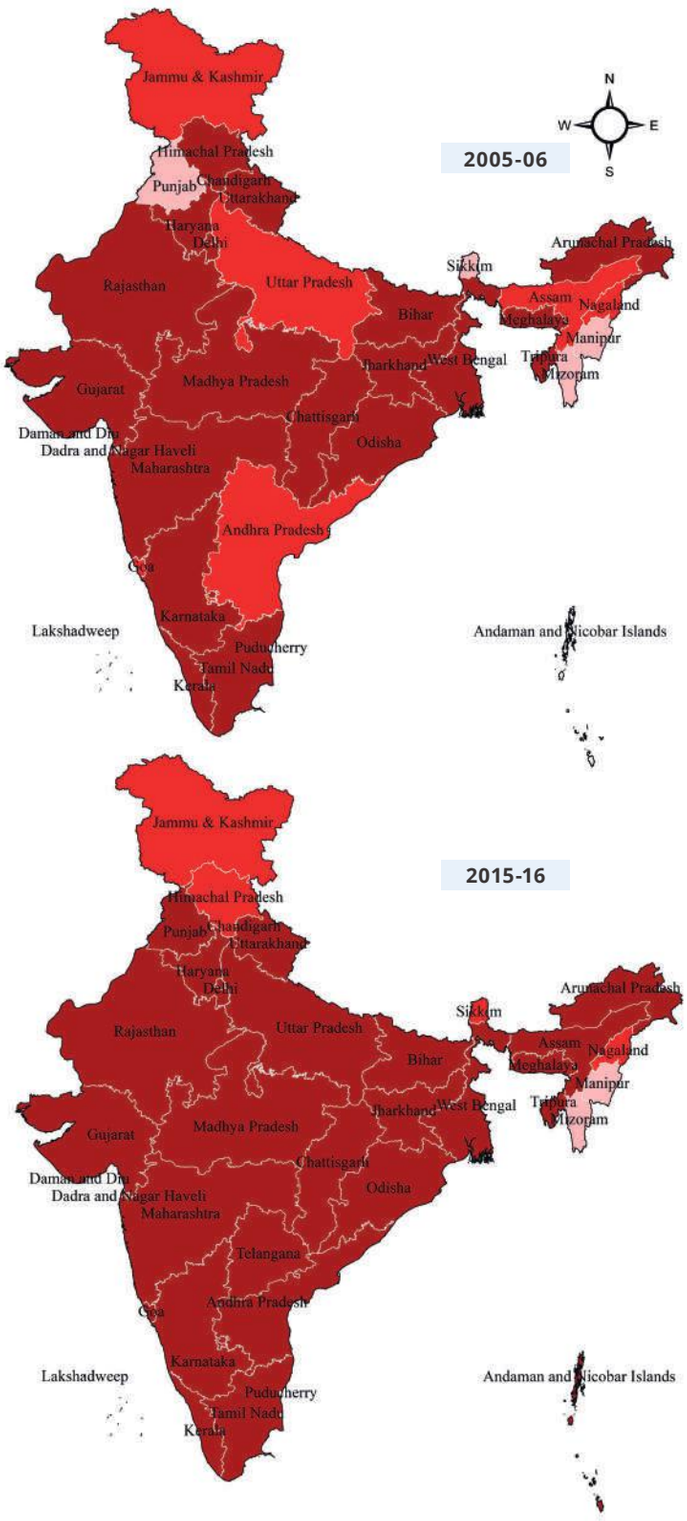
Map 5.4: *Prevalence of Stunting among Under-five Children in 640 districts of India, 2015-16*



Map not to scale

Source: National Family and Health Survey, 2015-16

Map 5.5: *Prevalence of Wasting among Under-five Children in India (using WHO Classification), 2005-06 and 2015-16*



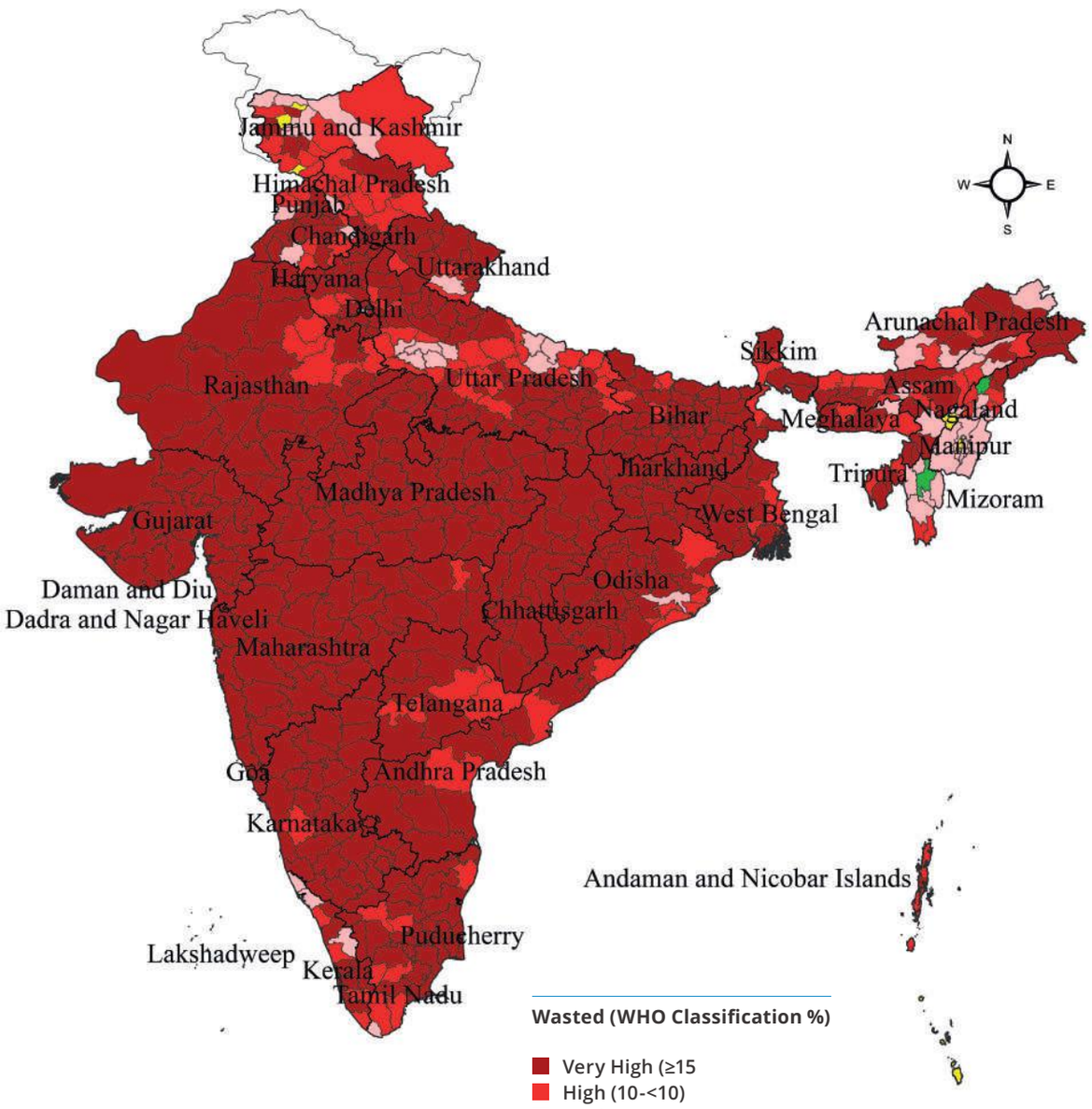
Wasted (WHO Classification %)

- Very High (≥15
- High (10-<10)
- Medium(5-<10)
- Low (2.5-<10)
- Very Low (<2.5)
- No Data

Map not to scale

Source: National Family and Health Survey, 2005-06 and 2015-16

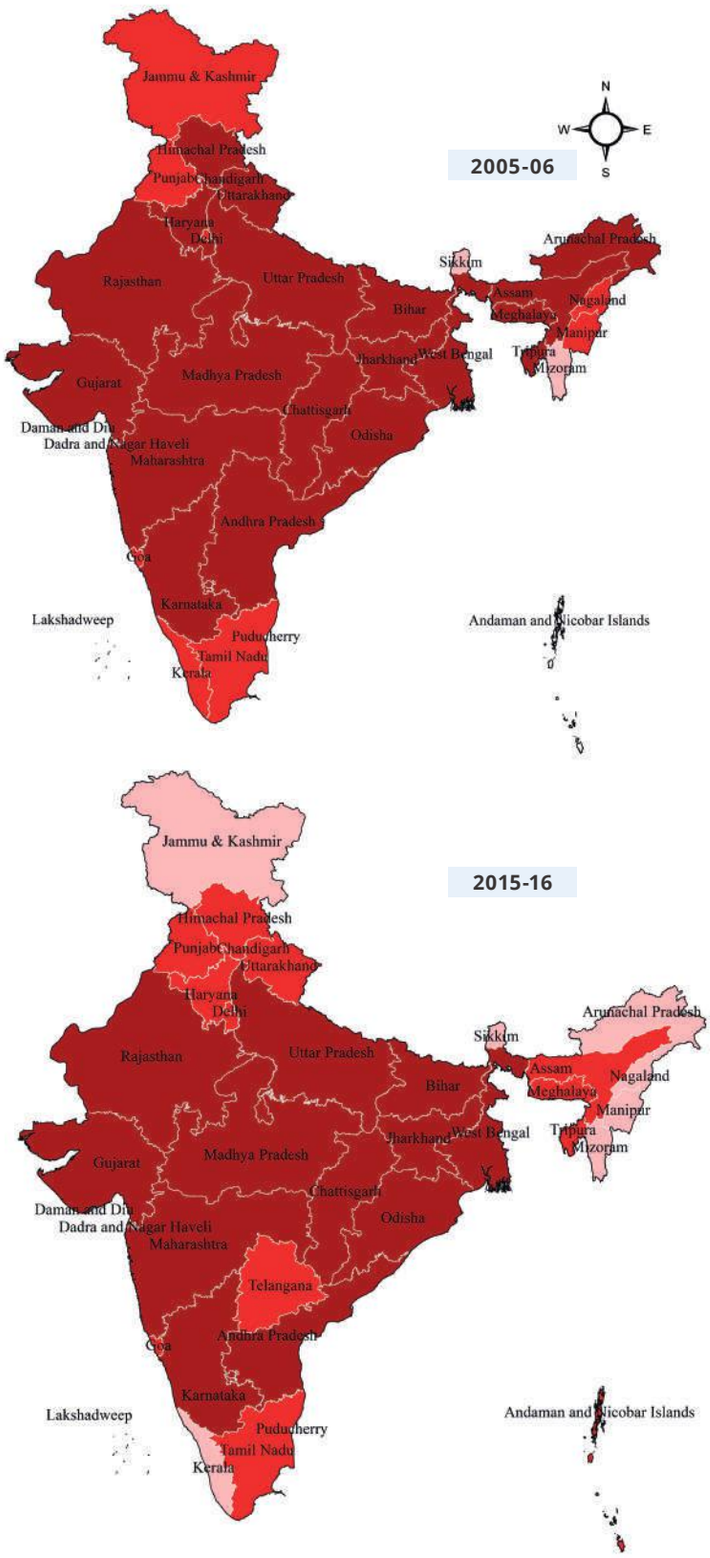
Map 5.6: *Prevalence of Wasting among Under-five Children in 640 districts of India, 2015-16*



Map not to scale

Source: National Family and Health Survey, 2015-16

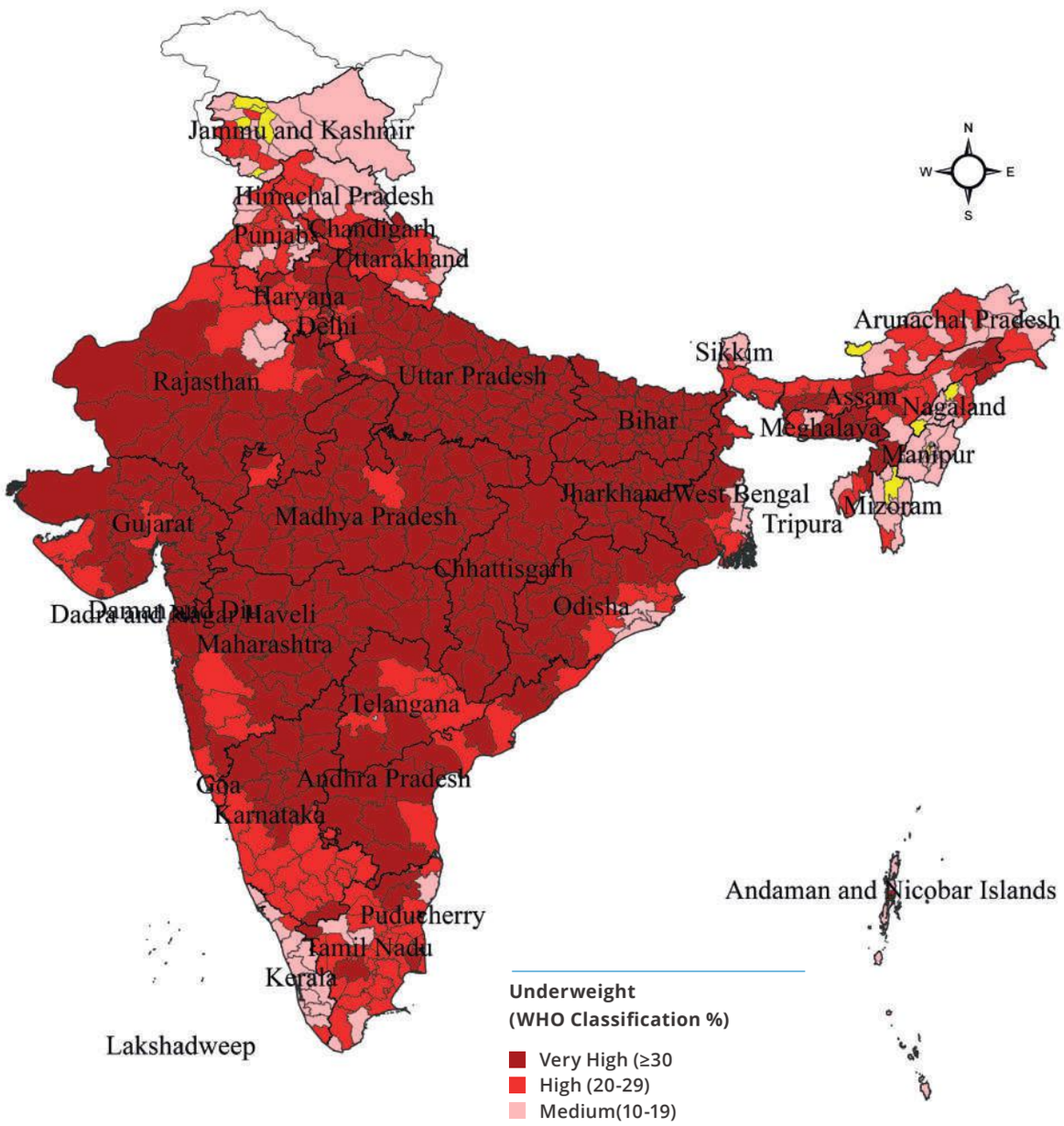
Map 5.7: *Prevalence of Underweight among Under-five Children in India (using WHO Classification), 2005-06 and 2015-16*



Map not to scale

Source: *National Family and Health Survey, 2005-06 and 2015-16*

Map 5.8: *Prevalence of under-weight among Under-five Children in 640 districts of India, 2015-16*



Map not to scale

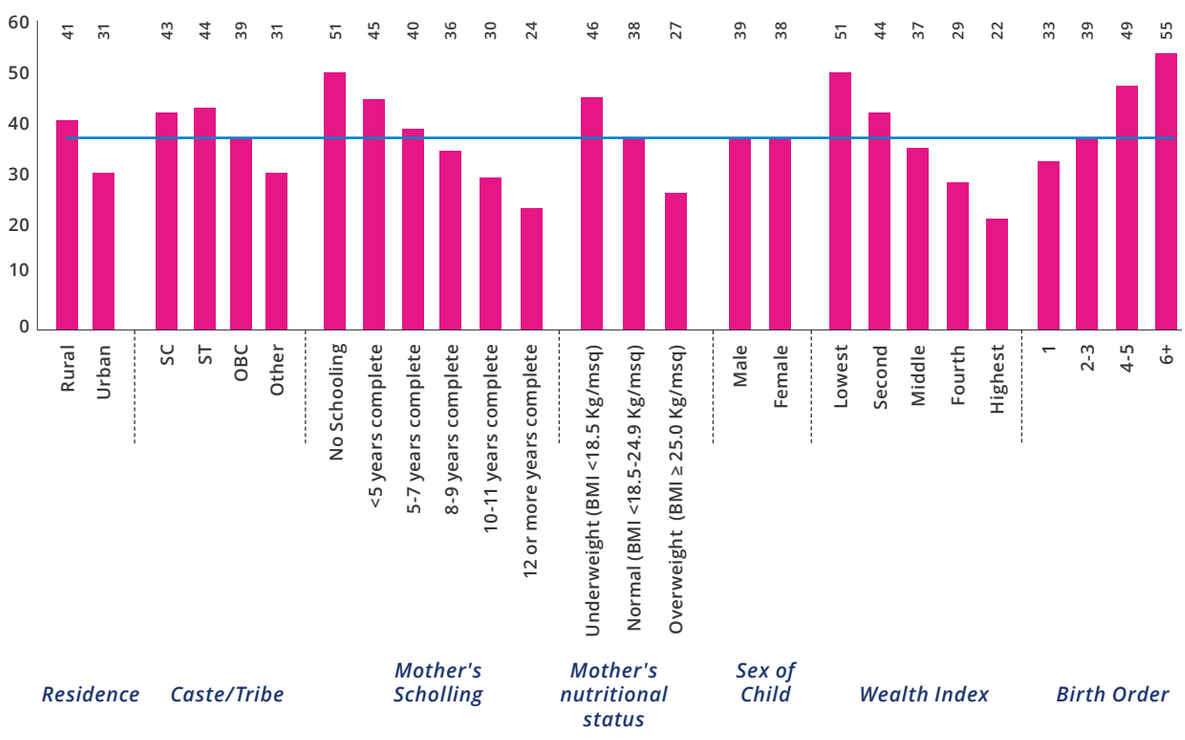
Source: *National Family and Health Survey, 2015-16*

Bihar (48.3 percent) and Uttar Pradesh (46.3 percent) continue to show the highest levels of stunting. Five more states (Gujarat, Rajasthan, Madhya Pradesh, Meghalaya and Jharkhand) and one UT (Dadra and Nagar Haveli) are above the National average for stunting (38.4 percent). Prevalence of wasting is highest in Jharkhand (29.0 percent) and above the national average in eight more states (Haryana, Goa, Rajasthan, Chhattisgarh, Maharashtra, Madhya Pradesh, Karnataka and Gujarat) and three UTs (Puducherry, Daman and Diu and Dadra and Nagar Haveli). Prevalence of under-weight is also highest in Jharkhand (47.8 percent) and is above the National average in seven more states namely Maharashtra, Rajasthan, Chhattisgarh, Gujarat, Uttar Pradesh, Madhya Pradesh and Bihar and one UT (Dadra and Nagar Haveli).

District level mapping of malnutrition has revealed interesting facts about intra-state variations in malnutrition (Map 5.4, 5.6 and 5.8). For example, Kerala as a state has the lowest level of stunting, however, within Kerala, five districts exhibit high levels of stunting.

There is high disparity in the levels of malnutrition among different sections of the population. Malnutrition (stunted, wasted and underweight) among under-5 children is comparatively higher in rural areas compared to the urban areas (Map 5.9, 5.19 and 5.11). Among caste categories, prevalence of child malnutrition is highest among ST population, with 44 percent stunting, 27 percent wasting, and 45 percent underweight among under-5 children in 2015-16. Map 5.12-5.14 shows that all forms of malnutrition were high among STs across states.

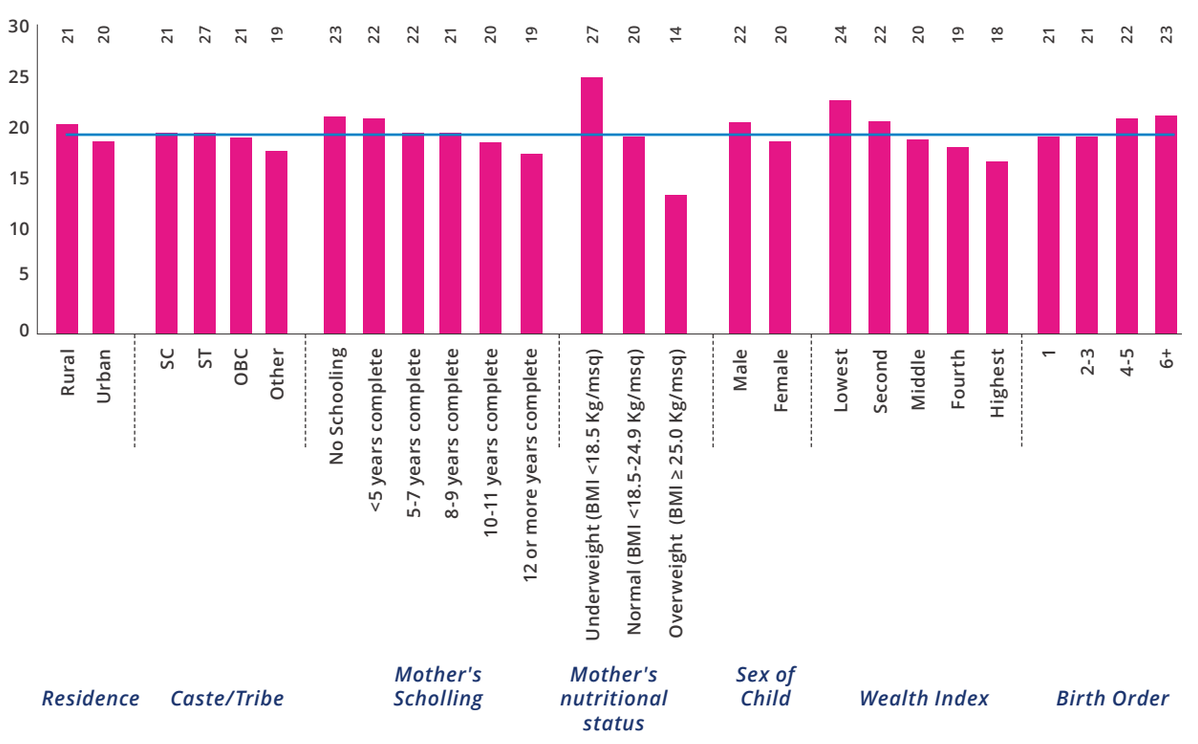
Figure 5.3: *Prevalence of stunting among under-five children by background characteristics, India, 2015-16*



Source: *National Family and Health Survey (NFHS), 2015-16*

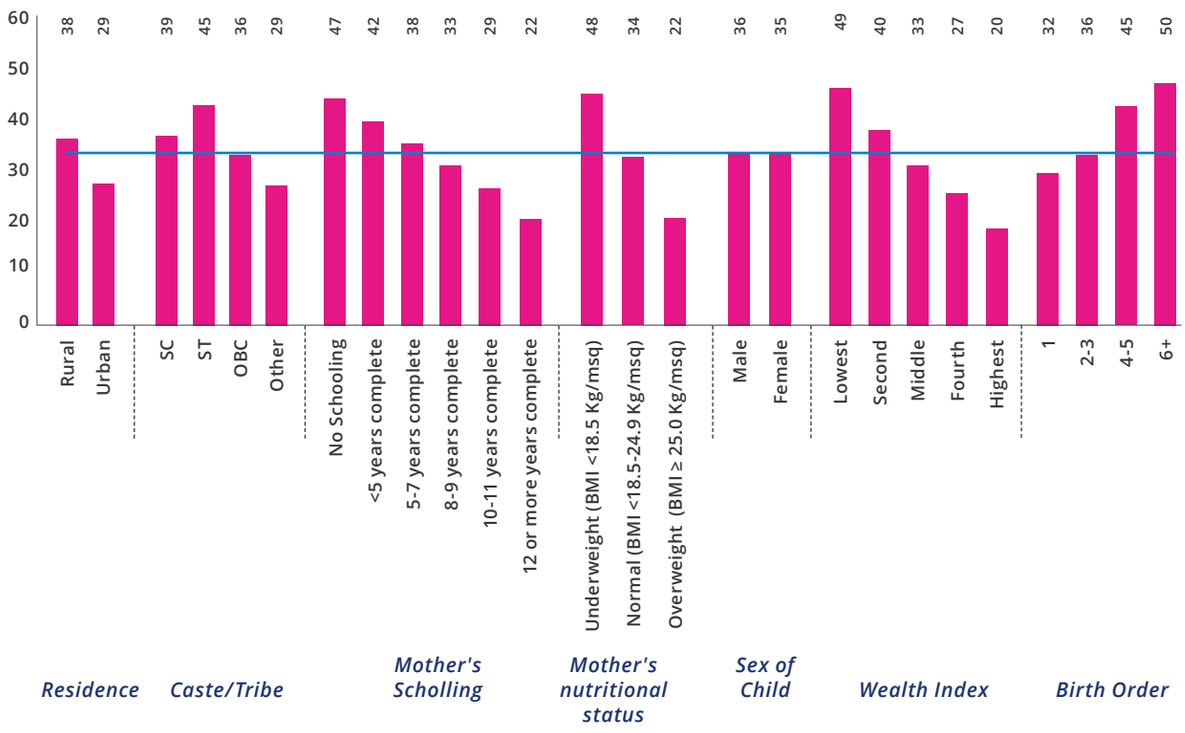
The link between status of a mother's education and the prevalence of malnutrition among her children has often been drawn. The same analysis can also be drawn in India. For example, among mothers who did not go to school, the proportion of under-5 children who are stunted, wasted and underweight is 51 percent, 23 percent and 47 percent respectively. This is much higher compared to the respective figures of 24 percent, 19 percent and 22 percent for children whose mothers completed 12 or more years of schooling. Prevalence of malnutrition is high in the lowest education quintile and relatively low for the highest quintile. Prevalence of malnutrition in the highest quintile also falls in 'very high' or 'high' category of WHO classification (Figure 5.3-5.5). The graph below shows that malnutrition is all pervasive in India.

Figure 5.4: *Prevalence of wasting among under-five children by background characteristics, India, 2015-16*



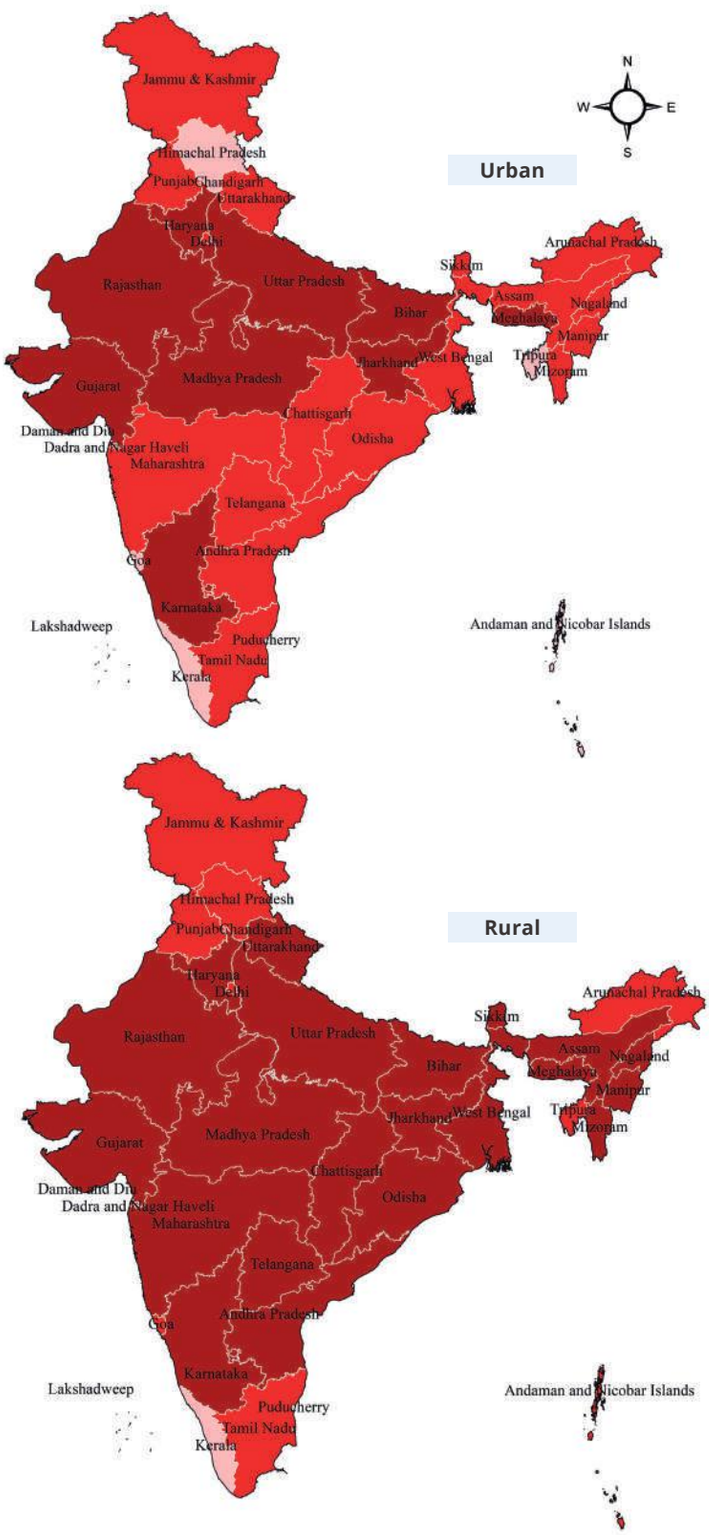
Source: *National Family and Health Survey (NFHS), 2015-16*

Figure 5.5: *Prevalence of underweight among under-five children by background characteristics, India, 2015-16*



Source: *National Family and Health Survey (NFHS), 2015-16*

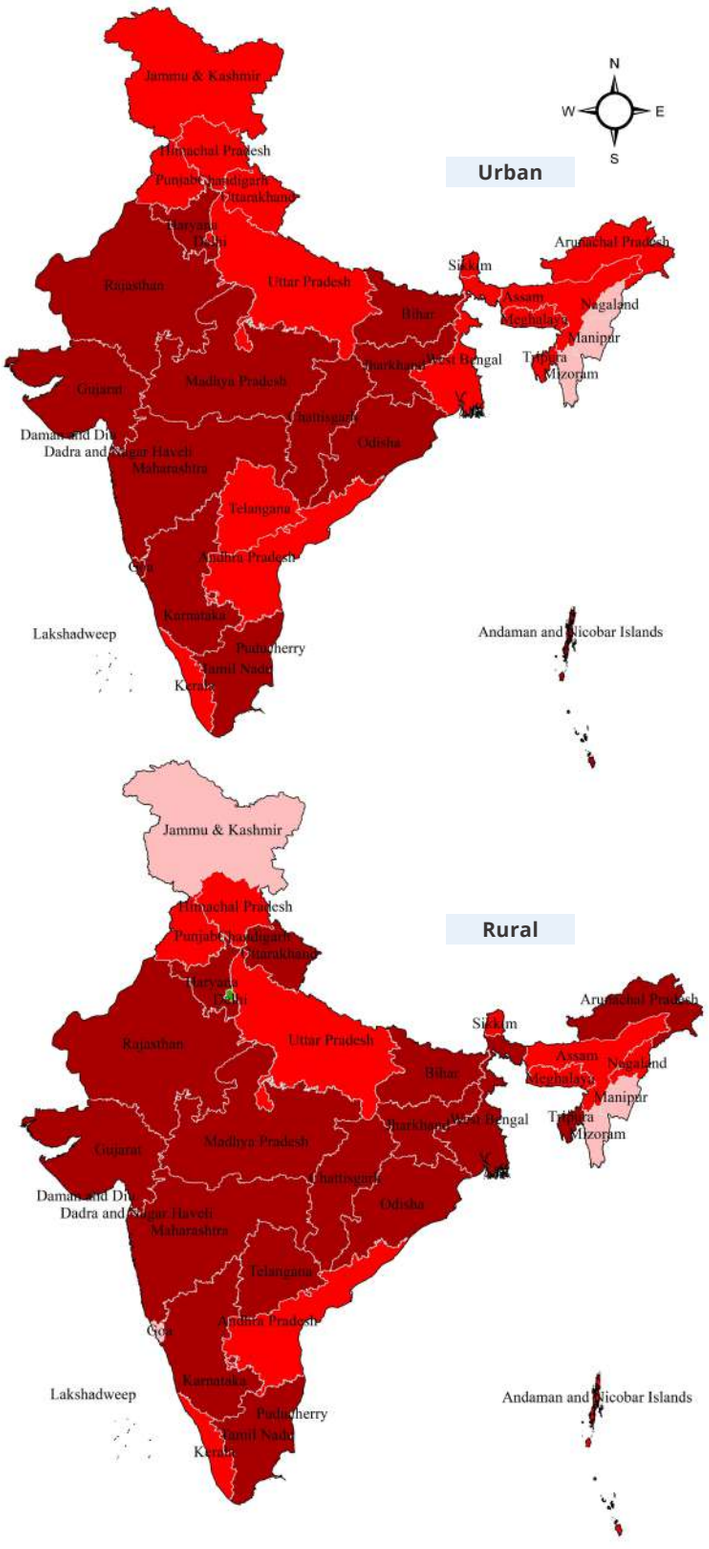
Map 5.9: *Prevalence of Stunting among Under-five Children in India by place of residence, India, 2015-16*



Map not to scale

Source: *National Family and Health Survey, 2015-16*

Map 5.10: *Prevalence of Wasting among Under-five Children in India by place of residence, India, 2015-16*



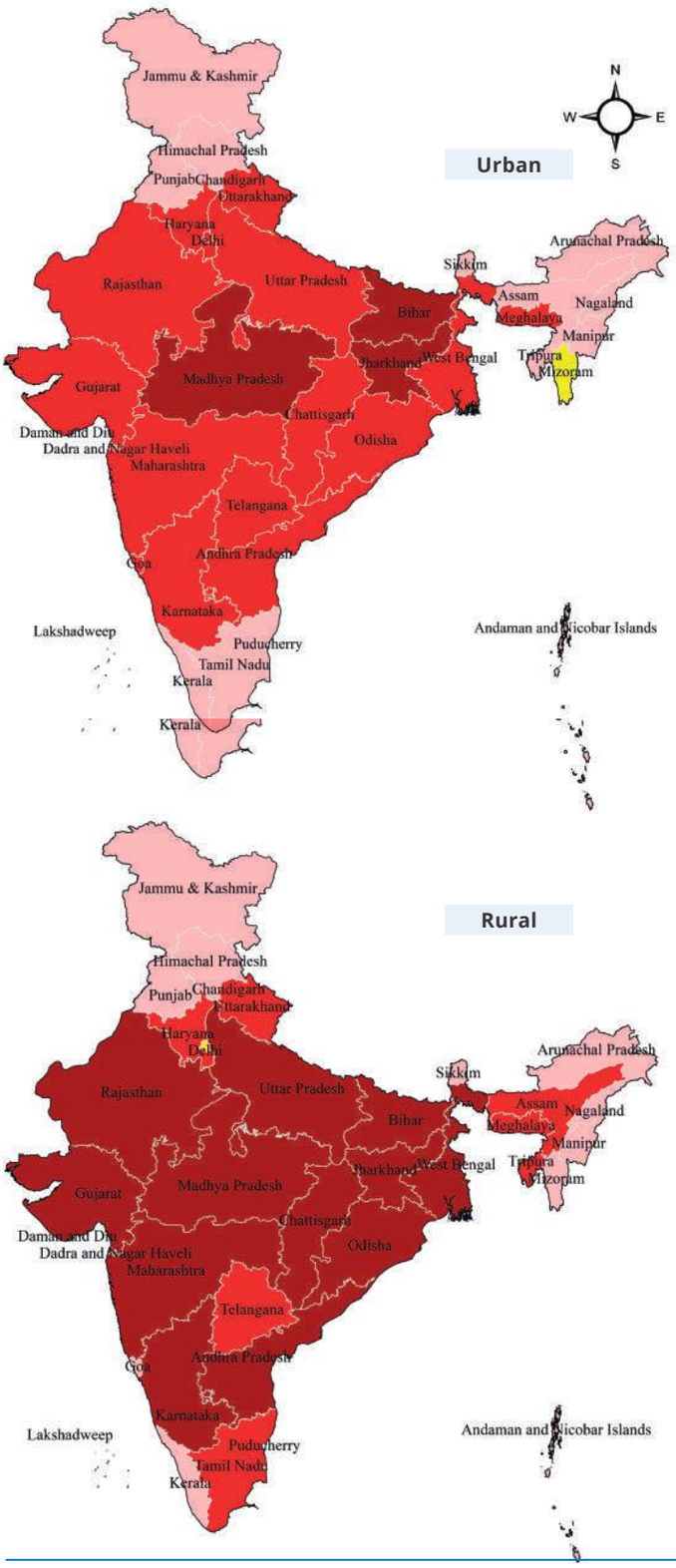
Stunted(WHO Classification %)

- Very High (≥15
- High (10-<15)
- Medium(5-<10)
- Low (2.5-<5)
- Very Low (<2.5)

Map not to scale

Source: National Family and Health Survey, 2015-16

Map 5.11: *Prevalence of Underweight among Under-five Children in India by place of residence, India, 2015-16*



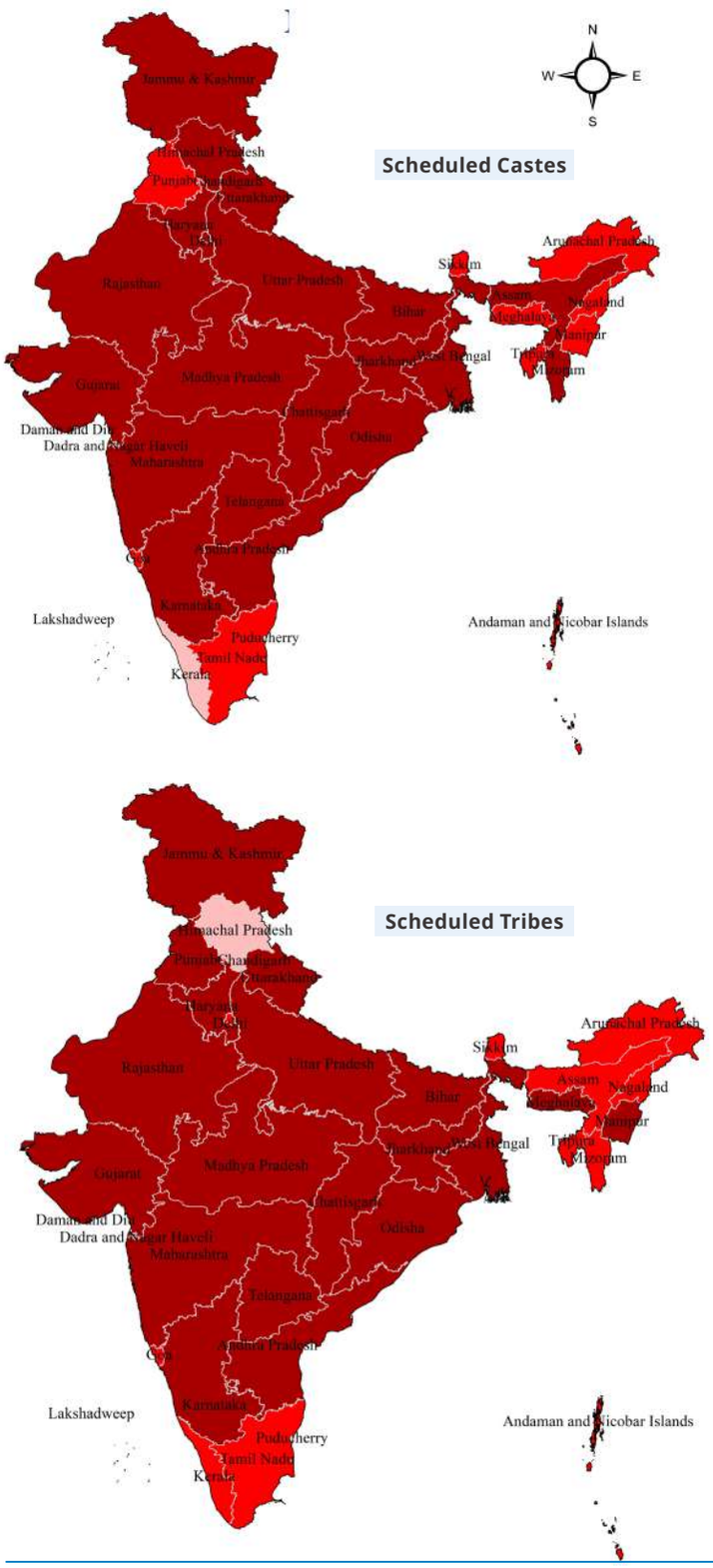
Underweight (WHO Classification %)

- Very High (≥30
- High (20-29)
- Medium(10-19)
- Low (<10)

Map not to scale

Source: National Family and Health Survey, 2015-16

Map 5.12: *Prevalence of Stunting among Under-five Children in by caste, India, 2015-16*



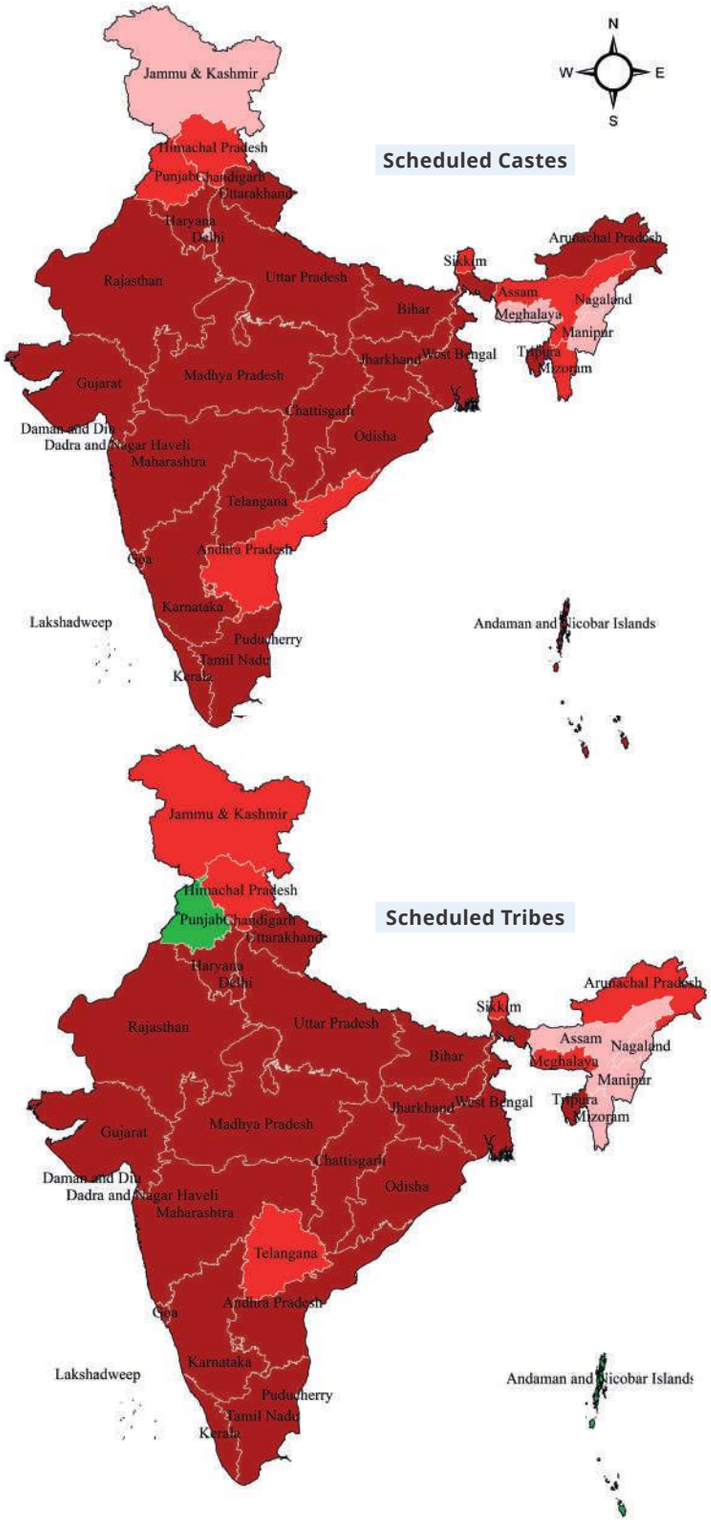
Stunted(WHO Classification %)

- Very High (≥30)
- High (20-<30)
- Medium(10-<20)
- Low (2.5-<10)
- Very Low (<2.5)
- No Data

Map not to scale

Source: National Family and Health Survey, 2015-16

Map 5.13: *Prevalence of Wasting among Under-five Children by caste, India, 2015-16*



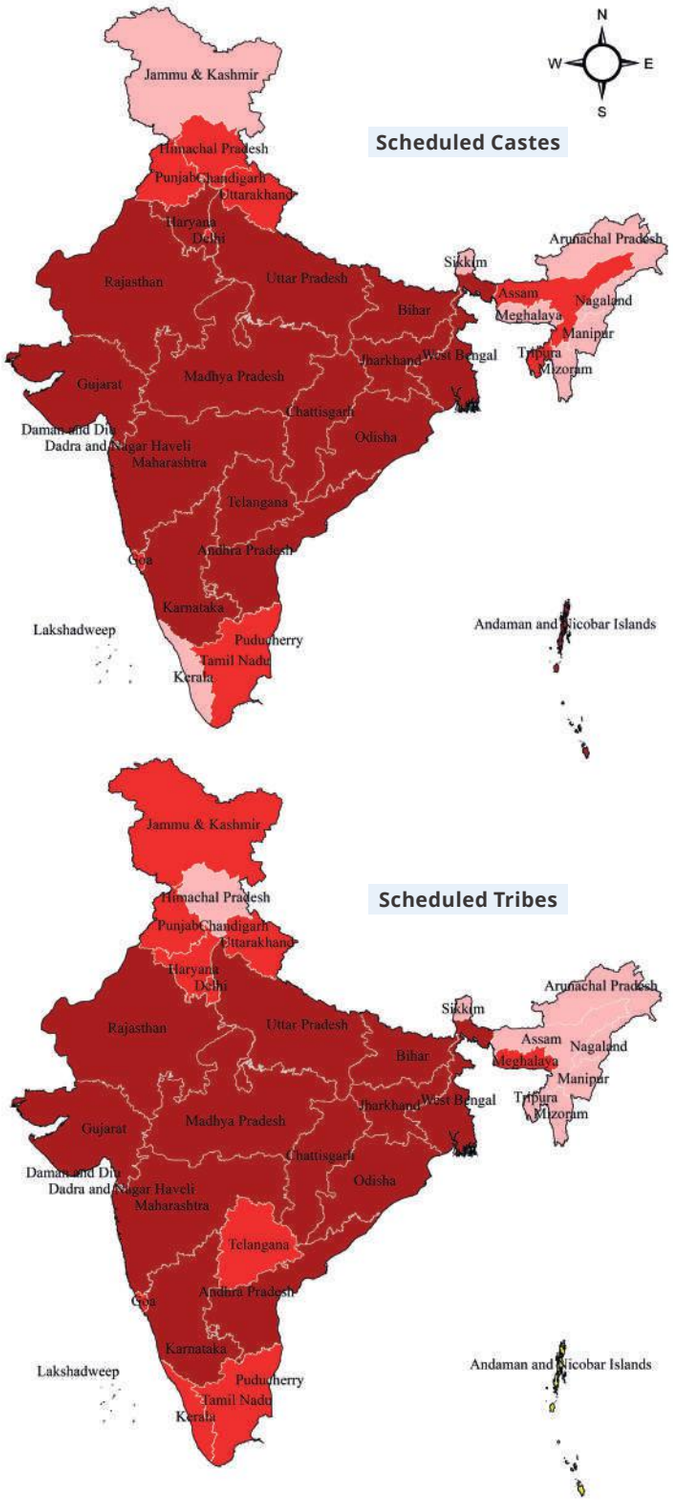
Wasted (WHO Classification %)

- Very High (≥15)
- High (20-<15)
- Medium(10-<10)
- Low (2.5-<5)
- Very Low (<2.5)
- No Data

Map not to scale

Source: National Family and Health Survey, 2015-16

Map 5.14: *Prevalence of Underweight among under-five children by caste, India, 2015-16*



Underweight (WHO Classification %)

- Very High (≥30)
- High (20-29)
- Medium(10-19)
- Low (-<10)
- No Data

Map not to scale

Source: National Family and Health Survey, 2015-16

Double Burden of Malnutrition

For several decades India was dealing with only one form of malnutrition- undernutrition. However, over the last two decades, the double burden of over and under nutrition has become increasingly more evident, posing a challenge of tackling both conditions simultaneously. Although India has not yet overcome the problems of poverty, undernutrition and communicable diseases, it is increasingly facing additional challenges related to affluence that results from industrialization, urbanization and economic growth. Overweight and obesity have emerged as serious public health problems.

In India, on one side women have anaemia and low BMI, and on the other side there is evidence of growing obesity among women as well as men. During 2005-2016, prevalence of low BMI declined from 35.5 percent to 22.9 percent among Indian women and from 34.2 percent to 20.2 percent among Indian men. On the other hand, prevalence of overnutrition (overweight + obese, BMI>25.0) has increased from 12.6 percent to 20.7 percent among women and from 9.3 percent to 18.6 percent among men during 2005-2016 (Figure 5.6). Prevalence of 'low BMI' is high among rural residents, lowest wealth quintile and ST population while overnutrition is more of an urban and affluent (highest quintile) society phenomenon (Figure 5.7 and 5.8)

Low BMI among women was seen to be most

Status	BMI (Kg/m2)
Too thin for their height	<18.5
Normal	18.5-24.9
Overweight	25.0-29.9
Obese	≥30.0
Over Nutrition/Obesity	≥25.0
Excludes pregnant women and women with a birth in the preceding 2 months NFHS-4,2015-16	

prevalent in the state of Jharkhand (31.6 percent), followed by Bihar (30.5 percent) and Rajasthan (28.4 percent) (Map 5.11). In contrast, states like Sikkim (6.4%), Mizoram (8.4 percent) and Manipur (8.8 percent) have lowest prevalence of low BMI among women aged 15-49 years. As per NFHS-4, Andhra Pradesh (33.2 percent) and Kerala (32.4 percent) have the highest prevalence of overnutrition among women (Map 5.15). Among UTs, Chandigarh has the highest prevalence of overnutrition among women (41.4 percent), followed by Lakshadweep (40.6 percent) and Puducherry (36.7 percent).

Among Indian men, low BMI was most prevalent in the states of Madhya Pradesh (28.4 percent), followed by Uttar Pradesh (25.9 percent) and Chhattisgarh (24.2 percent). Lowest prevalence of low BMI among men was observed in Sikkim (2.4

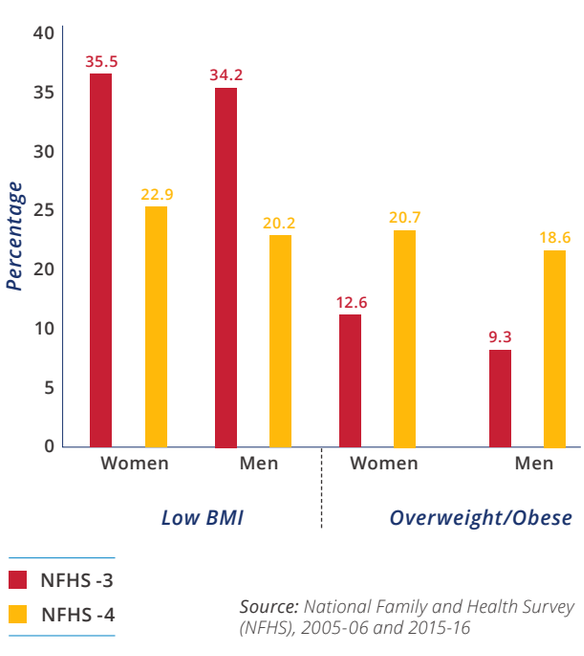
percent) and Mizoram (7.3 percent). Kerala (8.5 percent), Punjab (10.9 percent) and Haryana (11.3 percent) have recorded relatively lower levels of low BMI.

State-wise patterns reveal that overnutrition is highest in Andhra Pradesh (33.5 percent) followed by Kerala (28.5 percent), Punjab (27.8 percent), Meghalaya (10.0 percent), Chhattisgarh (10.2 percent) and Madhya Pradesh (10.9 percent) (Map 5.16). Union Territories of India have relatively high prevalence of overnutrition among men with peak prevalence in Andaman and Nicobar Islands (38.2 percent) followed by Puducherry (37.1 percent).

Relatively high level of obesity among urban residents and the richest quintile would have implications on health status of the population and may lead to higher prevalence of non-communicable diseases such as hypertension, diabetes, and other related morbidities.

Highlights: *Underweight and overweight among men and women (15-49 years), NFHS-4*
There is no substantial gap in low BMI prevalence among men (20.2%) and women (22.9%)
Overweight and obesity prevalence in men (18.9%) and women (20.7%) does not differ substantially
In men as well as women low BMI is more prevalent in rural area while overweight/obesity is more prevalent in urban area
Never married men and women have higher prevalence of low BMI and low prevalence of overweight/obesity
ST/SC women have highest prevalence of low BMI (31.7%/25.3%) and lowest prevalence of overweight/obesity (10.0%/17.2%) in comparison of other caste (17.8% and 26.9%, low BMI and overweight/obesity)
ST/SC men have highest prevalence of low BMI (16%/14%) and lowest prevalence of overweight/obesity (8.5%/12.5%) in comparison of other caste (10% and 19.4%, low BMI and overweight/obesity)
Men and women from highest wealth quintile have highest overweight/obesity prevalence
Men and women from lowest wealth quintile have highest low BMI prevalence

Figure 5.6: *Prevalence of low BMI and overnutrition (overweight/Obese) among Women (15-49 years) and Men (15-49 years) in India, 2005-06 and 2015-16*



Source: *National Family and Health Survey (NFHS), 2005-06 and 2015-16*

Map 5.15: *Prevalence of low BMI among Women aged 15-49 years in India (using WHO Classification), 2005-06 and 2015-16*

2005-06

2015-16

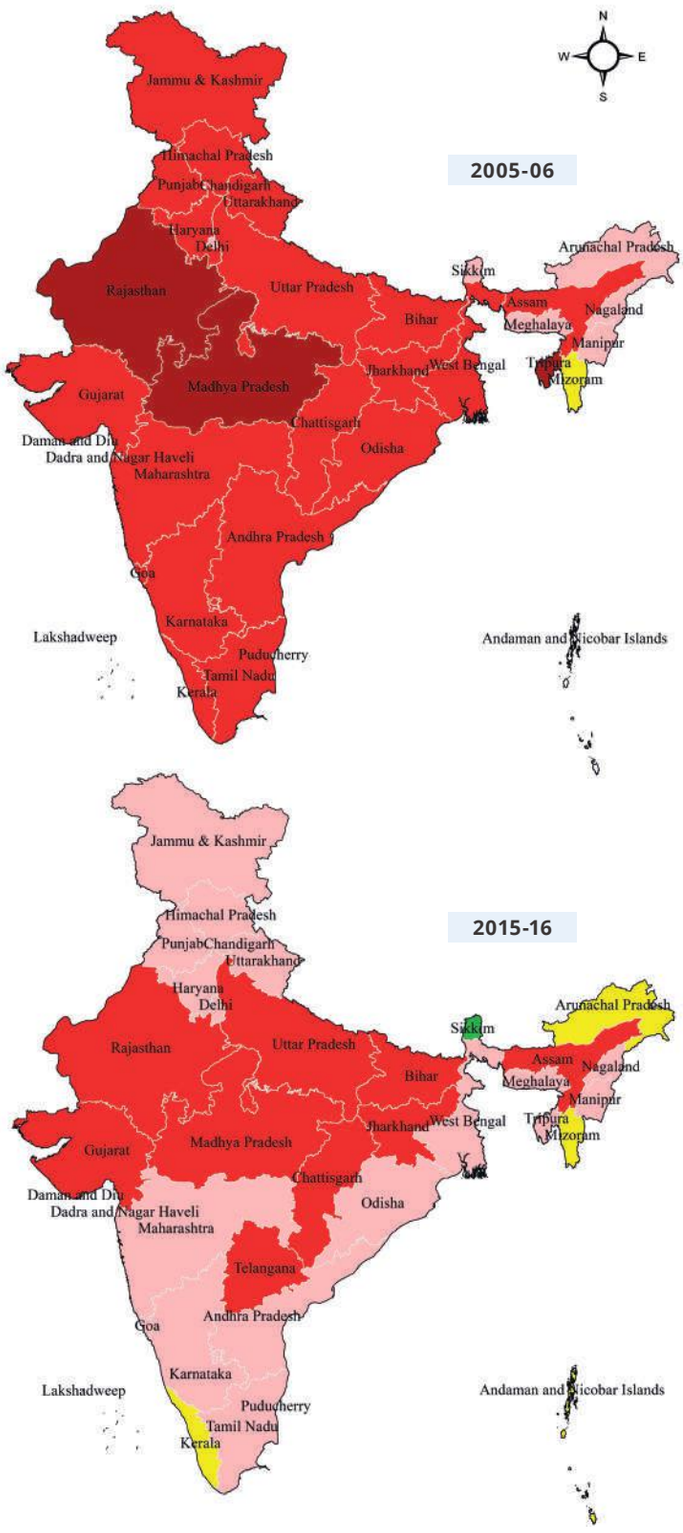
Low BMI (WHO Classification %)

- Very High (≥40)
- High (20-39)
- Medium(10-19)
- Low (5-9)
- No Data

Map not to scale

Source: *National Family and Health Survey, 2005-06 and 2015-16*

Map 5.16 : *Prevalence of low BMI among Men aged 15-49 years in India (using WHO Classification), 2005-06 and 2015-16*



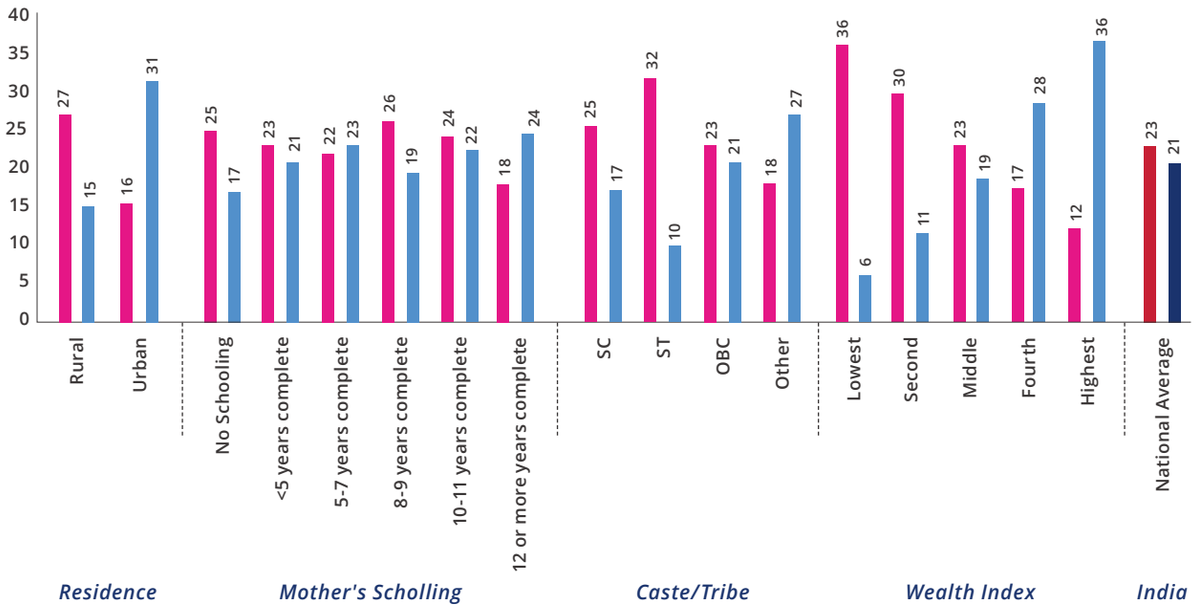
Low BMI (WHO Classification %)

- Very High (≥40)
- High (20-39)
- Medium(10-19)
- Low (5-9)
- No Significance (<5)
- No Data

Map not to scale

Source: National Family and Health Survey, 2005-06 and 2015-16

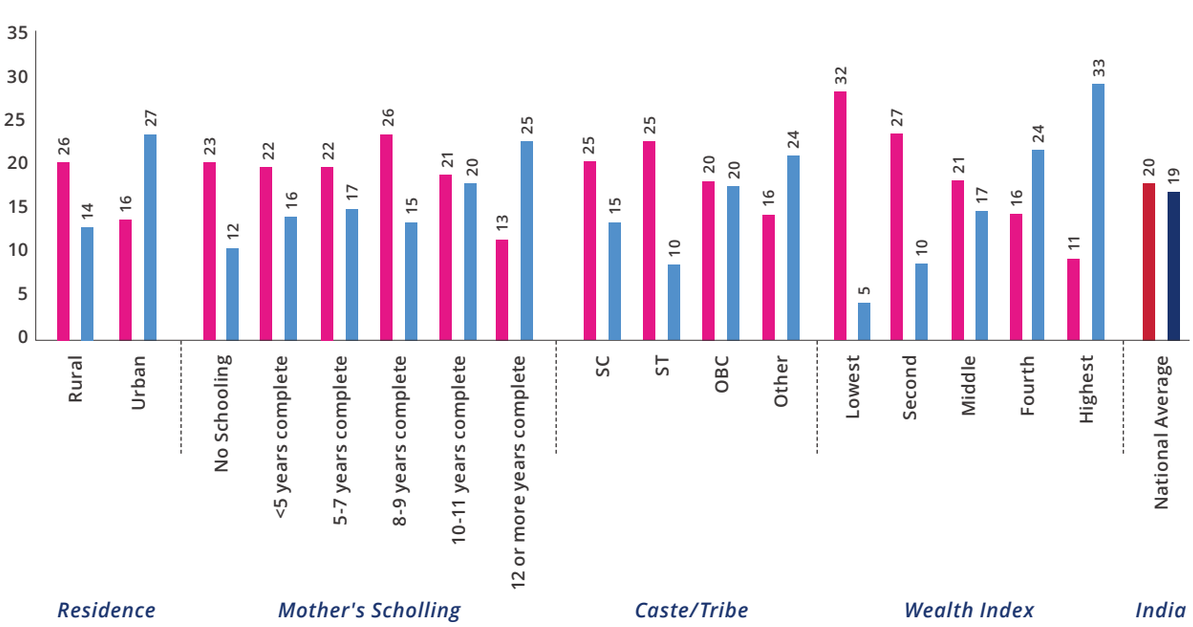
Figure 5.7: *Prevalence of low BMI and overnutrition (overweight/obese) among women aged 15-49 years by background characteristics, 2015-16*



Thin (BMI <18.5) Overweight/Obese (BMI≥25)

Source: *National Family and Health Survey (NFHS), 2015-16*

Figure 5.8: *Prevalence of low BMI and overnutrition (overweight/obese) among men aged 15-49 years by background characteristics, 2015-16*



Thin (BMI <18.5) Overweight/Obese (BMI≥25)

Source: *National Family and Health Survey (NFHS), 2015-16*

5.3.3 Micronutrient Malnutrition

Micronutrient malnutrition (micronutrient deficiencies) are another important form of malnutrition that lead to low immunity, higher disease burden and lower productivity. Vitamin A deficiency, iron deficiency and iodine deficiency disorders are the most common forms of micronutrient malnutrition globally. Overcoming micronutrient malnutrition is a precondition for ensuring rapid and appropriate development[3]. In total, more than two-thirds of the world's population - mostly women and children from poor households - suffer from at least one micronutrient deficiency. The effects are manifested in stunting, increased susceptibility to infectious diseases, physical impairments, cognitive losses, blindness and premature mortality[4]. Research has shown that the highest contributors to hidden hunger are iron deficiency anaemia, zinc deficiency, vitamin A deficiency and iodine deficiency, in that order[5].

Iodine from food is absorbed by the thyroid gland to help produce thyroid hormones which are responsible for regulating many functions in our body such as breakdown of fat, growth etc. In India, 93.1 percent households used iodized salt in 2015-16. Considerable improvement has been observed across the states of India regarding use of iodized salt from 2005-06 to 2015-16 (Map 5.17). In 2005-06, below 70 percent households in many states were using iodized salt while in 2015-16, more than 80 percent households in each state were using iodized salt (except Dadra and Nagar Haveli, 70.7 percent). The 10th five-year action plan (2002-07) of the Government of India, focussed on achieving universal access to iodized salt, - may have pushed up iodine consumption.

Vitamin A is an essential nutrient required for maintaining immune function, eye health, vision, growth and survival in human beings. In India, only 60.2 percent of children (9-59 months) received Vitamin-A dose in 2015-16 and 13 out of 36 states/UTs were lagging the national average. The state-wise condition has improved much from 2005-06 to 2015-16 (Map 5.18).

Anaemia is a condition that is marked by low levels of hemoglobin in the blood. Iron is a key component of hemoglobin, and iron deficiency is estimated to be responsible for half of all anaemia cases globally. Anaemia is a serious concern for children because it can impair cognitive development, stunt growth, and increase morbidity from infectious diseases. Classification of anaemia for public health significance, given by WHO, were used in mapping in this report (NLIS, WHO, 2010).

In 2005-06, 69.5 percent of children aged 6-59 months were anaemic, which reduced to 58.5 percent in 2015-16. Most Indian states had severe anaemia prevalence of anaemia. The prevalence of anaemia among children aged 6 to 59 months was highest in Haryana

Highlights: *Anaemia (6-59 months child), NFHS-3 and 4*
58.5% children were anaemic in 2015-16 against 69.5% in 2005-06.
In 2015-16, 27.8% children had mild anaemia, 29.2% had moderate anaemia and 1.6% children had severe anaemia.
Anaemia prevalence was maximum in age-group 12-17 months (71.2%) and minimum in 48-59 months (44.7%).
Place of residence and sex of child had almost no impact of on child anaemia.
Poorest wealth quintile had highest child anaemia prevalence (64%) against highest wealth quintile (51.8%)
Mothers having severe anaemia had 76% anaemic children against 50% anaemic children in non-anaemic mothers. It may be due to intergenerational anaemic cycle.

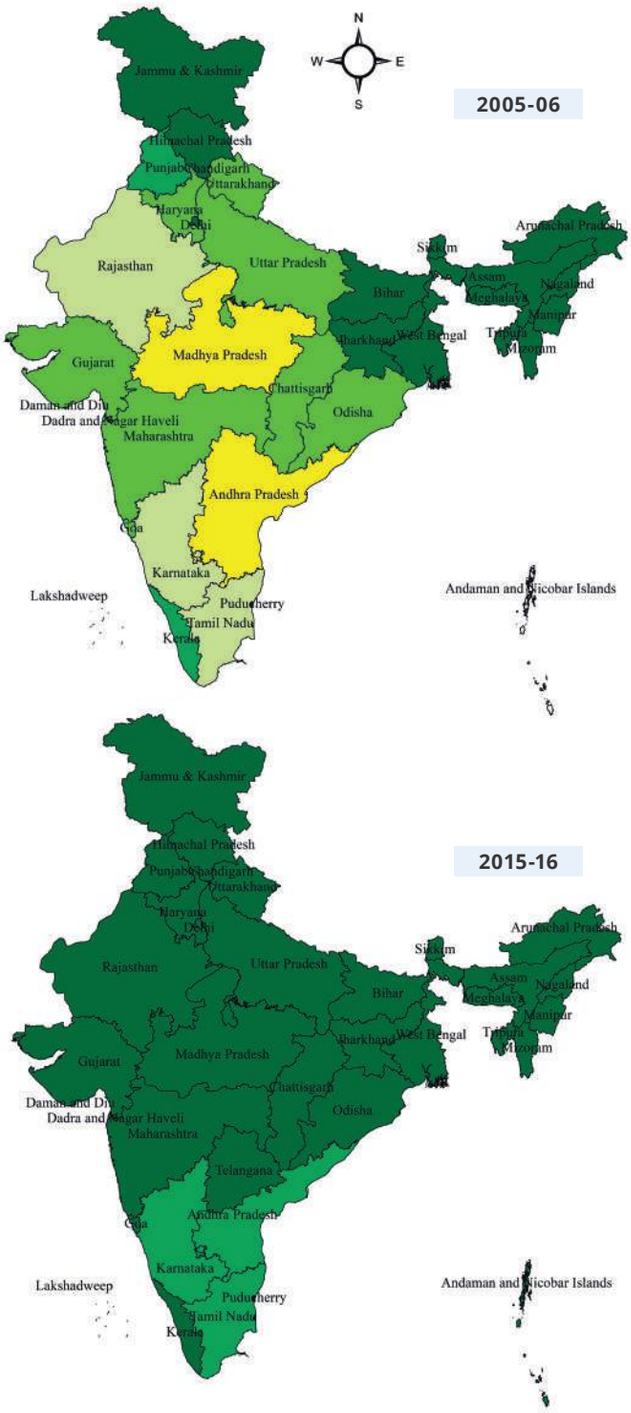
[1] *http://www.fao.org/docrep/x0245e/x0245e01.htm*

[2] *"The human and economic cost of hidden hunger", Food and Nutrition Bulletin, vol 28, no.2©2007, The United Nations University*

[3] *Ibidem*

(71.7 percent), followed by Jharkhand (69.9 percent) and Madhya Pradesh (68.9 percent). Several UTs had even higher prevalence of anaemia (Dadra and Nagar Haveli-84.6 percent, Daman & Diu-73.8 percent, and Chandigarh-73.1 percent) (Map 5.19).

Map 5.17: *Percentage og Household using Iodized Salt in India, 2005-06 and 2015-16*



Iodized Salt (%)

- 90-100
- 80-90
- 70-80
- 60-70
- 50-60
- No Data

Map not to scale

Source: *National Family and Health Survey, 2005-06 and 2015-16*

Map 5.18: *Percentage of Children (9-59 months received Vitamin-A dose in last six months in states of India, 2005-06 and 2015-16*

2005-06

2015-16

Vitamin A Supplement (%)

- 80-90
- 70-80
- 60-70
- 50-60
- 40-50
- 30-40
- 20-30
- 10-20
- 0-10
- No Data

Map not to scale

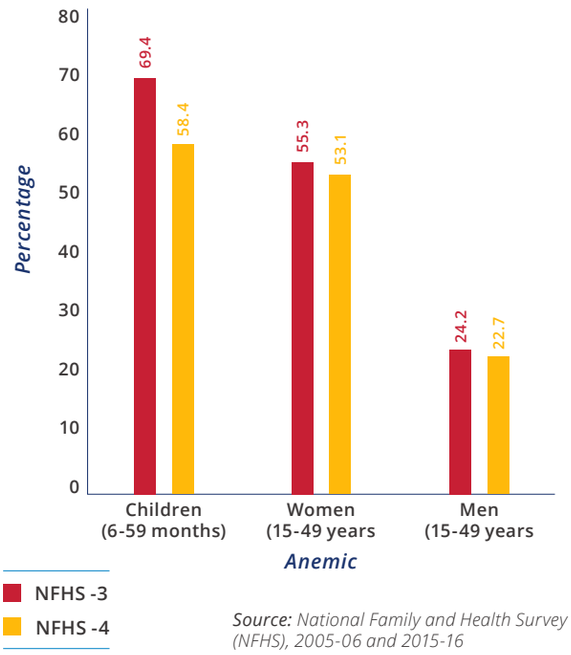
Source: *National Family and Health Survey, 2005-06 and 2015-16*

Prevalence of anaemia among women was highest in Jharkhand (65.2 percent), followed by Haryana (62.7 percent) and West Bengal (62.5 percent). UTs had even higher prevalence of anaemia among women viz. Dadra and Nagar Haveli (79.5 percent), Chandigarh (75.9 percent), Andaman and Nicobar (65.7 percent). Lowest anaemia prevalence was recorded in Mizoram (24.8 percent), followed by Manipur (26.4 percent) and Nagaland (27.9 percent) (Map 5.21).

In India, the prevalence of anameia was relatively low among men aged 15-49 years (22.7 percent) in comparison to women (53.1 percent) and children (58.5 percent). Among states, anaemia prevalence among men was highest in Meghalaya (32.4 percent) followed by Bihar (32.3 percent) and Andaman and Nicobar (30.8 percent). Lowest prevalence of anaemia among men was observed in Manipur (9.5 percent) followed by Goa (11.0 percent) (Map 5.22).

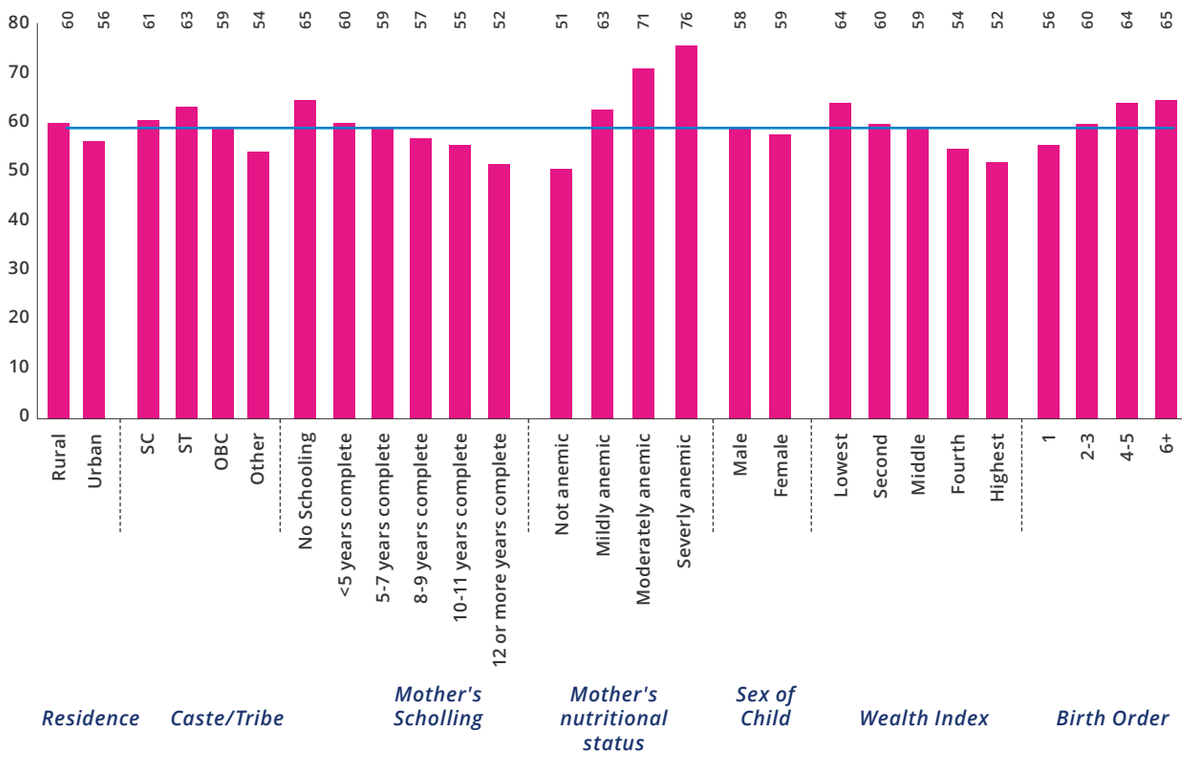
Highlights: *Adult anaemia (Men; 15-54 years and Women; 15-49 years), NFHS-4*
Anaemia prevalence has barely changed in last one decade in men as well as women
53.1% women and 22.7 % men are anaemic in 2015-16
In 2015-16, 39.6% women have mild anaemia, 12.4% have moderate anaemia and 1.0% women have severe anaemia.
In NFHS-4, 12.2% men have mild anaemia, 10.0% have moderate anaemia and 1.2% men have severe anaemia.
In 2015-16, 58% lactating and 50.4% pregnant women were anaemic
Women from richest wealth quintile were least anaemic (48.2%) in comparison of women from poorest wealth quintile (58.7%)
50.8% urban women were anaemic against 54.2% rural women.
Illiterate women have highest anaemia prevalence (56.4%) in comparison of women having 12 or more years of education (48.7%)
ST, SC and OBC women have highest anaemia prevalence (59.9%, 55.9, 52.2%) in comparison to other caste (49.8).
Men from richest wealth quintile were least anaemic (17.0%) in comparison to men from poorest wealth quintile (32.0%)
18.5% urban men were anaemic against 25.3% rural men.
Illiterate men have higher anaemia prevalence (29.0%) in comparison to men having 12 or more years of education (17.7%)
ST, SC and OBC men have highest anaemia prevalence (32.0%, 23.6, 22.0%) in comparison to other caste (20.3).

Figure 5.9: *Prevalence of anaemia among children aged 6-59 months, women (15-49 years) and men (15-49 years) in India (using WHO Classification), 2005-06 and 2015-16*



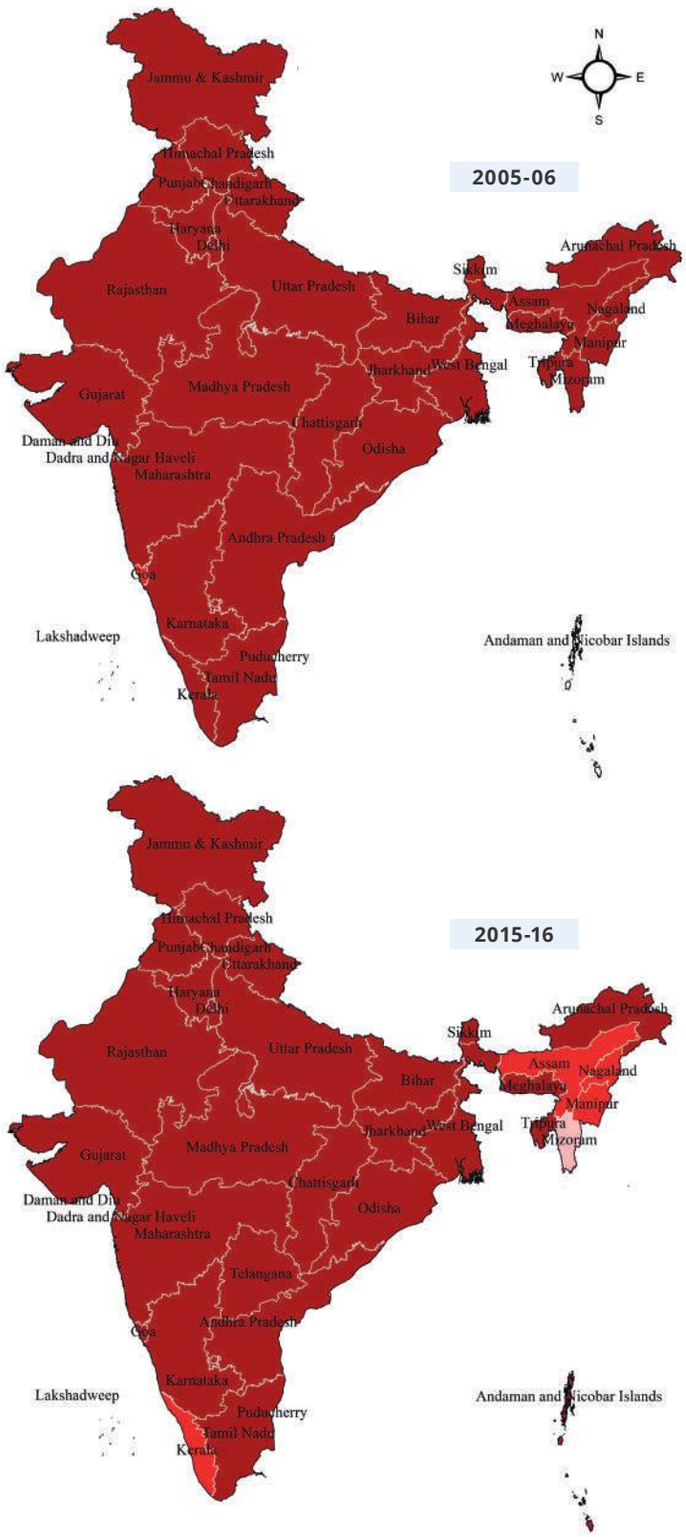
Source: *National Family and Health Survey (NFHS), 2005-06 and 2015-16*

Figure 5.10: *Prevalence of anemia among Children aged 6-59 months by background characteristics, India, 2015-16*



Source: *National Family and Health Survey (NFHS), 2015-16*

Map 5.19: *Prevalence of anemia among Children aged 6-59 months in India (using WHO Classification), 2005-06 and 2015-16*



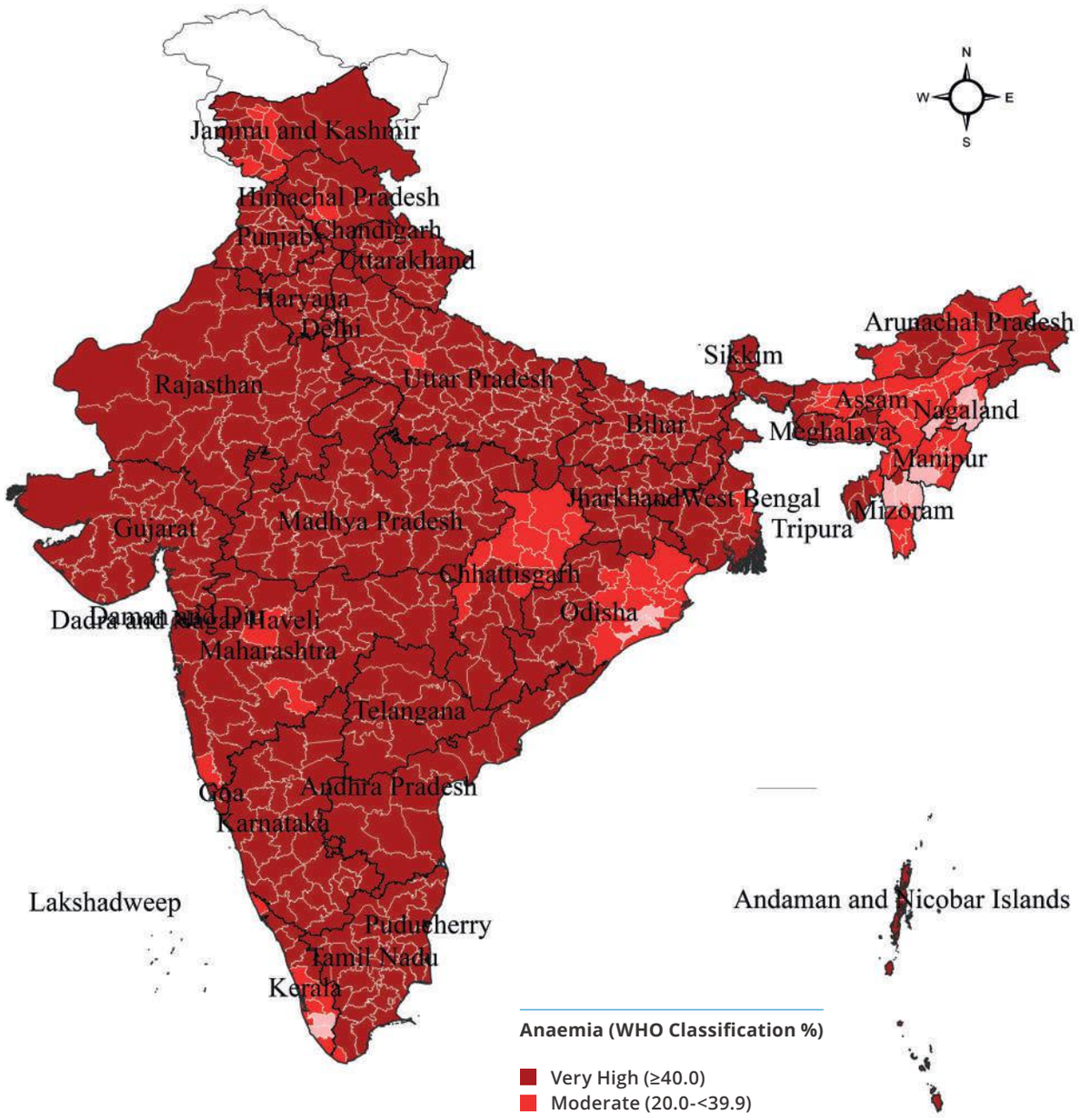
Anaemia (WHO Classification %)

- Severe(≥40.0)
- Moderate (20.0-39.9)
- Mild (5.0-19.9)
- No Significance (≤4.9)
- No Data

Map not to scale

Source: National Family and Health Survey, 2005-06 and 2015-16

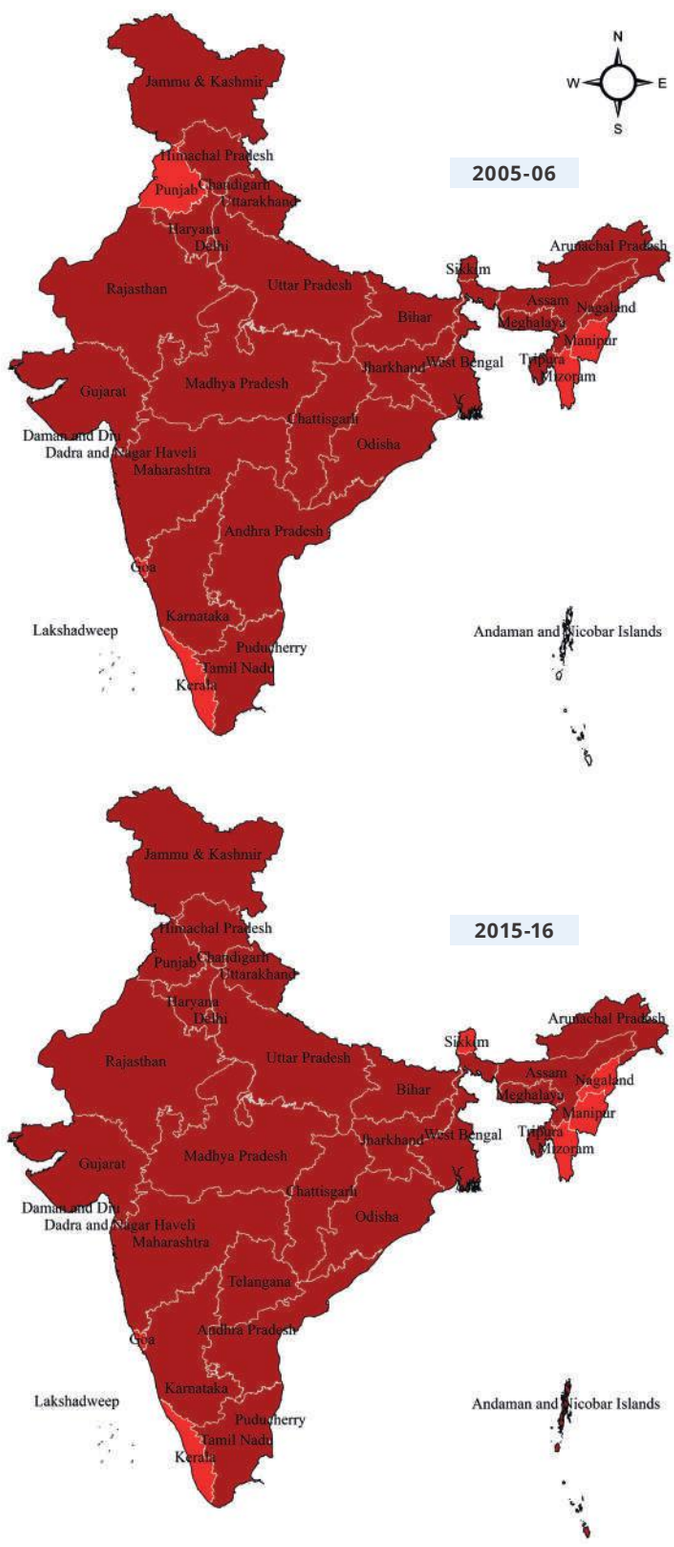
Map 5.20: *Prevalence of Anaemia among Under-five Children aged 6-59 months in 640 districts of India, 2015-16*



Map not to scale

Source: *National Family and Health Survey, 2005-06 and 2015-16*

Map 5.21: *Prevalence of anemia among Women aged 15-49 years in India (using WHO Classification), 2005-06 and 2015-16*



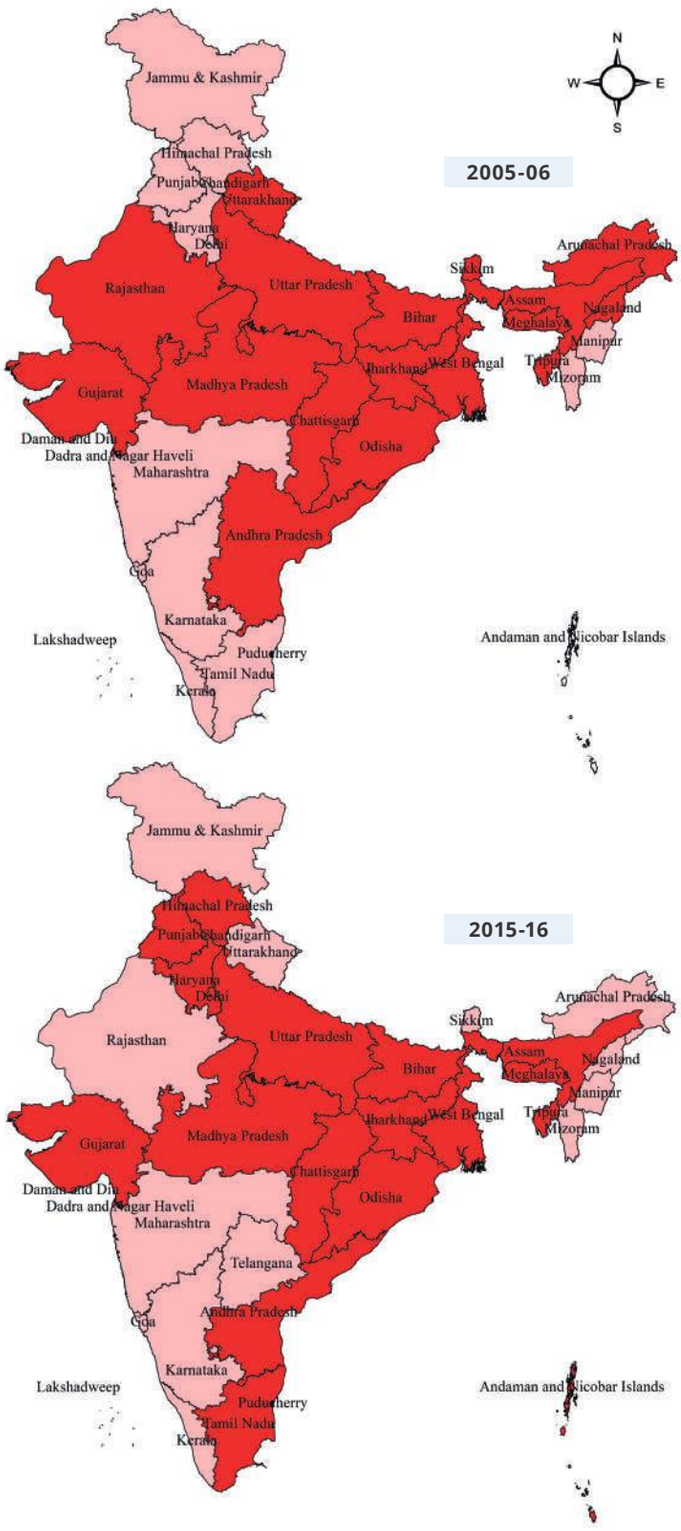
Anaemia (WHO Classification %)

- Severe(≥40.0)
- Moderate (20.0-39.9)
- Mild (5.0-19.9)
- No Significance (≤4.9)
- No Data

Map not to scale

Source: National Family and Health Survey, 2005-06 and 2015-16

Map 5.22: *Prevalence of anemia among Men aged 15-49 years in India (using WHO Classification), 2005-06 and 2015-16*



Anaemia (WHO Classification %)

- Severe(≥40.0)
- Moderate (20.0-39.9)
- Mild (5.0-19.9)
- No Significance (≤4.9)
- No Data

Map not to scale

Source: *National Family and Health Survey, 2005-06 and 2015-16*

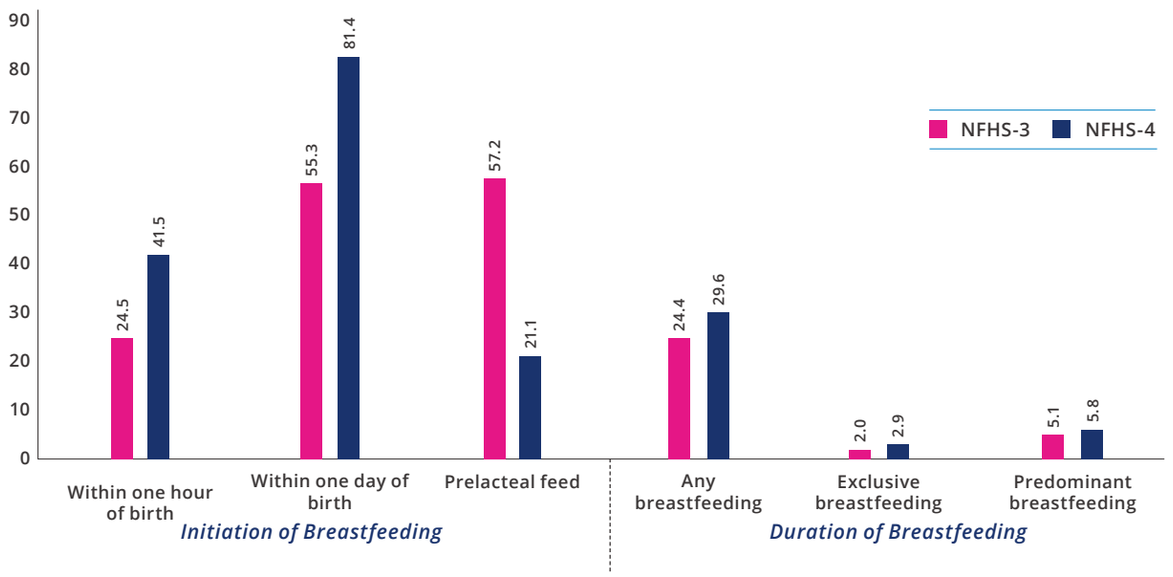
5.4 Immediate Factors Affecting Nutritional Status

Nutrition and health related interventions are aimed at improving the proximal food, health and care environment for women and children, especially for pregnant women and new-borns. Over the last two decades, awareness about breastfeeding practices and its benefits has increased. At the national level, 54.9 percent children of age 0-6 months have been exclusively breastfed, 41.5 percent have initiated breastfeeding within an hour of birth and 81.4 percent within one day of birth in 2015-16 (Figure 5.11). Among the states, Madhya Pradesh, Haryana, Goa, Rajasthan, Himachal Pradesh and Bihar have made considerable improvement in exclusive breastfeeding practices during 2005-05 to 2015-16 (Map 5.23).

Among children aged 6-23 months, only 9.6 percent children received minimum acceptable diet in India in 2015-16. However, 94.0 percent children aged 6-23 months received breast milk, milk or milk products and 22.0% children had minimum dietary diversity and 35.9 percent had minimum meal frequency, at the National level (Figure 5.12). The situation was worse among states, as hardly one-tenth of children aged 6-23 months received adequate diet in majority of the states. Highest percentage of children receiving minimum acceptable diet were in Puducherry (31.1 percent) and Tamil Nadu (30.7 percent) (Map 5.24). Therefore, the provision of minimum acceptable diet for children needs to be addressed as a priority, since this is the age when malnutrition gets rooted and develops with age among the new-borns.

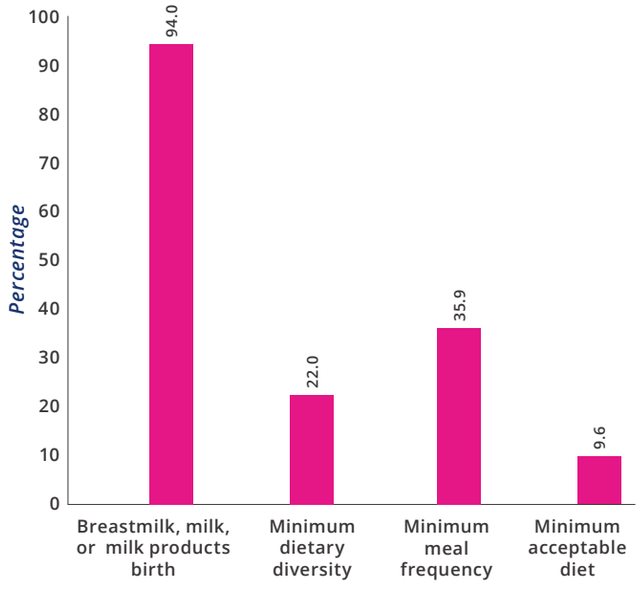
In India, 2.7 percent of children under 5 years of age had symptoms of Acute Respiratory Infection (ARI), and advice or treatment was sought from a health facility or provider for 78 percent of those children. State-wise level of ARI was also below 5.0 percent in most of the states (Map 5.25). About 9.2 percent of children under age 5 years had diarrhoea and advice or treatment was sought from a health facility or provider for 68 percent of those children. Thirty-eight percent of children with diarrhoea received continued feeding and oral rehydration therapy (ORT), as recommended (NFHS-4). Prevalence of diarrhoea declined in many states during 2004-05 to 2015-16, although it increased in a few states like Uttar Pradesh, Chhattisgarh, Andhra Pradesh, Tamil Nadu (Map 5.26).

Figure 5.11: *Initiation and duration of breastfeeding in India, 2015-16*



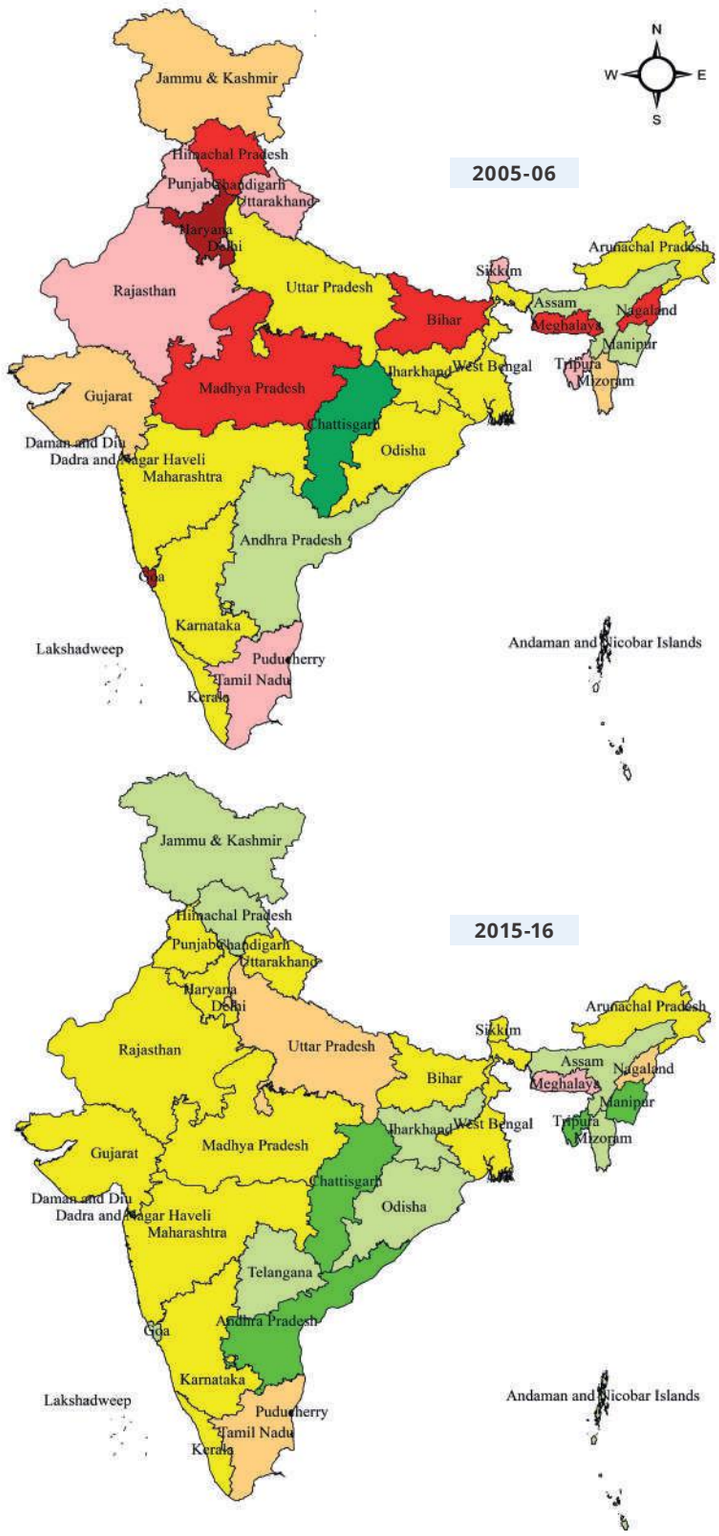
Source: National Family and Health Survey (NFHS), 2005-06 and 2015-16

Figure 5.12: *Percentage of youngest children age 6-23 months living with their mother who are fed minimum acceptable diet, India, 2015-16*



Source: National Family and Health Survey (NFHS), 2015-16

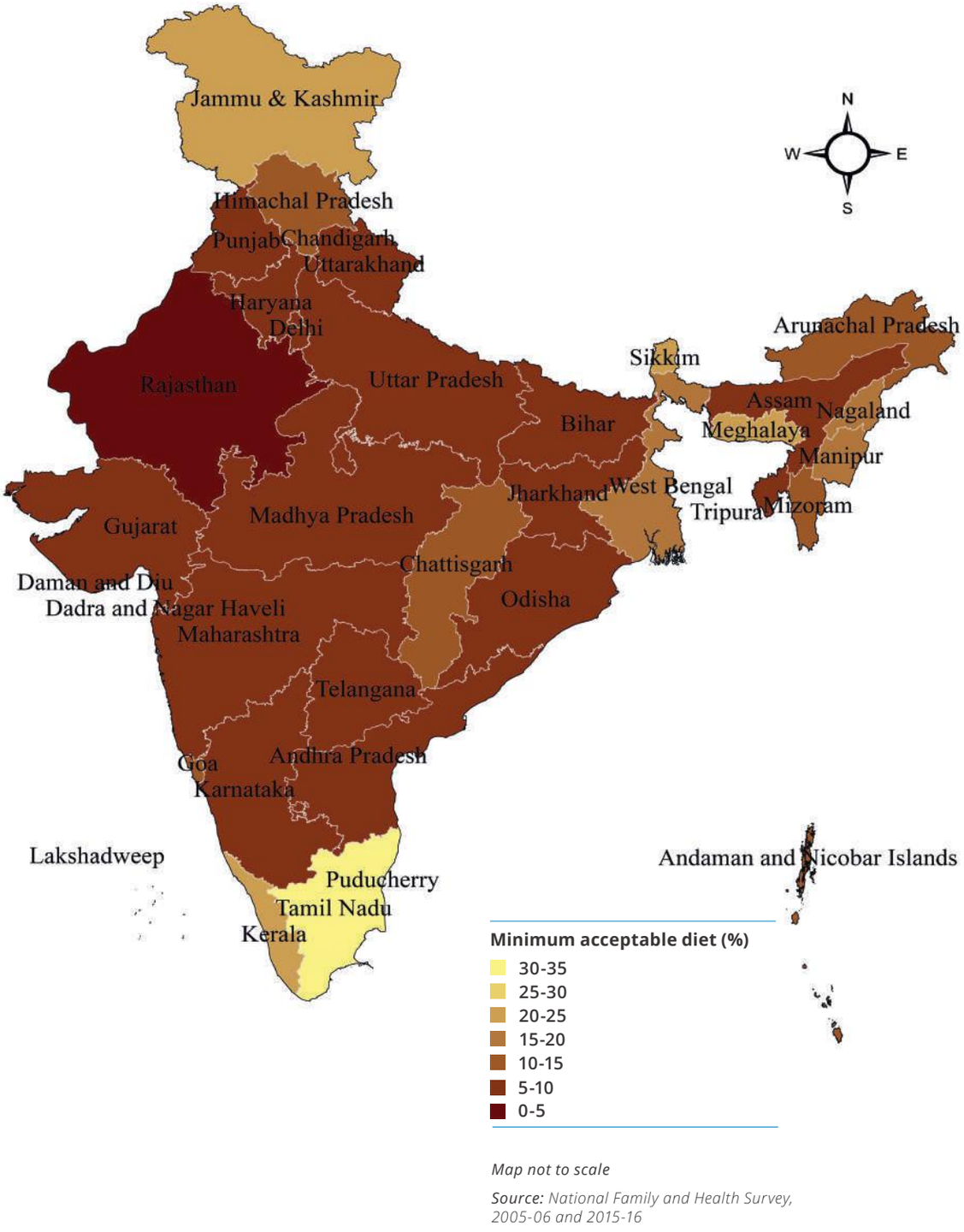
Map 5.23: *Percentage of children (0-6 months) exclusive breastfed in states of India,2005-06 and 2015-16*



Map not to scale

Source: *National Family and Health Survey, 2005-06 and 2015-16*

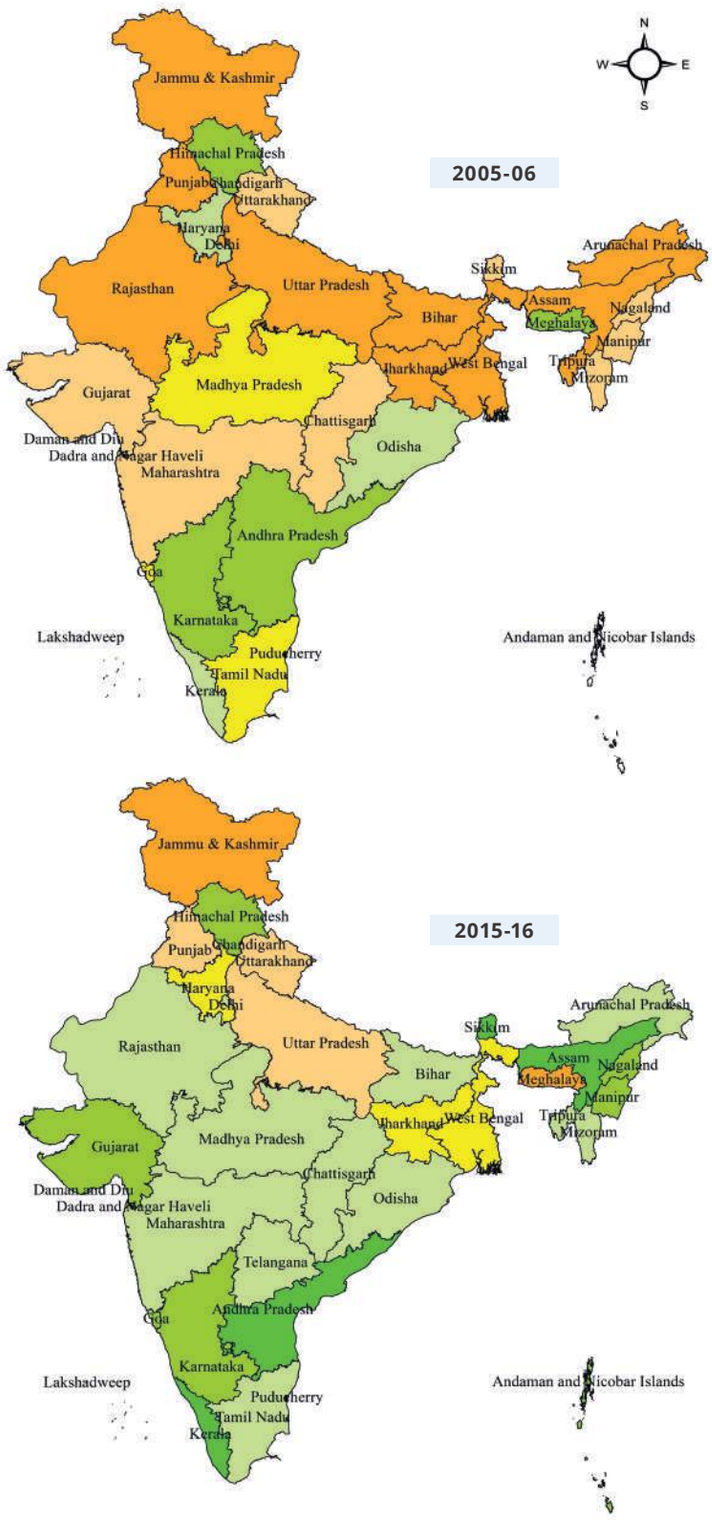
Map 5.24: *Percentage of children (6-23 months) having minimum acceptable diet in India, 2015-16*



Map not to scale

Source: National Family and Health Survey, 2005-06 and 2015-16

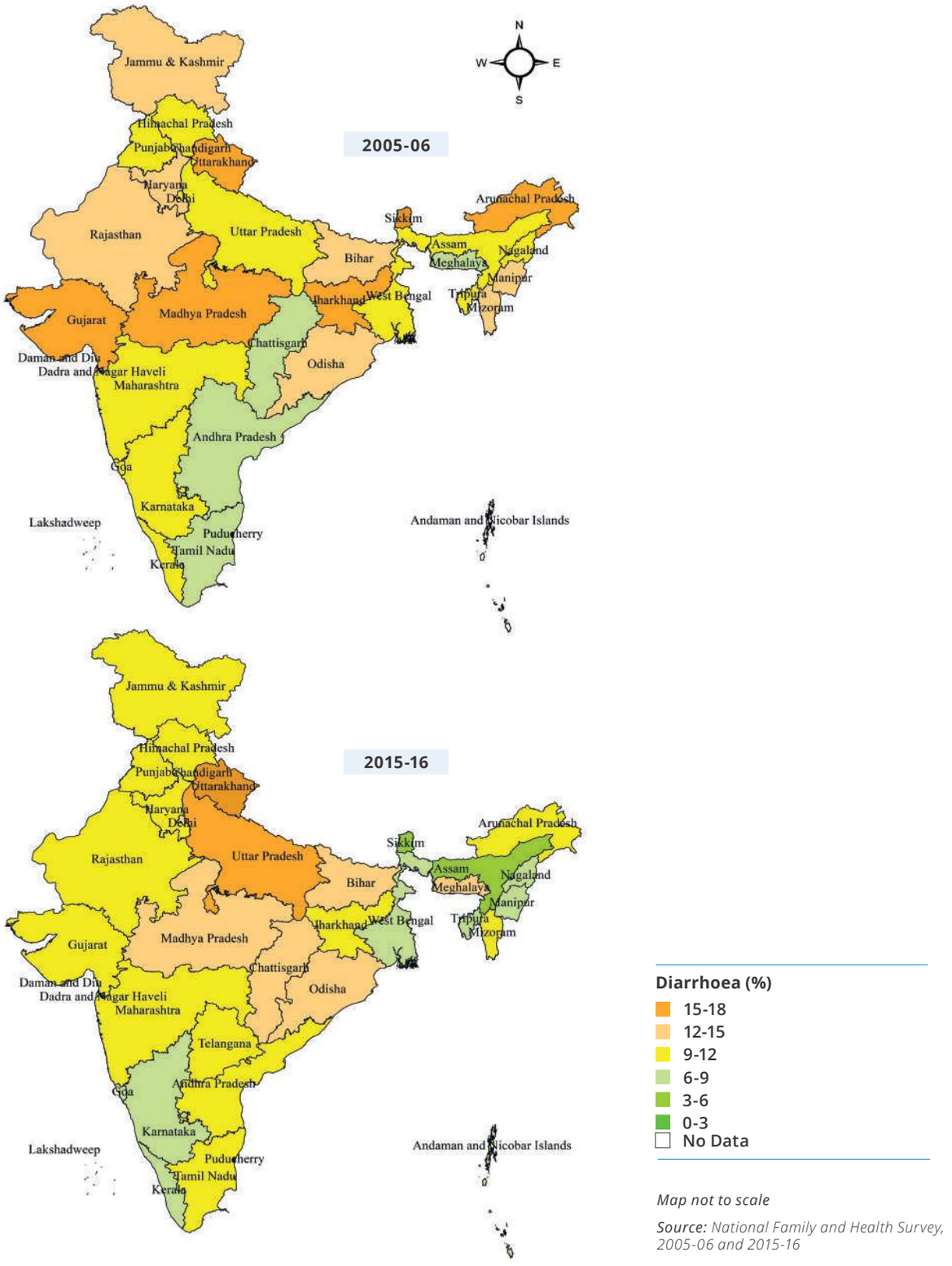
Map 5.25: *Prevalence of Acute Respiratory Infection (ARI) among under-five children in India, 2005-06 and 2015-16*



Map not to scale

Source: *National Family and Health Survey, 2005-06 and 2015-16*

Map 5.26: *Prevalence of Diarrhoea among under-five children in India, 2005-06 and 2015-16*



Map not to scale

Source: *National Family and Health Survey, 2005-06 and 2015-16*

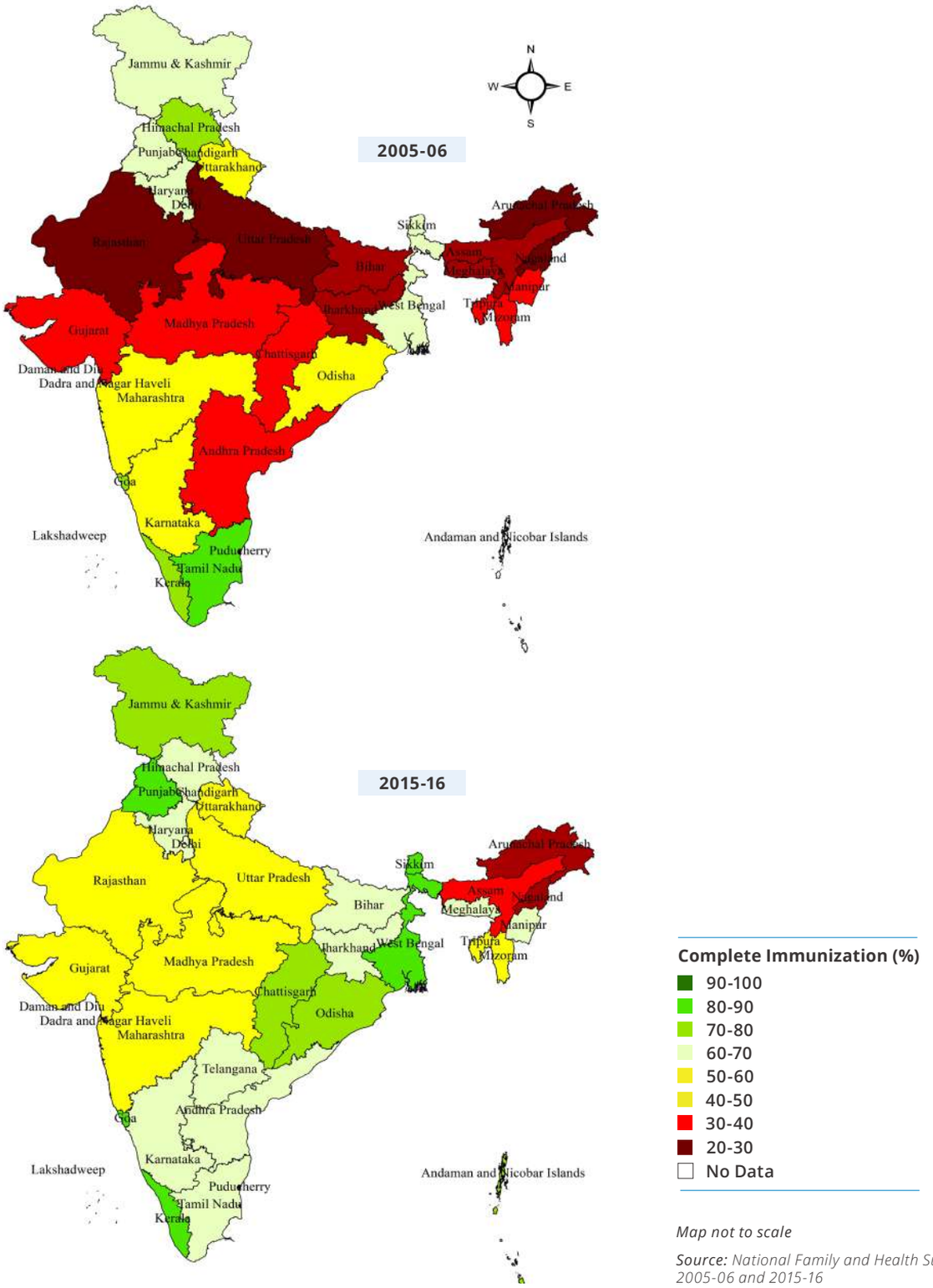
5.5 Intermediate Factors Affecting Nutritional Status

In addition to optimal feeding practices, child immunization is another important intervention that plays a critical role in child development by preventing communicable diseases. Routine immunization is one of the most cost-effective public health interventions, which provides active immunity, and further helps to prevent and eradicate the diseases that contribute to lower nutritional status. According to NFHS-4 data, 62.0 percent children of age 12-23 months are fully immunized. Only seven states out of 36 have more than 80 percent of children who are completely immunized. Although, the level of immunization has improved between 2005-06 to 2015-16, many bigger states need to focus more on complete immunization of children (Map 5.27).

Maternal health and health seeking behaviour are strong predictors of child health and survival. Availability and access to reproductive health care services such as Iron Folic Acid (IFA) tablets and Antenatal Care (ANC) play a pivotal role not only for the mother's health but also in the birth of healthy babies and prevention of infant and child deaths. In 2015-16, only 30.3 percent pregnant women consumed IFA for 100 days or more and 21.0 percent received full ANC in India. Status of IFA consumption and full ANC is similar among the states of India as 25 states are above and 11 are below the national average. Kerala is on top (Lakshadweep is on top among UTs) while Nagaland, Bihar and Arunachal Pradesh have recorded the lowest percentage of women consuming IFA for 100 days and women having full ANC (Map 5.28 and 5.29).

Altogether, the coverage and consumption of nutritional interventions has improved from the last decade, yet, the nation needs to accelerate improvement towards universal immunization and ANC facilities. Low prevalence of exclusive breastfeeding, full ANC, IFA consumption and extremely low percentage of children getting minimum acceptable diet in most of the states, is alarming and must be improved by spreading awareness and stronger policy support. Lack of these intermediate factors may restrict the translation of food access to food utilization.

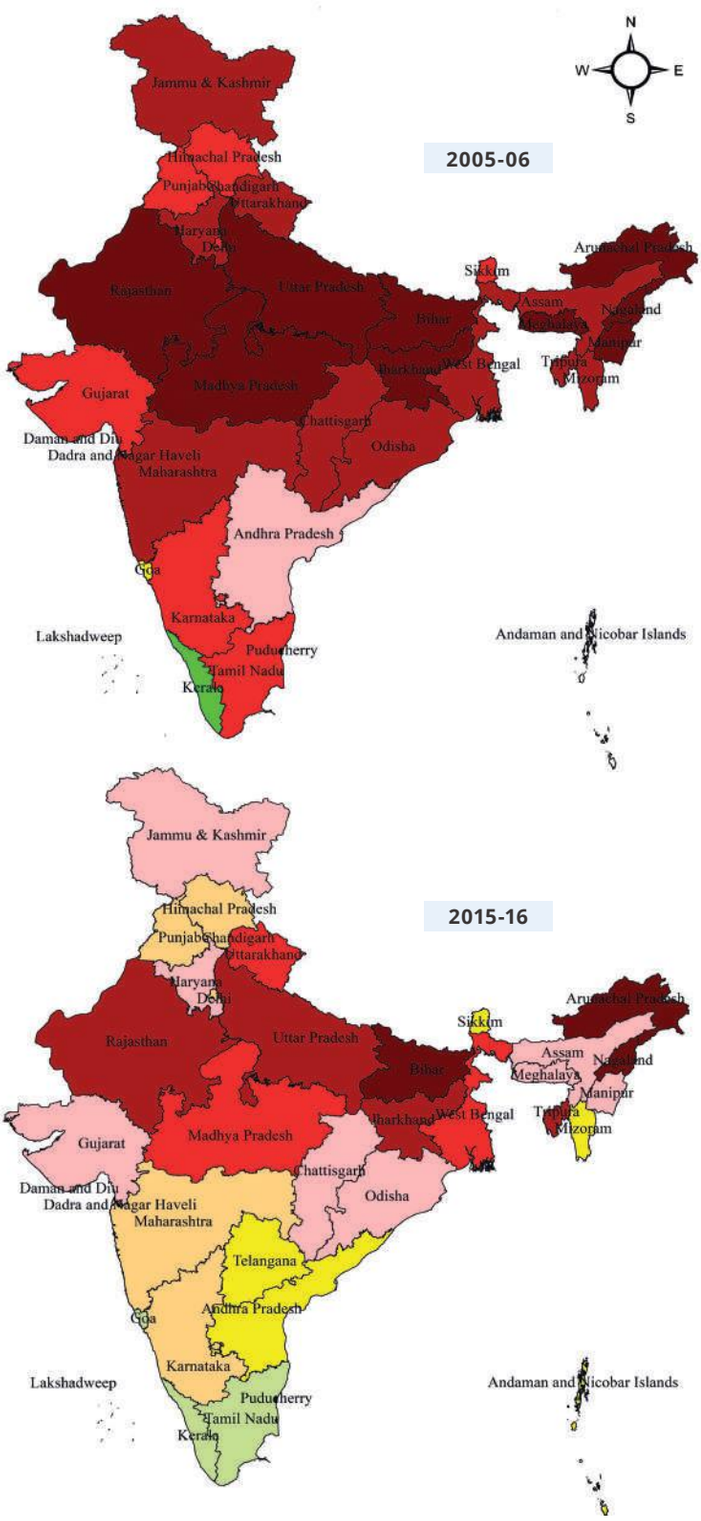
Map 5.27: *Percentage of children (12-23 months) completely immunized in India, 2005-06 and 2015-16*



Map not to scale

Source: National Family and Health Survey, 2005-06 and 2015-16

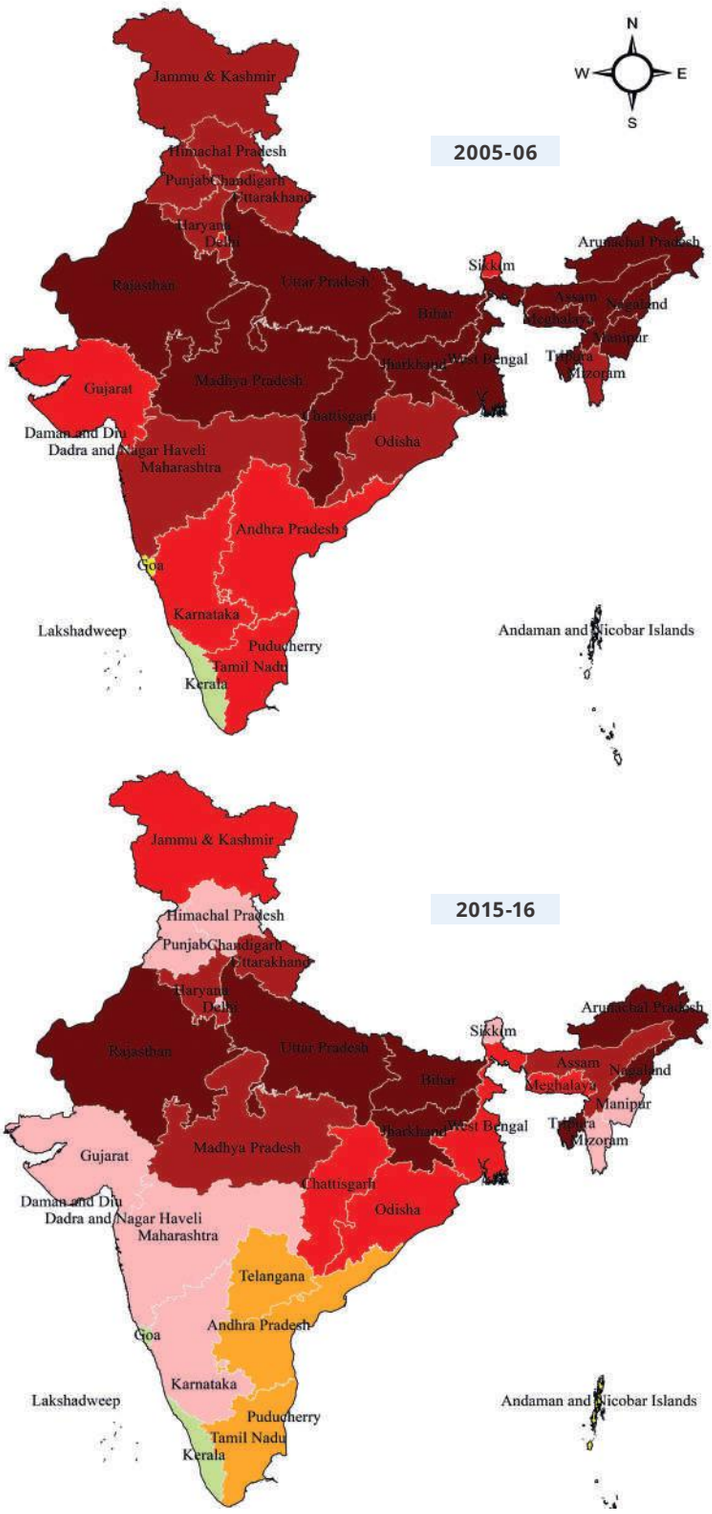
Map 5.28: *Percentage of Mothers who consumed iron folic acid (IFA) for 100 days or more when they were pregnant in states of India, 2005-06 and 2015-16*



Map not to scale

Source: *National Family and Health Survey, 2005-06 and 2015-16*

Map 5.29: *Percentage of Mothers who have full antenatal care (ANC) when they were pregnant in States of India, 2005-06 and 2015-16*



Map not to scale

Source: National Family and Health Survey, 2005-06 and 2015-16

5.6: Underlying Factors

Inadequate and unsafe drinking water, poor sanitation and unhygienic practices lead to many diseases, especially among children, due to low immunity and high susceptibility towards infection. In India, access to improved drinking water has reached a high level (89.9 percent) and about half of Indian households have access to improved sanitation (48.4 percent) in 2015-16. Access to improved drinking water has become almost universal in Chandigarh (99.5 percent) and Punjab (99.1 percent). Manipur is an exception with only 41.6 percent households having access to safe water (Map 5.30).

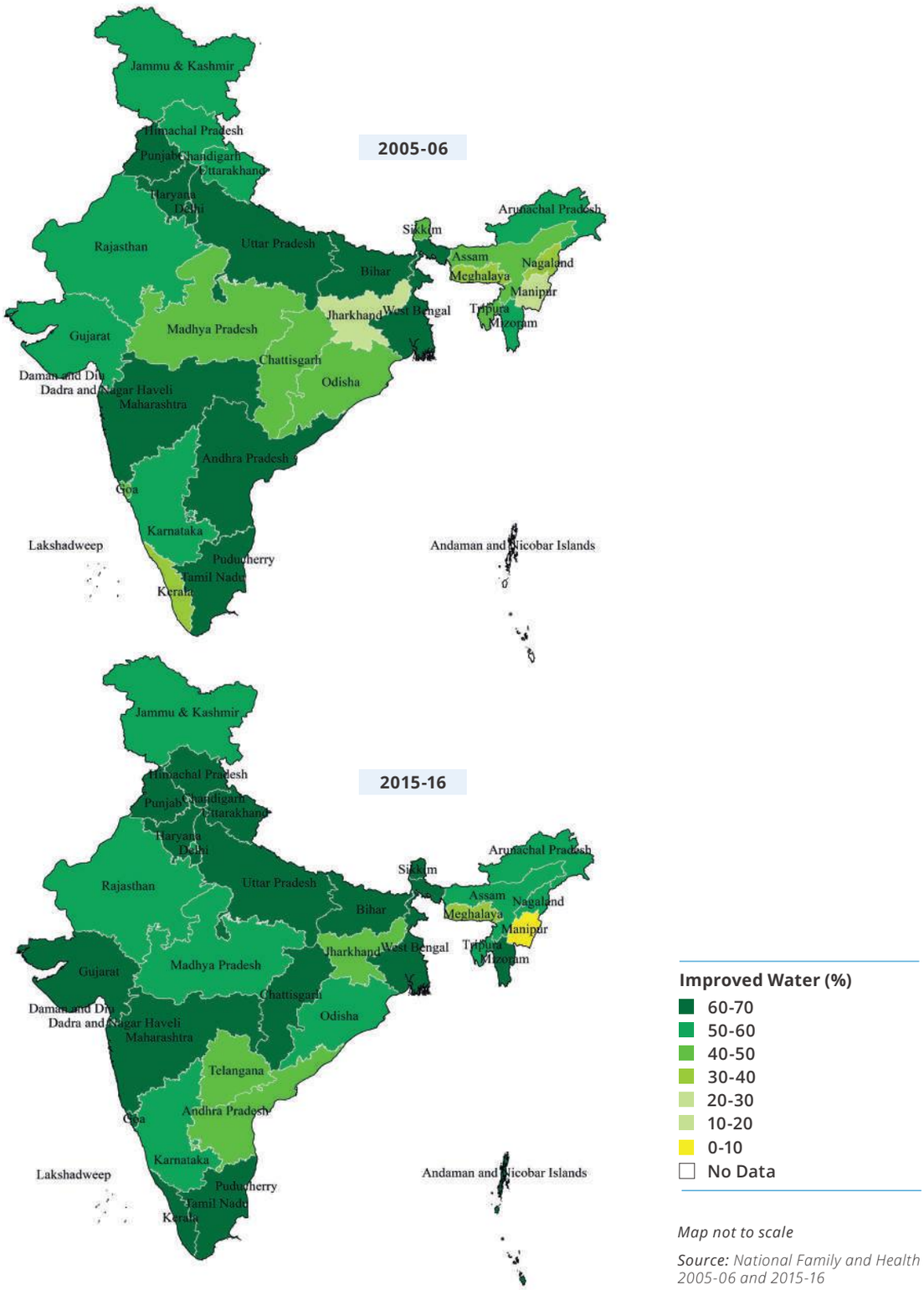
India may achieve a lot of positive impact towards improving nutritional and health status by providing improved sanitation facilities, as 38.9 percent households have either no sanitation facility or are practising open defecation (NFHS-4). Lakshadweep (99.4 percent) and Kerala (98.1 percent) have outperformed in providing access to sanitation facilities. More than 80 percent households in Punjab, Mizoram and Sikkim have access to improved sanitation facilities (Map 5.31). The Government of India launched a nationwide campaign to improve hygiene and sanitation, named Swachh Bharat Mission, in 2014. According to recent Government reports, the programme has been successful in building millions (around 90 million) of toilets in India and improving the sanitation coverage by more than 90 per cent[6].

Use of improved water by 90.0 percent of households and efficient use of health facility for seeking advice/treatment have also contributed to lower levels of ARI and diarrhoea among under-5 children in India. Moreover, various awareness programmes and campaigns by the Government played a

key role in spreading curative and preventive knowledge about benefits of using safe water and sanitation. Women's education has a positive impact on the health status of children (Table 5.4-5.6). Since 2005-06, there has been a substantial increase in the percentage of women and men between the age group of 15 to 49, who attended school and completed higher levels of education, and the gap between women and men has narrowed. In 2015-16, 68.0 percent women and 84.4 percent men were literate. Kerala remains on top and literacy is almost universal among women and men. Bihar has the lowest level of literate women (50 percent). Profile of women's literacy has improved in all the states of India (Map 5.32). Marriage at early ages, especially among women, is another big constraint, impacting their education as well as health status. The median age at first marriage is 19 years among women age 20-49.

http://sbm.gov.in/sbmdashboard/

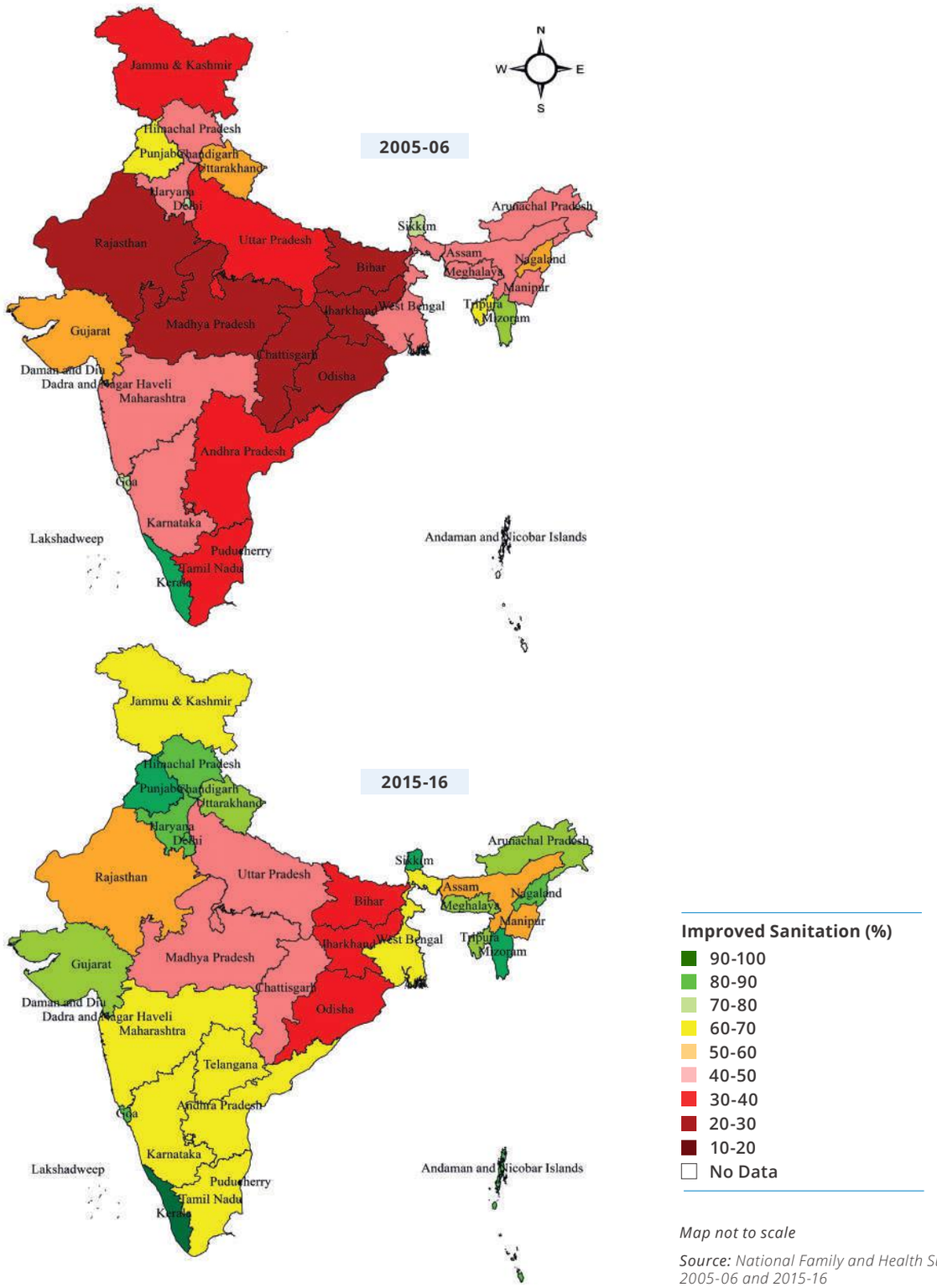
Map 5.30: *Percentage of households with an improved drinking water source in India, 2005-06 and 2015-16*



Map not to scale

Source: *National Family and Health Survey, 2005-06 and 2015-16*

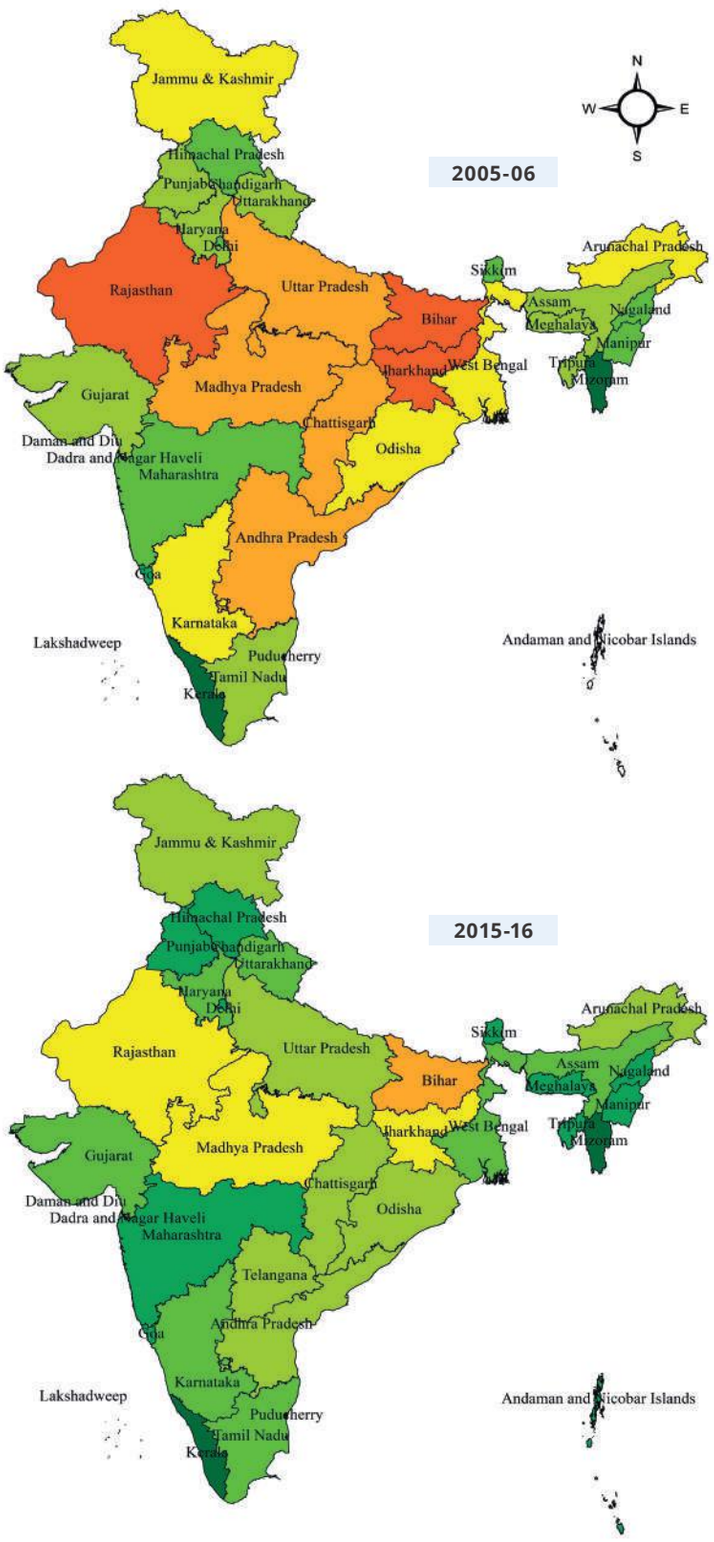
Map 5.31: *Percentage of households with an improved sanitation facilty in India, 2005-06 and 2015-16*



Map not to scale

Source: *National Family and Health Survey, 2005-06 and 2015-16*

Map 5.32: *Percentage of literate Women in states of India, 2005-06 and 2015-16*



Map not to scale

Source: National Family and Health Survey, 2005-06 and 2015-16

In 2015-16, 27 percent women between the age group 20-24 and 46 percent of women age in age group 45-49 married before attaining the legal minimum age of marriage of 18 years in India (NFHS-4).

5.7 Multiple burden of Malnutrition

Micro Level

Multiple burden of malnutrition is the coexistence of any two or all three forms of malnutrition: stunting, wasting and underweight. Figure 5.13 is a Venn diagram, showing co-existence of multiple forms of undernutrition among under-5 children in India. Among children aged 0-5 years, 6.5 percent children are stunted, wasted as well as underweight; 18.4 percent children are stunted and underweight and 8.2 percent children are wasted and underweight. This analysis also reveals that after disaggregating the coexistence of these three conditions, 13.6 percent children are only stunted (against 38.4 percent overall prevalence of stunting), 2.6 percent are only underweight (against 35.7 percent overall prevalence of underweight) and 6.3 percent (against 21.0 percent overall prevalence of wasting) are wasted.

State-wise analysis shows that Jharkhand (10.9 percent) has the highest prevalence of multiple burden of malnutrition (under-five children who are stunted, wasted and underweight); followed by Madhya Pradesh (8.5 percent) and Bihar (8.1 percent). Kerala (1.7 percent), Mizoram (1.4 percent) and Manipur (1.4 percent) are among bottom three states, having lowest burden of multiple malnutrition (Table 5.2).

Figure 5.13: *Multiple burden of malnutrition, India, 2015-16*

Source: *Estimated from NFHS-4 unit level data*

Table 5.2: ***Multiple burden of malnutrition (%) in the states of India, 2015-16***

States/UTs	Only Stunted	Only Wasted	Only Underweight	Stunted and Underweight	Wasted and Underweight	Stunted, Wasted and Underweight
Andaman and Nicobar Islands	10.8	9.2	2.3	9.5	6.7	3.0
Andhra Pradesh	9.8	5.0	3.0	16.7	7.3	4.9
Arunachal Pradesh	17.3	8.7	1.1	9.7	6.3	2.3
Assam	15.6	5.7	2.3	16.2	6.7	4.5
Bihar	14.7	5.1	2.7	25.5	7.6	8.1
Chhattisgarh	12.6	3.4	3.9	13.1	4.5	3.0
Chandigarh	13.6	6.6	3.3	17.8	10.3	6.1
Dadra and Nagar Haveli	15.7	9.9	1.4	19.6	11.4	6.4
Daman and Diu	7.9	11.6	1.9	12.2	9.2	3.4
Goa	8.0	11.2	3.4	9.7	8.3	2.3
Gujarat	12.4	8.0	2.8	18.2	10.4	7.9
Haryana	16.1	8.0	2.5	13.7	9.0	4.2
Himachal Pradesh	12.4	5.6	2.1	11.0	5.3	2.9
Jammu & Kashmir	15.8	6.0	0.8	9.6	4.2	2.0
Jharkhand	12.0	7.0	3.4	22.4	11.1	10.9
Karnataka	13.1	9.7	2.4	16.4	9.7	6.7
Kerala	10.9	8.1	1.4	7.1	5.9	1.7
Lakshadweep	11.9	4.0	2.6	11.3	6.1	3.6
Madhya Pradesh	12.7	7.1	3.3	20.8	10.2	8.5
Maharashtra	11.1	8.7	2.9	16.2	9.7	7.1
Manipur	18.5	3.3	1.3	9.0	2.2	1.4
Meghalaya	22.2	6.5	1.6	18.4	5.7	3.2
Mizoram	19.4	2.3	1.0	7.3	2.4	1.4
Nagaland	16.8	4.9	1.1	9.2	3.8	2.6
Delhi	11.4	6.5	1.6	16.0	4.9	4.5
Odisha	11.5	5.4	3.3	16.2	8.5	6.4
Puducherry	12.0	12.3	2.2	8.5	8.1	3.3
Punjab	12.7	5.4	1.7	9.5	6.8	3.5
Rajasthan	14.2	6.6	2.5	17.8	9.3	7.1
Sikkim	21.2	8.4	1.8	6.6	4.0	1.8
Tamil Nadu	12.9	8.0	1.9	10.2	7.7	4.0
Tripura	10.1	5.9	2.4	10.8	7.6	3.4
Uttar Pradesh	16.4	4.6	2.7	23.5	6.9	6.3

Table 5.2: ***Multiple burden of malnutrition (%) in the states of India, 2015-16***

States/UTs	Only Stunted	Only Wasted	Only Underweight	Stunted and Underweight	Wasted and Underweight	Stunted, Wasted and Underweight
Uttarakhand	15.9	7.8	1.3	13.7	7.7	3.9
West Bengal	12.8	5.0	2.9	13.3	8.9	6.4
Telangana	8.4	6.4	2.9	13.8	5.9	5.8

Source: Estimated from NFHS-4, 2015-16

5.8 Conclusions

This chapter aims to understand and map the nutritional status of children and adults in India. Although India progressed a lot in the last decade, there is substantial intra and inter-state variation in malnutrition, health and health seeking behaviour. Public health problems are limited to high focus states (Uttar Pradesh, Madhya Pradesh, Bihar, Rajasthan, Odisha, Jharkhand, Chhattisgarh and Uttarakhand). However, this analysis shows that malnutrition is almost a universal problem in India. A few states perform better than others on either over or undernutrition, but according to internationally acceptable standards for malnutrition, it is a serious public health problem across all states of India.

Level of mortality and malnutrition has declined from 2005-06 to 2015-16 in India and states but according to WHO classification, majority of the states and districts fall under 'very high' category. However, few districts in northern and north-eastern states have shown 'low' level of wasting and underweight. The desegregated analysis of malnutrition by various socio-economic characteristics and estimation of multiple burden of malnutrition were indicative to identify the vulnerable section of the population. For several decades, India was dealing with only one form of malnutrition- undernutrition. However, in the last decade, the double burden of over and under nutrition is becoming more evident, posing the challenge of tackling both simultaneously.

Nutrition and SDGs
SDG:2 aims to end hunger, achieve food security and improved nutrition and promote sustainable agriculture by 2030
SDG 2.2: By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons.
SDG 3.2: By 2030, end preventable deaths of new-born and children under 5 years of age
SDG 4.3: By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university.
SDG 6: By 2030, achieve access to adequate and equitable sanitation and hygiene for all

Anaemia prevalence has barely changed in last one decade among men and women, however prevalence of anaemia is more than double among women than men. Mother's anaemia is correlated with anaemia among children, prevalence of anaemia was higher among children of mothers with anaemia. WHO recommends mothers worldwide to exclusively breastfeed infants for the child's first six months to achieve optimal growth, development and health.

Low prevalence of exclusive breastfeeding, full ANC, IFA consumption and extremely low percentage of child getting minimum acceptable diet in most of the states is alarming and must be addressed by spreading awareness and through effective implementation of policies.

Government of India has well acknowledged this challenge and launched many ambitious programs like Mission Indradhanush to immunize all children against seven deadly diseases and Poshan Abhiyan" with a theme of "Sahi Poshan-Desh Roshan" to tackle all forms of malnutrition on a mission mode. There are few SDGs and some targets which specifically aim to improve the nutritional status along with key immediate and underlying factors of the health status by 2030.

Ensuring healthy lives as well as food and nutrition security at all ages is essential for sustainable development. The evidences coming out of this chapter reflects overall improvement in the health status and the factors influencing health of children, women and men but there is urgent need to accelerate the improvement. This is high time to join hands to achieve the ambitious targets of national nutrition mission and SDG on time, with multisectoral efforts and policy support.

CHAPTER SIX

UNDERLYING FACTORS OF FOOD AND NUTRITION SECURITY

6.1 Background

As has been discussed in detail in the previous chapters, food insecurity and malnutrition are multidimensional in nature and therefore require a multi-sectoral approach. While immediate factors such as inadequate food intake, inappropriate feeding practices, disease prevalence can be tackled through various public-sector interventions, the underlying factors need a much more holistic approach and broad set of interventions.

The analysis of core indicators of food and nutrition security in previous chapters indicates that India is making progress towards achieving SDG-2. For example, reduction in malnutrition over the last decade, increase in food production and per capita net availability of food grain, improvements in access to food as well as coverage of various health and nutrition services/practices over a period of time are evidences of this progress. This chapter discusses the underlying factors that affect food and nutrition security of the Indian population. The chapter has been divided into 4 parts- (i) incomes and livelihoods, (ii) social inequality (iii) status of health infrastructure and agricultural practices (iv) performance of social safety-net schemes.

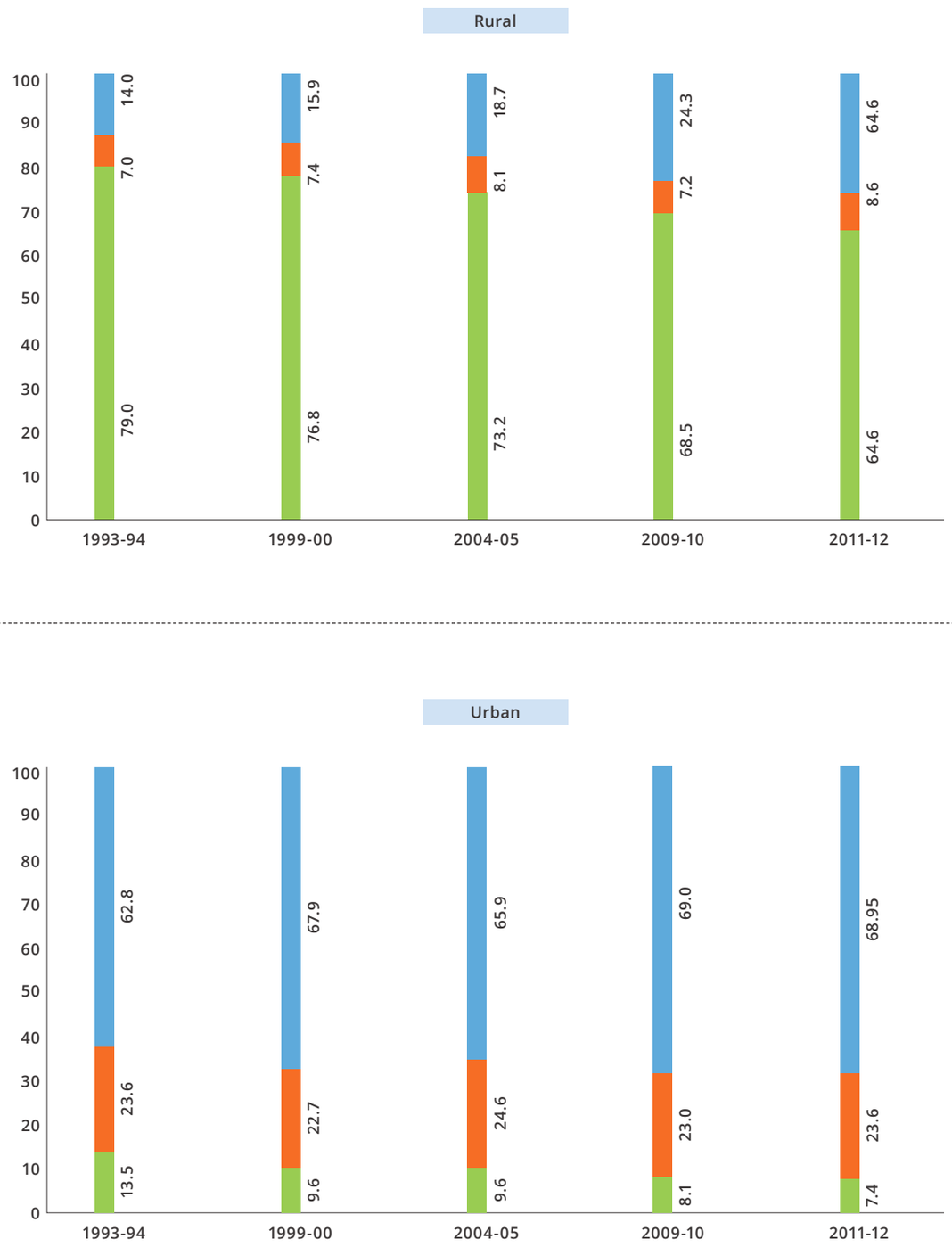
6.2 Income and Livelihoods

Low and subsistence level of income among the vulnerable population, especially in rural India, can be linked to the heavy reliance on the agriculture sector and a high dependency ratio, marked by overcrowding and low productivity (low output per worker ratio). While agriculture has achieved a growth rate of 1.6 percent between 1996-99 and 2015-18, it is prone to be affected by natural disasters such as cyclones, droughts and flash floods, leading to wide variation in annual outputs.

There has been a decline in the proportion of agricultural workers in India during 2001 to 2011. Only eight states have observed increase in proportion of agricultural workers - Himachal Pradesh, Uttarakhand, Jammu and Kashmir, Rajasthan, Nagaland, Arunachal Pradesh, Sikkim and Mizoram. Notwithstanding this, any growth in agriculture may not necessarily translate into higher incomes among the farmers in the absence of strong marketing linkages, efficiency in supply chain - storage, transportation and handling - of both agriculture and horticulture products. Therefore, there is a need for shifting the population from farm to more productive non-farm sectors, without which the income and purchasing power of the people may not improve substantially and household access to food will continue to suffer. An increase in the service sector in rural areas shows lessening of stress on agriculture, which however appears to be very slow (Figure 6.1). A higher number of dependents, especially in a rural setup, leads to very low allocation of income as well as food among individuals in a household. Rural India has a higher dependency ratio at 71.7 percent as compared with 52.6 percent in urban areas in 2011. The decline from 2001 to 2011 is a result of demographic transition. Currently, India is in a stage of demographic transition where the proportion of adult working population is more than dependent population (children and old age population).

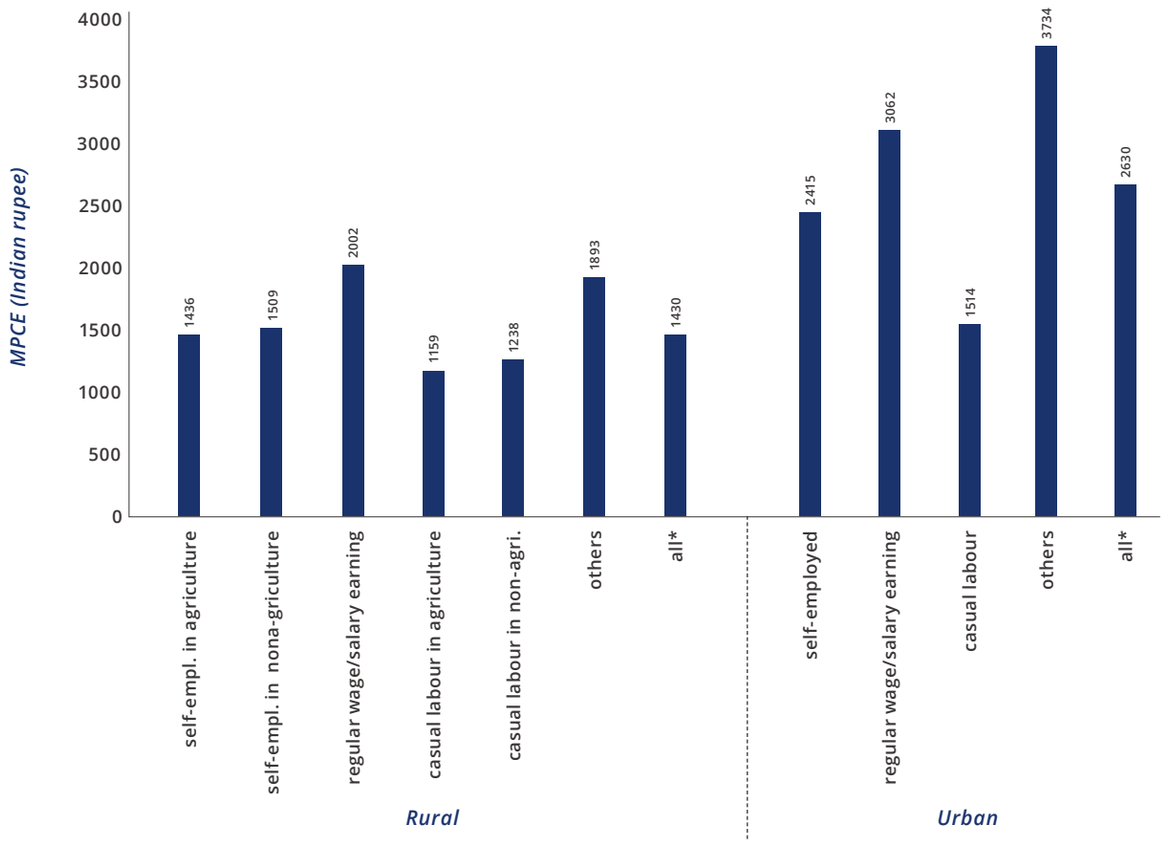
Many UTs of India have a high per capita Gross State Domestic Product (GSDP)for example Goa (INR 27,937), Chandigarh (INR 22,957) Delhi (INR 19,415). However, the bulk of India's population resides in the states that have the lowest GSDP, (and are also larger in size) such as Bihar (INR 2751), Uttar Pradesh (INR 3598), Assam (INR 4258) and Jharkhand (INR 4365) as recorded in 2011-12 (Map 6.2).

Figure 6.1: *Percentage of distribution of working population in three major industries by place of residence, India, 1993-94 and 2011-12*



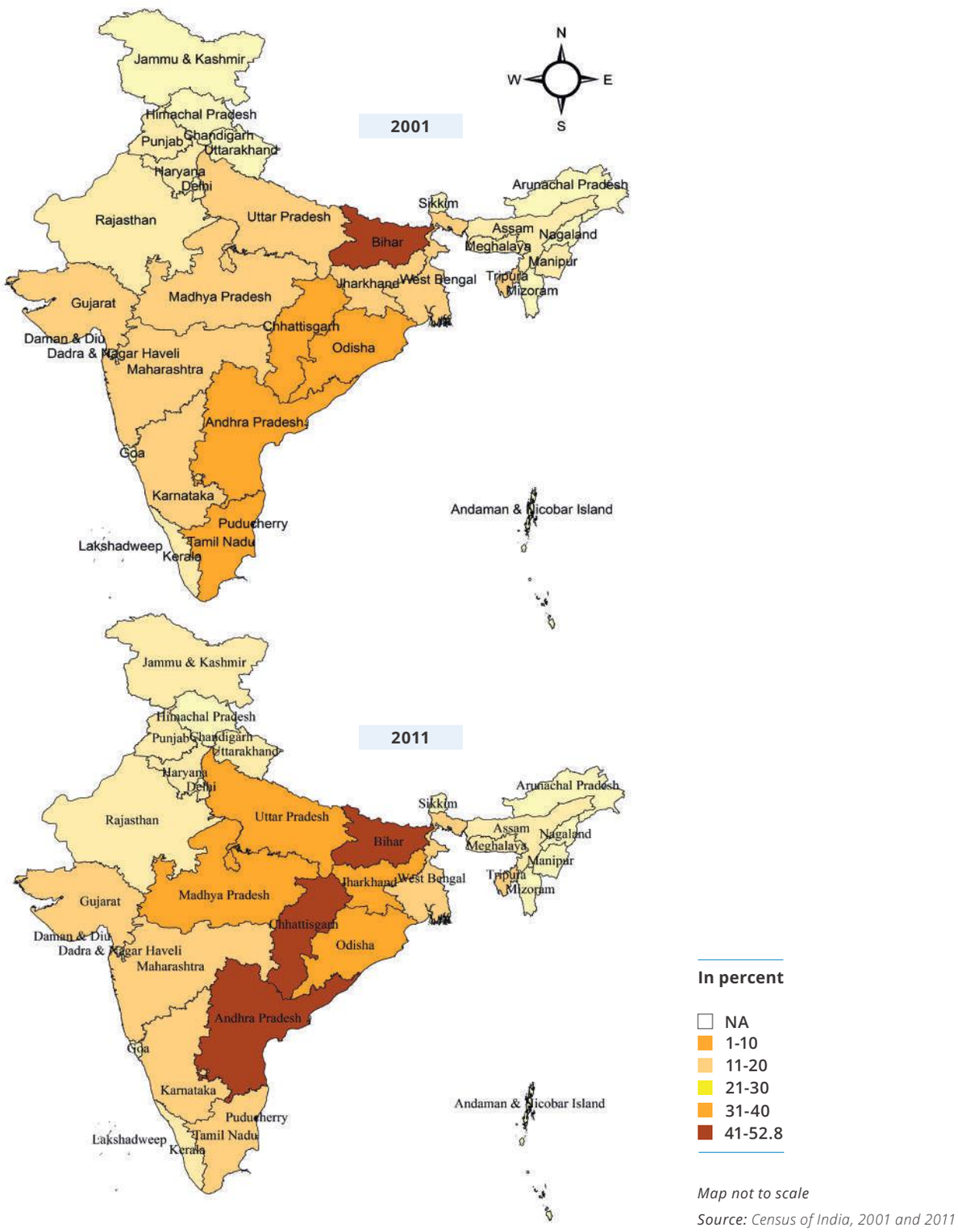
Source: Various rounds of National Sample Survey, MoSPI, GoI

Figure 6.2: *Average MPCE (Rs.) by employment group and place of residence, 2011-12*



Source: *Various rounds of National Sample Survey, MoSPI, GoI*

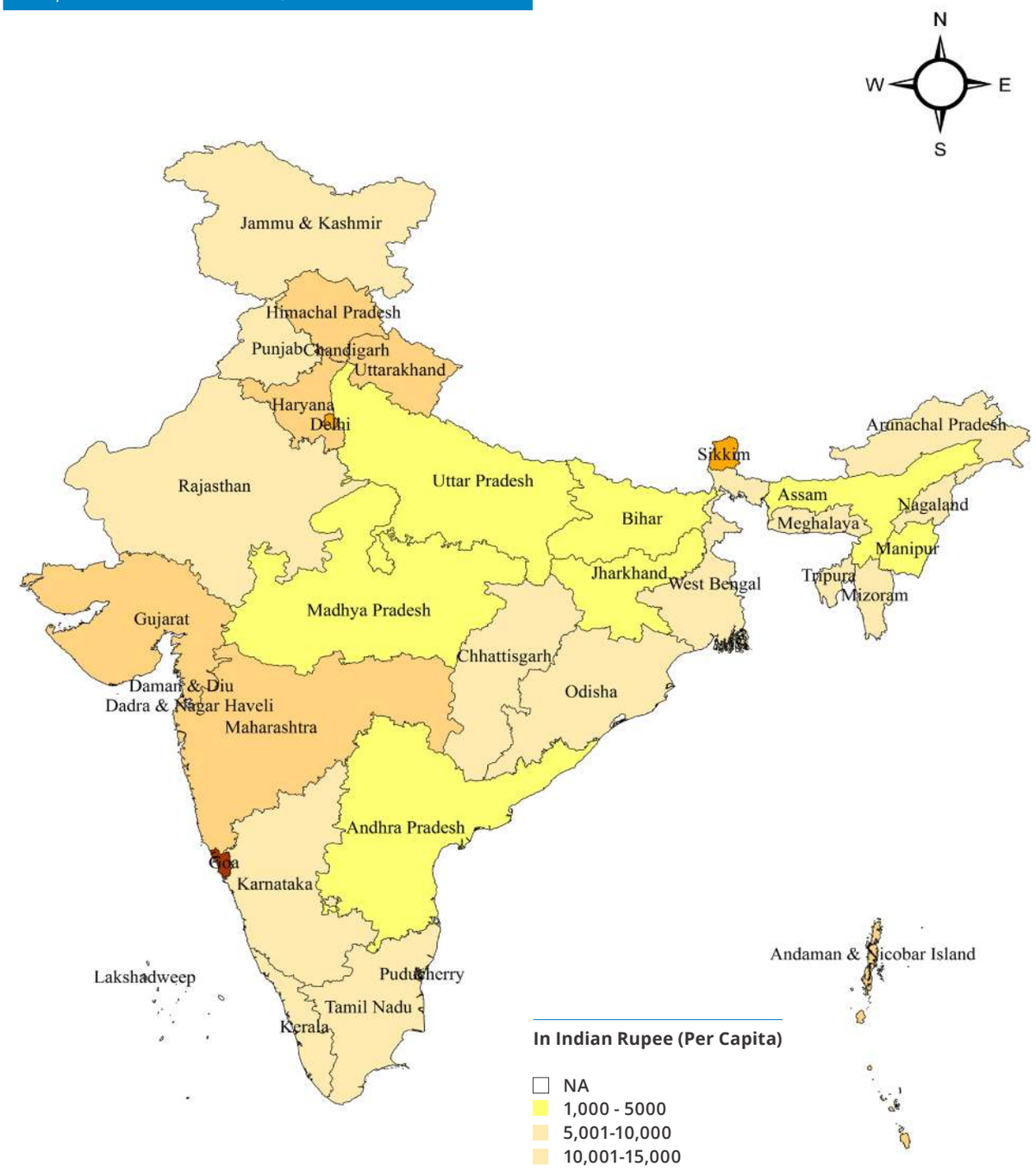
Map 6.1: *Proportion of Agricultural Worker to Total Worker in India between 2001 and 2011*



Map not to scale

Source: *Census of India, 2001 and 2011*

Map 6.2: *Per Capita Gross State Domestic Product (GSDP) in Rupee at Current Price in India, 2011-12*



Map not to scale

Source: *Central Statistics Office, Ministry of Statistics and Programme Implementation, Government of India*

Table 6.1: *Dependency ratio by place of residence in the states of India, 2001 and 2011*

States/UTs	2001			2011		
	Total	**Rural**	**Urban**	**Total**	**Rural**	**Urban**
Andhra Pradesh	65.8	69.4	56.9	56.0	59.4	49.4
Arunachal Pradesh	81.6	87.0	63.4	67.5	73.3	50.6
Assam	76.4	80.6	52.2	65.4	69.0	46.2
Bihar	95.1	97.4	77.5	91.1	94.0	70.9
Chhattisgarh	79.2	84.0	62.4	66.4	70.8	53.5
Delhi	60.5	69.4	59.9	51.7	58.7	51.5
Goa	49.4	49.8	49.1	49.4	50.4	48.8
Gujarat	66.0	72.3	56.3	58.6	65.5	50.1
Haryana	77.0	82.7	64.4	62.3	66.9	54.5
Himachal Pradesh	67.0	69.3	48.0	56.6	58.2	44.1
Jammu & Kashmir	73.9	81.4	54.7	70.1	77.6	53.1
Jharkhand	84.0	90.5	64.6	76.5	83.3	57.9
Karnataka	65.6	70.8	56.3	55.6	60.1	49.0
Kerala	57.6	58.8	54.3	56.3	56.9	55.7
Madhya Pradesh	84.3	90.9	68.2	70.6	76.7	56.5
Maharashtra	69.1	79.6	56.8	57.8	65.6	49.4
Manipur	65.0	66.9	60.2	59.4	61.1	55.6
Meghalaya	88.4	95.0	65.3	80.1	88.0	54.1
Mizoram	69.1	78.8	60.3	63.2	74.6	53.9
Nagaland	70.2	72.2	61.0	65.4	70.9	53.3
Odisha	70.9	73.9	55.7	62.3	65.3	48.7
Punjab	67.9	72.9	58.8	56.1	59.9	50.1
Rajasthan	88.2	94.4	70.5	73.1	78.5	58.6
Sikkim	67.9	71.0	46.7	51.3	55.1	41.2
Tamil Nadu	55.9	59.8	51.2	51.5	54.4	48.6
Tripura	69.3	74.2	49.2	55.3	59.7	44.2
Uttar Pradesh	92.6	98.2	74.0	77.8	83.5	60.5
Uttarakhand	79.1	86.0	61.8	66.7	72.8	54.3
West Bengal	67.8	74.7	52.3	55.3	59.0	48.1
Andaman and Nicobar Islands	52.2	56.2	44.6	45.1	48.2	40.1
Chandigarh	51.6	52.8	51.5	46.2	49.3	46.1
Dadra and Nagar Haveli	64.7	70.5	47.7	54.9	65.9	44.1
Daman and Diu	47.9	44.5	54.4	37.6	52.9	33.2
Lakshadweep	67.7	70.9	63.9	51.0	56.7	49.4
Puducherry	54.6	58.4	52.7	50.6	52.7	49.6
All-India	**75.2**	**81.9**	**59.9**	**65.2**	**71.7**	**52.6**

Source: *Census of India, 2001 and 2011*

6.3 Social Discrimination – Gender, Social Groups and Disability

Analysis across all dimensions shows that while progress is evident at the aggregate level, the poorest and deprived social groups perform the worse. It is critical to intensify progress with more emphasis on vulnerable sections of the population like rural residents, backward communities, under-five children, women and poor, who have low affordability arising out of low income, reduced opportunity and social discrimination, reflected in poorer nutritional outcomes.

A growing body of evidence demonstrates that the biases against the girl child begin early in life and continue throughout the lifecycle in one or another form. This results in inequality between women and men that becomes increasingly difficult to resolve. The plight of women has been worse owing to socio-cultural discrimination, compounded by lower asset base, lower participation rates, low wages and low participation in household decisions. The low status of women is directly reflected in poor nutrition and health outcomes in children.

The literacy rate for women aged 15 to 49 years in India is only 68.4 percent (NFHS-4). Further analysis of this indicator shows that states such as Bihar (50.5 percent), Rajasthan (43.5 percent), Jharkhand (41.6 percent), Madhya Pradesh (40.6 percent) and Uttar Pradesh (39.6 percent) not only the have highest rates of illiteracy for women but are also states with the largest gap in literacy rates between men and women of the same age group. Failing to educate women and girls limits their potential to contribute productively, reduces GDP growth and impedes achieving zero hunger. For instance, NFHS 4 (2015-16) highlights that 51 percent of children born to mothers with no schooling are stunted, compared with 24 percent of children born to mothers with 12 or more years of schooling. The corresponding proportions of underweight children are 47 and 22 percent, respectively.

Many recent studies highlight a strong correlation between hunger and gender inequality. FAO estimates that closing the gender gap in access to productive resources can increase domestic agricultural output by 2.5-4 percent and result in 100 million fewer people living in hunger[1] . In last three decades, the National Sample Survey Office (NSSO) survey highlights a decline in labor force in agriculture from 81 percent to 63 percent among men, and from 88 percent to 79 percent for women. The numbers suggest that women have higher share in agriculture, but the dark side of the story is that they are mostly agricultural laborers and not decision makers. Four out of five financially independent women are not involved in farm-related activities in India. Of this, 33 percent are working as agricultural laborer and 48 percent are self-employed farmers. According to the NSSO report, women lead almost 18 percent agricultural households and there is not a single area of agriculture in which they are not involved[2] .

India has only 25.5 percent[3] of women participating in the work force and among them, 95 percent work in the informal sector, with substandard employment conditions. In fact, owing to occupational segregation and disproportionate job growth benefiting men, there has been slight decline in the Female Work Participation Rate (FWPR) from 25.63 in 2001 to 25.51 in 2011. In 2011, FWPR was highest in Himachal Pradesh (44.8 percent) followed by Nagaland (44.7 percent), Chhattisgarh (39.7 percent), Sikkim

[1] *FAO. 2010, State of Food and Agriculture Report, 40*

[2] *Ministry of Agriculture & Farmer's Welfare (Press Information Bureau) - Aug, 2017*

[3] *Department of Economic & Social Affairs, United Nations, 2015, The World's Women 2015: Trends and Statistics*

(39.7 percent) and Manipur (38.6 percent) while most of the UTs recorded low (below 20 percent) FWPR (Map 6.5).

Among other issues, a special mention needs to be made about the challenge of BMI and anaemia among women. The Indian pattern of lower quantity and quality of food consumption by women and girls than by men and boys is a key household and social inequality aspect that leads to comparatively higher undernutrition in the girl child and woman. In many cases, women play the role of a mother, a sister or a wife and forego their needs in favor of her children, brothers, husband and elder members of the family, resulting in inadequate availability of food and nutritious items like fruits, vegetables and pulses, irrespective of their physiological condition. These nutritional deficiencies indicate the presence of hunger especially among women. This is particularly critical as among women affected by food insecurity, lack of macro and micronutrients, such as iron, during pregnancy leads to high-risk pregnancies, low birthweight babies and other health problems perpetuating the situation in an unending cycle. Nutritional needs of women are enhanced during pregnancy and lactation, further accentuating the need for special attention. As highlighted in the earlier chapters, the prevalence of undernutrition among girls below the age of 5 years is alarming - stunting (37.9 percent), underweight (35.3 percent) and wasting (20.1 percent)[4]. Though these figures are not significantly lower than boys, the gap increases with age, indicating growing deprivation relative to physiological requirements of nutrients for adolescent girls and women. In addition, children who suffer from growth retardation as a result of poor diet and/or recurrent infections tend to have a greater risk of suffering illness and death. Therefore, the nutritional status of children is a consequence of three interacting factors: food intake, health status, and parental and health care.

Table 6.2: ***Gender Inequality on Selected Parameters***

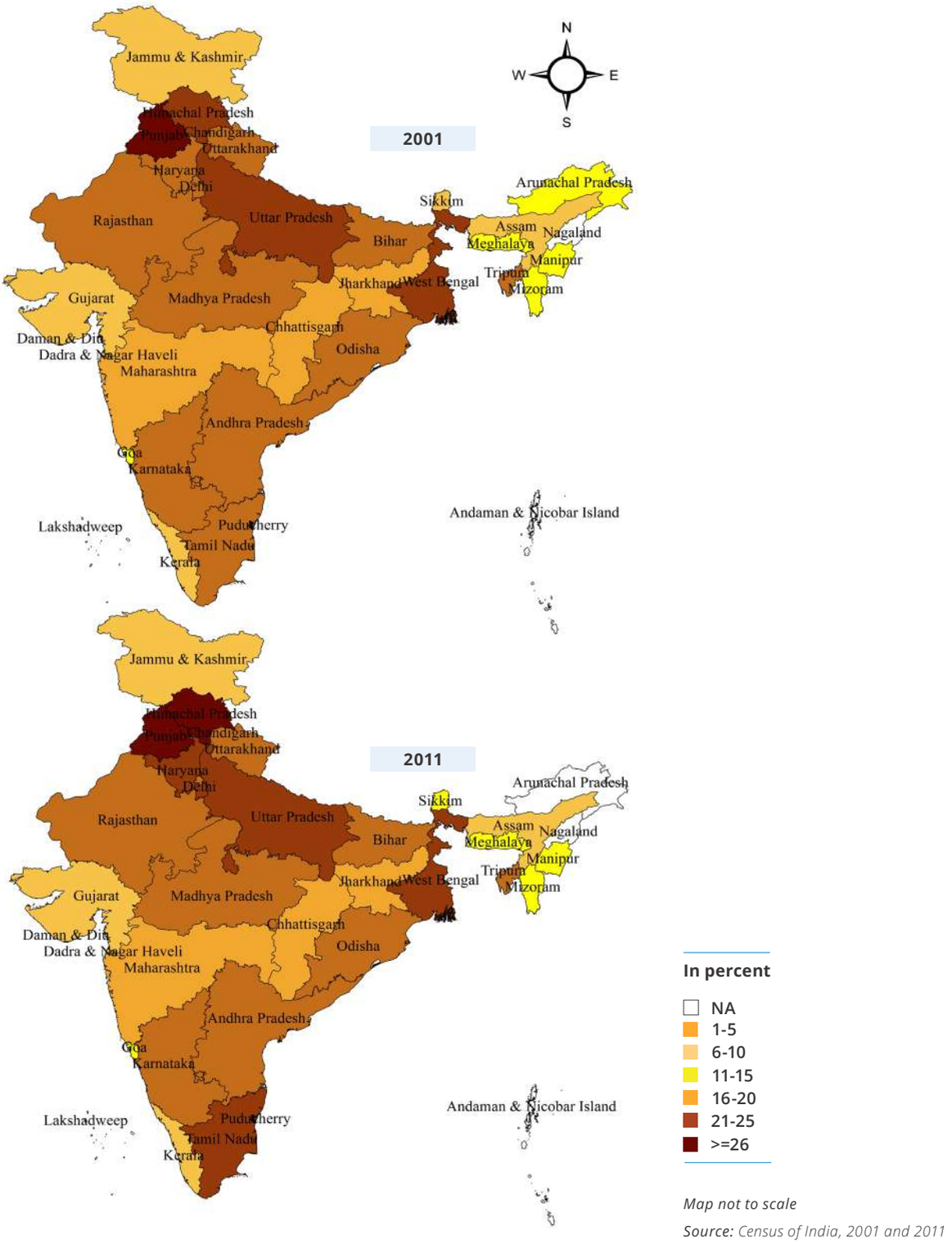
Indicators	Women	Men
Body Mass Index (BMI) is below normal (BMI < 18.5 kg/m2) (%)	22.9	20.2
Overweight or obese (BMI ≥ 25.0 kg/m2) (%)	20.7	18.6
Age 15-49 years who are anaemic (%)	53.0	22.7

Source: NFHS India Fact sheet, 2015-16.

Food and nutrition insecurity is further perpetuated by discriminatory social structures evident in caste and religion. As discussed in chapter 5, all forms of malnutrition and anemia are higher among scheduled tribes. So, the specific area, where proportion of SC or ST population is more, are at high risk. This has a negative impact on the nutritional, economic, social and educational status and ultimately overall productivity contribution to country's economy. People with disabilities are another segment of vulnerable populations that suffer due to social stigma, attached with disability, and reduced opportunities that further push them into more vulnerable conditions. According to Census of India 2011, about 2.2 percent (26.8 million) of the population are categorized as disabled. Of the total disabled population about 20.3 percent are disabled in 'movement', 18.9 percent in 'hearing', 18.8 percent in 'seeing' and about 8 percent have multiple disability. There is a high likelihood that they are deprived from access to better food and nutrition services as well. However, the data available for such analysis is extremely limited.

[4] *NFHS 4 (2015-16)*

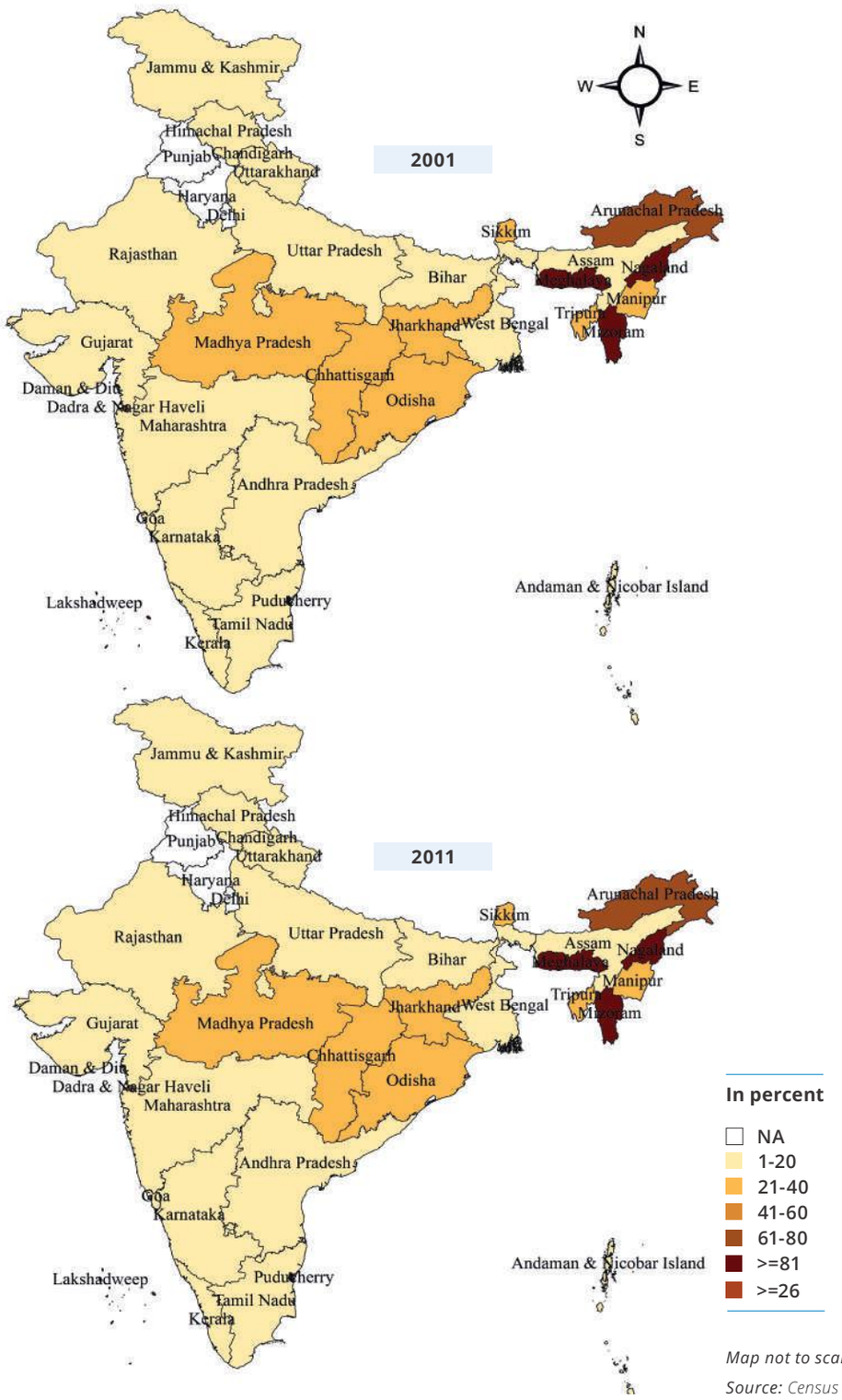
Map 6.3: *Percentage of Scheduled Caste Population in India*



Map not to scale

Source: *Census of India, 2001 and 2011*

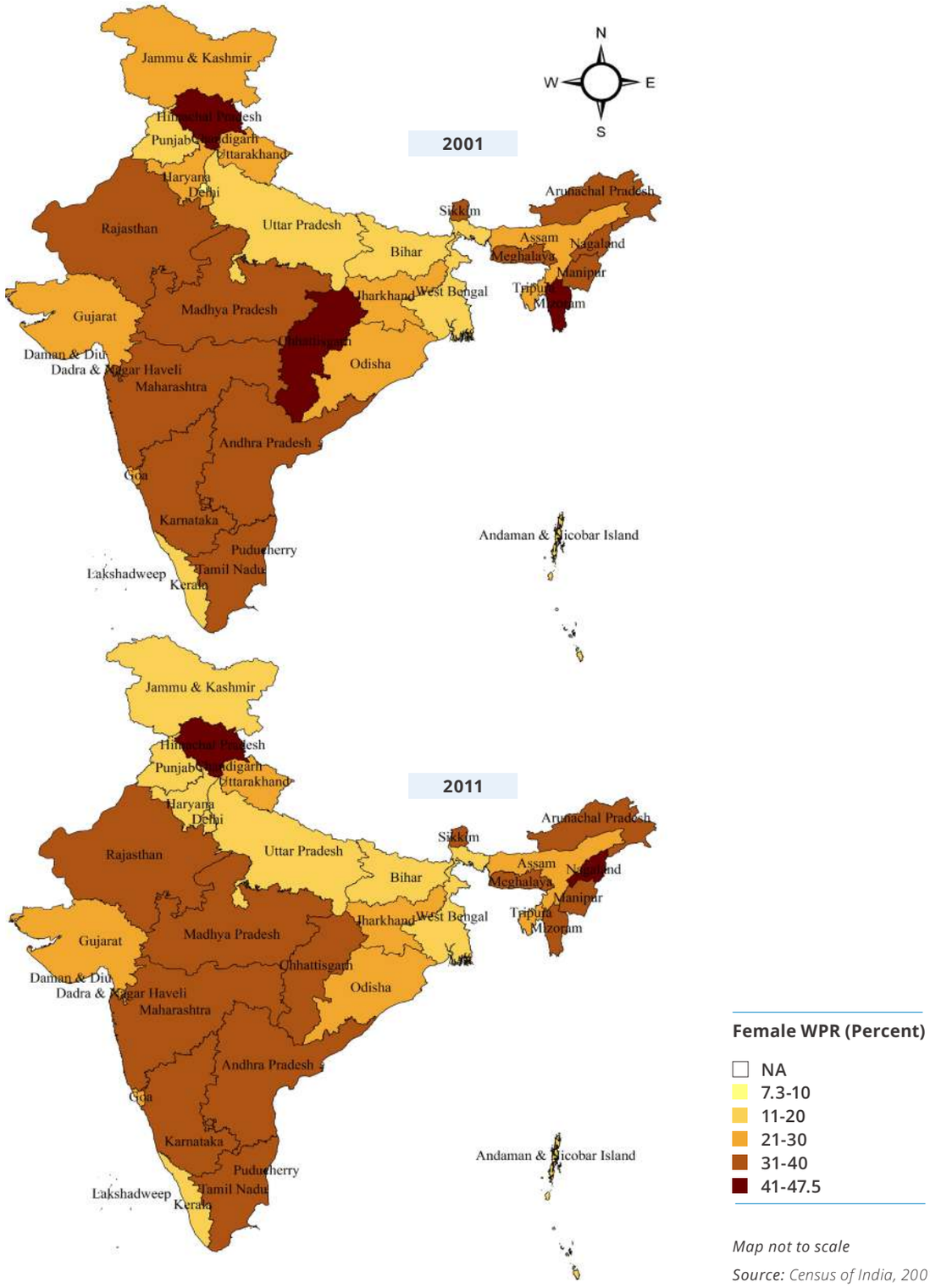
Map 6.4: *Percentage of Scheduled Tribe Population in India*



Map not to scale

Source: *Census of India, 2001 and 2011*

Map 6.5: *Female Work Participation Rate (FWPR) in India*



Map not to scale

Source: *Census of India, 2001 and 2011*

Table 6.3: *Percentage of Disabled population in various categories across the States in India, 2011*

States/UTs	Total disabled persons			In seeing			In Hearing			In Speech		
	Person	Males	Females	Person	Males	Females	Person	Males	Females	Person	Males	Females
Andhra Pradesh	2.68	2.89	2.47	17.57	16.21	19.16	14.75	13.66	16.03	9.69	9.93	9.39
Arunachal Pradesh	1.93	2.00	1.86	21.14	20.09	22.34	30.40	29.55	31.37	5.75	6.18	5.27
Assam	1.54	1.61	1.46	16.78	15.95	17.74	21.16	20.12	22.36	8.28	8.50	8.02
Bihar	2.24	2.47	1.98	23.56	22.12	25.51	24.55	22.94	26.73	7.33	7.29	7.38
Chhattisgarh	2.45	2.60	2.29	17.79	16.78	18.95	14.77	14.35	15.26	4.52	4.64	4.38
Delhi	1.40	1.54	1.24	12.83	12.19	13.74	14.69	13.93	15.77	6.43	6.46	6.37
Goa	2.26	2.30	2.22	15.04	13.81	16.34	16.20	15.40	17.04	15.97	16.50	15.41
Gujarat	1.81	1.95	1.66	19.61	18.54	20.97	17.46	16.39	18.82	5.52	5.76	5.23
Haryana	2.16	2.34	1.95	15.14	13.83	16.93	21.14	19.31	23.66	3.99	4.22	3.67
Himachal Pradesh	2.26	2.48	2.04	16.79	15.50	18.40	17.19	16.50	18.05	5.33	5.65	4.93
Jammu & Kashmir	2.88	3.08	2.65	18.40	17.41	19.70	20.52	20.87	20.06	5.17	5.54	4.69
Jharkhand	2.33	2.52	2.14	23.47	22.50	24.68	21.54	20.65	22.65	6.06	6.13	5.98
Karnataka	2.17	2.35	1.98	19.95	18.43	21.79	17.80	16.89	18.91	6.85	6.86	6.84
Kerala	2.28	2.46	2.11	15.16	13.47	16.98	13.83	12.18	15.60	5.43	5.65	5.18
Madhya Pradesh	2.14	2.36	1.89	17.45	16.23	19.07	17.23	16.32	18.45	4.47	4.54	4.37
Maharashtra	2.64	2.91	2.35	19.37	18.43	20.63	15.97	15.66	16.39	15.98	15.41	16.74
Manipur	2.05	2.17	1.93	32.78	31.81	33.90	22.02	21.45	22.66	4.55	4.77	29
Meghalaya	1.49	1.56	1.42	15.75	14.98	16.61	27.87	28.08	27.64	6.11	6.05	6.17
Mizoram	1.38	1.48	1.28	13.42	13.26	13.62	22.12	22.30	21.92	7.67	7.33	8.07
Nagaland	1.50	1.58	1.41	14.01	13.19	14.98	30.17	31.01	29.17	7.74	7.81	7.66
Odisha	2.96	3.18	2.74	21.20	20.28	22.29	19.11	18.26	20.12	5.51	5.71	5.27
Punjab	2.36	2.59	2.09	12.57	11.81	13.62	22.43	20.75	24.75	3.75	3.77	3.73
Rajasthan	2.28	2.39	2.17	20.12	18.40	22.17	14.00	13.34	14.77	4.44	4.97	3.82
Sikkim	2.98	3.03	2.92	15.24	14.53	16.07	29.38	30.55	28.02	8.67	8.36	9.03
Tamil Nadu	1.64	1.82	1.45	10.80	10.30	11.42	18.67	16.71	21.12	6.79	6.77	6.81
Tripura	1.75	1.89	1.60	16.83	15.53	18.42	18.18	17.99	18.41	7.10	7.15	7.03
Uttar Pradesh	2.08	2.26	1.88	18.38	17.25	19.86	24.72	23.06	26.91	6.41	6.39	6.44
Uttarakhand	1.84	2.00	1.67	15.71	14.09	17.73	20.34	18.67	22.41	6.66	6.82	6.47
West Bengal	2.21	2.41	2.00	21.04	19.81	22.60	15.62	14.71	16.79	7.30	7.21	7.42
Andaman and Nicobar Islands	1.75	1.90	1.58	16.28	15.49	17.36	18.30	17.20	19.83	7.97	8.18	7.68
Chandigarh	1.40	1.51	1.27	11.99	12.33	11.50	16.73	14.50	19.94	6.49	6.43	6.59
Dadra and Nagar Haveli	0.96	0.98	0.93	13.02	12.36	13.92	21.71	21.34	22.20	6.10	6.08	6.14
Daman and Diu	0.90	0.86	0.96	17.40	17.08	17.86	14.07	12.15	16.85	6.79	7.92	5.13
Lakshadweep	2.50	2.53	2.48	20.87	17.78	24.20	13.87	12.53	15.32	4.52	5.73	3.22

Table 6.3: ***Percentage of Disabled population in various categories across the States in India, 2011***

States/UTs	Total disabled persons			In seeing			In Hearing			In Speech		
	Person	Males	Females	Person	Males	Females	Person	Males	Females	Person	Males	Females
Puducherry	2.42	2.67	2.17	11.95	11.24	12.79	20.38	18.07	23.11	6.04	5.85	6.27
all-India	**2.21**	**2.40**	**2.01**	**18.77**	**17.61**	**20.25**	**18.92**	**17.87**	**20.25**	**7.45**	**7.49**	**7.40**

Source: Census of India, 2011

States/UTs	In Movement			Mental Retardation			Mental Illness			Any Other		
	Person	Males	Females	Person	Males	Females	Person	Males	Females	Person	Males	Females
Arunachal Pradesh	12.10	13.58	10.41	4.73	4.46	5.04	2.36	2.41	2.30	14.51	14.60	14.40
Assam	15.83	17.52	13.88	5.49	5.78	5.17	3.92	4.13	3.68	18.22	18.08	18.38
Bihar	15.85	18.28	12.55	3.83	4.12	3.43	1.61	1.85	1.28	18.52	18.35	18.75
Chhattisgarh	30.46	32.45	28.16	5.31	5.26	5.37	3.33	3.26	3.42	12.31	12.53	12.05
Delhi	28.69	29.43	27.62	6.96	7.50	6.17	4.28	4.55	3.89	15.76	15.74	15.78
Goa	16.90	18.53	15.16	5.50	5.67	5.33	5.07	5.14	5.00	17.52	17.24	17.82
Gujarat	22.51	24.36	20.15	6.08	6.41	5.65	3.85	4.07	3.56	18.10	17.53	18.83
Haryana	21.24	23.06	18.74	5.50	6.11	4.68	2.96	3.26	2.55	21.38	21.40	21.35
Himachal Pradesh	20.96	22.53	18.99	5.79	6.15	5.33	3.33	3.51	3.10	18.69	18.49	18.93
Jammu & Kashmir	16.10	17.16	14.71	4.63	4.78	4.43	4.34	4.30	4.39	18.54	17.99	19.26
Jharkhand	19.21	20.87	17.13	4.86	5.06	4.62	2.62	2.75	2.46	14.59	14.56	14.64
Karnataka	20.54	23.56	16.87	7.10	6.81	7.44	1.58	1.49	1.69	18.63	18.32	19.01
Kerala	22.53	25.56	19.27	8.63	9.02	8.20	8.78	8.57	9.01	12.62	12.54	12.70
Madhya Pradesh	26.08	28.40	22.97	5.01	5.24	4.71	2.55	2.67	2.37	19.01	18.69	19.44
Maharashtra	18.51	21.12	15.03	5.41	5.34	5.49	1.98	1.94	2.03	17.23	16.49	18.23
Manipur	9.08	10.15	7.85	8.28	8.42	8.11	2.49	2.70	2.25	14.74	14.49	15.02
Meghalaya	11.99	12.85	11.02	5.26	5.29	5.23	5.28	5.03	5.55	19.67	19.66	19.68
Mizoram	13.03	14.17	11.69	10.46	10.28	10.66	6.93	7.03	6.81	12.63	12.31	13.00
Nagaland	12.92	13.84	11.81	4.22	4.12	4.33	3.36	3.39	3.32	16.33	15.66	17.13
Odisha	20.89	22.67	18.77	5.82	5.98	5.63	3.44	3.40	3.50	13.89	13.93	13.85
Punjab	19.88	21.48	17.67	6.89	7.20	6.46	3.35	3.58	3.04	25.32	25.38	25.24
Rajasthan	27.33	28.42	26.04	5.20	6.19	4.03	2.63	2.97	2.21	12.77	13.37	12.05
Sikkim	11.37	12.46	10.10	2.84	2.80	2.88	2.82	2.61	3.07	13.52	13.11	14.00
Tamil Nadu	24.34	27.00	21.01	8.55	8.50	8.61	2.79	2.69	2.92	20.20	19.95	20.52
Telangana												
Tripura	18.19	20.08	15.87	6.69	6.65	6.75	4.52	4.46	4.59	18.38	18.33	18.43
Uttar Pradesh	16.30	18.68	13.17	4.36	4.82	3.76	1.84	2.08	1.53	22.76	22.37	23.28
Uttarakhand	19.97	22.13	17.28	6.18	6.76	5.45	3.48	3.83	3.04	16.58	16.69	16.44
West Bengal	16.01	18.18	13.26	6.77	6.77	6.77	3.54	3.61	3.46	19.97	20.25	19.62
Andaman and Nicobar Islands	23.92	27.01	19.65	4.41	4.14	4.79	5.47	4.22	7.18	12.58	12.69	12.43
Chandigarh	25.78	27.20	23.74	7.37	7.81	6.72	5.11	5.09	5.14	17.46	17.77	17.00

Table 6.3: *Percentage of Disabled population in various categories across the States in India, 2011*

States/UTs	Total disabled persons			In seeing			In Hearing			In Speech		
	Person	Males	Females	Person	Males	Females	Person	Males	Females	Person	Males	Females
Dadra and Nagar Haveli	20.70	23.24	17.27	5.46	5.02	6.07	3.49	3.70	3.21	14.66	14.05	15.49
Daman and Diu	28.23	28.23	28.24	8.01	7.54	8.71	4.05	4.15	3.91	12.02	14.00	9.15
Lakshadweep	22.35	25.06	19.43	6.93	8.95	4.76	5.94	4.06	7.98	11.33	11.93	10.68
Puducherry	29.99	33.37	25.98	7.73	7.85	7.60	2.83	2.75	2.92	13.70	13.41	14.06
all-India	**20.28**	**22.49**	**17.47**	**5.62**	**5.81**	**5.37**	**2.70**	**2.77**	**2.60**	**18.38**	**18.20**	**18.60**

Source: Census of India, 2011

6.4 Agricultural Practices and Status of Health Infrastructure

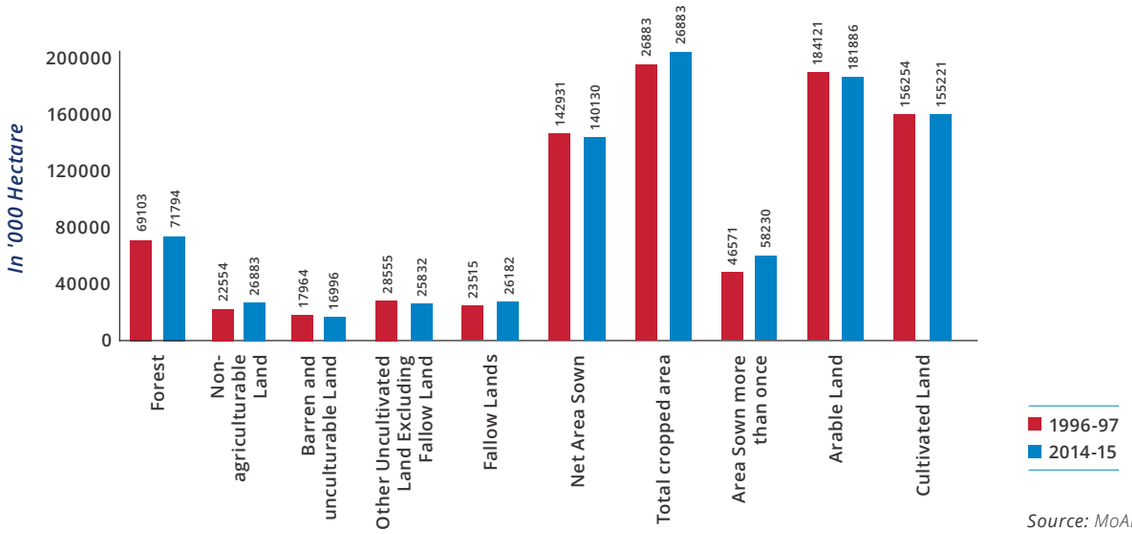
Land use is an important indicator to understand the state of agriculture and can also reflect the growth of agriculture over time. It has been observed, even in advanced economies, that agriculture productivity is always significantly lower as compared to manufacturing and services. This is primarily because of the extent and nature of constraints associated with agriculture. Land is the most valued form of property and a source of livelihood security in rural areas. It acts as a buffer against economic shocks, providing "almost complete insurance against malnutrition" as it reduces the dependency of the household on market prices for food commodities[5] . "Advances in technology" is another factor that can help agriculture grow faster. However, it is important to understand that the 'advances in technology' may not substantially increase the productivity (output per worker) in agriculture. To meet the higher demand for foodgrains arising out of the rising population in the country, there is a need for continuous increase in the production of foodgrains. The improvement in production would also have price smoothening effects, making food commodities available at affordable prices for the poor and vulnerable.

As discussed in chapter 3, land is one of the key factors that can determine the production of food grains. India's land utilization pattern over the last two decades shows that the arable land, cultivated land and net sown areas have declined slightly while total cropped area and area sown more than once has increased during 1996-97 to 2014-15 (Figure 6.3). In fact, forest area, fallow land, non-agricultural lands have increased and barren and uncultivable land has declined during the same period. If the declining trend of net sown area continues with growing population, it would mean that increase in production would potentially have to be achieved through intensifying cropping (i.e. raising more than one crop) over the existing area and raising the land productivity. Therefore, increase in 'area sown more than once' by 25 percent in the last two decades will have a favorable impact.

Map 6.6-6.9 depicts the arable land, net sown area, irrigated area and forest area at two points of time; 1996-98 and 2013-15 in the states of India. During 1996-2015, arable land and net sown area both have declined by 2235 000' hectares and 2801 000' hectares, respectively while irrigated area has increased by 13271 000' hectares in India. Of the 36 states and UTs, arable land and net sown area have declined in around 25 states/UTs during last two decades. Rajasthan, Maharashtra, Uttar Pradesh and Madhya Pradesh together capture around 45.6 percent of India's arable land and 47.7 percent of total net sown area during 2013-15. Among these four states, Uttar Pradesh and Madhya Pradesh are the top producers of foodgrain (Chapter 3).

[5]*Carter 2003; Deininger and Binswanger 1999, p. 256*

Figure 6.3: *Land use in India, 1996-97 and 2014-15*



Source: MoAFW, GoI

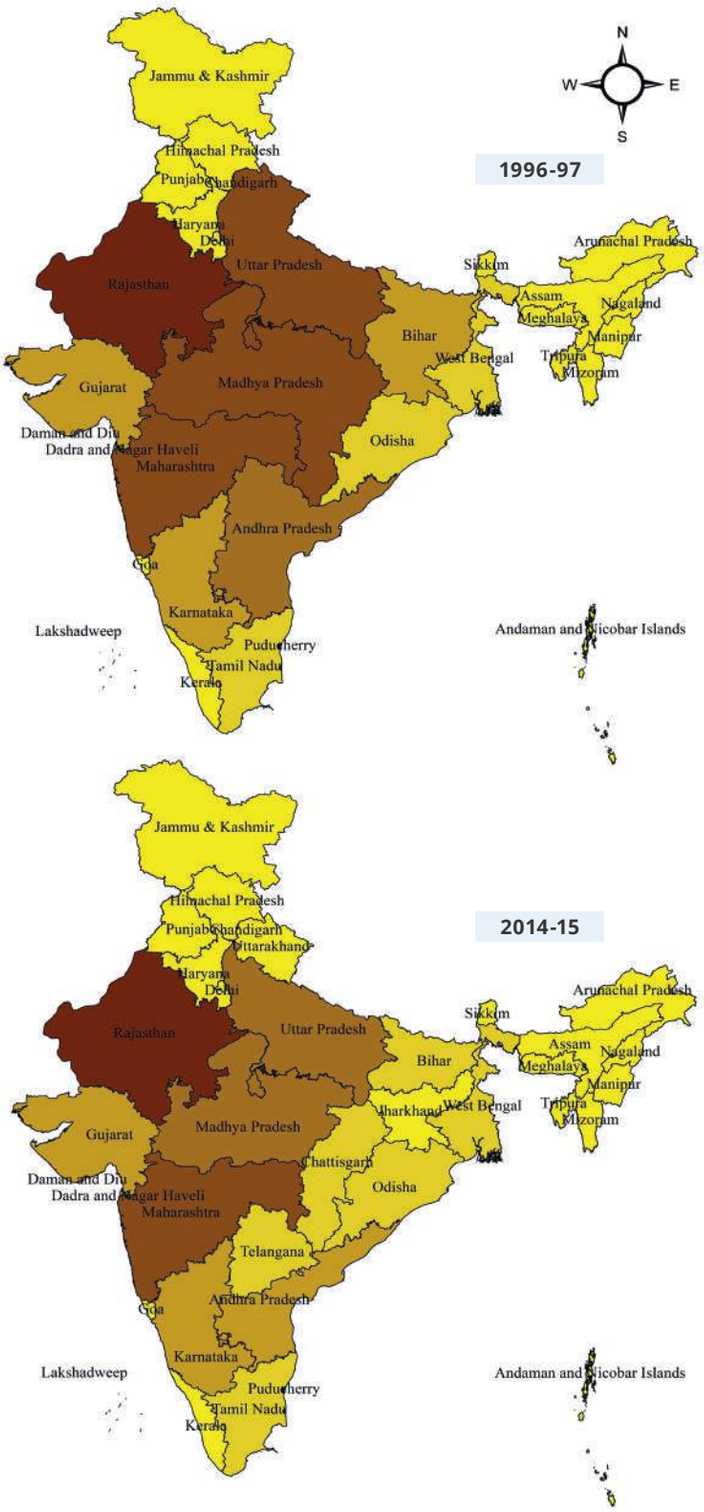
6.4.1 Intensifying Cropping

As discussed above, India needs to adopt measures to intensify the agricultural output to serve the growing population and cope up with other constraints. Cropping intensity refers to raising of several crops from the same field during one agriculture year. It can be expressed as: Cropping intensity = [(Gross cropped area / Net sown area) x 100]. The cropping intensity may exceed 100 percent where more than one crop cycles are permitted every year on the same area. Cropping intensity has increased from 132.6 in percent 1996-97 to 141.6 percent in 2014-15 in India. Punjab (190.8 percent) has recorded highest cropping intensity followed by Tripura (189.3 percent), Haryana (185.6 percent) and West Bengal (184.9 percent percent) in 2014-15 (Map 6.10).

It is interesting to note that similar scenarios/ rankings are seen among states, for both productivity (yield) and cropping intensity, (Punjab and Haryana on top)- which reflects a more intensified level of agriculture. Absolute food grain production and net sown area ranks states in a different order, influenced by the area and size of the states. Irrigation intensity, defined as the percentage of net irrigated area over net sown area, has increased by 10 percent points in the last two decades (from 38.6 percent in 1996-97 to 48.8 percent in 2014-15) (Map 6.11). Use of fertilizers also strengthens the productivity of food grain, although excessive use of fertilizers reduces the nutrient content in the crops. Use of fertilizers like Urea, Diammonium Phosphate (DAP), Muriate of Potash (MOP) and NPK (Nitrogen, Phosphate and Potassium) have increased during 1999-2017. Urea has been used more extensively than other fertilizers and its consumption has increased from 203 lakh tonne in 1999-2000 to 296 lakh tonne in 2016-17 (Figure 6.4).

In the recent years, wages in rural areas have increased at a rate higher than the inflation, thereby contributing to increase in real wages (RBI, 2012). This period is also characterized by the introduction of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) which provides 100 days of wage employment for one member of a family. It has been argued that MGNREGA has been one of the factors that has contributed to increase in wages (CACP, 2012). Wages of male agricultural laborer's have increased from Rs 239 per day in 2014 to Rs 256 Rs./Day in 2016.

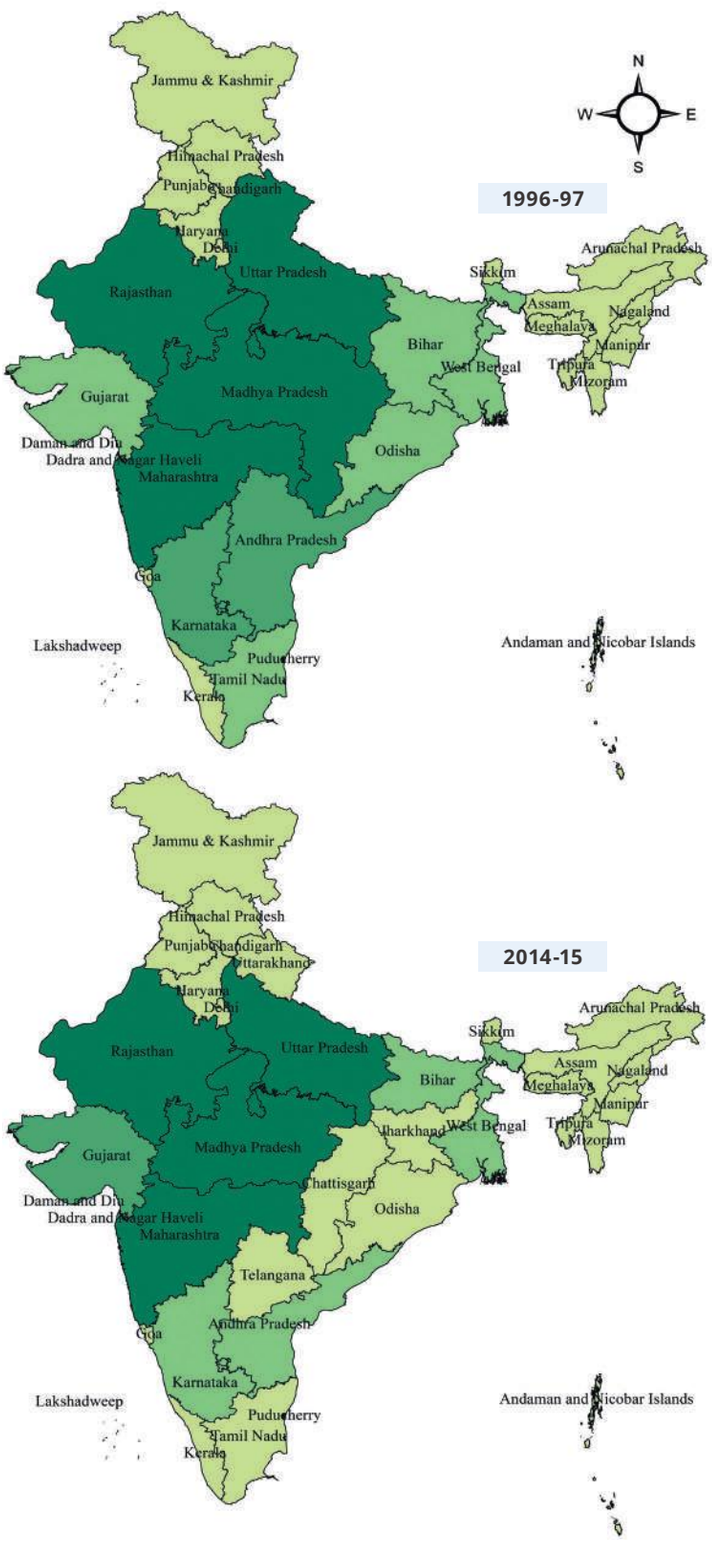
Map 6.6: *Arable Land in the States of India, 1996-97 and 2014-15*



Map not to scale

Source: Ministry of Agriculture and Farmers Welfare, Govt. of India.

Map 6.7: *Net Sown Area in the States of India, 1996-97 and 2014-15*



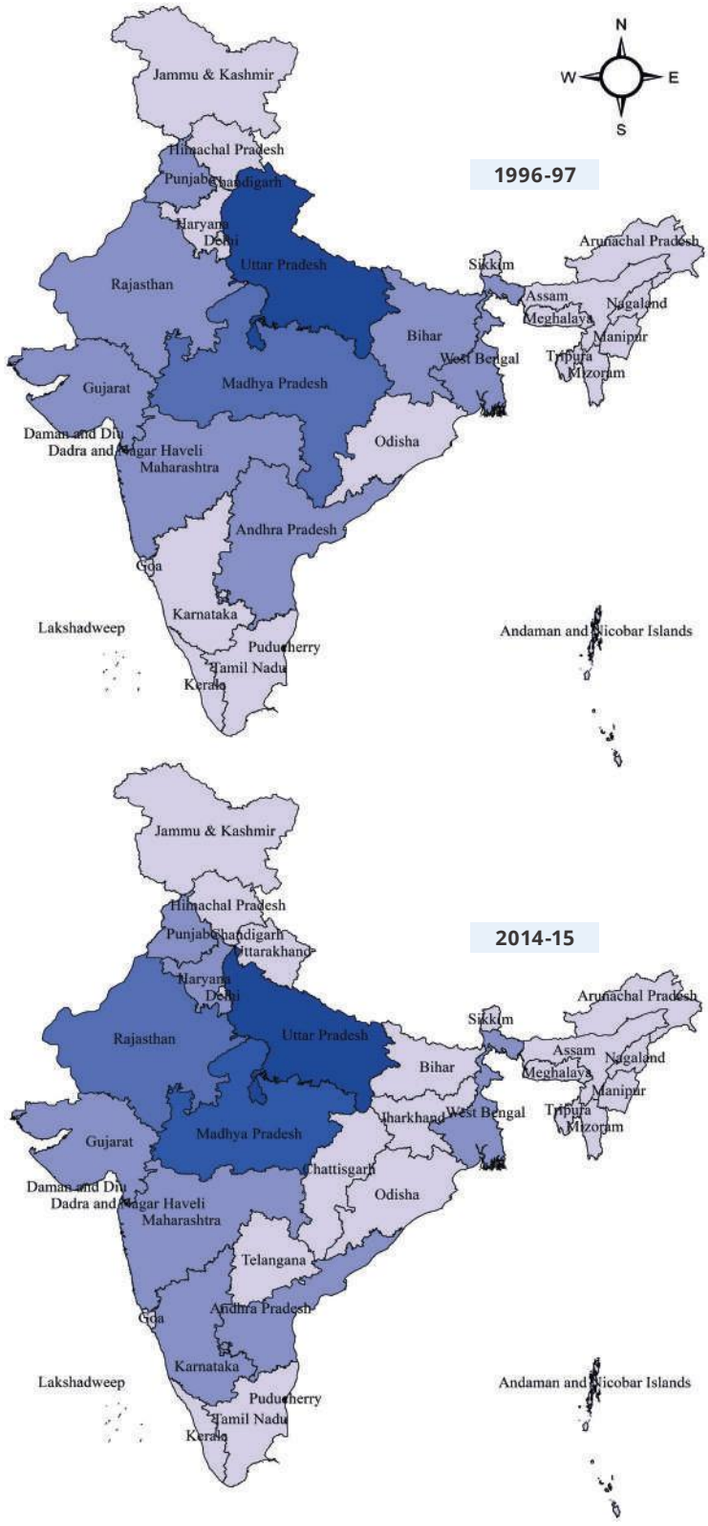
Net Area Sown '000 Hectare

- ≥15001
- 10001-15000
- 5001-1000
- ≤5000

Map not to scale

Source: Ministry of Agriculture and Farmers Welfare, Govt. of India.

Map 6.8: *Net Irrigated Area in the States of India, 1996-97 and 2014-15*



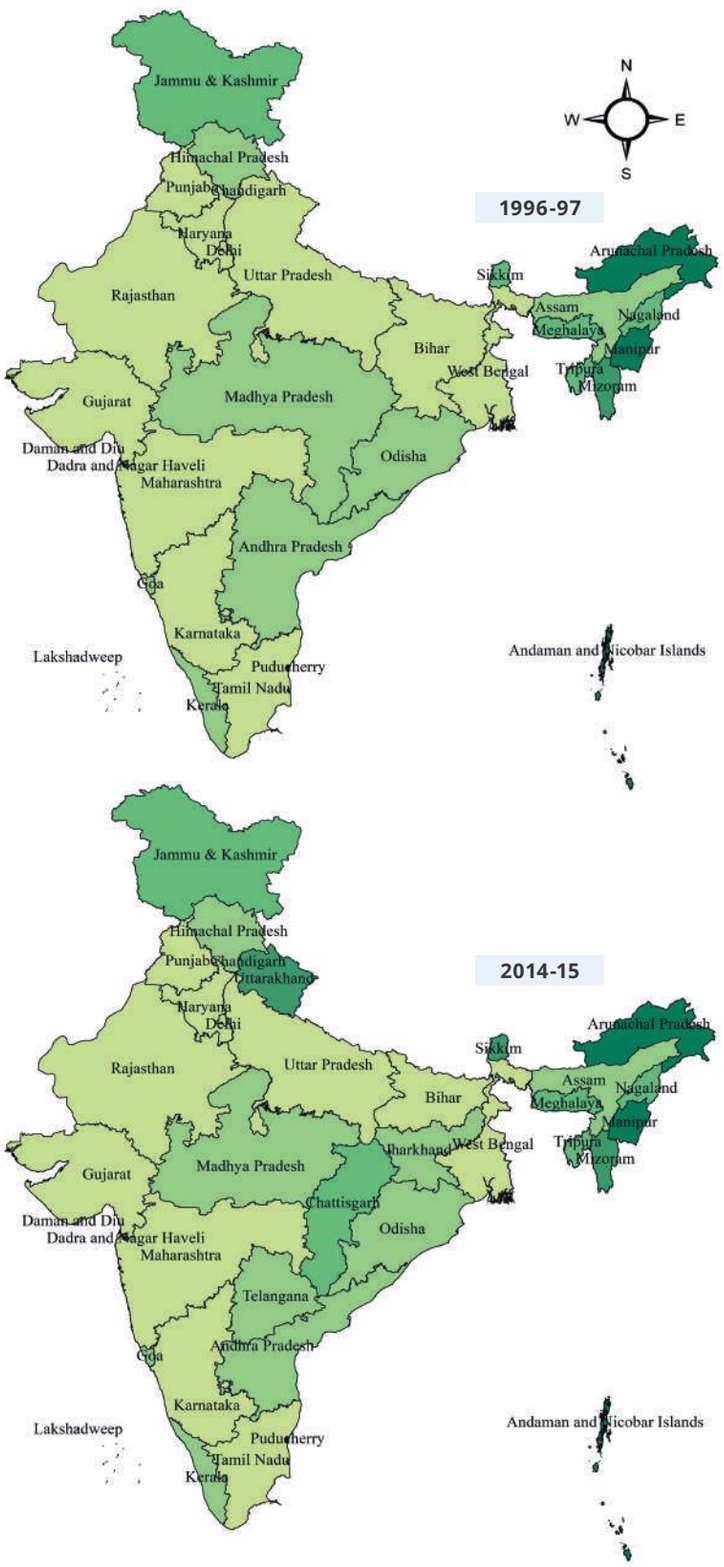
Net Irrigated Area '000 Hectare

- ≥12001
- 9001-12000
- 6001-9000
- 3001-6000
- ≤3000

Map not to scale

Source: Ministry of Agriculture and Farmers Welfare, Govt. of India.

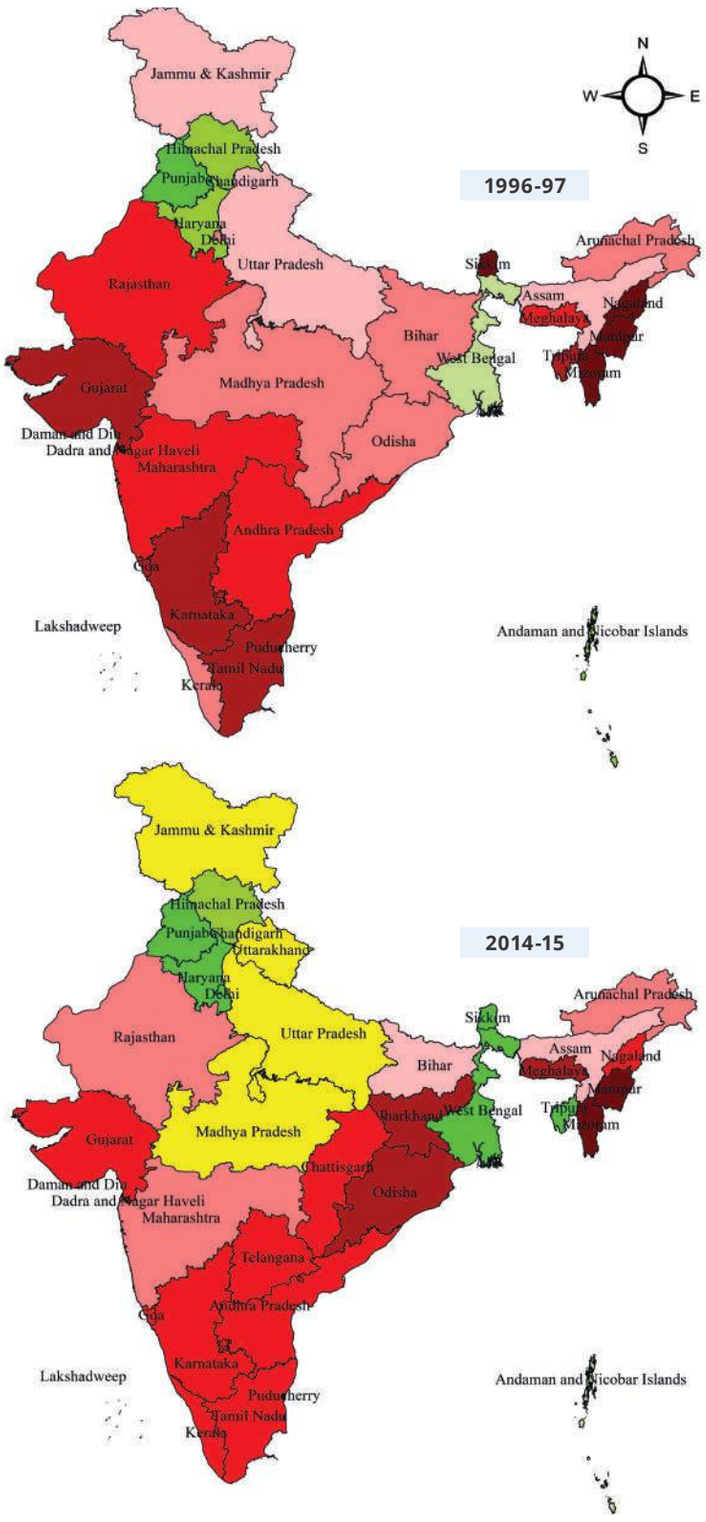
Map 6.9: *Forest Area in the States of India, 1996-97 and 2014-15*



Map not to scale

Source: *Ministry of Agriculture and Farmers Welfare, Govt. of India.*

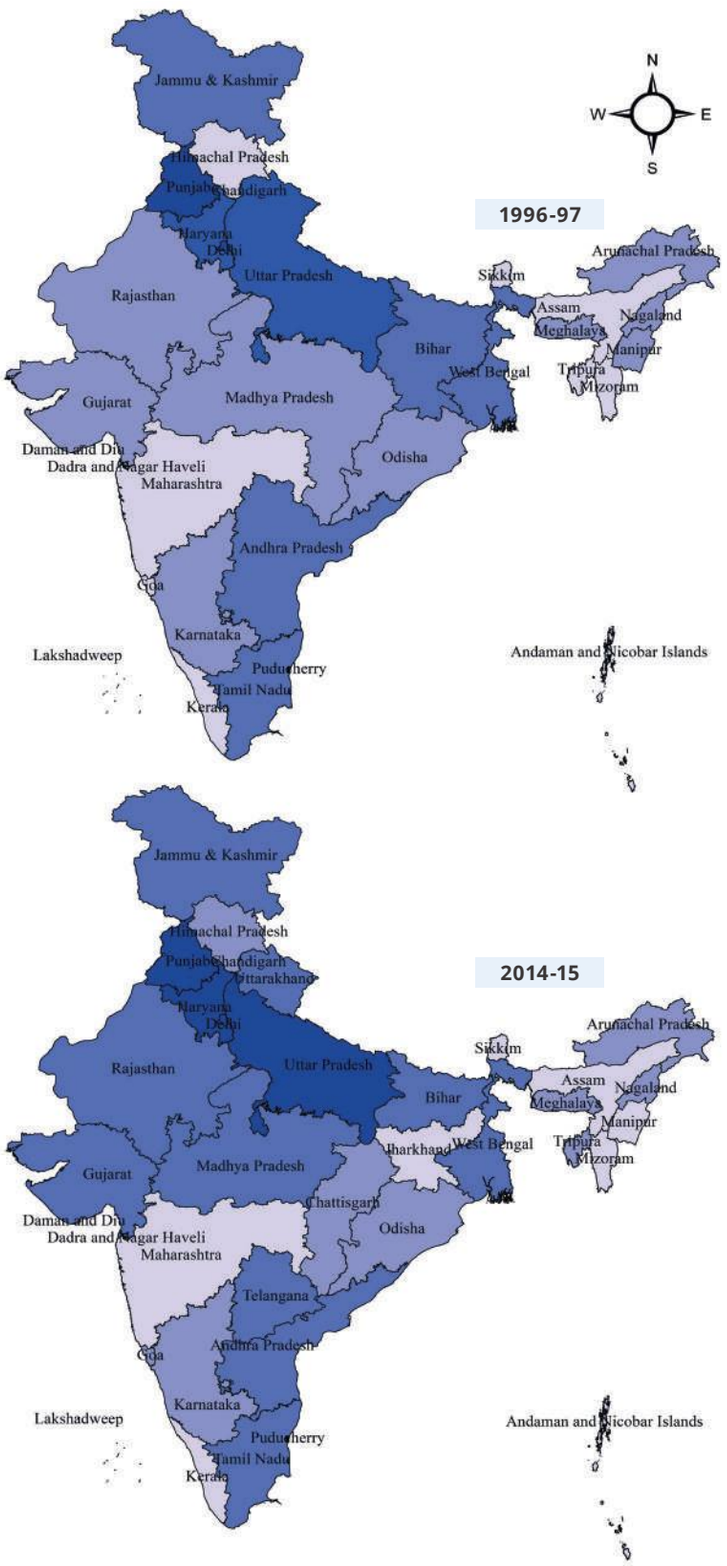
Map 6.10: *Cropping Intensity in the States of India, 1996-97 and 2014-15*



Map not to scale

Source: Ministry of Agriculture and Farmers Welfare, Govt. of India.

Map 6.11: *Irrigation intensity (irrigated area over net sown area) in the States of India, 1996-97 and 2014-15*



Irrigation Intensity (%)

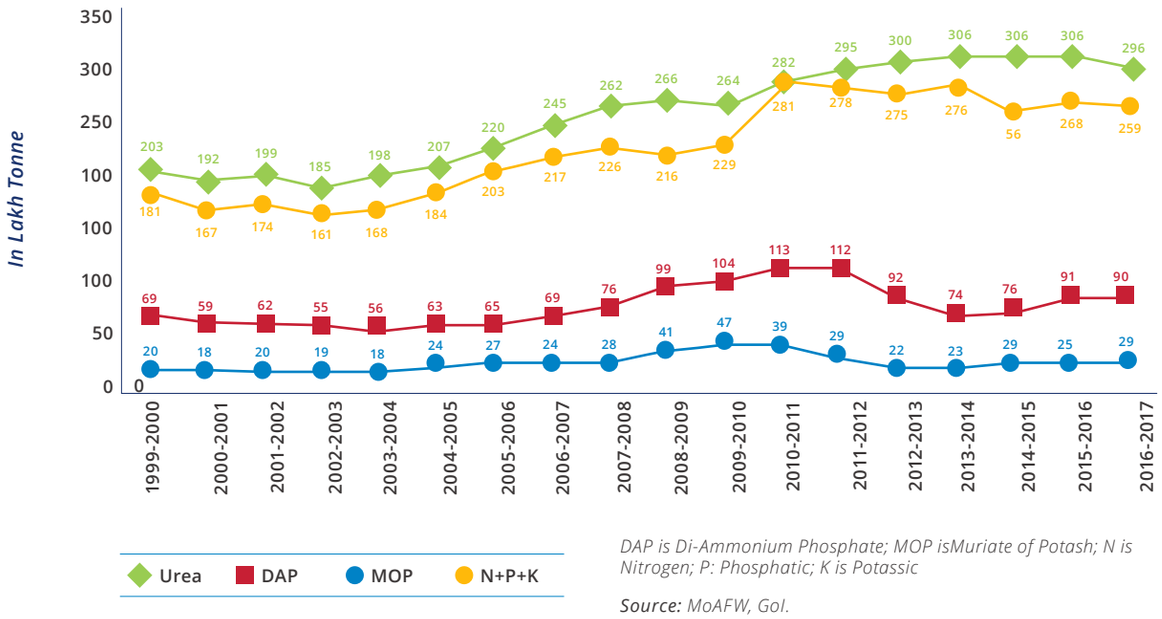
- 80-100
- 60-80
- 40-60
- 20-40
- 0-20

Map not to scale

Source: Ministry of Agriculture and Farmers Welfare, Govt. of India.

Figure 6.5; not adjusted for inflation). It is highest in Kerala (Rs 667 per day) and lowest in Madhya Pradesh (Rs 185 per day) in 2016.

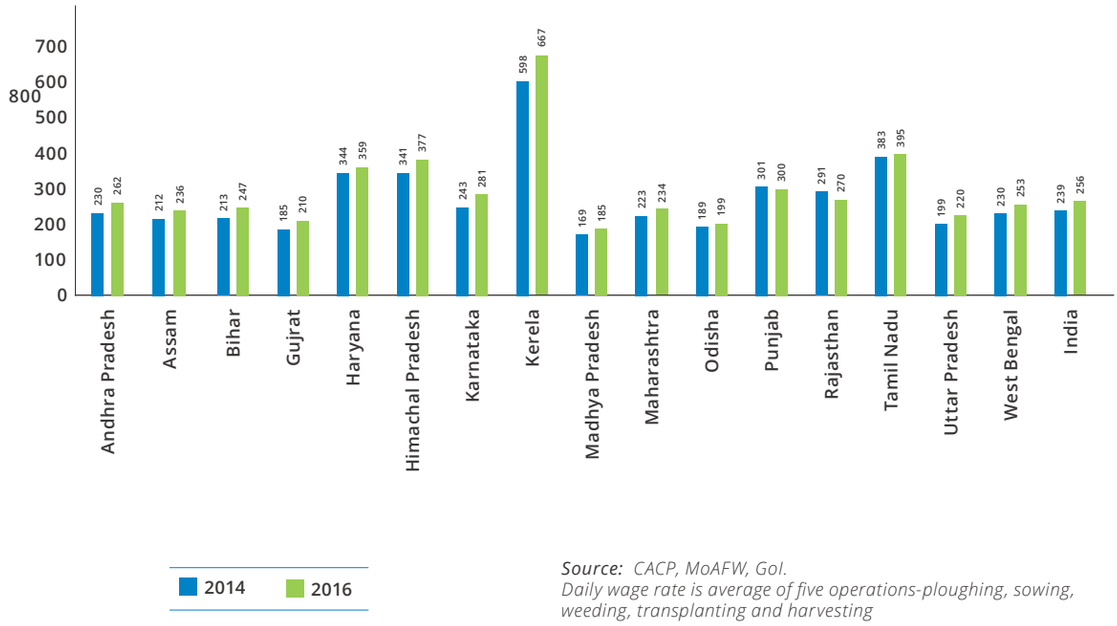
Figure 6.4: *Trend in consumption of major fertilizer in India and states, 1999-2017*



DAP is Di-Ammonium Phosphate; MOP isMuriate of Potash; N is Nitrogen; P: Phosphatic; K is Potassic

Source: *MoAFW, GoI.*

Figure 6.5: *Average Wage Rates (in Rs./Day) for Agricultural Labour (Man), India and selected states, 2014 and 2016*



Source: *CACP, MoAFW, GoI.*
Daily wage rate is average of five operations-ploughing, sowing, weeding, transplanting and harvesting

The conversion of food intake into physical and mental growth depends on the rate of assimilation of food by the body which in turn is dependent on several factors such as morbidity profile of individuals, availability and utilization of health facilities, safe drinking water and sanitation, health and hygiene practices, nutritional care among children during the first 1,000 days and breast-feeding practices.

Table 6.4: ***Requirement, In-Position and Shortfall of Sub-Centres, Primary Health Centres and Community Health Centres in India and States, 2017***

State	Sub-centre			Primary Health Centre			Community Health Centre		
	Required	**In Position**	**Shortfall**	**Required**	**In Position**	**Shortfall**	**Required**	**In Position**	**Shortfall**
Andaman and Nicobar Islands	50	123	-	8	22	-	2	4	-
Andhra Pradesh	7261	7458	-	1197	1147	50	299	193	106
Arunachal Pradesh	318	312	6	48	143	-	12	63	-
Assam	5850	4621	1229	954	1014	-	238	158	80
Bihar	18637	9949	8688	3099	1899	1200	774	150	624
Chandigarh	5	17	-	0	3	-	0	2	-
Chhattisgarh	4885	5186	-	774	785	-	193	169	24
Dadra and Nagar Haveli	56	71	-	8	9	-	2	2	0
Daman and Diu	13	26	-	2	4	-	0	2	-
Delhi	83	10	73	13	5	8	3	0	3
Goa	122	214	-	19	24	-	4	4	0
Gujarat	8008	9082	-	1290	1392	-	322	363	-
Haryana	3301	2589	712	550	366	184	137	112	25
Himachal Pradesh	1285	2083	-	212	538	-	53	89	-
Jammu and Kashmir	2009	2967	-	327	637	-	81	84	-
Jharkhand	6060	3848	2212	966	297	669	241	188	53
Karnataka	7951	9381	-	1306	2359	-	326	206	120
Kerala	3551	5380	-	589	849	-	147	232	-
Lakshadweep	4	14	-	0	4	-	0	3	-
Madhya Pradesh	12415	9192	3223	1989	1171	818	497	309	188
Maharashtra	13512	10580	2932	2201	1814	387	550	360	190
Manipur	509	421	88	80	85	-	20	17	3
Meghalaya	759	436	323	114	109	5	28	27	1
Mizoram	172	370	-	25	57	-	6	9	-
Nagaland	455	396	59	68	126	-	17	21	-
Odisha	8193	6688	1505	1315	1280	35	328	370	-
Puducherry	79	81	-	13	40	-	3	4	-

Punjab	3468	2950	518	578	432	146	144	151	-
Rajasthan	11459	14406	-	1861	2079	-	465	579	-
Sikkim	113	147	-	18	24	-	4	2	2
Tamil Nadu	7533	8712	-	1251	1362	-	312	385	-
Telangana	4708	4797	-	768	689	79	192	114	78
Tripura	691	987	-	109	93	16	27	21	6
Uttar Pradesh	31200	20521	10679	5194	3621	1573	1298	822	476
Uttarakhand	1442	1847	-	238	257	-	59	60	-
West Bengal	13083	10369	2714	2153	914	1239	538	349	189
India	**179240**	**156231**	**34946**	**29337**	**25650**	**6409**	**7322**	**5624**	**2168**

Source: Ministry of Health and Family Welfare, GoI
Note: The requirement is calculated using the prescribed norms on the basis of rural population from Census, 2011.

One of the important factors that contributes to undernutrition is the availability and effective utilization of health services both in terms of quantity and quality. Table 6.4 shows that there are 1,56,231 SubCenters (SC), 25,650 Primary Health Centres (PHC) and 5,624 Community Health Centres (CHC) across the country, a shortfall of 34946 SC (19 percent), 6409 (22 percent) PHC and 2168 (30 percent) CHC based on the requirement as per MoHFW, GoI. The gap between required and available numbers of SC, PHC and CHC is high in the states of Uttar Pradesh, Bihar, West Bengal, Madhya Pradesh and Jharkhand, where high level of malnutrition, lack of full ANC, low IFA consumption is noticed (in Chapter 5). It is evident that the overall health infrastructure in many states of India is under stress and suffering from shortage of resources.

As discussed in the framework of food and nutrition security, factors from each dimension influence each other. The trends and patterns of food grain production, consumption and requirement and nutritional status across different population groups have been discussed in detail in the previous chapters.

A correlation analysis is used to identify the association between the factors from all the three dimensions of food and nutrition security. The correlation matrix (Figure 6.6) shows that different forms of malnutrition i.e. stunting, wasting and underweight have a positive correlation with each other. Stunting has a strong positive correlation with underweight (r=0.81) but weak correlation with wasting (r=0.41), while underweight and wasting have a strong correlation (r=0.78). Improved drinking water does not exhibit any significant correlation with malnutrition components. However, use of improved sanitation has a strong negative correlation with stunting, wasting and underweight. This highlights the significance of Swachh Bharat Mission. It is evident that factors

Box 6.1: ***Highlights: Correlation matrix***

Stunting has positive and significant correlation with wasting (r=0.42) and underweight (r=0.81)
Women literacy is negatively correlated with stunting (r=-0.74), wasting (r=-0.50) and underweight (r=-0.76)
Improved sanitation facility has negatively correlation with stunting, wasting and underweight and positive correlation with women literacy
Adequate child diet reduces chances of stunting (r=-0.37) and underweight (r=-0.55)
Low BMI women prevalence have almost perfect sync with underweight children prevalence (r=0.92) and strong correlation with stunting (r=0.73) and wasting (r=0.68)
Child anaemia prevalence is positively correlated with Women anaemia prevalence (r=0.79)
State level IMR and U5MR are strongly correlated with stunting and underweight children prevalence

from all three dimensions of food and nutrition security are interrelated and affect each other. Therefore, we need to shift gears and adopt a convergent approach to tackle the malnutrition problem and to achieve food and nutrition security in India.

6.5 Performance of the Social Safety-Net Schemes

Malnutrition is identified as a major problem in our country, with children under five years of age being the worst affected. SDG-2 aims to achieve a world

Figure 6.6 : *Correlation matrix between malnutrition, access to food and selected underlying factors, India, 2015-16*

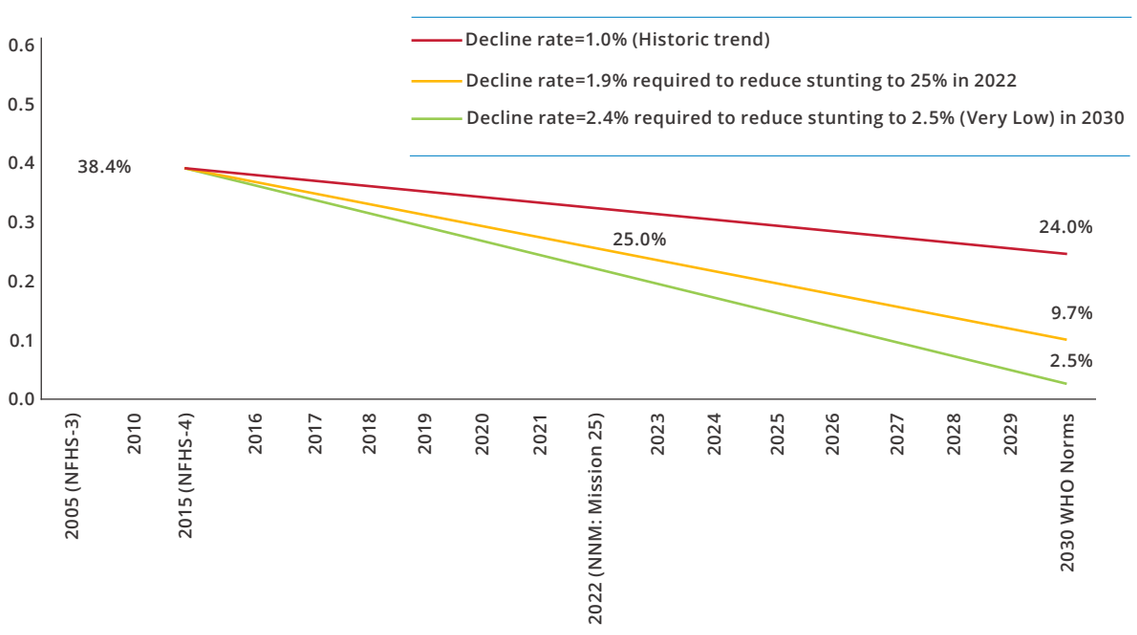
	Stunting	Wasting	Underweight	Women literacy	Improved Water	Improve Sanitation	Child Diet	Excl. Breastfeed	W Low BMI	Full ANC	Child Anaemia	W Anaemia	Forest	Irri Intensity	IMR	U5MR	R Calorie	R Protein
Stunting	1																	
Wasting	0.42	1																
Underweight	**0.81**	**0.78**	1															
Women Literacy	**-0.74**	**-0.50**	**-0.76**	1														
Improved Water	-0.17	0.18	0.02	0.11	1													
Improve Sanitation	**-0.70**	**-0.50**	**-0.74**	**0.85**	0.29	1												
Child Diet	-0.37	-0.32	**-0.55**	0.39	-0.08	0.23	1											
Excl. Breastfeed	-0.12	0.00	0.05	-0.18	-0.29	-0.28	-0.31	1										
W Low BMI	**0.73**	**0.68**	**0.92**	**-0.77**	0.01	**-0.79**	**-0.55**	0.26	1									
Full ANC	**-0.63**	-0.14	-0.42	**0.66**	0.10	**0.57**	0.31	0.09	**-0.46**	1								
Child Anaemia	0.39	**0.63**	**0.62**	**-0.45**	0.22	-0.25	**-0.57**	-0.07	**0.44**	-0.13	1							
W Anaemia	0.33	**0.48**	**0.56**	-0.39	0.14	-0.32	-0.41	0.07	**0.45**	-0.08	**0.79**	1						
Forest	-0.20	-0.38	**-0.46**	0.14	-0.29	0.06	0.28	0.37	-0.34	-0.10	**-0.49**	-0.42	1					
Irri Intensity	0.18	0.15	0.19	-0.27	0.22	-0.10	-0.01	-0.40	0.09	-0.17	0.27	0.19	**-0.47**	1				
IMR	**0.74**	0.15	**0.59**	**-0.64**	0.03	**-0.60**	**-0.48**	0.05	**0.61**	**-0.67**	0.26	0.19	-0.20	0.22	1			
U5MR	**0.80**	0.18	**0.62**	**-0.68**	-0.03	**-0.64**	**-0.46**	0.02	**0.63**	**-0.72**	0.25	0.18	-0.16	0.25	**0.98**	1		
R Calorie	-0.27	-0.19	-0.15	0.17	0.32	0.27	-0.10	0.10	-0.10	0.15	0.00	-0.03	-0.17	0.15	-0.01	-0.04	1	
R Protein	-0.16	-0.08	-0.05	0.07	0.42	0.29	-0.22	-0.13	-0.05	0.03	0.23	0.09	-0.33	0.33	0.06	0.03	**0.87**	**1**
R Fat	-0.27	0.15	-0.02	0.25	**0.50**	**0.44**	-0.24	-0.19	-0.13	**0.44**	**0.48**	0.26	**-0.56**	0.31	-0.15	-0.20	**0.59**	**0.75**
U Calorie	-0.30	-0.11	-0.18	0.11	0.35	0.20	-0.14	0.27	-0.05	0.15	-0.07	-0.03	0.05	0.08	-0.09	-0.12	**0.83**	**0.69**
U Protein	-0.21	-0.01	-0.05	0.07	**0.50**	0.26	-0.16	-0.06	0.00	0.10	0.17	0.13	-0.17	0.21	-0.05	-0.07	**0.83**	**0.90**
U Fat	-0.15	0.36	0.15	0.09	**0.54**	0.27	-0.30	-0.05	0.08	0.39	**0.58**	0.40	**-0.51**	0.31	-0.08	-0.13	**0.44**	**0.61**

Source: *NFHS-4, MoAFW, NSSO, GoI*

Note: *Values are showing Pearson correlation Coefficient. Green: +ve significant correlation, Blue: -ve significant correlation, Bold: p value<0.01, Underline: p value<0.05, Orange: Non significant negative correlation, Yellow: Non significant positive correlation. W stands for Women, R stands for Rural and U stands for Urban.*

free from hunger and malnutrition. Government of India has taken up this as a challenge and launched several health and awareness programs. in 2018 Ministry of Women and Child Development, GoI launched the POSHAN Abhiyan (previously called National Nutrition Mission, NNM). POSHAN Abhiyan aims to target problems of malnutrition and its further advanced forms like stunted growth etc. POSHAN Abhiyan's target is to reduce stunting from 38.4 percent in the year 2017 to 25 percent by the year 2022 (Mission 25 by 2022) resulting in a required rate of reduction of 1.9 percent per anuum. Figure 6.7 shows the trajectory of reduction in stunting in three scenarios: decline with historic trend (Green line, from NFHS 3 to NFHS 4), required rate of reduction to achieve POSHAN Abhiyan target and required rate of reduction to reduce stunting to 2.5 percent (WHO classification of Low category of) by 2030. According to WHO classification for stunting, a 2.5 percent prevalence of stunting is considered as 'Low'; to achieve this by 2030 India requires a reduction rate of 2.4 percent per annum.

Figure 6.7: *Trajectory to achieve NNM target*



Note: Percent point estimation/projection of the reduction rate required to achieve various targets, using NFHS-4 data.

Government of India has undertaken various measures to improve food and nutrition security in the country. As early as 1993, India adopted the National Nutrition Policy. The National Nutrition Policy documented comprehensively strong linkages between nutrition and development. Government has also adopted several programmes and schemes towards 'nutrition security for all'. Direct nutrition programmes such as the Integrated Child Development Services Scheme (ICDS) and Mid-Day Meal Scheme (MDM) backed-up by the Targeted Public Distribution System (TPDS) are major interventions towards better food and nutrition security. In 2013 the Government passed the National Food Security Act (NFSA) to ensure food security in the country. Despite these efforts, India is home to one of the most undernourished populations in

the world. Government of India is committed to achieving SDG-2 targets, and recently introduced new initiatives such as POSHAN Abhiyan, National Nutrition Strategy and 'Swachh Bharat Abhiyan' that contribute to improving the nutritional status of the people directly or indirectly. In this section major interventions of the government towards food and nutrition are examined.

6.5.1 Targeted Public Distribution System (TPDS)

Till 1997, the PDS served all citizens. In 1997, the Targeted Public Distribution System focusing on the poorer sections of population was introduced. This scheme aims to supplement food requirements of households. It is the joint responsibility of the central and state Governments. In TPDS, states were directed to identify the poor at the Fair Price Shops (FPS) level for the distribution of food commodities.

Subsequent to the evaluation by the Planning Commission (2005) and Justice Wadhwa Committee report, GoI has undertaken various reforms for improving the service delivery of TPDS including end-to-end computerization. These reforms were further accelerated by implementation of the National Food Security Act (2013), making food security an entitlement for 67 percent of Indian population. All the states of India have implemented the NFSA and the technological solutions for improved supply chain and reduced leakages.

A study on TPDS carried out by National Council of Applied Economic Research (NCAER) in 2016 in six states of India attempted to estimate the degree of exclusion and inclusion errors. It found wide variations in exclusion and inclusion errors across these states. Many households that are entitled for inclusion in the TPDS are excluded whereas some ineligible households were found to be included. High inclusion error is one of the causes of leakage of food grains from the central pool.

Recently NITI Aayog conducted a pilot study on the Direct Benefit Transfer (DBT) in three UTs (Chandigarh, Dadra & Nagar Haveli and Puducherry). As per the final report on 'Process Monitoring of Direct Benefit Transfer in the PDS', submitted to the NITI Aayog and Department of Food, Government of India, around 65 per cent of the beneficiaries across 3 UTs prefer DBT to PDS. In addition, beneficiaries rated rice and wheat quality purchased from the market higher than that available at the PDS. Further, beneficiaries reported using DBT to buy food and increase dietary diversity, but their responses were affected by social desirability bias. The analysis brought out that beneficiaries earning higher (household) income prefer DBT more than lower income ones; the difference was statistically significant only in Dadra & Nagar Haveli. Although the sample was confined only to 3 UTs, the study is indicative of preference shifting towards DBT, and in the process leading towards better quality and increased diversity. Given an opportunity to switch over to the DBT option, or to monthly opt between DBT and traditional PDS; more beneficiaries may shift towards DBT. This could have a desirable nutritional shift.

6.5.2 Mid-day Meal Scheme (MDM)

The Scheme aims at enhanced enrolment, retention and attendance besides improvement of nutritional levels among children. It was launched as the National Programme of Nutritional Support to Primary Education (NP-NSPE) as a Centrally Sponsored Scheme (CSS) on 15 August 1995 and was extended to entire country by 1997-98. In 2002, its coverage was for children

studying in centres run under the Education Guarantee Scheme (EGS), Alternative and Innovative Education (AIE) Scheme and Madarsas/Maktab. Initially covering only primary schools, it was made accessible to Upper Primary Schools in 2006-07. Since, 2009-10 the Scheme also covers children studying in the National Child Labour Project (NCLP) Schools. It covers free of cost supply of foodgrains at 100 grams per child per school day at Primary and at 150 grams per child per school day at Upper Primary.

Evaluation of Mid-Day Meal Scheme in many states, conducted by independent agencies reported that MDM is a visible programme and has helped increasing attendance and enrolment of children, particularly girls. They also reported an increase in retention, learning ability and achievement as well as greater social equity among caste, creed, sex and gender groups in the schools.

Table 6.5: *Food Norms*

Items	Quantity per day per child (in grams)	
	Primary	**Upper Primary**
Foodgrains	100	150
Pulses	20	30
Vegetables (leafy also)	50	75
Oils & Fat	5	7.5
Salt & Condiments	As per need	As per need

The Joint Review Mission of MDM (2016) (JRM) observed that health and nutrition linkage in the MDM programme appeared weak. Despite receiving MDM regularly in most states, the nutritional status of a majority of the students of both sexes was reported to be very poor, with high incidence of stunting, underweight, anemia and micronutrient deficiency. The awareness of teachers about nutrition was found to be very low.

To improve the acceptability and nutritional adequacy of MDM various recipes were introduced in states and districts as per the regional diet pattern. The JRM (2016) noted that many children reach the school empty stomach. This makes a strong case for introducing breakfast for the school kids. Moreover, innovative strategies need to be scaled up to improve nutrition quality and food diversity under the MDM.

6.5.3 Integrated Child Development Services

Launched on 2nd October 1975, the ICDS Scheme represents one of the world's largest and most unique programme to improve the nutritional and health status of children aged 0 to 6 years and pregnant and lactating women. The ICDS offers a package of services, which are supplementary nutrition, pre-school non-formal education, nutrition & health education, immunization, health check-up and referral services.

In September 2016, more than 1,010.56 lakh supplementary nutrition beneficiaries (children between 6 months to 6 years and pregnant and lactating mothers) were covered, and approximately 345.44 lakh children were given pre-school education (MWCD, 2016-17) from more than 13,49,153 *anganwadis*,. NFHS-3 detailed report reveals that only one out of every four children (26 per cent) aged 0-71 months, is covered by *anganwadi* centres. In most states, the proportion of the children who accessed any

service was less than even one out of every three children (NFHS-3). However, the NFHS-4 National Report showed an increase in the percentage of children aged 0-71 months receiving supplementary food to 53.6 percent.

6.5.4 National Food Security Act (NFSA), 2013

NFSA is one of the most important policies to address hunger and food security in India. NFSA mandates ensuring access to adequate quantity of quality food at affordable prices for the vulnerable population of India. This Act brought all the three food based safety-nets under one umbrella and has changed the coverage and entitlements under TPDS. NFSA aims at a coverage of 75 percent of rural and 50 percent of urban population. Priority households are entitled for 5 Kg of foodgrains per person at issue prices of Rs.3, 2 and 1 per Kg for rice, wheat and coarse grains respectively. Antyodaya Anna Yojana (AAY) households continue to receive 35 Kgs of foodgrains per household per month at the same rate. Some states provide other items such as pulses and cooking oil in addition to rice, wheat and sugar at subsidised rates through PDS. The criteria of identifying priority households are occupational and social vulnerabilities.

The NFSA also specifies nutritional standards for children, pregnant and lactating mothers. It stipulates that the nutritional standards are to be met by nutritious hot- cooked meal in accordance with the ICDS for children in lower and upper primary classes under the MDM Scheme and for pregnant women and lactating mothers to be met by providing 'Take Home Rations' (Table 6.6).

Table 6.6: ***Nutritional Standards - NFSA- Schedule II***

Sl No	Beneficiaries	Items	Calories (Kcal)	Protein (gms)
1.	Children (6 months to 3 years)	Take Home Ration	500	12-15
2.	Children (3 to 6 years)	Morning Snack and Hot -Cooked Meal	500	12-15
3.	Children (6 months to 6 years) who are malnourished	Take Home Ration	800	20-25
4.	Lower primary classes	Hot -Cooked Meal	450	12
5.	Upper primary classes	Hot- Cooked Meal	700	20
6.	Pregnant women and lactating mothers	Take Home Ration	600	18-20

6.5.5 National Nutrition Strategy

NITI Aayog brought out the 'Nourishing India-National Nutrition Strategy' in 2017 to bring nutrition to the centre-stage of the National Development Agenda. The strategy focuses on laying down a roadmap for effective action among both implementers and practitioners in achieving nutrition objectives. The objectives of the strategy are:

1. To reduce all forms of malnutrition by 2030 with a focus on the most vulnerable and critical age groups. The strategy aspires further to assist in achieving the targets identified as part of the Sustainable Development Goals related to nutrition and health.
2. 'Kuposhan Mukt Bharat' linked to Swachh *Bharat* and *Swasth Bharat*. The strategy aims that States create customized State/ District Action Plans to address local needs and challenges.
3. A framework having four proximate determinants of nutrition - uptake of health services, food, drinking water &

sanitation and income & livelihoods to work together to accelerate decline of under nutrition in India.

4. Promotion of a decentralized approach with greater flexibility and decision making at state, district and local levels. Further, it enables decentralized planning and local innovation along with accountability for nutrition outcomes.

For more inclusive growth, the National Nutrition Strategy emphasizes on reduction of maternal, infant and young child mortality through its focus on the following monitorable targets:

1. To prevent and reduce undernutrition (underweight prevalence) in children (0-3 years) by 3 percentage points per annum from NFHS 4 levels by 2022.

2. To reduce the prevalence of anaemia among young children, adolescent girls and women in the reproductive age group (15-49 years) by one-third of NFHS 4 levels by 2022.

Further, to address the dual burden of malnutrition (undernutrition and overnutrition) a long term strategy has been devised with a focus on progressively reducing all forms of undernutrition by 2030. This specifies a set of following six global nutrition targets for 2025, which the strategy focuses on achieving:

1. 40 per cent reduction in the number of children under five who are stunted;
2. 50 per cent reduction in anaemia among women of reproductive age;
3. 30 percent reduction in low birth weight;
4. Ensuring no further increase in childhood overweight;
5. Increasing the rate of exclusive breastfeeding in the first 6 months up to at least 50 percent; and
6. Reducing and maintaining childhood wasting to less than 5 percent.

The National Nutrition Strategy identifies the following as the key nutrition interventions which would be undertaken to achieve the aforesaid objectives/targets:

1. Infant and Young Child Care and Nutrition
2. Infant and Young Child Heath
3. Maternal Care, Nutrition and Health
4. Adolescent Care, Nutrition and Health
5. Addressing Micronutrient Deficiencies – including Anaemia, Vitamin A, Iron Deficiencies
6. Community Nutrition (interventions addressing the community)

The Strategy aims to establish a web enabled Nutrition Information System to provide real time data on child nutrition status for states, districts, urban areas, blocks, panchayats and villages. It further emphasizes on the importance of conducting Social Nutrition Audits for better evaluation of nutrition outcomes and their impact.

6.5.6 National Nutrition Mission (NNM)- POSHAN Abhiyan

The National Nutrition Mission (NNM) is a technology driven platform, which will monitor the growth of children as well as check the pilferage of food rations provided

at *Anganwadis.* The mission was approved by the Government on 1st December 2017. Under the NNM, the ministries of women and child development, health and family welfare, and water and sanitation will work together. The mission will be considered as an apex body responsible for monitoring, supervising, fixing targets and guiding nutrition related interventions across the ministries. NNM is meant to ensure convergence between the WCD ministry and ministry for health and family welfare in fighting against malnutrition.

The National Nutrition Mission aims at attaining annual reduction rates (ARRs) for levels of stunting, undernutrition, anaemia (among young children, women and adolescent girls) and low birth weight babies at 2 per cent, 2 per cent, 3 per cent and 2 per cent per annum respectively. It aims further to reduce stunting levels in India to 25 per cent by 2022.

The NNM strives to create synergy among different schemes, ensure better monitoring, issue alerts for timely actions and encourage States/UTs to perform, guide and supervise the line of ministries to achieve the targeted goals. The mission includes the following:

1. mapping of various Schemes contributing towards addressing malnutrition
2. introducing a very robust convergence mechanism
3. ICT based Real Time Monitoring system
4. incentivizing States/UTs for meeting the targets
5. incentivizing *Anganwadi* Workers (AWWs) for using IT based tools
6. eliminating registers used by AWWs
7. introducing measurement of height of children at the *Anganwadi* Centres (AWCs)
8. Social Audits
9. Setting-up Nutrition Resource Centres, involving masses through Jan Andolan for their participation for nutrition through various activities, among others.

The mission intends to use technology at the core for real time monitoring of services delivered by Anganwadi workers and frontline community health workers of ASHAs and auxiliary nurse midwives. Further, it aims to promote use of smartphones by anganwadi workers and tablets by their supervisors in mapping nutrition or growth levels of beneficiaries.

The mission involves a six-tier real-time reporting system, which includes an *anganwadi* worker, *anganwad*i supervisor, child development project officer, a district official, an official appointed by the chief secretary at the state level and officials at the centre. Additionally, mission entails the criteria of getting children under 5 years registered under the Aadhaar number of his or her mother and have made Aadhaar a mandatory requirement to avail benefits of the mission. Also financial incentives are being provided to the anganwadi workers to help those who does not have Aadhaar card yet in getting enrolled in Aadhaar. Further, it plans to provide group-based incentives to *anganwad*i workers, ASHAs and ANMs.

6.5.7 Swachh Bharat Mission

Swachh Bharat Mission was been launched in 2014 to accelerate efforts to achieve universal sanitation coverage and to focus on sanitation. The Mission targets to achieve a Swachh Bharat by 2019, as a fitting tribute to Mahatma Gandhi on his 150th birth anniversary. To ensure a continuous engagement and higher awareness among citizens, participatory approach has been adopted and includes cleanliness drives on regular intervals, specific to the sector. Theme-based interventions are conducted;

targeting core city spaces and areas. Depending upon the specific theme, relevant government departments and entities facilitate implementation of the drive and participation by the relevant stakeholders. The biggest focus of the Mission is on eliminating open-defecation in the country by construction of toilets in rural homes and urban slums. Since the inception of the scheme, there has been a 60% increase in the number of households with toilets.

6.6 Conclusions

India is a land of dichotomy. On the one hand India is known for its socio-cultural diversity and on the other hand, it is also known for its predominantly patriarchal culture. Many states of India have populations higher than a few neighboring countries. Indo-Gangetic plains is one of the most fertile lands and at the same time one of the most densely inhabited places of the World. Most of the states of Indo-Gangetic plains like Punjab, Haryana, Uttar Pradesh, Bihar, Jharkhand, West Bengal etc. are national leaders in one or more than one agricultural crop production. However, at the same time states like Uttar Pradesh, Bihar, Jharkhand are also known as socio-economically backward states of India, having the highest maternal and child health problems and lowest per capita income in the country. India, thus, has a very high number of malnourished children as well as adults, particularly women.

Key findings discussed in this chapter suggest that majority of the population in rural India is still dependent on the agriculture sector for their livelihood while in urban India people are more engaged in the service sector. MPCE is lowest for casual laborers as compared to salaried workers.
As India is experiencing a demographic transition, the population pyramid of India is wider in the middle which represents high proportion of adults or working age population. Due to this, dependency ratio has declined from 2001 to 2011, yet it is higher in rural than urban areas.

It is observed that some sections of the population like women, children, SC/STs and disabled people are relatively more vulnerable and need especial attention. Effective implementation of additional programs and policies for these vulnerable groups would accelerate the overall growth and development of the nation.

Over the years, the Government of India has accorded the highest priority to combat malnutrition among its people through the introduction of Targeted Public Distribution System, Mid-day Meal Scheme (MDM), National Food Security Act (NFSA), 2013, Swachh Bharat Mission, Mission Indradhanush and POSHAN Abhiyan.

Achieving India's SDG target (NITI Aayog, 2018) of reducing stunting to 21.03% by 2030 seems possible with targeted efforts of the Government of India, with the help of national programs like POSHAN Abhiyan and Swachh Bharat Mission. Goa and Kerala have already achieved this level in NFHS-4. Four other states (Daman and Diu, Andaman and Nicobar, Puducherry and Tripura) have already accomplished the targets of (NFHS-4) 'mission 25 by 2022' of POSHAN Abhiyan (GoI), and Punjab (25.7%) is on the verge of achieving it (NFHS-4). But according to WHO cut-offs, stunting prevalence of 21% will still be termed as high-level public health significance.


KGS
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CHAPTER SEVEN

DISCUSSION AND CONCLUSIONS

India has implemented many reforms and has taken innovative measures that have put the nation on a higher economic growth trajectory which has resulted in significant improvement on a number of global measures of economic and social well-being. For example, India has made significant progress agriculture with the production of cereals and pulses has been more than its domestic requirements while undernourishment has decreased from 23.7 percent in 1990-92 to 14.8 percent in 2015-17. Continued progress on poverty reduction, increased food grain production and reduced malnutrition contributed to improved food security for the majority of people in India. However, there are still some key areas that should be prioritised such as:

- Continued increase in productivity (yield/ha), diversification of crop production and also improving the ability for farmers to secure the minimum support price (MSP)
- Improving economic and physical access to food, including continued investments in infrastructure, especially for poor households, and
- Accelerating action to prevent malnutrition.

Despite the progress already presented, the current rates of improvement in food and nutrition security are not on track to reach India's targets under SDG 2 by 2030. In order to make these improvements it is important to know the following:

- Who are food insecure and malnourished?
- How many are they and where do they live?
- What are the underlying factors contributing to food and nutrition insecurity?
- Who are the most vulnerable groups?
- What can be done to improve food and nutrition security in the country?

- What are the opportunities and challenges in implementing food and nutrition security interventions and how to address these challenges?

This chapter summarises the findings to logically arrive at suggested critical recommendations for prompt action. The results of these analyses will be useful to national and state governments in developing policies and allocating resources for activities to address the issues concerning the specific dimensions of availability, access and absorption/utilization of food as well as sustainability. Most importantly, the findings will also provide the baseline information for monitoring SDG 2 targets and related indicators and India's progress towards achieving these targets by 2030 as well as fulfilling the vision of National Food Security Act, Poshan Abhiyan (under NNM) and other national development priorities.

The vulnerability of a household to food and nutrition insecurity is determined by a number of factors that are typically categorized according to their relationship to the three dimensions of food security: availability, access, and utilization. This report has selected multiple indicators that aim to capture the core aspects of the three dimensions along with nutrition and health outcomes. The definition, computation and sources of each indicator are provided in Chapter 1. Detailed explanations of the relationships between indicators and the food security dimensions can be found in Chapters 3–6. While the three dimensions of food security are closely intertwined, nutrition is a central issue that intersects across, reflecting the importance of mainstreaming a nutrition-centred approach in programmes and policies related to food security.

There is a data limitation to undertake a critical food security analysis using secondary sources. Each data source has different frequency, methodology and unit of measurement. Even the scope of analysis and level of disaggregation is different. Nevertheless, with the help of the available data, this analysis attempts to provide indicative answer to these questions.

A. Food Availability:

In terms of availability, the analysis concludes that there is limited crop diversification and excessive demand pressure on rice and wheat. There is also a situation of food surplus with low farm productivity. Some of the key findings from the study of agricultural growth, food grain production and productivity are summarized as follows:

- The compound annual growth rate of production for major crops between 1996-99 and 2015-18 is exceptionally high for maize (5.9 percent) followed by pulses (2.4 percent), wheat (1.8 percent), cereals (1.6 percent), rice (1.4 percent), bajra (0.9 percent) and total foodgrains (1.6 percent).
- However, during the same period there was a negative compound annual growth rate for other coarse cereals like jowar (-2.26 percent), small millets (-1.71 percent) and ragi (-1.21 percent).
- For total production, the share of wheat, rice, pulses and coarse cereals remains almost constant, with rice and wheat constituting around three-quarters of the total foodgrains production.
- Despite increased production for rice, wheat and cereals, their per capita net availability has slightly declined during the same period indicative of the pressure of demand on rice and wheat.
- Production of foodgrains has increased from 198 million tonnes (triennium average) in 1996-99 to 269 million tonnes in 2015-18 (36 percent increase).

- Production of coarse cereals increased from 32 to 42 million tonnes in the last two decades mostly due to intensified maize production (11 to 25 million tonnes) but only 9 percent maize is directly used for human consumption.
- The production of pulses was consistently lower than national requirements between 2000-2016, but new efforts after 2016 have resulted in increases which surpass the national requirement.
- Although yields in foodgrains have increased by 33 percent in the last two decades, it has been far less than desired as the national SDG target is to double the yield of wheat, rice, coarse cereals to 5,018 kg/ha from the current yield of 2,509 kg/ha by 2030.
- Although sub-nationally no state or UT has achieved this target, the UT of Chandigarh is close with average yields of 4,600 kg/ha while Punjab is reaching yields of 4,297 kg/ha.
- Between 1996 and 2015, available arable land and net sown area have both declined by 2.2 million hectares and 2.8 million hectares respectively. Out of 36 states/UTs, arable land and net sown area have declined in 25 during last two decades. This is mostly due to the increasing cost of inputs.
- Annually, production of cereals has been higher than the national requirement over last two decades, with the exception of the 2002-03 season.
- High production can lower the sales prices for consumers, also controlling inflation. However, the profit margin for farmers is also reduced due to surplus produce on the market.

Policy Measures

Government aims to reorient the agriculture sector by focusing on income centeredness. In order to realise net positive returns for the farmer, several schemes are being promoted and implemented across the states/UTs: Soil Health Card (SHC) scheme; Neem Coated Urea (NCU); Pradhan Mantri Krishi Sinchayee Yojana (PMKSY); Paramparagat Krishi Vikas Yojana (PKVY); National Agriculture Market scheme (e-NAM); Pradhan Mantri Fasal Bima Yojana (PMFBY); National Food Security Mission (NFSM); Mission for Integrated Development of Horticulture (MIDH); National Mission on Oilseeds & Oil palm (NMOOP); National Mission for Sustainable Agriculture (NMSA); National Mission on Agricultural Extension & Technology (NMAET) and Rashtriya Krishi Vikas Yojana (RKVY).

In addition, schemes relating to tree plantation (Har Medh Par Ped), Bee Keeping, Dairy and Fisheries are also implemented. The main objective of all of the schemes is to enhance production and productivity of agriculture and thereby enhance income of farmers (MoAFW, 2018).

Giving a major boost to farmers' income, the Government has increased the minimum support prices (MSP) of all *kharif* crops for the 2018-19 season. This decision is historic as it keeps the promise of the predetermined principle of fixing the MSPs at a level of at least 150 percent of the cost of production

announced by the Union Budget for 2018-19. NSSO conducted a Situation Assessment Survey (SAS) of Agricultural households during its 70th round (January 2013- December 2013) in the rural areas of the country with reference to the agricultural year July 2012- June 2013. The survey collected the details of income generated by the agricultural households (Rs. 6,426/month/agriculture household) from various economic activities. Additionally, the Government has developed a plan for doubling farmers' incomes by 2022, through increases in crop productivity, crop intensity and input efficiency, livestock integration, focus on high-value crops, improved price realization and a shift to non-farm employment.

As per NITI Ayog, "Government of India has identified millet as a vital addition to the food basket in order to tackle malnutrition. An INR 600-crore scheme, which will span over 2 years, has been launched by the Department of Agriculture Cooperation and Farmers' Welfare to promote millets as 'nutri-cereals'. A Committee was also constituted in NITI Aayog, under the chairmanship of Prof. Ramesh Chand, member (Agriculture), to recommend strategies to increase millet availability to ensure nutritional security. The committee's report, entitled "Improving Nutrition through Promotion of Millets under Public Distribution System" has been recently submitted to the Government of India for consideration, investigates the scope for millet in India."

Policy Recommendations

- In long run, a deep-rooted transformation of agriculture that doesn't rely on repeated sops is needed because agriculture as a sector should be productive enough to contribute in India's growth and job creation.
- The Government's current priorities are on cereals and containing food inflation. However, decisions on imports/pricing of crops and inputs with due consideration to farmer's interest in the long run should be prioritised. Better monitoring and forecasting of demand for foodgrains in this regard is crucial. The most recent example is the case of pulses where, in the 2016-17 agricultural season, India experienced its highest ever production which was close to 23 million metric tonnes. This was likely reflecting a combination of a normal monsoon and farmer response to higher market prices and MSPs and was more than enough to satisfy domestic demand. Despite record production, India imported 6.6 million tonnes of pulses (almost a third of total domestic production) due to existing commitments – leading to a massive domestic supply glut, and a sharp and sustained fall in pulse prices over the next two years which continues to this day, with prices currently 30 percent lower than their 2016 peaks.
- From the demand side, Government should encourage a diversified food consumption basket. This could be best achieved by first identifying food consumption patterns and nutritional mapping at state level and district, followed by state-specific strategies to promote local food groups to the extent possible, without compromising the nutritional quality.
- Similarly, on the supply side, there could be more focus on increasing production of coarse cereals (jowar, bajra, ragi) that have shown negative growth in the last decade. Recent initiatives by the Department of Agriculture Cooperation and Farmers' Welfare to promote millets as 'nutri-cereals' is a step in the right direction.
- Further, there is a need to make concerted efforts to pool, distil, and

evaluate traditional practices, knowledge, and wisdom. For sustainability of soil cover and soil health, village-level suggestive crop mixes should be evolved and tabulated in consultation with local farmers and then could be exchanged through extension machinery among all farmers. These tables should cover crop options concerning unirrigated/ irrigated conditions with the number of irrigation options available, use of water-efficient technologies, choice of organic manures or chemical fertilizers or a suitable mix; choice of organic/ inorganic/ suitable mix of pesticides, etc.

- For the actual selection of crops for a specific field, the information should be made available to farmers to the level of village and field; drawing upon the results from the soil health card. In fact, recommended crops, crop rotation/ diversification for *kharif/rabi/zaid* should also be made available to farmers taking into view the aforesaid inputs as well as MSPs and likely market rates, shelf-life and storage facilities, marketing linkages, food-processing linkages etc. to optimize long-term profits sustainably.

- Increased use of Information and Communication Technologies (ICT) to facilitate these mechanisms, especially through customized applications and tools like SMS messages and alerts, using limited number of steps on mobile phones, all in vernacular language, should be encouraged. It would also improve synergy with Kisan Call Centres, Krishi Mitras and mKisanPortal, making these instruments also more effective.

- A review and revision of incentives for food production, including price guarantees, subsidies and trade restrictions, could help ensure that the production of highly nutritious foods, such as soyabeans, vegetables and fruits, is given the same priority as staple food production. Increasing production of some nutritious foods may require imposing higher prices to create incentives for farmers to produce them, which will make these foods less affordable to people at the highest risk of malnutrition. This apparent contradiction can be mitigated to some extent through the appropriate use of social safety nets.

- Increase investment in research – covering new seeds, latest farming and irrigation techniques across all states. Widespread dissemination of new techniques could be carried out by leveraging on digital means.

- Invest in rural infrastructure such as irrigation, roads, improved transport and storage logistics.

B. Access to Food

Some of the key findings on food accessibility that have emerged from the study are highlighted below, followed by a summary of ongoing Government interventions focused on improving access to food. Policy recommendations for enhancing access to food are at the end of this section.

Nutritional Intake in India

- Trends in the daily per capita consumption of energy and protein are declining in rural are while in urban area, there are no consistent trends. Per capita daily fat intake has been increasing and is much higher than the Recommended Dietary Allowance (RDA).

- In rural India, daily per capita consumption for the lowest 30 percent of MPCE class, is 1,811 kcal for energy, while protein is 47.5 grams and fat is 27.8

grams. For urban areas, daily per capita consumption is 1,745 kcal for energy, 47.2 grams for protein and 35.1 grams for fat in urban areas. Current level of all three nutrients (energy, protein and fat) intake was much lower than the all-India average and the daily minimum consumption requirement. For these poorest in India, only fat intake for urban residents is higher than the daily minimum consumption requirement.

- State level analysis shows declining trends of daily per capita energy intake between 2004-05 and 2011-12 for rural areas in the 10 states of Arunachal Pradesh, Mizoram, Manipur, Meghalaya, Nagaland, Uttar Pradesh, Assam, Kerala, Jammu & Kashmir and Gujarat. Another 20 states show per capita per day intake of energy lower than the RDA of 2,155 kcal). Trends in daily per capita intake of protein and fat are more positive as there are only four states (Meghalaya, Manipur, Arunachal Pradesh and Chhattisgarh) which have daily per capita intake of protein lower than all-India RDA of 48 grams. In nine states (Nagaland, Manipur, Arunachal Pradesh, Meghalaya, Odisha, Mizoram, Assam, Tripura and Chhattisgarh) the daily per capita intake of fat is lower than the all-India RDA of 28 grams. For urban areas, minimum consumption requirements of energy is lower in than the all-India RDA in 17 states, while in Manipur and Nagaland it is lower for protein and for Meghalaya and Manipur it is lower for fat intake.

- It is heartening to note that among the poorest (lowest 30 percent PMCE class), the daily per capita intake of energy has increased in almost all the states (except Arunachal Pradesh, Bihar and Manipur) between 2004-05 and 2011-12. But, concern still remains as in almost all of the states, the daily per capita intake of energy is not higher than RDA norms in both rural and urban areas. In case of fat intake, the situation is relatively better among the poorest compared to other two nutrients. In 2011-12, rural areas of 15 states and urban areas of 18 states have daily per capita intake of fat that is higher than the RDA level.

- The states that require immediate attention for nutritional interventions to improve intake for the three nutrient groups are Manipur, Meghalaya, Mizoram. In addition, states that require interventions due to insufficient intake of both energy and protein Assam, Tamil Nadu, Arunachal Pradesh, Chhattisgarh, Uttar Pradesh and Bihar.

Changing Food Consumption Patterns in India

- In the food basket, the contribution of cereals to energy and protein intake has decreased in both rural and urban India. This decline has largely been due to substitutions by rich food items such as milk and its products, oils and fat and miscellaneous food products (mostly fast food, processed food, sugary beverages, etc.). Moreover, the share of miscellaneous food in the energy and protein sources of people is very high in urban areas compared to the rural areas. This has implications on the emerging problem of obesity in the country.

Changing Relative Importance of Food in the Household Expenditure Share

- On an average, people of India spend about 48.6 percent of their monthly expenditure on food in rural areas and 38.5 percent in urban areas. Both these figures are as high as 60.3 percent and 55 percent among the poorest respectively.

- Share of expenditure on food items has declined in both rural (33 percent) and

urban (40 percent) areas between 1972-73 and 2011-12. On the other hand, share of expenditure on non-food items has increased in both rural and urban areas (an increase of 90 percent and 73 percent respectively) during the same period. Since 2004-05, among the poorest, the share of expenditure on food has declined by 9 percent in rural areas and 9 percent in urban areas. Expenditure on other needs such transportation, education and health care have taken a substantial share of household's income.

- In the food basket, in both rural and urban areas, the share of expenditure on cereals and substitutes has greatly declined over the last couple of decades. For the same period, the relative expenditure on items such as beverages, milk and milk products and fruits and nuts has shown a remarkable increase. This indicates a significant shift in consumption pattern in both rural and urban areas.

Differences across Social and Income Groups

- Low daily per capita intake of energy (energy deprivation) was the highest among the disadvantaged social groups such as Scheduled Castes, Scheduled Tribes and OBC populations in both rural and urban areas. Per capita per day consumption of energy in all the three population groups shows less than the RDA norms. However, consumption of the other two nutrients (protein and fat) are higher than the RDA levels in all population group.

- In both rural and urban areas, households relying on casual labour are the most vulnerable in terms of daily per capita consumption of energy. As with the disadvantaged social groups, their daily per capita intake of proteins and fats is above than the minimum requirement among all income groups.

- Despite the increase in MPCE, the daily per capita consumption of energy has fallen much below the RDA among the poorest 30 percent MPCE class. It is interesting to note that since 2004-05, the share of expenditure on food among the poorest (lowest 30 percent MPCE class) has decreased by 9 percent in rural areas and 8 percent in urban areas.

Role of the Government's Food Safety Net (TPDS)

- Intake of foods from the Public Distribution System (PDS) has helped to fill the nutritional gaps for many vulnerable people across all states in order to attain the RDA levels of energy and protein. During 2011-12, the average daily per capita supplementation of energy from PDS was 453 kcal in rural areas and 159 kcal in urban areas. For protein it was 7.2 grams in rural and 3.8 grams in urban areas.

- Most of the households in the bottom 30 percent of monthly per capita expenditure groups consumed less than the requirements. Though these poor households received a high share of the subsidised foodgrains through PDS (around 339 kcal per capita per day), their household capability to access other foods was weak and, as a result they were not able to reach the RDA levels of energy and protein intake despite PDS support.

- State level analysis suggests that PDS has had a major impact on energy and protein intakes. When energy is sourced from household sources alone, only rural Punjab urban areas of Himachal Pradesh, Uttarakhand and Punjab had consumption above the RDA level of energy. When summing the PDS support in states, rural areas in 8 states and urban areas of 11 states show daily per

capita consumption of energy that is higher than the RDA level.

- There were only 9 states with higher per capita per day consumption of protein than the requirement which is sourced from other HH sources only in rural areas, while in urban areas the number of states was 18. With the PDS coverage, in only 2 states in rural areas (Manipur and Meghalaya) did not reach the minimum requirement level of protein in both rural and urban areas.

Policy Measures

National Food Security Act, 2013

- The National Food Security Act, 2013 (NFSA) extends the overall coverage at national level to about 67 percent of population (75 percent rural and 50 percent urban). Subject to the state/UT ceiling, DoFPD makes annual/monthly allocation of foodgrains to the states/ UTs after considering the actual NFSA coverage and monthly entitlement of foodgrains (35 kg per household for AAY households and 5 kg per person for Priority households).
- The Department of Food and Public Distribution (DFPD) has been implementing the scheme on "End to End Computerization of TPDS Operations" since December 2012, to improve efficiency in the delivery of subsidized foodgrains by eliminating fake and bogus ration cards and by reducing leakages or diversion through digitization of beneficiary databases, automation of supply chain management, setting up of transparency portals, online grievance redressal systems and toll-free helplines. All States/UTs have been instructed by this department to enter Aadhaar numbers in the ration card database and run a deduplication of their beneficiary list by using Aadhaar as a unique identifier. They have also been instructed to install e-PoS devices at Fair Price Shops (FPS) at the earliest to ensure leakages/diversion free distribution of foodgrains through biometric authentication of beneficiaries and for electronically capturing the transaction details. The reform measures and computerisation of TPDS operations have resulted in improved service delivery and food security.

Policy Recommendations

Strengthening the PDS

- Among the poorest (lowest 30 percent MPCE class), the daily per capita consumption of energy is below the RDA norms in almost all states. It is therefore, imperative to improve the targeting efficiency of the Targeted Public Distribution System (TPDS) to assess if there are people in this income bracket who are excluded.
- The quality and diversity of foodgrains supplied through the PDS should also be improved. All the quality assurance systems should be revisited, and efforts should be made to roll out periodic rapid assessments of the service delivery to improve the quality of the service.
- Immediate attention is needed in the north eastern states especially in Meghalaya, Manipur, Mizoram and Nagaland which are the most vulnerable (among others) in terms of food and nutrition insecurity due to low accessibility of required nutrients and high prevalence of malnutrition. Hence, a focused study with empirical evidence is needed in the north eastern states to better understand the causes and to identify opportunities to improve food and nutrition security in those areas.

Doubling Farmer's Income

- To ensure that farmers receive more of what is paid by the consumer, the farmer's access to domestic and international markets should be increased by reducing fees, and building the necessary infrastructure. Frequent closing or opening of access to international markets should be regulated.

- Seasonal price fluctuations of food commodities are common. As agricultural production is seasonal, farmers often do not benefit from higher prices as many resource-poor farmers are forced to sell their produce immediately after harvest due to lack of adequate storage as well as socio-economic constraints. Fruits, vegetables, pulses apparently show high price volatility among all agricultural produce which reduces the availability of nutritious foods throughout the year, especially among the poor, and thus should be addressed by appropriate policies and programmes.

- Improve and expand the current Pradhan Mantri Fasal Bima Yojana (PMFBY), especially as the incidence of climate fluctuations increases.

- Quick assessment of crop damage using new technologies such as satellite imagery and drones, as well as quick payout into their bank accounts to farmers who have endured losses, will enhance adoption.

- For landless laborers, the best short-term policy option is likely to be to strengthen the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). Evidence suggests that places with well-implemented NREGS schemes have significantly higher market wages – without hurting employment. Thus, increasing allocations to, and ensuring better implementation of, MGNREGS may be the best immediate policy option to protect the landless rural poor. Efficiency of NREGS spending can be increased by working with line departments to improve asset quality and create better quality rural infrastructure.

Gender-sensitive Agriculture Production

- With the feminization of agriculture, 80 percent of financially independent women are engaged in farm-related activities in India. Of these, one-third are working as agricultural labourers and nearly half are self-employed farmers. According to the latest NSSO report, women head nearly 18 percent of agricultural households and there is not a single area of agriculture in which they are not involved. A qualitative study on this theme, understanding the hardships of women in agriculture and its relationship with food and nutrition security should be taken up to devise appropriate policy to improve the status of women.

- The Ministry of Agriculture has developed drudgery reduction technologies to help women farmers – what is needed is greater outreach and connection with women farmers – tailored training packages, female extension workers, identifying and training peer educators among women farmers; also, utilizing women's role in kitchen gardening to promote nutritious food production at the community level. Such trainings have also been designed but again outreach is the major issue.

C. Food Utilisation

Some of the key findings on food utilization together with existing policy measures of the government are discussed below. Towards the end of this section, policy

recommendations to improve food utilization in India are presented.

Stunting

- With an annual decline of 1.0 percent, stunting has declined by one fifth over the last decade. Stunting burden is high across all states in India. Except Kerala, almost all states have a prevalence of stunting of >30 percent for children under 5 years of age.
- The trajectories to achieve targets in reducing stunting suggest that a rate of reduction of 4.9 percent is required to achieve the World Health Summit targets (40 percent reduction in stunting prevalence till 2025) or the SDG 2 target by 2030.
- By state, the highest prevalences of stunting and underweight are found in Jharkhand, Bihar, Uttar Pradesh, Madhya Pradesh, Gujarat and Maharashtra. Few states have a "very high" burden of malnutrition but none of the states are at the "acceptable level" for all forms of malnutrition according to WHO thresholds.
- The children from the poorest wealth quintile group are more likely to be stunted. In addition to the earlier mentioned states, among the larger states, the poorest two quintile groups in Haryana, Meghalaya, Karnataka, Rajasthan and Punjab are the most vulnerable to stunting.
- At the national level, among social groups, stunting is highest in children from the Scheduled Tribes (43.6 percent), Scheduled Castes (42.5 percent) followed by the OBC (38.6 percent). In Rajasthan, Odisha and Meghalaya, the prevalence of stunting in children from the STs is high, while in Maharashtra, Chhattisgarh and Karnataka the prevalence of stunting in children from both ST and SC is high.

Wasting

- There is an increasing trend in wasting India. None of the states fall in the WHO 'acceptable' category in terms of wasting prevalence.
- Jharkhand, Gujarat, Karnataka and Madhya Pradesh states have the highest burden of wasting. Increasing trends in wasting are observed in Punjab, Goa, Maharashtra, Karnataka and Sikkim.
- Wasting is all pervasive- across all wealth quintiles and social groups but among the social groups, STs in India are the most vulnerable group.

Micronutrient Deficiency and Anaemia

- Vitamin A, iron and iodine deficiency disorders are the most common forms of micronutrient malnutrition. In India, 93.1 percent households were using iodized salt in 2015-16 and it should be attributed to policy reforms carried out by the Government of India.
- Half of all women are anaemic, regardless of age, residence or pregnancy status. In the last decade, anaemia among women of reproductive age (15-49 years) dropped by only 2.3 percentage points; an annual decline of 0.4 percent. The prevalence of anaemia is much higher among women than men. In 2015-16, 53.1 percent women and 23.3 percent men were anaemic.
- In 2015-16, 58.5 percent children in the age 6 -59 months were anaemic compared to 69.5 percent in 2005-06. The prevalence of anaemia is highest among children in Haryana (71.7 percent), followed by Jharkhand (69.9 percent) and Madhya Pradesh (68.9 percent). Even higher levels of anaemia are found in several UTs: Dadra and Nagar Haveli (84.6 percent), Daman & Diu (73.8), and Chandigarh (73.1

percent). Mizoram was the only state in 2015-16 having a mild prevalence of anaemia, followed by Manipur.

- Almost all the districts in the country fall in the 'severe' (more than 40 percent) classification, with very few in 'moderate' (20-39.9 percent) and only 10 districts in 'mild' (5-19.9 percent) classification using the WHO thresholds.
- Maternal anaemia is a growing concern. The distribution (77.7 percent) and consumption (30.3 percent) of IFA tablets remains suboptimal all over the country, even in states where access to prenatal care has improved dramatically.
- Anaemia is not only stubbornly high but also appears to be much more complex. There are state wide variations in the availability of antenatal care and IFA supplementation for pregnant women. For example, pregnant women in Tamil Nadu are eight times more likely to access antenatal care and five times more likely to consume IFA tablets during pregnancy than their peers in Uttar Pradesh. However, they are just as likely to have anaemia.

Infant and Young Child Feeding and Dietary Intake

- Early initiation of breastfeeding (within 1 hour of birth) has improved to 41.5 percent and exclusive breastfeeding (EBF) to 54.9 percent. Prevalence of EBF varied from 35.8 percent in Meghalaya to 77.2 percent in Chhattisgarh.
- EBF decreased in six states (Uttar Pradesh, West Bengal, Chhattisgarh, Karnataka, Arunachal Pradesh and Kerala) between 2005-06 and 2015-16. Median duration of EBF is 2.9 months. It was reported to be longer in tribal and hill states and shortest in big states.
- Among children aged 6-23 months, only 9.6 percent children receive a minimum acceptable diet in India in 2015-16. However, 94 percent children receive breast milk, milk or milk products.
- The highest percentage of children receiving an adequate diet were in Puducherry (31.1 percent) and Tamil Nadu (30.7 percent), which is still quite low. Therefore, India has a long way to go to provide adequate diets to children and this is critical since this is the age when malnutrition gets rooted and develops with age among the newborns.
- In the same age group, only 22.0 percent children have minimum dietary diversity and 35.9 percent have minimum meal frequency in India.
- Breastfeeding ranks as the most important preventive approach for saving child lives and ensures nourishment to kids. On all the infant and child feeding indicators the performance of almost all states is extremely low and therefore it's an area of immense scope for improvement.

Health status and its Determinants

- Good health and hygiene practices always have a positive correlation with each other. As of 2015-16, about 90 percent of households were accessing water from improved sources while only 39.9 percent households have access to improved sanitation. Only, 2.7 percent of children under five years had symptoms of ARI and 9.2 percent of children under age five years had diarrhoea.
- There is also suggestive evidence that improvements in sanitation can have a positive impact on stunting. Analysis of India's national Total Sanitation Campaign[1] (TSC), for example, found that

[1]*India's Total Sanitation Campaign. In 1999, the Indian government introduced the Total Sanitation Campaign (TSC) to accelerate sanitation coverage throughout the country, particularly in rural areas. It focused on information and education to generate public demand for sanitation facilities, particularly in schools.*

on an average, the TSC increased height-for-age z-scores by approximately 0.2 standard deviations. These results were echoed by the findings of a randomized control trial (RCT) of community sanitation in Maharashtra which indicated a 0.3 to 0.4 standard deviation increase in children's height-for-age z-scores following the intervention.

Policy Measures to Improve nutrition

- The Government of India has undertaken various measures to address food and nutrition security in the country. As early as in 1993, India adopted the National Nutrition Policy. The National Nutrition Policy documented comprehensively strong linkages between nutrition and development. Government has also adopted several programmes and schemes towards 'nutrition security for all'. Direct nutrition programmes like the Integrated Child Development Services Scheme (ICDS) and Mid-Day Meal Scheme (MDM) backed-up by the Targeted Public Distribution System (TPDS) are major interventions towards better food and nutrition security. In 2013 government passed the National Food Security Act (NFSA) to ensure food security in the country which incorporated all the three schemes under one umbrella. Despite these efforts, India is home to one of the most undernourished populations in the world.
- To tackle the problem of malnutrition, the Ministry of Women and Child Development, GoI came up with a health program called, Poshan Abhiyan (earlier named as National Nutrition Mission, NNM). The mission is backed by a National Nutrition Strategy (NNS) prepared by the NITI Aayog- a premier think-tank of the Govt. of India, with the goal of attaining "Kuposhan Mukt Bharat" (malnutrition-free India) by 2022. For this, the targets outlined are to prevent and reduce undernutrition (underweight prevalence) in children (0-3 years) by 3 percentage points per annum from NFHS-4 levels; to reduce the prevalence of anaemia among young children, adolescent girls and women in the reproductive age group (15-49 years) by one-third of NFHS-4 levels.
- The analysis highlights that most of the energy and protein of mothers are derived from cereals, while the quality of protein intake remains poor. In addition to the food through TPDS, supplemental food is provided to pregnant women on a weekly basis as a THR or hot cooked meal (in few states) at Anganwadi Centres as part of the Integrated Child Development Services scheme. Although the food is intended to supplement pregnant women's diets, it is often shared with family members as per prevailing gender norms and cultural practices.
- India first launched a nationwide program for the prevention of anaemia among pregnant women in fourth five-year plan (1969-74) and since then the program has expanded and evolved multiple times considering program performances and new scientific evidences. In 2016-17, to bring synergy in the existing iron supplementation programs and schemes, Ministry of Health and Family Welfare developed the National Iron+ Initiative that embraced all the programs across all population categories for addressing anaemia. The initiative is an attempt to oversee interventions addressing Iron deficiency anaemia systematically across all life stages. Table 7.1 shows the current approach and delivery medium for addressing anaemia among women

and children. The Government of India has recently implemented a nationwide comprehensive programme on anemia prevention and control called Anemia Mukt Bharat (AMB). The earlier National Iron Plus Initiative has been subsumed within AMB programme. Anemia Mukt Bharat strategy was launched as part of the POSHAN Abhiyaan and is focused on benefitting six target beneficiary groups, through six interventions and six institutional mechanisms to achieve the envisaged target of anemia reduction under the POSHAN Abhiyaan. The strategy includes provision of supervised biweekly IFA supplementation by ASHA for all under-five children, weekly IFA supplementation for 5-10 years old children and annual/biannual deworming (children and adolescents), point of care testing (POCT) and treatment for in-school adolescents and pregnant women using newer technologies, establishing institutional mechanisms for advanced research in anaemia, addressing non-nutritional causes of anaemia, and a comprehensive communication strategy including mass/mid media communication material (Radio spots, TVCs, posters, job-aids, IPC materials, etc.).

Table 7.1: ***Approaches & delivery medium to address Anaemia in India***

Age Group	Intervention/Dose	Regime	Service delivery
6 –60 months	1ml of IFA syrup containing 20mg of elemental iron & 100 mcg of folic acid	Biweekly throughout the period 6-60 months of age & deworming for children 12 months & above	Ministry of health and family welfare: through ASHA
5 –10 years	Tablets of 45 mg elemental iron & 400 mcg of folic acid	Weekly throughout the period 5-10 years of age & biannual deworming	*Education system:* In school through teachers
10 -19 years	100 mg elemental iron & 500 mcg of folic acid	Weekly throughout the period 10-19 yrs of age & biannual deworming	Education system: In school through teachers & WCD-ICDS for out of school children through AWC
Pregnant & Lactating women	100 mg elemental iron & 500 mcg of folic acid	1 tablet daily for 180 days, starting after the first trimester, at 14-16 weeks of gestation. To be repeated for 180 days postpartum	*Ministry of health and family welfare:* ANC/ANM/ASHA
Women in reproductive age group	100 mg elemental iron & 500 mcg of folic acid	Weekly throughout the reproductive period	*Ministry of health and family welfare:* through ASHA

Note: Recently, the dosage for IFA supplementation has been revised to "60 mg elemental iron" from earlier "100 mg elemental iron". Dosage for folic acid remains same.

- Swachh Bharat Mission (SBM) launched in 2014 was a major policy initiative to push the WASH agenda in India. WASH is recognized as an important nutrition sensitive intervention in recently launched national nutrition strategy. The programmes to improve health and nutrition of mother and children under NHM and women and child development present a unique opportunity for promotion of hygiene and sanitation in communities. Alongside, Kayakalp Abhiyan and national quality assurance programme in national health mission are some of major initiatives to improve sanitation and hygiene at public health facilities, besides other quality parameters.

- The policy push to improve WASH condition in the country created an enabling environment. However, to achieve its impact on nutritional outcomes, greater attention is warranted at the implementation levels in high burden states and districts.

Policy Recommendations

Further inquiry into aspects of Stunting, Wasting and Anaemia are required

- The increasing trends in wasting and severe wasting is known to increase the risk of child mortality. Further inquiry needs to be undertaken to identify factors associated with increasing trends in wasting.
- To achieve Government of India and UN targets of reducing stunting and anaemia, it can be further accelerated with improved maternal nutrition. There is a need to improve mechanisms to identify levels of maternal malnutrition (moderate and severe malnutrition) during pregnancy and lactation. This can be done through further research in this space, specially taking cognizance of the cultural factors.
- There is also a need to find innovative ways to improve coverage and implementation. Also, awareness among all people about the need to ensure good nutrition of mothers and its implications on children would be required, so that families support maternal nutrition.

The Quantity and Quality of Minimum Dietary Intake

- Food access and supplementation programs largely focus on increasing calorie and protein intake. Improving micronutrient intake through food diversity is not yet factored as much.
- Quality of Take-Home Ration (THR) provided for children under two years of age should be contextualized to the local habits. Locally acceptable innovations to develop complementary foods may be prioritized. The key messages should be developed that can be delivered at the time of distribution of THR to every mother to improve complementary feeding during the critical period of 6 months to 2 years for the child.
- Fortification of ration in the food-safety net schemes could become a cost-efficient way of improving the micronutrient intake of low-income families. It is encouraging that a rice fortification pilot programme is ongoing and the Ministry of Health, with the release of standards on fortification, is promoting uptake of fortified commodities within government programmes and making it available for the public.

General Child Care and Feeding Practices

- Country lacks a national policy on Infant and Young Child Feeding (IYCF) as per the commitment to the global strategy on IYCF. Ten-step guidelines by the Ministry of Health to enhance optimal IYCF practices needs to be implemented in the health facilities and assessed periodically.
- Baby friendly hospital initiative needs to be revived by state governments as this can immediately improve the early initiation of breastfeeding.
- Immediate postpartum care of women and babies, including breastfeeding support is a part of the Government's institutional delivery promotion and Skilled Birth Assistance training module for nurses. This is a critical area. More emphasis and better implementation of the capacity building can prove to be a

key intervention in the mother and child care space.

- Appointment of dedicated IYCF counsellor or lactation management counsellor in health facilities, would aid in adoption and sustenance of breastfeeding practices in the facility and community. Currently, Mothers' Absolute Affection (MAA) has been implemented across the country under National Health Mission (NHM). As a core component of this programme, in-service IYCF trainings are being carried out for MOs, SNs and ANMs. The IYCF training module of MAA programme also includes information on IMS Act 2003.

- Treatment of children with moderate and severe acute malnutrition need to be available at the primary health care facilities (PHCs). This requires strengthening of PHCs. The community-based management of moderate and severe acute malnutrition models can help reducing mortality. Dedicated Treatment facility for SAM children who are medically sick is available at district level hospitals in form of Nutrition Rehabilitation Centres (NRC Units). At PHCs also the MOs and SNs are being trained on facility based SAM management.

- The current use rates for ORS and Zinc are unacceptably low. Incorporation of zinc therapy in the health programs can reduce antibiotic prescription and improve ORS utilization. Use of technology can be leveraged to improve ORS & Zinc supply chain and make it more responsive so that seasonal needs could be forecasted, and stock outs prevented.

- Reducing pneumonia and diarrheal deaths is well within the existing health system capacity. What is absent is the coordination to bring proven interventions to scale. Under National Health Mission, Intensified Diarrhoea Control Fortnight (IDCF) has been implemented across the country. Establishment of zinc and ORS corners, community mobilisation for use of zinc and ORS for childhood diarrhoea control by ASHAs and intense IEC/BCC activities for prevention of diarrhoea by improving hygiene and sanitation conditions are the core components of this IDCF campaign.

- Large-scale implementation studies providing evidence on scaling up of multi-sectoral interventions in different geographical locations would be useful to get evidence on implementation approaches and their feasibility.

- Delivering WASH messages during counselling, and improved WASH facilities at AWC, health facilities and schools can yield a high nutrition dividend.

Nutritional Awareness

- Low prevalence of exclusive breastfeeding, full ANC, IFA consumption and extremely low percentage of children getting adequate diet in most states is alarming and must be advocated by spreading awareness and effective implementation of policies. Nutrition and health education, awareness and dissemination of healthy lifestyles needs more focus by improving community awareness. Importance of intake of nutritious food, sanitation, personal hygiene, and access to safe drinking water through all means of communication needs to be spread around. Rolling out of comprehensive Nutrition Education Programme and capacity building of mothers may be focused to influence household dietary behaviour and child feeding practices.

- Additionally, the behaviour change communication strategy should be

made to focus on addressing gender disparities and cultural norms. Gender sensitive nutrition-centric behaviour communication strategy should be developed and implemented.

D. Sustainability

Climate Change

- The impact of climate change is huge and warrants a special focus to assess various parameters- which was out of scope of the present analysis. The Report thus has taken cognizance of the factor but has not studied it in detail.
- Higher temperatures will have an impact on yields while changes in rainfall could affect both crop quality and quantity. Climate change could increase the prices of major crops in some regions. For the most vulnerable people, lower agricultural output means lower incomes. Climate change exacerbates the risks of hunger and undernutrition through extreme weather events and long term and gradual climate risks.
- Climate change affects all dimensions of food security and nutrition. Changes in climatic conditions have already affected the production of some staple crops, and future climate change threatens to exacerbate this. Higher temperatures will have an impact on yields while changes in rainfall could affect both crop quality and quantity. It has direct bearing on the food availability.
- Climate change could increase the prices of major crops in some regions. For the most vulnerable people, lower agricultural output means lower incomes. Under these conditions, the poorest people — who already use most of their income on food — sacrifice additional income and other assets to meet their nutritional requirements, or resort to poor coping strategies. This will affect their access to food.
- Climate-related risks affect calorie intake, particularly in areas where chronic food insecurity is already a significant problem. Changing climatic conditions could also create a vicious cycle of disease and hunger. Nutrition is likely to be affected by climate change through related impacts on food security, dietary diversity, care practices and health. It will therefore affect the food utilization as well.
- The climatic variability produced by more frequent and intense weather events can upset the stability of individuals' and government food security strategies, creating fluctuations in food availability, access and utilization.

India's potential to improve the other factors that drive food security over time

- As per the latest NFHS 4, the literacy rates among the women aged between 15-49 in India is only 68.4 percent. An analysis of the same indicator shows that among the bigger states, states such as the Bihar (50.5 percent), Rajasthan (43.5 percent), Jharkhand (41.6 percent), Madhya Pradesh (40.6 per cent) and Uttar Pradesh (39.6 percent) have high rates of illiteracy among women in the age group of 15-49 and these are also the states with the biggest gap in the literacy rates among men and women in the same age group.
- On the Gender Parity Index (GPI), a socioeconomic index usually designed to measure the relative access to education of males and females, released by UNESCO, the GPI has increased from 0.75 in 1990-91 to 1.03 in 2014-15 in Primary (Class I-V) education and 0.61 to 1.09 in Upper Primary (Class VI-VIII). However, it

is only 0.90 in Secondary education – an area to improve.

- NFHS 4 (2015-16) also highlights that 51 percent of children born to mothers with no schooling are stunted, compared with 24 percent of children born to mothers with 12 or more years of schooling. The corresponding proportions of underweight children are 47 and 22 percent, respectively.
- Health care facilities and manpower also have bearing on the food and nutrition security. The shortfall in the number of CHC, PHC and sub-centres need to be addressed to fill the gap between in-position health infrastructure and the requirement.
- Ratio of production to storage capacity is more than one for India, which reflects higher production than storage capacity. At national level, production is around seven times higher than the storage capacity. This is an area that require immediate focus to reduce wastage of foodgrains.

Policy Measures

- Given the trends in urbanization, due to change in lifestyles and food habits, people, especially in urban areas, will tend to buy takeaway and ready to eat food, etc. from catering establishments and street food vendors. Advertisements promoting fast food create supply-driven demand for many unhealthy foods. Many such foods are adulterated by artificial colours and preservatives that exceed permitted levels. India has a dedicated organization namely Food Safety and Standards Authority of India (FSSAI) to make regulations on food safety such as colouring, sweetness, iodized salt, food packing and labelling.

Policy Recommendations

Enhance Nutrition Sensitivity of Agriculture Programmes

- There is considerable room to improve the nutrition sensitivity of agriculture programmes. Agricultural extension services could be directed more towards advising and assisting farmers on the cultivation, post-harvest handling and storage of a diversified range of food crops in fields and home gardens.
- The agriculture sector would benefit from research and development directed more towards food crop species and varieties of relatively high nutritional value. These programmes could work through established community groups to educate Indians about health and nutrition. Greater inclusion of women, especially women in farming communities, both in the design of agricultural programmes and as participants in the programmes,

would also contribute to improving food and nutrition security given women's primary responsibilities in food production, purchasing, preparation and intra-household distribution and in feeding/care practices.

- Within the Government, intersectoral coordination can be greatly improved by working to break down sectoral divisions in policy-making and government programmes, not least by improving the nutrition sensitivity of traditional welfare, agriculture and/or climate change programmes.

Overall Recommendations

- This study attempted to identify vulnerable geographies and populations for the different dimensions of food and nutrition security. However, the analysis was limited due to lack of timely and recent data at district and sub-district levels and for sub-population groups (gender, caste, religion, poor, wage type and disabilities etc.). Therefore, there is a need to improve the data availability and enriching the information to allow for more detailed analysis. Further, a special survey may also be planned out for collecting data on all dimensions through one survey.
- There is also a need for a comprehensive estimate for food and nutrition security that is robust, takes cognizance of all the three dimensions and provides regular information on status of food and nutrition security in the country towards SDG 2 monitoring.
- More recently the different government schemes are attempting to address the same, yet an integrated monitoring system with agriculture is absent. Therefore, greater policy coherence and co-ordination across the food systems, agriculture and nutrition is imperative.

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