NABARD Research Study - 35

नाबार्ड

Food and Nutritional Security in India

CHARTING THE WAY TO A ROBUST AGRI-FOOD SYSTEM

Department of Economic Analysis and Research

November 2022

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FOOD AND NUTRITIONAL SECURITY IN INDIA

CHARTING THE WAY TO A ROBUST AGRI-FOOD SYSTEM

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NATIONAL BANK FOR AGRICULTURE AND RURAL DEVELOPMENT

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FOOD AND NUTRITIONAL SECURITY IN INDIA

CHARTING THE WAY TO A ROBUST AGRI-FOOD SYSTEM

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Disclaimer: The views and opinions expressed are those of the authors alone and not of NABARD.

Department of Economic Analysis and Research (DEAR)

National Bank for Agriculture and Rural Development

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November 2022

Foreword

Uzhuthundu Vaazhvaare Vaazhvaarmatr Rellaam

Thozhuthundu Pinsel Pavar

(They alone live who live by agriculture; all others lead a dependent life).

-Thirukkural,1033

Agriculture and nutrition share a common entry point: "food". Food is a key outcome of agricultural activities, and, in turn, is a key input into good nutrition. Without agriculture, there is little food or nutrition. But, mere availability of food from agriculture does not ensure good nutrition.

India in 2021-22 produced an all-time high 315.72 million tonnes of foodgrains (Fourth AE), which is higher by 25 million tonnes than the previous five years' (2016-17 to 2020-21) average production of foodgrains. Horticulture production too hit record high at 341.63 million tonnes, an increase of about 7.03 million tonnes (increase of 2.10%) over 2020-21 (Final). However, despite this impressive feat brought through the hard work of our farmers and good policies, much more needs to be done in ensuring that nutritious food remains accessible to the people. This year's theme of World Food Day, 'Leave No ONE behind' is a philosophy NABARD has remained committed to. Good health benefits not only the individual, but the nation as well. The findings from the Fifth National Family Health Survey suggest that nutrition-related indicators have worsened in many of our States. In addition, findings from the Comprehensive National Nutrition Survey (2016-18) have highlighted the role of micro-nutrient malnutrition. This hints towards the need for a transformative change in Indian Agriculture for better production, nutrition, environment and life.

Several steps such as crop diversification to improve affordability and access to nutritious food; emphasis on cultivation of low input and resilient crops such as millets, diversifying the PDS food basket; bio-fortification; emphasis on women's education which has a positive multiplier effect on nutritional status of children have been taken in recent times. These need to be further strengthened going forward. I congratulate the authors for bringing out this publication and urging all of us to take collective steps to better our agri-food system.

P.V.S Suryakumar
Deputy Managing Director

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Preface

The NABARD Research Study Series has been started to enable wider dissemination of research conducted/sponsored by NABARD on the thrust areas of Agriculture and Rural Development among researchers and stakeholders. The report on '*Food and Nutritional Security in India: Charting the Way to a Robust Agri-Food System*' is the thirty-fifth in this series.

This study report discusses the status of food security in India through its four dimensions viz. availability, accessibility, utilisation, and stability. The availability aspect has been examined by looking at the production, yield and area under cultivation of major crops. The accessibility dimension has been looked at through the prism of food inflation and wastage of food. Utilization of food, which is a key aspect of food security has been assessed through nutrition indicators such as stunting, wasting, underweight, anaemia and obesity based on NFHS-5 data. The fourth aspect of stability which describes the temporal aspect of food security is discussed through how disruptions like Covid-19 and the Russia-Ukraine conflict affect the status of food and nutritional security.

We also attempt to bring out the link between agriculture and nutrition and look at how millets can be a solution to persistent malnutrition while grappling with climate change. We conclude by discussing the role being played by NABARD in ensuring food security and nutrition.

We would like to thank our Chairman and DMDs for their encouragement. Shri. Suryakumar, DMD, needs special mention for being a constant source of inspiration and keeping us young ever. We thank our CGM, Dr. KJS Satyasai, a co-author of this report for his continuous guidance and mentoring. We acknowledge and thank the senior officers in our department, Dr. Vinod Kumar, GM, Smt. Balwinder Kaur, DGM and Dr. Ashutosh Kumar, DGM for being our pillar of support. Support from our other colleagues of the department and Mr. Damodar Mishra, DGM is gratefully acknowledged.

Hope this and other reports we are sharing would make a good reading and help generate debate on issues of policy relevance. Let us know your feedback.

Benjamin Thomas Ipe
Shivangi Shubham
K J S Satyasai

Executive Summary

The World Food Day (WFD) is observed on 16th October each year to highlight the need for regular access to nutritious food for the millions of people worldwide who cannot afford a healthy diet. The WFD has a different theme each year and for 2022 it is "*Leave NO ONE behind*". The theme assumes particular significance as the world is facing multiple challenges including, the COVID-19 pandemic, conflict, climate change, rising prices and international tensions affecting global food security. The Global Hunger Index, 2022 has ranked India 107th among 121 countries with a score of 29.1 putting our country in the 'serious' category in level of hunger. All other countries in South Asia except for Afghanistan are ranked higher than India. In this light, food and nutrition security are extremely important dimensions as we strive towards higher levels of development. This document looks at the status of food and nutritional security in India.

Food security is a four-dimensional concept and comprises of availability to food, access to food, utilization and stabilisation. Availability is a physical determinant, which is ensured if adequate food is available at peoples' disposal. We look at the production, yield and area under cultivation of major crops in India over the period from 1950-51 to 2020-21. Thanks to Green Revolution, India has transitioned from a country dependent on food imports in the early 1960s to a major exporter of several agricultural commodities now. Despite this tremendous increase in production, the per capita availability of food grains has remained stagnant. The per capita availability of food grains at 510.1 grams per day in 1991 was the highest achieved and 20 years later in 2021 we are at 507.9 grams per day. We also look at the trends in production of proteins and calories and find that there has been a decrease in proteins and calories produced from food of crop origin and increase from food of animal origin. Food prices are an integral part of the food security equation and thus the trends in food inflation have been discussed. In September 2022, the inflation in cereals, vegetables and spices were all in double digits which indicates impediments in access to food for the poor. The use of export restrictions, subsidies, or price controls to reduce the burden of rising food prices may appear attractive but risks adding further upward pressure on global agricultural prices.

The utilization dimension of food security refers to the proper biological use of food. It covers a diet providing sufficient energy and essential nutrients, potable water, and adequate sanitation. Nutrition indicators viz. stunting, wasting, underweight, anaemia and obesity based on the NFHS data are analysed to understand utilisation dimension. Changes in the state-wise pattern of these indicators between 2015-16 and 2019-20 has been visually presented through heat maps. Anaemia, especially among women is severe across India

indicating hidden hunger and obesity is also on the rise indicating rise of triple burden of malnutrition.

The worsening picture of nutrition calls for a transformative change in Indian agriculture. Several steps to improve affordability and access to nutritious food have been taken in recent times. In tune with the WFD theme of leaving no one behind, we discuss the how millets could be a solution to persistent malnutrition while grappling with climate change. Most of the millet production is concentrated in a few states. Demand and supply side measures working in tandem would be required to increase their popularity, production and consumption. Millets can be cheaper alternatives to induce diet diversity and would certainly not leave anybody behind. Further, we need to devise solutions to minimise food waste as according to the Food Waste Index Report 2021, 50 kg of food is thrown away per person every year in Indian homes. We conclude by discussing the important role that NABARD has been playing in the food and nutritional security space.

Food and Nutritional Security in India

Introduction

The Global Hunger Index (GHI) 2022, published by Concern Worldwide, an Irish aid agency, and Welthungerhilfe, a German non-profit, has ranked India at 107 out of 121 countries, in its assessment of how successful countries have been in combating hunger[1]. Only 14 countries – many of them marked by violent strife – have performed worse than India. India's GHI score of 29.1 places it in the 'serious' category and is ranked below Sri Lanka (64), Nepal (81), Bangladesh (84) and Pakistan (99). Only war-torn Afghanistan at 109 is ranked below India in south Asia.

Agriculture contributes about 18.8% to India's gross value added (GVA) and is the largest employer of the workforce (2021-22)[2]. There is an urgent need for reorientation of the long-term direction of agri-food systems to not only enhance farm incomes but also ensure better access to safe and nutritious foods. Additionally, the agri-food systems need to be reoriented to minimise cost on the environment and the climate.

Further, food and nutrition are the way that we get fuel, providing energy for our bodies. The impact of inadequate nutrition perpetuates at not only 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. 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.

The theme of World Food Day 2022 is "Leave NO ONE behind". It is a recognition of the multiple global challenges, including the COVID-19 pandemic, conflict, climate change,

[1] https://www.globalhungerindex.org/india.html
[2] Economic Survey 2021-22, Ministry of Finance, Government of India

rising prices and international tensions affecting global food security. These testing times call for inclusivity. The agri-food systems are the most important part of the Indian economy.

Food and nutritional security are the key to attain to the Sustainable Development Goals and other high-level aspirational goals. The SDG 2 ('End hunger, achieve food security and improved nutrition and promote sustainable agriculture') is the only SDG that clearly mentions the concept of 'nutrition'. However, while explicit in only one SDG, nutrition is an important factor that crosses all the SDGs, in one way or another. This is depicted in Table 1. Malnutrition will represent an often-invisible impediment to the successful achievement of the SDGs. It results not just from a lack of sufficient and adequately nutritious and safe food, but also from a host of intertwined factors linking health, care, education, water, sanitation and hygiene, access to food and resources, women's empowerment and more.

Table 1. Nutrition in the context of the Sustainable Development Goals

SDGs	Link to nutrition
1. No poverty	Poverty limits access to adequate food intake and makes it difficult to reach nutritional recommendations
2. Zero hunger	Unsustainable food production causes undernourishment
3. Good health and wellbeing	Healthy and sustainable nutrition may reduce premature death including from non-communicable diseases
4. Quality education	Malnutrition affects learning abilities, while higher awareness may affect healthy and sustainable food choices
5. Gender equality	Empowering women to claim their rights leads to improved quality of life and nutrition; proper nutrition improves learning performance, which can be translated into better job opportunities
6. Clean water and sanitation	Access to safe drinking water and sanitation may reduce undernutrition
7. Affordable and clean energy	Creating independence from fossil fuels will reduce greenhouse gas emissions and environmental pollution, and ensure food security
8. Decent work and economic growth	Economic transformation may provide increased nutrition security and sustainable agriculture
9. Industry, innovation and infrastructure	Affordable access to technologies and infrastructure is essential for agriculture development and food security
10. Reduced inequalities	Inequalities cause disparities in income, food, health and education access
11. Sustainable cities and communities	Expansion into rural area increases food needs, creates competition for food and water resources, and finally dependence on food purchases
12. Responsible consumption and production	Meeting the nutritional needs of a growing global population requires sustainable solutions for food production and access to water, as uncontrolled and inefficient food production causes greenhouse gas emissions and soil degradation
13. Climate action	Climate change affects global food production and food security as well as access to freshwater resources
14. Life below water	Aquaculture reduces hunger and improves nutrition; however, overfishing limits biodiversity

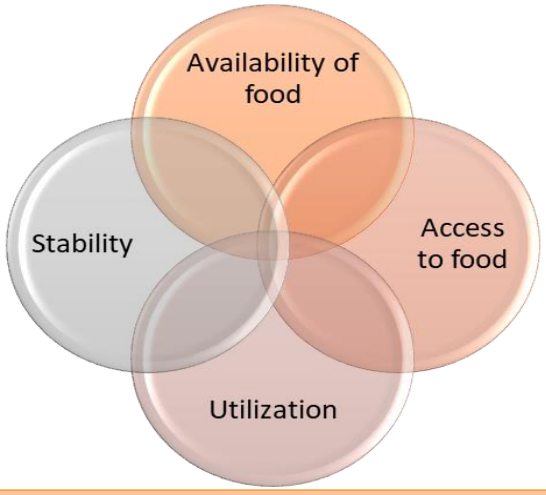
SDGs	Link to nutrition
15. Life on land	Change of land use causes soil degradation while reducing biodiversity and food production, and decrease access to fresh water
16. Peace and justice	War causes malnutrition and death due to inadequate/insecure food supplies and reduced access to food
17. Partnerships for goals	To achieve the goals partnership between both diverse sectors and governments is needed

Reference: *Nutrition in the context of the Sustainable Development Goals, Giuseppe Grosso, Alberto Mateo, Natalie Rangelov, Tatjana Buzeti, Christopher Birt on behalf of the Food and Nutrition Section of the European Public Health Association*

The trends in India's demographics show that India is home to relatively the youngest individuals across the world. India has only 10 years, beginning 2021, to hold on to this demographic dividend. The Youth in India report by the Ministry of Statistics and Programme Implementation of the Government of India states that the median age of Indian population is around 28 years in 2021 and will become 31 years by 2031. Good health is one of the chief parameters, which will determine whether we can successfully reap this demographic dividend and nutritional security is in turn a chief parameter determining health along with environmental factors.

Defining Food Security

The concept of Food Security evolved over time from 'freedom from hunger' in the early 1940s into broad concept encompassing four dimensions.



- *Availability is a physical determinant, which is ensured if adequate food is available at peoples' disposal.*
- *Accessibility is achieved if a household has sufficient resources to obtain an appropriate diet.*
- *Utilisation depends upon the biological and social environment and proper health care.*
- *Stability: To be food secure, a population, household or individual must always have access to adequate food. They should not risk losing access to food because of sudden shocks (e.g., an economic or climatic crisis) or cyclical events (e.g., seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security*

The 1995 World Food Summit declared, "Food security at the individual, household, regional, national and global levels exist 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" (FAO, 1996, p.3). The declaration further recognises that "poverty eradication is essential to improve access to food".

Dimensions of Food Security

Availability of Food in India

Food and nutrition security are intimately interconnected, since only a food-based approach can help in overcoming malnutrition in an economically and socially sustainable manner. Food production provides the base for food security as it is a key determinant of food availability**.** Between 1950-51 and 2006-2007, production of foodgrains (comprises production of rice, wheat, coarse cereals and pulses) in the country increased at an average annual rate of 2.5 per cent compared to the growth of population, which averaged 2.1 per cent during this period. Warding off doomsday predictions of hunger and famine, India came to be in a situation following the Green Revolution in the late sixties, where we hardly had to resort to foodgrain imports between 1976-1977 and 2005-2006, except occasionally. In Section I, we discuss the trends in production, yield and area under cultivation for major crops in India over the period 1950-51 to 2020-21.

Section I –Production, Yield and Area under Cultivation

i. Rice

Rice is one of the most important food crops of India and India has been the world's largest rice exporter in the last decade. Major share of rice is cultivated during Kharif season while a small share of rice is grown in rabi season with assured irrigation. Production of rice has increased almost six-fold over the period 1950-51 to 2020-21 (Fourth AE). Total production of kharif rice during 2021-22 is estimated at 107.04 million tonnes. It is higher by 9.21 million tonnes than the previous five years' (2015-16 to 2019-20) average Kharif rice production of 97.83 million tonnes. The introduction of high-yielding varieties, fertilisers, pesticides and irrigation has improved rice yields significantly and expanded the area under which rice is cultivated. However, there is tremendous scope for improvement as the yield remains lower than world average. There are improved technologies and various interventions which could be adapted to increase the productivity in the country. Cultivation of hybrid rice has potential to increase the productivity and needs to be promoted.

ii. Wheat

In India wheat crop is cultivated in Rabi season. It is normally sown during November and harvested between March and April. Production of wheat has increased from 6.46 million tonne in 1950-51 to 109.52 million tonne in 2020-21(Fourth AE), an increase of over 17 times. This has been made possible through both increase in productivity, which has increased more than 5 times and increase in area under cultivation, which has increased more than 3 times. This rise in productivity is due to adoption of high-yielding varieties coupled with other inputs.

Figure 1: Area, Production and Yield of Rice

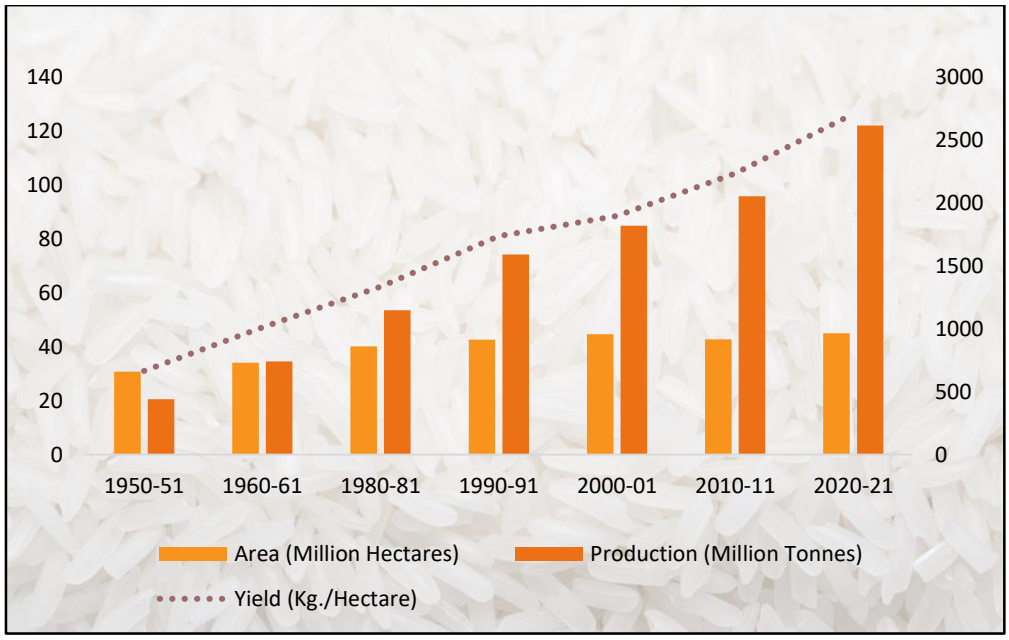
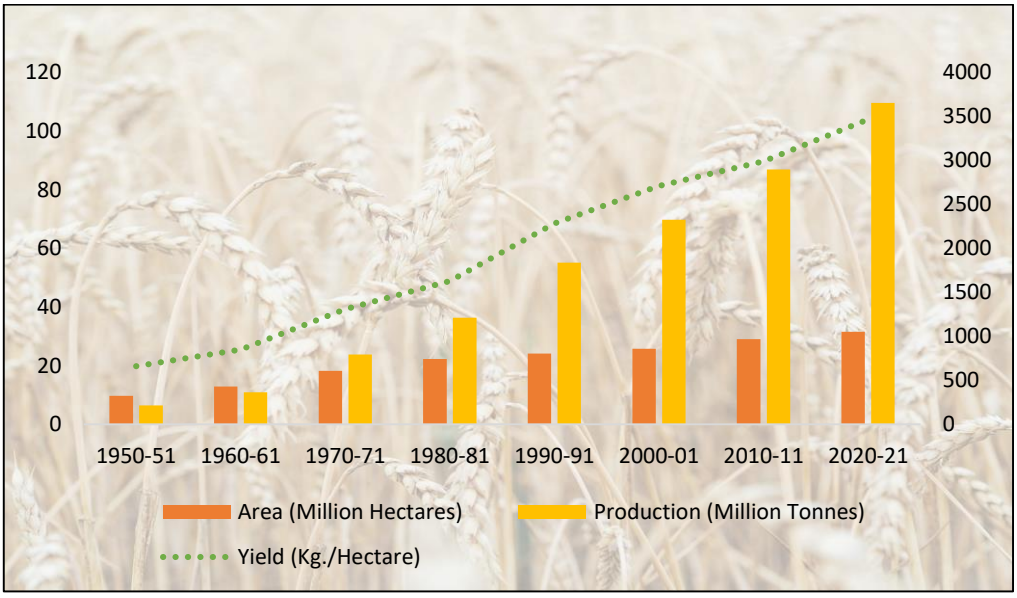


Figure 2: Area, Production and Yield of Wheat

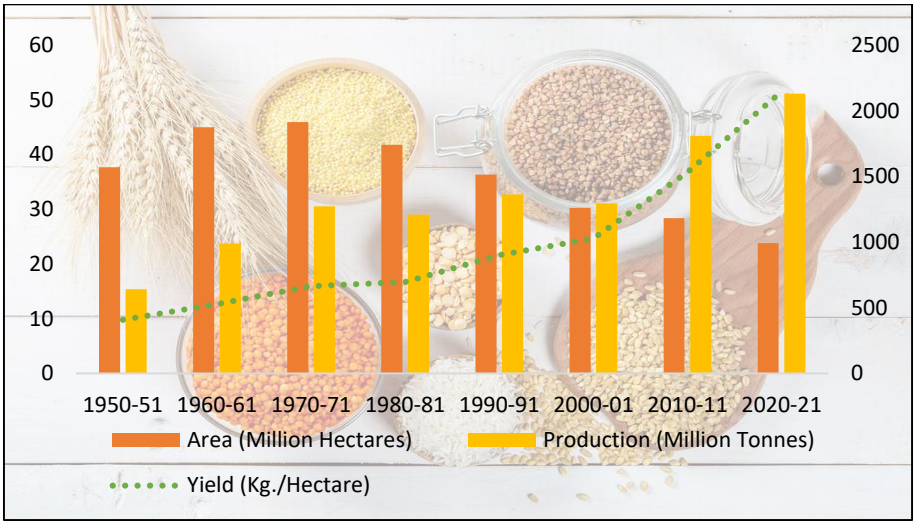


iii. Coarse Grains

Defined as cereal grains other than rice and wheat, and including maize, pearl millet (bajra), finger millet (ragi), sorghum (jowar), barley, and rye, coarse cereals are relatively high in iron content. However, the lands devoted to cultivating millets has been steadily shrinking since 1970s. One of the reasons for this decline is India's 'green revolution' in the mid-1960s, which focused on wheat and rice to meet food security demands. While wheat and rice received research, extension and market support, on the supply side, there was a marked shift away from coarse grains, with consequences for dietary micronutrients. Also, the dominance of public distribution system grains – rice and wheat – changed consumption patterns and

moved diets away from maize, bajra, ragi, jowar and barley. In India, the proportion of coarse cereals to total cereals consumed declined from 35% to 5% in rural areas and 17% to 3% in urban areas between 1961 and 2011. Despite this, production of coarse grains has increased over 60% in the last 20 years owing to the enhancement in productivity, which increased from 1027 kg/ha to 1990 kg/ha between 2000-01 to 2019-20. Realizing the health benefits of millets viz gluten free, low fat and low carbohydrates, the efforts have been made to increase production, productivity and income of millet growers under various schemes of the Central and State Governments. To encourage production and consumption of millets, Government of India notified millets as Nutri-Cereals in April 2018 which includes Sorghum (Jowar), Pearl Millet (Bajra), Finger Millet (Ragi/Mandua), Minor Millets i.e., Foxtail Millet (Kangani/Kakun), Proso Millet (Cheena), Kodo Millet (Kodo), Barnyard Millet (Sawa/Sanwa/ Jhangora), Little Millet (Kutki) and two Pseudo Millets Buckwheat (Kuttu) and Amaranthus (Chaulai)

Figure 3: Area, Production and Yield of Coarse Grains

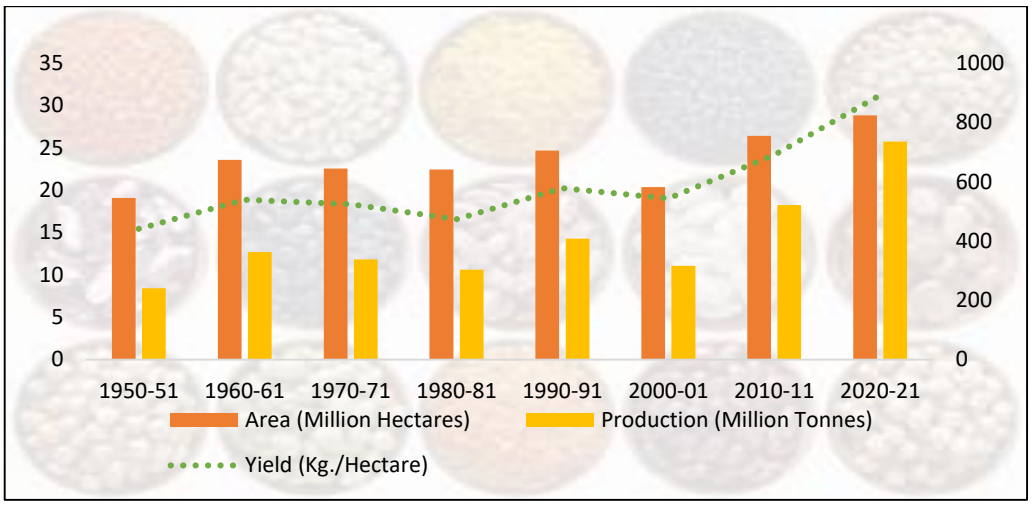


iv. Pulses

India is the largest producer (25% of global production), consumer (27% of world consumption) and importer (14%) of pulses in the world. Pulses account for around 20 per cent of the area under foodgrains and contribute around 7-10 per cent of the total foodgrains production in the country. Though pulses are grown in both Kharif and Rabi seasons, Rabi pulses contribute more than 60 per cent of the total production. Owing to their natural resilience to extreme weather conditions, low water requirements and being environmentally benign, pulses have been traditionally a smallholder's crop. The production of pulses which was almost stagnant post green revolution, witnessed a pick-up in the last twenty years and has increased from 18.24MT in 2010-11 to record production of 25.72MT in 2020-22 (Fourth AE). Total kharif pulses production during 2021-22 is estimated at 9.45 million tonnes. It is higher by 1.39 million tonnes than average pulses production of 8.06 million tonnes in the last

five years. India has ample opportunities and capabilities to sustain this high growth of pulses production. There is a need to maintain this momentum and make adequate and sustained investments in pulses research and developments and provide favourable policy support for boosting pulses production.

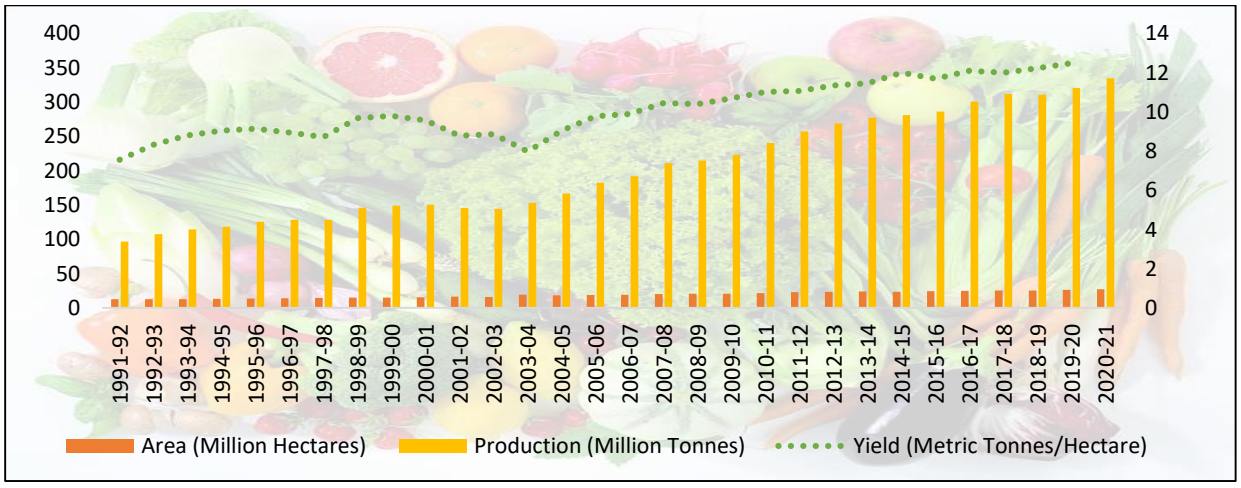
Figure 4: Area, Production and Yield of Pulses



v. Horticulture

High-value horticultural crops play a key-role in helping to feed the world with nutritionally healthy food. India has been bestowed with wide range of climate and physio-geographical conditions and as such is most suitable for growing various kinds of horticultural crops such as fruits, vegetables, flowers, nuts, spices and plantation crops (coco nut, cashew nut and cocoa). Total Horticulture production in 2020-21 is estimated to a record 334.60 million tonne , which is an increase of about 14.13 MT (4.4%) over that achieved in 2019-20. Total Horticulture production in 2021-22 is estimated to be 333.3 million tonne, a decrease of 0.4% over 2020-21.

Figure 5: Area, Production and Yield of Horticulture



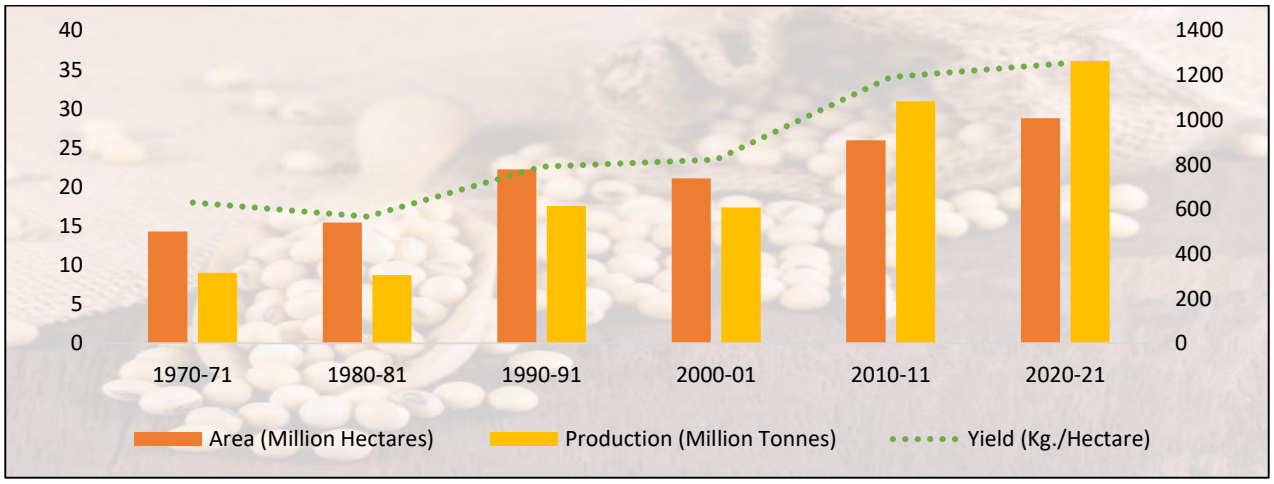
vi. Edible Oilseeds

A wide range of oilseed crops are produced in different agro-climatic regions of the country, which include groundnut, soybean, and rapeseed-mustard, besides, sesamum, sunflower and safflower. Domestic edible oil production has not been able to keep pace with the growth in consumption. During 2020-21 domestic production of edible oils was 11.16 million tonnes whereas Total domestic demand was 24.61 million tonnes.

Majority of the oilseeds are cultivated under rainfed ecosystem (about 72%). Only 28% of oilseeds area is covered under irrigation. The area under oilseeds has experienced a deceleration in general, due to their relative lower profitability against competing crops like maize, cotton, chickpea, etc., under the prevailing crop growing and marketing situations.

To achieve self-sufficiency in the production of oilseeds, the Ministry of Agriculture and Farmers Welfare has adopted a multi-pronged strategy.

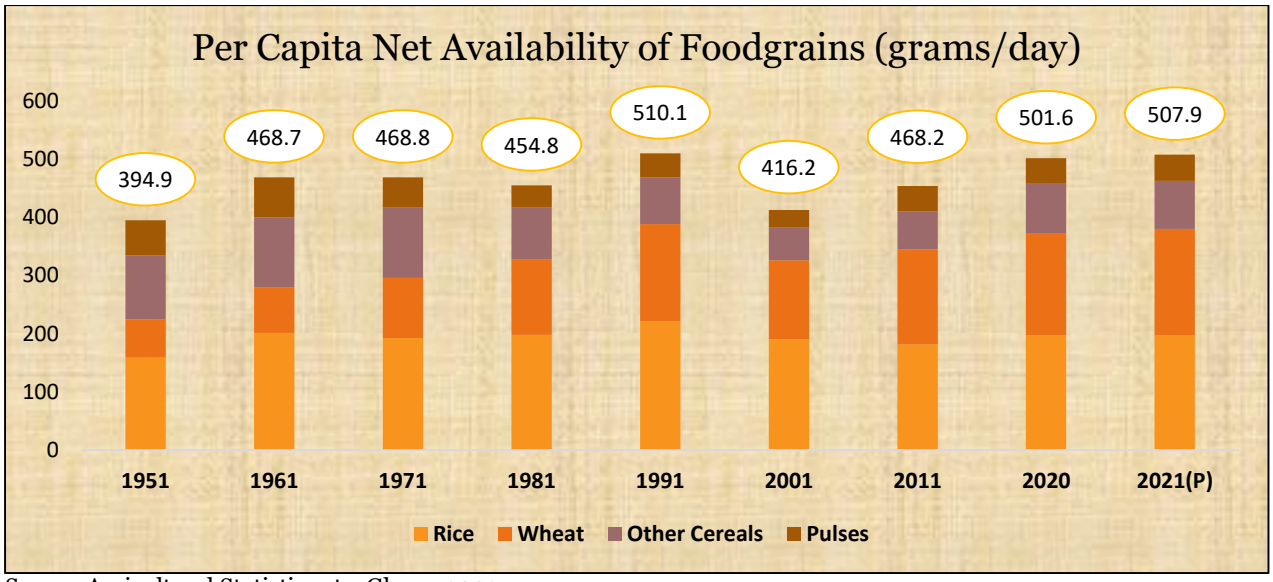
Figure 6: Area, Production and Yield of Edible Oilseeds



Section II –Availability in Per Capita Terms

As seen in the last section, India has witnessed a manifold increase in production of all crops in the last five decades. However, it is puzzling to note that despite this remarkable progress, India falls into the serious category of hunger as per the Global Hunger Index 2022 and has ranked 107 out of 121 countries, which is behind its neighbours Pakistan, Bangladesh and Nepal.

Figure 7: Per Capita Net Availability of Foodgrains



Source-Agricultural Statistics at a Glance 2021

One cue to this puzzle is that the per capita net availability has remained stagnant. 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 1961, the per capita availability of foodgrains was 468.7 grams, while in 1971 it was 468.8 grams. This dipped to 454.8 grams in 1981. Net availability increased by more than 12% in the next decade to reach 510 grams per person per day in 1991. However, this increase was ephemeral and reversed back to 468 grams the very next year. Till now, we have not been able to reach the level seen in 1991, only going close in 1997, and very recently in 2020 and 2021(P). Also, it is important to note that while historically food security in India has been synonymous with food grain security, there is changing trend in per capita food availability, away from staple food grains towards high value horticulture and animal products.

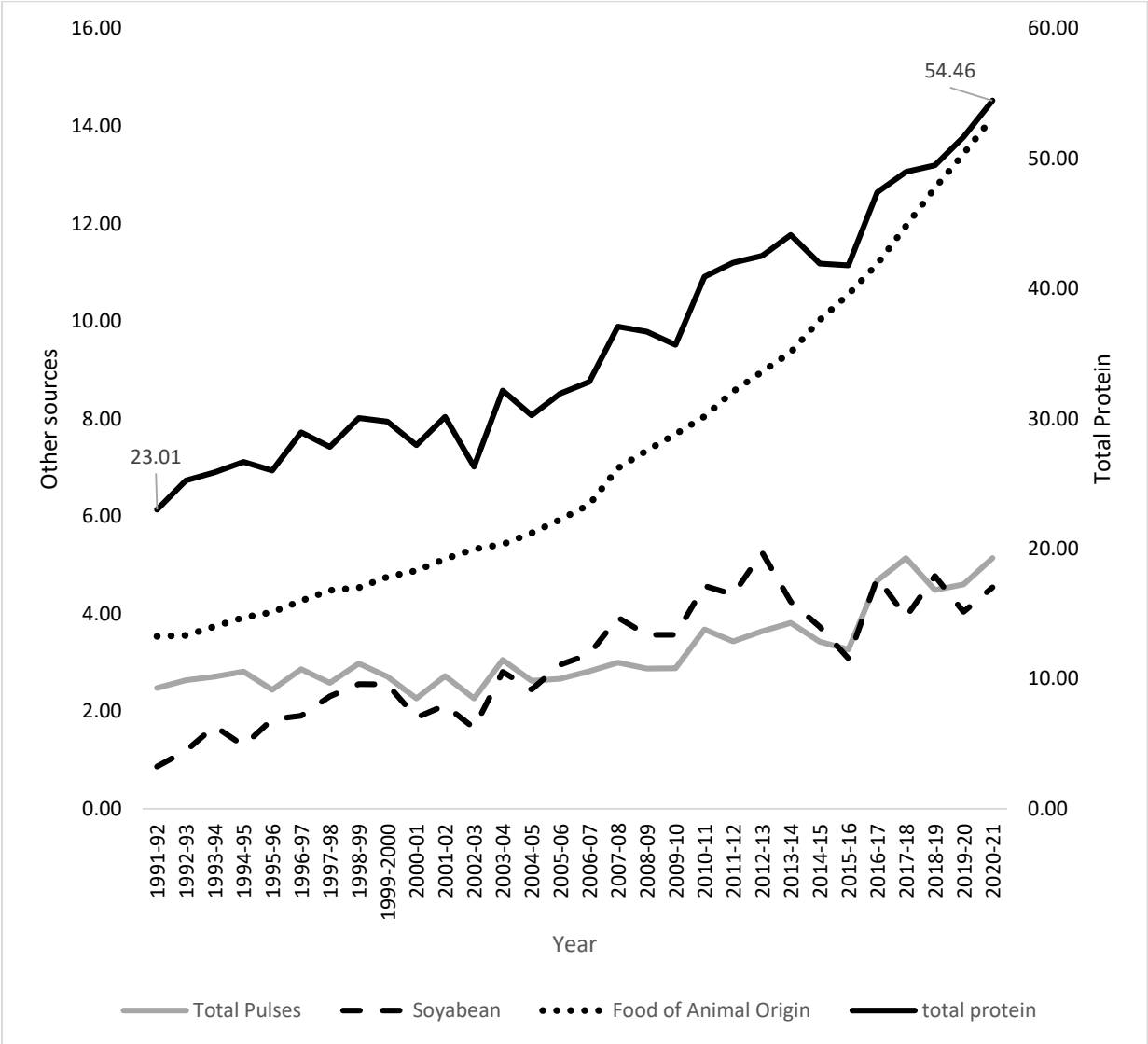
Section III- Trend in Protein and Calorie Production in India

Calorie and protein are the two important dimensions of nutrition. Increase in food supply ensures availability of calories, but the quality of such supply gets enhanced only when they come from diversified foods that can provide various nutrients. The quality of calorie basket would improve if more vegetables and fruits are added to the diet. The availability of protein — the building block of human body, on the other hand, can improve only when certain foods such as pulses, leguminous vegetables or foods of animal origin are consumed.

Food production from different crop and animal sources was aggregated using their respective protein and calorie content to estimate the gross protein content (GPC) and gross calorie

content (GCC) of food produced.[3] Indian agriculture produced food containing 51.87 million tonnes of protein in TE 2020-21 which is more than double the protein produced in TE 1993-94 (Table 2). The protein supply from food commodities of animal origin has seen a steady growth over the years while there was near stagnancy in protein supply from pulses. Between TE 1993-94 and TE 2020-21 the share of protein produced from food of crop origin reduced from 85% to 38% while that from animal origin increased from 15% to 26%. The per capita protein production increased 37% from 77.5 grams to 106 grams between TE 1993-94 and TE 2020-21.

Figure 8: Trend in Protein Production in India (million tonne)



[3] Satyasai and Shukla (2016), Contribution of Indian Agriculture to Nutritional Security, Agricultural Economics Research Review, Vol. 29

Table 2: Trend in Protein Production in India (million tonne)

Crop/Crop Group	Triennial Average for Triennium ended							
	1993-94	**%**	**2003-04**	**%**	**2013-14**	**%**	**2020-21**	**%**
CROP ORIGIN	**21.09**	**85.39**	**24.24**	**82.09**	**33.41**	**77.95**	**38.43**	**74.08**
Food Grains	16.56	67.03	18.80	63.67	24.42	56.99	28.64	55.22
Cereals	13.95	56.48	16.12	54.60	20.80	48.53	23.90	46.08
Fine Cereals	10.69	43.26	12.82	43.40	16.65	38.85	19.29	37.19
Coarse Cereals	3.26	13.21	3.31	11.19	4.15	9.68	4.61	8.89
Pulses	2.61	10.55	2.68	9.07	3.63	8.46	4.74	9.14
Oilseeds	3.71	15.02	4.18	14.14	6.55	15.28	6.97	13.43
Vegetables	0.62	2.51	0.93	3.14	1.78	4.16	2.05	3.96
Fruits	0.21	0.83	0.34	1.14	0.65	1.52	0.76	1.47
ANIMAL ORIGIN	3.61	**14.61**	5.29	**17.91**	9.45	**22.05**	13.45	**25.92**
Dairy Group	2.06	8.33	3.13	10.61	5.14	12.00	7.26	14.00
Non-dairy group	1.55	6.28	2.16	7.31	4.31	10.05	6.18	11.92
Total	24.70	100.0	29.53	100.0	42.86	100.0	51.87	100.0
Index of Diversification		0.75		0.75		0.78		0.79
Per capita production (kg/year)		28.29		27.97		34.69		38.68
Daily production (gm/ per capita)		**77.5**		76.6		**95.1**		106.0

The gross calorie content (GCC) from food production increased from 901.02 billion kcal in TE 1993-94 to 1725.01 billion kcal in 2020-21 (Table 3). Between TE 1993-94 and TE 2020-21, the share of foods of crop origin in total GCC decreased from 83.79 per cent to 78.48 per cent and of food from animal sources increased from 6.15 per cent to 12.47 per cent. The per capita calorie production from both crop and animal origin increased from 2827 kcal to 3524 kcal per day between TE 1993-94 and TE 2020-21.

Figure 9: Trend in Calorie Production in India (Bn kcal)

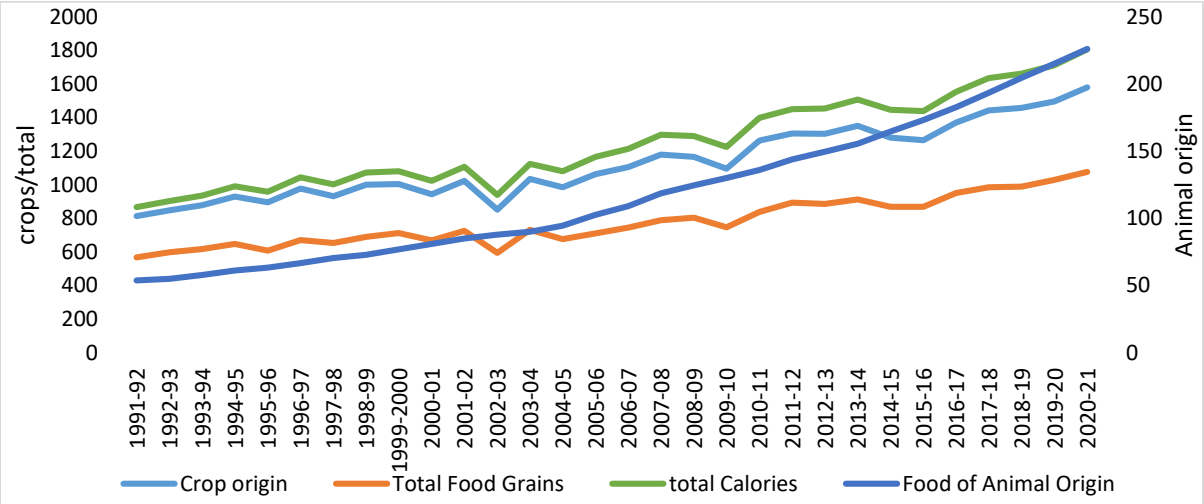


Table 3: Trend in Calorie Production in India (Bn. kcal)

Crop/Crop Group	Triennial Average for Triennium ended							
	1993-94	**%**	**2003-04**	**%**	**2013-14**	**%**	**2020-21**	**%**
CROP ORIGIN	845.59	83.79	968.43	81.46	1310.65	79.82	1509.98	78.48
Food Grains	593.60	65.88	683.08	64.68	888.52	60.56	1030.53	59.74
Cereals	551.84	61.25	639.78	60.58	828.36	56.46	952.04	55.19
Fine Cereals	466.33	51.76	539.97	51.13	689.42	46.99	790.85	45.85
Coarse Cereals	85.52	9.49	99.81	9.45	138.94	9.47	161.18	9.34
Pulses	41.76	4.63	43.30	4.10	60.15	4.10	78.49	4.55
Oilseeds	126.50	14.04	123.14	11.66	178.94	12.20	204.01	11.83
Vegetables	19.63	2.18	29.01	2.75	55.54	3.79	64.38	3.73
Fruits	15.19	1.69	24.98	2.37	48.07	3.28	54.86	3.18
Others	90.67	10.06	108.22	10.25	139.59	9.51	156.20	9.06
ANIMAL ORIGIN	55.43	6.15	87.59	8.29	156.43	10.66	215.03	12.47
Dairy Group	43.76	4.86	71.30	6.75	122.56	8.35	166.52	9.65
Non-dairy group	11.67	1.30	16.29	1.54	33.87	2.31	48.51	2.81
Total	901.02	89.94	1056.02	89.75	1467.08	90.49	1725.01	100.00
Index of Diversification		0.69		0.70		0.73		0.74
Per capita calorie production		1031.70		1000.02		1187.60		1286.23
Daily calorie production		2826.57		2739.79		3253.69		3523.92

The index of diversification which is a measure of the diversification of sources of protein or calorie production has been calculated in terms of deviation of Herfindahl Index values from unity. The Herfindahl Index is computed using the expression, Σp_i^2, where p_i is the proportion of each activity in the production basket. It is bounded by 1 (total diversification) and 0 (total specialization). The diversification index for both proteins and calories has increased over time. In the case of protein production, it has increased from 0.75 in TE 1993-94 to 0.79 in TE 2020-21. For calorie production the index has increased from 0.69 in TE 1993-94 to 0.74 in 2020-21.

Accessibility to Food in India

Food security exists when all people always have physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life. The pandemic and the Russian Ukraine War together with climate change have compounded the problem of Access to Safe and Nutritious Food at the global level. Access to food became extremely scarce for the poor, especially daily-wage labourers in certain regions. In India, although essential commodities were exempt from movement restrictions during the lockdown, farmers across the country struggled to access markets, resulting in tonnes of food waste. Meanwhile, instinctive hoarding by the middle class disrupted the value chain, further aggravating the situation.

Food Inflation

To ensure access to food for all, the mere availability of food in the country is obviously not sufficient. The economic access of a household to adequate food depends on its purchasing power. Food inflation is an important parameter by which we can gauge the economic access to food. Low-income earners are hit hardest by food inflation since they spend a high proportion of their income on food. When prices rise, food becomes unaffordable and inaccessible to these people who are already struggling, pushing more people into poverty.

Cost of food in India increased 8.6% year-on-year in September of 2022, the biggest rate since November of 2020, with vegetables (18.05%), spices (16.88%), cereals (11.53%) recording the biggest rise in 9 years. A recent report by ADB has found out that one per cent increase in food inflation leads to an increase of 0.3 per cent in both infant and child mortalities, and 0.5 per cent in undernourishment. Interestingly, the impacts are lesser in countries that have a higher contribution of agriculture to GDP.

Figure 10: Food Inflation in India over the Years (Y-o-Y % Change)

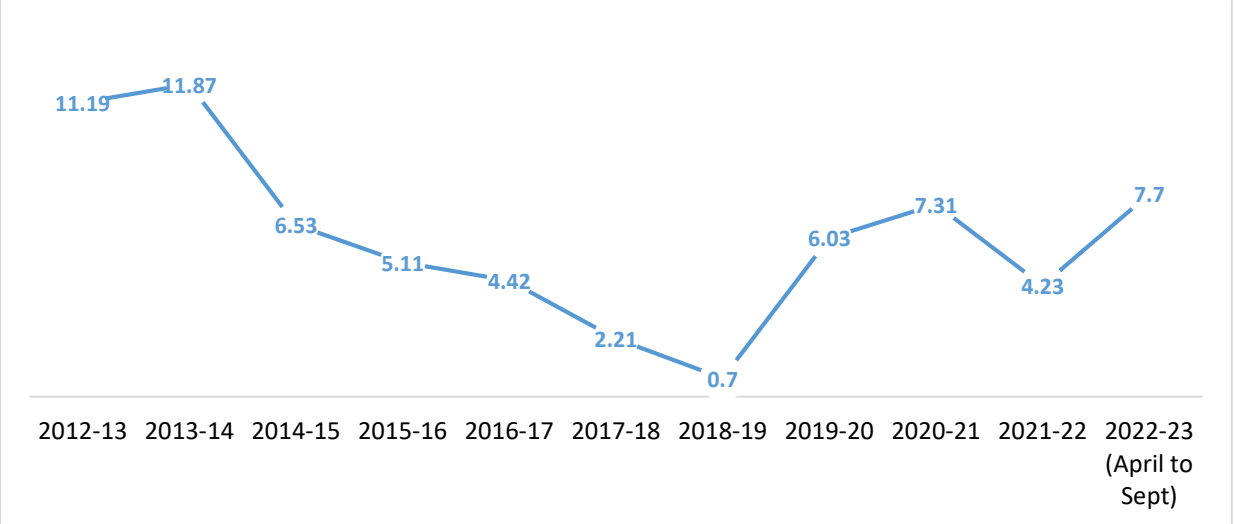
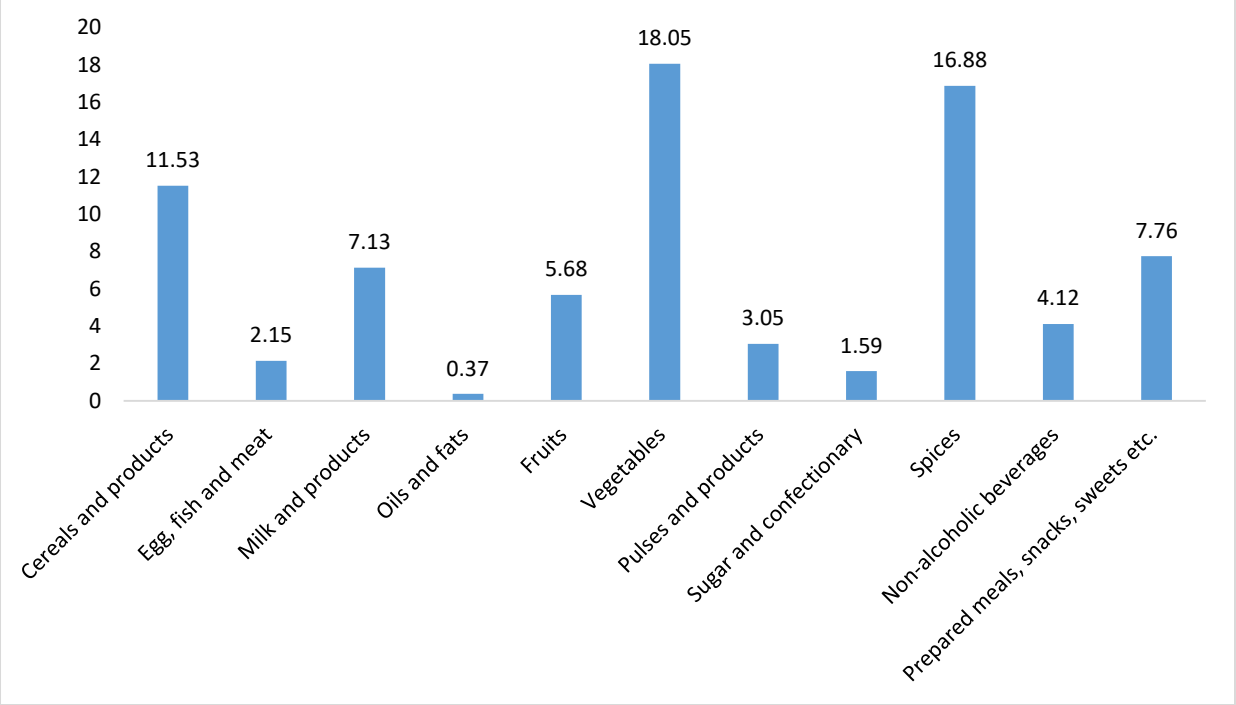


Figure 11: Food Inflation in September 2022 (Y-o-Y % change)



Role of Government in ensuring Access to Food

Government of India has been proactive about ensuring access to food to its citizen. The PDS is one of the biggest welfare programmes in the country in terms of expenditure. The Centre has allocated about 5.2% of its total budget for 2022-23 to the country's food subsidy programme. A crucial safety net, the food subsidy is used to provide consumers with affordable food grains through the public distribution system (PDS) and protect farmers against low market prices. A statutory body created by the Food Corporation of India Act of 1964, the FCI was established for the "purchase, storage, movement, transport, distribution and sale of foodgrains and other foodstuffs".

National Food Security Act, 2013 (NFSA) marks a paradigm shift in the approach to food security from welfare to rights-based approach. NFSA covers 75% of the rural population and 50% of the urban population under:

- Antyodaya Anna Yojana: It constitute the poorest of-the-poor, are entitled to receive 35 kg of foodgrains per household per month.
- Priority Households (PHH): Households covered under PHH category are entitled to receive 5 kg of foodgrains per person per month.

The eldest woman of the household of age 18 years or above is mandated to be the head of the household for the purpose of issuing ration cards. In addition, the act lays down special provisions for children between the ages of 6 months and 14 years old, which allows them to

receive a nutritious meal for free through a widespread network of Integrated Child Development Services (ICDS) centres, known as Anganwadi Centres.

For improving food access, especially for vulnerable populations, the Government of India has also implemented schemes such as the Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) and the Pradhan Mantri Poshan Shakti Nirman Yojana (PM POSHAN Scheme). Under PMGKAY the centre provides 5 kg of free food grains per month to the poor. This is in addition to the subsidized (Rs 2-3 per kg) ration provided under the National Food Security Act (NFSA) to families covered under the Public Distribution System (PDS).

The Government has also introduced the Centrally Sponsored Scheme 'Pradhan Mantri Poshan Shakti Nirman (PM POSHAN)' for providing one hot cooked meal in Government and Government – aided Schools from 2021-22 to 2025-26. The Scheme is being implemented by the Ministry of Education. The scheme (earlier known as Mid-Day Meal Scheme) has been launched with the objective to provide free food for 5 years to crores of children of government schools present in the country and eradicating malnutrition and at the same time encouraging school attendance. Nutrition and food norms under the scheme are as under:

S. No.	Items	Primary	Upper Primary
A. Nutrition norm per child per day			
1	Calorie	450	700
2	Protein	12 gms	20 gms
B. Food norms per child per day			
1	Food grains	100 gms	150 gms
2	Pulses	20 gms	30 gms
3	Vegetables	50 gms	75 gms
4	Oil & fat	5 gms	7.5 gms
5	Salt & condiments	As per need	As per need

Minimizing Food Waste to ensure Food for all

To solve the issue of access to food, it is important to discuss the issue of food waste. To provide access to food to the have-nots, we need to adopt a Waste not philosophy. Nearly 40 per cent of the food produced in India is wasted every year due to fragmented food systems and inefficient supply chains — a figure estimated by the Food and Agricultural Organisation (FAO). This is the loss that occurs even before the food reaches the consumer. Food systems

in which this quantum is lost and wasted are not consistent with sustainable consumption and production, noting the climate, water, biodiversity, food security and economic burden of such elevated levels of wastage. According to the ministry of consumer affairs, food and public distribution, between 2017 and 2020, 11,520 tonnes of foodgrains stored in government godowns rotted, resulting in a loss of about Rs 150 million. Food waste reduction is an integral part of Sustainable Development Goal 12, Ensure Sustainable Consumption and Production Patterns, enshrined in Target 12.3, to halve food waste and reduce food loss across supply chains by 2030.

As per the United Nations Environment Programme (UNEP) released the Food Waste Index Report 2021 an estimated 931 million tonnes or food, which is 17% of all food available at consumer level was wasted in 2019. The report shows that most of this waste globally comes from households (11%) followed by food services (5%) and retail outlets (2%).

Per capita food wastage was much higher in west Asian and sub-Saharan African countries compared to South Asian and most of the European and North American countries, challenging earlier narratives of higher food waste in developed countries, and food production.

Among south Asian countries, the highest amount of food is wasted in Afghanistan (82 kg per person per annum) followed by Nepal at 79 kg, Sri Lanka at 76 kg, Pakistan at 74 kg and Bangladesh at 65 kg. India is at the bottom in terms of food wastage; however, the figure is still high at 50 kg. This excess food waste usually ends up in landfills, creating potent greenhouse gases which have dire environmental implications.

We must attempt to change our “food abundance” mindset to a “food scarcity” one, working our way towards a zero-waste end goal.

Utilization of Food

Food utilization is the proper biological use of food, requiring a diet providing sufficient energy and essential nutrients, potable water, and adequate sanitation. Effective food utilization depends in large measure on knowledge within the household of food storage and processing techniques, basic principles of nutrition and proper childcare.

Nutrition is fundamental for good health and development during the early years of life. If children do not eat the right amounts of macronutrients like protein, fat, and carbohydrates and micronutrients like vitamin A, iodine, iron and zinc, they may become ill, have delayed mental and motor development that can have enduring adverse effects beyond childhood, or die. Optimal nutrition and correction of nutritional deficiencies during the early years are of particular significance as beyond 2 years of age, reversal may become very difficult.

Malnutrition refers to deficiencies or excesses in nutrient intake, imbalance of essential nutrients or impaired nutrient utilization. The double burden of malnutrition consists of both undernutrition and overweight and obesity, as well as diet-related non-communicable diseases. Undernutrition manifests in four broad forms: wasting, stunting, underweight, and micronutrient deficiencies. We try to understand the utilization aspect of food security by analysing the status of these parameters across the country.

A. Stunting (Indicates Chronic Undernutrition)

Stunting is the impaired growth and development that children experience from poor nutrition, repeated infection, and inadequate psychosocial stimulation. Children are defined as stunted if their height-for-age is more than two standard deviations below the WHO Child Growth Standards median.

Stunting in early life -- particularly in the first 1000 days from conception until the age of two - impaired growth has adverse functional consequences on the child. Some of those consequences include poor cognition and educational performance, low adult wages, lost productivity and, when accompanied by excessive weight gain later in childhood, an increased risk of nutrition-related chronic diseases in adult life. The World Bank says, “A 1 per cent loss in adult height due to childhood stunting is associated with a 1.4 per cent loss in economic productivity.” Stunting also has lasting effects on future generations

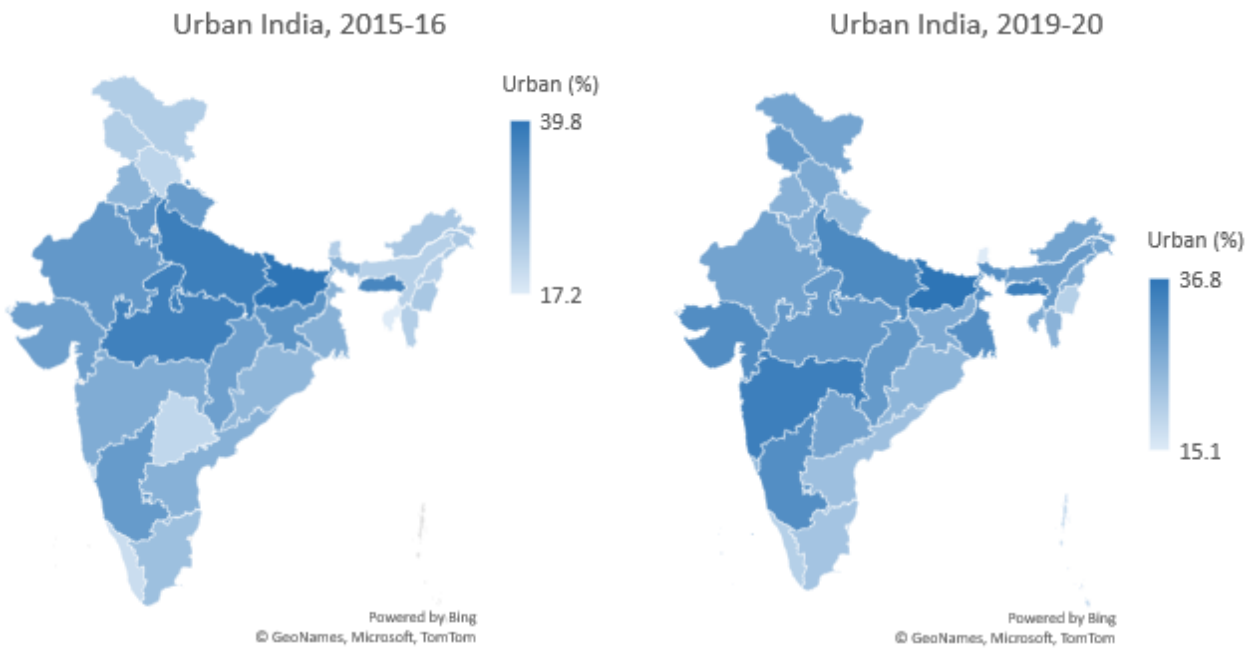
As per NFHS data, India has recorded a declining trend in child stunting from 48 per cent in 2006 to 35.5 percent in 2019 - a relative 20 per cent decrease. Even with impressive decline, the country accounts for nearly a third of the global burden of childhood stunting and disparities between/within states are quite visible. India has more stunted children in rural areas (37.3 per cent) as compared to urban areas (30.1 per cent). The inter-generational cycle

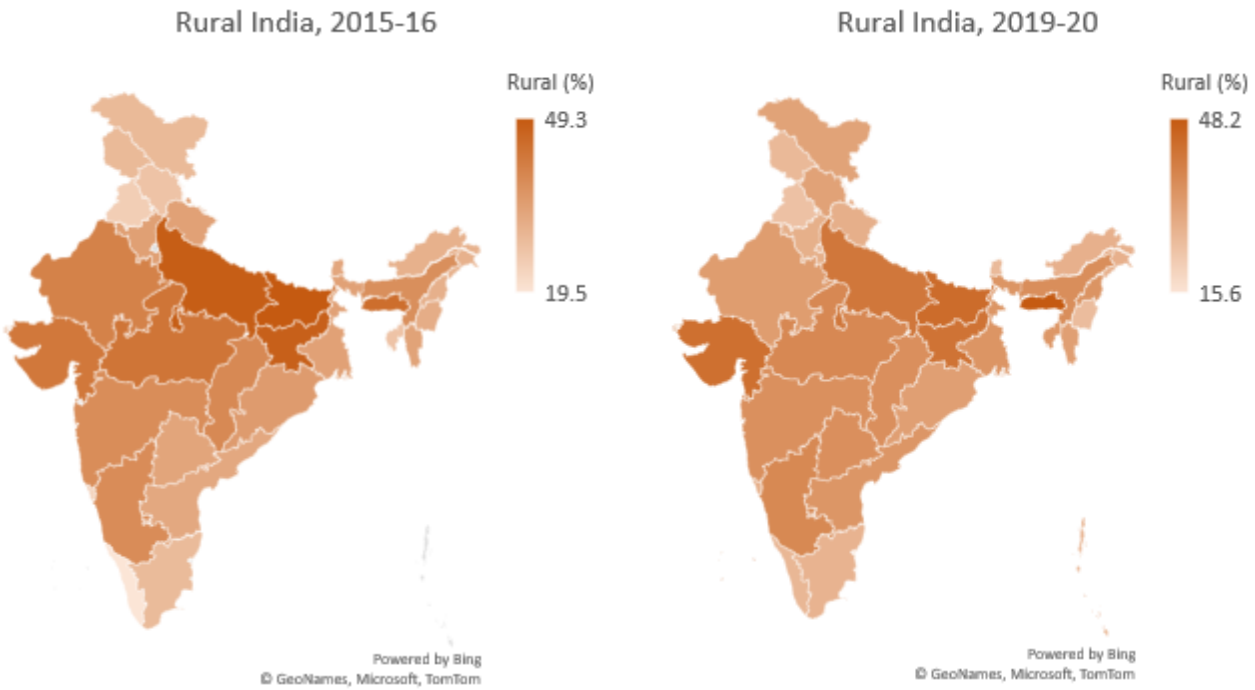
of malnutrition must be tackled with effective interventions for both mother (pre- and post-pregnancy) and child, to address the high burden of stunting.

In terms of geographical regions, Meghalaya (46.5 per cent), Bihar (42.9 per cent), Uttar Pradesh (39.7 per cent) and Jharkhand (39.6 per cent) have very high rates of stunting, while states/UT with the lowest rates include Sikkim and Puducherry at 22.3 per cent and 20 per cent, respectively. A comparison of NFHS-4 with NFHS-5 findings shows that few states (Madhya Pradesh, Uttar Pradesh and Uttarakhand) have reported decline in stunting by at least 6 percentage points, Rajasthan has recorded a decline by 7.3 per cent.

While nutrition has improved across all states, inter-state variabilities remain high. The two states that had the lowest stunting rates in children in 2015-16 (NFHS-4) but showed a substantial rise in stunting rate as per the NFHS-5 survey are Goa (from 20.1 per cent to 25.8 per cent) and Kerala (from 19.7 per cent to 23.4 per cent). Furthermore, the reversal in progress seen in West Bengal with rise in stunting from 32.5 in 2015-16 to 33.8 in 2019-20 is a cause of concern. At this rate of progress, it is unlikely that India would be able to achieve the SDG Target 2.1.2 of reducing stunting level by 40% by 2030 vis-à-vis 2016 levels.

Figure 12: Stunting (Height for Age), 2015-16 and 2019-20





The immediate and underlying factors causing stunting include infant and childcare practices, hygiene and limited food security among the poorest households. It is inseparably connected to reproductive and maternal nutrition and is often determined in the womb by a mother's social status and level of education. Traditional beliefs related to food intake and quality of care of an adolescent girl and of a woman during pregnancy and breastfeeding are also factors. A lack of clean water, sanitation and hygiene practices that lead to illnesses and life-threatening diseases like diarrhoea are also responsible for up to 50 per cent of all child malnutrition. (Source: World Health Organization, Geneva, 2008). To address the problem of stunting, it is imperative to push for convergence of health and nutrition programmes right from pregnancy until the child reaches five years of age.

B. Wasting (Indicates Acute Undernutrition)

Wasting is defined as low weight-for-height. It often indicates recent and severe weight loss, although it can also persist for a long time. It usually occurs when a person has not had food of adequate quality and quantity and/or they have had frequent or prolonged illnesses. Wasting in children is associated with a higher risk of death if not treated properly.

The main underlying causes of wasting are poor access to appropriate, timely and affordable health care; inadequate caring and feeding practices(e.g. exclusive breastfeeding or low quantity and quality of complementary food); poor food security – not only in humanitarian situations, but also an ongoing lack of food quantity and diversity, characterized in many resource-poor settings by a monotonous diet with low nutrient density, together with

inadequate knowledge of patterns of food storage, preparation and consumption; and lack of a sanitary environment, including access to safe water, sanitation and hygiene services.

These factors are strongly related to each other and have a cyclical relationship with wasting. Poor diet leads to increased risk of infection, and infection has a profound effect on nutritional status. A previously healthy child can quickly become wasted when faced with a severe infection, potentially leading to a loss of appetite. As wasting worsens, children become more susceptible to infections. This is known as the "vicious cycle" between infection and wasting.

In 2012, the World Health Assembly endorsed a Comprehensive implementation plan on maternal, infant and young child nutrition which specified nutrition targets for 2025 as per which the sixth target is to reduce and maintain childhood wasting to less than 5%. India has fared rather poorly with 19% children being wasted in 2019-20. Maharashtra has the highest proportion of wasted children (25.6%) and the state has seen an increase in the proportion of wasted children in both urban and rural areas. A total of 9 states and UTs have seen an increase in the proportion of wasted children between 2015-16 and 2019-20. Nagaland has seen the greatest increase in the proportion of wasted children during this time (11.3% to 19.1%).

Severe wasting is defined as a condition wherein the weight for height is below 3 standard deviations, based on the WHO standard. These would be children having extremely low weight relative to their height. At the all-India level, between 2015-16 and 2019-20, the proportion of severely wasted children has increased from 7.5% to 7.7%, which is a matter of concern. Among the 36 states and UTs, half of them have seen an increase in the percentage of severely wasted children between 2015-16 and 2019-20. Lakshadweep followed by Jammu and Kashmir and Ladakh have seen the highest increase in severe wasting during the same period.

C. Underweight (reflects inadequate food availability)

Weight is easy to measure; hence, this is the indicator for which most data have been collected in the past. The mortality risk is increased in children who are even mildly underweight, and the risk is even greater in severely underweight children.

The prevalence of underweight children in India is the highest among lower or middle-income countries in the world, and nearly doubles that of Sub-Saharan Africa with direct consequences for mobility, mortality, productivity and economic growth.

At an all-India level improvement has been as the underweight has reduced from 35.8% to 32.1%. The highest levels have been seen in Bihar (41%), Gujarat (39.7%), Jharkhand (39.4%), Dadra & Nagar Haveli and Daman & Diu (38.7%) and Maharashtra (36.1%). Further, the reversal in progress witnessed in Nagaland (10% increase) needs to be investigated.

Figure 13: Wasting (Weight for Height) in Children Under 5, 2015-16 and 2019-20

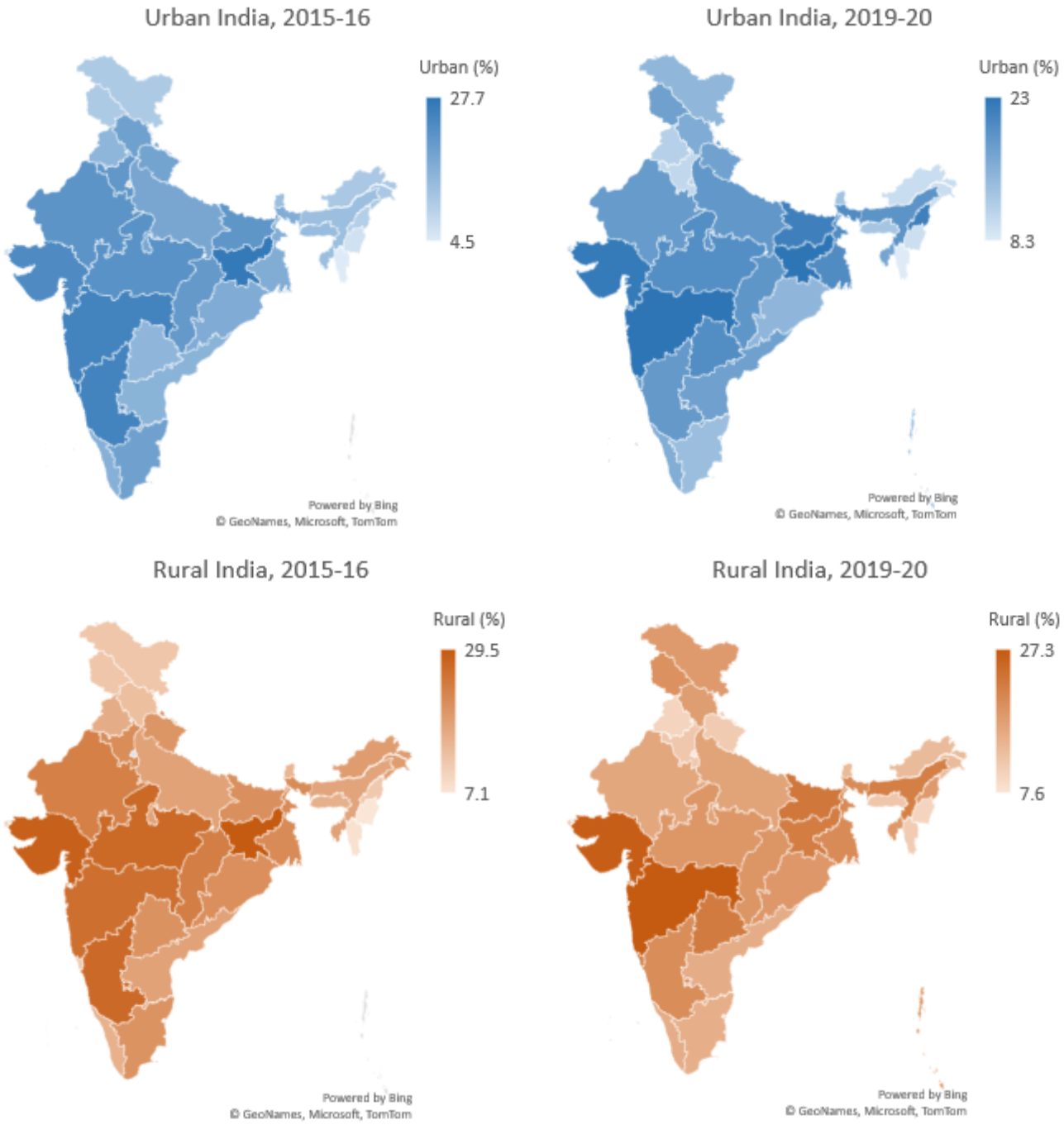


Figure 14: Severe Wasting in Children Under 5, 2015-16 and 2019-20

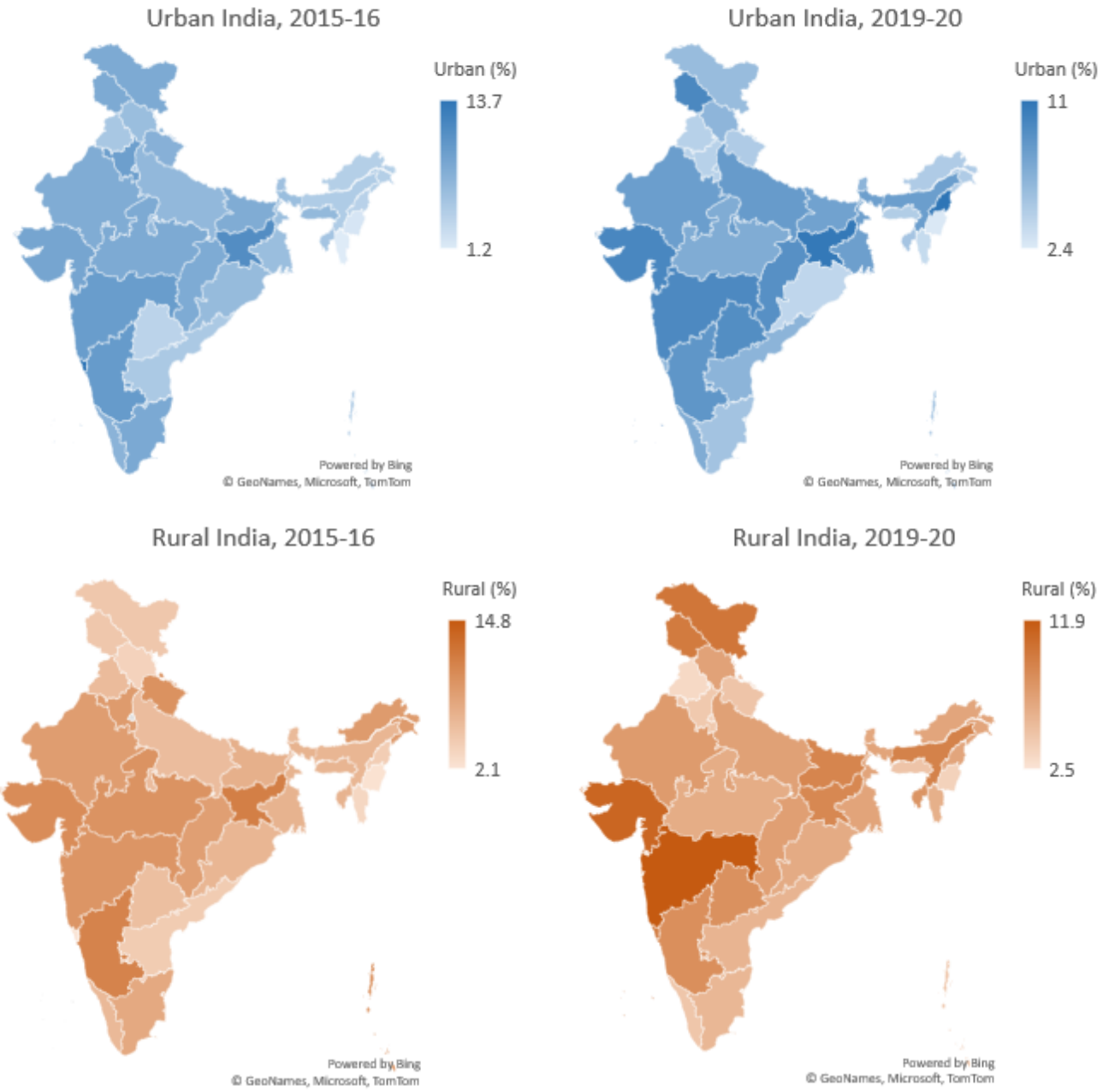


Figure 15: Underweight Children Under 5, 2015-16 and 2019-20

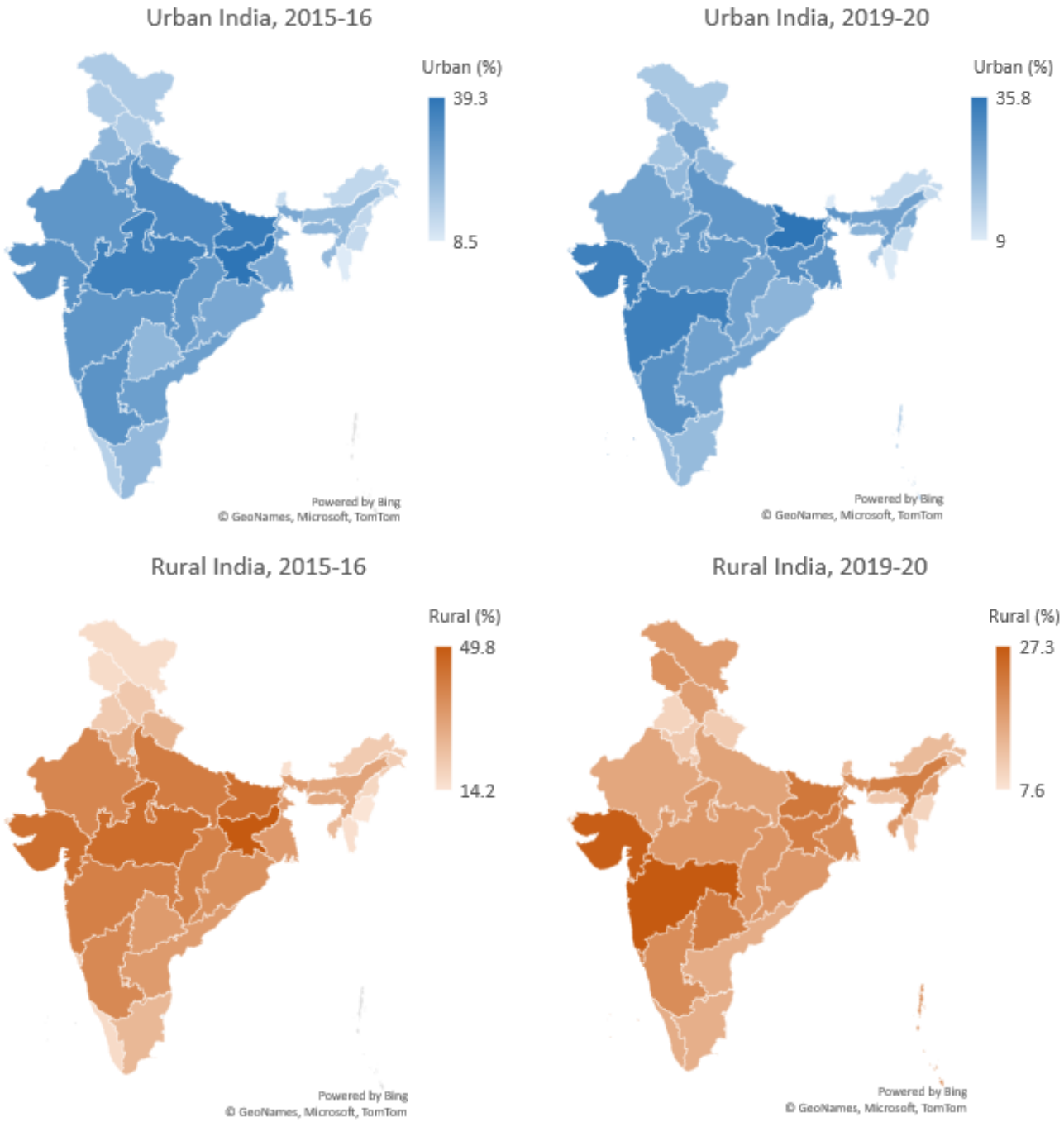
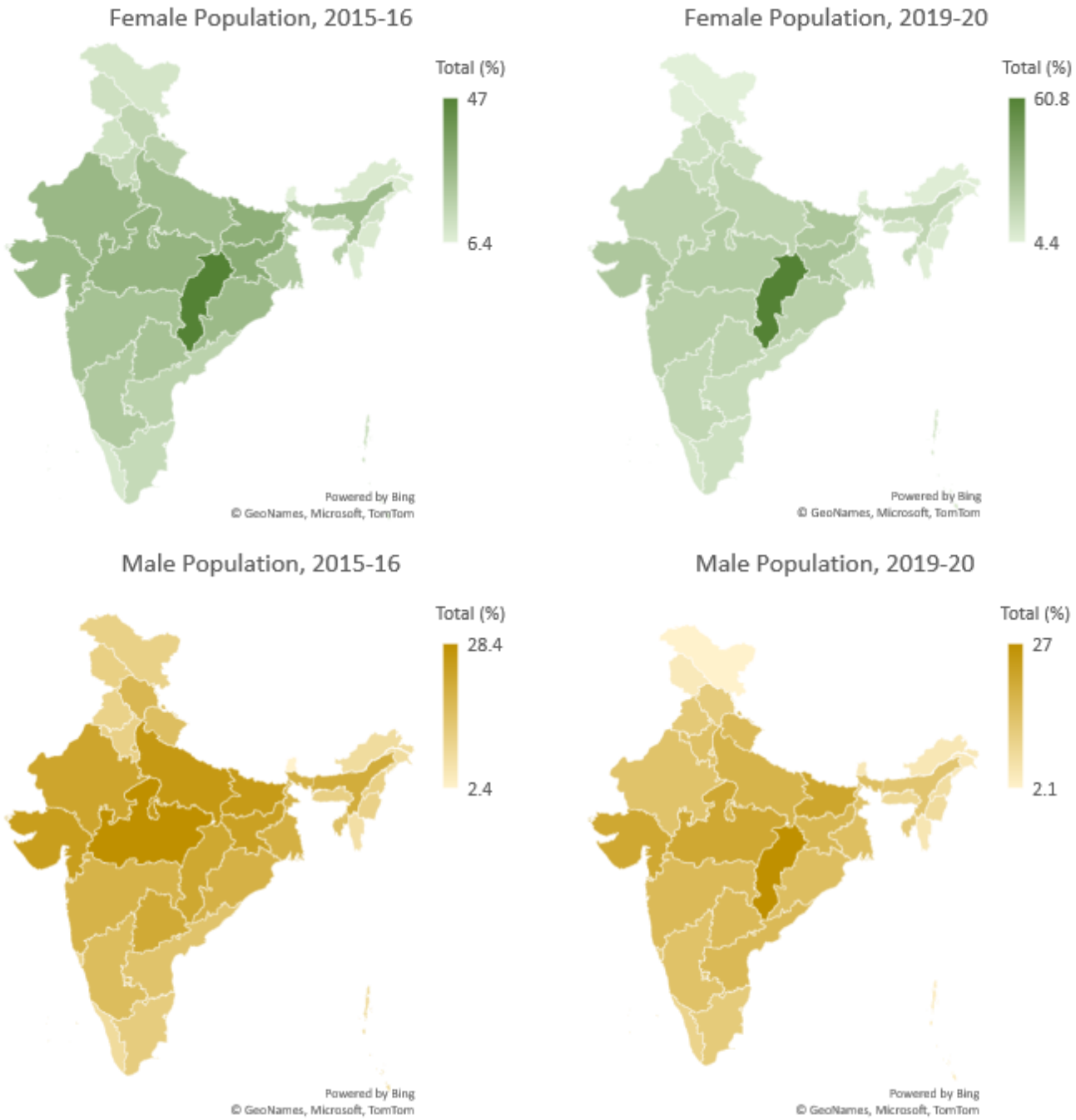


Figure 16: Female and Male Population with low BMI, 2015-16 and 2019-20



D. Micro-nutrient Deficiencies

While malnutrition encompasses several maladies, including micronutrient deficiencies, the most prevalent nutrition-related outcomes are those related to total energy intake, namely undernutrition, defined as having a body mass index (BMI) of less than 18.5 kg/m2, and overnutrition, defined as having a BMI greater than or equal to 25 kg/m2.

Nutritional status has been found to be unevenly distributed both within and between countries. In developed countries, for instance in the United States, overweight and obesity

disproportionately impact those having low incomes, having low education levels, and belonging to minority race/ethnicity (Drewnowski and Specter, 2004; USDHHS, 2001; Mokdad et al., 2003). In developing countries, such as India, nutritional status is related to levels of education, standard of living, and social status such that undernutrition is associated with low individual socioeconomic status (SES) and overnutrition is associated with high SES (Shukla et al., 2002; Subramanian and Davey Smith, 2006; Griffiths and Bentley, 2005; Osmani and Sen, 2003).

Since women in India are underweight – one in every five – compared to even sub-Saharan Africa, it is suggested as a reason for low birthweight in India. Chronic undernutrition in mothers' results in preterm and low birth weight babies.

E. Anaemia

Anaemia is defined as the condition of having a lower-than-normal number of red blood cells or quantity of haemoglobin. Although there are several causes of anaemia, the most important is the deficiency of iron in the diet followed by deficiencies in folic acid, Vitamin B12 and Vitamin A. Anaemia in children and women in India has been severe over the years with one in two women being anaemic. In India, anaemia caused by iron deficiency and vitamin B-12 deficiency are the most common. The problem is more severe in rural India as compared to urban India.

When talking about anaemia in children, except for Haryana, Jharkhand, Meghalaya and Uttarakhand, all other states have witnessed a worsening in the percentage of anaemic children. There were five states in 2019-20 with more than 70% children being anaemic which are Gujarat (79.7%), Madhya Pradesh (72.7%), Rajasthan (71.5%), Punjab (71.1%) and Haryana (70.4%). Among the UTs, Delhi, Jammu and Kashmir, Ladakh and Puducherry have seen an increase in the percentage of anaemic children. The problem is especially severe in the UT of Ladakh where 92.5% children were found anaemic in 2019-20.

Anaemia is more problematic in women as compared to men as among women, iron deficiency prevalence is higher than men due to menstrual iron losses and the high iron demands of a growing foetus during pregnancies. Nine states in 2019-20 had more than 60% anaemic women namely West Bengal, Tripura, Odisha, Jharkhand, Gujarat, Haryana, Chhattisgarh, Bihar and Assam. Except for Uttarakhand, Uttar Pradesh, Tamil Nadu, Meghalaya, Himachal Pradesh, Haryana, Arunachal Pradesh and Andhra Pradesh, all other states have seen an increase in the percentage of anaemic women. The problem is less severe in men with only three states viz., West Bengal, Tripura and Assam having more than 30% anaemic men in the states. As seen in children, the problem of anaemia is especially severe for both men (75.6%) and women (92.8%) in Ladakh. The high prevalence of anaemia in the cold desert region of

Ladakh could be due to the shortage of fresh vegetables and fruits during the long winter each year.

Figure 17: Anaemia in under 5 children, 2015-16 and 2019-20

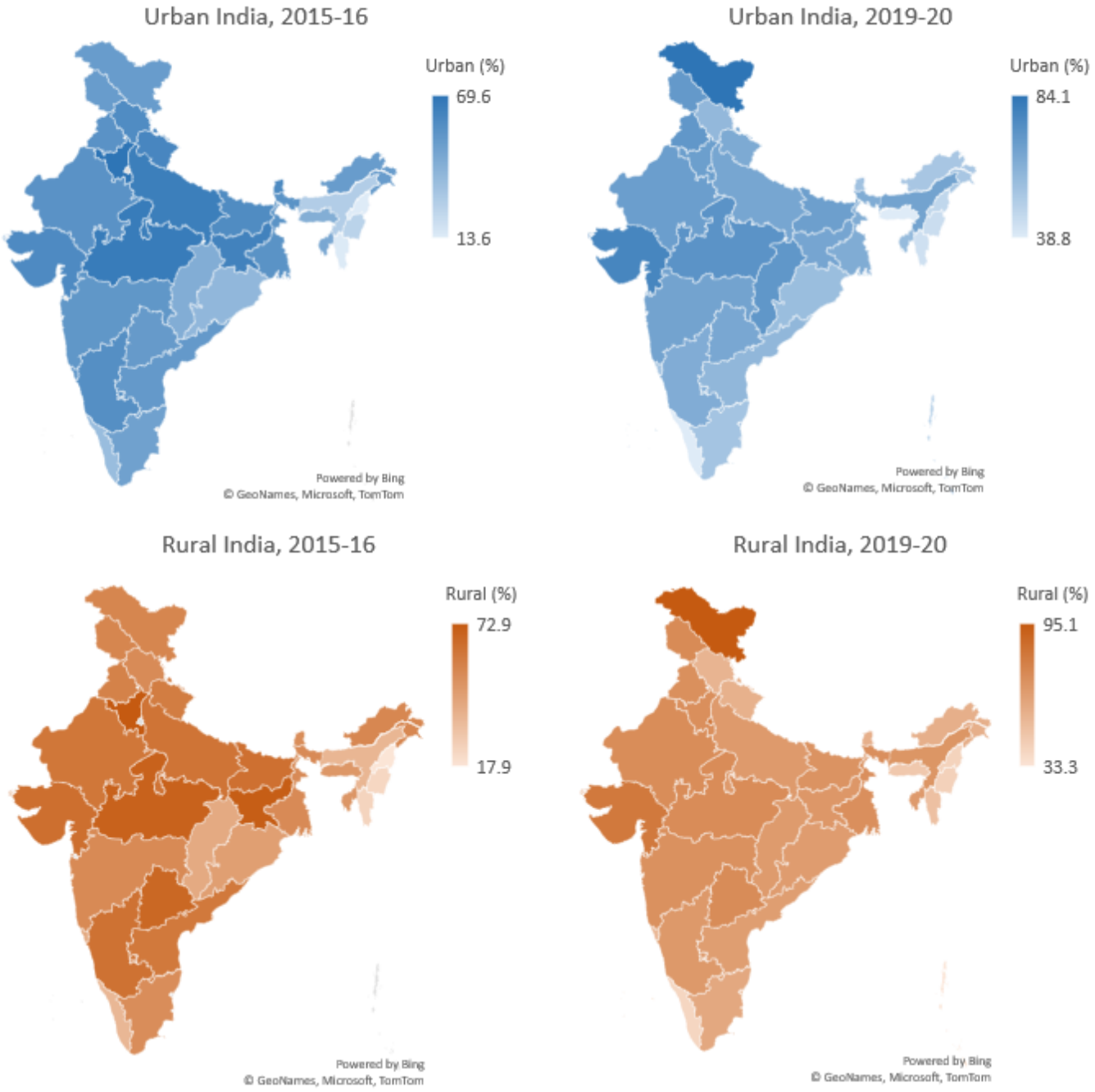
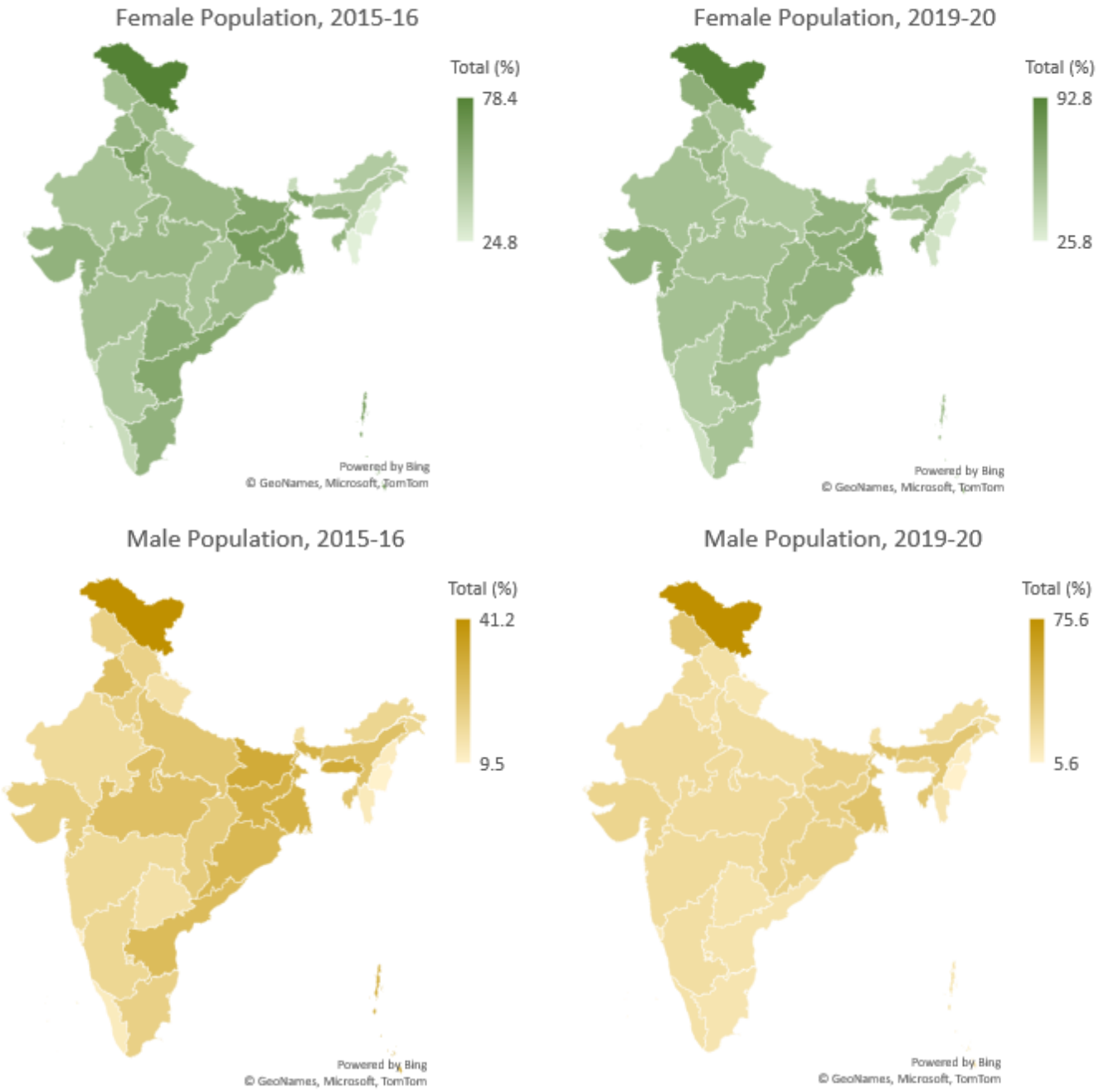


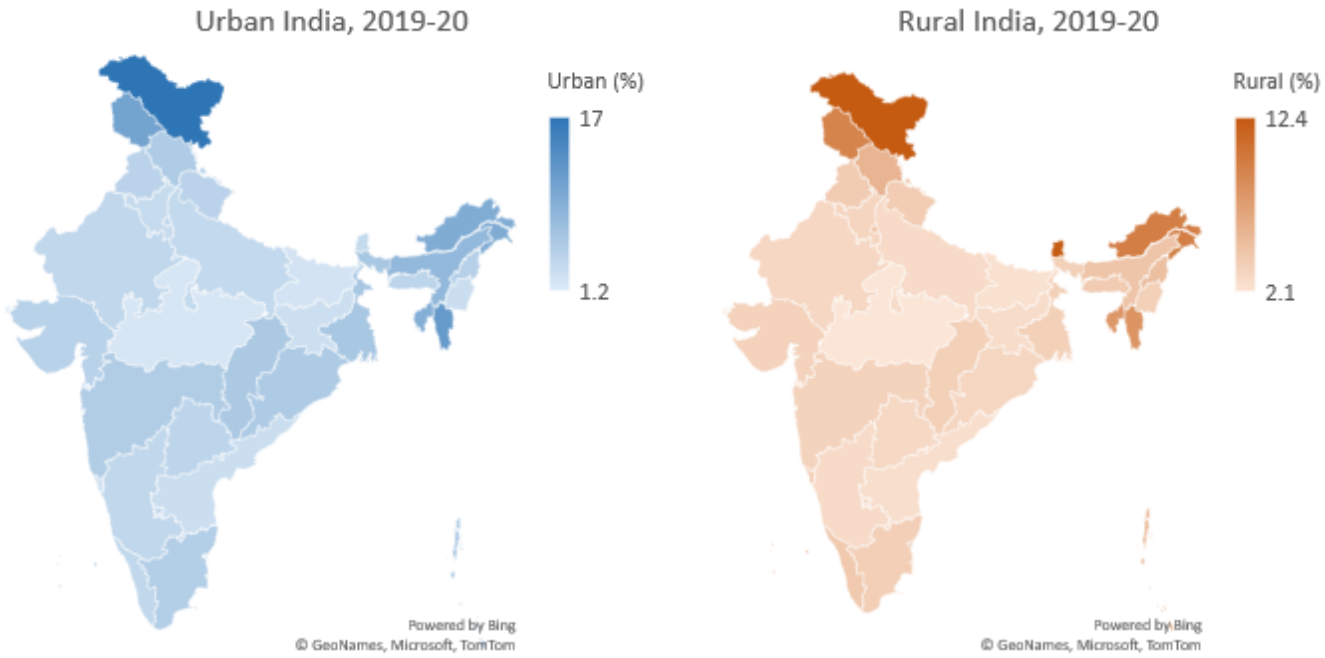
Figure 18: Anaemia in adults, 2015-16 and 2019-20



F. Double Burden of Malnutrition and rising Obesity

The NFHS 5 data shows that obesity is on the rise in majority of states and union territories. The problem appeared more concerning in children. Obesity among children under the age of five has increased, with all states reporting an increase in the number of overweight youngsters except Goa and Tamil Nadu. The proportion of overweight children grew from 2.1 per cent in NFHS-4 to 3.4 per cent in NFHS-5.

Figure 19: Overweight Children Under 5, 2015-16 and 2019-20



Amongst adults, obesity has increased by 4 per cent in both men and women in India during the last five years. In NFHS-5, the percentage of overweight or obese women is 24 per cent, up from 20.6 per cent in NFHS-4 (2015-16). The prevalence in men increased to 22.9 per cent (NFHS-5) from 18.9 per cent (NFHS-4). NFHS V also calculated Waist-to-Hip Ratio (WHR) to identify percentage of body fat and serves as a proxy for abdominal fat. This ratio when combined with the Body Mass Index (BMI) can more accurately predict a rise in risk of diabetes, stroke and heart attacks. More men have a bigger WHR (48 per cent) compared to women (40 per cent). Jammu and Kashmir (88 per cent) reported the highest proportion of women having a substantially increased risk of WHR while Madhya Pradesh reported the lowest (40 per cent). For men it is highest in Chandigarh (67 per cent) and lowest in Meghalaya (25 per cent).

Figure 20: Female and Male Population with high BMI, 2015-16 and 2019-20

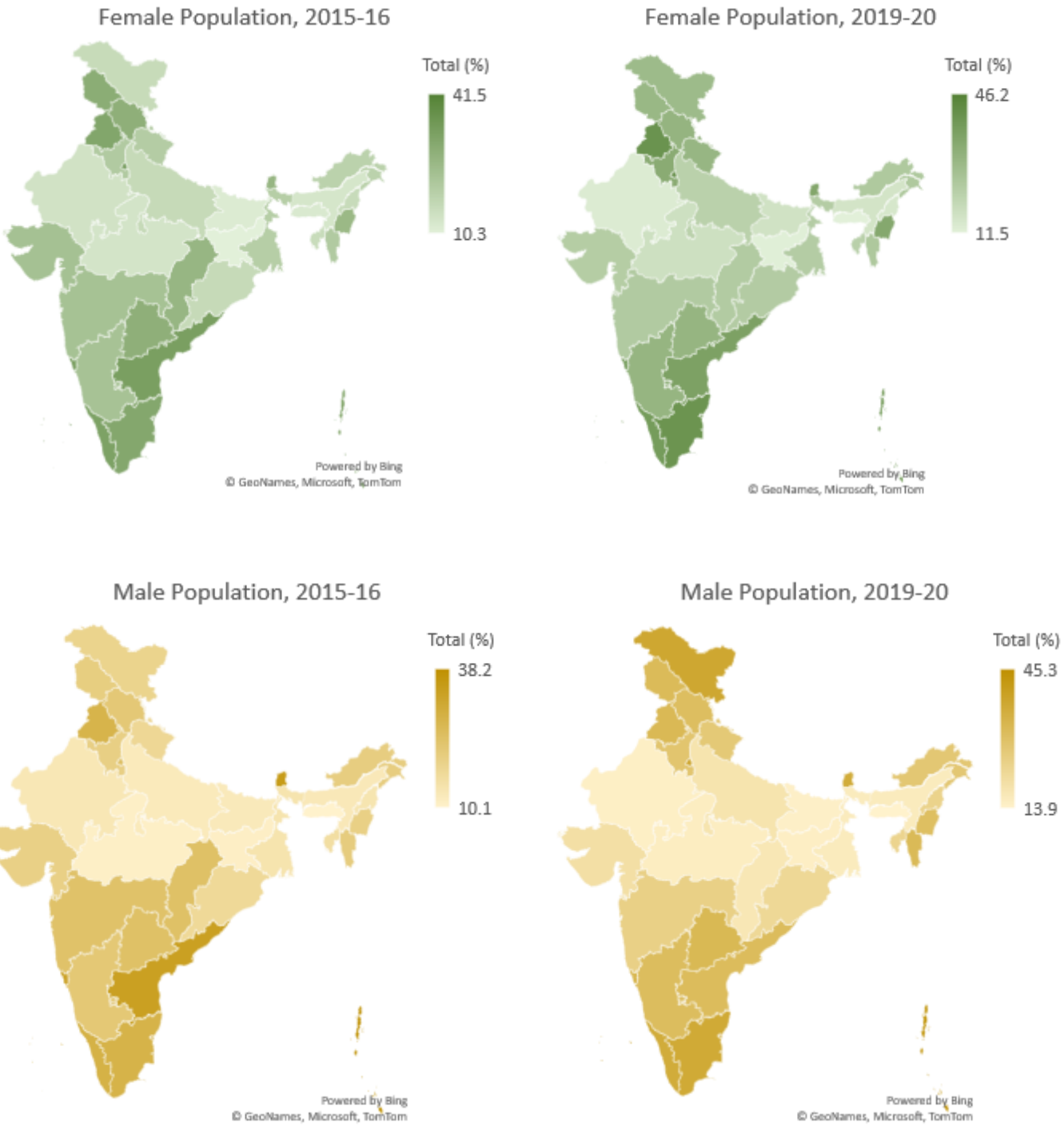
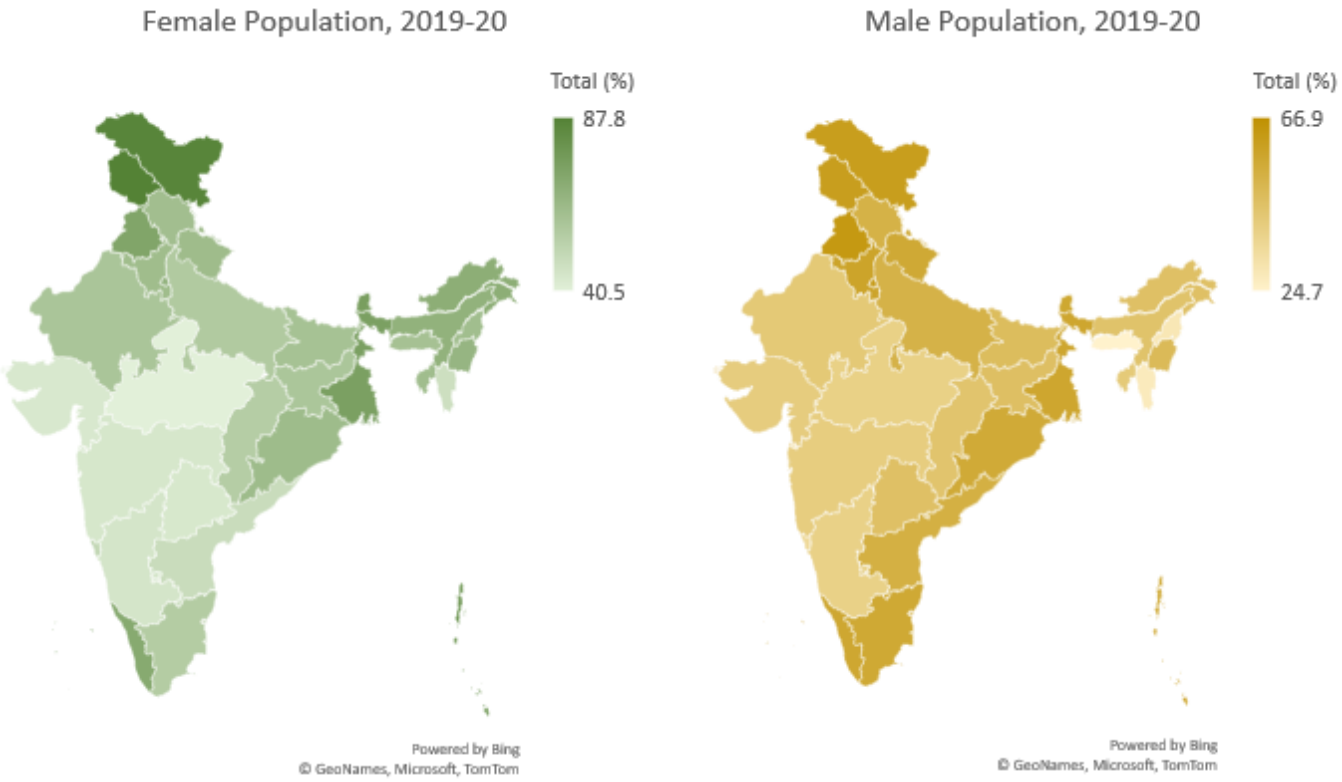


Figure 21: Female and Male Population with high-risk Waist-to-Hip Ratio (≥0.85)



Stability

Stability describes the temporal dimension of food and nutrition security, respectively, which ensures the food supply at household level remains more or less constant during the year and in the long-term. It is important to minimize external risks such as natural disaster and climate change, price volatility, conflicts or epidemics through interventions and improving the resilience of households through various coping mechanism. In the recent years, two events have impacted the stability aspect of food security- COVID 19 and the Russia Ukraine War.

Impact of COVID-19

Supply Chain Disruptions

The pandemic resulted in the crisis in health, economy, and food sectors. The impact is acutely be felt by the poorest and most vulnerable countries and communities. There have been major disruptions to food supply chains in the wake of lockdown measures, which have affected the availability, pricing, and quality of food (Barrett, 2020). The closure of restaurants and other food service facilities led to a sharp decline in demand for certain perishable foods, including dairy products, potatoes and fresh fruits, as well as specialty goods such as chocolate and some high value cuts of meat (Lewis, 2020; Terazono and Munshi, 2020). As the pandemic-related lockdowns took hold in many countries in March-May of 2020, there were widespread media reports of food items being dumped or ploughed back into the fields because of either collapsed demand or difficulties in getting these foods to markets (Yaffe-Bellany and Corkery, 2020). Farmers without adequate storage facilities, including cold storage, found themselves with food that they could not sell. The movement of food through the channels of international trade was especially affected.

Worsening of Nutritional Status

In India, as was seen in the state-wise analysis of indicators of undernutrition most states have fared worse in the period between 2015 and 2019. Covid-19 is expected to have exacerbated nutritional insecurities. It has also raised serious concerns on reduced access to nutritious food by vulnerable sections of the society which calls for affirmative actions on making safe and nutritious food available, accessible and affordable. Covid-19 and the resultant restrictions imposed to curb the spread of the virus is likely to have disrupted the various flagship nutrition interventions of the government. Services at Anganwadi centres, nutrition rehabilitation centres and village health sanitation and nutrition days were disrupted. Schools being closed for a greater part of the last two years the distribution of iron and folic acid tablets to children in schools was significantly reduced and awareness campaigns in schools on nutrition were suspended. This could further worsen the problem of anaemia which was already deteriorating

in the period between 2015 and 2019. With the pandemic requiring greater attention, health workers like ASHA and ANM were diverted from nutritional programmes for contract tracing, vaccination and other response and services. This is likely to continue as vaccinating a huge population such as that of India will take time. Further, a number of nutrition interventions are community based such as counselling and hands on training to pregnant and lactating women was been disrupted during this period.

Coping Mechanisms

A recent study suggests that poor households are likely to shift their spending away from fresh fruits and vegetables with high micronutrient content to less nutrient-rich staple foods as a direct result of the pandemic (Laborde, Martin and Vos, 2020). Other studies also showed a shift towards consumption of more processed foods (Bracale & Vaccaro, 2020). At the same time, in North America, there was a resurgence of interest in community supported agriculture (CSA) subscriptions, as people increasingly grew concerned about the safety of shopping in supermarkets and desired more direct access to fresh fruits and vegetables (Worstell, 2020), meat and fish products. CSA farms, however, were unable to meet all of this demand. There was also increased interest in home and community gardening as people sought to grow their own food to ensure their food security and nutrition (Lal, 2020). These changes to food environments had variable impacts on food diversity and nutrition.

War

Wars are inherently violent and harmful, but destruction of resources can sometimes create more catastrophic harm than bombs and bullets. Conflict can cause food shortages and the severe disruption of economic activities, threatening the means of survival of entire populations. Additionally, wars commonly trigger the displacement of huge numbers of people, cutting them off from their food supplies and livelihoods. Refugees are often vulnerable to acute food insecurity as well as disease. Alternately, if people remain in their homes, surrounding armies can trap people inside a village, city, or neighbourhood and deprive them of food, medicine, and other vital resources until they surrender. Many conflict zones desperately need humanitarian aid, but increasingly, one or both parties in a conflict may block relief operations from reaching starving populations or even carry out attacks against humanitarian organizations.

Armed conflict can certainly bring about dangerous conditions of food insecurity, but some scholars argue the reverse is also true: Food insecurity can precipitate violent political conflict. Most often, it is only one among several causal factors, but a sudden change in the availability or price of basic foodstuffs can trigger an explosion of social unrest. A famous example is the French Revolution of 1789, which was fueled in large part by poor grain harvests and economic

pressures that led to sharp increases in the price of bread. More recently, the Arab Spring uprisings of 2011 took place during a period of historically high food prices in North Africa and the Middle East.

The ongoing upheaval caused by the current Russia–Ukraine war, with all the human security implications this may entail, comes on the heels of pre-existing challenges that have already put pressure on prices and supply chains; the COVID-19 pandemic, an energy crisis, shipping constraints and recent climate-induced extreme events. Russia and Ukraine produce nearly 30% of the world's traded wheat and 12% of its calories. However, the conflict has disrupted the export of wheat, corn and barley from these countries, and a large portion of the world's supply of fertilizers is caught up in Russia and Belarus. As a result, food and fertilizer prices have increased rapidly. According to the FAO, the global food and feed prices will increase by 8% to 22% beyond their current high baseline levels if this conflict is not resolved early. Wegren et al. stated that the disruption of agricultural production in Eastern Europe will cause the food security of domestic and importing countries to be threatened. For example, a country such as Eritrea depends entirely on both countries to provide for its wheat needs, with Eritrea receiving 53% of its grain from Russia and 47% from Ukraine. If Ukraine cannot export wheat due to the conflict, other countries will have to meet 47% of Eritrea's wheat needs. The problem will be more complicated because the world food price is currently rising drastically.

This war is also affecting the ability of international agencies to provide food aid to countries that are suffer from famine or other armed conflicts. For instance, the World Food Programme (which buys 50% of its grain from Ukraine) has to reduce provided rations because of rising costs, with the risk of excluding millions of people from the current food aid programme.

Agri-Nutri Linkage

Agriculture and nutrition share a common entry point: "food." Food is a key outcome of agricultural activities, and, in turn, is a key input into good nutrition. Without agriculture, there is little food or nutrition, but availability of food from agriculture does not ensure good nutrition.

One would assume a strong liaison between the two fields of agriculture and nutrition however, in fact, there is often a significant disconnect. Extreme poverty and hunger are largely rural, with smallholder farmers and their families making up a very significant proportion of the poor and hungry. Thus, eradicating poverty and hunger are integrally linked to boosting food production, agricultural productivity and rural incomes.

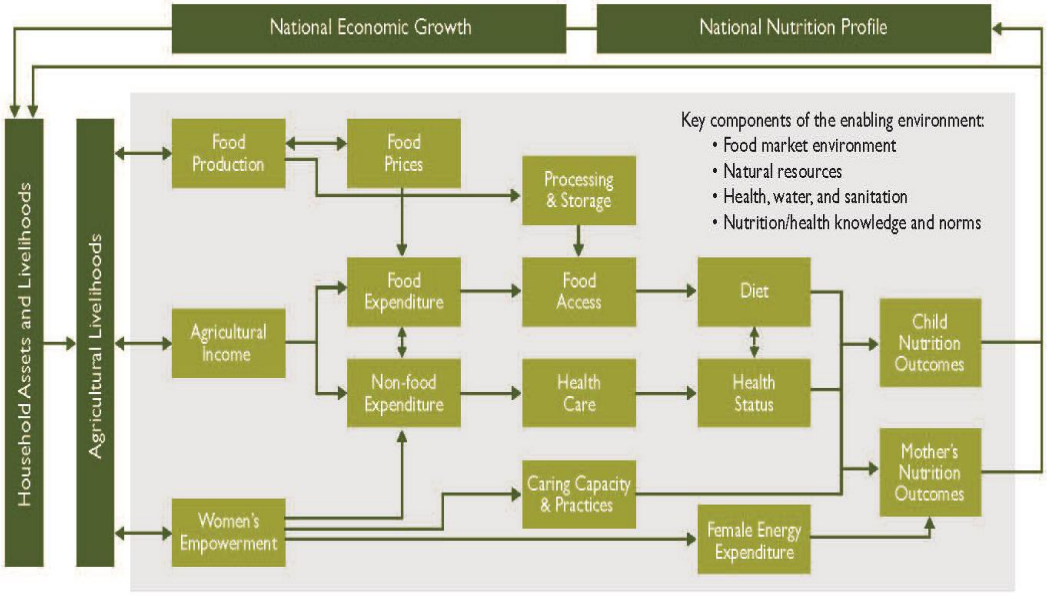
Agriculture systems worldwide must become more productive and less wasteful. Sustainable agricultural practices and food systems, including both production and consumption, must be pursued from a holistic and integrated perspective.

Land, healthy soils, water and plant genetic resources are key inputs into food production, and their growing scarcity in many parts of the world makes it imperative to use and manage them sustainably. Boosting yields on existing agricultural lands, including restoration of degraded lands, through sustainable agricultural practices would also relieve pressure to clear forests for agricultural production. Wise management of scarce water through improved irrigation and storage technologies, combined with development of new drought-resistant crop varieties, can contribute to sustaining drylands productivity. Halting and reversing land degradation will also be critical to meeting future food needs. There are many elements of traditional farmer knowledge that, enriched by the latest scientific knowledge, can support productive food systems through sound and sustainable soil, land, water, nutrient and pest management, and the more extensive use of organic fertilizers.

As a large developing country with a growing population, which is dependent on rainfed agriculture, India is particularly vulnerable to climate change. The most significant impact of climate change will be felt through its impact on the country's already stressed water resources. Several studies indicate that climate change will cause significant changes in annual and inter–seasonal variability of the monsoon. The number of dry days and wet days has steadily increased since the 1970s. Currently about 54% of the ground water wells are receding.

Given expected changes in temperatures, precipitation and pests associated with climate change, India needs to increase investment in research, development and demonstration of technologies to improve the sustainability of food systems in the country. Building resilience of the food systems will be critical to averting large-scale future shortages and to ensuring food security and good nutrition for all.

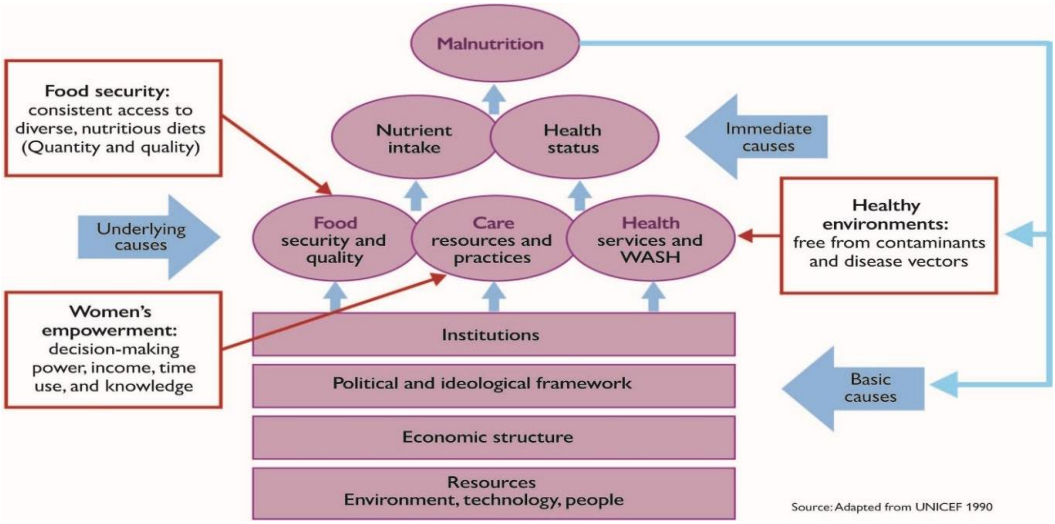
The figure below depicts the framework that helps us understand the pathways that link agriculture and nutrition as conceptualised by Herforth and Harris. The pathways are interconnected rather than linear.



Source: Understanding and Applying Primary Pathways and Principles. Herforth & Harris. USAID/SPRING Project; 2014. p.

The main pathways from agriculture to nutrition are through:

1. Food production
2. Agricultural income
3. Women's empowerment



Source: UNICEF 1990

Millets for Nutrition and Climate Action[4]

Hidden hunger or micronutrient deficiency is one of the major hurdles faced by the nations in achieving SDG2, i.e., to end all forms of hunger and malnutrition by 2030.[5] This is especially true for India. A major cause for this deficiency is excessive dependence on fine cereals like rice and wheat and lack of diversity. The need of the hour is to move towards sustainable and diverse food production system which would help achieve food as well as nutritional security. Millets, now known as Nutri-cereals with their superior nutritional profile compared to fine cereals while being climate resilient as well can play an important role in this regard.

A. Three-fold benefits of Nutri-Cereals

Millets have three-pronged benefits and are beneficial to farmers, consumers and the planet.

1. For farmers – as risk mitigation against droughts

It is a fact that even after realising the full irrigation potential, about half of the net sown area in India will continue to remain rainfed[6]. This calls for a shift towards low water intensive crops like millets, which can grow on shallow, low fertile soils with a pH of soil ranging from acidic 4.5 to basic soils with pH of 8.0. They can survive droughts and thus, can be used as a good risk mitigation strategy. They have alternative uses as food, fodder and fuel, which is an added advantage. It is concerning that the all-India area under production of nutri-cereals has been on a continuous decline since the early 1970s. The area under millets has declined from 45.95 million hectares in 1970-71 to 23.83 million hectares in 2020-21. During the same period, the area under wheat cultivation has increased from 18.24 million hectares to 31.61 million hectares.

2. For consumers – the nutrition angle

Millets contain 7-12% protein, 2-5% fat, 65-75% carbohydrates and 15-20% dietary fibre and are also a natural source of iron, zinc, calcium and other nutrients that are essential for tackling the problem of malnutrition and anaemia in India. Millets can also help in several lifestyle diseases like obesity, diabetes, cardiovascular diseases and cancer due to the presence of slow digestible starch (SDS) which prolongs digestion and absorption of carbohydrates[7].

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[4] This chapter has been adapted from the Rural Pulse XXXIX, June-July 2022

[5] A. D. Sukumaran Sreekala et al. (2022) Millet Production and Consumption in India: Where Do We Stand and Where Do We Go? The National Academy of Sciences, India

[6] (2012), Study Report No. 4 – Prioritization of Rainfed Areas in India, National Rainfed Area Authority, Government of India

[7] NFHS 5 India Report 2022 shows that 59.1% of women are anaemic, 35.5% of children are stunted, 32.1% of children are underweight, 24.0% and 22.9% of women and men are obese, and 8.9% of the population is diabetic.

However, the per capita consumption of millets has fallen drastically from 32.9 kg to 4.2 kg from 1962-to 2010[8].

3. For the planet – for combating climate change

Millets have a low overall water requirement, that too, over a limited growing period of 60 to 90 days. For example, pearl millet and proso millet require a rainfall of 20 cm vs 120- 140 cm for rice. Being C4 crops, millets can absorb more carbon dioxide from the atmosphere and convert it to oxygen, have high water and input use efficiency, and hence are environment friendly. Millets can, thus, contribute towards mitigating climate change by phasing out climatic uncertainties and reducing atmospheric carbon dioxide.

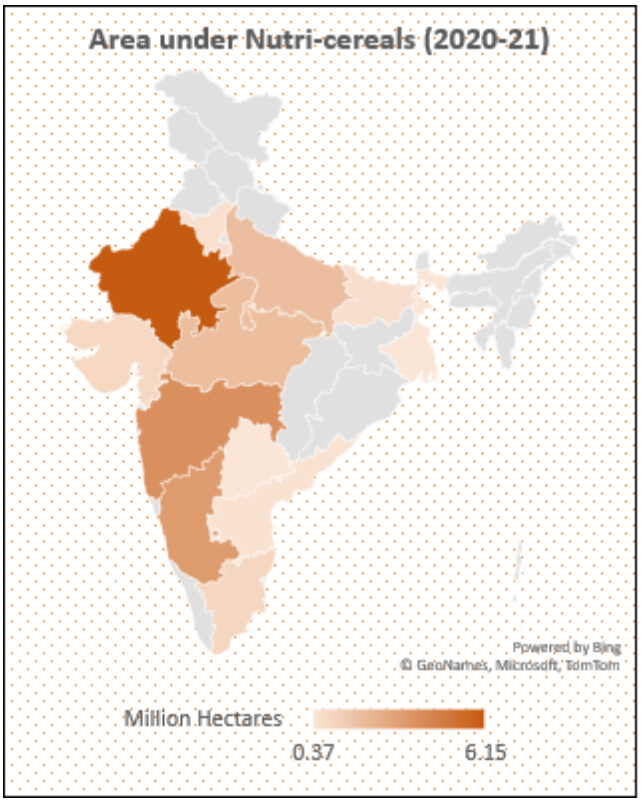
B. State-wise Area, Production and Yield of Nutri-Cereals

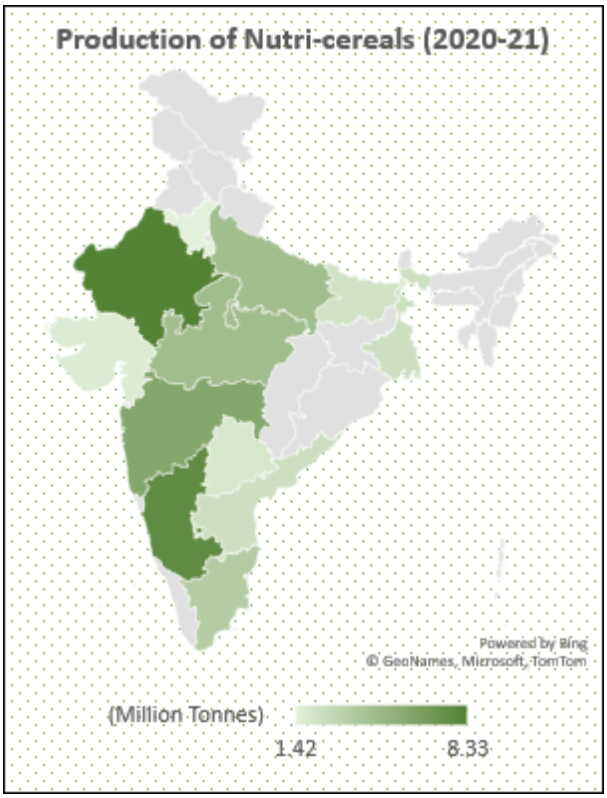
Among the states in India, Rajasthan has the maximum area under cultivation (6.15 million hectares) for millets and is the largest producer (8.33 million tonnes) as well. Telangana has the highest yield (6563 kg/hectare) for millets (Figure 3). West Bengal has seen the highest increase in area under cultivation as well as production between 2014-15 and 2020-21 while Telangana has seen the greatest increase in yield (Table 4). Maharashtra during the same period witnessed a 5.3% decline in area under millet cultivation but interestingly, the state's production has increased by 3.09%. A look at the state-wise production figures of nutri-cereals in 2020-21 shows that close to 70% of the production in the country is concentrated in the six states of Rajasthan, Karnataka, Maharashtra, Madhya Pradesh, Uttar Pradesh and Tamil Nadu[9]. Their production needs to be encouraged in other states and UTs as well especially in the states which have a very high incidence of anaemia such as Gujarat, Punjab and Haryana.

[8] Kane-Potaka J, Anitha S, Tsusaka TW, Botha R, Budumuru M, Upadhyay S, Kumar P, Mallesh K, Hunasgi R, Jalagam AK and Nedumaran S (2021) Assessing Millets and Sorghum Consumption Behavior in Urban India: A Large-Scale Survey. Front. Sustain. Food Syst. 5:680777. doi: 10.3389/fsufs.2021.680777 https://www.frontiersin.org/articles/10.3389/fsufs.2021.680777/full accessed on 19 Sept 2022.

[9] Agriculture Statistics at a Glance, 2021

Figure 22: State-wise Area, Production and Yield of Nutri-cereals





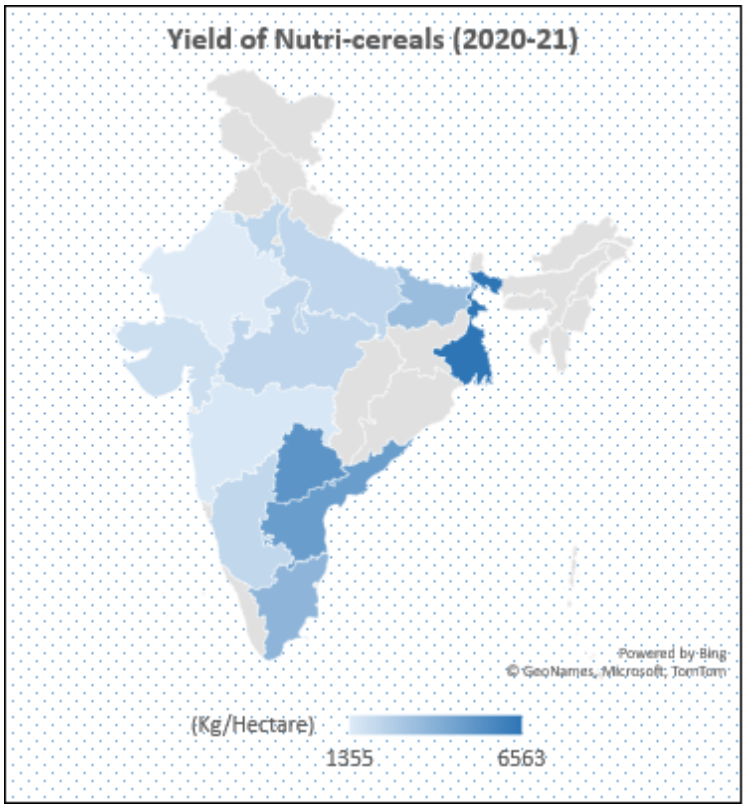


Table 4: CAGR (%) of Area, Production and Yield in Major Millet Producing States (2014-15 to 2020-21)

State	Area	Production	Yield
Rajasthan	0.44	1.81	1.37
Karnataka	0.49	1.79	1.31
Maharashtra	-5.38	3.09	8.91
Madhya Pradesh	1.95	6.74	4.79
Uttar Pradesh	0.08	4.28	4.14
Tamil Nadu	2.37	2.63	0.29
West Bengal	13.84	23.90	8.24
Andhra Pradesh	-0.64	0.99	1.51
Bihar	-1.42	-0.86	0.66
Telangana	-11.69	-3.40	9.25
Gujarat	-2.20	0.89	3.12
Haryana	4.72	9.58	4.88

Source: Authors' calculation using data from Agriculture Statistics at a Glance (2014-15 to 2020-21), Ministry of Agriculture and Farmers Welfare, Government of India

C. Demand and Supply Measures for Millet Promotion

While millets are gaining popularity among consumers, the actual consumption is not increasing, and supply cannot match it if large sections start consuming millets. Hence, we need two-pronged strategies to manage supply and demand-side issues. Recently the University of Agricultural Sciences, Raichur & NABARD organized a **"Millet Conclave" on 26 & 27 August 2022 at Raichur where several important issues have been discussed.** On that occasion, the Union Finance Minister announced the "Millet Challenge" for start-ups, to be jointly organized by **Atal Innovation Mission** and the **University** of Agricultural Sciences, Raichur. A few important suggestions culled from the Conclave[10] and other sources have been listed below:

[10] Suryakumar, P.V.S.S., Millet Conclave Raichur Karnataka https://www.linkedin.com/pulse/millet-conclave-raichur-karnataka-suryakumar-p-v-s accessed on 19 Sept 2022

Promoting consumption

a. Awareness campaigns involving celebrities and on the lines of those used for eggs in 1980s- '*Sunday ho ya Monday roz khao ande*'

b. Serving millet-based food and snacks on flights and premium trains

c. Include millets in flagship schemes of the government such as Mid-Day Meal Programme and the Integrated Child Development Services (ICDS) scheme

d. Including millets in PDS (GoI issued guidelines and states like Karnataka implemented)

e. Need to improve value chains and provide processing/value addition facilities so that consumers can get tasty and cheaper millet-based food. Indian Institute of Millets Research and other agencies have developed technologies for millet-based products and incubating entrepreneurs. They need to be scaled up. Ready to Eat and Ready to Cook millet products should be promoted for better acceptability among bachelors and youngsters

f. Urban consumers should be primary target and use of social media can be a game changer

Improving the production and promoting value chains

a. Enhancing the production base of millets

b. Varietal improvement to enhance productivity and profitability

c. Millet growers need to be incentivised through cash compensation and other measures.

d. Since there are several small producers in millet economy, organising them into FPOs, joining them through NRLM and SHGs is needed. There are several successful models in the field, which need scaling up. For instance, the Ramanar millets based FPO, incorporated in 2016 in Tamil Nadu, has been able to mobilise many members within a short period and has increased its volume of business to over Rs.200 lakh within a period of three years. It has also made profit in all the three years and increased percentage of profits in the 4th year, 2019-20.[11] The Arogya Millets Producer Company Limited with 300 women members from 35 villages in Vizianagaram, Andhra Pradesh

[11] NABARD Research Study – 25: Case Studies of FPOs in India, 2019-2021, Xavier Institute of Management, Bhubaneswar

is another successful millet collective that aggregates, processes and markets millets products under the brand name Arogya Millets[12]

e. Promoting millets in watershed and wadi projects of NABARD is being done and scaling up and linking to value chains is needed

f. Special incentives for entrepreneurs /FPOs for purchase of processing machinery (the cost could be about Rs.15 to Rs.30 lakh)

g. Fiscal incentives including tax concessions along the value chains is recommended

As the world is gearing up to celebrate the International Year of Millets 2023[13], thanks to the initiative of Government of India, the time is ripe to focus on increasing the share of millets in our food grain basket which would help achieve nutritional security along with food security.

[12] Annual Report 2021-22, National Bank for Agriculture and Rural Development (NABARD)

[13] The United Nations General Assembly (UNGA) resolution declared 2023 as International Year of Millets. Government of India spearheaded the campaign to create domestic and global demand and to provide nutritious food to the people.

NABARD's Interventions

NABARD with its vision of fostering rural prosperity has been playing a very important role in ensuring food security and nutrition. It has adopted a vision that incorporates not only short-term measures but also long-term action to bring fundamental changes.

1. Food Processing & Warehouse infrastructure

Food processing, the necessary conversion of raw materials to edible, functional, and culturally acceptable food products, is an important link between production and consumption within the food value chain. Without increased attention to the role of food processing it will be difficult to succeed in addressing the mounting challenges in delivering sustainable diets for all people. Food processing plays a dual role of ensuring food as well as nutritional security. Processing reduces wastage and improves the shelf life of food products. Processing also affects the content, activity and bioavailability of nutrients.

The Food Processing Fund has been instituted by the Government of India with NABARD for providing affordable credit for setting up of designated food parks notified by Ministry of food Processing industries (MOFPI), GoI and establishing food processing units therein. As on 31 March 2022, NABARD has sanctioned term loan of Rs. 781.1 crore for 14 mega food parks, 8 agro-processing clusters, and 13 individual food processing units. Recognizing the hardships faced due to COVID, NABARD deferred principal and interest payments of borrowing entities to the tune of ₹8.38 crore under Food Processing Fund (FPF) to mitigate the burden of debt servicing and ensure business continuity. The 'Resolution Framework for COVID-19 Related Stress' also granted an extension of 18 to 24 months (with moratorium) to borrowers under FPF for principal repayment. The borrowers were sanctioned funded-interest term loan to service the accumulated interest.

Warehousing infrastructure also plays a crucial role in avoiding wastage and contribute to food security. Cumulative sanctions stood at ₹9,707.6 crore and disbursements at ₹8,215 crore as on 31 March 2022, under the Warehouse Infrastructure Fund (instituted by the GOI in NABARD in FY2014) for a total designed capacity of 12.7 million tonne. The eligible activities include various storage infrastructure for agricultural commodities, including warehouses, silos, agri-logistic parks, storage infrastructure in market yards & food parks and cold chain activities like pre-cooling units, cold storage, Controlled Atmosphere (CA) stores, reefer vans, bulk coolers, Individually Quick Frozen (IQF) units, chilling infrastructure, etc.

2. Financing Rural Infrastructure

Several studies have articulated theoretically and established empirically the positive impact of infrastructure on agricultural development. Gulati et al. (2021) established infrastructure as one of the three important factors behind agrarian growth.

NABARD is a major player in India's rural infrastructure space. During its 26-year journey, RIDF has evolved into a dependable, affordable, and timely source of funding for rural infrastructure projects for state governments. On completion of the RIDF projects sanctioned under major sectors up to 31 March 2021, the cumulative benefits likely to be generated include the creation/restoration of 364 lakh ha of irrigation potential, rural road length of 5.1 lakh km, and rural bridges of 12.9 lakh metre. In addition, these projects are expected to generate around 65,500 lakh person days of non-recurring employment.

Interventions aimed at increasing water availability for livelihood and domestic activities have great potential to improve various determinants of undernutrition, such as the quantity and diversity of foods consumed within the household, income generation, and women's empowerment. NABARD has been funding the National Water Development Agency, the special purpose vehicle of the GOI and willing state governments under the Long-Term Irrigation Fund (LTIF) since FY2017 towards identified major and medium irrigation projects. Cumulative loans sanctioned and released under LTIF as on 31 March 2021 stand at ₹85,127.4 crore and ₹55,676.7 crore, respectively.

3. Enhancing area under cultivation

NABARD has been implementing watershed development projects on participatory approach for conserving natural resources and Adivasi Development Projects, popularly known as "wadi" in tribal habitations across the country for more than two decades. The major outcomes of the watershed development programme include increase in area under cultivation (up to 35%), improvement in productivity of various crops (29–53%), enhancement of groundwater recharge, change in net sown area and irrigated area, generation of additional employment, reduction in migration due to creation of employment, increase in cropping intensity and reduction in soil loss.

NABARD has sanctioned four pilot projects in Punjab and Haryana for reclamation of saline and alkaline soils through rainwater management with an initial grant of ₹0.1 crore as on 31 March 2021. The programme integrates a watershed/landscape approach and is supported by the Central Soil Salinity Research Institute, Karnal as the technical partner. The programme aims to cover a total area of 3,000 hectare (ha) in Punjab and Haryana (2,000 ha alkaline soils and 1,000 ha of saline soils).

NABARD has demonstrated successful business models through a variety of initiatives under the Umbrella Programme for Natural Resource Management (UPNRM) including System of Rice Intensification, Sustainable Sugarcane Initiative, Better Cotton Initiatives (using drip irrigation), integrated biogas, ecotourism, sustainable agriculture practices, fisheries, cultivation of medicinal plants with primary processing, soil and water conservation in tank-based irrigation in dryland areas, vermi-compost production, horticulture and plantation crop, organic farming, crop waste management, community drinking water, and installation of automated weather stations

4. Climate change initiatives for sustainability

NABARD has played a pivotal role in implementing climate solutions, as the National Implementing Entity (NIE) for the Adaptation Fund (AF) under the United Nations Framework Conventions on Climate Change and the National Adaptation Fund for Climate Change (NAFCC) of Government of India; it is also the Direct Access Entity to the Green Climate Fund.

It has been working in tandem with the goals of National Action Plan for Climate Change and State Action Plan for Climate Change to address the challenges, assess vulnerable areas and sectors for prioritization of climate actions, and develop climate action strategies. The interventions aim at engaging and training the members in protecting natural resources, say by reviving natural water resources to counter rainfall deficit, and increasing green cover through better farming practices like integrated mountain farming and climate-resilient crop cultivation and livestock rearing.

5. Sponsoring research and dissemination of knowledge to farmers

A. Extending assistance for research

NABARD has been regularly sponsoring research which will help optimize food production in the country. The Centre for Research in Rural and Industrial Development, Chandigarh conducted a study in Haryana to suggest the most remunerative crop combination in the region, the major recommendations NABARD also commissioned Xavier Institute of Management, Bhubaneswar to do an Action Research on Sustainable Agricultural System (SAS) to understand the interconnectedness of various factors affecting sustainable agriculture and to develop a sustainable farming operation manual.

B. Extending assistance for dissemination of knowledge

In collaboration with institutions under the Indian Council of Agricultural Research, state agricultural universities, Krishi Vigyan Kendras, and other research institutes, NABARD facilitated 270 exposure visits for 8,022 farmers to see new or innovative farming methods in

action, spending ₹2.1 crore under the Capacity Building for Adoption of Technology programme. NABARD also supported Krishi melas, fairs, workshops, etc., that showcased agri-products, machineries, and innovative practices, spending more than ₹1.2 crore on these activities.

6. Supporting start-up and innovation ecosystem in food related sectors

Agri-business incubation centres foster ideas, innovations, and technologies that focus on agriculture. They provide support and resources necessary for agri-startups and agri-entrepreneurs to develop ideas into viable commercial entities. Covering both agri technologies as well as rural technologies, NABARD extends end-to-end assistance and grant support in setting up rural agri-business incubation centres at agriculture universities and similar institutions. NABARD set up a ₹100-crore Catalytic Capital Fund in FY2020 to support agricultural and rural start-ups in 'Death Valley' phase through incubation centres and NABARD subsidiaries.

Conclusion

There are people in the world so hungry, that God cannot appear to them except in the form of bread." – Mahatma Gandhi

The health of a country's agri-food systems determines the health of its people. Demands on the global food systems are growing exponentially. Over the next 20 years, they will need to feed 10 billion people and at the same time, protect natural resources and ecosystems for future generations. The findings from the first round of the Fifth National Family Health Survey suggest that nutrition-related indicators have worsened in most States. Covid-19 has led us off-track even further.

However, there is hope. With 10 years to go to end hunger, poverty and inequality, food systems underpin all 17 of the UN Sustainable Development Goals for 2030. By leveraging the links between how we produce, buy, sell and eat food, it is possible to support healthier, more prosperous and fulfilling lives.

For Indians to eat better, a multi-prolonged strategy is required. A structural shift in dietary pattern and nutrition requires a shift in production. Pathways for nutritional security consist of improving dietary diversity, kitchen gardens, reducing post-harvest losses, making safety net programmes more nutrition-sensitive, women's empowerment, enforcement of standards and regulations, improving Water, Sanitation and Hygiene, nutrition education, and effective use of digital technology.

Addressing the complex problem of malnutrition is an enormous task for which we need to look at agri-food systems as a whole and adopt a multi-pronged approach. While COVID-19 has exacerbated the nutrition issue, climate change has challenged agricultural production itself. However, the country's agri-food systems are facing new and unprecedented challenges, especially related to economic and ecological sustainability, nutrition and the adoption of new agricultural technologies.

Agricultural development in India has been highly uneven on various fronts – regional imbalances and imbalances between main cereals on the one hand and millets, legumes, oilseeds on the other. The existing policy regimes like the Minimum Support Price (MSP) and Public Distribution System (PDS), coupled with subsidies on irrigation, power and farm inputs, are skewed in favour of staple crops like rice and wheat. Although MSP mechanisms exist for climate-resilient and more nutritious cereals like sorghum and millets, they are largely ineffective because of the policy bias in favour of the 'big two' staples. While these policies played an important role in ensuring calorie sufficiency across the country and thereby, led to a substantial reduction in the incidence of hunger, they tended to inhibit

diversification of the food systems and hence, the overall supply of micronutrient-rich food. Over time, this has led to nutrient imbalances in the food system that contribute to both obesity/overweight and micronutrient (mineral and vitamin) deficiencies without fully resolving the undernourishment challenge.

These imbalances need to be corrected. This would require clear strategies for diversification of production systems to improve the access and affordability of nutritious food, such as fresh fruit, vegetables, pulses and livestock products. It would also require strategies for promoting individual diet diversity. There is a need to achieve self-reliance in all staple foods, legumes and vegetables, including oilseeds and edible oils. However, farmers may be reluctant to switch to a new-crop production system unless their income from alternative crops is stabilised. The shift in farmers' behaviour can be made possible with suitable financial incentives during the transition (making inputs such as seeds affordable and available), value-chain strengthening and efforts to change consumer behaviour. The concept of food-miles being less (food being consumed nearer to its production) should be respected. Similarly, investments in the animal husbandry sector should be pursued considering the rising demand for meat, dairy products and eggs. The diversification to small ruminants, backyard poultry and aquaculture provide additional income to smallholder farmers and the landless poor.

Priority must be accorded for upscaling research on emerging areas of climate science to develop technologies that must include pest surveillance and forewarning systems, simulation modelling and big data analytics, etc. Using ICT and emerging technologies, digital agriculture could play an important role in helping adopt various climate-smart interventions. Focus on agricultural research and innovation to ensure efficiency in resources (water; nutrient) use; carbon sequestration; assessment of greenhouse gas (GHG) emissions from the agriculture sector, etc. must be made with the enhanced allocation of budgetary support and collaborations/partnerships. Enhanced allocation for research exclusively devoted to nutrition-sensitive agriculture, would be a very productive investment.

नाबार्ड

राष्ट्रीय कृषि और ग्रामीण विकास बैंक

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