

From Food Security to Nutrition Security in India

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CENTRE OF EXCELLENCE

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FROM THE DIRECTOR'S DESK

World Food Day, celebrated on October 16 every year, marks the founding of the United Nations Food and Agriculture Organization (FAO) in 1945. The FAO has since played a leading role in efforts to end global hunger, improve food security, and promote better nutrition.

The theme for World Food Day 2024 is “Right to foods for a better life and a better future.” This emphasizes the urgent need to ensure that safe, nutritious, and affordable food is accessible to all people worldwide. The theme calls for food to be recognized as a fundamental human right—one that promotes diversity, safety, sustainability, and affordability for people everywhere.

The challenges to food security are numerous and complex, worsened by climate change, economic downturns, and conflicts. FAO reports that while governments often support agricultural policies, these subsidies are often market-distorting, primarily benefiting large-scale production of staple crops, leaving out nutritious foods like fruits, vegetables, and pulses. As a result, food systems are not designed to promote nutrition and many farmers do not receive adequate support.

To change this, the FAO calls for revised subsidies and greater innovation in food production, distribution, and consumption. Technologies that reduce waste, enhance climate resilience, and support nutritious food production are essential for ensuring that food systems become inclusive, sustainable, and resilient.

This issue of ICRIER’s Agri-Food Trends and Analytics Bulletin advocates for a multifaceted approach to tackle hunger and malnutrition.

World Food Day serves as a reminder that tackling food insecurity requires global cooperation, smarter policies, and a commitment to sustainability. By investing in nutrition, technology, and diverse food systems, we can help ensure a better and more food-secure future for all.

Deepak Mishra
Director & Chief Executive
ICRIER



FROM THE CHIEF EDITOR'S DESK

On World Food Day 2024, with the theme “Right to foods for a better life and a better future,” we are reminded of the critical nexus between food security, poverty alleviation and economic development. The right to food is not about ensuring calories but about access to nutritious, affordable, and sustainably produced food for all. In a country like India, where agriculture remains the backbone of rural livelihoods, this theme underscores the need to address production inefficiencies and market linkages that leave millions without adequate access to food. It also requires re-visiting food policies that focus excessively on basic cereals and compromise on nutrition.

While India has made strides in food grain production, ensuring "right to food" requires us to move beyond quantity to focus on nutrition security and inclusivity. The key is not just producing more, but creating policies that encourage crop diversification, improve rural infrastructure, and foster equitable market access. A thriving agricultural sector, backed by robust policy frameworks, can guarantee every citizen the right to nutritious food, which is essential for a better quality of life and a sustainable future.

In this backdrop, the first article addresses the need to move from food security towards nutrition security. Achieving Sustainable Development Goal (SDG) 2 of Zero Hunger by 2030 remains a global challenge, with 733 million people facing hunger in 2023, and 2.33 billion people moderately or extremely food insecure. The shift from food security, which focuses on calorie needs, to food and nutrition security is crucial, as malnutrition persists despite improved food grain production. India faces a similar challenge reflecting serious hunger and malnutrition issues, particularly in children. The article highlights the need to promote agricultural diversification, nutrient-rich foods, and food fortification to ensure better nutrition outcomes. Additionally, aligning agriculture, health, and social safety nets is essential for addressing food and nutrition security and achieving SDG 2 by 2030.

The second article focusses on climate change issues that pose a growing threat to food security, with rising greenhouse gas (GHG) emissions and more frequent extreme weather events such as floods, droughts, and heatwaves severely impacting agriculture in India. Agricultural yields of key crops like wheat, rice, and maize are projected to decline due to climate change, especially under higher emission scenarios. To mitigate the impacts, the adoption of climate-resilient seed varieties, higher investment in irrigation, precision agriculture, improved risk monitoring, early warning systems, and Geographic Information System (GIS)-linked crop insurance are recommended.

The third article explores the changing patterns of food consumption in India since the 1991 economic reforms, highlighting a decline in cereal and pulse consumption and an increase in high-value food items. However, this shift has paradoxically led to a reduction in nutrient intake, sparking debates over whether this indicates poverty reduction or persistent deprivation. Using a food balance sheet approach, the study examines the gap between food availability and intake, revealing significant losses in the food supply chain due to waste, inefficiencies, and changing consumption patterns like the rise of processed foods and the HoReCa sector. It could also be either due to under-reporting of

consumption or over-reporting of production or a mix of the two. The study emphasizes the need for better data collection on production and consumption, besides food wastages, etc to address disparities in food access and reduce the availability-intake gap.

The last article examines food expenditure trends in India over the last three decades, highlighting the evolving dietary patterns and the impact of economic disparities on food consumption. It discusses how, in line with Engel's and Bennett's laws, rising incomes have led to a shift from staple cereals to diverse and high-value foods such as fruits, vegetables, and dairy. However, significant regional and rural-urban inequalities persist, as rural and lower-income households continue to spend a higher proportion on cereals, with limited access to nutrient-dense foods due to economic constraints and poor infrastructure in rural areas. The article calls for targeted policy interventions such as boosting high-value agriculture, transforming Fair Price Shops into nutrition hubs, implementing Direct Benefit Transfers for ration card holders to improve food security, enhance dietary diversity, and promote nutrition security for low-income households.

I hope these articles serve as valuable resources for policymakers, scientists, and readers helping to envision a sustainable food system in India that moves towards achieving nutritional security.

Ashok Gulati
Distinguished Professor
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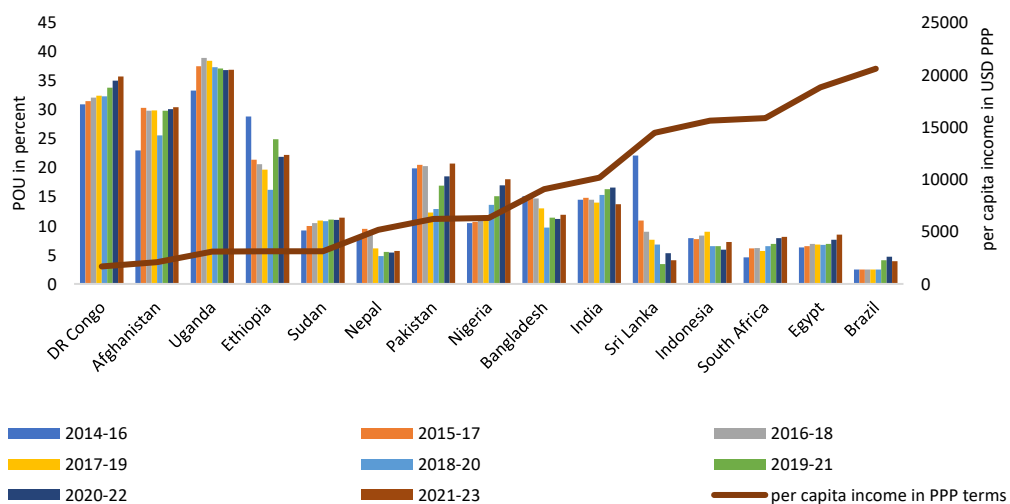
Beyond Hunger: Advancing from Food Security to Nutrition Security

Sulakshana Rao and Ashok Gulati

Achieving Sustainable Development Goal (SDG) 2 of Zero Hunger by 2030 remains a critical global challenge. Food and Agriculture Organization (FAO) assesses global hunger measured by prevalence of undernourishment (POU) - SDG 2.1.1. Despite commitments from various nations, the POU (Figure 1) remains a persistent concern, with an estimated 733 million people facing hunger in 2023 (SOFI, FAO, 2024), and 2.33 billion people facing either extreme or moderate food insecurity. The pandemic and geo-political disruptions exacerbated global inequalities, disrupting food supply chains, and increasing the vulnerability of populations at risk. Hunger is not just food scarcity but is about food access and availability. Globally, policy makers agree that eradicating hunger requires transitioning from

food security to food and nutrition security. Asia has the largest number with more than half the share of people facing hunger in the world (384.5 million). Among the countries with highest number of undernourished people (Figure 2), India has the highest (194.6 million) followed by Pakistan (48.8 million) and Nigeria (39.4 million). In Africa, 298.4 million people faced hunger in 2023 (FAO, 2023). In that sense, Asia, especially South Asia, and Africa, ought to be the focal points for those committed to abolish hunger from this planet. Achieving SDG 2 will require more than business as usual, targeted interventions to improve agricultural productivity, enhance food access, and address nutritional (healthy diets) requirements, along with policy reforms to strengthen resilience in food systems globally.

Figure 1: Prevalence of undernourishment (POU) among countries



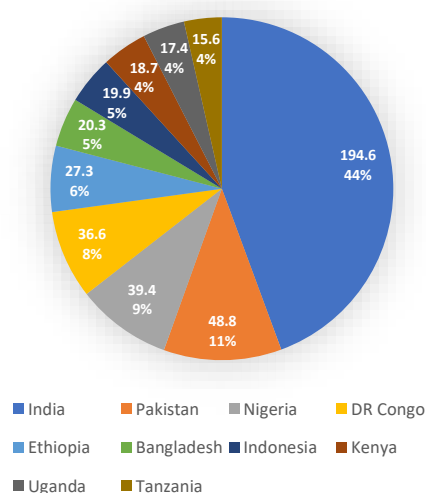
Source: FAO, 2024. *The State of Food Security and Nutrition in the World*

Food security focuses on ensuring that people have enough to eat while nutrition security deals with the need for a balanced diet that provides essential nutrients required for healthy growth

and development (INSA, 2009). This is essential as malnutrition, stunting, wasting and infant mortality rates are a recurring problem among children and women in the developing nations.

According to the State of Food Security and Nutrition in the World (SOFI) 2023 report, India's POU has gradually declined over the years, reaching 13.7 percent in 2022, which is lower than other countries with similar per capita income (Figure 1). However, despite this progress, India still has the highest number of undernourished people globally (Figure 2). Malnutrition is not only a consequence of poverty but also a driver of poverty, inequality, and human capital loss, perpetuating a vicious cycle of deprivation (Siddiqui et al., 2020). Therefore, advancing from food security to food and nutrition security is vital for achieving the UNSDGs.

Figure 2: Nations with highest number of undernourished people, in million (2022)



Source: FAOSTAT, 2023

Food Security and Nutrition Security in the Global Context

Based on World Food Summit (1996), food security is defined when “all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs for an active and healthy life” (FAO, 1996). Numerous countries have improved food security but there are significant disparities

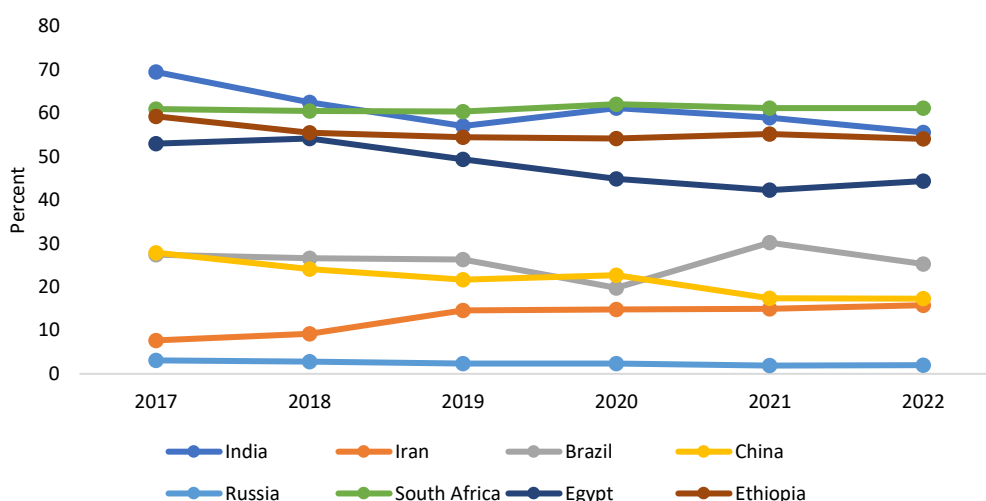
in access to nutritious diets globally as seminal reports like the SOFI show. Nutrition security is achieved “when all people at all times consume food of sufficient quantity and quality in terms of variety, diversity, nutrient content, and safety to meet their dietary needs and food preferences for an active and healthy life” (FAO, 2012). Over 2.8 billion people were unable to afford a healthy diet in 2022, and this is expected to grow (FAO, 2023).

Low-income countries bear the brunt of food insecurity. In 2022, 71.5 percent of the population in these countries could not afford a healthy diet, compared to 6.3 percent in high-income countries (FAO, 2023). Although there is a declining trend in India since 2014 (except during the pandemic period), 55.6 percent people could not afford a healthy diet basket in 2022 (Figure 3). These disparities are further deepened by food systems that favour staple crops like rice and wheat, which focus on calorie needs.

Food Security and Nutrition Status of India

India, with a population of 1.428 billion people as of 2023, faces significant challenges in addressing both food security and nutrition (UNICEF, 2023). India has made commendable strides in increasing food grain production (330 million tonnes in 2022-23) and achieving food security through public distribution systems (PDS) (free food grains to 813.5 million population) and social safety nets (GoI, 2023) yet transitioning from food security to nutrition security demands more than just increasing the agricultural output. It requires transforming how we produce, distribute, and consume food. The focus on staple grains such as rice and wheat has led to a neglect of more nutrient-rich foods, such as pulses, fruits, and vegetables.

Figure 3: Percentage of people unable to afford a healthy diet



Source: SOFI FAO, 2023¹

Note: The representation is for BRICS nations

Table 1: Nutritional indicators among children < 5 years of age

Nutrition Indicators	Children under 5 years of age (percent)		
	NFHS-III (2005-06)	NFHS-IV (2015-16)	NFHS-V (2019-21)
Infant Mortality Rate (IMR)	39	30	28
Under 5 Mortality Rate (U5MR)	45	35	32
Underweight	42.5	35.8	32.1
Stunting	48.0	38.4	35.5
Wasting	19.8	21.0	19.3

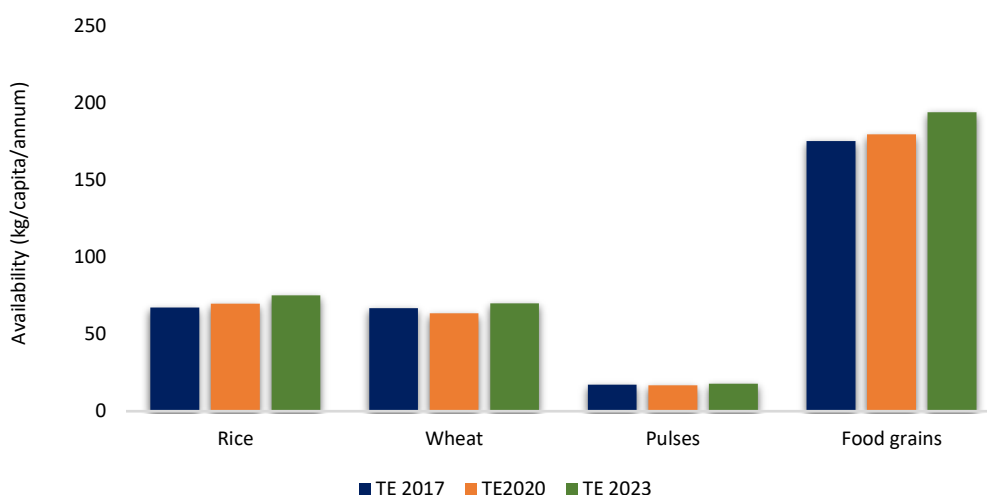
Source: IMR and U5MR from Sample Registration System Statistical Report 2014, 2019 and 2020; NFHS III, IV and V

Table 1 highlights a positive trend in child health over time, with reductions in infant mortality (IMR) and under-5 mortality rates (U5MR) as well as a decline in underweight, stunted and wasted children between 2005-06, 2015-16 and 2019-21. Despite improvements in mortality and stunting-wasting, a significant proportion of children remain undernourished. This underscores the limitations of India's current food system, which meets the calorie needs but not the broader spectrum of nutritional needs.

India's PDS has played a pivotal role in addressing caloric deficiencies, distributing free food grains to more than 813.5 million people. However, the PDS is biased towards rice and wheat which is essential but has failed to address nutritional needs. A close observation of the per capita availability of the food grains (Gol, 2023) indicate that per capita availability of pulses is lowest among rice, wheat, and food grains (**Figure 4**). The Indian government's focus on food grain security must include nutritional security by increasing the availability of pulses, coarse grains, and other nutrient-rich crops.

¹ Except UAE and Saudi Arabia

Figure 4: Per capita availability of rice, wheat, pulses, and food grains in India



Source: Agricultural Statistics at a Glance, 2023

Way Ahead: Policies and Investments to Enhance Food Security and Nutrition

Harmonizing agriculture, health policies and social safety nets are vital to advance from food security to nutrition, as India works towards achieving the SDGs by 2030. Comprehensive and multi-pronged approaches are needed to transform from food security to nutritional security. The Indian Council for Research on International Economic Relations (Jose et al., 2020) study on “Achieving Nutritional Security in India: Vision 2030” based on unit-level data from three rounds of the National Family Health Survey (NFHS), revealed that diets account for one-third of the story, while another one-third is attributed to women’s education, ensuring proper nutrition, healthcare access, and immunization; and the remaining one-third focuses on Water, Sanitation, and Hygiene (WASH) initiatives and the role of clean water and sanitation facilities in achieving better health and nutrition (Jose et al., 2020).

Agricultural policies should promote diet diversity and encourage micronutrient-rich crops production, such as pulses, fruits, vegetables, and coarse grains. Agricultural programmes need to evolve beyond increasing yields or subsidy-centric approach for rice and wheat. The policies

need to focus on augmenting farmers’ income while ensuring access and availability to healthy and nutritious foods. As discussed above, India’s food safety nets, have made commendable strides in ensuring food security, however, their bias towards rice and wheat is problematic, and the government needs to shift focus from calorie-rich staples to diverse and nutritious foods.

Govt has started many programs to address the issue of malnutrition. These programs range from fortification of rice in PDS to biofortification of basic cereals (like zinc rich rice and wheat, iron rich pearl millet, etc). Jose et al (2020) also highlighted the multiplier effect of investing in women’s education towards food and nutrition security. Another priority is interconnectedness of nutrition with WASH. Nutrition sensitive interventions could be paired with WASH efforts in line with the Swachh Bharat Abhiyan, especially in vulnerable communities for better nutrition outcomes. Transforming from food security to nutrition also requires financing to ensure stable, safe, inclusive, and nutritious food access for everyone.

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Climate change - increasing frequency of climate-related disasters – is an emerging threat to food security. Until few decades, changes in the global climate occurred naturally, across centuries or millennia, but now, human activities are altering the world's climate by increasing the atmospheric concentration of greenhouse gases (GHGs), thereby amplifying the natural “greenhouse effect” that is making the Earth warmer.

These GHGs comprise, primarily, carbon dioxide (mostly from fossil fuel combustion), methane (from rice cultivation, animal husbandry, and oil extraction), nitrous oxide (from fertilizers), and various human-made halocarbons. Global net emissions of GHGs have continued to rise from 38 Giga ton carbon dioxide equivalent (Gt CO₂ eq) (in 1990) to 59 Gt CO₂ eq (in 2019) (IPCC 2023). As a result, global surface temperatures rose above pre-industrial levels (1850-1900) by +1.1 °C in the last century. The average global temperature breached the 1.5°C mark for the first time in 2023. The temperature increase is not uniform across regions and countries.

India’s average temperature has risen by around 0.7°C during 1901–2018 (MoES 2020). The reduction of summer monsoon precipitation by 6 percent as compared to the period 1951 to 2015 has been observed with a marked decline in rainfall over the Indo-Gangetic Plains and the Western Ghat. At the same time, more intense extreme wet spells during the summer monsoon

season have been recorded over central India. Rainfall intensity beyond 150 mm per day increased by about 75 percent during 1950-2015 and the frequency of daily precipitation extremes also increased during this period.

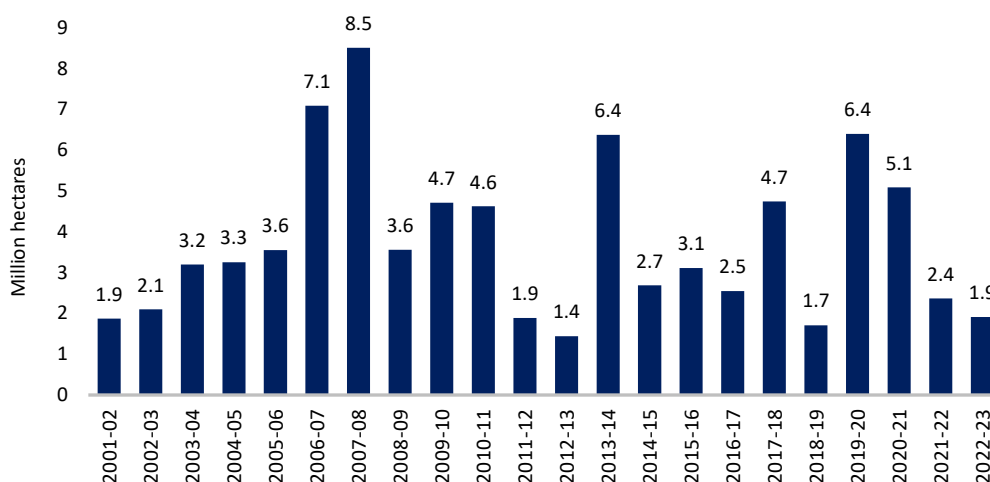
Impact of Climate Change and Extreme Weather Events on Food Security

The World Food Summit (1996) defined food security as “Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life (FAO 1996).” From the ‘ship to mouth’ in 1960s, India has come a long way to the Food Security Act of 2013 and Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) of 2020.

Agricultural activities are heavily dependent on environmental conditions, natural resources, and ecosystems. Climate and weather-related events directly affect the sustainability of agri-food sector that includes crops, livestock, fishery, and forestry. Indian agriculture has always faced climate risks; however, the frequency of some risks has begun to significantly increase. The agriculture activities are being disrupted due to flooding, water scarcity, drought, heat waves and other natural extreme events². Cumulative crop area affected due to natural extreme events from 2001-2023 was 87.2 million hectares (mha), with the highest affected area of 8.5 mha in 2007-08 (**Figure 1**).

² Natural extreme events include floods, heavy rains, landslides, lightning and thunderstorms, tropical cyclones etc.

Figure 1: Cropped area affected due to natural extreme events from 2001-2023 (All India)



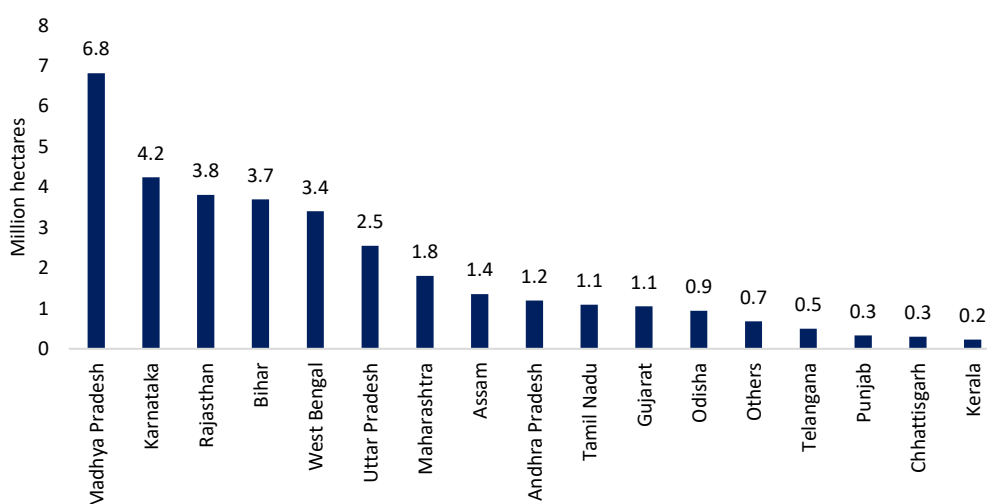
Source: Environment Statistics, NSO, MoSPI 2024

Note: 1. * as on 31.12.2019, 2. ** as on 02.12.2020, 3. # as on 31.12.2021, 4. ##25.11.2022

Hydro-meteorological calamities, including heavy rainfall and floods, have damaged 33.9 mha of India's cropped area cumulatively between 2015-16 and 2021-22, as per the Ministry of Agriculture data (Figure 2). The year-wise details are as follows: 3.36 mha in 2015-2016; 2.83 mha in 2016-17; 3.85 mha in 2017-18; 1.71 mha in 2018-19 and 11.41 mha in 2019-20, 6.66 mha in 2020-

21 and 4.18 mha in 2021-22. The data sets revealed that Madhya Pradesh, Karnataka, Rajasthan, and Bihar were among the most affected states from hydro-meteorological calamities. West Bengal, Uttar Pradesh, Maharashtra, Assam, Andhra Pradesh, Tamil Nadu, Gujarat, and Odisha were also found to be affected by these calamities.

Figure 2: Crop area affected due to hydro-meteorological calamities during 2015-16 to 2021-22



Source: MoA&FW 2022, Lok Sabha Unstarred Question No.1409

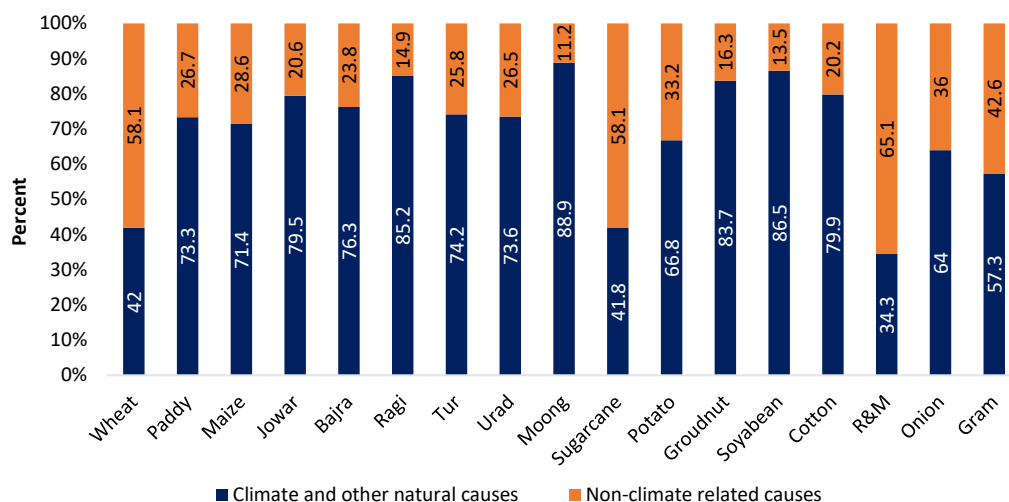
The amount of loss and damage produced by climate and natural extreme events depends on the speed and the spatial scale of the event along with the vulnerability and pre-existing risks. In

order to understand the extent of damage due to climate, Situation Assessment Survey (SAS, 2018-19) data was referred to. During July 2018-December 2018, out of the reported 38.4 percent

of agricultural crop households experiencing crop loss, 57.2 percent of the crop loss in paddy was attributed to inadequate rainfall/drought, 9.2 percent due to flood and 6.9 percent due to other natural causes. That means 73.3 percent crop losses in paddy is due to climate and weather events (Figure 3). The figure reaches even higher

for moong (88.9 percent), soybean (86.5 percent) and ragi (85.2 percent). During January 2019 – June 2019, losses due to climate and natural causes were reported in wheat (42 percent), onion (64 percent), gram (57.3 percent) and rapeseed/mustard (34.3 percent).

Figure 3: Percentage distribution of agricultural households experienced crop loss by reason (July 2018-June 2019)



Source: NSS Report No. 587: Situation Assessment Survey of Agricultural Households and Land and Livestock Holdings of Households in Rural India, 2019

Notes:

- Climate and other natural causes include inadequate rainfall/ drought; flood; other natural causes (fire, lightning, storm, cyclone, flood, earthquake etc); non-climate related causes include disease/insect/animal related causes and others
- Crop loss data for paddy, maize, jowar, bajra, ragi, arhar (tur), urad, moong, sugarcane, potato, ground-nut, soyabean and cotton was taken for the duration July 2018-December 2018. Crop loss data for wheat, rapeseed/mustard, onion, and gram was taken for January-June 2019.

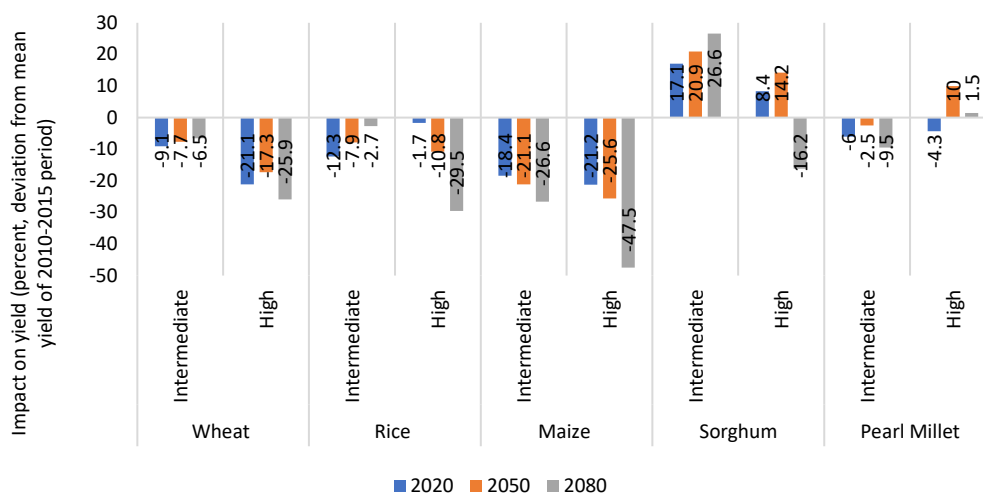
From an agricultural perspective, an analysis of the ensemble probabilistic scenarios for India was carried out at the environmental modeling lab of Indian Council of Agriculture Research (ICAR). Based on different emission scenarios, the analysis projected an increase in the minimum temperatures by 0.95 - 4.07°C in 2020 to 2080 period over baseline (1976-2005 period) in Kharif; and by 1.09-4.65°C in Rabi. An increase in maximum temperatures has been projected by 0.74 - 3.53°C (2020 to 2080) during Kharif and by 0.88 - 4.01°C in Rabi. Overall, northern parts of India to face more increase in temperatures as

compared to that in southern parts. Apart from temperature variability, an increase in rainfall by 2.3-3.3 percent in 2020 period (2010-2039), by 10.1 percent in 2050 period (2040-2068) during Kharif; and an increase by 12 percent in 2020 period and 12-17 percent 2050 period during Rabi has been projected (MoEFCC 2023). These climate change projections have substantial spatial-temporal variations with significant impacts on Indian agriculture. With the current level of technology adoption by farmers, reduction in all India wheat, rice and maize yield is projected in both intermediate as well as high

emission scenarios in 2020 period, 2050 period and 2080 period (2070-2099). However, in case of

sorghum, yield increase is projected in the intermediate emission scenario (**Figure 4**).

Figure 4: Projected impacts on cereals and millets



Source: MoEFCC 2023

Recommendations and Way Forward

Climate Resilient Seeds (Building Climate Resilience)

Since 2014, the National Agricultural Research System, under the aegis of the ICAR released 2,380 varieties of various field crops, of which, 1,971 are climate-resilient varieties. However, farmers still experience crop loss due to climate and natural reasons. Extension-related activities can facilitate the transition of research from the lab to land. The Ministry of Agriculture has also formulated District Agriculture Contingency Plan (DACP) for 650 districts to tackle weather-related challenges. These good practices and plan should be integrated in both development as well as recovery periods towards building back better.

Precision Agriculture

Through data-driven decision-making tools, precision agriculture can help farmers to adapt to climate change. Application of these tools play an important role in understanding soil types, improving soil quality, optimizing inputs such as

water, chemicals and energy and also provides early warning systems. This reduces the sector's vulnerability to climate change and optimize resource use efficiency. For example, soil moisture sensor provides real-time data on soil moisture levels which helps farmers to tailor their irrigation schedules as per the specific crop water requirements.

Invest more in Irrigation

Climate change is leading to more frequent droughts and heatwaves in many regions. This puts pressure on already dwindling water resources. Sprinkler and drip irrigation systems can improve efficiency of water distribution, reduce water use and water wastage. Investments in these systems should be promoted.

Complement Mitigation with Adaptation in Agriculture

Adaptation can reduce sensitivity and resilience against climate change while mitigation can reduce the rate and extent of the climate change.

Therefore, response options to protect agriculture from effects of climate change should include adaptation as well as mitigation. Together, they can significantly reduce climate change risks.

Climate Risk Information System

Agro-climate services, risk analysis, risk monitoring and early warning systems to enable anticipatory action must be improved to scale up climate risk reduction interventions. India Meteorological Department (IMD) runs an operational Agrometeorological Advisory Services (AAS) viz., Gramin Krishi Mausam Sewa (GKMS) scheme for the benefit of the farming community in the country. Presently agromet advisories are being prepared every Tuesday and Friday for all the agriculturally important districts (~700) and around 3100 blocks by 130 Agromet Field Units (AMFUs) and 199 District Agromet Units (DAMUs). With advanced technology and innovation, alerts and advisories to farmers and rural communities should be disseminated to ensure the information reaches the most vulnerable.

Geographic Information System (GIS)-linked Crop Insurance

Crop insurance is the safety net against extreme climate events. The current system is based on manual land records and lengthy verification processes that delays the process. The crop losses from the extreme events can be linked with advanced GIS-based monitoring tools.

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3

Widening Gap between Food Availability and Consumption

Ranjana Roy and Ashok Gulati

Since the economic reforms of 1991, India has witnessed an impressive growth trajectory, with GDP growth rates significantly surpassing those of the previous decade. This robust growth was anticipated to elevate the living standards of the country's poorer sections. One key measure of living standards is the consumption patterns of households. Data from the Household Consumer Expenditure Surveys (HCES) reveal a steady decline in the consumption of cereals and pulses, accompanied by a marginal increase in high-value items. However, this shift has paradoxically led to a reduction in nutrient intake, igniting a contentious debate among scholars.

On one side of the debate, some, like Deaton and Dreze (2009), argue that the decline in calorie consumption does not necessarily reflect worsening poverty, but rather a weakening relationship between income and calorie intake. On the other side, researchers like Patnaik (2010) points to persistent hunger and deprivation, highlighting that a significant portion of the population still fails to meet minimum per day nutritional requirements of 2400kcal for rural India and 2100kcal for urban India³.

In light of this debate, the present study aims to examine the issue from a new angle, by estimating nutrient intake using the food balance sheet approach, which tracks food supply at the national level. This supply-side estimate will then be compared with the direct consumption data reported in the surveys conducted by the Ministry of Statistics and Programme

Implementation (MoSPI), offering a fresh perspective on the so-called "calorie consumption fallacy."

Methodology

A food balance sheet provides a comprehensive overview of a country's food supply over the course of a given year. For each commodity, it details the amount available for human consumption, accounting for all sources of supply. The total supply is calculated by adding domestic production to imports and adjusting for changes in stock levels. To arrive at the net availability for consumption, adjustments are made for various uses, such as exports, livestock feed, seed usage, and losses incurred during storage and transportation. This approach offers a complete and systematic picture of food availability and utilization.

Availability of Non-Perishables are defined as:

$$\begin{aligned}
 \text{Availability}_t = & (\text{Marketed Surplus}_t / \text{Farmers' Sale}_t) + \\
 & (\text{Imports}_t - \text{Exports}_t) + \\
 & \text{Stock}_{t-1} \dots \dots \dots (1)
 \end{aligned}$$

Availability of Perishables are defined as:

$$\begin{aligned}
 \text{Availability}_t = & (\text{Marketed Surplus}_t / \text{Farmers' Sale}_t) + \\
 & (\text{Imports}_t - \text{Exports}_t) \dots \dots (2)
 \end{aligned}$$

³ With increasing urbanization and technological advancements, the average calorie requirement has gradually declined. The rise of sedentary jobs, automation, and widespread use of technology in

daily life reduces the need for high-calorie diets. In the latest guideline of National Institute of Nutrition (NIN) balanced diet is expected to provide 2000kcal per day.

Availability of Rice and Wheat are defined as⁴:

$$\text{Availability}_t = (\text{Marketed Surplus}_t - \text{Procurement} + \text{OMSS}) + (\text{Imports}_t - \text{Exports}_t) + \text{Stock}_{t-1} \dots \dots (3)$$

$$\text{MS}_t = \text{Production}_t - (\text{seed} + \text{feed} + \text{self-consumption} + \text{Farm Operation Losses}_t) \dots \dots (4)$$

To estimate availability for various crops, the study has used production data from Ministry of Agriculture and Farmers' Welfare (MoA&FW), Government of India (GoI) and Food and Agriculture Organisation of the United Nations (FAOSTAT); export and import figures were obtained from Directorate General of Foreign Trade (DGFT), Ministry of Commerce and Industry, GoI. Information on seed, feed wastage was gathered from Agricultural Statistics at a Glance, MoA&FW, GoI. Data on losses at different stages of the supply chain were obtained from a study conducted by NABARD consultancy services (NABCON)⁵.

National Statistical Office's HCES⁶ collects data of expenditures on and quantity consumed of different categories of consumption items. Among the food items physical quantity consumed of 8 food items are considered: Cereals & Cereal Substitutes, Pulses & Pulse Products, Edible Oil, Sugar and Sugar Products, Vegetables, Fruits, Milk and Milk Products and Egg, Fish & Meat. In the previous rounds of HCES, data are recorded with 3 recall periods: Uniform Recall Period (URP) (each item is recorded with a reference period of 'last 30 days' preceding the date of survey), Mixed Recall Period (MRP) (expenditure on clothing, bedding, footwear,

education, medical and durable goods is recorded for a reference period of 'last 365 days', and expenditure on other items is recorded with a reference period of 'last 30 days') and Modified Mixed Recall Period (MMRP) (household expenditure on high frequency items like edible oil, fish and meat, vegetables, fruits, spices, beverages, refreshments, processed food, pan, tobacco and intoxicants is recorded for a reference period of 'last 7 days', and for all other items, the reference periods are same as in case of MRP). MMRP data is considered to be the most appropriate in monitoring consumption, and it is available in the two rounds of HCES 2011-12 and 2022-23. This study utilized data from the most recent two rounds to ensure comparability.

The formula to estimate average per capita consumption for the entire population from the sample is as following:

$$\text{Per Capita Consumption} = \frac{\sum (\text{per person sample consumption}) * (\text{Household Size}) * (\text{Weight})}{\sum (\text{Household Size}) * (\text{Weight})}$$

The gap between food availability and actual intake represents the loss of edible food and nutrients at various stages, including storage, stocks in possession of traders, preparation, cooking, and plate waste. However, this discrepancy could also stem from potential overestimation of production figures or underestimation of consumption, as surveys like the HCES may not fully capture food eaten outside the home or other factors. To explore this divergence, we calculated the difference between availability (based on the food balance sheet) and intake (from HCES data), and expressed this gap as a proportion of total food

⁴ OMSS stands for Open Market Sale Scheme, which is a program run by the Food Corporation of India (FCI) to sell excess wheat and rice stocks at predetermined prices. The scheme is designed to help control inflation and make food grains more affordable for the public.

MS stands for Marketed Surplus explained in equation 4

⁵ NABARD stands for National Bank for Agricultural and Rural Development

⁶ The National Statistical Office (erstwhile National Sample Survey Organization) has been conducting this survey since its inception in 1950 and

the quinquennial surveys took place every five years. But the latest survey was conducted after a long gap of ten years. The present survey was carried out from August 2022 to July 2023 across the entire Indian Union, with the exception of a few inaccessible villages in the Andaman and Nicobar Islands. The survey encompassed 8,723 villages, covering 155,014 households in rural areas, and 6,115 blocks, covering 106,732 households in urban areas.

availability. This analysis was conducted in physical consumption terms. Understanding this discrepancy is crucial for identifying inefficiencies in the food system and improving data accuracy.

Trends in Food Availability

There has been steady increase in the per capita availability of food items in the last two decades. Food availability has changed in conformity with the change in consumption basket of the population (Chand & Singh, 2024, Damodaran, 2024). Availability of cereals has increased at a moderate rate of 0.6 percent per annum in the period of 2000-01 to 2022-23 indicating stagnant level of supply. The availability of pulses, edible oil, and sugar has increased at 3.3 percent, 5.7 percent, and 2.3 percent per annum respectively in the same period. From 2014-15 to 2022-23, the poultry meat, fishery, eggs, and milk subsectors recorded average annual production growth rates of 9.2 percent, 9.1 percent, 6.6 percent, and 5.8 percent respectively. The horticulture sector grew at 3.9 percent per annum in the same

period. Hence, the agriculture growth in the last decade has been largely contributed by the livestock sector.

India's Experience with Food Consumption

In addition to shifts in food expenditure patterns, there has been a notable change in the physical quantities of various food products consumed. The per capita consumption of grains has been steadily declining, and its share in total consumer spending has also decreased. At the same time, there has been an increase in the proportion of expenditure allocated to other food categories. In physical terms as well, consumption of cereals and pulses declined, while consumption of edible oil, eggs, fish, meat, milk, sugar, vegetables, and fruits have increased (Table 1). The most prominent rise is observed for milk and edible oil. In India as vegetarianism is a prevalent practice among the upper caste population, increase in consumption of milk can be assumed to be an indicator of diversification.

Table 1: Per capita monthly consumption of major food items (in kg)

	2011-12	2022-23	Percentage Change in Consumption (percent)
Cereals	10.7	9.17	-14.3
Pulses	0.82	0.78	-4.9
Edible Oil	0.73	0.90	23.3
Eggs (no)	0.14	0.25	78.5
Fish	0.26	0.26	0
Meat	0.31	0.49	58.1
Milk liquid (litre)	4.64	5.14	10.8
Sugar	0.74	0.75	1.3
Potato	1.86	1.77	-4.8
Onion	0.87	1.17	34.5
Tomato	0.65	0.80	23.1
Banana (no)	0.70	0.82	17.1

Source: Estimated from household level HCES data

Availability-Intake Gap

Food availability refers to the physical quantity of food stock present in sufficient amounts. In any country, this availability is influenced by factors

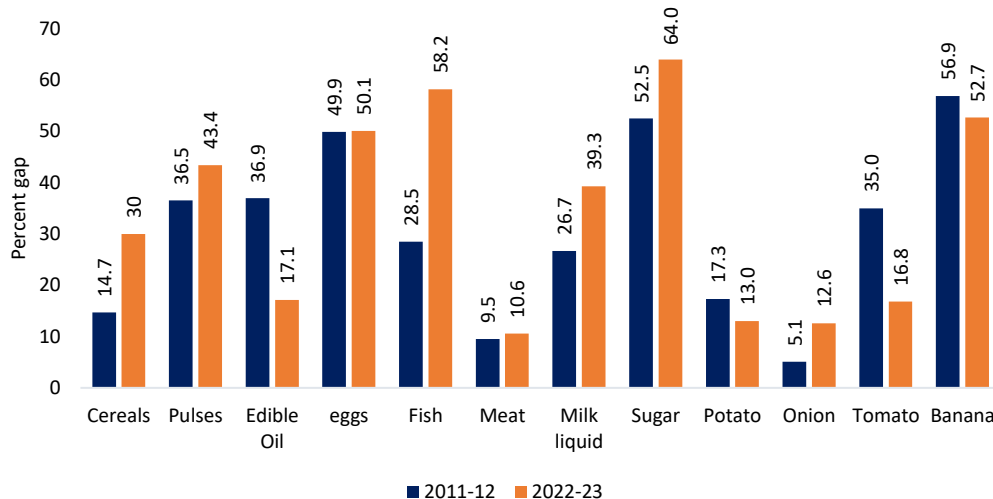
such as transportation, storage, infrastructure, and the degree of market integration. However, stocks held by traders, producers, and consumers are excluded when calculating these availability figures. National food availability surpasses

national food consumption by the extent of spoilage, waste, and diversion to non-food uses outside of households. Examples of such waste include wheat lost during flour production, fruits and vegetables spoiling in transit, fat and meat discarded from carcasses before reaching consumers, and sugar lost between the refinery and point of sale. Wastage is naturally higher for perishable products like fruits and vegetables.

Access to food depends on the economic capability of household and opportunities available to them to acquire enough food. The difference between access and absorption arises due to inability of households to biologically utilize the food consumed which requires access

to safe drinking water, sanitation, primary healthcare facilities and hygienic environment. These factors keep a gap between availability and absorption of food. The disparity between availability, access and absorption varies across countries. The FAO study found that low-income countries experience wastage in the early stage of supply chain that is in the post-harvest (transportation, handling storage) while the developed countries suffer waste at the consumption level (Gustavsson, J et al, 2011). With mechanization of agriculture, food loss and wastage are supposed to minimize. But for India, surprisingly the gap between availability and intake is expanding except for a few items (**Figure 1**).

Figure 1: Availability-Intake Gap as a Share of Availability



Source: Authors' Calculation

With economic growth and rising per capita income, there is often a shift in consumer behaviour, where a larger proportion of food consumption is directed toward processed foods and the Hotel, Restaurant, and Catering (HoReCa) sector. This shift in consumption patterns tends to widen the gap between food availability (the physical supply of food) and food intake (the actual amount consumed by households). The

gap occurs because consumption through processed food channels and the HoReCa sector is not fully captured by household surveys, which traditionally measure direct household consumption. Even though HCES data adjusted for 'meals taken outside home' while calculating the nutritional intake figures, absolute consumption of food items does not factor in HoReCa consumption⁷. As per market intel

⁷The current HCES 2022-23 report does not provide data on calorie and protein intake. Further analysis is required to estimate the nutritional outcomes accurately.

around 20-25 percent of total household consumption is attributed to HoReCa sector. Factoring that in reduces the gap between availability and intake in specific food categories like cereals and pulses. The gap narrows to 17 percent for cereals and 29 percent for pulses in 2022-23. This indicates that previously, a portion of the food that was categorized as "wastage" or unaccounted for in household surveys may actually be consumed through other channels such as food services and processing industries.

This shift highlights the importance of accounting for new consumption patterns in the calculation of national food availability and intake, particularly as economies develop and diets become more diversified.

Policy Implications

Farm diversification has been mirrored by a shift in dietary patterns, with household consumption expenditures moving away from calorie-dense foods toward those higher in proteins and micronutrients. This is very much in line with the Bennet's Law. However, the increasing gap between food availability and intake underscores the urgent need to reassess the survey methodology. In case of cereals and fish, the gap has more than doubled, while in case of edible oils and tomatoes, it has more than halved. It needs attention from the authorities monitoring these databases. What could be the reasons for such dramatic shifts on both sides? It could be either the consumption of fish and cereal is being underestimated or more likely their production is being overestimated. HCES agencies need to give some explanation with respect to such wide changes.

While the HCES provides valuable data on the consumption and nutritional status of the Indian population, there is considerable room for improvement. Recent trends in nutritional intake have been puzzling, indicating a pressing need for

more effective nutrition monitoring systems. Furthermore, India lacks comprehensive data on food wastage, an area that warrants focused research. Given that many people continue to live near the poverty line, reducing food waste could significantly enhance their livelihoods and contribute to food security.

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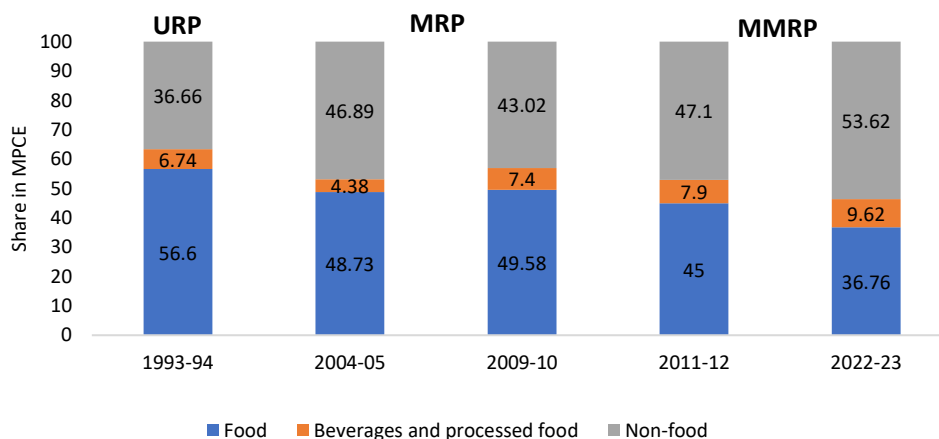
Understanding Consumption Expenditure Inequalities in India

Raya Das and Ashok Gulati

On World Food Day, observed on 16th October, it is a reminder to give a global call to prioritize food and nutritional security for all. To achieve that, it is important to understand the patterns of food expenditure, hunger, malnutrition, and inequality. According to Food and Agriculture Organization (FAO), globally 2.33 billion people do not have economic access to adequate diets (FAO, 2023). As highlighted in the World Inequality Report 2022, the global landscape is becoming increasingly unequal. Inequality can be measured in three main ways: income inequality, wealth inequality, and consumption inequality. In terms of income inequality, India fares better than major BRICS countries, with a Gini coefficient of 0.328, compared to Russia at 0.351, Brazil at 0.520, and China at 0.357 (World Bank, 2021). However, consumption inequality provides a more nuanced

view by examining disparities in access to essential goods and services, particularly food, which has a significant impact on food and nutritional security. This measure highlights the extent to which various segments of population can meet their basic needs, offering a broader perspective on living standards and quality of life. Access to the high-value nutritious foods remain uneven, both globally and within countries like India, where economic disparities, and the rural-urban divide significantly impact food consumption. This article explores food expenditure trends and the extent of inequality in the consumption pattern in India. It can help in understanding what could be the right policy choices for inclusive wellbeing of the population, especially in terms of eating adequate and nutritious food.

Figure 1: Trend in percentage composition of monthly per capita expenditure (MPCE) 1993-94 to 2022-23



Source: Household Consumption expenditure surveys (HCES), National Sample Survey (NSS), various rounds. Note: 1. # Estimated no. of households are derived from various NSS rounds. 2. Regarding the share in MPCE, 1999-00 and 2004-05 are based on Mixed Recall Period (MRP= reference period of “last 365 days” for

clothing, footwear, education, medical (institutional) expenses and durable goods and “last 30 days” for rest of the items) and 2011-12 and 2022-23 are based on Modified Mixed Recall Period (MMRP=The estimate of MPCE is based on household consumer expenditure on edible oil, egg, fish and meat, vegetables, fruits, spices, beverages, refreshments, processed food, pan, tobacco and intoxicants recorded for a reference period of “last 7 days”, 30 days for all other food, fuel and light, miscellaneous goods and services including non-institutional medical, rents and taxes, “last 365 days” for clothing, footwear, education, medical (institutional) expenses and durable goods. CPI weights use MRP method for estimation for 2011-12 CES round.

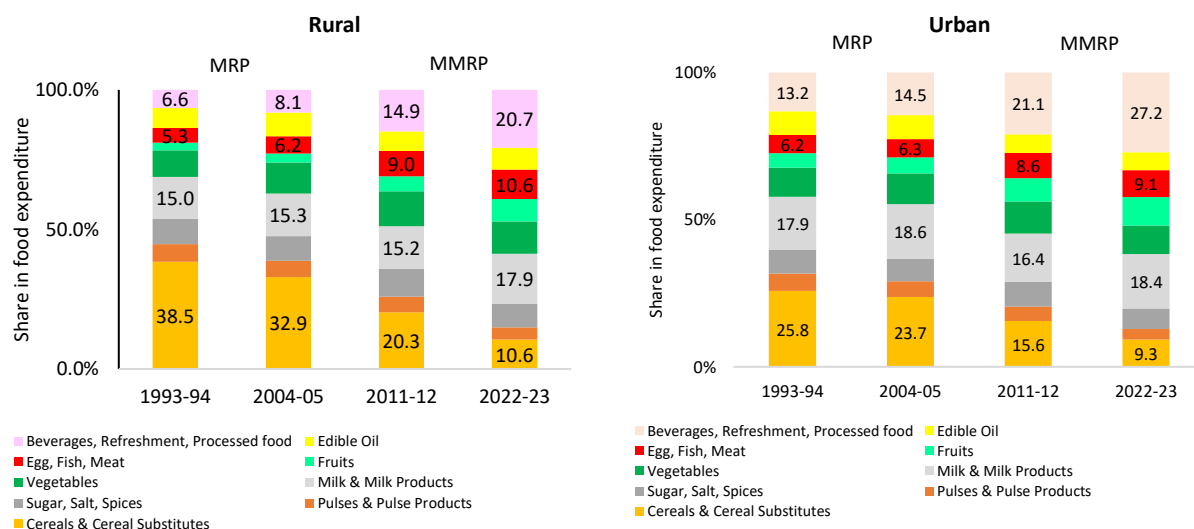
Consumption Expenditure Pattern in India

Engel’s law states that as per capita income increases, the proportion of income spent on food decreases, and non-food expenditure increases. This applies to individuals within households at any given time when comparing households of different income levels, as Engel did, and also over time for society as a whole as its average income grows (A. Chai & A. Moneta 2010, Zimmerman, 1932). Therefore, the proportion of total expenditure allocated to food is often utilized as an indicator of economic development. For India as well, there has been a steady decline in the share of expenditure on food (excluding beverages) from 56.6 percent in 1999-00 to 36.76 percent in 2022-23 (Figure 1).

Bennett’s Law complements this stating that as a household’s income increases, the proportion of income spent on staple foods such as cereals

decreases, while the proportion spent on non-staple foods (such as meats, fruits, vegetables, and processed foods) increases. At the 2022-23 price level, real urban monthly per capita consumption expenditure (MPCE) in India saw a significant increase, rising from Rs. 2,589 in 1993-94 to Rs. 6,459 in 2022-23. In rural areas, the MPCE also increased markedly, from Rs. 1,379 to Rs. 3,773 during the same period. This rise in expenditure levels reflects overall economic growth and improved living standards. Concurrently, the share of cereals in total food expenditure has decreased substantially, indicative of a dietary shift towards more diverse food items. In rural India, the proportion of expenditure on cereals in food dropped from 38.5 percent to 10.6 percent from 1993-94 to 2022-23, while in urban India, it declined from 25.8 percent to 9.3 percent during the same period (Figure 2).

Figure 2: Share of different food items in total food spending in India (Bennett Law)



Source: HCES, NSS, various rounds

Inequality and the Rural-Urban Divide in Consumption Expenditure

This section digs into the consumption inequality trend in last ten years and how does it vary between rural and urban and across regions in India. Overall inequality in rural and urban area have declined between 2011-12 and 2022-23. The Gini coefficient of consumption expenditure in urban areas declined from 0.363 in 2011-12 to 0.314 in 2022-23, while rural areas witnessed a decrease from 0.283 to 0.266 during the same period. The decline in Consumption Expenditure inequality can be explained through the free food distribution to 813.5 million population. The National Food Security Act (NFSA) was implemented by the UPA government, led by Congress, in 2013, aiming to provide subsidized food grains for large sections of population in India. However, in 2015 the Modi government came to power under the National Democratic Alliance (NDA) and continued to implement the program. The highly subsidized Public Distribution System (PDS) was further expanded, and under the Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) initiated in 2020, beneficiaries were provided with 5 kg of free rice or wheat per person per month. This free food distribution to about 58 percent of population may have reduced the consumption expenditure on basic cereals in the last decade. On the growth front, the average growth rate during UPA Govt between Financial Year 2004-05 (FY05) to (FY14) was 6.8 percent in contrast to that, it has been lower during Modi period of FY 15 to FY 24 at 5.9 percent (average annual rate of growth, revised series with 2011-12 base, MOSPI). Hence, even though the growth rate was marginally lower during the NDA period, it has been more inclusive as the inequality in consumption-expenditure declined from 2011-12 to 2022-23. However, the rural-urban divide in food consumption patterns remain a significant concern, which is also reflected from the stagnant real wage rate in rural India at 0.54 percent between 2015-16 to 2022-

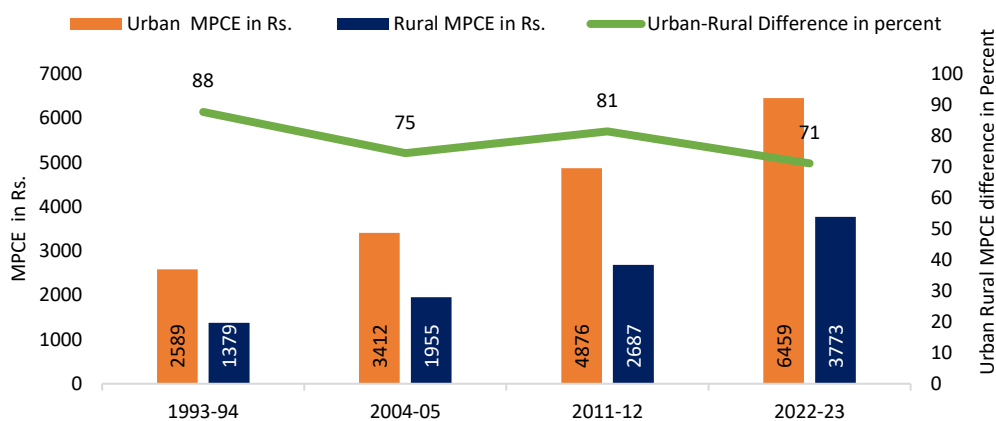
23 (Labour bureau statistics, GoI). Urban households, with better access to diverse markets and higher disposable incomes, are more likely to consume high-value foods. In contrast, rural households, especially in lower-income brackets, face barriers in accessing nutritious foods due to limited market access, inadequate infrastructure, and lower incomes. This divide has implications for public health and nutritional outcomes, as rural population is more likely to face malnutrition and micronutrient deficiencies. For instance, the share of anaemic male population is higher in rural areas compared to urban areas (NFHS-5, 2021). However, rural urban divide of consumption expenditure has declined over the period, from 88 percent in 1993-94 to 71 percent in 2022-23 (at 2022-23 constant price). This decline in the gap suggests that rural and urban consumption expenditure patterns are slowly converging, though urban households continue to spend significantly more than their rural counterparts (**Figure 3**).

Hence, the question remains: is the free food distribution to 813.5 million people the right policy choice for ensuring inclusive growth with nutrition security for the country? Given the stagnant rural wage rates and the significant gap in rural and urban consumption expenditure, it is evident that many rural households lack the capability to access a diverse range of foods. Access to high-value foods is constrained by both economic and logistical factors. For low-income households, the cost of nutrient-dense foods remains prohibitive, leading to continued reliance on cereals and starchy foods. Additionally, poor infrastructure in rural areas limits the availability of perishable items like fruits, vegetables, and dairy products. PDS focuses primarily on cereals, which, while addressing calorie intake, does little to improve dietary diversity. For cereals, there has been a decline in average per capita consumption across all income groups in both rural and urban areas indicating the dietary shift among the population as well. At all India level

per capita cereal consumption declined from 10.7 kg per capita to 9.17 kg per capita between 2011-12 and 2022-23 (HCES). There is an inverse relationship between anaemia and dietary

diversity indicating the role of access to high-value food in nutrition security and health wellbeing (Gol, 2024).

Figure 3: Trends of real MPCE in rural and urban India at 2022-23 prices



Source: HCES various round

Policy Implications

Access to high-value foods, such as fruits, vegetables, and dairy products, remains a significant challenge for low-income households in India. Economic constraints and inadequate infrastructure in rural areas contribute to the limited availability and affordability of these nutrient-dense foods. Although government programs like the PDS aim to ensure food security by primarily focusing on cereals, they often fail to enhance dietary diversity, which is crucial for improving overall nutrition.

Boosting High-value Agriculture Production

To ensure the availability of high-value foods, agriculture policies should prioritize investments in agricultural productivity, particularly for fruits, vegetables, livestock, and fisheries to cater to the growing demand. This includes improving irrigation facilities, providing access to quality seeds, and adopting modern agricultural practices that enhance crop yield and value-chain efficiency (Das et al., 2024). Supporting smallholder farmers through technical assistance

and policies encouraging diversification of agriculture needs to be boosted.

Transforming Fair Price Shops (FPSs) into Nutrition Hubs and Food Stamps Approach

More than 800 million beneficiaries under the NFSA are receiving assistance through the PDS across India. This aid is facilitated through a network of 5.45 lakh FPSs throughout the country. At least 10 percent of the existing FPSs can be transformed into nutrition hubs by linking it with food coupon approach. Beneficiaries can redeem these coupons at these nutrition hubs for a diverse range of produce, including eggs, pulses, and millets, alongside the cereals. This can play a crucial role in addressing the nutritional deficiencies prevalent among the poorer sections of society.

Direct Benefit Transfers (DBTs) for Ration Card Holders

Transitioning from the current in-kind transfer system to a cash transfer model can effectively address several issues associated with the PDS.

Implementing DBTs allows beneficiaries to choose the food items they need rather than being confined to standard rationed items. This flexibility empowers beneficiaries and helps them make dietary choices that meet their nutritional needs. Furthermore, it can alleviate the administrative burden on the government, streamlining the distribution process. The cash transfer system can be electronically linked to Aadhaar, ensuring secure and targeted transfers at the beginning of each month, thereby enhancing the efficiency and effectiveness of assistance provided to low-income households.

Promoting Alternative Employment Opportunities in Rural Areas

To further reduce the rural-urban divide in consumption expenditure, it is essential to create alternative employment opportunities in rural areas that can supplement agricultural income. This could involve fostering agro-based industries, promoting rural entrepreneurship, food processing units and supporting skill development programs. By diversifying income sources, households from the poorest decile can have more access to food and nutrition security.

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Visit to Punjab & Haryana (September 2024)

As part of the study on "Incentive Structures for Paddy versus Other Competing Crops in Punjab and Haryana," supported by the Ministry of Agriculture and Farmers' Welfare (MoA&FW), our team comprising Dr. Reena Singh, Dr. Ranjana Roy, and Ms. Purvi Thangaraj visited various stakeholders in both states. These stakeholders, including the Secretary of the Department of Agriculture (Government of Punjab), Punjab State Power Corporation Ltd., the Farmers Commission, and local farmers, provided insights into the challenges of crop diversification and efforts to reduce stubble burning in Punjab and Haryana.

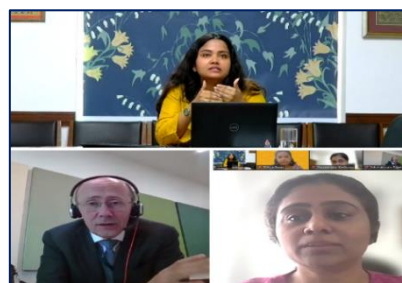


Conference/Workshop



- **Dr. Ashok Gulati**, Chaired & Co-Chaired multiple sessions in the 32nd Global International Conference of Agriculture Economists on "Transformation Towards Sustainable Agri-Food Systems", 2-7 August 2024, New Delhi, organised by the International Association of Agriculture Economists.

- **Dr. Raya Das** delivered a comprehensive presentation on the study titled, "**Reducing Postharvest Losses in Indian Agriculture: A Case Study of Selected Crops**," conducted in collaboration with Dr. Ashok Gulati and Dr. Alex Winter-Nelson at the 7th quarterly meeting for the Friends of Champions 12.3 India network organized by World Resources Institute (WRI), India.



- **Dr. Reena Singh** was the Panelist for the session "**Green Urea: Economic and Environmental Benefits**" organized by International Forum for Environment, Sustainability and Technology (iFOREST) on 30th July 2024. During the session, she highlighted environmental problems associated with the manufacturing, hydrolysis and use of urea in agriculture. She presented nitrogen oxide emission estimates from urea application in Indian agriculture and emphasized on transition from "**grey urea**" to "**green urea**".

- **Dr. Ashok Gulati** participated in a meeting under the Chairmanship of Hon'ble Prime Minister, Shri Narendra Modi on the theme of "An agenda to accelerate Growth and Employment across Regions and Sectors" organised by the Niti Aayog, 11th July, 2024.



- **Dr. Ashok Gulati** delivered a Lecture at the Policy BootCamp 2024 organised by the Rishihood University, Sonipat, Haryana, 02nd July, 2024.

Publications

- Thangaraj, Purvi, and Ashok Gulati: "[Union Budget 2024–25: What Does It Have for Rural–Agri Space?](#)," Economic and Political Weekly (EPW), Vol. 59, Issue No. 39, 28 Sep, 2024
- Singh, Reena, Purvi Thangaraj, Ritika Juneja and Ashok Gulati: "[Saving Punjab and Haryana from Ecological Disaster](#)," Economic and Political Weekly (EPW), Vol. 59, Issue No. 38, 21 Sep, 2024
- Roy, Ranjana and Prerna Terway (2024). Rising Wage Income and the Role of MGNREGA among Agricultural Households in India: Evidence from the Situation Assessment Survey, 2018–19. The Indian Journal of Labour Economics, 1-17.
- Roy, Ranjana, (2024) Presented a poster titled "The Impact of Farmer Producer Organizations in Sustainable Income Augmentation of Agricultural Households in India" on Wednesday, August 7, 2024. 32nd International Conference of Agricultural Economists
- Das, Raya (2024). Presented a poster titled "Is Contract Farming a Risk-Averse Strategy for Livelihood Sustainability? Evidence from West Bengal" on Wednesday, August 3, 2024. 32nd International Conference of Agricultural Economists
- Thangaraj, Purvi and Ashok Gulati: "[Union Budget FY25: What does it have for Rural-Agri Space?](#)", Policy Brief No. 22, ICRIER.
- Singh, Reena, Purvi Thangaraj, Ritika Juneja and Ashok Gulati: "[Saving Punjab and Haryana from Ecological Disaster: Re-aligning Agri-Food Policies](#)", Policy Brief No. 21, ICRIER.

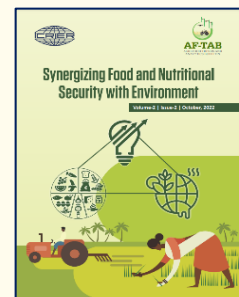
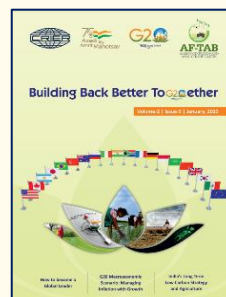
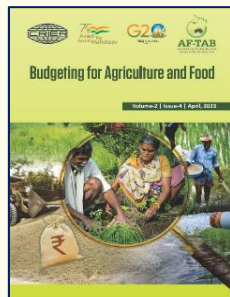
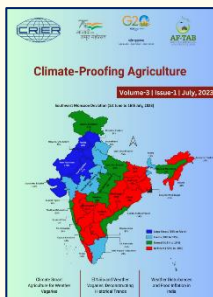
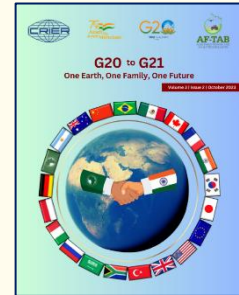
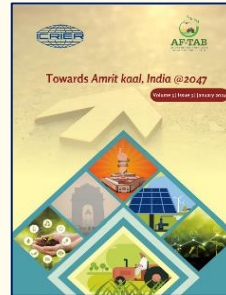
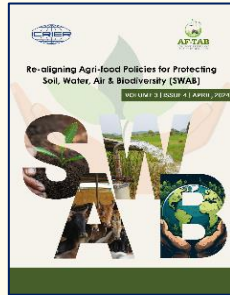
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