

Food Security in India: Concerns and Challenges

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Abstract

Food security means all people at all times have economic and physical access to food for dietary needs and healthy life. Ensuring food security for all is a challenge at the global level. Developing nations need help with food security. Developing countries like India are facing a severe challenge in ensuring food security. Various international and national factors contribute to food security. Global factors such as climate change affect agriculture production and productivity. Rising temperatures, increasing greenhouse gas emissions, erratic rainfall, and increasing flood and drought events affect food security adversely. The declining proportion of millet in total food production is another severe issue for physical and economic access to healthy food. Millet's crop is a consumer, environment, and farmer's friend. Several factors, such as increasing population, urbanization, food waste, reducing land for cultivation, and unhealthy change in crop patterns, are making the problem of food security more difficult. The increasing population and resulting anthropogenic activities are putting pressure on natural resources. This article discusses the food security problem and the factors contributing to this problem in the Indian case. We need to work on several fronts to ensure physical and economic access to healthy food security for the increasing population.

Keywords: Food security, SDG, GHI, FWI, Food subsidy, food availability.

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Food Security a Global Issue

Food security is a multifaceted and challenging issue and is not confined to some area or group, i.e., locality, income, education, and demography. The food availability at the global level is adequate; however, nearly one billion people chronically need more food. This size equals sixteen Percent of the world population. At the worldwide level, sixty Percent of hungry people are women, and more than five million children are undernourished (World, 2016). The highest number of food-insecure people globally belongs to Asia (ERS, 2017).

Table 1 indicates the problem of food insecurity in India. The problem of food security and nutrition in India is grave. In 2019-21, 17.8 percent of the population was undernourished. The government of India distributes

food through the public distribution system (PDS), Mid-day Meal (MDM), Integrated Child Development Scheme (ICDS), and National Food Security Act (NFSA). This indicates the need for more purchasing power to buy food. The food subsidy budget is increasing.

The public distribution system is the prime source of food distribution in India. The enactment of the National Food Security Act in 2013 was India's most significant food distribution step. Pradhan Mantri Garib Kalyan Yojana (PMGKAY) is India's most extensive food distribution system. Under PMGKAY, the government of India provides food security to 810 million people annually. The financial outlay of this scheme in 2023-24 was Rs 11.8 lakh crore (Economic Survey, 2023-24).

Table 1: Status of Food Security and Nutrition in India (in Percent)

Sr. No	Parameter	Size
1.	Undernourishment in 2019-21	17.8
2.	Stunting among children under 5 in 2020	30.9
3.	Wasting among children under 5 in 2020	17.8
4.	Anaemia among women aged 15 to 49 years in 2019	53.1
5.	People unable to afford a healthy diet in 2020	70.6
6.	Urban population living in slum areas in 2018	35.2

Source: FAO, 2023

NSSO consumption expenditure survey 2022-23 data indicates that in Rural India, 48 percent of Monthly Per Capita Consumption Expenditure (MPCE) is being spent on food items. In urban areas, 37.7 percent of MPCE is being spent on food items. In 1999-2000, this percentage was 59.4 for rural areas and 48.6 percent in urban areas. The share of cereal in MPCE was 12.35 in 1999-2000, which was reduced to 4.49 percent in 2022-23 in urban areas and 22.16 to 6.10 percent in rural areas.

Sixty-four percent of children aged from five to fifty-nine months are anemic. Fifty-four and forty-five Percent of pregnant and non-pregnant women were anemic in 2019-21 in the age group 15-49 years, respectively. In the age group of fifteen to nineteen years and fifteen to forty-nine years, 56.5 and 53.8 percent, respectively, women were anemic in 2019-21 in India. The NSHS-5 mentioned above data indicates the poor malnutrition situation in India.

Global Hunger Index (GHI) published by Welt Hunger Hilfe and Concern Worldwide, Bonn/Doblin annually globally. The Index does not use the definition of hunger given by the Food and Agriculture Organisation. It counts the undernourished population to represent hunger. The indicators used in calculating GHI have a biased weight structure. Several indicators unrelated to hunger have a high degree of positive association among them and do not represent the entire population, indicating the Index is biased. Weight structure and calculation of some indexes based on arithmetic mean do not comply with the ideal Index's time and factor reversal properties. The Index was calculated based on the wrong data. Global Hunger Index indicates that India lies in the 'serious' hunger category. This Index put India on 105 ranks out of 127 countries in 2024.

Global Food Security Index (GFSI) incorporates the issue of affordability, availability, quality safety, sustainability, and adaptation aspects of food security. Affordability means the ability to buy food items, the effect of price change on food availability, and government intervention during price shocks. The availability aspect incorporates food production, risk to supply shocks, food distribution, and research efforts to increase food production. The quality and safety aspect includes the average food nutrition quality and safety of

food. Sustainability and adaptation aspects of food security include the elements of the country's exposure to the effects of climate change, natural resource risk, and adaptability. In the Global Food Security Index (GFSI), India secured 68 ranks out of 113 countries with a score of 58.9 out of 100 in 2022, an improvement of 5.1 since 2012.

Food Security and Sustainable Development Goals

Food security is part of Sustainable Development goals. Sustainable Development Goals (SDG) 2.0 spells "End hunger, achieve food security and improved nutrition and promote sustainable agriculture" up to 2030. Food security affects all aspects of life. Other SDGs are only possible to achieve when dealing with the lack of food security. SDG 1.0 is about ending poverty, primarily related to food security. SDG 3.0 is associated with a healthy life for all age groups; food availability at all times at affordable prices is also related to this goal. SDG 4.0 describes the opportunity for education and lifelong learning. With proper food security, education, and lifelong learning goals are achievable.

The provision of Mid-Day Meals in school indicates the interlinkage between food security and learning outcomes. SDG 5.0 is related to gender equality and women empowerment, which has one component of food insecurity. SDG 6.0 is related to water and sanitation. Water resource management is deeply related to agriculture and food production. SDG 7.0 is related to energy security. The increasing role of agriculture and food grain production in energy security establishes the role of food security and energy security. SDG 8.0 is related to sustainable economic growth, and employment is strongly associated with agriculture and food grain production, which are linked to various vital links, especially in developing countries like India.

SDG 9.0 is about infrastructure, industrialisation, and innovation. The rural economy is primarily dependent on agriculture. The productivity growth in the agriculture sector paves the path of industrialisation via labour force shifting from the primary industry to the secondary sector. Higher growth in the agriculture sector makes the agriculture-industry linkages better. SDG 10.0 talks about reducing inequality within countries and inter-countries. A large proportion of the population without sufficient food can be

considered a significant cause of low income, earnings, and asset base. SDG 11.0 speaks about sustainable, safe, and inclusive settlements. The income level of the people plays a significant role in fulfilling this goal. The income and employment of a large population in rural areas depend upon agriculture production and proper food security. SDG 12.0 is about sustainable consumption and production patterns. Sustainable consumption is related to sustainable food production. Soil degradation and greenhouse gas emissions are related to inefficient and productive agriculture practices. SDG 13.0 is related to combat climate change and its impact. Agriculture, food production, water, and availability are closely related to climate change. Changes in precipitation, distribution, and temperature increase profoundly impact food production and security. SDG 14.0 is about conserving and sustainable use of the oceans, seas, and marine resources. This part of the earth affects aquaculture production and food security. SDG 15.0 is about the sustainability of the ecosystem and the preservation of forests, soil, and biodiversity. Ecosystem preservation, better soil quality, and biodiversity are indispensable to better agriculture and food production. SDG 16.0 concerns peaceful society, social justice, and inclusive institution development. War affects food security, as in the case of the Ukraine-Russia war. Inclusive institutions have a positive effect on economic growth. It also has a crucial impact on food management policies. SDG 17.0 is about global partnership for sustainable development. The problem of food security is a worldwide issue, and dealing with this international partnership is essential. These 17 SDGs not only affect food security but are affected by food security. We can explain these SDGs with the help of food security at the global level.

Climate Change and Agriculture Production

Changes in the duration and distribution of precipitation and temperature change have adverse effects on agriculture production and food security (Wang *et al.*, 2018). Precipitation affects water availability to the crops. Changes in the starting date of precipitation (monsoons) alter the date of sowing and harvesting, adversely affecting crop productivity, especially in a country like India, where a large part of the cultivation of crops is rainfed. Increasing temperature affects the rate of evaporation and water availability to crops. Several studies indicate that an increase in temperature reduces the productivity of food crops like rice and wheat. A degree increase in temperature reduces 6 percent of productivity in rice crops (Saseendran *et al.*, 2000). A 2-3.5 percent rise in temperature reduces farmer's revenue between 9 to 25 percent. Low-productivity areas are more vulnerable to a rise in temperature than high-productivity areas. Studies show that a 2-degree rise in temperature decreases 10-15 degrees when producing pearl millet. One Percent higher CO₂ concentration with increased temperature has negatively affected soybean productivity in Madhya Pradesh. Studies show that a one percent increase in

temperature depresses 3.06 percent yield in millets in India (Krishna *et al.*,* And Akram Ahmad Khan, 2023). Temperature also affects soil, pest, and weed prevalence (Chattopadhyay, 2010). Millets emit less greenhouse gases and use less water than other crops ((Bhuyan *et al.*, 2023). The adoption of climate-resilient agriculture management practices can play a crucial role in dealing with the adverse impact of climate change on food security.

Role of Millets Production in Food Security

Millets have contributed an essential role in food security in both qualitative and quantitative aspects since the inception of civilization. After the introduction and spread of technological progress in agriculture, its role in the total output value of agriculture was reduced. The growing concern about food security at the global level requires reconsidering the role of millets in food security. Millets are more environmentally friendly, have higher nutritional value, and are less sensitive to the increasing danger of climate change than any other cereals. Studies show that millets emit relatively less amount of carbon emission than other cereals (Wang *et al.*, 2018). This fact indicates that millet production reduces carbon emissions more than other cereals. Millets cultivation requires less amount of water than other than millet cereals. These crops are cultivated in arid and semi-arid climates. Pearl millet is more moisture efficient, mainly in areas with less assured irrigation facilities or where agriculture depends on less annual rainfall. Millets cultivation is less sensitive to the fertility of soil and temperature change. The declining share of millets in agricultural produce is a severe by-product of advancement in the agriculture sector at the global level. Finger millet can be grown in salinity and higher temperature areas. These crops have higher drought resistance. The declining share of millet production is more harmful to the food security of the low-income group and especially the developing world because millets are traditionally considered poor people's food. Millets are grown in diverse agroecological conditions with different landforms, water availability, and varying temperatures. It constitutes a staple food in Asia and Africa continents.

India contributes forty-one Percent of global millet production. Consumption and production side factors contributed to the decline of the share of millets in food staples in India (Michaelraj & Shanmugam, 2013). These factors are increasing income, urbanisation, and government policies. Karnataka, Andhra Pradesh, Tamil Nadu, Maharashtra, Odisha, Madhya Pradesh, Rajasthan, and Uttarakhand are the states contributing the most in millet production in India. Technological upgradation and high-yielding varieties (HYVs) contributed to millet productivity in India, but this technological breakthrough in millet is less than that of rice and wheat in India. From 1950-51 to 2017-18, the area under minor millets was reduced to one-fourth (from

8 million hectares to 1.8 million hectares), and the production of minor millets remained at half (4-million-ton to 2.44-million-ton) during the same period in India. Millets can significantly contribute to reducing the vast prevalence of malnutrition because, comparatively, millets have higher nutrition food than rice and wheat (DHAN, 2012). Millets will help diversify the population's food basket, which mainly depends on rice and wheat in India. High international price volatility of millets and lower public-private investment in millet seed development and production (Pray and Latha, 2009) in India are the factors adversely affecting the supply of millets. From 1949-50 to 2017-18, the area and production of millet showed a declining trend at the rate of 16.51 and 13.58 per year in India. Up to 2005, productivity showed a declining trend, and after that, a positive growth rate was recorded in millet production in India.

Food Waste

The UNEP Food Waste Index Report 2024 indicates that in India, 78.2-million-ton food is wasted annually, 55 kg per person per year of food waste. In Urban areas, food waste is higher than in rural areas in India as per 2024 estimates of the Waste Food Index by UNEP. Reducing food waste enhances food security, reduces greenhouse emissions, and reduces the pressure on the ecosystem.

Area, yield, and production of Food grains in India

The area under food grains in India was 115.30 million hectares in 1966-67, increased to 128.18 million hectares in 1975-76, and remained constant with slight variation after that. The area under food grain production in 2021-22 was recorded at 130.53 million hectares in India. Food grain production was 74.23 million tonnes in 1966-67 and increased to 131.5 million tonnes in 2021-22. The production shows continuous increases with minor changes in India. Food grain productivity was 664 kg/hectare in 1966-67 increased to 2419 kg/hectare in India. Only 18 percent of the area of food grains production was under irrigation, which increased to 59.96 percent in 2019-20. The five central food-producing states in India are Uttar Pradesh, Madhya Pradesh, Punjab, Rajasthan, and West Bengal, which are contributing 18.7, 10.57, 9.79, 7.81, and 6.44 percent, respectively, in 2022-21. In Punjab and Haryana, 98.78 and 94.99 percent of the food grains production area was under irrigation, while it was only 10.27 and 19.09 percent in Jharkhand and Maharashtra in 2020-21 in Nutri/Coarse Cereals.

India ranks first in the area, and production of millet at the global level. Millets are good for consumers, farmers, and the climate. Millets are even goods for agriculture and dietary diversity. United Nations declared the year 2023 as the International Year of Millets. These are ancient grains with a history dating back to the Indus Valley Civilization. The area under

Nutri/Coarse Cereals was 37.67 million hectares in 1950-51, increased to 47.34 million hectares in 1967-68, and after that, continuous reduction was seen under the area of Nutri/coarse cereals and reduced to 22.65 million hectares in 2021-22 in India.

Nutri/Coarse Cereals production in 1950-51 was 15.38 million tonnes and increased to 50.90 million tons in 2021-22. The increase in production of Nutri/Coarse Cereals in India was mainly due to an increase in productivity of Nutri/Coarse Cereals. The productivity of Nutri/Coarse Cereals was 408 kg/hectare in 1950-51, increased to 2247 kg/hectare in 2021-22. In India, the five central states of Nutri/Coarse Cereals producers are Karnataka, Rajasthan, Maharashtra, Madhya Pradesh, and Uttar Pradesh, which contributed 15.45, 16.29, 11.5, 9.65, and 8.97 percent of total production in India in 2021-22. The states with high productivity in Nutri/Coarse Cereals production are West Bengal, Telangana, and Andhra radish. The productivity of Nutri/Coarse Cereals in these states is more than double the average productivity at all India levels. Area Index under coarse cereals was reduced by 10 percent between 2007-08 and 2021-22 in India. It was 99.9 in 2007-08, reduced to 89.9 in 2021-22. The highest decline in area index was recorded in minor millets, from 100.1 in 2007-8 to 40.8 in 2021-22. For Jowar, the crop area and production index recorded a decline of 50 percent between 2007-08 and 2021-22 in India. The productivity growth in coarse cereals and pulses was higher than other cereals between 2007-08 and 2021-22. Karnataka contributes significantly to the procurement of Nutri/Coarse Grains in India. Per capita food availability in India was 144 kg per person per year, increasing to 186.8 kg per person per year in 2021. Per capita pulse availability was 22.1 kg per person per year, which was reduced to the level of 19.6 kg per person per year during the same period. Other cereals except rice and wheat per person per year availability reduced from 40 kg per person per year to 29.8 kg per person per year from 2017-0. The decline in the per-person availability of pulses and other grains poses a challenge to quality food for the country's population.

Land unavailable for cultivation includes areas under non-agricultural uses and barren and unculturable land. Land use statistics in India show that in 1950-51, it was 47.52 million hectares, reduced to 44.3 million hectares in 2018-19. The area under Non-agricultural uses was 9.36 million hectares to 27.36 million hectares in 2018-19. Barren and unculturable land was 38.16 million hectares, reduced to 16.5 million hectares in 2018-19. This indicates that the non-agricultural use of land has been increasing quickly. The availability of land for agriculture has been declining. From 2012-13 percent share of the area to gross cropped area was reduced in coarse cereal and oilseeds. For coarse cereals, it reduced from 12.9 percent to 11.52 percent; oilseeds reduced from 14.81 percent to 13.88 percent. In the case of

pulses, the percentage share of the area to the gross cropped area was reduced from 2012-13 to 2014-15, and after that, it showed an increasing trend. For other cereals and millets, the percentage share of area to gross cropped area reduced from 0.42 percent to 0.24 percent.

Lower productivity (per unit of land) is another cause of low production and availability of food grains in India. The productivity of maize and pulses in India is one-fourth of the productivity in the United States of America (USA). India is the second largest country in arable land after the USA. India contributes 11.2 percent of the arable land of the world. India contributes 25.88 percent of pulse production to the world ranking first. The agriculture productivity in India is less than the potential productivity in India.

CONCLUSION

Food Security is a complex and multi-aspect problem. End of hunger is Sustainable Development Problem 2.0. It was decided to eliminate the problem of hunger up to 2030. Other sustainable Development Goals are related to food security. With food security, achieving other sustainable development goals is more accessible. The problem of food security in India has multiple aspects. Food production is higher than the requirement. Per capita pulse availability is reducing. The problem of hunger and malnutrition is serious in India. Millets could be the food security solution, but millet production suffers various issues. The vast amount of food waste indicates that reducing food waste may significantly reduce food insecurity in India. Climate change is another problem in achieving food security. Climate change adversely affects the productivity and production of food grains. Reducing cultivable land in India is another way to increase food production and availability in India. India's present food security system depends on huge public subsidized food security programs. Reducing the area under millet harms food security, farmers' income, and environmental sustainability.

Reducing food waste and encouraging millet's role in food security can play a crucial role in food security in India. An increase in millet production can improve the food basket. Climate change has a less damaging effect on millet production. The government of India's food subsidy program needs to be more economically sustainable. An increase in productivity is the only solution for achieving food security in India as it is far below that of other developed countries and far below its potential productivity. The price incentive mechanism is a possible solution to raise pulse production and make food healthier in India. The government needs to intervene to ensure food security significantly because achieving food security in other SDGs is challenging.

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