

Nutritional Security in India: An Overview of Basics, Status, Programmes and Prospects

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Abstract

India witnessed a 1.56 times increase in foodgrain production, a 2.46 times increase in milk production, and a 3.12 times increase in egg production in the last 2 decades; while the problem of malnutrition still exists. This extent of malnutrition is one of the important hurdles in achieving nutritional security for the Indian population. Nutrition security is more than just physical, social, and economic access to food. Nutritional security talks about the intake of safe and sufficient (quantity and quality) to meet their dietary need and food preference and is supported by an environment of adequate sanitation, health services, and care. This overview aims to describe the status and prospects of malnutrition and nutritional security. Nutritional security is the outcome of 1) Modulating the production system (nutrition-sensitive agriculture), 2) Increasing outreach of processed and value-added products to the majority of the population and 3) affordable health care services to all. Equal emphasis on all these three components is essential and should be discussed in terms of the soil-plant-animal-human being nexus. Soil and plant have to play important role in achieving nutritional security considering the ultimate source of nutrients to animals and human beings. Therefore, all components should be treated equally rather than giving more emphasis only to the last component of nexus viz., human being.

Keywords: Hidden Hunger; Malnutrition; Nutritional Security; Nexus

Introduction

The journey of India after independence started with struggling for achieving food security with several attempts for increasing agricultural production [1-4]. The introduction of improved varieties of rice and wheat [5-7], increase in the application of chemical fertilizers from 0.49 kg N, P₂O₅ and K₂O ha⁻¹ to 145 kg N, P₂O₅ and K₂O ha⁻¹ from 1951-52 to 2021-22 (Fertilizer statistics, 2021-22), creation, and utilization of irrigation facilities for cereal production and use of agrochemicals for the management of pests and diseases are the major steps taken in these times. This leads to a significant increase in food production (mainly cereals). With the significant increase in food grain production, the government of India starts different commodity-based programmes for increasing their production. These attempts lead to a significant increase in the production of a different commodity. The increase in food-grain, milk, vegetables, fruits, egg, and fertilizer in India in the last two decades is 1.56 times, 2.46 times, 2.1 times, 2.3 times, 3.12

times, and 1.76 times, respectively. Such a phenomenal increase in the production of different commodities was formerly and popularly known as the green revolution, white revolution, silver revolution, pink revolution, golden revolution, yellow revolution, etc. Finally, these all attempts lead to achieving food security in India which further turns into food resilient India with a surplus of food-grains as well as other agricultural commodities. During the same time, the population of India increased from 1.06 billion to 1.41 billion in 2022 (In 1950-51 it was 0.357billion). This increase in population is accompanied by degrading of the natural resources due to severe stress on them from an increased population of both humans and domestic animals. Both degraded resources and increased demand for goods and services from limited natural resources as well as costly artificial resources create concern about the quality of agricultural produce.

The quality of agricultural produce is expressed most commonly as the nutritional composition of produce (both main and by-product). The extensive attempts for increasing productivity of

crops per unit resource used through plant approaches (varietal development), input endowments, and changing management practices led to changes in the quality of crop produce even though both decreased nutritional content and significant changes in nutritional properties were reported [8]. Moreover, major attention is given to cereal crops and attention to other crops (more especially to fruits and vegetables) was received off-late. This makes the wider prevalence of cereal-based and easily affordable diet; while consumption of nutrient-dense food items is distributed with high disparity due to higher prices attached to it. These conditions all together increase the concerns of nutritional security and malnutrition. The concerns of malnutrition are realized by the report of malnutrition [9,10], increase in research under the aegis of agronomic bio-fortification [11], different schemes of government for enhancing the availability of nutritious food [12] and increasing emphasis on the development of biofortified varieties [13] in India. Nutritional security is defined as physical, social, and economical access to safe food with a) safe and sufficient (both quantity and quality) to meet the dietary need and food preferences and b) supported by an environment of adequate sanitation, health services, and care for healthy and active life [14,15]; while nutrient density in food items indicates the nutritional ingredients present in food items per unit weight of food or nutritional ingredients in any food items per unit of calories. This nutritional deficiency in the food items consumed by the majority of the population is reflected in the increasing concerns of health-related risks of the Indian population. The increasing concern of nutrition-related health concerns can be expressed based on the status of malnutrition in the Indian population.

Status of malnutrition in India

Around 16.4% of percent population of India is living below the poverty line in India with very low purchasing power. This is a decisive factor for availing nutritious food as nutrient composition is the most important criterion for the pricing of food items. This variation in income and pricing system creates a disparity in the distribution and availability of different commodities per capita (Table 1). Hence, besides the production of nutritional food, its reach to every individual as influenced by the disparity in distribution and socio-cultural factors had a major role in explaining the causes of malnutrition. As per the report of the ministry of child and woman development Government of India, 35.5%, 19.3%, and 32.1% of children below five years of age are suffering from stunting, wasting, and under-weight, respectively in India in 2021. The reports showing the problems of malnutrition in India (Table 2) showed that 58.5% of children are anemic, nearly 74% are at risk of anemia due to iron deficiency, 62% at risk of Vitamin A deficiency, and 31% are at the risk of iodine deficiency [16]. About

2 billion people are suffering from micronutrient deficiency and around half of the world's micronutrient-deficient people are living in India [16,17]. Among the major age groups, children, adolescents, and women were most affected due to malnutrition; while among states, Bihar, Gujarat, Maharashtra, and Meghalaya showed higher concerns of child malnutrition in India. This malnutrition is a major hurdle in achieving nutritional security. Another hurdle in nutritional security is different non-communicable diseases either transmitted by hereditary or due to imbalance in the body which reduces the nutrition absorption capacity. Diabetes, overweight or obesity, cardiovascular diseases, hypertension, and dementia are the non-communicable diseases reported in India by the world health organization. The pattern of expenditure by consumers showed that the percent expenditure on cereal was 12.0% in 2011-12; while the same for fruit and vegetables was 1.9 and 4.8%, respectively in 2011-12 [18]. This indicates the predominance of cereals in the diet which are known as a major source of energy and a deficit in several nutritionally important ingredients [19]. The increasing population, decreasing natural resources availability per person, degradation of natural resources, and impact of climate change on production activities as well as on the health of humans and domestic productive animals will again be expected to aggravate the gap between individual nutritional requirements and capacity to cater the need. Economics ties between resource-poor and resource-rich countries and the ill distribution of population in them will expect to play an important role in deciding the disparity of distribution. For India, the over burden on resources can be realized by seeing the population of humans and animals which account for 17% and 14-15% of the global population with only 2.4% and 4.2% of the global land and freshwater resources. The increasing inflation leading to a surge in the price of food commodities, decreasing role of local establishments due to centralization and globalization of food and related markets, and the availability of affordable nutritious food items will be deciding factors for affecting the nutritional security of the Indian population. The increasing population, changing demographic situation (migration of population from rural to urban areas), and changing food habits are other determinants of malnutrition and nutritional security. The different forces are intervening and will expect to play important role in reducing the gap between the requirement and availability of nutritious food to the Indian population. These forces are governmental policies, institutional framework, health care systems and incentives on health care, import-export policy for food items, changes in production systems, and attempts for sustaining and enhancing the productive capacity of natural resources. Personal factors such as awareness, ignorance, like-dislike, and belief will also play important roles in achieving nutritional security irrespective of income and availability of nutritious food.

S. No.	Food items/commodity	Availability per individual*
1.	Rice	73.4 kgannum ⁻¹ person ⁻¹ (201.2gday ⁻¹ person ⁻¹)
2.	Wheat	64.8 kgannum ⁻¹ person ⁻¹ (177.7gday ⁻¹ person ⁻¹)
3.	Other cereals	31.3 kgannum ⁻¹ person ⁻¹ (85.7gday ⁻¹ person ⁻¹)
4.	Cereals	169.6 kgannum ⁻¹ person ⁻¹ (646.4 gday ⁻¹ person ⁻¹)
5.	Pulses	17.5 kgannum ⁻¹ person ⁻¹ (47.9gday ⁻¹ person ⁻¹)
6.	Foodgrains	187.1 kgannum ⁻¹ person ⁻¹ (512.5 gday ⁻¹ person ⁻¹)
7.	Edible oil	19.2kgannum ⁻¹ person ⁻¹ (52.6gday ⁻¹ person ⁻¹)
8.	Vanaspti	0.6kgannum ⁻¹ person ⁻¹ (1.64gday ⁻¹ person ⁻¹)
9.	Sugar	18.8kgannum ⁻¹ person ⁻¹ (51.5gday ⁻¹ person ⁻¹)
10.	Tea	0.85kgannum ⁻¹ person ⁻¹ (2.33gday ⁻¹ person ⁻¹)
11.	Coffee	0.10kgannum ⁻¹ person ⁻¹ (0.27gday ⁻¹ person ⁻¹)
12.	Vegetables	99.28 kgannum ⁻¹ person ⁻¹ (272 gday ⁻¹ person ⁻¹)
13.	Fruits	51.46 kgannum ⁻¹ person ⁻¹ (141 gday ⁻¹ person ⁻¹)

Table 1: Percapita availability of different food commodities in India [18,20].

(*: The units for the different commodities are different and given along with their per capita availability).

S. No.	Problem reported
1.	Protein-energy malnutrition was high in India in children up to five years old. This is calculated based on underweight, stunting, and wasting (low weight for height). Stunting was observed in 48 % of children, wasting in 19.3 % of children, and underweight among 42.5 % of children. This under nourishment makes the children more susceptible to infection [21,22].
2.	Percent woman with the problem of being underweight is 36%; women and adolescents between the ages 15 to 19 years suffering from iron deficiency anemia due to undernourishment is 56 % [12,23].
3.	India has a co-existence of under-nutrition, overweight (obesity), and micronutrient deficiency (hidden hunger) - A triple nourishment. The problem of being underweight, stunting, and wasting in boys (<5 years of age) was 42.1 %, 44.3 %, and 22.5 %, respectively; while the same for girls with age less than 5 years were 41.1 %, 42.9 %, and 21.5 %, respectively [24].
4.	The survey was conducted in the slum area of Bareilly city of Uttar Pradesh for school-age children. The result found that stunting and underweight were highest in the age group 11 to 13 years; while wasting was higher in the age group of 5 to 7 years [25].
5.	The under nutrition in under 5 years children in India was high and varied widely. The percent under-weight, stunting, and wasting were 39–75 %, 15.4–74 % and 10.6–42.3 %, respectively [26].
6.	The information on chronic energy deficiency in 76 studies was reviewed for the tribal population in India. Results showed that 52 % of tribal women and 49.3 % of tribal males was passing through a critical situation with respect to nutrition [27].

Table 2: Status of malnutrition in India.

Particular	Adult male		Adult female	
	Sedentary	Heavy	Sedentary	Heavy
→Cereals	375	600	270	480
Pulses	75	120	60	90
Milk and milk products	300	300	300	300
Roots and tubers	200	200	200	200
Green leafy vegetables	100	100	100	100
Other vegetables	200	200	200	200
Fruits	100	100	100	100
Sugar	20	55	20	45
Fat	20	40	30	30

Table 3: Nutritional requirement for a balanced diet for adults (male and female) with different work types (g/day/person) [28].

Programme and schemes and prospects for nutritional security in soil-plant-animal- human being nexus

The aspects of nutritional security and malnutrition were addressed mainly at the last components (human being) of the soil-plant-animal-human being nexus. This was mainly done through regulating the supply of food items, establishing the standards for food items as well as different food establishments, and creating awareness among the population about nutrition and its significance. Besides these attempts, the nutritional food and different ingredient supply to the targeted population through launching different schemes complements and supplements the regular at-

tempts to achieve nutritional security (Table 4). These schemes and programmes need a consistent supply of nutritious foods and this can be achieved only by taking care and contributing to other components and treating soil-plant-animal-human being as nexus for achieving nutritional security (Figure 1). Such attempts are going on at different scales; while are described and discussed at the individual component level. The outcomes of these attempts are condition by investment through different policies and government decisions, the tangible contribution for human nutrition, capability to interlink different components in nexus and regulation, and responsiveness by end users (may be target specific such as children, women, adolescents, etc.).

S.No.	Scheme/Programme	Major aims and objectives	Targeted population
1.	Integrated child Development service scheme	Improvement of nutritional and health status of children for proper development. Reduce mortality and morbidity through providing different services and implementing schemes for the integrated development of children and mothers	Children of 0 to 6 year age and mothers of age varies from 15 - 45 years.
2.	National health mission	Provide affordable and quality health care services for needy people through government support	For all age groups and gender
3.	Pradhan Mantri Matru Vandana Yojana (Previously known as Indira Gandhi Matritva Sahyog Yojana)	Provide maternity benefits for improving the health of pregnant and lactating women.	Pregnant and lactating woman
4.	Pradhan Mantri Poshan Shakti Nirman (PNPOSHN) (Formerly known as National Programme for Mid-Day Meal in Schools)	Provision of one hot cooked meal to children per day consisting of 100-150g food-grain, 20-30 g pulses, 50-75g vegetables, and 5-7.5g oil/fat.	Schools going to children from class 1 to class 8.
5.	National Rural Drinking Water Programme (Jal Jeevan Mission)	To make provision of potable water to every household in rural areas through tap water connection.	Rural population
6.	Rajiv Gandhi National Creche scheme for children of the working woman	Provide day care facility for children of 6 months to 6 years of age of the working woman and improve nutrition, health, and holistic development of children.	Children of the working woman (age of 6 months to 6 years)

7.	Rajiv Gandhi Scheme for Empowerment of Adolescent Girls	Provide nutrition and social and economic uplifting to girls between 11-18 years old.	Girls between 11-18 years old (in selected districts of India)
8.	Nirmal Bharat Abhiyan (Total Sanitation Campaign)	The provision of individual and public sanitation infrastructure which includes household latrines, sanitation facilities in government schools, and solid and liquid waste management.	Rural area
9.	Targeted public distribution system	Provide subsidized food-grains (including some state initiatives) to the poor population.	Poor population
10.	National Iodine deficiency disorder control programme	Determine iodine deficiency disorders in different districts and provide iodized salt. Monitoring of iodized salt.	Endemic districts with the prevalence of iodized salt.

Table 4: Different programmes and schemes in India for addressing the malnutrition at last component of nexus (human beings).

Figure 1: Interventions in soil-plant-animal-human being nexus for nutritional security

(Note: IIFS: Integrated intensive farming system; IFS: Integrated Farming system; P&P: Public and private system; NF: Natural farming; PDS: Public distribution system; LEISA: Low external system Sustainable Agriculture).

Conclusion

Ensuring nutritional superiority in the food production and processing system and implementing different health care programmes for reducing malnutrition is essential to achieve nutritional security for the majority of the population in India. The interlinking of attempts at each component of the soil-plant-animals-human being nexus is essential to quantify their contribution

and sustain the policy support in favour of each of these attempts rather than focusing only on the last component (human being). Interventions such as dynamism and target-specific modulation in policy support for a different component of this nexus will be an essential requirement for achieving and sustaining the nutritional security of our populous, demographic, and democratic country.

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