



A lemon vendor at a wholesale fruit market in Kolkata, India. India is the world's largest producer of lemons, much of which are exported to Gulf countries. (Abhijit Kar Gupta)

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Unraveling India's Malnutrition Dilemma – a Path Toward Nutrition-sensitive Agriculture

Prabhu Pingali* and Mathew Abraham
Cornell University, Ithaca, New York, USA

* plp39@cornell.edu

Introduction

Following the Green Revolution, India successfully increased agricultural productivity and overall food production, achieving a surplus in cereals for the first time ever and cementing a national focus on calorie availability. In subsequent decades, as the economy continued to grow, the country experienced a significant decline in poverty levels. Despite this momentous achievement, the rate of malnutrition in India remains stubbornly high. Between 1990 and 2009, India had the highest proportion of underweight children when compared with Bangladesh, Bhutan, Pakistan, Nepal, and Sri Lanka, despite its relatively higher per capita Gross National Income (GNI) growth (Dreze and Sen, 2011). Across the 29 Indian states, there is also much variation in malnutrition rates: in 2015, the prevalence of stunting ranged from 19.7% in Kerala to 50.4% in Uttar Pradesh (IIPS and ICF, 2015). Simultaneously with slow progress in combating child stunting and micronutrient malnutrition, overweight and obesity are also on the rise. The prevalence of obesity grew from 12.6% in 2005–2006 to 20.7% in 2015–2016 among women and from 9.3% to 18.9% among men (IIPS and ICF, 2015).

In this chapter, we make the case for India to shift to a nutrition-focused agricultural sector that goes beyond staple grain productivity to emphasize the production and consumption of micronutrient-rich foods. The chapter first reviews the nutrition trends in India, characterized by slow progress in addressing high and variable rates of malnutrition. It then assesses

the policies that have influenced agricultural growth trajectories and safety-net programs to highlight the major challenges and disconnects in agriculture and nutrition policy. Finally, it calls for integrating some elements that a food-systems approach would consider, such as income, availability of nutritious food, intra-household distribution, and the health environment, as a way forward in addressing India's malnutrition dilemma.

Malnutrition in India: Major Challenges

Data from India's National Family Health Survey (NFHS) from 2015 painted a mixed picture of nutrition in India. On the one hand, malnutrition, anemia, and low BMI among children and adults showed much improvement from 2005–2006 to 2015–2016 (Table 17.1). The prevalence of stunting and underweight during this period declined by 20% and 16%, respectively, as did anemia in children (16% decline), women (4% decline) and men (6% decline). The prevalence of underweight decreased from 35.5% to 23% in women and from 34% to 20% in men.

However, most other statistics show discouraging trends. The prevalence of wasting among children is on the rise and is among the highest in the world. Anemia among children and adults in India is still extremely high. The anemic status of a mother influences the propensity of her child to be stunted or wasted, and anemia in children may lead to impaired cognitive development, increased morbidity from

Table 17.1. Change in prevalence of malnutrition, micronutrient deficiency and overweight or obesity figures in India (2005–2006 to 2015–2016).

Prevalence	NFHS-3 (2005–06)	NFHS-4 (2015–16)	Change
Stunting (children < 5 years)	48.0	38.4	–20.00%
Wasting (children < 5 years)	19.8	21.0	6.06%
Underweight (children < 5 years)	42.5	35.7	–16.00%
Anemia (children 6–59 months)	69.4	58.5	–15.71%
Anemia (women)	55.3	53.0	–4.16%
Anemia (men)	24.2	22.7	–6.20%
Men with BMI < 18.5 kg/m ²	34.2	20.2	–40.94%
Women with BMI < 18.5 kg/m ²	35.5	22.9	–35.49%
Overweight or obese men (BMI ≥ 25.0 kg/m ²)	9.3	18.9	103.23%
Overweight or obese women (BMI ≥ 25.0 kg/m ²)	12.6	20.7	64.29%

infectious disease, and stunting and wasting (Bentley and Griffiths, 2003; Murray-Kolb and Beard, 2009; Diamond-Smith *et al.*, 2016). Obesity and overweight prevalence among adults are also rising, highlighting the dual challenge of underweight and obesity. NFHS 2015–2016 shows that the proportion of thin women is higher in rural areas compared with urban areas and the opposite for overweight and obesity, a reflection of an increase in overweight or obesity as household income increases.

Malnutrition rates in India remain high in comparison with other countries and regions with similar and even lower income levels. Many countries in Africa south of the Sahara and in South Asia show better performance in child malnutrition indicators (Table 17.2).

Figure 17.1 shows significant regional variations in the prevalence of malnutrition among Indian states, an indication of socioeconomic inequalities but also differences in governance, agricultural growth, and the public provisioning of basic services. Poorer regions have higher rates of undernutrition, but even within states the variations are determined by whether the region is rural or urban and by agroecological differences. States with higher per capita income, such as Andhra, Goa, Kerala, and Tamil Nadu, have lower child and malnutrition rates but a higher prevalence of overweight and obesity. Alarming, the prevalence of adult overweight or obesity in some of these states has almost doubled.

The Policy Environment and India's Nutritional Challenges

Agriculture is closely linked with nutrition and food security in three ways: (i) agricultural

production determines the availability of food; (ii) production reduces the real cost of food; and (iii) agricultural livelihoods provide incomes to farming households that can be used to access nutritious and diverse foods (Ivanic and Martin, 2008; Swinnen and Squicciarini, 2012; Pingali *et al.*, 2015). Countries that proactively support pro-agricultural growth policies tend to see better child development indicators compared with countries that do not (Webb and Block, 2012). However, agricultural policy alone is insufficient and needs to be supported by strong nutrition policy. In this regard, the disconnect between agriculture and nutrition policy in India is especially glaring.

Agriculture policy – from getting the price right to distribution

The Green Revolution in the late 1960s ushered in a new approach toward agricultural development in India. The introduction of improved seeds along with investments in infrastructure such as irrigation and subsidized access to fertilizers and pesticides led to massive gains in agricultural productivity (Pingali, 2012). As food policy in India centered on promoting cereal-based production systems to meet the population's calorie requirements (Varshney, 1998), government policies in turn prioritized the sustained production of wheat and rice and their distribution to poor consumers. Measures were also taken to invest in research and development and extension services (Tilburg *et al.*, 2000), and the Public Distribution System (PDS) directly procured and distributed cereals on a national scale (de Janvry and Subbarao, 1986; Freebairn, 1995; Goldman and Smith, 1995; Dorward

Table 17.2. Child Malnutrition in Africa south of the Sahara and in South Asia.

Region/Countries	Stunting	Wasting	Underweight	Source
Africa south of Sahara	33.2	7.8	16	Akombi <i>et al.</i> , 2017 (based on DHS 2016 data)
Nepal	36	10	27	MoH Nepal <i>et al.</i> , 2017
Bangladesh	36	14	33	NIPORT <i>et al.</i> , 2014
Sri Lanka	17	15	20.5	DCS and MoHNIM, 2017
Pakistan	45	11	30	NIPS and ICF, 2013
India	38.4	21	35.7	IIPS and ICF, 2015

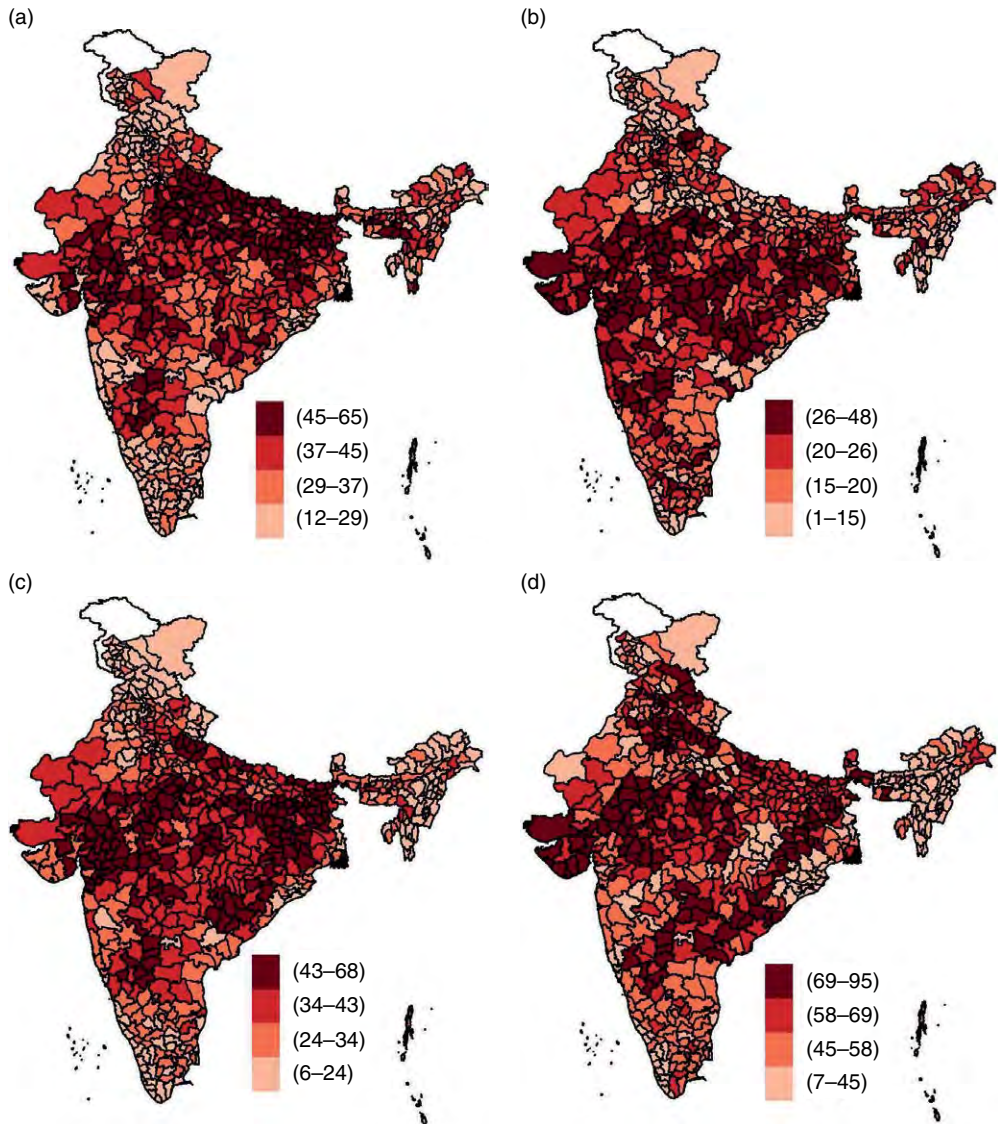


Fig. 17.1. District-level variation in child malnutrition (2015–2016), generated using NFHS 2015–16 district factsheets. (a) Children under 5 who are stunted (%). (b) Children under 5 who are wasted (%). (c) Children under 5 who are underweight (%). (d) Children aged 6–59 months who are anemic (%).

et al., 2004). The government also set the Minimum Support Price (MSP) at the start of each growing season to ensure that when market prices fall below the MSP, government agencies would step in and procure from farmers. (Although initially only for wheat and rice, MSP currently extends to pulses, coarse grains such as sorghum, pearl millet, barley, oilseeds such as groundnut, rapeseed, mustard, soybean, sesame,

sunflower, safflower, nigerseed, and to other products such as copra, cotton, and raw jute. However, procurement is still exclusive to wheat and rice and in the past 2 years in limited quantities to pulses in some states.)

These measures helped increase the per capita availability of food grains from 140 kg in 1950 to 160 kg in 2000, in line with population growth, lowered food prices, and increased

incomes, to enable agricultural modernization and structural transformation (Hazell and Ramasamy, 1991). There were, however, some limitations. For example, the technology and targeted inputs relied on the availability of irrigation, even though 60% of agricultural land in India is dependent on rainfall. As a result, new technologies were not adopted uniformly across the country, exacerbating inter-regional and cross-household inequalities, and resulting in a singular focus on irrigated crops, fluctuating outputs, and environmental degradation due to poor land and crop management (Prasad *et al.*, 2007; Pingali, 2012). As a consequence, in the states of eastern India and semi-arid central India, agricultural development, income growth, and nutrition have lagged behind.

The PDS was initially established during World War II to address food security through rationing, and following the Green Revolution, it was tasked with distributing surplus grain (Mooij, 1998). Under the PDS, rice, wheat, kerosene, sugar, and edible oil were distributed to consumers through Fair Price Shops at subsidized prices. PDS encountered various challenges, including poor geographic coverage and escalating fiscal costs, and was ultimately deemed a failure (Ramaswami, 2002), with evaluations showing that it did not impact overall calorie intake in the country (Kochar, 2005; Kaushal and Muchomba, 2015). In 2005, measures were taken to improve the system's coverage, efficiency, and targeting (Dreze and Sen, 2013; Dreze and Khera, 2015). In states where the PDS restructuring was carried out successfully, it was found to have increased calorie intake and improved dietary diversity through income effects (Kishore and Chakrabarti, 2015; Rahman, 2015; Krishnamurthy *et al.*, 2017).

Policy and institutional support for staple crops relative to other crops, as exemplified by PDS, has crowded out traditional micronutrient-rich food crops, such as coarse grains and pulses, especially in the irrigated tracts of the Indo-Gangetic plains. Farmer incentives to diversify out of staple grains are limited, with the markets for non-staples characterized by high transaction costs, resulting in the decline in the per capita availability of pulses from 65.5 g per day in the 1960s to about 44 g in 2015 (Pingali, 2015). A nutrition-sensitive agriculture policy

can create a level playing field for nutrient-rich coarse grains and pulses (Pingali, 2015).

Nutrition policy – a long road

Mechanisms to combat malnutrition in India over the years have taken the form of policy legislations and Mission Mode Projects (projects with a set timeline) under various ministries of the government. These include the National Nutrition Policy (1993), National Plan of Action (1995), National Health Policy (2002), National Nutrition Mission (2003), and National Health Mission (NHM) (2013), the latter delivering iron supplementation, antenatal care, and postnatal care. That a proliferation of initiatives has not made sufficient headway on nutrition may be a sign to rethink these approaches.

Perhaps the most notable food-based assistance program enabled by these various missions and policies is the Integrated Child Development Services (ICDS) program. The ICDS was launched by the Ministry of Women and Child Development in 1975 with the aim of providing nutrition services and education to children under 6 years of age and pregnant and lactating mothers, especially within disadvantaged social groups. In the early 2000s, evidence showed that the program's effectiveness in reducing child nutrition was limited despite being in place for more than three decades (Balarajan and Reich, 2016). An inter-ministerial group was constituted to restructure the ICDS. Reforms included: (i) increasing the number of *anganwadis* (village-level centers providing nutrition services to mothers and children), especially in remote areas; (ii) making food supplementation universal; and (iii) increasing ICDS' budget fourfold between 2004 and 2008 (Biswas and Verma, 2009). These changes led to the program being able to reach 67% of children under 6 years of age across India in 2013.

Another notable initiative has been the Mid-Day Meal Scheme (MDMS) under the Ministry of Human Resource Development. The MDMS was introduced in 1995 to address hunger among children aged 6–14. It was only in 2001 that the scheme was adopted by all states after the Supreme Court of India ruled it mandatory to provide cooked meals (with 300 calories

of energy and 8–12 g of protein) to all primary-school children for a minimum of 200 days a year. The ruling also extended to the ICDS scheme, making the entitlement a 'right to food'.

Although MDMS has increased school enrolment and attendance rates (Dreze and Kingdon, 2001; Afridi, 2010; Jayaraman and Simroth, 2015), the impact of both ICDS and MDMS on nutrition outcomes is not clearly established (Pingali and Rao, 2017). Similar to the PDS, both for the most part have been staple grain-based safety-net programs that have not considered local tastes and preferences, or micronutrient requirements (Pingali *et al.*, 2017). Some studies have shown ICDS to have an impact on reducing malnutrition among girls (Jain, 2015). Mittal and Meenakshi (2015) found that villages benefiting from ICDS in eastern India saw an 11 percentage-point decline in the prevalence of underweight children. Singh *et al.* (2014) also found that in Andhra Pradesh, access to mid-day meals at school provided significant health gains in drought-affected regions.

New Policy Directions: Challenges and Constraints

Although policy measures to combat malnutrition in India have often been fragmented and uncoordinated, in recent years more comprehensive policies and programs have taken center stage, but with significant limitations. The National Food Security Act (NFSA) and the National Nutrition Strategy Mission are two notable examples. The NFSA was launched in 2013 to increase food and nutrition security by enabling access to quality food at affordable prices (Desai and Vanneman, 2015). The Act legally entitles 75% of India's rural population and 50% of its urban population to a minimum of 5 kg of staple food grains per person per month, at subsidized prices. The Act also aims to give financial support to pregnant and lactating mothers and free nutritional support to children up to the age of 14. Coordinated by the PDS, NFSA would increase PDS's coverage by 15–20 million people, resulting in 884 million beneficiaries. Again, however, the NFSA's focus on staple grains sidesteps the problems of micronutrient deficiencies and protein energy malnutrition.

It has also thus far had limited coordination with other schemes and programs (Pingali *et al.*, 2017).

Long overdue, the National Nutrition Strategy is being formulated to achieve a *Kuposhan Mukta Bharat* or malnutrition-free India. Spearheaded by the Ministry of Women and Child Development in consultation with various advisory groups, the mission is tasked with mechanisms to address child malnutrition, especially in poorly performing states and districts (Government of India, 2017). It aims to reduce underweight (below -2 standard deviations) among children (< 5 years of age) from the current 35.7% to 20.7%, anemia among children (6–59 months) from 58.54% to 19.5% and anemia in women and girls (15–49 years) to 17.7% from 53.1%. Implementing this strategy requires governance reform, convergence between different departments of the state running similar or complementary programs and also effective ways of monitoring and evaluation. This is not the first attempt at a comprehensive initiative at tackling malnutrition. The National Nutrition Policy formulated in 1993 attempted to address micronutrient deficiencies, and also land reforms, income transfers, health, and food safety concerns, but fell short (Government of India, 1993).

A Nutrition-sensitive Agricultural Sector for India

The link between agricultural production and nutrition is a crucial one that calls for a nutrition-sensitive agricultural sector. While a traditional agricultural sector encompasses the production, distribution, and consumption of food, a nutrition-sensitive one also addresses intra-household distribution of food and individuals' absorption and intake of micronutrients (Pingali and Sunder, 2017). This framework (Fig. 17.2) acknowledges that people's nutrition status is shaped not only by their individual behaviors and nutrient absorption but also by their household's access to food quality, quantity, and diversity, as determined by household income and that household's access to diverse foods year-round (Pingali and Ricketts, 2014). This section analyzes India's progress and challenges within the various areas of the framework.

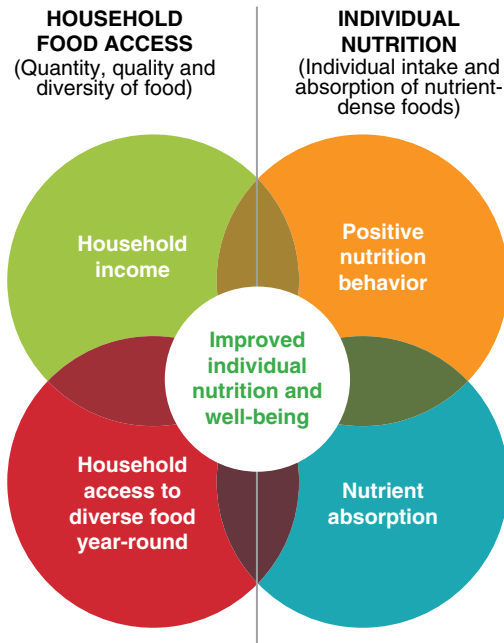


Fig. 172. Multisectoral pathways towards improved individual nutrition (adapted from Pingali and Ricketts, 2014; license no. 4355620836211).

Household food access: quality, quantity, and diversity of food

Although household income determines the ability to access sufficient, nutritious food, the link between income and nutrition outcomes in India is not so straightforward. On the one hand, food producers are also net buyers of food; as such, food access is conditional on income (Gaiha *et al.*, 2013). Most nutrients are also income elastic; therefore, a rise in income also increases nutritional intake (Pingali and Rao, 2017). However, while studies have shown that agricultural growth, as a proxy for income, has led to improvements in women's BMI, there is only a weak association with reduced child stunting (Ravallion and Datt, 1996). In states such as Kerala, Bihar, Himachal Pradesh, Tamil Nadu, Assam, and Tripura there appears to be a strong association, while in Gujarat and Madhya Pradesh, there appears to be a disconnect (Ravallion and Datt, 1996). The limited impact that income growth has on child nutrition in some Indian states can be attributed to the multidimensional nature of malnutrition (Jones *et al.*, 2014; Snapp and Fisher, 2015).

Diversifying the agriculture sector can help it become more nutrition sensitive. Production

diversity has been shown to have a positive impact on diet diversity (Herforth *et al.*, 2012; Pingali and Sunder, 2017). However, as discussed earlier, India's disproportionate price and marketing incentives to major cereals have made diversification to pulses and coarse grains difficult. Diversification to animal husbandry, especially small ruminants and dairy, can also serve as an important source of income for smallholder farmers and the landless, considering the rising demand for meat. Although India has had successful dairy cooperatives, only a quarter of the volume of milk produced is marketed through the organized sector.

Linking smallholders to value chains may also improve nutrition, since the impact of production diversity on dietary diversity is often limited by poor markets (Berti *et al.*, 2004; Bhutta *et al.*, 2013; Girard *et al.*, 2012). There has been a major drive in India to promote farmer producer organizations; since 2013, nearly 700 have been established, comprising 500,000 farmers. Although their impact on small farm production has not yet been studied, they could be a useful instrument in disseminating research and development (R&D) to close yield gaps and address climate resilience in coarse grains and pulses, and promoting biofortified, micronutrient-rich

crops, such as iron and zinc pearl millet, zinc rice, and zinc wheat. The production and promotion of biofortified crops at the farm level is still in the nascent stages, however (Pingali *et al.*, 2017). The NFSA has provisions for fortified wheat to be distributed, and some states such as Gujarat, Rajasthan, and West Bengal have piloted its distribution (Bhattacharya *et al.*, 2017).

More and more, international trade is also playing a role in meeting the demand for nutritious foods. Traditionally, close to 60% of agricultural imports have been palm, soybean, and vegetable oils, but recent years have seen a surge in imported pulses, fruits, and vegetables. Effective distribution over and above availability would require PDS and ICDS to expand their services to include a more diverse food basket (Bhattacharya *et al.*, 2017). In some states, such as Karnataka and Tamil Nadu, millets are being provided by the PDS. In other states, like Chhattisgarh and Uttarakhand, the PDS provides pulses. This distribution should be expanded to other states, especially those lagging on key nutrition indicators.

Individual nutrition: intake and absorption of nutrition dense foods

Household-level access to food alone does not ensure nutrition security: intra-household allocation and the health environment are also critical factors. Traditionally, the allocation of food within the household has favored men and boys, leaving women and girls behind (Berti *et al.*, 2004; Pinststrup-Andersen and Watson, 2011). Addressing unequal control of resources and workloads, as well as access to water, sanitation, and hygiene, is essential to improve the nutritional status of women and children (see Chapter 6). Empowering women and improving the status of women is shown to have lasting impact on their nutritional outcomes and on the outcomes of their children (Case and Paxson, 2008; Almond and Currie, 2011). ICDS and the NHM have child- and gender-specific aims and priorities, but these are not integrated with empowerment initiatives. The NFHS-4 data show that stunting is more prevalent among children of illiterate mothers than among children of mothers with more than 12 years of education. It also shows

that the prevalence of anemia among women decreases with more years of education. Education and behavior-change communication targeted to women thus needs to be integrated into existing interventions (Shankar *et al.*, 2017).

Water, sanitation, and hygiene also influence individuals' nutrition status and nutrition absorption. Studies have linked stunting and poor cognitive development to poor sanitation in early life and to the practice of open defecation (Case and Paxson, 2008; Almond and Currie, 2011). Access to clean water is also found to influence a variety of health outcomes, including child health and mortality (Desai and Vanneman, 2015). About half of the open defecation that occurs anywhere in the world takes place in India (UNICEF and WHO, 2017), and according to the NFHS-4 about 55% of the households surveyed reported to have members defecating in the open. It has become increasingly clear that toilet construction alone does not translate into toilet use. Initiatives such as *Swachh Bharat Abhiyan* (SBA), or the Clean India Campaign, that focus on the construction of toilets need to incorporate awareness and behavior change more fully.

Conclusion

India's slow progress in tackling hunger and malnutrition is of grave concern, revealing the challenge of meeting the UN's Sustainable Development Goal (SDG) 2 of eradicating hunger and malnutrition by the year 2030. To understand the nature and patterns of malnutrition in India, this chapter has analyzed the disconnect between the country's agriculture policies – focused on calories from rice and wheat production – and contemporary nutrition challenges. The preoccupation with staple grains permeates Indian institutions such as the PDS and major policies such as the NFSA (which does not address micronutrient deficiencies or protein energy malnutrition). It has also meant that regions that did not benefit from technologies of the Green Revolution era have shown poorer development and more severe malnutrition problems.

This chapter argues for a multidimensional, nutrition-sensitive approach to leveraging agriculture to tackle malnutrition. This approach requires policies and schemes such as the PDS,

ICDS, NHM, and MDMS to integrate nutrition into all agricultural activities from production to consumption, while also addressing intra-household distribution of food, especially for women and girls, and individual absorption of nutrients. Diversifying the country's agriculture sector away from grains is essential to increase economic opportunities and improve the availability of micronutrient-rich foods. Interventions for empowering and saving time for women are crucial, as are interventions to ensure access

to clean water, sanitation infrastructure, and good hygiene practices.

India has the largest number of malnourished children in the world, but the status quo can be changed. Neighboring Bangladesh has outperformed India in recent years, owing to its scale-up of health- and nutrition-related programs targeting women (Chowdhury *et al.*, 2018). A nutrition-sensitive agricultural approach can help the country achieve these same successes within a short period of time.

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