

## Nutritional security vis-à-vis food production in India: the strength of agri-nutri linkage in retrospect

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India, the largest producer of milk, wheat and fruits, and the second largest producer of rice, pulses and vegetables in the world<sup>1</sup>, with 194 million undernourished people, tops the 'world hunger list' as well<sup>2</sup>. It is astonishing to find that the nation has failed to achieve both Millennium Development Goal (MDG) and World Food Summit (WFS) targets, despite consistently high agricultural production over the years and a promisingly higher rate of economic growth. This failure is inconceivable in the sense that the country still has a farming population of around 54% of the total, and has made great strides towards achieving 'self-sufficiency' in food production. Existing evidences show that prevalence of undernutrition among children under five years of age in the country is still considerably high and it varies widely – 39–75% underweight, 15.4–74% with stunted growth and 10.6–42.3% wasting<sup>3</sup>. It clearly indicates that neither higher agricultural production nor high economic growth has been successful in ensuring nutritional security of the country, which implies that the poor and hungry have hardly succeeded to benefit much from such a growth not being inclusive. Enormous population pressure on the food basket has been an important factor resulting in such a dismal situation, with several reports indicating the strong linkages among population, health and development. However, the other important factors in this regard should not be overlooked. Although several public, private and voluntary organizations have made significant efforts to spread family, health and nutrition education, particularly in rural areas, those are discrete in nature, fulfilment being highly subjected to a raised level of family income and educational status.

### Production–nutrition disparity: some curious cases

The balance between food security and nutrition stays firm on three pillars, namely availability, accessibility and utilization. Food within a geographical

boundary may be available, but may not be accessible to all those living within the geographical boundary. It may be accessible, still may not be utilized well for necessary absorption of macro- and micro-nutrients released into the body due to poor metabolic function. Anthropometric measures like weight for height, height for age, upper arm circumference, body mass index, etc. of children below five years hitherto been utilized as potential indicators of undernutrition invariably across the globe. The Clinical, Anthropometric and Biochemical (CAB) Survey, 2014 conducted as a part of the Annual Health Survey of India reveals that nine states, namely Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh (MP), Odisha, Rajasthan, Uttarakhand and Uttar Pradesh (UP) have been under severe grip of malnutrition. The survey covering 284 districts has revealed that the status of malnutrition has worsened in UP, despite the fact that the state is the highest producer of wheat and sugarcane, the second highest producer of rice and overall the highest producer of food grains (50.05 million tonnes in 2013–14)<sup>4</sup>, contributing to about one-fifth of the country's food basket (Table 1). Still, the state has 62% of stunted and 45% of underweight children with malnutrition among boys being slightly higher than that in girls<sup>5</sup>.

MP, another important food-producing state in the central part of India, is not far behind when vulnerability of its children to nutritional insecurity is concerned. More than 40% of children under 5 years in the state are underweight, and more than 50% of children in the same age group are reported to have stunted growth<sup>5</sup>, in spite of the fact that MP is the major non-animal protein source for the entire nation. The state ranks first both in pulse (5.09 million tonnes in 2013–14) as well as in soybean (5.37 million tonnes in 2013–14) production, the two most vital sources of plant protein. Overall, the state is also the third largest producer of food grains (24.24 million tonnes in 2013–14) in the country after UP and Punjab. Thus, the magnitude of malnutrition status in the state

as reported is a gross mismatch to the agricultural contribution made by its farmers.

Rajasthan is another major plant protein supplier in the country. The state is the third largest producer of both pulses (2.47 million tonnes in 2013–14) as well as soybean (0.98 million tonnes in 2013–14). It ranks second in the country in the production of coarse cereals like sorghum, pearl millet, finger millet, small millets, maize and barley taken together (6.60 million tonnes in 2013–14). The nutritive value of millets, especially in the supply of minerals, phosphorus and crude fibre to the body is making them popular nowadays. Given the ever-increasing rate of gastro-intestinal disorders across the globe, some researchers firmly believe that minor cereals like millets are going to be the major food for human being in the coming decade. Still, 44.0% of children below 5 years with stunted growth and 36.6% underweight children in the same age group, disharmonize the production–nutrition balance of the state.

### Probable factors of production–nutrition imbalance

Challenges to India's health status, food and nutritional security are huge due to its large population; they are complex too due to its diversity, chronic poverty and inequality. There are extreme inter-state variations in the country as far as food security and nutrition are concerned. The factors associated with malnutrition should therefore always be looked upon at least from two levels: state and household. As long as state-level malnutrition is concerned, it is obvious that population pressure has always aggravated the problem of nutritional insecurity. UP is a classic example of the same. With a total population of about 200 million<sup>6</sup>, the state is the most populous as well as the most malnourished among the 35 Indian States and Union Territories. However, it must not be overlooked that the inter-state variations in food, health and nutritional status are

**Table 1.** Production–nutrition disparity in three important food-producing states of India

Nutritionally vulnerable state	Population (in millions)	Total food grain production (million tonnes)	UP, MP and Rajasthan are among top three Indian states in production of field crops	Nutritional status of children below 5 years of age	
				Stunted growth (%)	Underweight (%)
Uttar Pradesh	199.3	50.05	Rice, wheat, sugarcane, total foodgrains	62	45
Madhya Pradesh	72.6	24.24	Wheat, pulses, rapeseed, mustard, soybean, total oilseeds, total foodgrains	51.5	40.6
Rajasthan	68.5	17.80	Coarse cereals, pulses, soybean, rapeseed, mustard, total oilseeds	44.0	36.6

Source: Authors' compilation.

caused not only by population pressure on the food reserves of the states; socio-cultural diversity among states with regard to food intake also plays a vital role in this regard. The differences can also be attributed to the different stages of demographic and epidemiological transition, and socio-economic development of the states<sup>7</sup>. Within the states also, rural and urban areas show disparity in access to nutritionally rich diets and balanced food; even within the rural areas, heterogeneity exists among villages in terms of dietary diversity and food intake. There are gender differences in nutritional status; malnutrition being more prevalent among women members of a family than their male counterparts<sup>8</sup>. Family wealth, education level of the head of the family, household size and purchasing power are important determinants of household nutritional status<sup>9,10</sup>. The substantial increase in the number of rural markets, alongside significant rise in purchasing power and consumerism among the rural population is surely a promising sign of the future prospects of enhancing nutritional security in the country through proper technological and educational interventions<sup>11</sup>.

### Technological options for ensuring nutritional security

There is immense scope for inclusion of nutritional issues in agricultural research, agricultural extension programmes and dialogues, e.g. the ICAR-Indian Agricultural Research Institute (IARI), New Delhi has developed Fe and Zn micronutrient-rich bread wheat variety HS 562 and a semi-dwarf *durum* wheat variety HD 4728 for different regions of the

country. A 'double zero' (erucic acid <2% and glucosinolates <30 ppm) variety of mustard, namely Pusa Double Zero Mustard 31 was released by the Institute with great success.  $\beta$ -Carotene-rich cauliflower (var. Pusa Kesari VitA 1) and Fe-rich pearl millet (Pusa Composite 701 and 443) were also developed and released by IARI. The Chennai-based MS Swaminathan Research Foundation (MSSRF) has made some efforts in this specific regard. As found effective by MSSRF, the concepts of 'nutrition-sensitive agriculture', 'farming system for nutrition', 'women-managed community nutrition gardens' and 'family farming' need to be tried at a larger scale and in a planned manner<sup>12,13</sup>. Although post-harvest processing and value addition in field and horticultural crops have provided remunerative livelihood to a large number of agripreneurs, these options have hardly been utilized from a nutrition point of view. In the current context of global climate change, there is every possibility that the chemical composition of foods synthesized by plants may alter due to the rising levels of atmospheric CO<sub>2</sub> (ref. 14). Bringing larger areas under cultivation with bio-fortified crop varieties may provide a potential solution to the problem. Alongside, successful agronomic food fortification practices may be popularized through focused extension efforts, particularly in the areas with prevalence of micronutrient deficiency-linked malnutrition.

### Conclusion and suggestion

The issue of malnutrition in India is complex, and should be tackled both at the state and household levels. Given the

current status of agri-nutri linkage of the country, intensifying focus only upon increasing foodgrains production for better availability and profitability will hardly be able to address the issue of malnutrition adequately. The real goal of food production can only be realized when agriculture is fully translated into nutrition. Hitherto, there has hardly been any structured effort at a large scale to integrate nutrition awareness and nutrition education in the capacity building and agricultural development programmes meant for agricultural and allied entrepreneurs in India. The research and extension priorities of the country, by and large, are restricted to production, productivity and profitability. Linking household nutrition has hardly been a national priority while planning and designing agricultural research programmes. While reaching to the farming community with technologies and practices, it is important to include nutritional aspects as an integral part of technology transfer. Additionally, it is important to have firsthand assessment of the existing level of knowledge and skill, and thereafter map the overall competency of the farming households in practising and at the same time utilizing nutritional values of the technologies promoted in this specific regard. Assessment of micro-eco situation, cultural and demographic understanding should be a prerequisite for interventions. The existing social capitals like self-help groups, commodity interest groups and farmer producer organizations must be mobilized to take up inclusive production systems comprising both high-yielding and nutri-rich crops and crop varieties. With more than half the population of India belonging to farming communities, strengthening the agri-nutri

linkage in farm households should be the first step in ensuring nutritional security of the country.

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