

## **Food Security: Challenges & Opportunities in India**

### **-An Exploratory Study**

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### **Abstract**

Approximately 7.5 billion people are occupying the earth, at present. In order to feed every one adequately we need 2800 million tonnes of cereals would be required, against which global production is only 2100 million tonnes. This deficit in production has left over 868 million people undernourished worldwide, out of which 850 million are living in developing countries and India is one of such countries which has a major proportion of undernourished children. India ranks poorly in terms of both hunger and malnutrition. On the contrary the demand for protein of animal is increasing day by day due to rapid urbanization. By 2050, consumption of meat and dairy products is projected to increase by 173% and 158%, respectively, as that of 2013. To meet the growing demand and to cope up with 9 billion world population by 2050, agricultural production needs to increase by 60% (compared to 2005/2007 production) including of increase in animal production and animal products. In addition cropland per capita is one of the biggest challenges for feeding Indian people who are on the track of rapid urbanization.

Availability of food grains is a necessary condition for food security. The Indian people are more or less self sufficient in cereals, however, to achieve self sufficiency in pulses and oilseeds have become a major challenge for it. Due to changes in consumption patterns, the demand for fruits, vegetables, dairy, meat, poultry, and fisheries has been increasing. Crop diversification is very much required for better production. It may be noted that the slowdown in agriculture growth could be attributed to structural factors on the supply side, such as public investment, credit, technology, land and water management, etc., rather than globalization and trade reforms as such. This paper will try to explore the progress in food

supply in terms of availability at the national level? How far has India progressed in terms of access to food and nutrition requirements at the household level? What are the programmes and policies India has followed in order to realize food and nutrition security? What should be done to realize food and nutrition security for all the citizens of India? Future demand, production efficiency and climatic change etc.

## **Introduction**

The growing world population, environmental degradation, limited natural resources and climatic change pose a greatest challenge to the food security of human population. It is estimated that about 870 million people have been undernourished and 98% of these live in developing countries ( Source: FAO, WFP and IFAD, 2012) like India. Further, a billion people lack adequate nutrition. Hunger and malnutrition alone is killing almost 6 million children each year worldwide. In India, situation is far more pathetic, about 17.5 percentage (217 million) of population is undernourished and the country stands at 63 rank of 69 nations in Global Hunger Index (Source: IFPRI, 2013). Occurrence of underweight in children under five years is also alarming with 40.2% of children being underweight and India ranked second to last on child underweight out of 129 countries, second highest prevalence in the world (Source: IFPRI, 2012). The condition of women is also very poor, approximately 36% of Indian women of childbearing age are underweight, compared with only 16% in 23 Sub-Saharan African countries (Source: Deaton and Dreze, 2009). The extensive hunger and malnutrition has placed the country at 70 out of 107 nations in Global Food Security Index (The Economist, 2013). In the human development front, India's performance is again very poor, it is ranked 136 in Human Development Index (UNDP, 2013). Food security and human development are linked inextricably and that their outcomes are significant co-determined (Misselhorn *et al.*, 2012). Ensuring food security of 17% of world's human population and feeding 10.71% of world's livestock with 2.4% of world's geographical area and 4% of its water resources is the major challenge before India. Hence, we tried to provide an insight into India's future challenges of food security with special emphasis on livestock production and to explore a possible strategic options applicable to the country so as to overcome these challenges which have major policy implications on India's food security and livestock development.

## **Scenario in India**

Guaranteed food security must to be an issue of great importance for a country like India where more than one-third of the population is estimated to be absolutely poor and one-half of all children malnourished in one way or another. There have been many emerging issues in the context of food security in India in the last two decades. These are: (i) economic liberalization in the 1990s and its impact on agriculture and food security; (ii) establishment of WTO: particularly the Agreement on Agriculture (AoA) under it; (iii) challenges of climate change; crisis of the three Fs, viz., food prices, fuel prices, and financial crisis; (iv) the phenomenon of hunger amidst plenty, i.e., accumulation of stocks in the early years of this decade and in 2008-09 along with high levels of poverty; (v) introduction of targeting in the Public Distribution System (PDS) for the first time in the 1990s; (vi) 'Right to Food' campaign for improving food security in the country and the Supreme Court Orders on mid-day meal schemes; (vii) proposal for National Food Security Law (Right to Food); and (viii) monitorable targets under the Tenth and Eleventh Five Year Plans similar to the Millennium Development Goals (MDGs) on poverty and women and child nutrition. These developments in the last two decades have provided both opportunities and challenges for food and nutrition security of the country.

It is, by now, well known that the question of food security has a number of dimensions that extend beyond the production, availability, and demand for food. According to Food and Agriculture Organization (FAO), food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Food security has three components, viz., availability, access, and absorption (nutrition). The three are interconnected. Many studies have shown that improvement in nutrition is important, even for increase in productivity of workers. Thus, food security has intrinsic (for its own sake) as well as instrumental (for increasing productivity) value.

The objective of this paper is to examine the performance, challenges, and policies in food security in terms of availability, access, and absorption over the last three decades.

## **Objectives**

The paper addresses the following questions specifically:

- (a) What is the progress in food supply in terms of availability of food grains at the national level?
- (b) How far has India progressed in terms of access to food and nutrition requirements at the household level?
- (c) What are the programmes and policies India has followed in order to realize food and nutrition security?
- (d) What should be done to realize food and nutrition security for all the citizens of India?
- e) Future demand and production efficiency of food in India.
- f) To see how climatic change has a major role in food production?
- g) How limited resources become a major constraint for food security?

## **Domestic Availability of food**

Food security at the national level refers mainly to availability of the sufficient stocks of food grains in the country to meet its domestic demand, either through domestic supply or through imports. Here we look at the performance and policies with regard to availability of food.

Attainment of self sufficiency in food grains at the national level through the increased domestic production is one of the country's major achievements in the post-independence period. From being a food deficit country (an importer of food grains), for two decades, even after independence, it has now achieved self sufficiency in food grain production at the macro level. There have hardly been any food grain imports after the mid-1970s. Food grain production in the country increased from about 50 million tonnes in 1950-51 to around 264.38 million tonnes in 2013-14. The growth rate of food grains has been around 3.2 per cent per annum between 1951 and 2013-14. The production of oilseeds, cotton, sugarcane, fruits, vegetables, and milk has also increased appreciably.

The experience of the last two decades shows that the growth rates of production and yield have declined for crop groups/crops during the period 1996-2008 as compared to the period 1986-97 (Table 1). The growth rate of food grain production declined from 2.93 per cent to 0.93 per cent during the same period.

**Table 1: Trend growth rates in production and yields of food grains and oilseeds**

Crop groups/crops	Production		Yields	
	1986-87 to 1996-97	1996-97 to 2007-08	1986-87 to 1996-97	1996-97 to 2007-08
Foodgrains	2.93	0.93	3.21	1.04
Cereals	3.06	0.97	3.36	1.19
Coarse cereals	1.19	1.53	3.66	2.25
Pulses	1.32	0.36	1.49	-0.02
Oilseeds	6.72	1.99	3.32	1.49
Rice	3.06	1.02	2.37	1.22
Wheat	4.09	0.65	2.93	0.34

Note: These are fitted trend growth rates

Source: CACP, Ministry of Agriculture (2009)

It is depicted from Table 1 that the performance of overall agriculture sector and the factors responsible for the slowdown provide an explanation for the decline in the growth of food production. It may be noted that food grains, pulses, oilseeds, sugar, fruits and vegetables, poultry, dairy, meat, fish, etc. constitute the bulk of the output in the agriculture sector. The performance of agricultural production is important for availability and access to food as more than 55 per cent people in the country are dependent on this primary sector.

### **Challenges before Agriculture in India**

There are both short run and long run problems in agriculture. Farmers' suicides continue sharply, even increasing in some states, as growth rate in food grains yield is on the decline. Farming is rapidly becoming a non-viable activity. Further scope for increase in net sown area is limited. Land degradation in the form of depletion of soil fertility, erosion, and water logging has increased. There has been decline in the surface irrigation expansion rate and a fall in the level of the ground water table. Disparities in productivity across regions and crops, and between rainfed and irrigated areas has increased. Decline in per capita land and

decreasing farm size is another reason for agricultural crisis. Land issues such as SEZs, land going to non-agriculture, alienation of tribal land etc. are becoming important.

### **Per Capita Availability of Food grains**

Declining per capita availability of food grains has been a major concern in India, says the Economic Survey for 2012-13. Food grains production reached a record level of 259.32 million tonnes in 2012-13.

Indian agriculture is broadly a story of success. It has done remarkably well in terms of output growth, despite weather and price shocks in the past few years. The growth target for agriculture in the Twelfth Five Year Plan remains at 4 per cent, as in the Eleventh Five Year Plan.

According to the survey, it is not only important to increase per capita availability of food grains but also to ensure the right amount of food items in the food basket of common man. For this, a thrust on horticulture products and protein-rich items is required for enhancing per capita availability of food items as well as ensuring nutritional security, the survey adds.

The survey notes that the pace of agricultural growth in the eastern and north-eastern regions has been slower than in rest of the country.

The good prospects of production in many crops in these parts of the country should quickly be taken advantage of in the years to come. Hence, "a strategy for agricultural development in eastern and north-eastern India comprising multiple livelihood opportunities, sustainable agricultural development through a farming system approach, efficient national resources management, ecoregional technology missions, and rice-based farming system needs to be put in place", the survey says.

Another critical issue is supply chain management in agricultural marketing in India. Farmers' access to markets is hampered by poor roads, basic market infrastructure, and excessive regulation. Many agricultural crops are perishable in nature and post-harvest handling issues and marketing problems affect the farm incomes.

Climate change and extreme weather events with greater intensity and frequency can have serious implications for our agriculture sector and create greater instability in food production

and thereby farmers' livelihood. Recently the government allowed foreign direct investment (FDI) in retail, which has been supported by many farmer organizations as well, this can pave the way for investment in new technology and marketing of agricultural produce in India.

Changes in consumption patterns and demand for non-cereal food in spite of increase in per capita real expenditure during the period 1972-73 to 2004-05, the per capita cereal intake declined in both rural and urban areas. However, the fall in cereal consumption was offset by increase in the consumption of non-cereal food. It is now widely recognized that the food basket is more diversified and dramatic changes in food consumption patterns have taken place in India in the post-Green Revolution period.

**Table-2: Procurement of Rice and Wheat till 2010 in India**

Procurement of Rice and Wheat (in million tonnes)

Year	Wheat	Rice
2003-04	15.8	22.8
2004-05	16.8	24.6
2005-06	14.8	27.7
2006-07	9.2	25.1
2007-08	11.1	28.7
2008-09	22.7	33.2
2009-10	25.3	--

Source: Department of Food and Public Distribution System, GoI, 2009

Note: The shares are derived from the expenditures at constant prices (1993-94 prices)

Source: NSS Consumer Expenditure Surveys, Government of India Demand and Supply Projections of Food upto 2020

From Table 2 it is depicted that procurement of wheat has increased significantly compared to rice during 2006-2010.

### **Projected Demands for crops**

According to NSS Consumer Expenditure Survey, GOI, projected demand for rice at 84.2 million tons for 2011, 96.4 million tons for 2021, and 101.5 million tons for 2026. The corresponding supply projections are 95.7, 105.8, and 111.2 million tons respectively, envisaging a surplus of 11.46, 9.38, and 9.73 million tons respectively. Mittal's projections

for wheat demand are 59.8, 66.1, and 68.1 million tons for the above mentioned years as compared to the supply projections of 80.2, 91.6, and 97.9 million tonnes indicating surpluses of 20.41, 25.53, and 29.84 million tonnes for 2011, 2021, and 2026 respectively. For total cereals, the projected surpluses are 27.59, 12.76, and 4.63 million tons.

Rosegrant et al (1995) used demand elasticity and technical coefficients synthesized from other sources, primarily from past studies, and projected demand for total cereals at 237.3 million tonnes for the year 2020. Hanchate & Dyson (2004) projected demand and supply for total cereals for 2026 at 217.6 million tonnes and 265.8 million tonnes respectively. Kumar (1998) projected the demand for cereals at 223.7 million tonnes and 265.7 million tonnes for 2010 and 2020 respectively, against the supply projections of 248.4 million tonnes and 309.0 million tonnes. Bhalla and Hazell (2001) computed demand for total cereals in 2020 as 374.7 million tonnes. These estimates are based on the IMPACT model and based on the assumptions of GDP growth of 7.5-7.7 per cent. All studies, except that of Bhalla and Hazell indicate that there would not be deficit for foodgrains particularly cereals. The study of Bhalla and Hazell assume high feed stock demand than other studies. In case of pulses and oilseeds, the country would have to depend on imports, even by 2020. According to some projections, the household demand for milk and milk products would increase from 64 million tons in 2000 to 166 million tons in 2020, and fruits and vegetables from 48 million tons to 113 million tons (Radhakrishna, 2002).

Given the shifts in consumption patterns, towards non-cereal food, and even to non-food, we feel that the demand projections of the Ministry of Agriculture on food grains of around 250 million tons for 2020 are reasonable. There would be enough supply to meet the demand for foodgrains by 2020.

### **Projected Demand for Animal Protein**

The per capita meat consumption (kg/year) in the year 2009-2010 was only 5.1 kg (FAO, 2006) and is projected to increase by 17.9 kg in 2030 (Keyzer *et al.*, 2005). As proposed under National Dairy Plan the domestic demand for milk is expected to be 180 million tonnes in 2020, to meet this demand milk production must increase at around 5.5% per annum. Egg demand is also expected to increase by 39.55 billion between 2012 and 2020 (Mohanty and



Rajendran, 2003).

This rise in demand for animal protein is difficult to meet with the present livestock farming system, as already India is facing feed and fodder deficiency and shrinkage of grazing land.

## **Challenges Ahead**

### **Programmes and policies in India for food security**

The **National Food Security Act, 2013** (also **Right to Food Act**) is an Act of the Parliament of India which aims to provide subsidized food grains to approximately two thirds of India's 1.2 billion people. It was enacted on September 12, 2013.

The National Food Security Act, 2013 (NFSA 2013) converted into legal rights for existing food security programmes of the Government of India. It includes the Midday Meal Scheme, Integrated Child Development Services scheme and the Public Distribution System. The Midday Meal Scheme and the Integrated Child Development Services Scheme are universal in nature whereas the PDS reaches to two-thirds of the population (75% in rural areas and 50% in urban areas) in our country.

The share of monthly expenditure on cereals by families in total consumption spending has fallen drastically, prompting economists to suggest food security should have a larger basket than just cereals and should be reviewed periodically (Business Standard, December 31,2014).

Rural households spent 12 per cent of their total consumption outlay on food in 2011-12 against 18 per cent in 2004-05, while the share fell to 7.3 per cent from 10.1 per cent in urban parts over the period.

According to economists, there is a gradual change towards higher value agriculture food items. According to them India's food policy should be in tune with this emerging demand pattern.

This transformation in consumption pattern, experts believed, happens when the economy is on a growth trajectory.

Easy availability and relative price decline has led to this change and has made it easier for

people, even in the poorest sections, to substitute. They now go for higher value food, which gives more protein and nourishment as cereals are calorie-based. Vegetables, food, milk products give other nutrients which are not available in cereals.

The Food Security Bill should recognise the changing consumption expenditure pattern and offer the people a wider choice, which will be in line with the production pattern. If India remains cereal centric, then it will go towards regressive manner.

### **Production Efficiency**

A major concern in the Indian livestock sector is low animal productivity. In India, average milk yield per cow per day is only 0.92 and 5.42 kg for indigenous and crossbred cattle, respectively (Gandhi and Sharma, 2005), whereas world average is 6.3 kg per day.

Furthermore, the actual milk yield of bovines is reported to be 26-51% below the attainable yield under field conditions (Birthal and Jha, 2005). Since 2004, India's livestock production has increased by 23.5 points but this improvement has come from increase in numbers rather than increase in production efficiency. The population of cattle, buffalo, sheep, goat and pig has increased 128.19, 242.71, 183.01, 297.75 and 252.95% between 1951 and 2007. This increase in livestock population has serious implications on the limited natural resources of the country as they are one of the significant contributors to environmental problems (Aiking, 2011; Steinfeld *et al.*, 2010). The crop yield per hectare is almost less than 50% that of USA and China. The country employs 47.2% of the work force (World Bank, 2013) in agriculture and contributes only 14% to Gross Domestic Product (GDP) at 2004-05 prices (GoI, 2013a). The poor productivity of crop land, livestock and labor force engaged in agriculture is a cause of serious concern in Indian agriculture.

### **Limited Resources**

Over the last three centuries, 20% of the world's forests and woodlands are lost and croplands have expanded by 466% (Richards, 1990). Today, of the total global land about ~20-30% is used for grazing and as much as a third of cultivated land area is used to grow feed and forage (Ramankutty *et al.*, 2008). In India, of the total land mass, 52.92% of land is used for

agriculture and the area under fodder cultivation is estimated to be about 4% of the gross cropped area. As per Indian Council of Agricultural Research (ICAR, 2010) estimates, out of total geographical area (328.73 million hectare), about 120.40 million hectare is affected by various kind of land degradation. Between 1990-1991 and 2010-2011, the number of operational holdings increased from 106.64 million to 137.8 million, while the operational farm size has reduced from 1.57-1.16 ha (GoI, 2007). The problem of land fragmentation, degradation, nutrient depletion, salinization, expanding urban areas pose greater challenge to feed the country's population with only 0.128 ha of crop land per capita, against world average of 0.23 ha (Pimentel and Pimentel, 2006).

## **Climate Change**

Climate change will have major impacts on the more than 600 million poor people depending on livestock for their livelihoods in Asia and sub-Saharan Africa (Thornton *et al.*, 2002). Crop yields are projected to fall in the tropics and subtropics by 10 to 20% by 2050 due to combined effect of warming and drying (Jones and Thornton, 2003). India is very much vulnerable to climatic change due to its large crop sector, very warm springs (Mendelsohn, 2014) and huge dependency ratio on agriculture; it is ranked 18 in Global Climate Risk Index 2014 (Kreft and Eckstein, 2014). Around 68% of the country is prone to drought in varying degrees of which 35% drought prone receiving rain falls between 750 and 1125 mm, while 33% is chronically drought prone, receives less than 750 mm rainfall (GoI, 2011). Small farmers and fisher folk will suffer complex impacts of climate change, due to poor adaptive capacity and other climate-related vagaries, particularly in the Indo-Gangetic Plain (IPCC, 2007). A rise in temperature of 2.5-4.9°C, will reduce rice yields by 15-45% and wheat yield by 25-55% (Parikh, 2002), the largest reduction in yields between 2011-2040 will occur in the upper Indian Ganga Basin (Mishra *et al.*, 2013). If temperatures rise by 2.0°C with an 8% increase in precipitation, agricultural net revenue may fall by 12% or \$4 billion/year in India (Sanghi and Mendelsohn, 2008). Grazing and mixed rain-fed systems of livestock production will be the most damaged by climate change (Nardone *et al.*, 2010) which supports India's 40% of the human and 60% of the livestock population.

## Conclusion

Food security can be achieved by closing 'yield gaps,' increasing crop and livestock production efficiency, reducing waste in the food supply chain; crop/livestock diversification and integration; conserving crop wild relatives and agro-biodiversity, by adopting greenhouse gas abatement , production boosting technologies in agriculture and animal husbandry. Application of these measures together, could double the food production with available resources without increasing environmental impacts. Smallholder's intensification and linking them with corporate bodies and modern retail food supply chains needs urgent attention since they hold majority of livestock in the country and can play a major role in food security and environmental stability. To avoid harmful effects of global warming, small changes in our day to day life style is a crucial turning point which need due attention. Techniques of remote sensing and Geographical Information System (GIS) need to be fully explored against various unpredicted outcomes because of fluctuating climatic conditions. The recent advances in science and novel technologies/concepts need to be fully explored for their optimum potentials like genetic engineering, disease resistant varieties, embryo transfer technology, artificial insemination, superior genetics and breeding practices, cloning, nutrigenomics, immunomodulatory among others. These altogether may help increase and boost both agricultural and animal produces including of crops, cereals, foods, milk, meat and other products, and this will help us to achieve the objective of feeding the population with enhanced food security for everyone.

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