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Challenges of Food Security in India: Role of Food Policy and Technology*

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Technology and policy move hand in hand to bring about the desired change in any economic activity. While technology shifts the production surface upward, policy is used by the State to create an enabling environment for promoting the adoption of technology and further innovations to achieve the bigger goal of social welfare. Food policy in India evolved from the era of food scarcity in the country during the 1950s and early 1960s, and included agricultural price and marketing policy, technology generation and dissemination mechanism, agricultural trade and input delivery, besides development of irrigation and availability of adequate institutional credit at concessional rates. Assuming imperfection of the domestic agricultural markets, agricultural price policy had the twin objectives of providing remunerative prices to the farmers to produce enough foodgrains and ensure availability of such grains to the consumers at reasonable prices. The major instruments of the policy were the minimum support prices, procurement of the grains for maintaining buffer stocks and distribution of the subsidised grains through the public distribution system (PDS), and subsidies on production inputs such as fertilisers, in addition to the setting up of agricultural universities and massive public investments in major and medium irrigation structures. As a result, Indian agriculture witnessed Green Revolution and was able to achieve not only self-sufficiency in the food production, but also got transformed from a food-deficit to a food-surplus country. Comparing to the food production of about 51 million tomes in 1950-51, the country produced more than five times in 2011-12 at 257 million tonnes. While imports of food grains were the norm till mid-1970s, we have turned into the net exporters of the grains for about 25 years during the last three and a half decades, due to the success of Green Revolution. The Punjab State has been the biggest contributor to this success, contributing 25-45 per cent of rice and 38-75 per cent of wheat to the central pool of grains. During drought years when the foodgrain production declines significantly, the contribution of the state to food security increases. It is encouraging to have such a huge contribution with just 1.53 per cent of the geographical area of the country.

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The food production increased faster than the population growth in India during 1970s and 1980s enhancing per capita availability of food grains by more than 25 per cent during 1951 and 1991 as it increased from about 395 g/capita/day to 510 g/capita/day. Rising productivity and production not only enhanced farm incomes as well as the employment opportunities in agriculture, but also benefitted inputs industry and trade in India. It can be gauged from significant reduction in poverty from 56.4 per cent in 1973-74 to 21.9 per cent in 2011-12 and the states showing better agricultural growth achieved larger reduction in poverty. But the challenge is not yet over. The availability of grains reduced to the 1961 level owing to continuous growth in population and recent slow down in the agricultural sector.

MSP and Food Production

The most potent instrument of food policy, which facilitated higher productivity and production, was minimum support prices (MSP) backed by state procurement of grains under PDS. Remunerative prices, in the form of MSP, are declared for almost 24 agricultural commodities covering more than 80 per cent of the cropped area and 75 per cent of the value of agricultural production in the country. The MSP ensured a significant margin to the farmers above the cost of production and increased annually at 5-6 per cent for wheat and rice during 1980s, even higher at 9-10 per cent during 1990s. Despite a freeze in the early 2000s, the MSP has almost doubled during the last 5 years. Higher productivity and remunerative MSP ensured better returns to the farmers. Effective procurement of the grains, at the declared prices, encouraged private capital investments on the farms and enhanced the use modern farm inputs to stimulate farm productivity. At the all-India level, almost one-fourth of the grains are procured by the public agencies, though this is very high around 70 per cent of wheat and rice production in Punjab.

However, the effectiveness of MSP policy varied across regions and crops. It has largely been effective for wheat and paddy (rice) crops in the irrigated regions, which produce large marketable surpluses. In 2010-11, only four states of Punjab, Haryana, Uttar Pradesh and Andhra Pradesh accounted for almost two-third of the rice procurement in India and two states of Punjab and Haryana accounted for more than 56 per cent of the wheat procurement. Due to market imperfections, private trade dominates through collusions and other malpractices and farm harvest prices remain lower that the MSP for other crops. It is the case even for wheat and paddy in the deficit states like Bihar, Assam, Uttar Pradesh, West Bengal, etc., where the Government does not intervene into the markets for public purchase (Ali *et al*., 2012). The grain surplus states which either do not contribute to the central pool or contribute very small amounts have not benefitted much by the price policy. Same is true for the small v/s large farmers. More than 83 per cent of the farmers in India have the operational holding of size less than 2 ha. Such farmers lack any marketable surplus of grains and thus are the net buyers of the food grains. The food policy has

not saved them from selling at lower prices in the harvest season and buying at high prices later. The equity issue of the food policy has to be addressed as its support for technology and infrastructural development for realisation of higher productivity, production and resultant food security cannot be ignored.

Input Subsidies

The food policy has also aimed to encourage the use of modern inputs such as high-yielding seeds, fertilisers, irrigation, etc., through input subsides. Fertiliser subsidy bill has been estimated at Rs. 67199 crore in 2011-12. The subsides helped India in increasing fertiliser consumption from mere 66 thousand tonnes in 1950-51 to around 28 million tonnes in 2011-12. Due to the introduction of high-yielding varieties of wheat and rice during late-sixties and early seventies, fertiliser use showed tremendous growth. From mid-seventies to late eighties, when the Green Revolution technology matured, use of fertilisers grew at a very high rate. The growth in fertiliser-use, however, was very low since 1989-90 when the slowdown in the agricultural sector set in. In a similar manner, the proportion of irrigated area under food crops increased from about 18 per cent in 1950-51 to more than 55 per cent in 2010-11. The net area irrigated as per cent of the net area sown increased from just about 22 per cent in 1970-71 to more than 45 per cent in 2009-10. Even the power consumption in agriculture, which is highly subsidised in almost all the states, has increased from mere 17817 GWh in 1982-83 to 119492 GWh in 2008-09 and it constitutes about 21 per cent of the total power consumption in the country.

Fertiliser subsidy in India has largely benefitted the irrigated areas. Further, this subsidy had been confined to small number of crops. The states of Uttar Pradesh, Andhra Pradesh, Maharashtra, Madhya Pradesh, Punjab and Haryana have been the major beneficiaries. Four major crops which are assumed to appropriate almost two-third of these subsidies are rice, wheat, sugarcane and cotton. The pricing of fertilisers under the subsidy regime however have also been blamed to encourage the imbalanced use of fertilisers favouring more use of nitrogenous fertilisers and adversely affecting the NPK ratio. Such imbalanced use coupled with more intensive cultivation has caused depletion in soil health and is considered to be one of the causes of slow down in the food productivity in more productive areas.

The provision of free electricity to agriculture has also altered the economics of various crops and encouraged increase in area under water intensive crops such as rice. In the absence of pricing of electricity, there is no incentive to save water and adopt resource saving technologies. Its ultimate result is faster depletion of the ground water resources and decline in the quality of water as well, which is clearly evident in the Punjab state. India is the biggest user of ground water in the world. Of the additional net area irrigated added since 1970 in India, about 80 per cent is on account of ground water. While in the states of Punjab, Haryana and Rajasthan the net draft of water has exceeded the net replenishable availability, the rate of

exploitation is quite high in Tamil Nadu, Uttar Pradesh and Karnataka as well. Almost 60 per cent of the districts in India are facing the problem of either ground water depletion alone or that combined with the deterioration in water quality in the form of contamination with fluoride, arsenic, nitrate, iron, etc.

Grain procurement under PDS and consequent food subsidy, is another important instrument of food policy aiming to ensure food security. A huge proportion of the procured gains are then distributed to the poor at subsidised rates to ensure consumer welfare, which entails large amounts of food subsidy. There has been a tremendous increase in the food subsidy during the post-reform period from Rs. 2,850 crore in 1991-92 to about Rs. 72,823 crore in 2011-12. The subsidy increased annually at 17.8 per cent during 1990s, remained almost stable between 2002-03 and 2006-07 and rose sharply again at more than 20 per cent annually between 2006-07 and 2011-12, due to significant increase in the MSP. The National Food Security Bill, which aims at ensuring food security to the poor and economically less privileged population of India in the context of right to food for every citizen of the country by covering 75 per cent of rural and 50 per cent of urban population, will expectedly add to food subsidy bill of the country. Still almost one-third of the population, living below the poverty line, has poor access to food. It is paradoxical when such a large population faces food shortage on the one hand and the national food stocks are overflowing with grains on the other.

National Programmes and Food Production

Agricultural productivity varies widely across regions of the country. The North-west Indo Gangetic Plains are more agricultural advanced regions while the average productivity is low in Bihar, Madhya Pradesh, Odisha and eastern and north-eastern states. Some low productivity states are well endowed with fertile land and water resources but are failing due to poor infrastructure, lower adoption of improved farm technologies, capital constraints and imperfect agricultural markets. Many development programmes have targeted these regions to raise their agricultural productivity. National Food Security Mission (NFSM) and Rashtriya Krishi Vikas Yojana programmes were launched in the year 2007. Under NFSM, additional production of 10, 8 and 2 million tonnes of wheat, rice and pulses respectively was targeted in these areas through improved seeds, other production inputs, information and training on improved agricultural practices, etc. The results are visible through enhanced foodgrain production from around 200 million tonnes during 2000-06 to 240 million tonnes during 2007-12. Production in many low productivity and production states has substantially increased. For example, wheat production in Madhya Pradesh has increased from around 7 million tonnes during 2006-07 to more than 13 million tonnes in 2011-12. The rice production in Assam, Uttar Pradesh, West Bengal, Chhattisgarh and Madhya Pradesh has improved by 5.4 million tonnes from 32.3 million tonnes in 2006-07 to 37.7 million tonnes in 2010-11. Rajasthan has

also witnessed increased production of pulses. Despite that, there is a wide gap between the realised productivity and the achievable potential for wheat and rice in low productivity states such as Madhya Pradesh, Assam, Bihar, Uttar Pradesh, Rajasthan, etc. It reflects that the policy and institutional interventions have to play a significant role for enhancing agricultural production and improving food availability to meet the national food demand in general and raise access to and availability of food in these states, where poverty incidence is high and superior technological alternatives are available.

Buffer Stocks and Distribution

There is a wider consensus about large inefficiencies in the food price, availability and distribution policies, harming the interests of the producer as well as consumer. Despite a positive scenario of food production, efforts to release the food stocks in the country did not match the food reserves. The procurement of rice and wheat was higher by 40 per cent during 2008-09, 2009-10 and 2010-11 when compared to 2007-08. It happened despite the fact the stock position in the central pool of grains was much higher than the minimum buffer stock norm of about 25 million tonnes. The consequence was that in July 2011, the stocks were almost double and in December 2012, these were more than three times the stipulated norms. Despite huge stocks, food inflation persistently remained high at around 9 per cent during 2011. Though it moderated in early 2012, it again seems to climb to two-digit level. While the stocks have been bulging, the off take of grains has been poor with less than 20 per cent of the grains allocated at the all-India level being lifted during the period of October 2009 to March 2010. The policy of the government not to release grains at prices lower than the MSP is leading to the building of stocks and hence further increase in the food subsidies due to escalating storage cost, losses and overheads. There is need to think about releasing the grains at less than the MSP in an effective manner so that the poor can benefit more in the era of rising prices without encouraging the traders to re-circulate the grains back into the national pool. There is also a need to synchronise the procurement of grains and releasing of the food stocks in the domestic market and exporting to other countries so that huge capital is not locked up in the large amount of stored grains, implies declining supply of grains in the market while the demand is increasing. It ultimately contributes to the food inflation and does not help the cause of providing cheaper grains to the poor consumers. The recent rise in food prices threatens to wipe out the success achieved on the poverty front not only in India but the whole world. India ranks poorly in Global Hunger Index (66th out of 88 countries, 2008) and 12 out of 17 major states fall in the alarming category of the hunger index. Still almost 22 per cent of the population in India is facing the undernourishment. Further, 42 per cent of children aged below 5 years in India are underweight, twice as compared to Sub-Saharan Africa. Despite huge efforts on the food policy front we have not been able to achieve

the desired objectives. The food distribution through the PDS has also been afflicted with pilferages. It adds to the cost of providing cheaper grains to the poor and may be the major reason for prevalence of still large levels of malnutrition and hunger.

The trade policy is also marred with many weaknesses. With the dominating national focus on food security, it has largely distorted the market signals by distorting prices in favour of food crops, especially rice and wheat. This way it seems also not to promote diversification to the high value crops and accelerate agricultural growth. The distorted price signals also contribute to the degradation of natural resources such as depleting soil health and ground water resources. Power subsidy to agriculture in Punjab, which has promoted rice cultivation to an unsustainable level, is an example of such deleterious effects.

Required Reforms in Food Policy

It is high time to look into the food policy afresh and bring some important changes that can help in putting the agricultural sector on a higher growth trajectory without comprising with the welfare of the farmers as well as consumers. First of all, the deceleration of MSP needs to be rationalised. We must also consider the demand and supply situations at the national as well as the international levels. While there may be significant enhancements at the time of deficit production, these should be cautiously decided during the periods of surplus production. It will not only reduce the burden of ever-increasing food subsidies but will also pave the way for crop diversification. The release of the grains from the national grain stocks must be made more regular and significant and a standard mechanism must be evolved. Not only the revival of market forces in the food policy will help achieving food security, the newer format of markets in the form of value chains and organised retails may also play an important role in enhancing food availability by reducing the post-harvest losses and thus passing on the benefits to both the consumers and producers. Although the earlier attempts in this direction have not yielded the expected results in some states like Punjab, increased efforts in this direction will help in achieving better results in future. Further, the mechanism of passing the food and input subsidies to the intended beneficiaries through coupons and bank account transfer will also allow the market conditions to prevail better so that the optimal decisions are taken and the pilferages are controlled to the maximum extent possible.

Technology and Food Production

Let me now shift my focus to the other important driver of future growth in agriculture. While a renewed approach on food policy will help a lot in this direction, we cannot ignore the importance of technology in agriculture for enhancing the food production and availability. Technology is an even more important determinant for increasing production than price factors because prices bring only efficient resource

allocation, while technology shifts production frontier upward. We should remember that, like in the past, future growth in agriculture will again be spearheaded by the technology.

Unfortunately, technology generation and dissemination impacts have not remained uniform across states and crops as is evidenced by Total Factor Productivity (TFP) growth, which separates the impacts of inputs use, and technology, infrastructure and farmers' knowledge and management skills.

Empirical evidence has shown that the TFP varied considerably among different states of the country as well as across crops. Growth in TFP during 1981-2005 was the highest in wheat (1.92) followed by maize (1.39) and barley (1.38), which shows that the maximum technological gains happened in wheat. TFP for rice was estimated at 0.67 while for two important oilseed crops (groundnut and rapeseed and mustard) it was around 0.78. Further, the growth in TFP of wheat and rice decelerated after mid-1990s indicating that technological improvements slowed down in recent years and the growth in output is coming primarily from higher inputs use. However, the introduction of single cross hybrids in maize in recent years has raised its TFP after 1995, which was as high as 1.64 during 1996-2005. The share of TFP to output growth was as high as 59 per cent in wheat while for rice it was around 25 per cent and for maize around 17 per cent (Chand *et al*., 2011).

TFP growth in wheat was the highest at 1.77 per cent in Uttar Pradesh whereas it was 1.14 per cent in Punjab because Punjab is using higher dosages of inputs for incremental output than Uttar Pradesh, which has reduced its TFP growth. This growth in rice was the highest at 2.3 per cent in Punjab inspite of the fact that inputs use grew at 5 per cent. Punjab state was followed by Tamil Nadu and Andhra Pradesh at around 1.55 per cent of TFP growth. However, there are still some states where TFP growth was low (less than 0.5 per cent), such as Bihar, West Bengal and Odisha. Similarly, in case of wheat, TFP growth was less in Rajasthan. An effective dissemination of the already available technology in the low productivity states and new technological breakthroughs in high productivity regions will lead the future growth in production and productivity. So, what is needed in less productive but with high potential states, is the access to technology, credit, markets and infrastructure and institutions which can help fast and wider adoption of available technology. Developing new technologies in high productivity regions is resource intensive and needs expansion of agricultural research programmes, requiring lot of financial resources.

Further, more agricultural advanced states face challenges with regard to fall in profitability and excessive use of natural resources. The initial phase of green revolution saw significant increase in productivity of cereals especially wheat and rice in these regions during 1970s and mid-1980s due to adoption of high-yielding seeds, expansion in irrigation, use of chemical fertilisers and agro-chemicals, and farm mechanisation. After this phase, productivity growth slowed down even at higher levels of inputs use and some ecological problems cropped up such as

imbalanced use of fertilisers, nutrients deficiency, fall in groundwater table, etc. During the last one and a half decade, productivity growth has almost stagnated and ecological concerns have become more serious such as mining of nutrients, appearance of micro nutrients deficiency, fast decline in groundwater table, air pollution, very high but inefficient use of energy and higher incidence of pests and diseases. The negative impacts of input intensive agriculture pose a great task of accelerating growth in productivity, sustainability of natural resources, improvement in the income of farmers and enhanced national food and nutritional security simultaneously. Technological advances in terms of developing new varieties, disease and pest management methods and conservation agricultural production practices constitute a pivotal component of the solutions to these problems.

Required Technological Advancements

The genetic strategy has been consistently successful in enhancing yield and is still viewed as the engine of future growth in the face of increasing demand for food due to rise in population and per capita income. The impact of new varieties can be gauged from the fact that wheat productivity in Punjab state increased from 12 q/ha in 1960-61 to 51 q/ha in 2011-12 and that of paddy from 15 q/ha to 60 q/ha, respectively. Increased food production in future, unlike in the past, will have to come from shrinking land and reduced water availability.

Climate perturbations in the form of heat, drought and uneven rainfall pattern favouring new disease and pest incidence, pose another challenge to the crop improvement strategy. Modern wheat varieties are expected to respond positively to resource conservation technologies (such as zero tillage or bed planting), confer additional nutritional benefits (e.g., micronutrient fortified grains) and be amenable to variable processing. Due to the inability of the conventional breeding programmes to respond to such diverse challenges, there is an urgent need for accelerated breeding programmes, integrating the conventional strategy with wide spectrum of available and emerging molecular-genetic technologies. Hallmarks of the required new-era breeding programme in response to these challenges would be: (i) accelerated breeding processes, capable of delivering varieties to the farmers' fields in a significantly shorter time frame, and (ii) precise and rapid transfer of genes to desirable backgrounds for various cultivation contexts.

Plant diseases and pest attacks reduce crop yields, quality as well as resource use efficiency. Changes in climate, increasing cropping intensity, changes in crop patterns and introduction of GM crops are influencing the host-pathogen relationship as well as causing emergence of new insect pest species, resulting into increased incidence and severity of many plant diseases and pest problems. In addition, secondary pest outbreaks and insect resurgences have been recorded in some crops due to indiscriminate use of insecticides. Currently, chemical pesticides are extensively used to manage plant diseases and insect pests, leading to environmental

pollution besides having residue problem and non-target toxicity. Rising temperatures and unpredictable rainfall patterns including frequent cloud bursts may further add to uncertainty in disease and pest management practices, compelling modifications in the management practices in the form of adjusting the planting dates or altering the microbial ecology. Besides this, there may be problems with applications of bio-control agents in the field because of the vulnerability of bio-control agent populations to environmental variations and environmental extremes. Improved crop protection strategies are therefore necessary to increase production and enhance food security in a changing scenario.

CONCLUSIONS

In conclusion, I would say that Indian agriculture has a record of remarkable progress since Independence but it still faces the challenge of meeting food and nutritional security and raising standard of living of farm families along with sustainable environment. This is a huge task. While the food policy has to play its ever important role in creating incentives for the food producers and ensuring consumer's welfare also, there is a need for a large scale transformation of its approach and instruments. Forgetting the role of technology will only exacerbate the toughness of challenges we face now and thus the focus on research and development needs to be enhanced in the form of more funding and infrastructural development for agriculture R & D in the country. I would emphasise that this challenge has to be met seriously, together and without wasting any moment from now.

REFERENCES

Ali, Shayequa Z, R.S. Sidhu and Kamal Vatta (2012), "Effectiveness of Minimum Support Price Policy for Paddy in India with a Case Study of Punjab", *Agricultural Economics Research Review*, Vol.25, No.2, pp. 231-42.

Chand, Ramesh, P. Kumar and Sant Kumar (2011), *Total Factor Productivity and Contribution of Research Investment to Agricultural Growth in India*, Policy Paper, National Centre for Agricultural Economics and Policy Research, New Delhi.