

## A Critical Assessment Food and Agribusiness Industry in India

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### Abstract

The issue of food wastage is central to India's efforts in combating hunger and improving food security. While focus has been on improving production, reducing food supply chain losses remains a relatively unaddressed problem till very recently. It is hard to put a figure to how much food is lost and wasted in India today due to lack of adequate infrastructure, however, a 2011 report by a UN body, FAO, puts wastage in fruits and vegetables as high as 45% of produce (post-harvest to distribution) for developing Asian countries like India. Role of government In India, a large part of the agri supply chain ecosystem is either in the public sector, or strongly linked to it. The Indian government attempts to insulate the cultivator from price fluctuations by procuring their produce at Minimum Support Prices (MSPs), decided by the Commission for Agricultural Costs and Prices after analyzing the costs of growing a particular crop. The 7500+ Agricultural Procurement and Marketing Committee (APMC) mandis provide a marketplace for the transaction and the Food Corporation of India (FCI) plays the role of the buyer, storing the procured produce in the relevant warehousing corporation's warehouse. Ultimately, this gets distributed through the Public Distribution System (PDS) shops and reaches the consumer. For non-MSP crops, the producer is dependent on the traditional private channels to market her produce. Agriculture is a 'state subject' and a large part of investment as well as regulatory progress is happening at the state level. Till very recently, regulatory barriers had constrained the development of storage and processing infrastructure but measures like inclusion of agri-warehousing under priority sector lending by RBI, subsidy schemes, tax incentives and the Warehousing Act have helped private players take an active interest in the same. The Private Entrepreneur Guarantee Scheme is one such initiative to incentivize private investment for construction of warehouses by private entrepreneurs, with an FCI guarantee to hire them for 10 years, assuring a fair return on investment by the entrepreneur. Gaps Inefficient price signals: The government has been buying almost one-third of all rice and wheat produced in India through the PDS system, but in other kinds of grains, fruits and vegetables (both being highly perishable), the role of the government is limited. This leads to MSPs being ineffective as both price signals and as insulators from the perspective of the larger agricultural population. Limited reach of mandis: Also, this procurement system has failed to cover the entire country evenly (back of the envelope calculation suggests that on an average, a farmer needs to travel 12 kms to reach the nearest mandi and more than 50 kms in NE India) while according to the recommendations by National Farmers Commission, availability of markets should be within a 5 km radius. Too many intermediaries, information asymmetry: The above mentioned problems have led to formation of long marketing channels, with multiple intermediaries, adding to the woes of the producers of perishable agri goods. These intermediaries have led to a cost inflation of ~250% (over the cost of production) and have exacerbated the existing information asymmetries in agriculture, especially for non-MSP crops. Inadequate infrastructure for storage: The Planning Commission has recently estimated the gap between agri-warehousing supply and demand at 35 mn MT. Currently, public sector agencies like the FCI, Central Warehousing Corporations (CWC) and the various State Warehousing Corporations (SWC) have a storage

capacity of 71 mn MT, while the private sector has close to 25 mn MT. To put the scarcity in perspective, food grain stocks held only by the government was 80 mn MT last year (peak) according to the FCI annual report. Skewed distribution of capacity: Skewed distribution of this capacity is another issue, with North India having access to 60% of the total storage infrastructure. The Planning Commission has recently estimated the gap between agri-warehousing supply and demand at 35 mn MT. Lack of cold storage infrastructure: India's current cold storage capacity at 25 MT is barely sufficient for 10% of fruit and vegetables produced in the country. Lack of collateral management options: Collateral management refers to financing of agricultural goods stored at warehouses, and is estimated to be a ~Rs 3,500 cr opportunity by industry sources. Emerging solutions Comprehensive agriculture logistics solutions: Private players like Star Agri that provide integrated post harvest management solutions have entered the space to fill these gaps. Apart from providing warehousing services, Star Agri, which recently raised funding from IDFC PE, provides collateral management and other value added services (quality testing, agri insurance, bulk procurement and rural retailing) to its clients. Sohan Lal Commodity Management, which raised funding from Nexus and Mayfield and Shree Shubham Logistics are other comprehensive agri-logistics solutions players providing services across the spectrum. SV Agri is another player that provides end-to-end solutions for the potato supply chain. Other major players include, National Bulk Handling Corporation and National Collateral Management Services. Integrated cold chain solutions: ColdStar Logistics provides customized solutions for cold storage and refrigerated transportation across India for fresh and frozen commodities. Promoted by Tuscan Ventures, a logistics focused investment firm, their services include specialized refrigerated storage, warehousing, transportation, distribution and logistics. Apart from this, LEAF is also involved in contract farming and agro processing, working on improving income realizations for small farmers through yield improvements, productivity increases, and consistent produce pricing. Alternate marketplaces: A young innovative company, eFarm, is providing a way to bypass the long chain of intermediaries by directly connecting buyers and sellers of agricultural produce and allied services, via a web and mobile based information exchange platform. This is a B2B (Business to business) model and aims to connect all stake holders in the supply chain: from farmers, to buyers, to suppliers of services like labor and transportation. The portal currently has over 5,000 kinds of produce listed. Reducing the information asymmetry: Riding on the high mobile penetration in rural India, Reuters Market Light and Fasal Intuit are working on the problem of information asymmetry for agricultural producers, by making personalized agricultural market information available to the farmers at minimal costs, through a mobile based service.

### **Introduction**

The Indian Agriculture Industry is at the verge of a revolution that will modernize the entire food chain in India and as the total food production in India is likely to double in the next ten years. Today there are excellent export prospects, competitive pricing of agricultural product standards that are compared internationally which has created trade opportunities in the agro industry. This has enabled Indian Agriculture Industry Portal to serve as a main means by which every exporter and importer of India and abroad, could fulfill their requirements and avail the benefits of agro related buy-sell trade leads and other business opportunities. This Indian Agricultural Industry revolution brings along with it the opportunities of profitable investment. The Indian government initiative has taken up to improve the Agricultural Standards by formulating the policies like EXIM policy, price policy, seed policy and this has paved the way for the profits to the Agricultural Industry in India. The statistics convey that the Indian Agricultural Industry today is the world's second largest producer of food. From canned, dairy, processed, frozen food to fisheries, meat, poultry, food grains, alcoholic beverages & soft drinks, the Indian agro industry has dainty areas to choose for business.

### **Market capitalization**

According to the analysts the turnover of the total food market is approximately Rs.250000 crores out of which value-added food products comprises of Rs.80000 crores. The Indian Government has also approved proposals for foreign collaborations, joint ventures, and industrial Licenses and 100% export oriented units predicting an investment of Rs.19100 crores out of which foreign investment is over Rs. 9100 crores.

### **Agribusiness Industry and Trends**

Despite the accelerating industrialization of the globe over the past 100 years, and the rapid growth of manufacturing industry across the developing world over the past 20 years, around four in 10 of the total global population remain involved in agriculture, according to the United Nations Food and Agriculture Organization (FAO). The FAO says that, in 2009, more than one billion people were engaged in agriculture, or around one in three workers. There are huge variations across the globe. In sub-Saharan Africa around 60% of the workforce is engaged in farming. In the United States, by contrast, less than one per cent of the population claims farming as an occupation.

### **Food Prices**

Food price inflation at the retail level has fallen significantly from its peak in 2008, and its contribution to overall inflation has become more moderate. Nevertheless, food price inflation remains high in many developing countries and is still outpacing overall inflation in a majority of countries. A surge in food prices during the summer of 2012, fuelled by the worst drought in more than half a century in the United States, and dry weather in other major exporting countries, raised fears of a new food crisis such as the one seen in 2008. However, food prices fell for the third month running in December 2012. Nonetheless, food prices will stay at high levels in 2013, and low stocks pose the risk of sharp price increases if crops fail, the FAO warned in January 2013. The FAO's Food Price Index, which measures monthly price changes for a basket of cereals, oilseeds, dairy, meat, and sugar, averaged 212 in 2012, down 7% compared to 2011, but still at historically high levels. The FAO's index is below a peak of 238 points hit in February 2011, when high food prices helped drive the Arab Spring uprisings in the Middle East and North Africa.

### **Western Diets Sweep the Globe**

Rising living standards and changing patterns of food consumption in emerging countries are other key factors driving global demand for food, and putting upward pressure on commodity prices. Consumption of dairy products in countries such as India and China used to be very low, but is now surging to such an extent that it is driving up prices for dairy products around the world. Similar trends are occurring in meat, vegetable oils, and many other areas. In 2011, the UN's World Health Organization (WHO) warned that the number of overweight African children under five had tripled to 13.5 million in 20 years. Poor diet, low rates of breastfeeding, and a sedentary lifestyle were largely to blame for the sharp rise in overweight children in developing nations, the WHO said. In Africa, the jump was from four million in 1990 to 13.5 million in 2010, an increase from 4% of the total under-five population to 8.5%, it said. In Asia, the corresponding gain over the same period was from 3.2% to 4.9%.

### **The Growing Power of Supermarkets and the Impact on Agribusiness**

The growing power of supermarkets around the world is also having an enormous impact on agribusiness and the food chain. The phenomenon has already been well documented in Western countries. Up until the early 1960s, small neighborhood grocery shops, independent butchers, and local fruit and vegetable shops dominated food retailing in many Western countries, such as the United Kingdom. Today, supermarkets account for more than 90% of UK food sales. Furthermore, four major chains—Tesco, Asda (part of US

giant, Wal-Mart), Sainsbury's, and Morrisons—account for around 75% of sales, with Tesco alone taking more than £3 of every £10 spent on food in the country. Similar trends can be seen in other developed countries, and, increasingly, in emerging economies around the world. Supermarkets entered Latin America in the early 1990s, and South-East Asia in the latter part of the decade. They are now sweeping across India, China, Eastern Europe, and parts of Africa. In many countries, supermarkets now account for around 50% of food sales. While suppliers and wholesalers could once dictate prices, and even tell retailers which products they could sell, the balance of power has now shifted decisively to the retailers, which are in a position to demand ever-lower prices and improved terms. The major supermarket chains increasingly source their produce from around the world, placing further pressure on local suppliers, which either meet the demands of the major chains, or go under. Inevitably, this trend affects the person at the bottom of the supply chain: the farmer. The supermarkets are also using the increasing acceptance and popularity of their own brands to exert pressure on suppliers.

### Market Analysis

According to Frost & Sullivan's Food & Agricultural Research Practice, the cumulative value of all revenue derived from the global food and beverage value chain—from farm to fork—was well over US\$20 trillion dollars in 2012, representing nearly 30% of the world's entire economy.

### Global Trends by Commodity

The FAO's forecast for world cereal production in 2012 (published in February 2013) estimated output of 2,302 million tonnes (including rice in milled terms), 2% down from the previous year's record. However, the FAO says that early prospects for 2013 point to increased global wheat output. Contributing largely to this outlook is an estimated 4-5% increase in the winter wheat area in the EU where, additionally, winter weather conditions have been generally favorable. Elsewhere in Europe, prospects are satisfactory in the Russian Federation and Ukraine, where winter plantings remained similar to 2011's levels, and moisture conditions are somewhat improved except in those southern parts of Russia worst affected by drought in 2012, according to the FAO. The organization adds that in Asia, winter wheat prospects are reported as being favorable in China, where higher minimum purchase prices have encouraged farmers to maintain last year's crop production. In India, plantings are around the respectable level seen in 2012, and another bumper crop is in prospect. In the United States, the outlook is less favorable. Despite an estimated 1% increase in winter wheat plantings, and prospects for spring wheat areas to expand, severe drought conditions continue to plague the southern Great Plains, where the condition of crops is reported to be very poor. In terms of coarse grains, the first 2013 prospects for maize crops in South America's main producing countries are favorable. In Southern Africa, prospects for the 2013 maize harvest, due to start from April/May, are generally favorable, despite the late onset of seasonal rains in parts.

### Rice

Rice is the staple food for around 2.5 billion people, or more than one-third of the global population. The global price of rice has been increasing for much of the past decade. According to the International Rice Research Institute (IRRI), a non-profit research and education center, this is because the world is consuming more rice than it is producing, and global stocks are becoming rapidly depleted. A number of factors are causing this imbalance between supply and demand. They include:

- A slowdown in the growth of rice yield. In South Asia, for example, average yield growth decreased from 2.14% per year between 1970 and 1990 to 1.40% per year between 1990 and 2005, according to IRRI.



- In Asia, pressure on land is limiting the scope for increasing the area devoted to the cultivation of rice.
- Governments are devoting decreasing resources to agricultural research and development. IRRI says that declining rice prices in the 1990s led to complacency about the need for R&D among governments.
- Rice has become an increasingly popular food in Africa, leading to further pressure on global supplies.
- Population growth is outstripping growth in rice production, a problem that is projected to worsen.
- Rapid economic growth is increasing the pressure on agricultural land. IRRI says that highly productive rice land has been lost to housing and industrial development, or to the cultivation of vegetables and other cash crops.

### **Meat and Meat Products**

Global demand for meat has risen more than five-fold in the past 50 years, according to the FAO. However, the FAO says that in late 2012/early 2013, global meat markets are challenged by high feed prices, stagnating consumption, and falling profitability, with growth in total output slowing down to 2%. Virtually all of the sector growth in 2012 is forecast to stem from the feed-dependent poultry and pig meat sectors, as gains in both bovine and sheep meat outputs are anticipated to be modest.

### **Fish and Fish Products**

Fish is the main source of protein for around a billion people. As with meat, demand for fish is also increasing rapidly, driven by population growth and rising incomes. Indeed, global per capita consumption of fish increased from 9 kg in 1961 to an estimated 16.5 kg in 2003, and around 17.1 kg in 2008, according to the FAO. In 2011, trade volumes and prices both saw a positive uplift, sustained by dynamic demand globally, but particularly from emerging economies. Supply fell short of demand for many farmed species, including Atlantic salmon, trout, sea bass, and sea bream. In addition, growing domestic consumption of local fish products, especially in Asia and South America, is constraining export availability.

### **Dairy Products, Eggs, Oils, and Fats**

International prices of dairy products began to strengthen in mid-2012, reversing the steady decline that had characterized the previous 12 months. The change in trend resulted from a tightening of supplies to the world market. The FAO believed that global supply and demand would be finely balanced until at least the end of the year, as output in the northern hemisphere moved seasonally downwards and only a limited increase was anticipated during the new production year in the southern hemisphere. The absence of substantial growth in milk output in the principal exporting countries is likely to mean a further upward movement in prices. World milk production in 2012 is forecast to have grown by 3% to 760 million tonnes—a higher rate than the average for recent years, according to the FAO. Asia is expected to account for most of the increase, with output also growing in Oceania and South America. The FAO believes that the world trade in dairy products continued expanding in 2012. Demand remained firm, with imports anticipated to have reached 52.9 million tonnes of milk equivalent, up 4.6% from 2011. Most of the growth in demand is coming from Asia, followed by Africa.

### **Indian Agriculture: Managing Growth with Equity**

Ensuring food security—the availability of basic staples at affordable prices—for a large and growing population has been one of India's biggest economic and political challenges. Since the 1960s, policies have sought to balance producer and consumer welfare by focusing on increasing wheat and rice production, supporting prices, maintaining buffer stocks, and broadly distributing subsidized grain to consumers. With

improved food grain supplies, the focus is now turning to reducing the high cost of public food grain management and improving the safety net for the poor. In addition, significant new challenges have emerged as rising incomes shift demand patterns in favor of high value foods such as fruit, vegetables, milk, meat, and eggs, and away from cereals. Diversification of agricultural production and marketing now offers the primary opportunity to strengthen lagging growth in farm output and rural employment. However, achieving diversified growth with equity also requires new measures to increase investment and provide the market institutions needed to develop India's inefficient food processing and marketing sectors, and to ensure that the transformation to higher-value agriculture is inclusive of India's large number of marginal and small farmers. By far the most striking transformation occurring in Indian agriculture is the shift from a food grain-oriented supply led framework dominated by the public sector, to a more diversified and demand driven framework with an expanding role for the private sector. Against this backdrop, we examine the emerging dynamics and challenges in India's agricultural sector, including managing improvements in food access for the poor, facilitating a private sector led transformation to more efficient agricultural markets, and effectively linking small farmers to these increasingly diverse markets.

### **Food Security: A Challenge Met**

Despite marked improvement in food grain production since the 1960s, when India was heavily dependent on food aid, ensuring adequate domestic supplies and stable prices remain top priorities for Indian policymakers. Although India still periodically imports wheat, it is now a net food grain exporter that is typically among the top three world rice exporters and periodically a significant exporter of wheat and coarse grain. India's improved domestic food grain supply situation is reinforced by a dramatic rise in foreign exchange reserves stemming from the increased competitiveness of its nonfarm exports since the early 1990s. In contrast to the 1960s and 1970s when cereal import costs exceeded foreign exchange reserves (Ganesh-Kumar, Gulati, and Cummings, 2007), current (April 2009) reserves of about \$250 billion now far exceed the cost of any plausible grain import requirement without disrupting other trade and capital account transactions.

### **Food Grain Management: A Continuing Challenge**

The efficient management of public procurement, handling, and storage of food grains by the Food Corporation of India (FCI), and effective targeting of consumer subsidies on low-income groups are continuing challenges in the food grain economy. Changes in weather and price policy have driven large swings in public procurement and stocks of wheat and rice since the early 1990s (Figure 1). Sharp hikes in minimum support prices led to the accumulation of large surpluses far in excess of targeted food security needs during the early 2000s—and now again in 2009/10—to be worked off through domestic and export subsidies, as well as storage losses. The real cost of public food grain management is growing about 9% annually, and now far exceeds annual public investment in agriculture [Landes, 2008].

Even with a vastly improved availability of food staples and burgeoning outlays on consumer subsidies, effectively targeting food subsidies on India's large population of rural and urban poor remains a challenge. India's national subsidized food distribution program was renamed the Targeted Public Distribution System (TPDS) in 1997/98, with a sharpened focus on targeting people living below the poverty line. Although subsidies have been increased for the poorest consumers, the TPDS is criticized for pilferage, poor delivery of services, and failure to make an effective dent in hunger, particularly in states where the concentration of poverty is the highest. The National Rural Employment Guarantee Scheme (NREGS), a large program introduced in 2006, aims to enhance livelihood security and household purchasing capacity by ensuring at least 100 days of wage work annually in rural areas. Local governance issues remain critical to the success of the NREGS and other efforts to target transfers to poor households.

### **The Diversification Challenge**

Indian farm output has been diversifying away from cereals and towards high value crop and livestock products since the early 1990s. The share of cereals in the total value of farm output has steadily declined, while growth in high-value products, including fruits and vegetables, sugar and fiber crops, milk, meat, and eggs, has significantly outpaced that of cereals. In recent years, India has emerged as the world's largest producer of milk, the second largest producer of fruit and vegetables, and among the top producers of poultry meat and eggs. Increasingly, it is not just food grains that drive the agricultural sector and farm incomes, but growth in a broadening range of high value products.

In contrast to cereals, where policy intervention has been extensive, the expansion of high-value crop and livestock agriculture has been led primarily by growth in consumer demand and changing preferences associated with rising incomes, urbanization, and youthful demographics. Although India's climate, soil, and water resources provide the potential to diversify output, agricultural markets, market institutions, and processing industries needed to support diversification remain severely underdeveloped because of weak public and private investment. The agricultural marketing and processing sectors are characterized by a large number of small-scale, nonintegrated, and inefficient enterprises, and relatively few large vertically or horizontally integrated firms.

Accelerating private investment in marketing and processing agribusiness requires overcoming a historically risky central and state government policy climate that heavily regulates movement, storage, and marketing of farm products, as well as poor power and transport infrastructure (Landes, 2008). Recent domestic and foreign private investment activity in marketing and processing, in part associated with regulatory reform by some states, may signal the emergence of a more dynamic agribusiness sector to support agricultural diversification. The rapid expansion of India's poultry industry since the mid-1990s, driven by private investment in integrated operations that have significantly reduced the cost of producing and marketing poultry, is an example of the potential for private sector led growth (Landes, Persaud, and Dyck, 2004). Another is the expansion of private investment in milk processing and marketing after 2002, when regulatory reform allowed private firms to compete with the traditional dominance of dairy cooperatives. The market share of private players in the dairy sector is now expected to overtake the cooperatives by 2011 (Gupta, 2007). Since 2000, there has also been rapid growth in investment in modern food wholesaling and retailing by both domestic and foreign players. Food marketing in India has traditionally been dominated by small-scale independent wholesalers and retailers with little backward integration to farmers. Although the modern retailers still account for only about 1.5% of total food sales, and "back end" investment in supply chains remains limited, the expansion of modern retailing has the potential to spark investment in marketing efficiency and processing that yields benefits to both producers and consumers.

### **The Challenge of "Inclusive" Agricultural Growth**

The progress achieved in food security and agricultural diversification is promising for Indian agriculture, but perhaps the key challenge in achieving welfare gains lies in ensuring agricultural growth that is inclusive of small holders. It has been well documented that agricultural diversification generates greater employment opportunities, particularly for women, and higher incomes for farm households (Joshi, Birthal, and Minot, 2006). The area shift from cereals to vegetables, in particular, has enhanced employment opportunities in rural areas (Joshi, et al., 2005). However, the combination of a large number of small farmers, poor rural

infrastructure, and fragmented and underdeveloped markets complicates establishment of efficient and equitable links between farmers and the diverse, emerging domestic market.

Marginal and small farmers, whose average operational landholding declined from 2.2 hectares in 1970 to 1.06 hectares in 2003, continue to dominate India's large agrarian economy. Nearly 88% of holdings are less than two hectares, with these holdings accounting for about 44% of the operated area (Figure 3). Fragmentation of operational holdings has expanded the bottom of the agrarian pyramid in all but a few Indian states. Small farms have proved to be more productive than large farms—they contribute about 51% of the value of farm output—owing to their intensive cultivation practices and abundance of family labor. In the case of fresh fruit and vegetables, survey results show that 52% of fruit area and 61% of vegetable area is cultivated by smallholders (BIRTHAL, et al., 2006).

But, significant progress needs to be made in developing efficient and equitable markets for large numbers of small surpluses of perishable goods, and in managing the limited risk bearing capacity of small farmers. India's agricultural markets are crowded with middlemen and commission agents who receive high fees and margins that eat into the farmer's incomes (MATTOO, Mishra, and Narain, 2007). Part of the problem lies in lack of adequate storage and transport infrastructure and integration between growers and markets which result in large postharvest losses. Because marketing regulations have historically prevented direct links between farmers and agribusinesses, a great deal needs to be done to build integrated processing and marketing firms, and to develop contract farming models and other market institutions to link small producers with markets.

### **Policy Challenges**

Indian agricultural policy must balance a changing food security landscape with the emerging need to diversify farms and markets towards high value commodities. On the food grain front, where the focus has been on increasing productivity, the current challenges are to reduce the cost and inefficiency of public food grain operations by the FCI, and to ensure an effective food safety net for low-income households. A key policy option is to shift responsibility for procuring, handling, and transporting operational supplies of wheat and rice to the private sector and confine the role of the FCI to holding buffer stocks (Srinivasan, Jha, and Landes, 2007). To improve the food safety net, current options include expansion of targeted rural employment and food distribution schemes such as the NREGS and school feeding programs, and the introduction of bio-metric identity cards to improve targeting the poor.

Realizing the benefits from agricultural diversification implies significant challenges for agricultural price policy. The current price policy of favoring rice and wheat cultivation with support prices set on a cost-plus basis has become a politically important source of income support in grain surplus areas, but undercuts incentives to diversify even when diversified enterprises potentially yield more income per hectare. Lower relative support levels for food grains are necessary in order to allow market forces to play a larger role in resource allocation, but it is unclear how politically feasible this will be or if suitable compensating measures can be identified. The most-discussed option has been to reduce the minimum support prices for grain, while purchasing all operational and buffer stocks required for subsidized distribution programs at prevailing market prices.

In contrast to the dominant role played by the public sector in the development of India's food grain sector, the process of diversification into high-value agriculture will largely depend on participation and investment by the private sector. The policy challenge is to shift from the role of dominant market player, to that of facilitator of private investment and efficient private markets. The pace of diversification is likely to hinge on



an improved climate for private investment in agribusiness and infrastructure, including continued market-oriented reform of central and state level regulations that impede the emergence of modern, integrated marketing and processing firms.

Meeting the challenge of fostering inclusive growth appears to be tied closely to easing restrictions on private sector participation in agricultural markets. Policymakers are increasingly focused on reforms that can help develop firm-farm linkages, including contract farming, cooperatives, and grower organizations. These activities have been restricted by state marketing regulations now being amended in some states to permit backward integration to the farm level by private agribusinesses. India's poorly developed land rental markets are also a potential obstacle to firms and farms coming together to do business. Current laws do not adequately protect either party in land rental agreements, creating risks that minimize formation of larger operational holdings that might be more conducive to improving farm-firm linkages and on-farm investment. However, the politically sensitive legal reforms and costly improvements in land records needed to develop a more viable land rental market appear unlikely in the foreseeable future.

### **Indian Agriculture: Challenges and potential**

India is an agricultural country, one third population depends on agriculture sector directly or indirectly. Agriculture continues to be the main stay of the Indian economy. Indian agriculture contributes to the national Gross Domestic Product is about 25 per cent. With food being the crowning need of the mankind, much emphasis has been on commercialising agricultural production. Hence, adequate production and even distribution of food has lately become a high priority global concern. With the changing agricultural scenario and global competition, there is a need of exploiting the available resources at maximum level.

In Indian agriculture the factors like high soil productivity, supply of balanced crop nutrients, efficient water management, improved crops, better plant protection, post-production management for value-addition and marketing, are responsible for higher yield as compared to most of the other countries. Achievements of Indian agriculture like development of HYVs, new hybrids of different crops, research in the area of vaccine production, varietal development through somoclonal variations, developing better quality products and transgenic in crops such as brinjal, tomato, cauliflower and cabbage have strengthened the field. In 21<sup>st</sup> century agriculture, application of modern biotechnologies like DNA finger printing, tissue culture, terminator gene technology and genetic cloning will hold the key in raising the productivity.

In the new millennium, the challenges in Indian agricultural sector are quite different from those met in the previous decades. The enormous pressure to produce more food from less land with shrinking natural resources is a tough task for the farmers. To keep up the momentum of growth a careful economic evaluation of inputs like seeds, fertilisers, irrigation sources etc are of considerable importance. Considering the irrigation needs in Indian agriculture, emphasis be given to promote the proven cost-reducing micro-irrigation technology of drips irrigation which helps conserve water reduces fertilizer inputs and ensures higher productivity. Farmer awareness programmes coupled with subsidy incentive may prove helpful strategies. The sustainable method of irrigation needs to be popularized. Salinity and waterlogging problems in the commands of major irrigation systems need to be minimized by recognizing and incorporating corrective measures. Further, proper drainage facilities involving farmer's groups need to be created. Watershed approach to management of water in rainfed areas should continue to get the due thrust.

Diffusion of fertilizer consumption in Indian agriculture has been quite widespread. The imbalances in the use of N, P and K have become highly conspicuous. The intensity of fertilizer use has gradually gone up from about 3 kg/ha. In early Sixties to about 88 kg/ha in 1997-98. Therefore, wider distribution of fertilizer needs

to be promoted by covering regions with low use of fertilizers such as central and eastern regions of Uttar Pradesh (in the case of wheat and rice) through creation of an extensive network of rural infrastructure (including roads and credit) for establishing an appropriate interface of input markets and output markets in these regions.

In Indian agriculture, multiplication, distribution and availability of good quality seed is crucial to accelerated food production. With entry of MNCs in seed production and distribution and consequent effects of patenting under the WTO regime, providing quality seeds to farmer at an affordable cost will be a measure challenge in future. To meet the growing competition companies should adopt modern processing technologies and seed growers have to be trained in cost reducing methods of growing quality seed material. Indian agriculture has to become more cost-effective to meet the growing challenges and opportunities arising out of WTO agreements and the consequent globalization impacts. For this, future growth of agriculture has to be yield based. Development of infrastructure is essential to support this growth.

The farm credit system in Indian agriculture, evolved over decades has been instrumental in enhancing production and marketing of farm produce and stimulating capital formation in agriculture. Credit for Indian agriculture has to expand at a faster rate than before because of the need to step-up agricultural growth to generate surplus for exports, and also because of change in the product mix towards animal husbandry, aquaculture, fish farming, horticulture and floriculture, medicinal plants, which will necessitate larger investments.

India is the third largest producer of fruits and the 2<sup>nd</sup> largest grower of vegetables. The total production is about 27.83 MT in fruits and 54 MT in vegetables. The farmers can grow any type of vegetable and fruits throughout the year.

Flowers are estimated to be grown in about 35,000 ha in India of which 10,000 ha are under modern flowers like rose, carnation, orchid, etc. Major flowers grown are jasmine, marigold, rose, etc. In many countries including Israel flowers are cultivated under green house conditions. In India, the land and climate are suitable to grow all types of flowers throughout the year in one part or the other.

India has attained self sufficing in food. It is now exporting rice and wheat to some countries including China. There is a vast scope of exporting the cereals to various countries.

Though India's irrigated area is about one third of the world, the area under drip and sprinkler irrigation is very meagre compared to total drip and sprinkler area in the world. The area under drip is 1,60,000 ha and under sprinkler, it is about 0.60 Mha. It is estimated that in the next 7 years, the area under drip and sprinkler will be about 1 Mha and 5 Mha respectively. India's share in the world market has risen to 0.7%. If the trend continues it is expected that the trade may go upto 1.5%. This is because of rising exports and the opening up of the domestic market rapidly. India will make its presence felt on the world trade scene.

In Indian agriculture, rural women play a vital role and participate in all stages of crop production, as they constitute 50% of rural labour force. They contribute in agricultural operations like, transplanting, manuring and fertilizing, harvesting, threshing, winnowing, drying and carrying the product. To better exploit the emerging opportunities, there is need for changing property rights in favour of women, evolving technologies to suit women farmers, increasing the number of women extension workers, educating and training women farmers.

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