

# CHAPTER - 1

## AGRICULTURE IN INDIA

*“If Agriculture goes wrong, nothing else will go right in the country”*  
- M.S. Swaminathan

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India experienced impressive growth and productivity gains in agriculture since Independence reflecting our enterprising farmers' resilience against multiple odds and challenges. Despite a structural transformation through green, yellow, white and blue revolutions characterised by food security policy objective, the regular distress and crises in the recent past pose a severe threat to the income and livelihoods security of farmers. Farmers are at the epicentre of the Indian economy, and their livelihood upliftment is a step towards the holistic development of the nation. Therefore, enhancing the incomes of farmers and ensuring their income security, thus, has been of concern to all. Unless farmers' income increases substantially, distress cannot be tackled.

Some possible options for enhancing farmers' income are

1. Enhancing Gross Income
2. Increasing Production
3. Enhancing Output Price
4. Diversifying within the farm sector
5. Diversification to non-farm sector
6. Reducing costs
7. Stabilising income and risk mitigation
8. Expanding irrigation
9. Diversification to High-value crops/Enterprises
10. Better price realisation
11. Improving terms of trade for agriculture
12. Technology up-gradation
13. Non-farm activities bolstering the livestock sector
14. Tapping solar power on farmers' fields and so on.

The major constraints, for doubling of farmers' income by 2022 within 5 years (i.e., 2018-2022) are as follows:

1. Low and unrealisable Minimum Support Price (MSP)
2. Non-remunerative price in the market
3. Low share of farmers in final price
4. Poor penetration of crop insurance
5. High and increasing input cost and
6. Absence of adequate and required market infrastructure, etc.

This chapter, set in this backdrop, says that doubling of farmers' income is possible as there exists potential and explores different options for enhancing farmers' incomes while elaborating a few important of them. We conduct a quick recap of the agriculture revolutions, the past trends in farmers' incomes, the present situation, government interventions, research, extension, metrological services, financial services including banking, credit and insurance, input (seeds, implements, fertilizers, and pesticides), storage, food processing, and marketing, respectively. Further, we discuss certain areas where we need to focus more and differently.

## 1.1 A Quick Recap

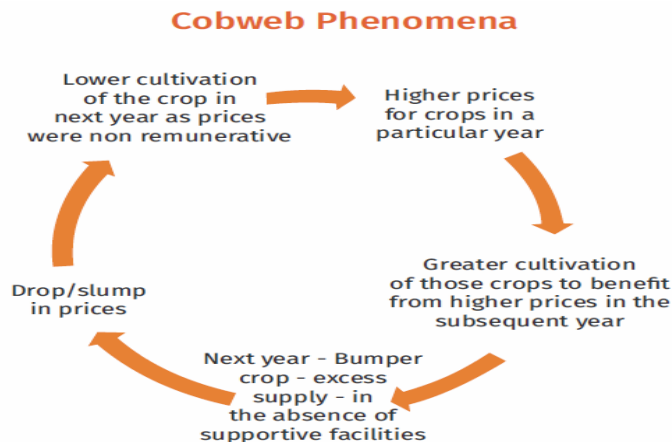
Although India is amongst the world's leading food producers in the world, low yields persist despite the Green Revolution. It is the second-largest producer of rice and wheat in the world but, in terms of yield, it is ranked much below. The agriculture sector also suffers from issues such as high dependency on the monsoons, a weak post-harvest infrastructure, underdeveloped agro processing facilities and high levels of post-harvest losses, which, together, adversely impact productivity levels. This is one reason why the contribution of the sector has declined a mere 15.87 per cent of the national output, in spite of the sizable proportion of people depending on it still remaining at about 58.0 per cent.

The income levels of farmers in India have remained significantly low. The National Sample Survey Office (NSSO) survey results show that in 2011-12, nearly 23 per cent of the farm households earned incomes less than the poverty line, with this proportion being much higher in states like Jharkhand (45 per cent), Odisha (32.1 per cent), Bihar (28 per cent) and Madhya Pradesh (26 per cent). Income levels have also been unstable, as they have mainly followed the pattern of food production which has fluctuated over the years primarily on account of the changing climate which has made rainfall erratic and unpredictable in recent years, leading to a substantial increase incrop failures. This has led to agrarian distress and agitations. Farm loan waivers have never

been useful to alleviate distress; long-term solutions are needed to address the deeper structural problems which continue to plague the sector.

- *Weak post-harvest infrastructure and high food wastage:* About 35-40 per cent of the total food production in India is wasted every year. Part of the wastage takes place at the farm level due to pests, weeds, other diseases and lack of proper storage facilities.
- *Low returns on farm produce:* Inadequate infrastructure facilities coupled with poor market linkages has led to the creation of multiple levels of aggregators/intermediaries in India who take care of transportation and distribution of food. With a mark-up to producer price at each aggregate or interface, the gap between the farm gate price and consumer price widens, with farmers receiving much lower prices for their produce as compared to the price at which they are sold in the terminal retail markets.

Farmers also suffer on account of the cobweb phenomenon. It has been observed in India that whenever prices of a commodity increase during a season of scarcity, farmers tend to increase the cultivation of the same commodity, leading to a problem of plenty, which consequently leads to a decline in its prices, causing a huge loss to farmers. That, in turn, makes farmers turn away from that commodity in the succeeding season.



**Figure 1.1** Cobweb Phenomenon

Other factors responsible for affecting the returns of farm produce are:

1. Weakness in the APMC Act limit the wholesale prices received by farmers: Traders in Agricultural Produce Market Committees (APMCs) have often been found to be forming cartels and obstructing transparent price discovery. Small farmers are offered lower prices while the same

items are sold to large buyers such as rice/flour mill owners at higher prices. The license fee in APMCs is also prohibitive very high and restricts the entry of new buyers, resulting in the continuation of the monopoly of existing traders and their cartels.

2. Restrictive trade policies prevent exporters from tapping export opportunities - Continued restrictions on exports during times of excess production lead to a fall in farmer incomes. Policy interventions have reportedly reduced gross farm revenues by over six per cent per year between 2014 and 2016.

The above issues have been addressed by the GoI recently in the following ordinances

- (i) The Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Ordinance, 2020
  - (ii) The Farmers Produce Trade and Commerce (Promotion and facilitation) Ordinance, 2020 under clause (1) of article 123 of the Constitution of India
3. Overstocking of food grains by the Food Corporation of India locks a substantial quantity that can be made available for exports and can fetch higher returns for farmers.
  4. Input subsidies (power and fertilisers) have led to deteriorating soil quality and depletion of ground water far in excess of the utilisable recharge, resulting in alarming falls in water tables across the country.
  5. While the introduction of the Soil Health Card Scheme has had a positive impact, there are concerns regarding inadequate infrastructure (laboratories and manpower).
  6. Drought proofing measures such as micro-irrigation have not succeeded and have had little impact on water availability.
  7. Minimum Support Price (MSP) measure taken to insure farmers against price crashes and ensure food security, has not been fully effective. The low level of awareness of the MSP scheme and procurement practices has hindered the effectiveness of the scheme. In addition, limited coverage of crops (23) under MSP and providing heavy subsidies for inputs such as fertilisers, seeds, and pesticides for certain crops have led to a skewed food basket and uneconomic cropping pattern, leading to large surpluses in some crops and shortages in others. Domestic policies (MSPs) may also encourage the production of locally consumed commodities and, thus, farmers fail to capture available export opportunities for commercial and horticulture crops.
  8. Farm loan waivers have provided no relief and have only vitiated the repayment climate apart from reducing the size of the overall kitty available for lending.

9. Frequent changes in trade policy, which are used largely as a price stabilisation tool to provide necessary price support to farmers have restricted export growth.
10. Heavy subsidies provided for inputs such as fertilisers, seeds, and pesticides are mostly accessed only by large farmers.

## Historical Developments

### Great Bengal Famine of 1770

The Great Bengal Famine of 1770 occurred between 1769 to 1770, affecting the lower Gangetic plain of India from Bihar to the Bengal region. It is estimated to have claimed 10 million lives. The report of Warren Hastings, the then Governor General of India, estimated that a third of the population in the affected region starved to death. It was one of the many famines and famine-triggered epidemics that devastated the Indian subcontinent during the 18th and 19th centuries. It is usually attributed to a combination of climatic conditions and the policies of the British East India Company. The start of the famine has been attributed to a failed monsoon in 1769 that caused widespread drought and two consecutive failed paddy crops. The poor infrastructure investments in the pre-British period, devastation from war, and exploitative tax revenue maximization policies of the British East India Company after 1765 crippled the economic resources of the rural population. Nobel Prize winning Indian economist Amartya Sen describes it as a man-made famine, noting that no previous famine had occurred in Bengal that century.

As a result of the famine, large areas were depopulated and turned to jungles for decades to come, as the survivors migrated in search of food. Many cultivated lands were abandoned-much of Birbhum, for instance, returned to jungle and was virtually impossible for decades afterwards. From 1772 onwards, bands of bandits and Thugs became an established feature of Bengal, and were only brought under control by punitive actions in the 1890s.

The most common approach to famines is to propose explanations in terms of the Food Availability Decline (FAD). This FAD approach has been extensively used to analyse and explain the Bengal famine. The Famine Inquiry Commission's view that the primary cause of the famine was 'a serious shortage in the total supply of rice available for consumption in Bengal' provides the standard explanation of the famine, as George Blyn notes in his authoritative account of 'agricultural trends in India' (1966), referring to the Report of the Famine Inquiry Commission and to the Census of India 1951. In 1942-43 cyclones and floods reduced the Bengal rice crop by about a third; this, coupled with the absence of exports from Japanese-controlled Burma, and inadequate

relief, led to famines, epidemics (malaria, cholera and smallpox), aggravated by widespread starvation'.

## **Green Revolution 1960s**

The Green Revolution, or the Third Agricultural Revolution, is a set of research and technology transfer initiatives occurring between 1950 and the late 1960s that increased agricultural production worldwide, particularly in the developing world, beginning most markedly in the late 1960s. The initiatives resulted in the adoption of new technologies, including high-yielding varieties (HYVs) of cereals, especially dwarf wheat and rice, in association with chemical fertilizers and agro-chemicals, and with controlled water supply (usually involving irrigation) and new methods of cultivation, including mechanization. All of these together were seen as a 'package of practices' to supersede 'traditional' technology and to be adopted as a whole.

Both the Ford Foundation and the Rockefeller Foundation were heavily involved. One key leader was Norman Borlaug, the "Father of the Green Revolution", who received the Nobel Peace Prize in 1970. He is credited with saving over a billion people from starvation. The basic approach was the development of high-yielding varieties of cereal grains, expansion of irrigation infrastructure, modernization of management techniques, distribution of hybridized seeds, synthetic fertilizers, and pesticides to farmers.

The term "Green Revolution" was first used in a speech by the administrator of the U.S. Agency for International Development (USAID), William S. Gaud, who noted the spread of the new technologies: "These and other developments in the field of agriculture contain the makings of a new revolution. It is not a violent Red Revolution like that of the Soviets, nor is it a White Revolution like that of the Shah of Iran. I call it the Green Revolution."

In 1961, India was on the brink of mass famine. Dr. Norman Borlaug was invited to India by the adviser to the Indian Minister of Agriculture, Dr. M.S. Swaminathan. Despite bureaucratic hurdles imposed by India's grain monopolies, the Ford Foundation and Indian Government collaborated to import wheat seed from the International Maize and Wheat Improvement Centre (CIMMYT). Punjab was selected by the Indian government to be the first site to try the new crops because of its reliable water supply and a history of agricultural success. India began its own Green Revolution program of plant breeding, irrigation development, and financing of agrochemicals.

The two successive severe droughts in 1965-66 and 1966-67, gave rise to international apprehensions about India's capacity to feed her huge and growing population. The harshest critics recommended the application of the "triage" formula to countries like India which were considered beyond redemption.

Fortunately for the country, at this very time the High Yielding Varieties (HYVs) of cereals became commercially available. India's policymakers plumped for it with alacrity. Dr. Norman Borlaug complimented the then Minister C. Subramaniam, a visionary for Agriculture as "the first high officer to recognize the significance of the new wheat strains and willing to take the risk involved in importing 18,000 tonnes of dwarf Mexican varieties".

The Pearson Report characterized the speedy adoption of HYVs as "one of the authentic marvels of our time". Others described the process of agricultural transformation as "one of the most amazing stories of our time". While this was a general observation, the economists, who had neither anticipated the Green Revolution nor played any part in its adoption by way of even policy advice, did not take kindly to it. Their reaction varied from scepticism ("Cornucopia or Pandora's Box") to downright condemnation on the ground that it was leading towards the emergence of dualism. Let us accept that technological changes ushered through the application of HYVs "as such have contributed to the widening of the income disparities between 1. different regions, 2. small and large farms and 3. land owners on the one hand and tenants and agricultural labourers on the other". But the question is: situated as the country was in the mid-Sixties, when its capacity to feed its people was seriously being questioned, and some critics were advocating the application of "triage" and "life boats" formula to food aid, what was the choice before the policymaker? The highest priority had to be assigned to augmenting food production and the HYVs offered an excellent means of doing so. The possibility of its in egalitarian effects - assuming that these could be clearly perceived at that time - had to be weighed against the obvious in egalitarian effects of food shortage and high prices, under which the poor suffer the most.

It is also asserted that "despite technological changes, the growth of agricultural output in India slowed down in the 1960s compared to 1950s".

## **Post-Independence Growth of Indian Agriculture**

Indian agriculture has come a long way since the inception of planning in 1951. All along there was an almost obsessive concern of development policy with the attainment of self-sufficiency in food. The country faced an acute shortage of food grains in the 1960s, when the average annual imports of wheat hovered around three million tonnes. It survived through this phase because of the munificence of the US, which supplied wheat to us under its PL-480 programme. This donor-donee relationship was far from flattering, as revealed by M.L Dantwala in the following quotation, reproduced, from the book 'Famine' 1975 by Paddock Brothers, reflecting the perception of the US: "America will have to apply classical medical 'triage' method. Like doctors on the battlefield trying to make the best out of minimum resources, will have to

decide which countries to save and which to sacrifice. Today India absorbs like a blotter 25 percent of the entire American wheat crop. No matter how one may adjust present statistics and allow for future increases in the American wheat crop, it will be beyond the resources of the US to keep famine out of India during the 1970s. Of all national leaderships, the Indian comes close to being the most childish and inefficient and perversely determined to cut the country's economic throat." The moral: If other more deserving countries are to be saved, India must be sacrificed. At the time of our gaining independence, the first Prime Minister Jawaharlal Nehru said, "everything else can wait, but not agriculture." There have been several policy statements for agriculture during the last sixty years. Thanks to the Green Revolution, India attained self-sufficiency in food grains in the 1970s and, what is more, emerged as an exporter of food grains in recent years.

Attainment of food self-sufficiency, even in a technical sense, is admittedly an important landmark in the history of Indian agriculture development, but this has not meant the dilution of problems. Indian agriculture is facing problems of agricultural growth and rural development in general continue to remain, in the new millennium, as daunting as they were in the 1950s. One major difference is that the agricultural sector today faces a host of what we might call second generation problems on which we would seek to focus.

The post-Independence development of Indian agriculture can be broadly grouped into four phases. The first phase (1947-64) was the Nehruvian era where the major emphasis was on the development of infrastructure for scientific agriculture and a large expansion of area under irrigation. During this period, the population started increasing by over 3 percent a year as a result of both the steps taken to strengthen public health care systems and advances in preventive and curative medicine. The growth in food production was inadequate to meet the consumption needs of the growing population, and food imports became essential. Such food imports, largely under the PL-480 programme of the United States, touched a peak of 10 million tonnes in 1966, (M.S. Swaminathan, 2003). In this period, there was an interesting debate between structuralist' school, i.e., those believing in drastic changes in land relations as a prerequisite for effecting a breakthrough in agriculture and those who thought, based on the evidence of high output response to irrigation and new technology, that high agricultural growth was possible through input intensification, despite the smallness of farm size and prevalence of tenancy. It became clear that the potential for agricultural growth from the investments made in irrigation, and from the autonomous factors, e.g., the expansion of area under cultivation, intensives created by the implementation of land reforms like the abolition of intermediaries and the rise of agricultural classes to political power were nearly exhausted, and that further growth of agriculture depended



crucially on the expansion of agricultural infrastructure and the application of new technology to raise farm productivity and profitability.

The large imports of food grains in the wake of two-successive droughts in mid-sixties, and the unacceptably high political costs that it entailed, pushed the government towards a bold strategy for achieving self-sufficiency in food grains through the green revolution by stepping up investments in irrigation, evolving and applying High-Yielding Varieties of seeds and intensifying the use of inputs like fertilizers. The results of the adoption of the High Yielding Variety (HYV) programme were quick and substantial. Food grains production which had hovered around 50.82 million tonnes per year since 1950-51 started increasing at a fast rate.

In the second phase (1965-1985), India underwent a radical change in the production of food grains from the mid-60s onwards, consequently, "in 1968, several thousand year old barrier in the yield of wheat was broken and India achieved a wheat production of 17 million tonnes. An American scientist Dr. William Gaud called the dramatic breakthrough the "Green Revolution". The main achievement was in the area of wheat production and therefore many economists called it the Wheat Revolution instead of the Green Revolution. The advent of the Green Revolution was at a time when the availability of additional land had more or less reached its limits, the agricultural scenario changed from one of land reclamations to one heavily dependent on modern inputs.

The introduction and rapid spread of High Yielding rice and wheat varieties resulted in steady output growth for food grains. The production which was 10.40 million tonnes in 1965-66, rose to 99.70 million tonnes in 2017-18. Wheat exports which were 1.64 Lakh tonnes 2009-10 with a value of 231.90 crores have now come down to a mere 0.11 Lakh tonnes with a value of 26.92 crores. Public investment in irrigation and other rural infrastructure, research and extension together with improved crop production practices has significantly helped to expand production and stock to food grains. This increase in food grains production has helped the country to achieve a considerable degree of self-sufficiency in terms of food requirements and tide over recurring food shortages reminiscent of the 1960s and 1970s.

The third Phase (1985-2000) was characterized by the greater emphasis on the production of pulses and oilseeds as well as of vegetables, fruits, and milk. This period ended with large grain reserves with the government, with the media highlighting the co-existence of "Grain Mountains and hungry millions".

### **Indian Agriculture during the 1980s**

The poor growth record of the early Green Revolution period was reversed after 1980-81, a period we call the "late Green Revolution period". As Bhalla and Singh (2001) noted, the 1980s represent a period of the spread of the Green

Revolution to larger areas and more crops. Some authors have called the 1980s as the phase of “wider technology dissemination” (Chand, 2004). Food grain yields increased at an annual rate of 3.2 percent between 1981-82 and 1991-92. A sharp increase in rice yields accounted for most of the increase in food grain production, rice yields grew annually at 3.3 per cent between 1981-82 and 1991-92 compared to 1.5 per cent between 1967-68 and 1980-81. The agriculture GDP also registered an impressive annual growth rate of 3.4 per cent in the 1980s. There were two important factors that contributed to the turnaround in the 1980s: first, there was a major jump in production in the eastern region of the country, particularly in the State of West Bengal. Secondly, there was a major improvement in the production of oilseeds in the central Indian region.

### **Indian Agriculture during the 1990s**

By the late-eighties and the early-nineties, the official policy on agriculture followed until then came to be criticized. This critique of the earlier policy was led by a section of economists as well as international financial institutions, such as the World Bank, all wedded to the ideas of the Washington Consensus. It was argued that the earlier policy deliberately skewed the terms of trade against agriculture through protectionist industrial and trade policies and an overvalued exchange rate. It was argued that once we “get the prices right”, the incentive structure in agriculture would improve, and farmers would respond to higher prices by producing more.

According to one study if domestic prices had been aligned with world prices, average incomes in agriculture in the early-1990s would have been 16 to 25 per cent higher than what they actually were. Liberalization of agricultural trade was an important step in imparting efficiency to Indian agriculture.

These arguments were derived primarily from the standpoint of the neo-classical trade theory, in which free trade and openness would maximize efficiency and gains. It was argued that India has major comparative advantages in diversifying its cropping pattern in favours of high value, export-oriented crops like fruits, vegetables and flowers. Further, restrictions on private stocks and internal trade should be eliminated, which would help to evolve a national market in agriculture. The argument of the proponents of the new policy has been that once terms of trade improve; price incentives would generate a significant supply response. However, the vast literature on the supply responsiveness of farmers has shown that the relationship between prices and output is very weak. There are, of course, major issues related to the accuracy of economic models used to estimate supply response in agriculture, such as the measurement and control of different effects. Yet, the range of long run supply

elasticity of aggregate agricultural output has historically been between 0.1 and 0.5 in developing countries.

India has 198.36 million hectares of cultivable land with 157.81 million agricultural holdings. The average operational holding is 1.08 hectares, and about two-thirds of the cultivable land solely dependent on monsoons. Indian agriculturists with all the constraints have to compete with farmers from the rest of the world with operational holdings exceeding 1,000 hectares. Indian agriculture has to be modernized to compete in the world. The productivity of crops has to improve through the introduction of micro-irrigation systems and new farming technology, strengthening extension services, improved post-harvest management and bio-technology, promoting information technology and enhancing market leadership. There had been some improvement, particularly during the Five Year Plan periods. During the year 2005-06, actual percentage Growth in Agriculture and allied sector was 4.9 percent over three years (2005-06 to 2007-08), it has reduced to 1.6 in the year 2008-09.

The package of macro-economic and trade policy reforms introduced in 1991 consisted of macro-economic policy changes, changes in exchange and trade policy, devaluation of the currency, gradual dismantling of the industrial licensing system and controls, reduction of tariffs, reform of public enterprises and increasing privatization. Although no direct reference was made to agriculture, the new policy framework was expected to be highly beneficial to tradable agriculture through ending discrimination against it.

**Table 1.1** Average GDP Growth Rates in Agriculture  
(% per Year at 1999–2000 Price)

S.No.	Period	Total Economy	Agriculture and Allied Sectors	Crops and Livestock
1	Wider technology Dissemination period 1981–82 to 1990–91	5.40	3.52	3.65
2	Early reforms period 1991–1992 to 1996–97	5.69	3.66	3.68
3	Ninth Plan 1997–98 to 2001–02	5.52	2.50	2.49
4	Tenth Plan period 2002–03 to 2004–05	7.77	2.47	2.51
	to 2006–07 of which 2002–03	6.60	0.89	0.89
	2005–06 to 2006–07	9.51	4.84	4.96

Source: National Accounts Statistics 2008 (New Series), Central Statistical Organization, Ministry of Statistics and Programme Implementation, New Delhi.

The liberalizers argued that the import substitution strategy of industrialization under the planning regime followed by most developing countries in the post war period was highly discriminatory against the agricultural sector. But despite the changes in the macro-economic policy framework and trade liberalization, India's agricultural sector did not experience any significant growth subsequent to the initiation of economic reforms in 1991. In fact, except for a short period 1991-92 to 1996-97, when because of a highly favourable international climate, agricultural exports rose sharply, the agricultural sector has not derived the expected benefits from trade liberalization. Nor has the new macro-economic policy framework resulted in accelerating agricultural growth. In fact, when compared with the immediate pre-liberalization period 1980-81 to 1990-91, agricultural growth in India recorded a visible deceleration during the post-liberalization period 1990-93 to 2003-06.

### **Agriculture during the 2000s**

In the fourth phase, a further increase in food grains production became difficult. According to the GoI's Economic Survey, 1999-2000, "There are limits to increasing production through area expansion as the country has almost reached a plateau in so far as cultivable land is concerned. Hence, the emphasis has to be on increasing productivity levels. The area under food grains has more or less remained constant at around 125 million hectares since 1970-71.

The agricultural decline is taking place at a time when international prices of major food grains are going up steeply, partly owing to the use of grain for ethanol production. Land for food versus fuel is becoming a major issue. For example, the export price of wheat has risen from \$197 a ton in 2005 to \$263 a ton in 2007. Maize price has gone up from about \$100 a ton in 2005 to \$166 a ton now. International trade is also becoming free but not fair. There is also an indication of adverse changes in rainfall, temperature, and sea level as a result of global warming.

While the government rejoices over a record total food grain production in the country is estimated at record 291.95 million tonnes which is higher by 6.74 million tonnes than the production of food grain of 285.21 million tonnes achieved during 2018-19. There are doubts about the country's ability to produce enough to meet demand by 2033-34, if agricultural production does not remain above the population growth rate. In India there is a need to increase the annual food grain production from the present 295.67 million tonnes to 340-355 million tonnes by 2033-34 based on actual consumption, i.e., 2033-34 as estimated by NITI Aayog working group (February 2018). Our agriculture is at the crossroads economically, ecologically, technologically, socially and

nutritionally. A "business as usual approach" in the farm sector now will lead to an unprecedented human calamity, the beginnings of which we are now witnessing in the form of suicides by farmers in several parts of the country, including the Punjab which is the heartland of intensive agriculture, (Government of India, 2004).

### **Structural Adjustment of India's Economy 1991-2010**

In 1991, India faced an unprecedented balance of payments crisis. For almost a decade the government had borrowed heavily to support an economic strategy that relied on expansionary public spending to finance growth. From 1980 to 1991 India's domestic public debt increased steadily, from 36 percent to 56 percent of the GDP, while its external debt more than tripled in 2013-14 to \$70 billion.

Political changes, unrest in parts of the country, and the 1990 Persian Gulf crisis compounded the already volatile situation. The crisis caused oil prices to rise, substantially increasing the cost of oil imports, and foreign exchange earnings to drop. India's creditworthiness, already under strain, became even more vulnerable as Indians from abroad withdrew their substantial foreign currency deposits and commercial banks reduced their exposure. Toward the end of 1990, India's credit worthiness was downgraded, effectively cutting its access to sources of commercial credit. By early 1991, India was on the brink of default.

As the crisis unfolded the debates in India's political and economic circles increasingly focused on reforms. In India's large and highly diverse democracy, those debates proved important in building political consensus around the voices for reforms. Nevertheless, it took a new government, which came to power in June 1991, to launch India's first comprehensive economic policy reform program, which the World Bank supported with a \$500 million Structural Adjustment Operation (SAL), approved in December 1991 and closed in December 1993.

### **Features of Existing Agricultural Policies**

The existing policy framework for agriculture is the outcome of many years of experimentation. The evolution of policy and current policy framework can easily be discerned from the changes in objectives. The strategic objectives of agricultural development in India and changes there on can be identified as follows:

**Table 1.2** Objective of Agriculture Development Policy in India

Period	Strategic Objectives
Before independence up to mid-60s	To keep prices of food grains low.
Mid 60s to early 80s	Maximizing production of food grains
Early 80s to early 90s	Evolving production pattern according to varying demand patterns.
	Slow opening up of trade in agricultural commodities.

Source: Compiled by the author

Several policy instruments for achieving the above set of objectives have been tried and used in India. The instruments, which are currently in use, include the following:

1. Fixation and announcement of Minimum Support Prices for 24 commodities before sowing and maturing, arrangements for purchases of farm produce at these prices in case market price dip below these levels.
2. Selective intervention in the market for some commodities under the market intervention scheme of the GoI.
3. Open market operation by public agencies and cooperatives for some commodities like raw cotton, oil seeds and copra.
4. Buffer stocking of food grains specially wheat and rice.
5. Public distribution of certain commodities like wheat and rice at subsidized prices.
6. Levy of rice mills and sugar factories and distribution of levy rice and sugar at subsidized prices.
7. Imposition of stock limits on traders and processors.
8. Regulation of marketing practices in agriculture produce markets.
9. Preserving quality and grade standards of agriculture produce markets.
10. Creation of infrastructure facilities for improving marketing such as market yards and sub-yards in primary produce markets roads, communication facilities and dissemination of market infrastructure.
11. Encouraging cooperatives in agricultural development and marketing.
12. Regulation of exports and imports and Agricultural Export Policy

### **India's Agreement on Agriculture at WTO**

After over 7 years of negotiations the Uruguay Round multilateral trade negotiations were concluded on December 15, 1993, and were formally ratified in April 1994 at Marrakesh, Morocco. The WTO Agreement on Agriculture was one of the many agreements which were negotiated during the Uruguay Round.

The WTO Agreement on Agriculture contains provisions in 3 broad areas of agriculture and trade policy: market access, domestic support and export subsidies.

The implementation of the Agreement on Agriculture started with effect from 1.1.1995. As per the provisions of the Agreement, the developed countries would complete their reduction commitments within 6 years, i.e., by the year 2000, whereas the commitments of the developing countries would be completed within 10 years, i.e., by the year 2004. The least developed countries are not required to make any reductions. The products which are included within the purview of this agreement are what are normally considered as part of agriculture except that it excludes fishery and forestry products as well as rubber, jute, sisal, abaca and coir.

## **Farmers' Suicides in India**

### **Suggestions for the Prevention of Distress in the Farming Community**

On account of continuing distress, caused largely by the failure of markets and consequent increase in indebtedness, farmers in the country have been taking recourse of the extreme step of ending their lives. Cases of suicides have been reported from states such as composite Andhra Pradesh, Karnataka, Maharashtra, Kerala, Punjab, Rajasthan, Odisha and Madhya Pradesh. A report of the National Commission on Farmers (NCF, 2006) has underlined the need to address the farmer suicide problem on a priority basis. Some of the measures suggested include:

1. Farmers to be given orientation and awareness to overcoming their stress.
2. Measures by the government to reduce costs of cultivation process and it also can purchase the agricultural produce at a higher price.
3. Import of new technological tools to increase the shelf-life of perishable products.
4. Joining all the rivers of India.
5. Enactment and implementation of strict environment protection laws to be implemented by the government.
6. Provision by the government of affordable health insurance and revitalization of primary healthcare centres. Extension of the National Rural Health Mission to suicide hotspot locations on a priority basis.
7. Setting up State level Farmers' Commissions with representation of farmers for ensuring dynamic government response to farmers' problems.
8. Restructuring microfinance policies to serve as Livelihood Finance, i.e., credit coupled with support services in the areas of technology, management and markets.

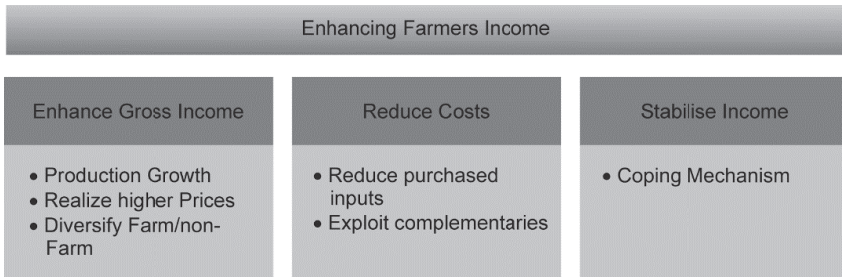
9. Cover all crops by crop insurance with the village and not merely the block as the unit for assessment.
10. Provision of a social security net with provision for old age support and health insurance.
11. Promotion of aquifer recharge and rainwater conservation. Decentralization of water use planning. Every village should aim at Jal Swaraj with Gram Sabhas serving as Pani Panchayats.
12. Ensuring availability of quality seed and other inputs at affordable costs and at the right time and place.
13. Recommending low risk and low-cost technologies which can help to provide maximum income to farmers because they cannot cope with the shock of crop failure, particularly those associated with high cost technologies like Bt cotton.
14. Introduction of focused Market Intervention Schemes (MIS) in the case of life-saving crops such as cumin in arid areas. Establishing a Price Stabilization Fund in place to protect the farmers from price fluctuations.
15. Swift action on import duties to protect farmers from fluctuations in the international markets.
16. Setting up Village Knowledge Centres (VKCs) or Gyan Chaupals in the farmers' distress hotspots to provide dynamic and demand driven information on all aspects of agricultural and non-farm livelihoods and also to serve as guidance centres.
17. Conduct of public awareness campaigns to make people identify early signs of suicidal behaviour.
18. Promotion of policies of Integrated Pest Management (IPM) to prevent pest damage – an all-inclusive approach that integrates biological, chemical, mechanical and physical methodology should be used to prevent crop damage.
19. Lowering of fertilizer costs, helping fertilizer industries cut down on costs.
20. Leveraging advancements in Science and Technology by ensuring that state seed policies focus on new genotypes, Contract farming and sensitization to adverse weather conditions.
21. Introduction of the Fasal Bhima Yojana, a crop insurance scheme Paramparagat Krishi Vikas Yojana, to encourage traditional and sustainable organic farming.

### **Sources of Farmers' Income Growth**

There are several possibilities for increasing the income of farmers. Some may be low hanging fruit, i.e., they can be realised within a year or so. Others may be realised over the years depending on the process involved. Also, the



strategies and the blueprints should be different for different states/regions and the clientele groups. In fact, one should go to the district or agro-climatic zone level data to understand and suggest location-specific strategies. A broad scheme for enhancing farmers' income is given below.



**Figure 1.2** Enhancing Farmers' Income

Fundamentally there are three options available for enhancing the income of farmers, viz., increasing the gross income, reducing the costs and stabilising the income. Various options under each of these three broad options are listed.

**Table 1.3** Possible options for enhancing farmers' income

Enhancing Gross Income	
Increasing production	<ul style="list-style-type: none"> <li>• Area expansion – cropping intensity</li> <li>• Yield enhancement – bridging existing yield gaps, enhancing genetic yield potential through breeding/biotechnology, providing irrigation, additional nutrient use</li> </ul>
Enhancing output price realization	<ul style="list-style-type: none"> <li>• Increase in Minimum Support Price (MSP)</li> <li>• Increase in procurement at MSP through market support operations</li> </ul>
	<ul style="list-style-type: none"> <li>• Aggregation for building volume for better price realisation through collective bargaining</li> <li>• Staggered sales and discouraging distress sales and improving holding capacity of farmers</li> </ul>
Diversifying within the farm sector	<ul style="list-style-type: none"> <li>• Choose an ideal farming system considering linkages to increase and stabilise income</li> <li>• Optimal crop mix including horticulture, sericulture, fisheries, animal farming, poultry</li> <li>• Increase scale, increase productivity, enhancing prices of outputs</li> </ul>
Diversification to non-farm sector	<ul style="list-style-type: none"> <li>• Non-Farm Sector (NFS) linked to agriculture – artisans, equipment repairers, tool/implement manufacturers, traders, processing units, custom hiring services</li> <li>• NFS not linked to agriculture – manufacture of consumer goods, shops, hotels, handlooms, etc.</li> <li>• Increase wage income</li> </ul>

**Table 1.3 Contd...**

<b>Enhancing Gross Income</b>	
Reducing costs	<ul style="list-style-type: none"> <li>• Reducing use of purchased inputs</li> <li>• Input saving technology better agronomical practices</li> <li>• Organic Farming</li> <li>• Better nutrient management through soil health monitoring</li> <li>• Use of bio-pesticides and restoring ecological balance</li> <li>• Farming systems approach/ better by product management</li> </ul>
Stabilising income and risk mitigation	<ul style="list-style-type: none"> <li>• Traditional coping mechanism</li> <li>• Water saving technology to expand irrigation cover</li> <li>• Crop and asset insurance</li> <li>• Climate change adaptation</li> </ul>

### **Strategies for Doubling Farmers Income**

1. Laying emphasis on irrigation along with end to end solution on creation of resources for 'More crop per drop' Krishi SinchayiYojana.
2. Provision of quality seeds and nutrients according to the soil quality of each farm.
3. Promoting large investments in warehouses and cold chains to prevent Post-harvest losses.
4. Promotion of value addition through food processing.
5. Implementation of National Agricultural Markets and e-platforms (e-NAM).
6. To mitigate the risk, introduction of crop insurance scheme at a lower cost.
7. Promotion of allied activities such as Dairy-Animal Husbandry, Poultry, Beekeeping, Horticulture, and Fisheries.

### **Doubling Farmers Income, Operation Greens and other Recent Policy Responses**

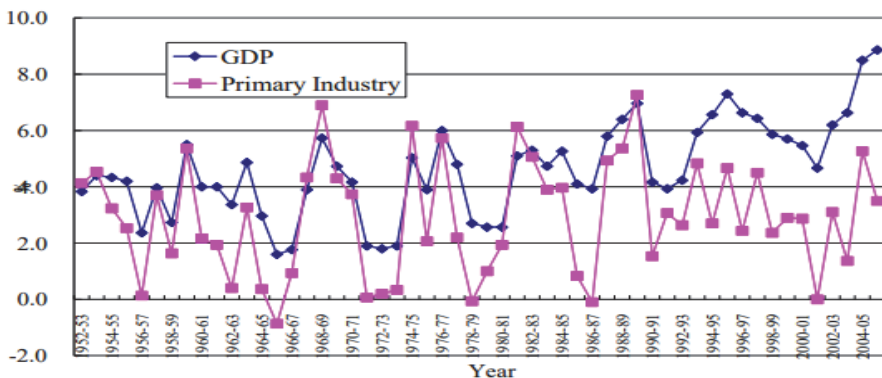
Soon after independence, in addition to prioritising food security and low prices, the GoI recognised the need for generating adequate remuneration for farmers. One key component of the Green Revolution interventions was the Minimum Support Price (MSP) for several commodities, which is updated twice a year. The central government has announced that it will set MSPs at 150% of the cost of inputs in line with the aim of doubling farmers' incomes by 2022.

## 1.2 Revolutions in Agriculture

### 1.2.1 The Green Revolution

Before focusing on the agricultural sector development in India, let us first look at briefly the overall economic development process of the country since independence in 1947 until the present day. Figure 1.3 illustrates the economic growth rates (three-year moving averages) of India in order to eliminate year to year fluctuations. It is found from the figure that India registered a relatively low economic growth rates of around 3.5 percent per annum until the late 1970s, with large fluctuations owing to the influence the agricultural sector growth which largely depended on the monsoon situation. Indian economy then experienced some improvement in the 1980s because of the government's liberalization policies (but not on a full-scale) under the Rajiv Gandhi regime and a relatively high growth rate attained by the agricultural sector in the decade. And finally, after the full-scale global economic liberalization in 1991 the economic growth rates in India accelerated to a very high level (usually more than 6 percent, and even more than 8 percent after the mid-2000s) until recently.

It is notable at the same time that the agricultural sector growth started to clearly lag behind the GDP growth since the 1990s, which indicates that the Indian economy was plunged into a new developmental stage after the 1990s, where widening disparity between agricultural and non-agricultural (or between rural and urban) sectors has become one of the major problems for the economy. *(Now let us look into the agricultural sector development in India by dividing the whole period from the independence to the present time into several periods.)*



**Figure 1.3** Economic Growth Rates in India (Three Year Moving Averages)

Source: Koichi Fujita, 2009, Green Revolution in India

## Trends in Food Grain Prices

Trends in Food grain Prices Based on Wholesale Price Index (WPI) (2011-12=100), WPI in the case of food grains increased by 10.38 percent in July, 2019 over July, 2018. Among food grains, WPI of pulses, cereals and oilseeds increased by 20.08 percent, 8.60 percent, and 8.70 percent, respectively, in July, 2019 over July, 2018. Among cereals, WPI for wheat and paddy increased by 5.79 percent and 3.16 percent, respectively, in July, 2019 over July, 2018. Similarly, WPI in case of food grains increased by 1.29 percent in July, 2019 over June, 2019.

Among food grains, WPI of pulses, cereals and oilseeds increased by 0.07 percent, 1.52 percent and 0.001 percent, respectively, in July, 2019 over June, 2019. Among cereals, WPI for paddy and wheat increased by 0.95 percent and 1.72 percent, respectively, in July, 2019 over June, 2019.

## Factors that are extended to trigger the growth of the agriculture sector in India

Sustainable growth in the agriculture sector in India will substantially depend on many factors that include:

Increase in demand for food items- With the rising population, (India's projected population in 2030 would reach 1.5 billion) there has been a steady increase in the demand for food items such as milk, vegetables, fruits, rice, wheat and pulses, among others. The projected demand for food grains is mentioned in the table below:

**Table 1.4** Food item wise increase in the demand

Types of food items	Demand in year 2000 (in million tones)	Projected demand in year 2030 (in million tones)
Milk	76	182
Vegetables	93	180
Fruits	43	110
Food grains	192	335
Rice	81	156
Wheat	64	95
Cereals	33	102
Pulses	14	30

Source: Industry reports

## Food Supply Projections and Gap

The supply for different commodities has been projected using the Triennium Ending (TE) 2010 as the base year production. The supply projections for different food commodities under different scenarios have been presented at 10-year intervals from 2010-2030. To provide a glimpse, food supply and demand gaps for food grains, edible oils and sugar are presented and for high-value commodities, viz. vegetables, fruits, milk, meat, eggs and fish, are given as follows:

## Investment in Irrigation Infrastructure

The largest increase in the irrigated area across the world in the next few years is expected in India, with 17.3 M Ha, as public investment in irrigation has remained relatively strong and private investment in groundwater has been rapid. However, even in India, the projected 1995 to 2020 rate of growth in the irrigated area of 1.2 % per year is well below the rate of 2.0 % per year during 1982-93. As we will see in India, the per annum increase in canal irrigated areas is rapidly falling. The most severe problem facing Indian canal irrigation is not so much the slowdown in its growth, but the rapid deterioration of systems that have already been created. Maintenance is being woefully neglected, leading to poor capacity utilisation, rising incidence of water logging and salinity and lower water use efficiency (WUE). On the whole large canal based irrigation is threatening to become unsustainable physically, environmentally as well as financially.

Various projections have been made for future water demands. The National Commission for Integrated Water Resources Development Plan appointed by the GoI in 1996 has made projections for future water demands for irrigation.

**Table 1.5** Future Water Demand Projections in Billion Cubic Meters (BCM)

Scenario	Year 2010	Year 2025	Year 2050
Low	489	619	830
Medium	536	688	1008
High	556	734	1191

Source: Government of India, 1999b:8-9

### Note:

1. Low, Medium and High scenarios represent Low, Medium and Medium population projects and 4, 4.5 and 5% growth rates in expenditure.
2. Figures above should be compared with the total average utilisable water resources of 1086 BCM per annum. In 1990, availability level was 520 BCM per annum.

## Increased Investment in Agriculture and Infrastructure

We have noted that earlier that public investment in agriculture has been declining, resulting in declining productivity and low capital formation in the agriculture sector. With the burden on productivity - driven growth in the future, this worrisome trend needs to be reversed. Private investment in agriculture has also been slow and must be stimulated through appropriate policies. Accelerated investment are needed to facilitate agricultural and rural development through:

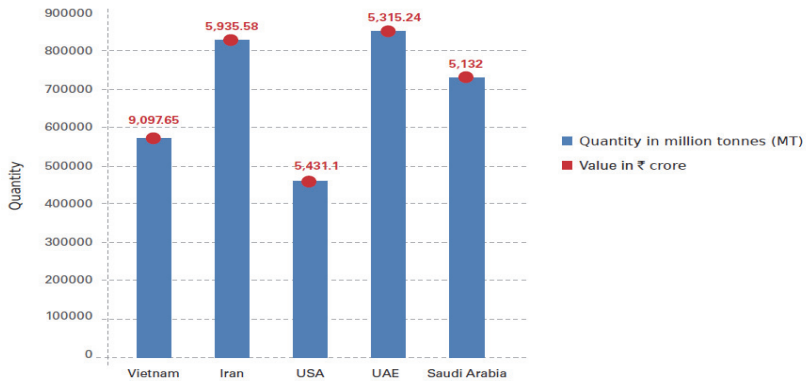
- Introducing new varieties of crops, breeds of livestock, strains of microbes and efficient packages of technologies, particularly those for land and water management, can increase productivity, apart from addressing biotic, socio-economic and environmental challenges;
- Efficient post-harvest and value-addition technologies will obviously help.
- Ensuring the reliable and timely availability of quality inputs at reasonable prices, functioning in place institutional and credit organising support, especially for small and resource-poor farmers, and organising support to land and water resources development are other measures that can be adopted to increased yield.
- Creation of increased employment opportunities, in the rural areas including through creating agriculture-based rural agro-processing and agro-industries, improved rural infrastructures, including access to information, and effective markets, farm to market roads and related infrastructure;
- Centre-staging to the needs and ensuring participation of women farmers is another important area.

## Agriculture Exports

India has played an integral role in global agricultural trade in the past one decade. As per the World Trade Organisation data for 2015, it ranks ninth among the world's major exporters. The country produces nearly 600 million tonnes (mt) of agri-products, including horticultural produce. Total agricultural exports registered a CAGR of 16.45% over FY10-18 to reach US\$ 38.21 billion in FY18; it stood at US\$ 15.67 billion in April-August 2018.

Globally, India is the second-largest producer of rice, wheat, and other cereals. Cereals export stood at US\$ 8 billion during 2017-18, with rice (including basmati and non-basmati varieties) contributing a major share. During the same period, fruits and vegetables worth US\$ 1.4 billion and spices worth US\$ 3.1 billion were exported. Tea exports reached a 36-year high of 240.68 million kg in CY 2017, while coffee exports touched a record 395,000 tonnes. vis-à-vis organic products, India enjoys a twin advantage-an agro-climatic zone suiting varied crop varieties and a rich and native tradition of

organic farming—which it is leveraging to meet the growing demand in the domestic as well as international markets.



**Figure 1.4** Top Five Countries for India's Agricultural Exports, 2018-19

Source: [http://agriexchange.apeda.gov.in/index/genReport\\_combined.aspx#content](http://agriexchange.apeda.gov.in/index/genReport_combined.aspx#content)

Supportive policy measures have added strength to the geographic advantage the country enjoys, which lends it easy connectivity to Europe, the Middle East, Japan, Singapore, Thailand, Malaysia, and Korea.

A number of factors have contributed to India's rise as a consumer market as well as an export hub—a strong consumer base, evolving food choices, large expanses of farm lands, and a large population engaged in agricultural work. The Make in India drive has already brought in a renewed focus on value addition and on processed agricultural products. The agri-export policy goes several steps ahead, adopting a more holistic approach with implications across the spectrum—production, processing, transportation, infrastructure, crossing the hurdles of competition in quality pricing, R and D, removal of trade barriers, and enabling market access aimed at integration with the global value chain.

## 1.2.2 The Yellow Revolution – Oil Seeds

In India, oilseeds production, which was only 5.16 million tonnes (mt) in 1950-51, increased to 10.60 mt in 1975-1976. Total oilseeds production increased from 9.37 mt in 1980-1981 to 12.95 mt in 1984-1985. The production, however, again decreased from 12.95 to 10.83 mt in 1985-1986. The spectacular success of the “Yellow Revolution” was observed when oilseeds production rose to 18.03 million tonnes (mt) in 1988-1989 and 24.38 million tonnes (mt) in 1996-1997 and 24.75 million tonnes (mt) in 1998-1999. This spectacular increase in oilseeds production could be attributed to the advent of the “Technological Mission on Oilseeds” in May 1986, which aimed at

accelerating self-reliance in oilseeds production in the country. Total Oilseeds production in the country during 2019-20 is estimated at 34.19 million tonnes which is higher by 2.67 million tonnes than the production of 31.52 million tonnes during 2018-19. Further, the production of oilseeds during 2019-20 is higher by 4.54 million tonnes than the average oilseeds production.

**Table 1.6** Demand for Edible Oil and Oil Seeds based on Behavioural Approach (Household and Total Consumption) (Million tonnes)

Year	Household Consumption		Total Consumption	
	Edible Oil	Oilseeds (28%)	Edible Oil	Oilseeds (28%)
<b>Baseline (growth rate of GDP at 6% per annum)</b>				
2011-12 Actual	10.66	38.10	9.55	34.11
2012-13	13.27	47.40	11.52	41.13
2016-17	13.27	47.40	14.75	52.67
2020-21	15.82	56.50	17.79	63.54
2021-22	16.57	59.20	18.69	66.76
2028-29	22.73	81.20	26.22	93.65
2032-33	27.13	96.90	31.78	113.49
2033-34	28.36	101.30	33.36	119.13
<b>High growth (growth rate of GDP at 8% per annum)</b>				
2012-13	11.02	39.40	11.52	41.13
2016-17	14.18	50.70	15.67	55.95
2020-21	17.85	63.80	19.83	70.80
2021-22	18.96	67.70	21.08	75.30
2028-29	28.66	102.40	32.16	114.85
2032-33	36.21	129.30	40.86	145.93
2033-34	38.40	137.20	43.40	154.99

Source: Demand and Supply Projections towards 2033, NITI Aayog Working Group Report

Oilseed crops are the second most important determinant of an agricultural economy, next only to cereals within the segment of field crops. The self-sufficiency in oilseeds attained through the “Yellow Revolution” during the early 1990s, could not be sustained beyond a short period. Despite being the fifth largest oilseed crop producing country in the world, presently India is also one of the largest importers of vegetable oils. There is a spurt in vegetable oil



consumption in recent years in respect of both edible as well as industrial usages. The demand-supply gap in the edible oils has necessitated huge imports for accounting for 60 per cent of the country's requirement (2017-18: import 15.36 million tonnes; cost Rs. 74,995 crores). Despite the commendable performance of domestic oilseeds production of the nine annual crops (Compound Annual Growth Rate of 3.89%), it could not match with the galloping rate of per capita demand on account of enhanced per capita consumption driven by an increase in population and enhanced per capita income.

As estimated by NITI Aayog Working Group with the increase in population, demand for edible oils is expected to increase. Positive elasticity indicates that growth in income would work as an accelerator for future demand not only for edible oils but also for the other high value commodities. The edible oils demand for household consumption is expected to increase from 11 million tonnes in the base year (2011-12) to 15 million tonnes by the end of 2020-21 and up to 27 million tonnes by 2032-33 with the baseline growth rate of 6 percent per annum. However, if the future economy grows at a higher growth rate of 8 percent annum, the demand for edible oils for household consumption would be up to 18 million tonnes by the end of 2020-21 and 36 million tonnes annum in the baseline scenario and 5 percent in the high growth scenario. Thus, the demand for food grains for household consumption.

### 1.2.3 The White Revolution

The White Revolution in India occurred in 1970 when the National Dairy Development Board (NDDB) was established to organize dairy development through co-operative societies. Dr. Verghese Kurien was the father of the White Revolution in India. The dairy development program through co-operative societies was first established in the state of Gujarat. The cooperative societies were most successful in the Anand District of Gujarat. The co-operative societies are owned and managed by the milk producers. These co-operatives apart from financial help, also provide consultancy. The increase in milk production has also been termed as Operation Flood.

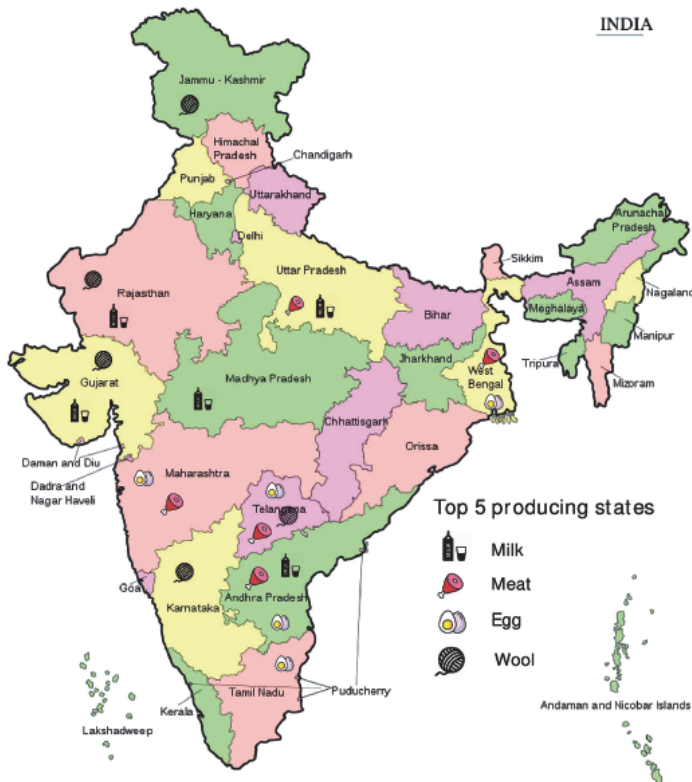
Operation Flood, launched in 1970 is a project of the National Dairy Development Board (NDDB), which was the world's biggest dairy development program, that made India, from a milk-deficient nation to the world's largest milk producer, surpassing the USA in 1998, with about 17 percent of global output in 2010–11, which made dairy farming India's largest self-sustainable rural employment generator. It was launched to help farmers direct their own development, placing control of the resources they create in their own hands.

The Anand pattern experiment at Amul, a single, cooperative dairy, was the engine behind the success of the program. Verghese Kurien was made the

chairman of NDDDB by the then Prime Minister of India, Shri Lal Bahadur Shastri, and he was the chairman and founder of Amul as well. Kurien gave the necessary thrust using his professional management skills to the program.

### Dairying and Animal Husbandry

Dairying as an economic activity is significant particularly from the viewpoint of rural women for whom it provides them an opportunity for economic empowerment. Many cooperatives have established cattle feed manufacturing plants to meet the demands of the dairy owners for well formulated feed nutrients and to provide information on the health of the animals. The Directorates of Animal Husbandry in the states also have the mandate of providing information and health care services. However, there are variations in milk production as well as per capita in India.



**Figure 1.5** Top five milk, meat, egg, and wool producing states in India

In the recent past the dairy sector has transformed into a major activity from its subsidiary status as the value of milk output has surpassed that of output of cereals and pulses combined.

Meat remains the largest export earner among various agriculture commodities. As a result, it is important to understand the value chain of various animal husbandry activities and identify financing opportunities for the banking community in dairy as well as sheep, goat and piggery farming. It is also very important to make strategic plans for dovetailing the macro level infrastructure and marketing plans with the micro-level production activities.

Milk and Milk products are essential food items and provide sufficient essential nutritional support to children. In the context of the GoI's objective of "Doubling of Farmers' Income by 2022" with diversification as one of the key strategies for achieving the same, the animal husbandry sector plays a very important role. This sector provides multiple employment opportunities to small and marginal farmers and plays a major role in ensuring the food security of the most vulnerable part of our population particularly from the point of view of climate change. Therefore, future animal husbandry interventions should focus on climate smart livestock farming that can meet the challenges of climate change and its impacts. There is also a need for understanding the latest trends in livestock farming, pooling of the knowledge sources and formulating strategic approaches for the development of the sector.

Animal husbandry and dairying activities, along with agriculture, continue to be an integral part of human life since the process of civilization started. These activities have contributed not only to the food basket and draught animal power but also to maintaining ecological balance. They play a significant role in generating gainful employment in the rural sector, particularly among the landless, small and marginal farmers and women, besides being sources of cheap and nutritious food.

### **Increase in Demand for Food Items**

Demand for horticultural products including fruits and vegetables will increase from 128.25 million tonnes in the base year of 2011-12 to around 190.5 million tonnes by 2020-21 and further to 462.45 million tonnes by 2033-34 in the baseline scenario. In the high growth scenario, demand will increase up to 343.14 million tonnes in 2020-21 and cross 690.60 million tonnes by 2032-33. The growth in demand for these high value commodities for household consumption will be slightly less than 5 percent per annum in the baseline scenario that would exceed 6 percent per annum in the high growth scenario. The aggregate demand for milk and milk products can touch 355 million tonnes in 2032-33, while meat and meat products can rise up to 44.74 million tonnes.

The aggregate demand for fruits and vegetables could be as high as 580 to 690 million tonnes depending on various growth scenarios.

**Table 1.7** Demand for dairy and horticulture based on Behavioural Approach – Household Consumption (million tonnes)

Year	Milk and Products	Egg, Fish and Meat	Vegetables	Fruits	Nuts	Fruits and Vegetables
<b>Actual Demand</b>						
2011-12	69.17	10.11	102.2	26.05	1.64	128.25
<b>Baseline (growth rate of GDP at 6% per annum)</b>						
2012-13	71.48	10.45	105.67	26.94	1.7	132.61
2016-17	85.66	12.52	127.33	32.41	2.04	159.74
2020-21	101.66	14.86	151.89	38.61	2.43	190.5
2021-22	106.39	15.56	159.19	40.44	2.55	199.63
2028-29	144.49	21.13	218.46	55.28	3.48	273.74
2032-33	171.43	25.07	260.74	65.82	4.14	326.56
2033-34	178.96	26.17	272.6	68.77	4.33	341.37
<b>High growth (growth rate of GDP at 8% per annum)</b>						
2012-13	71.48	10.45	105.67	26.94	1.70	132.61
2016-17	91.35	13.36	136.37	34.58	2.18	170.95
2020-21	114.19	16.70	171.91	43.41	2.73	215.32
2021-22	121.07	17.71	182.69	46.07	2.90	228.76
2028-29	180.28	26.38	276.52	69.13	4.34	345.65
2032-33	225.61	33.02	349.29	86.89	5.45	436.18
2033-34	238.69	34.93	370.42	92.03	5.77	462.45

Source: Demand and Supply Projections towards 2033, NITI Aayog Working Group Report

**Table 1.8** Demand for dairy and horticulture based on Behavioural Approach – Total Consumption (million tonnes)

Year	Milk and Products	Egg, Fish and Meat	Vegetables	Fruits	Nuts	Fruits and Vegetables
<b>Actual Demand</b>						
2011-12	119.38	11.64	152.14	88.13	1.64	240.27
<b>Baseline (growth rate of GDP at 6% per annum)</b>						
2012-13	123.46	12.08	156.21	80.9	1.7	237.11
2016-17	149.47	14.68	185.39	102.24	2.04	287.63
2020-21	177.82	18.15	220.41	122.73	2.43	343.14
2021-22	185.99	19.21	230.65	128.26	2.55	358.91
2028-29	252.96	28.8	314.33	173.97	3.48	488.3
2032-33	300.89	36.8	374.15	206.84	4.14	580.99
<b>High growth (growth rate of GDP at 8% per annum)</b>						
2012-13	123.46	12.08	156.21	80.90	1.70	237.11
2016-17	155.16	15.51	194.43	104.41	2.18	298.84
2020-21	190.35	19.99	240.44	127.53	2.73	367.97
2021-22	200.67	21.37	254.16	133.89	2.90	388.05
2028-29	288.74	34.05	372.39	187.82	4.34	560.21
2032-33	355.06	44.74	462.70	227.90	5.45	690.60

Source: Demand and Supply Projections towards 2033, NITI Aayog Working Group Report

### 1.2.4 The Blue Revolution

The Blue Revolution was launched in India during the 7<sup>th</sup> Five Year Plan (FYP) that went from 1985 to 1990, during when the government started the Fish Farmers Development Agencies (FFDA)s. During the 8<sup>th</sup> FYP, from 1992-97, the Intensive Marine Fisheries Program was launched in which collaboration with MNCs was encouraged. Over a period of time, fishing harbours in Tuticorin, Porbandar, Visakhapatnam, Kochi and Port Blair were

established. A number of research centres have also been set up to increase the production as well as to do improvement in species.

The Blue Revolution is part of the Government's efforts to promote fishing as an allied activity for farmers in order to double their incomes. It refers to an explosive growth in the aquaculture industry. As part of its efforts to raise seafood output and exports and promote sustainable aquaculture, the Government has constituted an independent Ministry for Fisheries. In the budget 2019-20, the government allocated an estimated 3,737 crore rupees for the newly carved out Ministry of Fisheries, Animal Husbandry and Dairying.

Fish touch our lives in countless ways in terms of providing food, nutrition, recreation, livelihood, employment and many more. It comes mainly from two modes of production systems: Capture Fisheries (capturing wild fish from marine and freshwater) and Culture Fisheries (farming fish, also known as aquaculture). The total fish production of 12.59 million metric tonnes was registered during 2017-18 with a contribution of 8.90 million metric tonnes from the inland sector and 3.69 million metric tonnes from the marine sector. The average growth in fish production during 2017-18 stands at 10.14 per cent when compared to 2016-17 (11.43 million metric tonnes). This is mainly due to 14.05 per cent growth in Inland fisheries when compared to 2016-17 (7.80 million metric tonnes). India is currently the world's second-largest producer of fish. It is also world number two in aquaculture production as well as in inland capture fisheries. India is the second-largest fish producing country in the world with an annual production of about 12.60 million metric tonnes; it is aimed to increase it to 15.00 million metric tonnes by 2020 of which 65 per cent was from the inland sector. Almost 50 per cent of inland fish production is from culture fisheries, which constitutes 6.5 per cent of global fish production. The sector has been showing steady growth in the total gross value added and accounts for 5.23 per cent share of agricultural GDP. Fish and fish product exports emerged as the largest group in agricultural exports and in value terms accounted for Rs. 47,620 crore in 2018-19. As per The Economic Survey 2018-19, Foreseeing the vast resource potential and possibilities in the fisheries sector, a separate Department of Fisheries was created in February 2019. The Government has merged all the schemes of fisheries Sector into an umbrella scheme of 'Blue Revolution: Integrated Development and Management of Fisheries focusing on increasing fish production and productivity from aquaculture and fisheries resources, both inland and marine'.

The growth in fish production in India has been at a faster rate than in the world in general; mainly as a result of the increasing contribution from inland fisheries. In the pre-WTO period of 1990-91, the share of exports India's fisheries was 3.90, which rose to 4.56 in the post-WTO period of 2003-04.

Overall, the share of the developing world in total world fish production increased from 43 percent in 1973 to about 73 percent in 1997. Mainly on account of increased contributions from countries such as China and India.

From a production level of 0.75 million tonnes during 1950-51, fish production reached 13.34 million tonnes during 2018-2019. With a share of 6.30% in global fish production and 5% in global trade, India is the 2<sup>nd</sup> largest fish producer in the world in terms of total production and also ranked 2<sup>nd</sup> in aquaculture production. While the growth in marine sector is stagnating with a CAGR of 2.5%, the inland sector has been growing at a CAGR of 5.74% (Fig 13) supported by the growth in aquaculture production especially of carps, pangaisus fish and shrimp.

### Trend in Export of Marine Fish

Total fish production in India was 12.59 million tonnes (mt) and the country exported 1.38 mt fish and fish products with a value of over ₹45,000 crore in 2017-18. Inland capture fisheries accounted for 8.9 mt, the share of marine fisheries was 3.69 mt. India is currently the second largest producer of fisheries after China. The total fish production in 2017-18 was 10.14 per cent more than 11.43 mt produced in 2016-17. Inland fisheries, which grew at 14.05 per cent accounted for much of the growth. Marine fisheries production, on the other hand, went up by only 1.73 per cent in 2017-18.

**Table 1.9** Top Five fishery States in India

States	Inland (in lakh tonnes)	Marine (in lakh tonnes)	Total (in lakh tonnes)
Andhra Pradesh	28.45	6.05	34.50
West Bengal	15.57	1.85	17.42
Gujarat	1.34	7.01	8.35
Kerala	5.34	1.51	6.85
Tamil Nadu	1.85	4.97	6.82
All India Production	89.02	35.88	125.90

Source: State Governments, CIFRI & CMFRI

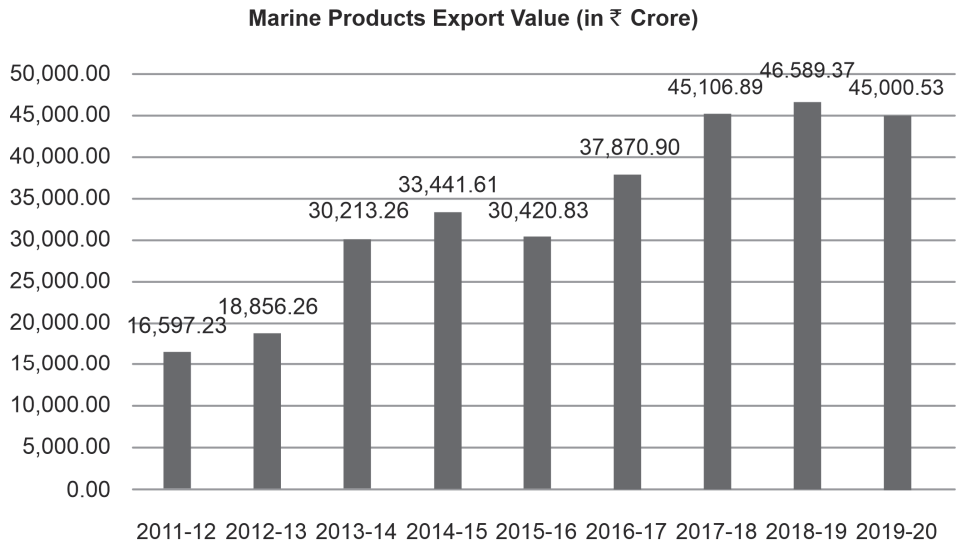
Andhra Pradesh, which captured 3.45 MT of fish, topped the Indian states, followed by West Bengal, which accounted for 1.74 MT. While Andhra Pradesh, retained the top position in inland capture fisheries with 2.85 MT, Gujarat with 7.01 lakh MT was number one in marine fisheries. There has been steady growth in the export of fish and fish products from India.

**Table 1.10** Trend in Export of Marine Products

Year	Marine Products Export Value (in ₹ Crore)
2011-12	16,597.23
2012-13	18,856.26
2013-14	30,213.26
2014-15	33,441.61
2015-16	30,420.83
2016-17	37,870.90
2017-18	45,106.89
2018-19	46,589.37
2019-20	45,000.53

Source: State Government, CIFRI & CMFRI

During 2018-19, the volume of fish and fish products exported was 1.39 MT and ₹46,589 crore in value and 2017-18, the volume of fish and fish products exported was 1.38 mt and ₹45,107 crore in value. The export of marine fish products registered an annual growth of 21.35 per cent in volume and 19.11 per cent growth in value.

**Figure 1.6** Marine Products Export Value from 2011 to 2020

Source: State Government, CIFRI & CMFRI



## 1.3 Current Trends in Agriculture

### 1.3.1 Government Initiatives

The government has set a goal of doubling farmers' incomes by 2022. The 14-volume report of the Committee of Doubling Farmers Income, headed by Ashok Dalwai, has an entire volume devoted to the need for science and technology interventions in agriculture. The use of Big Data, the Internet of Things, Artificial Intelligence and Block Chain in developing value chains and the use of robots and sensors figure significantly, along with the need for better research in crop science and genetically modified technologies, in the to-do list.

The Indian Council of Agricultural Research (ICAR) 2025 Vision Document, too, emphasises the use of technology, including robotics and automation; energy-efficient and environment-friendly devices for farm operations; GIS, GPS and remote sensing; climate smart resource management technologies; and pathogens. According to the document, high-performance computing could be used to analyse very large data sets, particularly those related to agricultural genomics, proteomics, geo-informatics and climate change. It also articulates the need to have a regulatory process for new technological advancements and suggests that a mix of technologies be used to achieve higher productivity.

Some of the recent major government initiatives are:

- The Pradhan Mantri Kisan Samman Nidhi Yojana (PM-Kisan) under which ₹ 2,021 crores (US\$ 284.48 million) was transferred to the bank accounts of more than 10 million beneficiaries on February 24, 2019.
- The Transport and Marketing Assistance (TMA) scheme to provide financial assistance for transport and marketing of agriculture products in order to boost agriculture exports.
- The Agriculture Export Policy, 2018 which aims to increase India's agricultural exports to US\$ 60 billion by 2022 and US\$ 100 billion in the next few years with a stable trade policy regime.
- The ₹ 15,053 crore (US\$ 2.25 billion) procurement policy named 'Pradhan Mantri Annadata Aay Sanraks Han Abhiyan' (PM-AASHA), announced in 2018, under which states can decide the compensation scheme and can also partner with private agencies to ensure fair prices for farmers in the country.
- The ₹ 5,500 crores (US\$ 820.41 million) assistance package for the sugar industry in India was announced in 2018. The Pradhan Mantri Krishi Sinchai Yojana (PMKSY) with an investment of ₹ 50,000 crores (US\$ 7.7 billion) aimed at the development of irrigation sources for providing a permanent solution from drought.

- Also, on the anvil is a provision of ₹ 2,000 crores (US\$ 306.29 million) for computerisation of Primary Agricultural Credit Societies (PACSS) to ensure that cooperatives are benefitted through digital technology.
- A new AGRI-UDAAN programme to mentor start-ups to enable them to connect with potential investors in order to enable them to connect with potential investors in order to triple the capacity of the food processing sector in India from the current 10 per cent of agriculture produce. A commitment of ₹ 6,000 crores (US\$ 936.38 billion) as an investment for mega food parks in the country, as a part of the Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters (SAMPADA) allowing.
- Permitting 100 per cent FDI in the marketing of food products and in food product e-commerce under the automatic route.

### 1.3.2 Production and Trade of Major Farm Products

India's food grain production is expected to reach a record 291.95 million tonnes, as per the second advance estimates of production of food grains, oilseeds and other commercial crops for the agricultural year 2019-2020. As per the second advance estimates for 2019-20, total foodgrain production in the country is estimated at a record 291.95 million tonnes which is higher by 6.74 million tonnes than the production of foodgrains of 285.21 million tonnes achieved during 2018-19. Foodgrain production during 2019-20 is also higher by 26.20 million tonnes compared with the average production during the previous five years (2013-14 to 2017-18). The total production of rice during 2019-20 is estimated at a record 117.47 million tonnes, which is higher by 9.67 million tonnes than the five years' average production of 107.80 million tonnes.

Production of wheat during 2019-20 is estimated at a record 106.21 million tonnes, which is higher by 2.61 million tonnes compared with wheat production during 2018-19 and is 11.60 million tonnes higher than the five-year average wheat production of 94.61 million tonnes. Production of nutri/coarse cereals, estimated at 45.24 million tonnes, is higher by 2.18 million tonnes than the 43.06 million tonnes production achieved during 2018-19. It is also higher by 2.16 million tonnes than the five-year average production. The total production of pulses during 2019-20 is estimated at 23.02 million tonnes, which is higher by 2.76 million tonnes compared to the five-year average production of 20.26 million tonnes. Total oilseeds production in the country during 2019-20 is estimated at 34.19 million tonnes, which is higher by 2.67 million tonnes than the production of 31.52 million tonnes during 2018-19. Further, the production of oilseeds during 2019-20 is higher by 4.54 million tonnes than the average oilseeds production.

Total production of sugarcane in the country during 2019-20 is estimated at 353.85 million tonnes. The production of sugarcane during 2019-20 is higher by 4.07 million tonnes compared to the average sugarcane production of 349.78 million tonnes in the past five years.

Cotton production is estimated at 34.89 million bales (of 170 kg each) in 2019-20, which is higher by 6.85 million bales than the production of 28.04 million bales produced during 2018-19. Production of jute and mesta is estimated at 9.81 million bales (of 180 kg each).

### 1.3.3 Emphasis on Rain Fed Ecosystems

Resource-poor farmers in the rain fed ecosystems practice less-intensive agriculture, and since their incomes depend on local agriculture, they benefit little from increased food production in irrigated areas. To help them, special effort is needed to disseminate available dry land technologies and to generate new ones. It will be necessary to enlarge the efforts for promoting available dry land technologies, increasing the stock of this knowledge, and removing pro-irrigation biases in public investment and expenditure, as well as credit flows, for technology-based agricultural growth. Farming system research to develop location specific technologies must be intensified in the rainfed areas. Strategy to make grey areas green is expected to lead to a second Green Revolution, which would demand a three-pronged strategy - watershed management, hybrid technology and small farm mechanisation, including land scape farming.

### 1.3.4 Fertilizer Application to Enhance Soil Health

Building and maintaining soil quality is the basis for harmonious and successful farming. The link between soil quality, farming practices, long-term soil productivity, sustainable land management, agriculture and environmental quality is now widely acknowledged (Fig. 1.7), as it represents the importance of conserving soil as a resource for future generations instead of “soil fertility”, which was otherwise associated with crop yield alone.



**Figure 1.7** Relationship among soil quality, environmental quality and agricultural sustainability

## Soil Testing

The main science-based tool to estimate a soil's capacity to supply nutrients on agricultural land is soil testing. As a number of non-fertility factors impact final crop yield (environmental conditions, pests, etc.) soil testing is not an exact science, and resulting fertilizer recommendations may not be precise. Nevertheless, soil testing remains one of the most valuable and effective nutrient management tools available.

## Zero Budget Natural Farming (ZBNF)

ZBNF is a set of practices that aims at optimising farming costs and reducing the gap between promise and actual realisation. Integrates the sustainable farm intensification practices with a focus on minimising the costs. Zero budget means zero cost, i.e., “no need for market based inputs”, it is propagated that only 1.5 per cent of the nutrients required by the plants are provided by the soil and the remaining 98.5 per cent comes from air, water and solar energy. Even the 1.5 per cent required is available in plenty in every type of soil, albeit in an unavailable form. Thus, micro-organisms in the soil can be increased with the application of desi (i.e., country like India) cow dung and no fertilizer or pesticide is needed. Zero budget natural farming is based on 4 wheels/ non-negotiable guidelines/principles or package of farming practices that would increase soil health and crop yields at zero external inputs or costs. These include: 1. Jivamrita (life tonic); 2. Bijamrita (seed protection tonic); 3. Acchadana (mulching) and 4. Whapasa (soil aeration/moisture).

1. Jivamrita acts as a catalytic agent that enlivens the soil, increasing microbial activity and organic matter. It helps to prevent fungal and bacterial growth and increases earthworm activity.
2. Bijamrita protects seedlings from seed or soil borne diseases, as well as young roots from fungus.
3. Acchadana enhances decomposition and humus formation through the activity of the soil biota activated by Jivamrita.
4. Whapasa is the condition in which there are both air molecules and water molecules present in the soil.

ZBNF encourages reducing irrigation and recommends irrigating only at noon in alternate furrows. There are also a number of pest management measures such as neemastra, agniastra and brahmastra – which are home-made preparations used for insect and pest control. While the scientific credentials are tested, Andhra Pradesh (AP) is promoting it on a large scale. In fact, AP Government is aiming to cover all the 6 million farmers and 8 million hectares in the state under the initiative of Climate Resilient Zero Budget Natural Farming (CRZBNF) by 2027. In Andhra Pradesh it was observed that yield of various crops have gone up, ranging between 9 per cent (paddy) to 40 per cent

(ragi), net incomes have gone up substantially ranging between 25 per cent (ragi) and 135 per cent (groundnut). The main objective of CRZBNF is to make agriculture viable, sustain agrarian livelihoods and reduce agrarian distress through cost reduction and sustainable agricultural practices that are climate resilient. It aims to reduce costs of cultivation and climate risks, enhance yields and soil fertility through the adoption of agro-ecology framework. Extension support is led by farmers (including women) and through farmer-to-farmer learning.

The State Government's target is to reach out to all farmers in the state (6 million including tenants) and achieve 100 per cent chemical free agriculture by 2027. This is an unprecedented transformation towards sustainable agriculture on such a massive scale. Its focus is on the poorest of the poor farmers (bottom 30 per cent - above 1.5 million families) with nutrition and livelihoods security. This transformation is expected to be achieved through providing support for each farmer family for at least 5 years till they attain sustainable and viable livelihoods. CRZBNF also aims to create human and social capital necessary for vibrant and inclusive agricultural production.

**Table 1.11** Farmers' perception on CRZBNF vis-à-vis non- CRZBNF

CRZBNF	Non-CRZBNF
Farmers see lot of benefits in terms of soil quality and water conservation	Business as usual, soil degradation is a major concern. Increased use of FYM/organic matter
Yields are much lower than expectations Wrong or misinformation about yield rates	Yield fluctuations are often related to climate
Timely availability of inputs. Not very convenient to practice	Easy and convenient due to readymade availability of inputs
Only hardworking farmers with family labour only could practice	Minimum involvement of family labour
Difficult to practice in irrigated areas (canal command) due to sea-page of chemicals	Climate resilient land use practices are limited to dryland areas
Some farmers adopt only for self-consumption, as they don't see much advantage in terms of net economic benefits	Apart from high costs it is more convenient with established set of practices.

Source: Drawn from the discussions with farmers

Climate Resilient Zero Budget Natural Farming (CRZBNF) is the most sustainable practice but the spread is slow. If the climate of increased yields at reduced (if not nil) costs are true, CRZBNF should have spread much faster than Green Revolution technologies where high yields are associated with high

costs. It is true that sustainable practices need support and promotion, especially when environmental or/and social benefits outweigh the immediate economic benefit. The promotional strategies need to be designed accordingly rather than based on false expectations. The strategies ought to integrate policies and institutions at central and state levels. The success of Green Revolution technologies lies in such coordinated efforts, viz., input supply chains fostered with input subsidies along with promotional activities. Moreover, the benefit (impact) of adaption are dramatic in the case of Green Revolution technologies setting an effective demonstration effect. This may not be the case with CRZBNF as the process of realising the impact is slow and hence would require direct support in terms of demonstration, awareness building, etc.

### **System of Rice Intensification (SRI)**

The system of rice intensification is an innovative method comprising uncomplicated management practices that allow rice-growers to attain higher productivity. Similar to the central principle of sustainable agriculture which seeks to make optimal use of naturally available resources as functional inputs, SRI too works by integrating invigorating processes such as optimum plant population, transplanting single young seedlings, wider square planting, mechanical weeding at 10 DAT (Days After Transplantation), keeping the soil moist but not inundated, using Leaf Colour Chart (LCC)-based nitrogen management, using compost, Farm Yard Manure (FYM) or green manure to the greatest extent possible and converting all of these resources synergistically to achieve higher yield from the rice crop. The synergy between these practices helps to produce more healthy and productive plant phenotypes and subsequently to obtain higher returns. SRI also minimises the use of high-cost external inputs that are detrimental to farmers and how productively they are able to employ them.

### **Six Key Elements of SRI Farming**

SRI farming practices for traditional rice growing methods are:

1. Transplanting seedlings much earlier than in conventional methods.
2. Planting only one seedling per hill, rather than a handful.
3. Spacing plants wider apart than in conventional methods and arranging them in a square pattern.
4. Applying water intermittently instead of continuous flood irrigation.
5. Using rotary weeding to control weeds and promote soil aeration; and
6. Applying organic fertilisers to enhance soil fertility and yield.
7. The available studies on the SRI method of paddy cultivation suggest that farmers can double paddy productivity with reduced use of farm inputs

and irrigation water. Using the SRI method of paddy cultivation, countries like India, Indonesia, Cambodia, Vietnam, and the Philippines have recorded an increase of rice yield from 60 per cent to over 170 per cent.

### **Post-harvest Management**

India produces, annually, over a billion tonnes of raw food crops and commodities, and some of these, mainly fruits, vegetables, milk, meat and fish are highly perishable. For want of adequate cold chain facilities, and processing and product development technologies, a substantial amount of produce is lost. The country can ill afford this loss. On an average, postharvest losses of 10-25% in durables and 30-35% in fruits and vegetables were documented. The challenge is to handle fresh produce post-harvest with reduced losses, value additions and maintenance of eating quality. Agro-processing is a sunrise sector in the Indian economy, in view of its large potential for growth and likely socioeconomic impact, specifically on employment and income generation. Estimates suggest that, in developed countries, up to 14% of the total workforce is engaged in it directly or indirectly. In India, however, only 3% of the workforce finds employment in this sector, a reflection of its underdeveloped state and vast untapped potential. Skills need to be developed to undertake primary processing or small product development, while the industrial sector needs to look at the large-scale production of value added products with enhanced shelf lives.

#### **1.3.5 Diversification of Agriculture and Value Addition**

In the face of shrinking natural resources and the ever-increasing demand for larger food and production due to high population and income growth. Intensification is needed to drive the future growth of agriculture research for product diversification. Besides developing technologies for promoting intensification, greater attention needs to be paid to the development of technologies that will facilitate diversification, particularly towards intensive production of fruits, vegetables, flowers and other high value crops. Per capita availability of arable land is quite low and has been declining over time. Diversification, towards these high value and labour-intensive commodities can provide adequate income and employment to the farmers dependent on the small size of farms. Due importance should be given to quality, nutritional aspects, development of post-harvest handling and agro-processing facilities and value addition technologies. The role of biotechnology in post-harvest management and value addition needs to be enhanced.

### **Value addition and Cost-Effectiveness**

Post-harvest losses generally range from 10 to 25 percent for non-perishables and about 30 to 35 per cent in fruits and vegetables. These losses can and must be minimized. Emphasis should therefore be placed to develop post-harvest handling, agro-processing and value-addition technologies not only to prevent losses, but also to improve quality through proper storage, packaging, handling and transport. With the thrust on globalization and increasing competitiveness, this approach is expected to improve the agricultural export contribution of India. Agro-processing facilities should preferably be located close to the points of production in rural areas, to facilitate the promotion of off-farm employment. Agricultural cooperatives and Gram Panchayats need to be encouraged to play a leading role in this effort, keeping the needs of small farmers in mind.

### **Increased Investment in Agriculture and Infrastructure**

We have noted earlier that public investment in agriculture has been declining, resulting in declining productivity and low capital formation in the agriculture sector. With the burden on productivity-driven growth in the future, this worrisome trend needs to be reversed. Private investment in agriculture has also been slow and must be stimulated through appropriate policies. Accelerated investment are needed to facilitate agricultural and rural development through:

- Introducing new varieties of crops, breeds of livestock (Gir, Kankrej and Ongole, etc.), strains of microbes and efficient packages of technologies, particularly those for land and water management, can increase productivity, apart from addressing biotic, socio-economic and environmental challenges.
- Promoting efficient post-harvest and value-addition technologies.
- Ensuring the reliable and timely availability of quality inputs at reasonable prices, putting in place institutional and credit organising support, especially for small and resource-poor farmers, and organising support to land and water resources development.
- Creation of increased employment opportunities, in the rural areas including through creating agriculture-based rural agro-processing and agro-industries, improved rural infrastructures, including access to information, and effective markets, farm to market roads and related infrastructure.
- Centre staging the needs, and ensuring participation of women farmers is another important area.

#### **1.3.6 The Farm to the Fork approach and Sustainability**

Feeding the burgeoning population while simultaneously ensuring sustainable management of natural resources such as land, water and the atmosphere is a



major challenge. Production increases so far have been at the cost of depleting or degrading resources, especially soil, water and biodiversity. Doubling farmers' incomes and sustaining food and nutritional security call for an integrated approach to various sectors of agriculture viz., food grain crops, animal husbandry, dairy farming, horticulture (fruits and vegetables) and forestry, livestock and fisheries, process engineering and machines as against our hitherto major tilt towards food crops over others.

### **Delivering Farm to Fork Sustainability**

Agribusiness is a practice of activities, with backward and forward linkages related to research, extension, financial services, meteorological services, production, storage, processing, marketing, trade, and distribution of raw and processed food, feed and fibre. With the structural transformation of the economy, the share of crop production (farming) is decreasing, and that of processing, distribution and trade is increasing. With rising disposable incomes reflected in the augmented purchasing power and growing nuclear families, the demand for processed foods is witnessing a considerable rise. These factors are further inducing the need for sophistication in various segments of agribusiness such as procurement, storage, transportation, distribution, etc. The demand to feed the growing population and tap emerging global market opportunities shall provide additional thrust to the sector.

### **Good Agricultural Practices (GAP)**

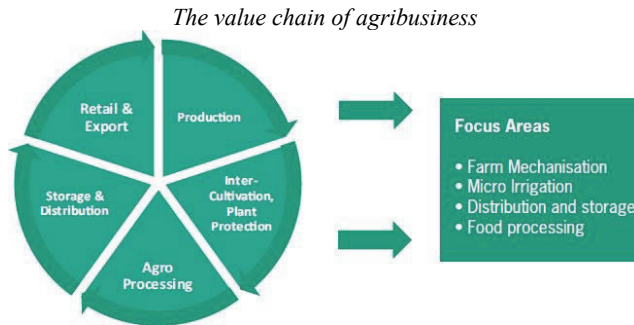
GAP are internationally recognized basic environmental and operative conditions necessary for the production of safe and wholesome fruits and vegetables. They ensure economic and social sustainability for on-farm processes and result in safe and quality food and non-food agricultural products. In the era of declining factor - productivity and degradation of the natural resource base of agricultural production system, there is an urgent need to develop GAP. The challenge, especially in a country such as India, is to transfer GAP to the farmers' field. The present training on GAP includes almost every aspect of farm operations for efficient use of farm resources and a better understanding of them will lead to quality outcomes from field operations. In the context of the extant resource and production vulnerabilities including climate change, GAP will help meet those challenges apart from raising farmers' incomes and employment generation, minimizing the risks in farming and enhancing resource use efficiency.

### **Importance of Agribusiness in India**

Following the structural transformation of the Indian economy, the share of agricultural production (farming) in the economy has been decreasing steadily, while that of processing, distribution and trade is increasing. Further, with the

increase in backward and forward linkages, the distinction between agriculture and agro-industry is also blurring. Farm production, processing and trade continue to integrate further. The need for a robust supply chain is gaining momentum.

With rising disposable incomes reflected in the augmented purchasing power and a growing number of nuclear families, the demand for processed foods is witnessing a substantial surge. These factors are spurring the need for sophistication in various segments of agribusiness such as procurement, storage, transportation, distribution, etc.



**Figure 1.8** Composition of segments in agribusiness in India

### **Production**

Production involves sowing, planting and harvesting of the produce that is to be channelized in the agribusiness value chain. It is crucial to ensure high quality of production as well as higher levels of yield.

### **Agribusiness Growth and Future Potential**

#### **Agribusiness Growth**

Over 52.8% of India’s arable land can be cultivated, compared to the global average of 11%. India is among the highest-ranking countries in terms of output for various commodities like rice, cotton and dairy goods. On the other hand, there is a need for sustained efforts to improve productivity through measures such as simplification of regulatory processes, enhancement of efficiencies in the food distribution system, spreading awareness on modern agricultural practices and tackling unpredictable weather patterns.

To this end, the GoI has, from time to time launched various initiatives such as establishing mega food parks, initiating easier access to credit for farmers, creating a long-term irrigation fund, introducing Krishi Kalyan Cess and the National Cold Chain Development Scheme, among others. Over the years, India

has developed export competitiveness in certain specialised products, making it the world's 15<sup>th</sup> largest agricultural, fishery, and forestry product exporter.

Small-sized farm holdings are, quite naturally, a challenge when, increased production and enhanced productivity are being addressed. Over 85% of farmers in India belong to the small/marginal category with holdings measuring less than 1 ha. Small and marginal farmers with less than two hectares of land account for 86.2% of all farmers in India, but own just 47.3% of the crop area, according to provisional numbers from the 10th agriculture census 2015-16. Well-intentioned programmes such as the Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA) have also exacerbated the situation by shrinking the availability of labour, apart from resulting in wage levels rising unacceptably. The best way to overcome these challenges would be through the evolution of farm mechanisation.

The agriculture sector in India has witnessed a considerable decline in the use of animal and human power. This has resulted in a shift from traditional agricultural practices to more mechanised processes. Though the level of mechanisation in India is lower as compared to other developed countries, it is certainly showing an upward trend, particularly in farmer's cooperatives.

**Table 1.12** The extent of mechanisation at various levels of the value chain

Extent of mechanisation	Levels of value chain
Soil working and seedbed preparation	40%
Seeding and planting	29%
Plant Protection	34%
Irrigation	37%
Harvesting and Threshing	60–70%
Overall	40–45%

Source: Department of Agriculture and Cooperation, Ministry of Agriculture, GoI

The use of farm equipment can increase farm productivity by ~30% and reduce the input cost by about 20%. The government is therefore promoting farm mechanisation by subsidising the purchase of equipment as well as supporting bulk buying through front-end agencies. Considerable emphasis needs to be laid on R and D in these areas and lessons need to be learnt from countries such as Japan.

### Micro Irrigation

Given the dependence of Indian agriculture on natural water resources and monsoons, the efficient use of available water resources becomes more crucial. With the use of micro irrigation systems, conveyance losses are minimised.

Evaporation, runoff and deep percolation are also reduced by using micro irrigation methods. Another water saving advantage is that water sources with limited flow rates such as small water wells can also be used. Micro irrigation provides significantly higher water usage efficiency on account of proximity and focused application. Hence, the concept of micro irrigation has been re-introduced under the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY).

Micro irrigation can result in an overall saving of irrigation water by 20-38%, fertilisers by 28.5% and energy by 30.5%. The total potential of micro irrigation in India is estimated at around 69 million hectares, however, the coverage of micro irrigation was only 8.53 million hectares in FY 2019 (drip irrigation coverage being 3.37 million hectares and sprinkler irrigation coverage being 4.36 million hectares). There is thus, a good deal of untapped potential.

### **Water use efficiency – “Per Drop More Crop”**

The GoI has the mandate to increase the water use efficiency by at least 20 per cent. It can be observed that the water use efficiency in terms of biomass produced in kg/m<sup>3</sup> of water consumed can be increased by more than 200 per cent in the case of vegetables by using the drip method of irrigation. Similar is the case with fruits, oilseeds, pulses, cash crops such as sugarcane and cotton, etc. If the drip irrigation systems are adopted on a large scale for all the crops, this will not only provide “Har Khet Ko Pani” and “Per Drop More Crop”, but will also fulfil our beloved Prime Ministers’ dream of “Doubling Farmers’ Income” in the near future.

### **Cold Chains**

India is the leading producer for many of the agricultural commodities such as fruits, vegetables, spices, milk and other fishery products. Still, the share of India’s exports in these segments is comparatively low. The prime reason for the same is the lack of appropriate cold chain infrastructure facilities which includes both storage and transportation facilities. However, with increasing urbanisation and growth of organised retail, food servicing and food processing sector, there has been a boost in the growth of the cold chain industry.

India’s cold chain sector is a combination of surface storage and refrigerated storage. The industry has grown at a CAGR of 20% in the last 3 years (2014-16). The cold chain market in India is expected to reach ₹ 624 billion by the end of 2017. The Indian cold chain market was worth INR 1,121 Billion in 2018. The market is further projected to reach INR 2,618 Billion by 2024, growing at a CAGR of 14.8% during 2019-2024. (The biggest source of revenue for the Indian cold chain industry is the cold stores. There are around 6,300 cold storage facilities in the country, with an installed capacity of 30.11 million tonnes. The current cold storage capacity in India is pegged at 37-39 million

tonnes (mt). According to official statistics, there are about 7,645 cold storages in the country with 68 per cent of the capacity being used for potato, while 30 per cent is multi-commodity cold storage. Major players in this market include ColdEx, Bhramanand Himghar, Dev Bhumi Cold Chain, Gati and Snowman Logistics, among others.

Some interesting facts about the cold chain industry in India are (as of 2016):

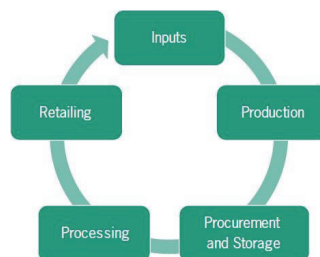
- Organised players contribute only 8 to 10% of the cold chain industry market
- 36% of cold storages in India have capacities below 1,000 MT and are unevenly spread.
- 65% of India's cold chain storage capacity is contributed by the states of Uttar Pradesh and West Bengal
- At the current capacity less than 11% of what is produced can be stored

Factors that have accelerated the growth of Indian cold chain industry are:

- Growth in the organised retail industry – Over the last few years, organised retail and food service industries have emerged as new segments of the cold chain, mainly due to changing consumption patterns. There is an increased demand not only for capacity addition of cold storage facilities for a set of highly perishable products, but also for a wide variety of vegetables, fruits and grains.
- Growth in end-user segments - With the growth in the end user segment, cold chain infrastructure is expected to get a boost and help in reducing wastage.
- Demand from the pharmaceutical sector – The growth in the pharmaceutical industry has created an incidental demand for the increase in cold chain facilities in the country.

## Food Processing

The Food processing industry is known to provide a vital link between the agriculture and manufacturing sectors of the economy.



**Figure 1.9** The value chain in the food processing sector

There has been a significant increase in the number of registered food processing units in the country i.e. from 26,219 units in 2007-08 to 39,748 units in 2019. The industry engages approximately 1.85 million people in around 39,748 registered units in 2019 with fixed capital of \$ 32.75 billion and aggregate output of around \$ 158.69 billion. Major industries constituting the food processing industry are grains, sugar, edible oils, beverages and dairy products.

Some of the factors that have contributed to the growth in the food processing sector are:

- Increased FDI inflows – 100% FDI is permitted under the automatic route in food processing industries. As a result of this, the sector has witnessed an increase in FDI inflows which has directly led to the acceleration of the growth of this sector.
- Mega Food Parks Scheme -As a result of the government-led initiative Mega Food Park Scheme, 42 mega food parks are being established in the country with a total investment of ₹ 155 billion. The primary objective of the scheme is to facilitate the establishment of an integrated value chain, with processing at the core, supported by requisite forward and backward linkages. The scheme now covers 22 states of India. Currently, 17 mega food parks have become functional.
- Recognition as a priority sector - The food processing sector was recognised as a priority sector in 2011 to ensure a greater flow of credit to entrepreneurs for setting up food processing units and attracting investment in the sector.
- Creation of the food processing fund - In the budget for the year 2015-16 the GoI allocated a corpus of ₹ 2,000 crore (approximately US\$ 300 million) for the creation of a special fund called “Food Processing Fund” under the National Bank for Agriculture and Rural Development (NABARD) to provide cheaper credit to the food processing industry. Excise duty on plant and machinery for packaging and processing was brought down to 6% from 10%.

### **Policy Initiatives to Support the Growth of Agribusiness in India**

There have been a lot of government initiatives and measures to propel the growth of the agriculture sector in the country. The government targets to double the income of farmers by 2022, from the level obtaining in 2016. To achieve this the government has undertaken many initiatives which include:

- Increased importance for micro irrigation – The GoI has allocated a sum of ₹ 5,300 crore for micro irrigation, watershed development under ‘Pradhan Mantri Krishi Sinchai Yojana’ (Union Budget, 2015-16).

- **Increased allocation of Budget** - The agriculture sector was allocated a budget of ₹ 47,912 crores for the year 2016-17, which is 84% more than the budget allocated for the year 2015-16. The total budgetary allocation for rural, agricultural and allied sectors is ₹ 187,223 crore in 2017-18. Union Budget 2020 benefits the Indian Agriculture Sector by the allocation of ₹ 2.83 lakh crores.
- **Establishment of Mega Food Parks** - The Ministry of Food Processing Industries (MoFPI) has undertaken an initiative to establish 42 mega food parks across the country, to increase the level of processed food from the 10% in 2015 to 20% in the next few years. Attractive incentives have also been introduced by the central and state governments to include capital subsidies, tax rebates, and reduced custom and excise duties. The central government is also encouraging disbursement of loans under a priority sector lending scheme to ensure that entrepreneurs have access to credit to set up food processing units.
- **Cold chain sector initiatives:**
  - GoI has recognised the cold chain industry as a sub-sector of infrastructure in the Union Budget in 2015 and investment in the cold chain has been opened under the automatic route for 100% FDI participation.
  - There has been viability gap funding of up to 40% of the cost.
  - 5% concession has been provided on import duty, service tax exemption and excise duty exemption on several items.
  - Subsidy of over 25 to 33.3% is provided for cold storage projects
  - The central government has approved 138 integrated cold chain projects. To develop the cold chain supply and to increase storage capacity, a National Cold Chain Development office has been established. The office of the Foreign Agricultural Service of the USA, in New Delhi has been collaborating with the Global Cold Chain Alliance (India chapter) to identify areas where US technology and expertise can help develop the cold chain sector in India.
- **Easier access to credit** - The government has helped arrange easier access to credit on behalf of farmers. These farmer-friendly policies and the new and growing trend of collaborative farming in India have encouraged the farming community to embrace mechanisation, leading to a structural shift in demand towards high-powered agricultural machineries. Some state governments, with support from the central government, have embarked on a public-private partnership (PPP) model to start custom hire centres to provide agricultural machinery on a rental basis to farmers.
- **The National Agriculture Market (NAM):** NAM was set up as a pan-India electronic trading portal to network existing APMC mandis. By the

end of March 2017, 417 mandis across 13 states had been integrated with the e-NAM Portal. As of May 15, 2017, 83.57 lakh tonnes of agricultural produce worth ₹ 19,802.98 crores had been traded on the platform. Furthermore, 45,45,850 farmers, 89,934 traders and 46,411 commission agents had registered on the platform.

- Creation of a long-term irrigation fund - The government has created a dedicated long-term irrigation fund in NABARD with an initial corpus of about Rs. 20,000 crore and raised the agriculture credit target to Rs. 9 lakh crores for 2016-17 as against the target of Rs. 8.5 lakh crore during 2015-16. In 2017-18, target for agricultural credit has been fixed at Rs. 10 lakh crores.
- Introduction of the Krishi Kalyan Cess - In order to finance initiatives to improve the agriculture sector, the government has imposed a 'Krishi Kalyan Cess' of 0.5% on all taxable services.
- **Introduction of new projects and measures** – Some of the other measures that have been introduced to help farmers in increasing their income through farming and allied activities are:
  - Pashudhan Sanjivani - Animal welfare programme and provision of animal healthcare cards.
  - e-Pashudhan Haat - e-Market portal for connecting farmers and breeders; National Genomic Centre for indigenous breeds
  - **Increase in the land to be brought under irrigation** – Budget 2016-17 proposed to bring around 2.85 million hectares of land under irrigation so as to improve agriculture and increase farmers welfare. The government has started work on 99 major and medium irrigation projects, slated to be completed by 2019.
  - In Budget 2017-18, the Long Term Irrigation Fund already set up in NABARD has been proposed to be augmented by 100% to take its total corpus to Rs. 40,000 crores. Furthermore, a Dedicated Micro Irrigation Fund has been planned under NABARD to achieve 'per drop more crop' with an initial corpus of Rs 5,000 crore.
  - **100% rural electrification** – GoI has planned for 100% village electrification by 1 May, 2018. Rural electrification is a must-have in rural areas as this helps in meeting various energy needs including basic lighting, irrigation, communication, water heating, etc. The availability of power will further improve farm productivity as a result of substitution from manual tools to power-based equipment.
  - **Small Farmer Agribusiness Consortium (SFAC):** Department of Agriculture and Cooperation commissioned Small Farmers Agri-business Consortium (SFAC) in 2011-12 to promote the formation of Farmer Producer Companies which was considered as a key strategic goal under the



12th five-year plan. A farmer producer company is an amalgamation between a private company and a cooperative society which addresses the rising need of an institutional structure that consists of ethos of cooperation on one side and business resilience on the other side. Formation of FPCs leads to collectivization of farmers which helps in bringing down the input costs, enabling better bargaining power at the hands of the farmer and magnifies their voices. India currently has around 600 FPCs, of which a third are in Maharashtra alone. On January 1, 2014, SFAC launched a Central Sector Scheme “Equity Grant and Credit Guarantee Fund Scheme for Farmers Producer Companies” to support the Farmer Producers Organizations (FPOs) in terms of strengthening their capital base. The two main components of the schemes are:

- **Equity Grant Scheme:** Every registered Farmer Producer Company (which is registered under the special provision of the Companies Act) is provided a grant of upto ₹ 10 lakh with an objective to enhance the equity base of the FPC and enable it to approach financial institutions for raising working capital.
- **Credit Guarantee Fund (CGF):** The CGF offers a cover of 85% (up to a maximum of ₹ 1 crore) to loans extended by banks to Farmers Producer Companies without collateral.

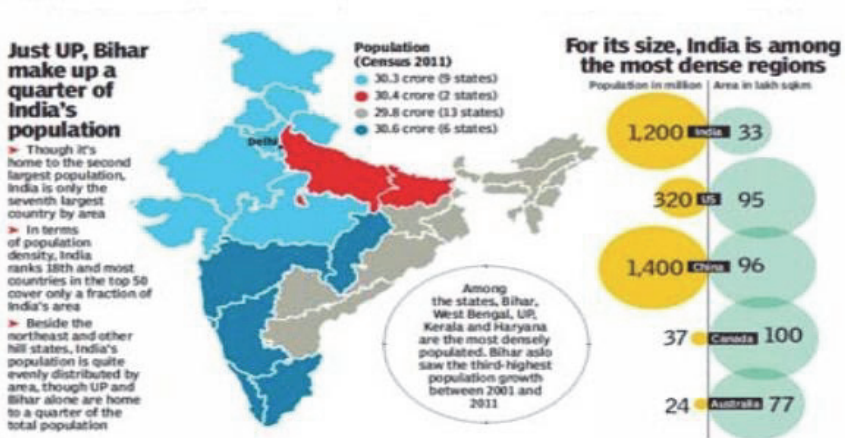
### **The Population and Food Scenario**

It is interesting to recall that the world population was 1 billion in 1800 AD; 2 billion in 1930 (1 billion being added in 130 years), 3 billion in 1960 (1 b in 30 years), 6 billion in 2000 (3 billion in only 40 years) and projected to be 10 billion+ in 2100 (4 billion in 100 years). Major contributions to population growth came from Africa, Asia and Latin America. Today, considering its size, India is among the densest regions in the world. By 2050 India’s population will be about 1.7 billion which will be the highest in the world and about 400 million more than China- the most populous nation today. How to feed them and preserve our finite production and life support resource systems are issues of highest concern. There is no way to postpone or ignore these issues and challenges any longer.

The population change in India since 1950 and the UN’s projections of population by age bracket. Here we see that the number of children under the age of five (under-5s) peaked in 2007; since then the number has been falling. The number of Indians less than 15 years old peaked slightly later (in 2011) and is now also declining. These are landmark moments in demographic change. India’s population will still continue to grow as a result of ‘population momentum’ – the effect often referred to by Hans Rosling and Gap minder as the ‘inevitable fill-up’ when young generations grow older. But we can now see an end to population growth: reaching ‘peak child’ anticipates the later ‘peak

population'. The number of children has peaked; the total population will follow and reach its peak in four decades. In 1950, the Indian population was only 376.32 million which is expected to overtake China and become the most populous nation in 2024. It is estimated that by 2030, the Indian population would be 1.52 billion and approximately 1.70 billion by 2050. It is after 2060 that the population will stabilize and start declining.

Even at a glance, population distribution maps can tell you a lot about a country. A study of population density can offer insights on a country's geography or highlight trends in migration.



**Figure 1.10** Population density in India

India has been able to feed its vast population and enacted the National Food Security Act which legally empowers the population below the poverty line to be provided with the basic food requirements. But with the population expected to reach 1.7 billion by 2050, the pressure on land, water and other resources to meet its food and development needs is going to be very intense. Food and nutritional security are also threatened by issues such as the severe decline in the health and productivity of the soil leading to a decline in Total Factor Productivity, low nutrient content in the food, poor health of the crops predisposing them to severe insect-pests and diseases, ultimately resulting in poor health of human beings and animals.

By 2050, India needs to step up production of all agricultural commodities by around 30 per cent in food grains and to more than 300 per cent in vegetable oils to meet the needs of increased population and rising living standards. To meet the expected higher demand for agricultural commodities, the most appropriate strategy would appear to be improvement of productivity through various measures, including increasing cropping intensity, adoption of the best water, soil and land care management practices, along with the preservation of prime agricultural lands, water resources and biodiversity.

## 1.4 Financial Services

Finance plays an important a role in supporting agriculture in tune with development of technologies. Liberal credit support by lending institutions in the past enabled rapid infrastructural growth and improved farm level credit absorption capacity. Availability of, and accessibility to, credit, has, however, shown acute skewness over regions, subsectors of the agriculture sector (such as minor irrigation or horticulture) and sections of the farming community such a small/marginal farmers, the youth and women, etc. Some of the states with better natural resource base have progressed well, while some others lagged far behind. Likewise, some farmers with better resource endowments and access to financial and other institutions have done better. Furthermore, the multiplicity of lending institutions and the liberal deployment of credit through various ongoing schemes including micro-financing have saved rural dwellers from the clutches of money lenders to a large extent.

The achievement of targets in the agricultural sector which covers the production of food and essential raw material like cotton, jute and oilseeds, ought not to be allowed to suffer for want of adequate credit. However, specific items of productive work and rates of interest need to be considered as an integral part of the Plan. For providing these facilities all the existing agencies like money lenders, Commercial Banks (CBs), cooperatives and the State have to be integrated and harnessed to a common purpose. Such a comprehensive approach is essential for ensuring the optimal use of all the available resources of the nation.

### Classification of Finance

**Short-Term:** "Short-term loans" or "seasonal agricultural operations" loans are generally advanced for meeting annual recurring expenses such as, seed, feed, fertilizers, pesticides, weedicides hired labour expenses, and hired machinery charges which are termed as seasonal loans/crop loans/production loans. These are expected to be repaid after the harvest. It is expected that the loan together with interest will be repaid from the income received through the enterprise in which it was invested. The time limit to repay such loans is a year.

**Medium-Term:** "Medium-term loans" are advanced for comparatively longer lived assets such as machinery, diesel engine, wells, irrigation structure, threshers, shelters, crushers, draught and milch animals, dairy/poultry sheds, etc., where the returns accruing from an increase in farm assets are spread over more than one production period. The usual repayment period for such types of loan is from fifteen months to five years.

**Long-Term Loans:** Repayable over a longer period (i.e., above 5 years) are classified as long-term loans. "Long-term loans" are related to the long-life

assets such as heavy machinery, land and its reclamation, erection of farm buildings, construction of permanent-drainage or irrigation system, etc. which require large sums of money for the initial investment. The benefits generated through such assets are spread over nearly the entire life of the asset. The normal repayment period for such loans ranges from five to fifteen or even up to 20 years (Desai. S.S.M, 1990).

**Traders and Commission Agents:** Traders and commission agents advance loans to agriculturists for productive purposes against their crop without completing legal formalities. It often becomes obligatory for farmers to buy inputs and sell outputs through them. They charge a hefty rate of interest on the loan and a commission on all the sales and purchases, making it exploitative in nature.

**Landlords:** Mostly small farmers and tenants depend on landlords for meeting their production and day to day financial requirements.

**Money Lenders:** Despite the rapid growth of rural branches of different institutional credit agencies, village moneylenders continue to have an important role. They are of two types, agriculturist moneylenders who combine their money lending jobs with farming and professional moneylenders whose sole job is money lending.

A number of reasons have been attributed for the popularity of moneylenders such as: they meet the demand for productive as well as unproductive requirements, they are easily approachable even at odd hours; and they require very low paper work and advances are given against promissory notes or land. Moneylenders charge a huge rate of interest as they take advantage of the urgency of the situation. Over the years a need for regulation of money lending has been felt. But lack of institutional credit access to certain sections and areas have facilitated the unhindered operation of money lending.

**Institutional Credit Agencies:** The evolution of institutional credit to agriculture could be broadly classified into four distinct phases - 1904-1969 (predominance of Cooperatives and setting up of RBI), 1969-1975 (Nationalization of CBs and setting up of Regional Rural Banks (RRBs)), 1975-1990 (setting up of NABARD) and from 1991 onwards (financial sector reforms). Institutional funding of the farm sector is mainly done by CBs, regional rural banks and cooperative banks. The share of CBs in total institutional credit to agriculture is almost 48 per cent followed by cooperative banks with a share of 46 per cent. Regional Rural Banks account for just about 6 per cent of total credit disbursement.

**Cooperative Credit Societies:** The history of the cooperative movement in India dates back to 1904 when the first Cooperative Credit Societies Act was passed by the Government. The scope of the Act was restricted to the

establishment of primary credit societies and non-credit societies. The shortcomings of the Act were rectified through the passing of another Act called the Cooperative Societies Act 1912. The Act gave provision for registration of all types of Cooperative Societies. This made the emergence of rural cooperatives both in the credit and non-credit areas, though with uneven spatial growth. Soon after the independence, the GoI following the recommendations of the All India Rural Credit Survey Committee (1951) felt that cooperatives were the only alternative to promote agricultural credit and development of rural areas. Accordingly, cooperatives received substantial help in the provision of credit from the Reserve Bank of India as a part of loan policy and large scale assistance from Central and State Governments for their development and strengthening. Many schemes involving subsidies and concessions for the weaker sections were routed through cooperatives. As a result cooperative institutions registered remarkable growth in post-independent India.

Cooperatives play a very important role in the disbursement of agricultural credit. Credit is needed both by the distribution channel as well as by the farmers. The distribution channel needs it to finance the fertilizers business and farmers need it for meeting various needs for agricultural production including purchasing fertilizers. The credit needed by the farmers for the purchase of fertilizers and other inputs is called 'short term' credit or 'production credit' whereas, credit needed by the distribution channel is called 'Distribution Credit'. Cooperatives also play a very important role in the disbursement of 'Medium Term' and 'Long Term' credit needed by the farmers'. In India, 78 per cent of the farmers belong to the category of small and marginal farmers, and they depend heavily on credit for their agricultural operations. These farmers will not be able to adopt modern agricultural practices unless they are supported by a system that ensures adequate and timely availability of credit on reasonable terms and conditions.

**Commercial Banks:** Previously CBs were confined only to urban areas serving mainly the activities of trade, commerce and industry. The insignificant participation of CBs in rural lending was explained by the risky nature of agriculture due to its heavy dependence on monsoon, unorganized nature and subsistence approach. Following the nationalisation of CBs in 1969 and they played an active role in agricultural credit was accelerated, and they are the largest source of institutional credit to agriculture.

**Regional Rural Banks (RRBs):** RRBs were set up in those regions where availability of institutional credit was found to be inadequate but the potential for agricultural development was very high. However, the main thrust of the RRBs is to provide loans to small and marginal farmers, landless labourers and village artisans. These loans are advanced for productive purposes. At present 56 RRBs are functioning in India to support rural people, particularly to weaker sections.

**Micro financing:** Micro financing through Self Help Groups (SHG) has assumed prominence in recent years. SHGs is a group of rural poor who volunteer to organise themselves into a group for the eradication of poverty of the members. They agree to save regularly and convert their savings into a common fund known as the Group corpus. The members of the group agree to use this common fund and such other funds that they may receive as a group through common management. As soon as the SHG is formed and a couple of group meetings are held, an SHG can open a Savings Bank account with the nearest Commercial or Regional Rural Bank or a Cooperative Bank. This is essential to keep the thrift and other earnings of the SHG safely and also to improve the transparency levels of SHG's transactions. Opening of SB account is the beginning of a relationship between the bank and the SHG. Once this process is over, banks liberally lend to the groups or to members and recover the loans conveniently. The banks even offer a subsidy to the amount of loans borrowed based on their good response.

**Micro Credit:** Micro credit is the extension of small loans to entrepreneurs too poor to qualify for traditional bank loans. In developing countries, especially, micro credit enables very poor people to engage in self-employment projects that generate income. Though the micro credit financing has got its root from the development of Grameen Bank in Bangladesh in 1976s, and now it has been expanded globally, not only in terms of covering a larger number of clients but also with the increasing number of microfinance institutions that come forward to carry out these services for the poor. In order to give further fillip to micro-finance movement, the RBI has enabled Non-Governmental Organisations (NGOs) engaged in micro-finance activities to access external commercial borrowings (ECBs) up to US\$ 5 million during a financial year for permitted end-use, under the automatic route, as an additional channel of resource mobilisation. RBI is moving towards a systems perspective for providing effective policy support not only because a number of different institutions, viz., banks, MFIs, NGOs and SHGs are involved, but also because these institutions have very different institutional goals.

**Non-Governmental Organisation (NGO):** An NGO is a voluntary organization established to undertake social intermediation like organizing SHGs of micro entrepreneurs and entrusting them to banks for credit linkage of financial intermediation like borrowing bulk funds from banks for on-lending to SHGs. The microfinance sector has emerged from the efforts of Non-Governmental Organisations (NGOs), and as a response to the failure of existing structures to deliver financial services to the poor. The efforts by NGOs have emerged from grassroots and represent diversity.

**Self-Help Group (SHG):** An SHG is a registered or unregistered group of micro entrepreneurs having homogenous social and economic background voluntarily, coming together to save small amounts regularly, to mutually agree

to contribute to a common fund and to meet their emergency needs on mutual help basis. The group members use collective wisdom and peer pressure to ensure proper end-use of credit and timely repayment thereof. In fact, peer pressure has been recognized as an effective substitute for collaterals. The RBI has also permitted all the banks as a special case to provide access to credit to unregistered SHGs.

## Categories of the Priority Sector

**Agriculture (Direct and Indirect finance):** Direct finance to agriculture includes short, medium and long term loans given for agriculture and allied activities (dairy, fishery, piggery, poultry, beekeeping, etc.) directly to individual farmers, Self-Help Groups (SHGs) or Joint Liability Groups (JLGs) of individual farmers without limit and to others (such as corporate, partnership firms and institutions) for taking up agriculture/allied activities.

**Small Enterprises (Direct and Indirect Finance):** Direct finance to small enterprises include all loans given to micro and small (manufacturing) enterprises engaged in manufacture/ production, processing or preservation of goods, micro and small (service) enterprises engaged in providing or rendering of services, and whose investment in plant and machinery and equipment (original cost excluding land and building and such items as mentioned therein). The micro and small (service) enterprises include small road and water transport operators, small business, professional and self-employed persons, and all other service enterprises. Indirect finance to small enterprises include finance to any person providing inputs to or marketing the output of artisans, village and cottage industries, handlooms and to cooperatives of producers in this sector.

**Retail Trade:** includes retail traders/private retail traders dealing in essential commodities (fair price shops), and consumer cooperative stores.

**Micro Credit:** Provision of credit and other financial services and products of very small amounts not exceeding ₹ 50,000 per borrower, either directly or indirectly through a SHG/JLG mechanism or to NBFC/MFI for on lending up to ₹ 50,000 per borrower, will constitute micro credit.

## Crop Insurance

Crop insurance is availed of by farmers, ranchers, and others to protect themselves against either the loss of their crops due to natural disasters, such as hail, drought, and floods, or the loss of revenue due to declines in the prices of agricultural commodities.

The Crop insurance schemes aim at providing comprehensive risk insurance which covers the yield losses that occur to the agricultural output of small and marginal farmers due to non-preventable risks.

The crop insurance risks covered under the non-preventable category are listed below:

- Natural Fire and Lightning' Storm, Hailstorm, Cyclone, Typhoon, Tempest, Hurricane and Tornado
- Flood, Inundation and Landslide
- Drought and Dry spells
- Insect Pests and Diseases

The sum insured under the crop insurance risks covered usually extends to the value of the threshold yield of the insured crop. This is usually subject to the option of the insured farmers. Nevertheless, a farmer may also choose to insure his crop beyond the value of the threshold yield level up to 150 per cent of average yield of the notified area on payment of premium at commercial rates. Apart from the risks covered in the crop insurance scheme, what is important is the sum insured. In case of Loanees farmers the sum insured would be at least equal to the amount of crop loan advanced. Further, in the case of the Loanees farmers, the insurance charges that will be levied will be additional to the Scale of Finance for the purpose of obtaining loan. Apart from the above-mentioned issues, the matters of Crop Loan disbursement procedures, which have been outlined by the RBI or NABARD are binding. The insurance premium issues still stand at an undecided state as the transition to the actuarial regime in case of cereals, millets, pulses and oilseeds is expected to be made in a period of five years.

The government through its various schemes of finance to agriculture aims helping farmers and thereby promoting the growth and productivity of agriculture. This enhancing attempt is a major encouragement to farmers to sustain the growth in agriculture. The schemes of finance explained is a continuous and sustained effort of the government to encourage farmers.

## **The Crop Insurance Schemes**

Crop insurance is an important measure undertaken by the central government in India to manage the risk associated with drought, unseasonal rainfall, floods, other natural calamities. The most popular scheme in this area is Pradhan Mantri Fasal Bima Yojana (PMFBY). Based on past experience, PMFBY was introduced by the central government in 2016-17 with the objective of covering the total cropped area in the country through the modest yearly target of covering 30 per cent of the cropped area. In 2016-17 the target was achieved.

Market determined premia are fixed, based on an open tendering system for each cluster comprising a few districts (2-5 neighbouring districts in one cluster) with similar agro-ecological conditions. In this, all insurers (insurance companies) can participate in the bidding and the lowest bidder in terms of



premium quoted. The final selection of the successful bidder for the cluster is based on the lowest weighted average premium rate. All crop insurance activities in that particular cluster have to be operated by the winner- insurer for the notified year. Under this scheme, there are about 5 public and 13 private insurers who bid for the cluster for all notified crops.

Evidence from many states suggest, that there are insufficient bidders in rain fed, remote and backward districts. This could result in an oligopoly situation under which there is scope for cartelisation of the insurers to rig premium rates, so that market determined premium rates are higher than the actuarial rates. In these backward districts, it was found that in some instances market determined premiums were as high as 25 per cent due to few bidders participating in the bidding process, leading to above normal profits for the insurers.

The government needs to take steps to increase competition among insurers to lower market-determined premium rates charged by insurers. Further, there is a need to strengthen the State Level Co-ordination Committee on Crop Insurance (SLCCCI) and District Level Monitoring Committee (DLMC) in collaboration with financial institutions and insurers to promote healthy competition.

In India, most farmers are unaware of PMFBY and its modalities. First, there is a need to increase awareness in frontline field staff like, department of agriculture, banks and insurers, who could be the game changers for the scheme. Currently, they themselves need to be educated about the scheme modalities which will help them in disseminating proper information to farmers. There is a need to sensitize the first contact point of farmers like input dealers, Gram Panchayat members and Agricultural Extension Officers (AEOs) to increase awareness of the scheme.

Uniform cut-off dates for premium payments are not ideal for diverse agro-climatic conditions across the districts. There needs to be flexibility in deciding the cut-off dates for premium payments at the local level. This task could be entrusted to the DLMC. The roles and responsibilities of DLMC needs to be enhanced so that, it can announce cut-off dates in time, conduct field level inspections in case of any calamity and decide mid-season or end of the season claims and see that every farmer gets it in time. The denial and delay of claim issue can be solved, that can reduce dependency on money lenders.

There is also inadequate infrastructure in terms of dedicated field staff of the insurers to address grievances of the farmers, to inspect yield losses etc. Therefore, there is need to increase the efficiency of the whole set of operations like the functioning of weather stations, conduct of crop-cutting experiments, etc., by measures such as the use of drones, satellite images, and GIS-based mobile phones.

## Agriculture Inputs

Indian agriculture has consistently struggled with low productivity. Thus, agricultural inputs are a key sector of focus to tackle the challenge of low yield and support the Doubling Farmers' Income initiative.

### Seed Market

India has a share of 4% in the global seed market. The Indian seed market reached a value of US\$3.6 billion in 2017, exhibiting a CAGR of about 17% during 2010-2017. The seed market is expected to surpass US\$8 billion by 2023.<sup>25</sup> Indian seed market is dominated by maize, cotton, paddy, wheat, sorghum, sunflower and millets.

India, being a major agriculture-based economy, is also a key player in the agricultural seed trade. The sector shows huge potential for growth supported by seed policies in favour of seed producers and exporters. The seed industry is exempted from the Goods and Service Tax (GST) rate on seeds used for sowing purposes only. The Government has also allowed 100% Foreign Direct Investment (FDI) in the development and production of seeds and planting materials.

### Strategic Interventions

**Setting up seed production hubs:** Currently, there are no dedicated seed production hubs in India. Setting up dedicated seed production hubs can lead to focused efforts in sector development. Inclusion of the private sector is necessary for the successful operation of these hubs, as it can bring in the necessary expertise to the sector. Government incentives for investment in these hubs can help attract private players.

**Export orientation:** As mentioned, India has a huge scope for the promotion of seed exports and requires efforts in this area. The seed production hubs can be oriented towards exports by establishing an export promotion wing. The functions of this wing may include global seed trade assessment, thorough understanding and tracking of seed import requirements across geographies, and consequently, alignment of the seed production as per import requirements.

**Strengthening of Seed Village Programme:** Strengthening the Seed Village Programme will improve seed delivery. Seed subsidies for high yielding variety and hybrid seeds may be given to farmers at specified intervals, so that the maximum number of farmers gain access to newly developed seeds.

**Seed cost rationalisation:** In the present system for vegetable hybrids, the varieties and hybrids developed by ICAR-SAUs are given to private sector seed companies at nominal rates of royalty. By providing breeder seeds on a cost basis to public sector seed organisations, they may be able to produce vegetable

seeds on a large scale and provide them to farmers at reasonable prices. ICAR and SAUs should also provide variety wise packages of practices for vegetable seed production and technology, along with breeder seeds.

**Improving seed traceability:** To control the distribution of spurious seeds, improving seed traceability is an important measure that needs to be in place. Using a barcode or Quick Response (QR) Code could be one method. Using these unique codes could help in strengthening seed traceability and enable farmers to track the origin of the seed before purchasing. Besides deterring spurious seeds, it could also help in tracing their origin in case of quality issues.

### **Agrochemical Industry**

The agrochemical industry is also integral to Indian agriculture. The agrochemical industry is comprised of insecticides, fungicides, herbicides, bio-pesticides and other chemicals, such as fumigants and plant growth regulators. The Indian agrochemical market is pegged to reach US\$6.3 billion by FY20. Further, at the global level, India remains one of the lowest users of agrochemicals even though it is a major food producer. While India ranks second in global food production, its share in agrochemical usage is comparatively very low, ranking 13 globally.

The rationalisation of pesticide regulation is necessary to reduce the time taken to register new molecules and create a more efficient system. Currently, most new molecules with patents are imported. Impetus on the domestic production of new molecules by incentivising such efforts is necessary. Currently, the organic pesticides and bio-stimulants category is not covered under the Pesticides Act, and thus, a comprehensive policy regulation is necessary.

### **Fertilizers**

Given the heavy dependency of our economy and employment on agriculture, the fertiliser sector continues to be a major focus area for policymakers. Fertilisers played a significant role in the Green Revolution and overall agricultural growth in the country. With the increasing demand for production, usage and growth in the fertiliser sector have also seen an upward trend. However, India still lags behind in average fertiliser usage when compared to developed economies. There are also significant variations in inter-country usage.

To prevent urea diversion from agriculture, the Department of Fertilizers has mandated that 100% of production by all domestic manufacturers should be neem-coated urea. Currently, most of the fertiliser usage is not based on the soil testing report and overlooks the location and crop-specific nutrient status. This may impact the yield levels of the crop. The Soil Health Card Scheme is one of

the positive initiatives by the Government in this direction, although implementation challenges still persist. Linking of Soil Health Cards to other measures like agri finance and subsidies need to be taken up on priority.

Despite the increase in fertiliser use in the last few decades, food grain production has not grown proportionately. Today, we are producing less food per kg of Fertiliser than we were earlier. The decline in fertiliser use efficiency is attributed to dwindling organic carbon in Indian soils, micronutrient deficiencies and imbalanced fertiliser use. The country lags behind in the introduction of high efficiency fertiliser technologies capable of reducing wastage, like nanotechnology, nitrification inhibitors and urease inhibitors which are popular in other parts of the world.

### **Implements/ Farm Mechanisation**

India accounts for around one-third of the global tractor production. However, the level of farm mechanisation in India is still lagging behind developed economies. With the Government's increasing focus on farmer remuneration, it has become imperative to increase the use of farm machinery and farm equipment, especially with regard to irrigation practices. Custom hire centres have been developed by many states on a PPP basis to rent out agricultural equipment. The level of mechanisation in India stands at about 40-45%.

There is a high level of regional variation in the level of mechanisation in India. States like Punjab, Haryana and Uttar Pradesh showcase high mechanisation in agriculture, while states in the south, west and northeast lag behind. The high level of mechanisation may be attributed to favourable government policies, large landholdings and high awareness. The Indian farm mechanisation market is expected to reach ₹ 400 billion by 2019-20.

Access to finance for farm equipment must be improved by simplifying the documentation process and providing interest subvention for timely payments. Most of the subsidy released is a back-ended producer subsidy and is often delayed. The process needs to be converted to Direct Benefit Transfer (DBT) to ensure timely and rightful subsidy release. Custom Hiring Centres (CHCs) tackle many challenges in farm mechanisation. However, they face certain challenges themselves, such as availability of farm machinery and implements during peak period and underutilisation during lean period, lack of awareness and support services. To improve the efficiency of CHCs, certain measures could be adopted, such as in addition to providing access to machines on rental providing access to a package of practices, quality inputs, extension services and input application equipment.

## Production Scenario

As per Fourth Advance Estimates for 2019-20 released on 19.08.2020, total food grain production in the country is estimated 296.65 million tonnes. Total production of rice during 2019-20 is at a record 118.43 million tonnes, production of wheat, estimated at record 107.59 million tonnes, pulse production 23.15 million tonnes, oils seeds production of nine seeds (groundnut, castor, sesamum, niger seed, soya bean, sunflower, rapeseed, mustard, linseed, safflower) are 334.23 million tonnes. Total production of sugarcane in the country during 2019-20 is estimated at 3557.00 million tonnes, cotton as 354.91 lakh bales of 170 kg each, total jute and mesta estimated at 99.06 lakh bales of 180 kg each.

The total production of rice during 2018-19 is at a record of 116.48 million tonnes. Production of rice has increased by 3.66 million tonnes than the production of 112.76 million tonnes during 2017-18. Production of wheat, estimated at record 102.19 million tonnes, is higher by 2.32 million tonnes as compared to wheat production of 99.87 million tonnes achieved during 2017-18. Total pulses production during 2018-19 is estimated at 23.40 million tonnes. Total oilseeds production in the country during 2018- 19 is estimated at 32.26 million tonnes which is higher than the production of 31.46 million tonnes during 2017-18. With an increase of 20.25 million tonnes over 2017-18, the total production of sugarcane in the country during 2018-19 is estimated at 400.16 million tonnes. Production of cotton estimated at 28.71 lakh bales (of 170 kg each) and production of jute and mesta estimated at 9.77 lakh bales (of 180 kg each).



## Irrigation in India

As agriculture is the main water consuming sector in India, there is a need for sound water-management in water-scarce regions. The Irrigation sector currently consumes 80% of the total water used. Owing to competing demands from other sectors, it is expected that water consumption in this sector will

probably reduce to about 70% by 2050. According to a World Bank report, groundwater has supported 60% of irrigated agriculture, whereas 40% of irrigated agriculture is supported by surface water. This excessive dependence on groundwater, has, in many areas, caused over-extraction of groundwater, an issue that needs to be addressed.

The National Water Policy (NWP), 2012 states that water saving in irrigation is of utmost importance. Goal 4 of the National Water Mission (NWM), 2008 of India highlights the main objective of NWM, which is to improve water use efficiency by at least 20% in all sectors, including domestic, industrial, agricultural and commercial. This objective can be attained by enhancing the efficiency of the demand side and the supply side in the agriculture sector by the use of micro irrigation techniques. Below given table represents the source-wise net irrigated area and the percentage of the net irrigated area by source (in million hectares) in India. As per the table, from 1960 to 2015, the area under canal irrigation increased from 10.37 Mha (million hectares) to 16.8 Mha, whereas the area under tube-well irrigation increased from 0.13 Mha to 31.60 Mha, and overall there had been an increase in the net irrigated area from 24.66 Mha to 68.38 Mha. The increase in net irrigated area as well as the shift in dependence from surface water to groundwater has had a detrimental impact on the groundwater resources. As water resources become increasingly scarce, there will arise the need to manage irrigation water efficiently and the adoption of micro irrigation systems.

**Table 1.13** Ten years trend on source-wise net irrigated area and percentage wise net-irrigated area in India.

Source-wise net irrigated area and the percentage of the net irrigated area by source									
Year	Canal		Tanks		Tube wells		Other wells		Net irrigated area Mha
	Mha	%	Mha	%	Mha	%	Mha	%	
1960/61	10.37	42.05	4.56	18.49	0.13	0.55	7.15	29.01	24.66
1970/71	12.83	41.28	4.11	13.22	4.46	14.34	7.42	23.88	31.10
1980/81	15.29	39.49	3.18	8.22	9.53	24.62	8.16	21.08	38.72
1990/91	17.45	36.34	2.94	6.13	14.25	29.62	10.43	21.73	48.02
1995/96	17.12	32.06	3.11	5.84	17.89	33.51	11.80	22.10	53.40
2000/01	15.71	28.65	2.51	4.59	22.32	40.71	11.45	20.88	54.83
2005/06	16.72	27.50	2.08	3.40	26.03	42.80	10.04	16.50	60.84
2010/11	15.64	24.6	1.98	3.10	28.54	44.8	10.63	16.70	63.66
2013/14	16.27	23.90	1.84	2.70	31.13	45.70	11.31	16.60	68.10
2014/15	16.18	23.66	1.72	2.52	31.60	46.21	11.35	16.60	68.38

Source: DES, MoA & FW, GoI

However, even though the overall potential micro irrigation in India is projected to be about 70 Mha (million hectares), actual coverage by 2018 was only around 9 Mha. Therefore, at the current coverage rate of 0.6 Mha/annum, it

would take approximately more than 100 years to achieve the potential target of micro irrigation in India.

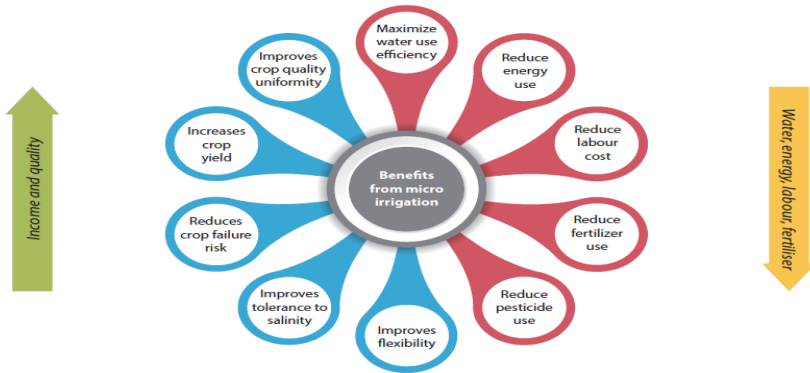
### **System of Water for Agriculture Rejuvenation (SWAR)**

To drastically save and efficiently use water, the Centre for Environment Concerns, an NGO, has developed a unique, and first of its kind, an irrigation system of “delivering measured moisture at the plant root zone” called the System of Water for Agriculture Rejuvenation (SWAR). Sri K S Gopal developed SWAR won global champion water innovation awards in Paris and Washington and listed by NITI Aayog as a best practice in irrigation water use. SWAR is transformative to shift irrigation from measuring water and given on the surface to subsurface root zone area and based on moisture level and shows 40% water savings compared to drip systems by a scientific study and farmers' experience. Technically, SWAR involves storing of water in overhead tanks and sending it through a small diameter pipe to a customised locally made clay pot that is buried near the root area. The clay pot contains micro-tubes that transmit water through a sand pouch, to prevent the roots from invading the pipes and the pot. The slow oozing of water provides moisture for a prolonged period, the level of which is calculated based on soil type, plant species and their age. Thus, SWAR uses less water and wastes nothing. SWAR is used extensively for horticulture and forestry crops and comes as low-cost affordable add-on drip laterals.

### **Micro Irrigation**

Micro irrigation ensures conservation and the efficient use of water, minimal wastage of water and higher productivity of crops with less water consumption by the usage of the drip irrigation method and the sprinkler irrigation method, respectively. For optimal and efficient use of surface and groundwater sources for irrigation, micro irrigation is one of the most-effective ways.

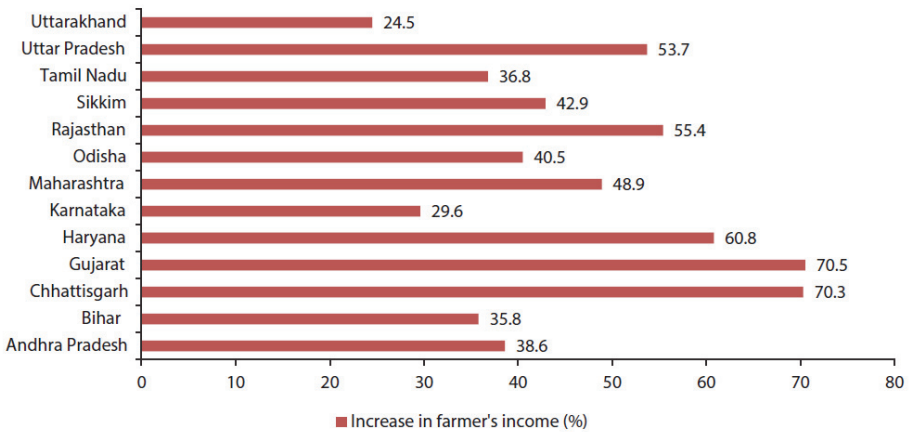
Micro irrigation includes the usage of drip and sprinkler systems. Micro irrigation could be one of the solutions to the challenges and issues faced by Indian agriculture. The water use efficiency of the flood method of irrigation in India is estimated to be only around 40%. This is mainly due to the significant losses through conveyance, distribution and evaporation, whereas, micro irrigation systems can provide water use efficiency from 80% to 95%. The reason for this difference is because transmission loss is nominal, while losses through evaporation, run-off and deep percolation are also reduced significantly by using micro irrigation methods. Efficient water use results in additional benefits such as an increase in the area coverage under irrigation with the same amount of water as well as increasing the potential usage of marginal/degraded land using micro irrigation systems.



**Figure 1.11** Benefits of micro irrigation adaptation

Source: Author compilation

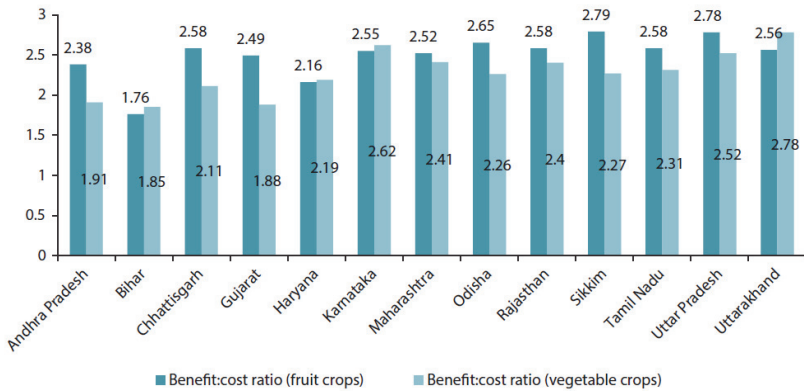
The Indian Council of Food and Agriculture (ICFA) has established that farmers have an increase in income ranging from 24.5% to 70.5%, with an average increase in income of about 46.8% after micro irrigation systems adoption. The net-income increases following the adoption of micro irrigation systems need to be widely publicized so that these benefits can be availed on a large scale.



**Figure 1.12** Increase in farmer's income

Source: Details available at <https://icfa.org.in/assets/doc/reports/indian-micro-irrigation-market.pdf>, last accessed on 15 May 2019





**Figure 1.13** Benefit-cost ratio

Source: Details available at: <https://icfa.org.in/assets/doc/reports/indian-micro-irrigation-market.pdf>, last accessed on 15 May 2019

The average benefit cost ratio for the crops grown in each state indicates the benefits to the farmers of adopting micro irrigation system (MIS). The benefit-cost ratio also shows that horticulture crops seem to be more profitable as compared to vegetable crops in the majority of states such as Andhra Pradesh, Maharashtra, Gujarat, Odisha and Sikkim, where farmers have adopted MIS.

### Agriculture Debt Waivers, WriteOffs and Subsidies

From ancient times, farming has been more a way of life than a commercial activity. If farming has proved to be sustainable, (leaving apart man-made famines like those in Bengal). In the exceptional cases of crop failures, since the British rule, compensation was available on an ‘annavari’ basis, i.e., if crop loss was more than 50-60 percent (eight annas in a rupee consisting of 16 annas). The concession was extended by way of postponement of repayment of principal or instalments, that too only for those who repaid outstanding interest. Further, these concessions were met out of mandated “Relief and Guarantee Funds” built up in each Cooperative Bank - the mainstay of Agriculture Credit (covering 80% farmers, mostly small and marginal farmers). In certain extreme cases, ‘taccavi’ loans were also given by governments directly to the identified affected farmers. It’s worth noting that government support was not routed through the banking system to ensure no damage is done to the repayment ethics in the institutional credit channels.

While the system was going on systematically, post-independence- politics overlook good sense and the whole system got derailed. Pre-reforms, RBI/NABARD rigorously controlled/ stopped the unethical waivers and write-

offs. Some aggrieved states approached the Courts questioning the authority of the regulators in interfering with the States' actions. But to no avail. The NTR Govt. in AP in 1980s complied with the mandate to keep away Government support from institutional credit channels by choosing Panchayati Raj institutions. Overtime, both the Centre and State Govt. defied the regulators by liberally using the waivers and write-off route for political gains. It became a soft (though grossly wrong) option for politicians to paint indebtedness credit alone as the villain of distress in agriculture, ignoring other factors such as input - supply and markets, besides infrastructure support. That started the decline and fall of credit discipline and vitiated the repayment atmosphere of leading to the decay of institutions. "Financial Inclusion" took a back seat and the traditional money lender regained his supremacy.

The pleas of the intelligentsia to stop indiscriminate and across-the-board dole outs proved unacceptable in a democracy. If the ₹ 2 lakh crores of subsidies in the agriculture sector – are diverted to meet the requirement of rural infrastructure, the decline in the Agri sector could have been stopped and enduring growth could have been put back on track. "Cooperatives failed but cooperatives must succeed" – we need to wait and see if our democracy respects the sound appeal of eminent guardians of the Cooperative Movement, the hope for adequate, timely and effective credit to farmers.

### **Empowering the Small Farmers**

Contributions of small holders in securing food for the growing population have increased considerably even though they are the most insecure and vulnerable group in society. Off-farm and non-farm employment opportunities can play an important role. Against expectation under the liberalized scenario, the non-agricultural employment in rural areas has not improved. Greater emphasis needs to be placed on non-farm employment and adequate budgetary allocations and rural credit through banking systems should be in place to promote appropriate rural enterprises. Specific human resource and skill development programmes to train them will make them better decision-makers and highly productive. Human resource development for increasing productivity of these small holders should get high priority. Thus, knowledge and skill development of rural people both in agriculture and non-agriculture sectors is essential for achieving economic and social goals. A careful balance will therefore need to be maintained between the agricultural and non-agricultural employment and farm and non-farm economy, as the two sectors are closely interconnected.

Raising agricultural productivity requires continuing investments in human resource development, agricultural research and development, improved information and extension, market, roads and related infrastructure development and efficient small-scale, farmer-controlled irrigation technologies, and custom

hiring services. Such investments would give small farmers the options and flexibility to adjust and respond to market conditions.

For poor farm-households whose major endowment is its labour force, economic growth with equity will give increased entitlement by offering favourable markets for its products and more employment opportunities. Economic growth if not managed suitably, can lead to growing inequalities. Agrarian reforms to alleviate unequal access to land, compounded by unequal access to water, credit, knowledge and markets, have not only rectified income distribution but also resulted in sharp increases in productivity and hence need to be adopted widely. Further, targeted measures that not only address the immediate food and health care requirements of disadvantaged groups, but also provide them with developmental means, like access to inputs, infrastructure, services and most important, education should be taken.