

India's Agriculture at Present

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History

The history of Indian agriculture begins from the Indus Valley Era (9000 BC) in Northern regions [Violatti, 2013] even before in Southern regions by raising -edible crops, -domesticated animals and -fisheries based on farm, ranch, backyard, forest, grasslands, aquatic ecosystem and natural habitats blessed by two major monsoon rains. Archaeological study trust that rice was a domesticated crop along the banks of the River Ganges in the 6th millennium BC [Gopal and Srivastava, 2008; Gupta, *et al.* 2017]. Spices, barley, oats, wheat, lentil and chickpea grown in north-west India before the 6th Millennium BC. The crops like cotton, safflower, sesame, mustards, castor, linseed, mung bean, black gram, pigeon pea, horse gram, grass pea, fenugreek, jujube, dates, grapes, mango, jackfruit, black plum and mulberry recorded to cultivate more than 3000 to 6000 years ago. The sugarcane cultivation was largely confined to India before the 18th Century.

The Department of Agriculture and Cooperation under the Ministry of Agriculture is responsible for the development of the agriculture sector in India. It manages several other bodies, such as the National Dairy Development Board (NDDB), to develop other allied agricultural sectors. Agriculture and its allied sectors (including agriculture, livestock, forestry and fishery) also plays a significant role in the growth of the socioeconomic sector in India. On the other hand, agriculture is the backbone of India's economy due to; 1) Large share of the country's income generated, 2) Majority of Indian population depending on agriculture income for life and 3) Growth of other Industrial sectors depends on agriculture income [FAO, 2015, 2017]. With more than 150 million hectares, India contributes the second largest agricultural land in the world blessed with 20 Agro-climatic landscape. During the early period, farmers raised wheat, barley, peas, lentils, linseed and mustard in winter season and millet, sesame and probably cotton in summer season. In South India rice, pulses, rubber, potatoes, cotton, sugarcane was cultivated along with several tropical fruits and vegetables. The statistical records showed that farmers in India range from 96 million (~8%) to 260 million (~22%) to 450 million (~38%), from the overall population of 1.27 billion in 2011-2012. Therefore, India accounts for ~7.7% of total global agricultural production with a gross domestic product (GDP) rate of US\$ 496 billion and ranked 12th in the world and about 18% within India. India's contribution in agriculture sector is much higher than the World's average of approximately 6.1%, which is the 4th largest economy by purchasing power parity (PPP) basis. As per the 2nd advised estimates by the Central Statistics Office (CSO), the share of agriculture is expected to be around 17% of the Gross Value Added (GVA) in 2016-17 when compared to 2011-12 prices [Business Maps of India, 2017; MSPIPC, 2017].

According to Food and Agriculture Organization (FAO) report, India holds largest producer of fresh fruits, vegetables, milk, major spices, selected fibrous crops, millets and castor oil seed [FAO, 2015, 2017]. Besides, India is the second largest producer of wheat and rice, the world's major food staples, several dry fruits, agriculture-based textile raw materials, roots and tuber crops, pulses, farmed fish,

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eggs, coconut, sugarcane and numerous vegetables. In addition, many cash crops such as coffee, cotton, livestock, poultry and meat India ranked the world's five largest producers. India is the largest producer of spices, pulses, milk, tea, cashew and jute; and the second largest producer of wheat, rice, fruits and vegetables, sugarcane, cotton and oilseeds. Further, India is second in global production of fruits and vegetables, and is the largest producer of mango and banana. It also has the highest productivity of grapes in the world. Organic agriculture has fed India for centuries and it is again a growing sector in India. India has 650,000 organic producers, which is more than any other country. India also has 4 million hectares of land certified as organic wild culture, which is third in the world [Paull and Benjamin, 2016]. India was the world's third largest producer of eggs, oranges, coconuts, tomatoes, peas and beans. In addition to growth in total output, agriculture in India has shown an increase in average agricultural output per hectare in past six decades. Improving road and power generation infrastructure, knowledge gains and reforms have allowed India to increase farm productivity from 40% to 500% during the past 40 years [Central Bank, 2011]. Indian agriculture also plays a predominant role by earning foreign income by exporting of agricultural products. Agricultural exports accounted around 45% of India's total merchandise exports in early 1960's. Although, the share has declined gradually in recent years, however, agriculture still contributes more than 17% of export income in India.

With a population of 1.27 billion, India is the world's largest democratic country. In the past decade, the country has witnessed accelerated economic growth, emerged as a global player. India's integration into the global economy has been accompanied by impressive economic growth that has brought significant economic and social benefits to the country. Nevertheless, disparities in income and human development are on the rise. Preliminary estimates suggest that in 2009-2010 the combined all India poverty rate was 32% compared to 37% in 2004-2005 [World Bank, 2011]. Going forward, it will be essential for India to build a productive, competitive, and diversified agricultural sector and facilitate rural, non-farm entrepreneurship and employment. India has made a lot of progress in agriculture since independence in terms of growth in output, yields and area under many crops. It has gone through a green revolution, a white revolution, a yellow revolution and a blue revolution. India has made immense progress towards food security since after independence. The Indian population has tripled, and food-grain production more than quadrupled. There has been a substantial increase in available food-grain per capita [Agriculture in India-Wikipedia, 2017]. In this article some important aspects of Indian agriculture have been reviewed based on gray literature, government reports and news.

Agriculture/Horticulture Market in India

The agro-industry in India is divided into several sub segments such as canned, dairy, processed, frozen food, fisheries, meat, poultry, and food grains. Overall production and economic value of horticultural produce, such as vegetables, fruits and nuts has doubled in India in between 2002-2012. Namely, the total horticulture produces reached around 270 million metric tons (MMT) in 2013, making India the second largest producer of horticultural product [Bera, 2010]. India, in 2013 alone produced over 80 million tons (MT) of fruits, over 160 MT of vegetables, over 5.0 MT of spices, over 17 MT of nuts and plantation products (e.g., cashew, cacao, coconut, etc.), around 1.0 MT of aromatic produce and around 2.0 MT of flowers. On the whole, India's horticulture output, is estimated to be 290 MT in 2016-2017 after the first advance estimate [FAOSTAT, 2010; IBEF, 2017a].

As of 2013 statistics, India exported nearly \$40 billion worth of agriculture products which is 7th largest exporter on global scale equals 6th largest net exporter [United States Department of Agriculture, 2014]. Besides, India is the rapidly growing exporter of agricultural products during the past decade as its \$40 billion of net exports is twice of the combined exports to the European Union. India holds world's largest supplier of rice, cotton, sugar and wheat. Indian agricultural products are exported up to 120 countries, primarily in the Southeast Asia, SAARC countries, Middle East, the EU and the United States [IBEF, 2017b]. Particularly, India exported about 2.0 million metric tons (MMT) of wheat and about 2.1 MMT of rice in 2011 to Africa, Nepal, Bangladesh and other regions. Total food grain production reached an all-time high of over 250 MT during the 3rd quarter of 2015. Rice and wheat production in the country stood at 103 MT and 91 MT, respectively. Therefore, India's contribution to agricultural products, export seem to very significant.

India's GDP is expected to grow 7.1% in 2016-2017, led by growth in private consumption, while agriculture GDP is expected to grow at 4.1% equals US\$ 1,640 billion. As per the 2nd Advance Estimates, India's food grain production is expected to be 272 MT in 2016-2017. Production of pulses is estimated at 22 MT. India's exports of basmati rice may rise to US\$ 3.42 to 3.49 billion, with a volume of around 4.1 MT in 2017-2018 [IBEF, 2017b]. Wheat production in India is expected to touch an all-time high of 97 MT during 2016-2017. Groundnut exports from India are expected to cross 700,000 tons in 2016-2017 when compared to 537,888 tons in 2015-2016, owing to the expected 70% increase in the crop size due to good monsoon seasons. India's groundnut exports rose to 653,240 MT during 2016-2017. India's export of grapes to Europe and China are expected to increase by 10 to 20% in 2017 in support of higher production on account with expected good monsoon and higher demand due to competitors such as the Chile shifting focus of the US market. Spices exports from India grew by 9% in volume and 5% in value year-on-year to 661,000 tons and US\$ 1.87 billion, respectively in 2016-2017 [IBEF, 2017b].

Development of Agriculture in India

India depends heavily on the agriculture sector, especially on the food production unit after the 1960 crisis. Until 1960's India was largely dependent upon food imports from foreign countries. After that, the country has put enormous effort to be self-sufficient in the food production and this endeavor of India has led to the Green Revolution with following six measures; 1) acquiring more area for cultivation purposes, 2) expanding irrigation facilities, 3) use of improved and the advanced high-yielding variety of seeds, 4) implementing better techniques that emerged from agriculture research, 5) water management and 6) plan protection activities through prudent use of fertilizers, pesticides, and cropping applications [Business Maps of India, 2017]. After the green revolution came into existence the successive stories of the agriculture sector of Indian economy has made it self-sufficing in grain production, especially wheat and rice. The country also has substantial reserves for the staple grains after green revolution.

Although reports claimed that increasing India's population would lead to shortage of rice and wheat. However, recent studies reveal India can easily feed its growing population, in addition to produce wheat and rice for global exports, if it can reduce food staple spoilage, improve its infrastructure and raise its farm productivity to those achieved by other developing countries such as Brazil and China. Since then, India has shown a steady average nationwide annual increase in the kilograms produced per hectare for some agricultural items, over the last > 55 years. For example, total rice production in India has increased 430% in between 1950 to 2014 from 20 MT to 106 MT [Giri, 2016]. The significant increase in the yield is due to the availability of latest technology, developed seeds, improvement in irrigation facility and new methods of production [FAO, 2015, 2017]. India is the second largest producer of wheat with total production of 88.94 million tons in 2014-2015 [Giri, 2016]. Total production of wheat in India has been continuously increasing after independence. Jowar is (Sorghum) considered to be the staple diet, especially for the lower income families in India. Jowar can be used to feed the animals and used as raw materials in various industries. Total production of jowar during 2013-2014 was 5.4 MT which was similar to the 1950-1951 with total production of 5.5 MT, although the total cultivated area for jowar declined from 15.6 million hectares in 1950-1951 to 5.82 million hectares in 2013-2014 [Giri, 2016].

Agriculture and Government Policies

Considering the success encounter by the wheat and rice production by after green revolution, a National Pulse Development Programme (NPDP) was formed in 1986. The major objective of NPDP is to introduce the improved technologies to the farmers to boost the oilseeds sector in the Indian economy. In addition, a new seed policy was planned to provide an entree to superior quality seeds and plant material for fruits, vegetables, oilseeds, pulses, and flowers. The Indian government also set up the Ministry of Food Processing Industries (MFPI) to stimulate the agricultural sector of Indian economy and make it more lucrative. Since the agriculture sector highly depends upon the monsoon as heavy rainfall during the time leads to a rich harvest. However, the entire year's agriculture cannot possibly depend upon only in the rainy season. Based on this fact, a second green revolution is likely to be formed to overcome such restrictions. An increase in the growth rate and irrigation area, improved water management, improving the soil quality, and diversifying into high value outputs, fruits, vegetables, herbs, flowers, medicinal plants, and bio-diesel is also on the list of the services to be taken by the second green revolution to improve the agriculture in India [Business Maps of India, 2017].

The Government plans to improve the old model Agriculture Produce Marketing Committee Act (APMC Act) and design out the provisions on contract farming into a separate law to form a new Contract Farming Act [IBEF, 2017a]. The Government of India has introduced several projects to assist the agriculture sector. The Pradhan Mantri Gram Sinchai Yojana (PMGSY) is one among them with the scheme aims to irrigate the field of every farmer and improving water use efficiency to achieve the motto “*Per Drop More Crop*”. Overall the scheme ensures improved access to irrigation. The Paramparagat Krishi Vikas Yojana (PKVY) is the scheme aimed to motivate groups of farmers to take up organic farming [IBEF, 2017a]. The National Institution for Transforming India (NITI) Aayog has also proposed various reforms in India's agriculture sector, including liberal contract farming, direct purchase from farmers by the private sector, direct sale by farmers to end user, and single trader license, among other measures, in order to double rural income in the next five years. The Ministry of Agriculture, Government of India, has been conducting various consultations and seeking suggestions from numerous stakeholders in the agriculture sector, in order to devise a strategy to double the income of farmers by 2022 [The Indian Express, 2016].

Given the importance of the agriculture sector, the Government of India, in its Budget 2017-2018, planned several steps for the sustainable development of agriculture. The total allocation for rural, agricultural and allied sectors for 2017-2018 has been increased by 24% every year to US\$ 28 billion. A dedicated micro-irrigation fund will be set up by National Bank for Agriculture and Rural Development (NABARD) with a corpus of US\$ 750 million. The government also plans to set up a dairy processing fund of US\$ 1.2 billion over three years with initial corpus of US\$ 300 million. The participation of women in Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) has increased to 55% and allocation to the scheme has been increased to a record US\$ 7.2 billion for 2017-2018. Short-term crop loans up to US\$ 4,500 at subsidized interest rate of 7%/year would be provided to the farmers. An additional incentive of 3% is provided to farmers for prompt repayment of loans within the due date, making an effective interest rate for them at 4% [India Budget 2017-2018, 2017].

According to the Department of Industrial Policy and Promotion (DIPP), the Indian agricultural services and agricultural machinery sectors have cumulatively attracted Foreign Direct Investment (FDI) equity inflow of about US\$ 2,300 million in between 2000 to 2016 [IBEF, 2017b]. India and Brazil have signed a bilateral investment agreement, aimed at enhancing cooperation in areas of agriculture, cattle genomics, ship building, pharmaceutical industry, defense production, ethanol production and oil and gas [IBEF, 2017b]. The Government of India and the Government of Israel have expressed their commitment to further strengthen bilateral relations in the field of agriculture and allied sectors, as well as enhance cooperation at the government-to-government and business-to-business levels [IBEF, 2017b].

Major Problems in Agriculture of India

As with rice, the lasting benefits of improved seeds and improved farming technologies now largely depends on whether India develops infrastructure such as irrigation network, flood control systems, reliable electricity production capacity, all-season rural and urban highways, cold storage to prevent spoilage, modern retail, and competitive buyers of produce from Indian farmers [Agriculture in India-Wikipedia, 2017]. This is increasingly the focus of Indian agriculture policy. India's agricultural economy is undergoing structural changes. Between 1970 and 2011, the GDP share of agriculture has fallen from 43% to 16%. This is not because of reduced importance of agriculture or a consequence of agricultural policy. This is largely because of the rapid economic growth in services, industrial output, and non-agricultural sectors in India between the years 2000 to 2010. Furthermore, the majority of the cultivated area is dependent on the yearly rainfall. There has been increasing cases of crop failure and farmer suicide in the recent years. In 2012, the National Crime Records Bureau of India reported 13,754 farmer suicides. Farmer suicides account for 11.2% of all suicides in India [Agriculture in India-Wikipedia, 2017]. Activists and scholars have offered a number of conflicting reasons for farmer suicides, such as monsoon failure, high debt burdens, genetically modified crops, government policies, public mental health, and family problems. The lack of effective policy for the minimum support price has also emerged as one of the major problems. Also majority of the rural population who are dependent on agriculture have small land holdings where the marginal productivity of each member is close to zero. Furthermore, the major challenges faced by the agriculture sector in India include the lack of credit, soil erosion, lack of agricultural marketing, inadequate storage

facility and lack of a proper mechanism [Dwivedy, 2011; Ministry of Agriculture, 2015]. Similarly the welfare of the small and marginalized farmers should also be taken into consideration. In the recent time the introduction of crop insurance Pradhan Mantri Gram Sinchai Yojana seems to be a good initiation. However the effectiveness of the scheme can only be analyzed after its implementation.

India has very poor rural roads affecting timely supply of inputs and timely transfer of outputs from Indian farms. Irrigation systems are inadequate, leading to crop failures in some parts of the country because of lack of water. In another area regional flood, poor seed quality and inefficient farming practices, lack of cold storage and harvest spoilage cause over 30% of the farmer's produce going to waste. Lack of organized retail and competing buyers thereby limiting Indian farmer's ability to sell the surplus and commercial crops [Agriculture in India-Wikipedia, 2017]. The Indian farmer has received just 10% to 23% of the price the Indian consumer pays for exactly the same produce, the difference going into losses, inefficiencies and middlemen. Farmers in the developed economies of Europe and the United States receive 64% to 81%.

Although India has attained self-sufficiency in food staples, the productivity of its farms is below that of Brazil, the United States, France and other nations. Indian wheat farms, for example, produce about a third of the wheat per hectare per year compared to farms in France. Rice productivity in India was less than half that of China. Indian total factor productivity growth remains below 2% per annum; in contrast, China's total factor productivity growths is about 6% per annum, even though China also has smallholding farmers. Inconsistent government policy, agricultural subsidies and taxes are often changed without notice for short term political ends. Irrigation facilities are inadequate, as revealed by the fact that only 53% of the land was irrigated, which result in farmers still being dependent on rainfall [Agriculture in India-Wikipedia, 2017]. By contrast, Indian farms in some regions produced the best yields, for sugarcane, cassava and tea crops. Crop yields for some farms in India are within 90% of the best achieved yields of farms in developed countries such as the United States and in European Union.

As indicated above, improper water management is another problem affecting India's agriculture. At a time of increasing water shortages and environmental crises, for example, the rice crop in India is allocated disproportionately high amounts of water. One result of the inefficient use of water is that water tables in regions of rice cultivation, are on the rise, while soil fertility is on the decline. Aggravating the agricultural situation is an ongoing Asian drought and inclement weather. This has partially been due to relatively unfavorable distribution of rainfall, leading to floods in certain parts of the country and droughts in some others. Despite the fact that agriculture accounts for as much as a quarter of the Indian economy and employs an estimated 60% of the labor force, it is considered highly inefficient, wasteful, and incapable of solving the hunger and malnutrition problems. Given this scenario, it is time to make a shift to micro irrigation so that the efficient and judicious use of scarce water resources can be made [Agriculture in India-Wikipedia, 2017]. A study conducted by the National Mission for Sustainable Agriculture on micro irrigation, reveals that there were significant reductions in the use of water and fertilizer, but the yield of crops increased up to 45% in wheat, 20% in gram and 40% in soybean. However, high initial costs deter farmers to adopt this technology. While big farmers can easily avail this technology, the government should consider giving subsidies to small farmers to boost the adoption of this technology. Despite progress in this area, these problems have continued to frustrate India for decades. It is estimated that as much as one-fifth of the total agricultural output is lost due to inefficiencies in harvesting, transport, and storage of government-subsidized crops.

Indian National Policy for Farmers of 2007 stated that "prime farmland must be conserved for agriculture except under exceptional circumstances, provided that the agencies that are provided with agricultural land for non-agricultural projects should compensate for treatment and full development of equivalent degraded or wastelands elsewhere". The policy suggested that, as far as possible, land with low farming yields or that was not farmable hold be earmarked for non-agricultural purposes such as construction, industrial parks and other commercial development. There have also been negative environmental effects in the form of the depleting water table, emission of greenhouse gases, and the contamination of surface and ground water. Needless to say, the agriculture sector is in a state of distress, which is severely affecting peasants and marginal farmers, and urgent policy interventions are required to protect their interests [News 24th August (2015)].

Further, there is a lack of interest of students in pursuing research in agriculture. As the Economic Survey notes, even in states where agriculture is relatively more important, agriculture education is especially weak if measured by the number of students enrolled in agricultural universities. There has also not been any major contribution from the private sector towards research and development. Government should thus woo private players by giving them incentives to play a major role in agricultural research and development [Chaudhary and Singh, 2016]. Many have cast doubts over the ambition of government to double the income of farmers by 2022. Further, India Spend is also skeptical of government ambition as their analysis shows that after adjusting for rising costs, an Indian farmer's income effectively rose only 5% per year over a decade (2003-2013). All this, in many ways, paints a bleak picture of the future of Indian agriculture. However, if we want to save the future of our farmers and permanently cure the ills of Indian agriculture, major policy interventions have to be made at the earliest.

Future Indian Agriculture

The agriculture sector in India is expected to generate better momentum in the next few years due to increased investments in agricultural infrastructure such as irrigation facilities, warehousing and cold storage. Factors such as reduced transaction costs and time, improved port gate management and better fiscal incentives would contribute to the sector's growth. Furthermore, the growing use of genetically modified crops will likely improve the yield for Indian farmers. India is expected to be self-sufficient in pulses in the coming few years due to the concerted efforts of scientists to get early maturing varieties of pulses and the increase in minimum support price [IBEF, 2017b]. The required level of investment for the development of marketing, storage and cold storage infrastructure is estimated to be huge. The government has not been able to implement schemes to raise investment in marketing infrastructure. One of the major barriers to boosting farm productivity is the lack of new technologies and major breakthroughs. While the National Agriculture Research System played a major role in the green revolution, in recent years there hasn't been any major breakthrough in research. One of the main reasons for this is the lack of financial resources.

The National Agricultural Policy of 2000 stated that private sector participation will be promoted through contract farming and land leasing arrangements to allow accelerated technology transfer, capital inflow and assured market for crop production [Chaudhary and Singh, 2016]. During 1960-61, the total investment in the agricultural sector was 1670 crores Indian Rupees of which the private sector contributed 590 crores and the public sector, 1070 crores. However, during 1980-81, the total investment increased to 4640 with 2840 and 1800 crores by the private and the public sectors respectively [Economic Survey, 1998-99]. One of the major factors that has deterred private players from agricultural sector is the long pending reform of wholesale markets, which are regulated by the Agriculture Produce Management Committee (APMC) Act. The APMC forces the farmers to sell their produce in government-controlled marketing yards. While the objective of APMC was to regulate markets and increase market yards, it has acted as a major obstacle to private investment. Therefore, to increase private sector participation in agriculture, it is imperative to remove these entry barriers.

In recent year, Indian agriculture has experienced profound changes. A major change that took place in this sector is the globalization of Indian agriculture. The first tentative change to support arrangements was introduced following India's implementation of the Agreement on Agriculture (AoA), which required India to revise its trade support policies [Mathew 2006]. Globalization of Indian agriculture offers both opportunities and challenges to policy makers. Opportunities exist for deriving large benefits through a substantial increase in the agricultural exports, especially, high value labor-intensive agricultural products.

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