

ROLE OF TECHNOLOGY IN THE GROWTH OF AGRICULTURE SECTOR

Punam Kumari
Research Scholar,
Department of Geography,
Maharshi Dayanand University, Rohtak

ABSTRACT:

Indian agriculture history is witness of the new agriculture arrangement which took place in India has changed the overall traditional cropping pattern in India. There have been many agriculture reforms such as Land Reforms, Green Revolution, Minimum Support Price (MSP), and new economic reforms have adopted in Indian agriculture. All these reforms have directly affected the agriculture sector. Along with these reforms, technology has played a big role in developing the agricultural industry. Today it is possible to grow crops in a desert by use of agricultural biotechnology. With this technology, plants have been engineered to survive in drought conditions. Through genetic engineering scientists have managed to introduce traits into existing genes with a goal of making crops resistant to droughts and pests.

INDEX TERMS:

Agriculture growth, Technology, GDP, Organic Agriculture, Transportation

INTRODUCTION:

Indian economy is classified in three major sectors - Agriculture & allied, Industry and Services. Agriculture sector includes Agriculture (Agriculture proper & Livestock), Forestry & Logging, Fishing and related activities. Agriculture is an important part of the Indian economy. At around 1,530,000 square K.M., India has the second-largest amount of arable land, after the US, with 52% of total land under cultivation. Although the total land area of the country is only slightly more than one third of China or the US, India's arable land is marginally smaller than that of the US, and marginally larger than that of China. However, agricultural output lags far behind its potential. The low productivity in India is a result of several factors.

According to the World Bank, India's large agricultural subsidies are distorting what farmers grow and hampering productivity-enhancing investment. Over-regulation of agriculture has increased costs, price risks and uncertainty, and governmental intervention in labour, land, and credit are hurting the market. Infrastructure such as rural roads, electricity, ports, food storage, retail markets and services remain inadequate. The average size of land holdings is very small, with 70% of holdings being less than one hectare (2.5 acres) in size. Irrigation facilities are inadequate, as revealed by the fact that only 46% of the total cultivable land was irrigated as of 2016, resulting in farmers still being dependent on rainfall, specifically the monsoon season, which is often inconsistent and unevenly distributed across the country.

In an effort to bring an additional two crore hectares (20 million hectares; 50 million acres) of land under irrigation, various schemes have been attempted, including the Accelerated Irrigation Benefit Programme (AIBP) which was provided Rs.80,000 crore (Rs.800 billion) in the union budget. Farming incomes are also hampered by lack of food storage and distribution infrastructure; a third of India's agricultural production is lost from spoilage.

Technology has turned farming into a real business, now farmers have electrified every process, a consumer can place an order directly online, and the product will be transported from the farm to the consumer in time when it's still fresh. This saves the farmer money and it cuts out mediators who tend to buy low from farmers and sell high to end consumers. Every farmer uses this technology in their own way. Some use it to create fertilizers, others use it to market their products, and others use it in production. So as a farmer, you have to specify what you need.

REVIEW OF LITERATURE:

Jodhka, S. Surinder (1994) suggested modernization of agriculture. Modernization should lead not only to an increase in productivity and integration of agriculture into the broader national market but also being about a fundamental change in the social relationship of production leading to freeing of agriculture labour from all kinds of patronage and institutions dependency relationships.

Dev, Mahendra (2003) found improvement in agriculture. He was in favour of second revolution in agriculture. To encourage the diversification of agriculture, there is a next of Hi-Tech technology. He also found some problems in agriculture, e.g. finance problems, sterilization of prices, hiked prices of fertilizers, pesticides, crude oil, problem of credit creation in rural area, reduction in custom duty on drugs, continues decline in GDP in agriculture etc.

Gulati, A. and Narayanan, S. (2003) observed that the Indian government started raising administered prices of rice and wheat in the 1990s, with a view to gradually eliminating the so called discrimination against agriculture and bringing these in alignment with the world price. To begin with the world prices were also rising and hence the competitiveness of agricultural exports from India was not adversely affected.

Bhalla, G.S. (2004) measured the competitiveness of Indian agriculture sector in 1990s under import and export hypothesis. On the basis of import hypothesis, most of the crops except oilseeds, some coarse cereals, and sugar were competitive. In the case of these commodities also, the picture would change in case the developed countries agree to withdraw their domestic support to agriculture.

Mathur, Das, Sircar (2007) raised some issues in agriculture. Agriculture is a core sector of economy and 60% population is dependent on it for livelihood. Agriculture is not strong to meet the demand of the economy. The study identifies factors that affect agricultural growth and analyses constrains that have affected its growth in the sector. There has been a decline in growth rate of the agriculture sector during the 1990 till the recent past. This is accompanied with recent decline in yields per hectare for a number of food crops. There are vast inter-state differences in growth rate of agriculture and even more so for food grains.

Gupta, S.K. (1993) has revealed the vocational advantages of development of agro based industries in different parts of India. He examined the strength and weakness of agriculture sector. He gave new vision to agriculture sector through boosting various programmes.

METHODOLOGY:

This paper is based on secondary data and on various views of different authors, magazines, journals, books, government publications etc.

OBJECTIVES:

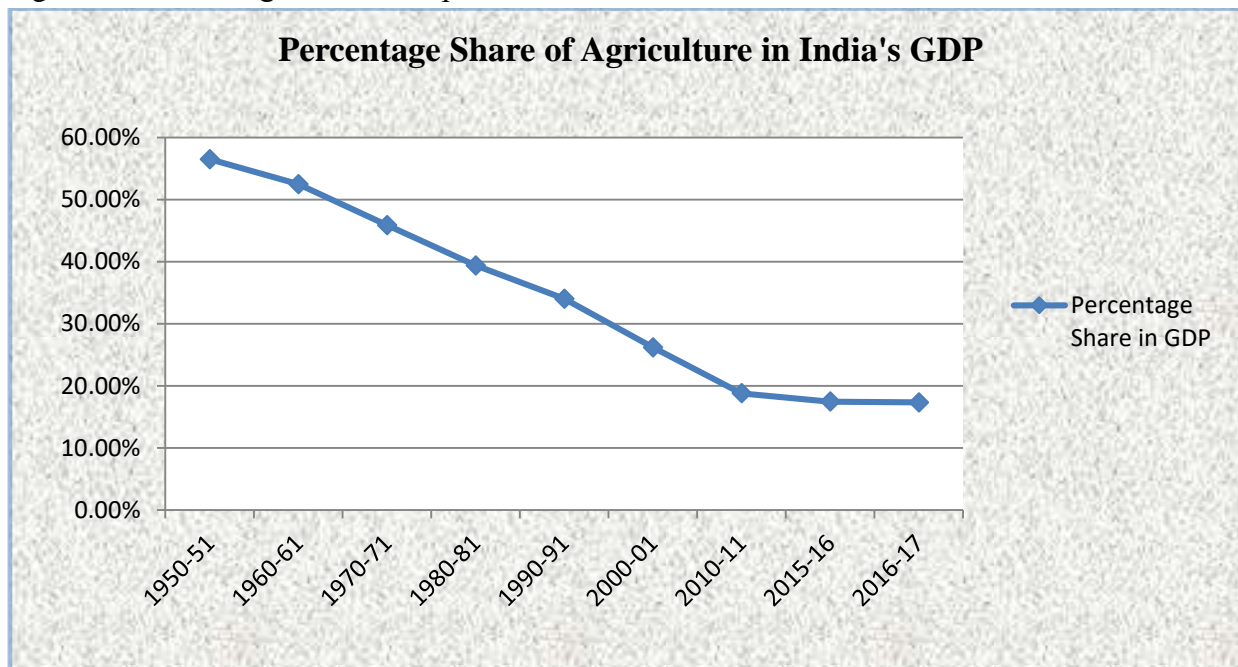
- To understand the reasons for low investment in agricultural research, even though agricultural research brings to an economy a higher rate of return on investments
- To examine the performance of Agriculture and Allied sectors.

- To identify major factors responsible for the performance of agriculture sector.

OVERVIEW OF INDIA'S AGRICULTURAL ECONOMY:

Agriculture was considered to be the backbone of Indian economy and its contribution to the National Income was estimated at about 56.50% in the early fifties. This position got altered steadily and significantly since then (Figure 1). In 2000-01, the contribution of agriculture to GDP was halved again to about 26.18%. In 2007-08, it is estimated that agriculture contributes only 19.78% to the GDP. Though it is expected that in the process of development the sectoral contribution to the GDP would change, the issue is whether the observed trends in India's agricultural sector's share over time is desirable. The reality is that, still it accounts for about 54.6% of the employment in the country where as this percentage is much less in advanced countries.

Figure 1: Share of agricultural output in India's GDP:



Source: Various issues of Economic Survey, Government of India

India is basically an Agricultural society, where close to 59% of our population is dependent on it. Past 20 years of economic reforms has brought growth in services and manufacturing sectors but contribution of Agriculture has been coming down. It became the least preferred employment opportunity. In the last six decades, the Government's objectives in agricultural policy and the instruments used to realize the objectives have changed from time to time, depending on both internal and external factors.

But, in spite of having bumper crops every year, we still house most hungry and malnutrition people in whole world. The food prices are rising, but this is not transforming into income growth to Agriculture. Is Indian agriculture is a paradox? The factors leading to this dichotomous situation include the following:

- Land Holdings and Green Revolution
- Water Availability
- Availability of Finance and Market Conditions
- Post harvest Mechanisms

HOW HAS TECHNOLOGY CHANGED FARMING?

Agriculture technologies advanced rapidly in the second half of the 20th century and at the beginning of the 21st century. These developments forever changed the way farmers work. Let's have a look at how farming technology has changed over the last 50 years.

1960s	The Green Revolution	In the mid-1940s U.S. Vice President Henry Wallace spearheaded a program to help developing nations feed their growing populations. The program included four scientists, one of whom was Dr. Norman Borlaug. Borlaug started a growing process that allowed plants to thrive with new irrigation and crop management techniques. By the 1960s, the benefits of what was nicknamed the "Green Revolution" were apparent when successful new wheat varieties were made available in countries across the globe.
1974	Roundup agricultural herbicide released	Monsanto developed a new herbicide using glyphosate as the active ingredient. Glyphosate-based herbicide is used by farmers to control weeds in their crops. Roundup also made its way into lawn and garden products, which allow landowners to kill weeds along sidewalks, driveways, gardens, and fences.
1975	Rotary combines are introduced	The first twin-rotor system combine was created by Sperry-New Holland. This allowed the crop to be cut and separated in one pass over the field. For corn, it not only separated the husk and ears, but shelled the kernels, and chopped the stalks.
1982	First genetically modified plant cell	Scientists working at Monsanto Company became the first in the world to genetically modify a plant cell. The team used Agrobacterium to introduce a new gene into the petunia plant and announced their achievement the following year. Within 5 years, Monsanto researchers planted their first outdoor trials of a genetically modified crop – tomatoes that were resistant to Roundup agricultural herbicide, insects, or viruses. The Agrobacterium method first used in 1982 is still in use today by Monsanto scientists and by other companies' scientists.
1994	Satellite technology advances farming	For the first time, farmers were able to use satellite technology to see their farms from overhead, allowing for better tracking and planning.
1996	Monsanto's first GMO crops become commercially available	Monsanto introduced Roundup Ready soybeans and Bollgard insect-protected cotton, the first GMO row crops available to farmers. The soybeans provided tolerance to Roundup agricultural herbicide. The GMO traits in cotton provided protection against the cotton bollworm, tobacco budworm, and pink bollworm.
2000s	Software and mobile devices help farmers have	Like many people, farmers started carrying mobile devices, which allowed them to stay connected to colleagues while in the field. This also meant they now had access to data needed while on-the-go, including the ability to place orders for seed or fertilizer at any time or

	better harvest	in any place.
2015	Data revolutionizes farming potential	Farmers make decisions based on the information they have on-hand, which is why data has helped them harness the power of information to make better-informed decisions that allow them to use resources more sustainably. The Climate Corporation's Climate FieldView™ is a digital platform that brings together data collection, agronomic modeling, and local weather monitoring, which gives farmers a better understanding of their fields. These tools allow farmers to plan for better harvests and make decisions that are better for the planet.

AGRICULTURE TECHNOLOGY:

Modern farms and agricultural operations work far differently than those a few decades ago, primarily because of advancements in technology, including sensors, devices, machines, and information technology. Today's agriculture routinely uses sophisticated technologies such as robots, temperature and moisture sensors, aerial images, and GPS technology. These advanced devices and precision agriculture and robotic systems allow businesses to be more profitable, efficient, safer, and more environmentally friendly.

IMPORTANCE OF AGRICULTURAL TECHNOLOGY:

Farmers no longer have to apply water, fertilizers, and pesticides uniformly across entire fields. Instead, they can use the minimum quantities required and target very specific areas, or even treat individual plants differently. Benefits include:

- Higher crop productivity
- Decreased use of water, fertilizer, and pesticides, which in turn keeps food prices down
- Reduced impact on natural ecosystems
- Less runoff of chemicals into rivers and groundwater
- Increased worker safety

In addition, robotic technologies enable more reliable monitoring and management of natural resources, such as air and water quality. It also gives producers greater control over plant and animal production, processing, distribution, and storage, which results in:

- Greater efficiencies and lower prices
- Safer growing conditions and safer foods
- Reduced environmental and ecological impact

USE OF TECHNOLOGIES IN AGRICULTURE:

Now a farmer can cultivate on more than two acres of land with less labor, and can cut costs even more when they are looking for a used tractor and other harvesting technology, versus new equipment. The use of planters and harvesters makes the process so easy. In agriculture, time and production are so important; you have to plant in time, harvest in time and deliver to stores in time. Modern agricultural technology allows a small number of people to grow vast quantities of food and fiber in a shortest period of time.

- 1) **MODERN TRANSPORTATION:** This helps in making products available on markets in time from the farm. With modern transportation, consumers in Dubai will consume a fresh carrot from Africa with in the same day that carrot lives the garden in Africa. Modern transportation technology facilities help

farmers easily transport fertilizers or other farm products to their farms, and it also speeds the supply of agricultural products from farms to the markets where consumers get them on a daily basis.

- 2) **COOLING FACILITIES:** These are used by farmers to deliver tomatoes and other perishable crops to keep them fresh as they transport them to the market. These cooling facilities are installed in food transportation trucks, so crops like tomatoes will stay fresh upon delivery. This is a win-win situation for both the consumers of these agricultural products and the farmers. How? The consumers get these products while still fresh and the farmer will sell all their products because the demand will be high.
- 3) **GENETICALLY PRODUCED PLANTS** like potatoes can resist diseases and pests, which rewards the farmer with good yields and saves them time. These crops grow very fast they produce healthy yields. Since these are resistant to most diseases and pests, the farmer will spend less money on pesticides, which in return increases on their (RIO) return on investment.
- 4) **DEVELOPMENT OF ANIMAL FEEDS:** This has solved the problem of hunting for grass to feed animals, now these feeds can be manufactured and consumed by animals. The price of these feed is fair so that a low income farmer can afford them. Most of these manufactured animal feeds have extra nutrition which improves on animal's health and the output of these animals will also increase. In agriculture, the health of an animal will determine its output. Poorly feed animals are always unhealthy and they produce very little results in form of milk, meet, or fur.
- 5) **BREEDING OF ANIMALS WHICH ARE RESISTANT TO DISEASES:** Most of these genetically produced animals will produce more milk or fur compared to normal animals. This benefits the farmer because their production will be high. Cross breeding is very good in animal grazing, cross breed animals are more strong and productive.
- 6) **IRRIGATION OF PLANTS:** In dry areas like deserts, farmers have embraced technology to irrigate their crops. A good example is in Egypt, were farmers use water pumps to collect water from river Nile to their crops. Most of these farmers grow rice which needs a lot of water, so they manage to grow this rice using irrigation methods enhanced by advanced technology. Advanced water sprinklers are being used to irrigate big farms and this helps the crops get enough water which is essential in their growth. Some farmers mix nutrients in this water, so also improves on the growth of these crops.

SUGGESTIONS TOWARDS THE GROWTH OF AGRICULTURE SECTOR:

Apart from the above discussed use of technology, here are some other suggestions towards the growth of agriculture sector:

- 1) **AGRICULTURAL SAFETY:** Agriculture, which has high rates of fatalities and serious injuries, ranks among the most dangerous professions in the United States. Training farmers, ranchers, and tree farmers to operate machinery safely and use protective equipment correctly can help reduce the high number of accidents.
- 2) **FARMER EDUCATION:** Farmers require ongoing education to stay aware of fast-moving developments in technology, science, business management, and an array of other skills and fields that affect agricultural operations.
- 3) **ORGANIC AGRICULTURE:** Organic farmers, ranchers, and food processors use agricultural methods intended to preserve the environment. USDA organic regulations restrict the use of certain conventional tools such as synthetic fertilizers and pesticides.
- 4) **SMALL AND FAMILY FARMS:** More than 90 percent of farms in the U.S. are classified as small, with a gross cash farm income of \$250,000, or less. These farms, most of which are family-owned and

operated, confront considerable challenges due to current trends, such as increased movement into cities, an aging population, farm consolidation, and changing weather patterns.

- 5) **SUSTAINABLE AGRICULTURE:** Agriculture often places significant pressure on natural resources and the environment. Sustainable agricultural practices are intended to protect the environment, expand the Earth's natural resource base, and maintain and improve soil fertility.

CONCLUSION:

To conclude, it can be said that agricultural sector in India is facing a crisis today. The globalisation process, which started in the 1990s, is one of the reasons for this crisis. The solution of the problem is not in a few "packages" but in drastic changes in the present economic policies related to agriculture. For this, the government should be ready to take bold steps. Farmers, agricultural labourers and people's organisations in civil society should work collectively to assist and persuade the government to make the necessary changes. It is high time that the government and the people realised that India can become a real "superpower" only when the vast majority of the people, especially the farmers in the rural areas, become prosperous and are really empowered.

For this, policy and programs involving timely and adequate investment in agriculture would facilitate farmers' access to technologies for production, food processing and preservation, farm-to-market linkages, agricultural research and extension, large-scale development of bio-diesel, modernization, mechanization and commercialization of agriculture. Role of credit to agriculture cannot be viewed just as a support to food-producing activity but it should focus "need to improve the overall income and economic well-being of the farmers" as agriculture has been the basic requisite for national sovereignty. The words of Dr. M.S. Swaminathan are relevant here: "In a country where 60% of people depend on agriculture for their livelihood, it is better to become an agricultural force based on food security rather than a nuclear force."

REFERENCES:

- 1) Jodhka, S., Surinder (1994), "Agrarian Changes and Attached Labour-Emerging Patterns in Haryana Agriculture", Vol. 29, Issue No. 39
- 2) Dev, Mahendra (2003), "Small Farmers in India: Challenges and Opportunities", retrieved from <http://www.igidr.ac.in/pdf/publication/WP-2012-014.pdf>
- 3) Gulati, A. and Narayanan, S., (2003), "The subsidy syndrome in Indian agriculture", Development Strategy and Governance
- 4) Bhalla, G.S., (2004), "Globalisation and Indian Agriculture", 'State of Farmer: A Millennium Study', Academic Foundation Publication, New Delhi.
- 5) Mathur, Das, Sircar (2007), "Status of Agriculture in India", Vol. 41, Issue No. 52
- 6) Kalirajan, K.P., G. Mythili and U. Sankar, eds. (2001), "Accelerating Growth Through Globalization of Indian Agriculture", Macmillan, India.
- 7) EGAI (2007), Report of the Expert Groups on Agricultural Indebtedness, New Delhi, Government of India, Ministry of Finance.
- 8) Sendilkumar, R., (2012), "Empowerment of Farmers through GALASA Programme: A Journey for Sustainable Agriculture Development", Indian Res. J. Ext. Edu., 12(3).
- 9) Agriculture Census, (2016-17), Government of India.

WEB REFERENCES:

- 1) https://www.researchgate.net/publication/239919257_Development_Strategy_the_State_and_Agriculture_since_Independence
- 2) https://mpra.ub.uni-muenchen.de/18930/1/Agriculture_crisis_in_India.pdf
- 3) <http://ageconsearch.umn.edu/bitstream/204559/2/05-Keynote-Srijit%20Mishra.pdf>
- 4) <http://www.thehindu.com/todays-paper/tp-opinion/agrarian-crisis-nature-causes-and-remedies/article3044873.ece>
- 5) <https://www.useoftechnology.com/technology-agriculture>

