

# CONTRIBUTION OF MODERN TECHNOLOGY IN THE DEVELOPMENT OF AGRICULTURE IN INDIA

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**Abstract-** The main purpose of this paper is to introduce the modern technology adoption its importance usage and contribution of development of agriculture. The contribution of technology is significant in agricultural development and with the advent of digital technology the scope has widened. Innovation is leading to an evolution in agricultural practices, reducing losses and increasing efficiency. Technology in agriculture affects many areas of agriculture, such as fertilizers, pesticides, seed technology, etc. Biotechnology and genetic engineering have resulted in pest resistance and increased crop yields. Mechanization has led to efficient tilling, harvesting and a reduction in manual labor. Irrigation methods and transportation systems have improved. Processing machinery has reduced wastage etc...and the effect is visible in all areas. New technologies focus on robotics, precision agriculture and more. Technological advances appeared eventually in agriculture development in India. The introduction of tractors was followed by new tillage and harvesting equipment, irrigation methods and air seeding technology, all leading to improved quality of the food and fiber. Farmers can leverage scientific data and technology to enhance crop yields and keep themselves abreast with cutting-edge methods of farming. Technology in agriculture affects many areas of agriculture. India managed to achieve self-sufficiency in food grain production by leveraging modern methods of agriculture along with farm mechanization.

**Keywords:** Modern Technology, Biotechnology, Mechanization, Pesticides, Harvesting equipment, Air seeding technology.

## INTRODUCTION:

The agriculture sector forms only about 18 percent of India's GDP despite employing almost 65 percent of the total workforce. Despite significant improvement in food grain production, there are several challenges to tackle as the government aims to increase agricultural production as a share of GDP. Agriculture in India is largely dependent on nature, but climate and global warming issues make farming unpredictable. The need of the hour is to educate farmers in the use of modern technology and innovative approaches to increase productivity and raise profitability. Agricultural development practices over a while have been perceived to exploit natural resources faster than they could be renewed. Exponential growth in the human population has resulted in demand for food and shelter, which the "natural" carrying capacity of the land is under pressure to provide. Natural imbalance is visible in pollution, soil degradation, wildlife population decline, and human-created alterations of flora and fauna. It is reasonable to assume that human population growth will continue and place greater demands on the agri-ecosystem. Thus, technology has and will continue to play a major role in agriculture and sustainable development going forward. Technology has a major role in farming and agriculture practices; and with the advent of digital technology, the scope has widened. Innovation in agriculture is leading to an evolution in agricultural practices, thereby reducing losses and increasing efficiency. This is positively impacting farmers. The use of digital and analytic tools is driving continuous improvement in agriculture, and the trend is here to stay, resulting in improving crop yields and helping to increase the income of the farming community. The role of modern technology is significant in agricultural development; and with the advent of digital technology, the scope has widened. Innovation is leading to an evolution in agricultural practices, reducing losses and increasing efficiency. Manual labor and hand tools used in agriculture have limitations in terms of energy and output, especially in tropical environments. Resistance to agricultural mechanization, especially among smallholder farmers due to accessibility, cost, and maintenance issues, often acts as a detrimental factor. To reduce manual labor and make processes faster, combine harvesters are finding greater use. Indian farming is characterized by small landholdings, and the need is to partner with others to take advantage of modern machines. Capacity building of farmers through hand holding, making modern machines available especially to small farms, and tackling affordability issues through policy will lead to greater adoption of mechanization services going forward. Agricultural mechanization has the potential to, directly and indirectly, affect yields through a reduction in post-harvest losses and an increase in harvest gains. Climate/ weather prediction through artificial intelligence. A major advance in agriculture is the use of artificial intelligence (AI). Modern equipment and tools based on AI enable data gathering and assist in precision farming and informed decision-making. Drones, remote sensors, and satellites gather 24/7 data on weather patterns in and around the fields, providing farmers with vital information on temperature, rainfall, soil, humidity, etc. However, AI finds slow acceptance in a country like India where marginal farming, fragmented landholdings, and other reasons act as impediments. But there is no doubt that technologies based on AI can bring precision to large-scale farming and lead to an exponential rise in productivity. Agricultural sensors communications technology has evolved rapidly in India and made smart farming a possibility. Sensors are now being used in agriculture to provide data to farmers to monitor and optimize crops given the environmental conditions and challenges. These sensors are based on wireless connectivity and find application in many areas such as determining soil composition and moisture content, nutrient detection, location for precision, airflow, etc. Sensors help farmers save on pesticides, and labor, and result in efficient fertilizer application. They allow farmers to maximize yields using minimal natural resources. Improving farm yields and supply chain management use Big Data. The collection and compilation of data and its further processing to make it useful for decision-making/problem-solving are expanding the way big data functions. Big data is slated to

play a major role in smart farming, and the benefits percolate across the entire supply chain and the markets. Agriculture is becoming larger, and it depends on a large number of variables. This is resulting in greater collection and use of complex data, which has to be meaningfully interpreted and managed. Data can be from external sources such as social media, supplier networks, markets, or from sensor/machine data from the fields. Transformation of agriculture from using big data is taking place that affects crop yield, supply chain management, yield prediction, etc.

#### **METHODOLOGY:**

The Methodology of this research paper is based on how agriculture can be increased through modern technology. India is a developing country and is dominated by agriculture. To develop agriculture with increasing population it is necessary to develop it by contributing modern technology. Modern technology has an important contribution in developing Indian agriculture as an agricultural industry. The methodology of this research paper has described how agriculture has been developed in Indian agriculture by contributing modern technology.

**High yielding technologies:** The green evolution of the sixties would not have occurred without the High Yielding Varieties of Wheat and Paddy. These high yielding varieties along with increased area under irrigation fertilizers saw India becoming a bread basket from once being leveled as a begging bowl. Unfortunately, presently also our yields are less comparative to the yields of crops in other countries. This has severely reduced our total production. If Indian agriculture is to remain in competition with the global agriculture it has to increase the per unit yield of its crops. This requires the development and production of seeds which have more yields, are resistant to diseases, are not susceptible to insect pest attack, and can withstand the environmental extremities. Sustainable intensification of agriculture is a good alternative to avoid localized chronic food and nutrition insecurity when between 75 and 90 per cent of staple foods are produced and consumed locally. System of Rice Intensification (SRI) has emerged as an alternative to the conventional rice growing methods. SRI uses less water, is more efficient in using available water and considerable higher yields are achieved by this method. Unleashing the full potential of smallholders, including that of women farmers, is thus key to global food and nutrition security, creation of decent work, and sustainable agriculture. Post harvest technologies

**Post harvest technologies:** Post harvest infrastructure also plays an important role in Indian agriculture. A considerable proportion of our produce goes wasted in the absence of suitable post harvest infrastructure. A study puts this loss to the tune of rupees 44,000 crore. This can be avoided if suitable post harvest infrastructure is provided to the farmers. As most of the horticultural produce is perishable therefore immediate handling of the produce after harvest is necessary. Suitable post harvest infrastructure in terms of cold storages, processing units, road networks in inaccessible areas, establishment of local regulated markets at the Panchayat levels can give a big boost to the agriculture sector by promoting value addition and food processing. This can also help in creating employment opportunities for the others also.

**Climate resilient technologies:** The effects of Climate change are being witnessed all over the globe but the vulnerability of Indian agriculture to this is high. This is because a large population is dependent on agriculture and also we lack suitable coping mechanisms. Already negative effects of the rising temperatures have been reported in many food crops and the situation can get further aggravated. In India agriculture is mostly in rainfed areas therefore climate resilient technologies are the need of the hour. In the country a project entitled 'National Initiative on Climate Resilient Agriculture' has been going on. This aims to enhance resilience of Indian agriculture to climate change and climate variability through strategic research and technology demonstrations in most vulnerable districts of India. The basic purpose is to enable the farmers to cope up with the climatic variability through efficient management of their resources. Technologies for drudgery reduction: Agriculture in India is prone to drudgery and women that constitute half of the work force in agriculture are more susceptible to this. Mechanization is also another important aspect for enhancing agricultural production. Unfortunately mechanization is very low in India. Farmers still operate with their traditional implements which hamper their performance. Women which constitute an important partners in this sector are still not been recognized properly. A study done in Orissa under the Project, 'Standardization of women specific field practices in rice in Orissa' revealed that women of family contributed highest hours per season in harvesting and post harvest operations (61.66). But their condition still is deplorable deep down in the drudgery. Women do most of the operations right from the harvesting to winnowing, grading and storage. FAO estimates that giving women better access to land, inputs, and technology could increase yield by 2.5-4 per cent and reduce undernourishment by 12-17 percent. Improved farm tools and implements for reducing drudgery reduction are the need of the day. Our research efforts should also focus on relieving the women of this drudgery by developing appropriate tools that could reduce drudgery of the women engaged in this sector. The Central Institute of Agricultural Engineering, Bhopal has developed tools such as the seed drill, seed broadcaster, seed treatment drum, hand ridges and dibblers. The marginal and small farmers despite being the major producers of food, especially in developing regions, are the majority of the world's poor people still outside the ambit of technologies and a very large proportion of the chronically undernourished. Agriculture which is not specific to growing of food crops but also includes livestock, apiculture, pisciculture, apiary, goatry forestry etc has to undergo a significant transformation in order to meet the above related challenges. This new agriculture paradigm must ensure that the small and marginal farmers be at the center stage of any technological interventions.

**Resilient crops developed via the use of biotechnology:** Agriculture refers to a wide resource of methodologies that include traditional breeding methods, genetic engineering, and the development of microorganisms for agriculture. Generally speaking, genetic engineering uses the understanding of DNA to identify and work with genes to increase crop resistance to pests, and the development of high-yielding varieties also makes improvements to livestock. The spinoff of biotechnology in agriculture has resulted in all-around benefits for farmers and end consumers. Though some controversial approaches have led to resistance to the

adoption of biotechnology, there is no doubt that the future of agriculture is heavily dependent on SAFE biotechnology, given the changing climate and increase in population.

**Livestock monitoring :** The use of chips and body sensors can help prevent disease outbreaks and are crucial in large-scale livestock management. Chips and body sensors measure vital parameters and indicators that could detect illness early and prevent herd infection. Similarly, ultrasounds are a useful tool to judge the quality of meat. This helps control and improve the quality of the meat.

**Monitor and Control Crop Irrigation Systems through Smartphones:** Mobile technology has also been playing a significant role in monitoring and controlling crop irrigation systems. With this modern technology, farmers can control their irrigation systems via smartphones and computers instead of driving to each field. Moisture sensors planted underground can provide information regarding the moisture levels present at certain depths in the soil.

## CONCLUSION:

The use of modern technology in the agriculture sector is vast. It has helped farmers in various ways. The adoption of new and improved technologies has increased the production and productivity of crops. It has also helped in reducing the cost of production. The use of technology has also made the farming process easier and more efficient. Modern technology in agriculture has led to increased production and productivity. This has in turn led to improved food security and incomes for farmers. In addition, it has helped to create new jobs and improve the quality of life for rural communities. Technology has played a key role in increasing agricultural productivity. For example, the use of mechanization has reduced the need for manual labor, thus increasing efficiency and output. The introduction of irrigation systems has also helped to boost production by making it possible to grow crops in otherwise arid areas. In addition, modern technology has made it possible to develop high-yielding crop varieties that are resistant to pests and diseases. In recent years, there has been a significant impact of agricultural technology on farmers across the globe. With the help of technology, farmers are now able to increase their yields and produce more crops than ever before. In addition, they can also reduce their costs by using less labor and inputs. However, there are also some drawbacks to using technology in agriculture. One of the main problems is that it can lead to over-dependence on machines and chemicals, which can be expensive to maintain. Moreover, if not used properly, it can also damage the environment. Agricultural technology has impacted consumers in many ways. The use of modern technology has helped farmers to increase the production of crops and livestock. It has also helped to improve the quality of the products. The use of new technology has also reduced the cost of production. The adoption of new technology has also led to the development of new methods of marketing and distribution of agricultural products. This has helped the farmers to reach a wider market for their products. The use of technology has also helped to create new jobs in the agricultural sector. Modern technology has had a significant impact on agriculture, revolutionizing the industry and improving productivity, efficiency, and sustainability.

Technology can also help to create new jobs in the agricultural sector. For instance, the use of mobile phones and other digital technologies is providing new opportunities for farmers to connect with markets and sell their products directly to consumers. In addition, the development of value-added services such as agro-tourism is creating new employment opportunities in rural areas.

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