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## THE USE OF TECHNOLOGY IN THE AGRICULTURAL SECTOR: A REVIEW

**Shubham Sharma\***

\*Department of Agricultural Sciences, Teerthanker Mahaveer University,  
Moradabad, Uttar Pradesh, INDIA  
Email id: sharma.shubham2812@gmail.com

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### ABSTRACT

*Agriculture requires efficient use of technology to increase output and employability of people. The major parts that have been taken into account are, important decisions are made to adoption of technologies, types of techniques, technologies used in the agricultural sector, modern agricultural technologies used in the present existence, areas of information systems and role of information technology in agricultural education management. For effective growth and development of the agricultural industry, there is a need to acquaint with new technologies, including biotechnology, nanotechnology, elevated protected cultivation and contemporary irrigation techniques to speed output. These technologies, when used in an appropriate way, might show to be helpful in increasing productivity and profitability. Usage of technology will improve in maintaining livelihood possibilities for the farmers. . The primary aim of this study work is to learn, how to make efficient use of technology in the agriculture industry. There are many kinds of technology that are made use of to improve productivity. This may have significant consequences as to the structure of the farms and the number of farmers that are able to guarantee their financial situations in future.*

**KEYWORDS:** *Agricultural Sector, Farming, Information Technology, Production, Technology.*

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### 1. INTRODUCTION

Agriculture is considered as a major profession of the people in rural regions. To feed the growing population, it is necessary to adopt new and creative methods in the agriculture industry. New technologies are needed to stimulate the yield frontiers to an advanced level, make use of the inputs resourcefully and diversify to a more sustainable and higher value cropping patterns. These are all knowledge demanding technologies that need both a robust research and extension infrastructure and experienced farmers. In addition, it also needs a stronger interface, where emphasis is placed on community sharing of knowledge, providing benefits to everyone. Making use of resources in an effective way is described as the driving factor for the usage of agricultural technology. Several resource conservation methods include, green manure, agricultural rotations etc[1], [2].

Improvement in the agricultural growth is an important element for leading to overall growth and development of the nation. The reason being, this sector supports livelihood of 65 percent

of the people. However, the contribution of agriculture towards Gross Domestic Product (GDP) is 14 percent. Several revolutions in agriculture have taken place to improve the industry. These include, Green Revolution, Evergreen Revolution, Blue Revolution, White Revolution, Yellow Revolution, Bio-technology Revolution, Information and Communications Technologies (ICT) Revolution. In order to improve production, it is necessary to make use of technology and what is needed is the expansion of these established systems. Agriculture extension that has been coupled with infrastructure is considered as the essential element towards agricultural development. Involvement of the private sector would assist in the assimilation of technology in this area in a fast manner.

### *1.1. Factors relating to Adoption of Technologies:*

Factors related to adoption of technology have the potential to contribute to the sustainable agricultural systems. It is a complete concept that is influenced by the creation, distribution and use at the farm level of the current and new biological, chemical and mechanical methods, all of which are integrated in farm capital and other inputs. The adoption of technology for sustainable farming systems and other agricultural practices is a difficult and a lively problem for the farmers, extension services, agriculture industry and policy makers. The agricultural industry has to use a broad variety of evolving technology and farm practices across many different farming systems and structures to satisfy a diversity of changing and diverse demands from customers and the public for food, fibre and other products and services that are supplied. Quite frequently unclear results in terms of their impact on sustainability are presented [3], [4].

The farmers and the agricultural workers need to acquire sufficient knowledge on how to make use of technology to produce output. Demand of the farmers have led to an increase in the use of technology. Farmers have long turned to new technology as a means to reduce the expenses. In addition, greater incomes, better knowledge and improved means of communication are driving customers to expect low cost food of excellent quality, progressively produced via organic techniques in many nations, with more variety, consistency and year-round availability. At the same time, customers are increasingly expressing a demand that their food be produced, using the methods that preserve natural resources, minimize environmental constraints and pay more regard to rural practicality and animal welfare. The process of trade liberalisation involves expanding the sources of supply and the degree of competition. The varied needs are mirrored in policies and are forcefully conveyed to the farmers by the media, pressure organizations, food merchants and processors.

There has been development of technology in the global market and used at the farm level but have an effect on the sustainability beyond the farm. Both traditional and emerging technologies, in particular linked to biotechnology, information and precision agricultural methods, are worldwide businesses. The distribution of such technologies is typically inside the national market, but their usage is local. However, the impacts on sustainability of farm level adoption extend beyond the farm. With greater vertical integration, either via formal ownership structures or contractual connections throughout the entire food chain, determinations on the use of technology at the farm level frequently cannot be separated from the choices made elsewhere in the food chain. Adoption of technology is interdisciplinary, taking into consideration the goals linked with sustainable agriculture [5], [6].

Adoption of technology entails uncertainty and trade-offs. To create sustainability, it is essential for the technology to contribute to an economically effective agricultural sector, financial practicality of the farmers and increasing environmental performance. Technological advancements are developing at a rapid speed and information on the costs and advantages of adopting technology in agriculture is frequently insufficient. Thus, the choices on technology adoption are made in a climate of ambiguity with a significant element

of trial and error in its application, and the speediness and quantity of adoption vary. Research and development efforts, the movement towards better education and training of farmers, the shift in the focus of guidance, rapid and inexpensive means of distributing and sharing information, accessibility of financial resources, pressures from consumers, non-government organisations, the media and the public in general are contributing towards assisting in the implementation of sustainable farm technologies. Many policies, particularly those related to agriculture, environment, and research and development, are making provision of a mix of incentives and disincentives to technological adoption. Environmental policies themselves increasingly limit the activities of the farmers, like the laws, animal welfare standards and public health policies.

The farmers need to hold adequate knowledge and information to make advantage of technology and agricultural methods. The farmers will make investments, when they are guaranteed, they would produce profits. Agricultural policy may alter the pricing that farmers are facing for inputs and outputs, which in turn will impact their choices on investment and can lead to unmanageable agricultural practices. Where the environmental advantages from using sustainable technology are not anticipated to accrue to farmers, but to individuals outside the agriculture sector, and where there are no markets for the benefits, levels of adoption may be sub-optimal from a society viewpoint. Equally, if the costs of environmental consequences of current agricultural operations are covered by other sectors, farmers will have little motivation to adopt ecologically friendly technology.

The effect of agricultural technology was evaluated according to relatively few, usually obvious and quantifiable parameters, output, productivity, farm incomes, employment and trade. Assessing sustainability is more complex, when environmental, social and ethical factors are taken into account. It is often not clear, what relationships are between the various components of sustainability, what should and can be measured, and how the results are to be understood, so that farmers, policy makers and other stakeholders can recognize with rational confidence which sustainable technologies work, which networks can best facilitate their distribution and implementation in different conditions, and at what costs and benefits..

### *1.2. Technologies used in the Agricultural Sector:*

The primary aim of making use of technologies in the agricultural sector is to lead to a rise in output, so that adequate food is accessible to the people. Various technologies have been mentioned as follows:

#### *1.2.1. Biotechnology:*

Use of biotechnology technologies in agriculture may make food crops high productive and more robust to biotic and abiotic challenges. This may soothe and expand food supply, which is essential against the backdrop of rising food needs, climate change and land and water shortages. In 2012, 170 million hectares, by more than 17 million farmers in approximately 12 percent of the worldwide arable land were planted with genetically modified crops, such as soybean, maize, cotton, and canola, although most of these crops were not produced mainly for direct use. In India, genetically modified cotton, biotechnology cotton was first marketed in 2002 and in 2012, over seven million farmers have embraced this technique over 10.8 million area, which is equal to 93 percent of the country's total cotton area. Biotechnology cotton has positively improved the profitability of the farmers and concurrently decreased the usage of chemical pesticides in this crop considerably. The adoption of biotechnology has decreased food insecurity by 15 to 20 percent amongst the Indian cotton farmers.

#### *1.2.2. Nanotechnology:*

Nanotechnology may be utilized in agriculture in many ways. It can help in promoting soil fertility and balanced crop nutrition, effective weed control, enhancing seed emergence using

carbon nanotubes, delivery of agriculture chemicals, fieldsensing systems to scrutinize the environmental stresses and crop conditions and improvement of plant traits against environmental pressures and diseases. Nanotechnology offers accessible substantial possibilities for the creation of new products and uses for agriculture, water treatment, food production, processing, preservation and packaging. Its usage may provide significant advantages to the farmers, food sector and consumers alike. Nanotechnology based food and health food items and food packaging materials are accessible to the customers in certain countries and more goods and uses are currently in the research and development stage. Nanotechnology has a tremendous potential in changing the food packaging. Nanoparticles such as, titanium dioxide, zinc oxide and magnesium oxide, as well as a mixture of them, once functionalized may be effective in destroying micro-organisms and are less costly and safer to employ than metal-based nanoparticles[7]–[9].

#### *1.2.3. Protected Cultivation:*

Protected culture or greenhouse cultivation is the region where output of horticultural crops has improved qualitatively and quantitatively. In India, the area under protected agriculture is currently 25,000 hectares. While the greenhouse vegetable growing area is approximately 2000 hectares. Having constraints of land holdings, growing urbanization, diminishing crop output, reducing biodiversity and ever-increasing population, need for food, especially vegetables has grown multiple and protected agriculture. These variables have provided a new perspective to create more in a restricted space. Poly-houses may also be used for rain water collection. The irregular yearly demand for a 175 square metre poly-house is on the order of 52,000 litres. The semi-annual requirement for a crop of six months length is 26,000 litres of water. In a location with an annual rainfall of 400 mm, the rainwater falling on the roof of the poly-house is in the order of 70,000 litres. Assuming a collection rate of 80 percent, 56,000 litres of rainwater may be collected, which is more than the yearly requirement.

#### *1.2.4. Farm Mechanization:*

India has a large proportion of labour (55 percent) with lower contribution to agricultural mechanisation (40 percent). Making agricultural methods less remunerative leads to a rise in the poverty of the farmers. One of the main obstacles in agricultural mechanization in India is 138 million land holdings, which are enormous in contrast to just two to three percent of the population owning landholdings in the United States of America. Farm mechanization the use of contemporary gadgets, machinery, equipment and instruments for well-timed and efficient completion of activities in agricultural field is one of the most essential elements for increasing production. Small equipment, suited for horticultural activities in the hills and mountains will enhance operation usefulness and farm revenue. Farm mechanization will assist to increase the total production with lowest cost. Farm mechanization may assist in 15 to 20 percent savings in seeds, 15 to 20 percent savings in fertilizers, 5 to 20 percent rise in cropping intensity, 20 to 30 percent savings in time, 20 to 30 percent decrease in human labour and 10 to 15 percent overall improvement in farm production.

#### *1.3. Use of Modern Irrigation Methods:*

Availability of water is considered as the most important factor for improving production in agriculture. In India, approximately 78 percent water is used in the agricultural sector and the remainder is made use of, for industrial, drinking and other uses. Therefore, it is necessary to expand the water storage facilities. Dry land agriculture should be the primary emphasis, since more than 60 percent of the farmed area inside the nation is without adequate irrigation techniques. The water usage efficiency under traditional flood techniques of irrigation, which is mainly used in Indian agriculture, is poor owing to significant conveyance and distribution losses. Recognizing the fast decrease of irrigation water potential and growing demand for

water from various sectors, a variety of demand management techniques and programmes have been developed to conserve water and improve the water use efficiency in Indian agriculture. Irrigation is important to the global food supply since 18 percent of the world's irrigated agriculture produces 40 percent of the world's food. Less than four percent of the world's irrigated area is fitted with micro-irrigation devices.

#### *1.4.Areas of Information Technology:*

The use of information technology in the agricultural industry includes making accessible online services for information, education and training, monitoring and consulting, diagnostic and monitoring, and transaction and processing. E-commerce is mainly utilized for direct connections between local manufacturers, merchants, retailers and suppliers. The ease of communication between researchers, extension knowledge workers, and farmers is essential. Question and answer services, where specialists respond to the queries on specific subject's ICT services to block and district level developmental authorities for increased efficiency in providing services for full agricultural development. Current information has to be given to the farmers early, regarding topics such as, packages of practices, market information, weather forecasts, input supply, loan availability and so forth. Databases should be established with the specifics on the resources of the local people, site-specific information systems, expert systems and so forth.

Provision of the early warning systems about the illnesses, pest issues, information about the rural development initiatives, crop insurances, post-harvest technologies and so forth. It is essential for the farmers to facilitate the land records and online registration methods. Recording of information is deemed important even in the long term, to recognize the advances that have taken place in different sectors. Recording information regarding productivity in the past and then recording information making use of information technology, allows people to find out its advantages. Rearing of animals, producing milk and milk products is considered essential to provide a source of income in rural regions. Individuals are engaged in the marketing of milk and milk products. Services offering information to the farmers about farm business and management. Increased competence and production of co-operative societies via the computer communication network and the newest database technologies[10].

Tele-education for farmers, websites established by the agricultural research institutions, making the newest material accessible to the extension knowledge workers and collecting their comments have made a major contribution in the growth of the agricultural sector. There have been several efforts in India, making use of ICT in the agriculture industry. Despite the tremendous potential to link ICT for agricultural growth, just a few initiatives have been started in India and a handful in other areas of the globe. Stimulatingly, many of these initiatives were launched by the non-government groups, commercial organisations, co-operative entities and governmental agencies other than agricultural departments. This demonstrates the unconcern of agricultural development departments towards integrating ICT into their everyday operations. To frame a strategy for comprehensive agricultural growth, the separate ICT initiatives need to be studied into and the familiarities produced must be acknowledged to build instructions for the future.

#### *1.5.Role of Information Technology in Agricultural Education Management:*

IT for Agricultural Teachers and Educational Planners: Teachers working in agricultural schools, colleges and universities need to be enabled to effectively make use of IT. IT in the current life is of paramount importance to promote learning amongst people. It is essential to organize training of these people in the basics of computers and then progressively acquaint them with the sophisticated modules of computer applications. Teachers need to make use of technology to give instruction to the people. The educational planners and administrators should be trained to prepare Annual Budget Plan, for teaching aids, resource persons and

material expenses, infrastructure budget requirements, time tables to monitor and scheduling the teaching resources, to create and maintain comprehensive student's records, files and so forth. With the introduction of internet, the learners may attend a virtual class on the monitor of their computer at their homes or the workplaces. This is obvious, before, one is making use of technology, one should be properly educated. After one has attended the virtual lesson on the computer, one is allowed to appear for an online examination

IT to link Agricultural Colleges of India: In the current existence, communication between the agricultural colleges may be simplified via the usage of IT. Appropriate links with the other institutions, allows to create knowledge about academic growth and compare work with them. This helps in discovering the faults and inconsistencies and making required adjustments. Exchange of valuable information, including collection of question papers, current trends, new and creative methods, information on seminars, symposiums, workshops, trainings and any other academic developmental activity may be acquainted with via the usage of IT. It should be the main responsibility of Indian agricultural educational planners to implement IT in all the agricultural colleges of India and create a link between them to make use of the libraries of agricultural colleges and faculties. Computerization procedure of the libraries with newly integrated IT has enhanced learning.

## **2. DISCUSSION**

The manner in which technology are utilized and made use of are varied among nations. The various policies and concerns about the achievement of sustainable agriculture have resulted in the variety of methods and levels at which they are put into action. Market signals, voluntary co-operative industry-led methods influence the development, distribution and acceptance of technology in certain nations. There has been considerable focus on the government involvement. Such government participation varies from an aiding to a required role, and includes direct financing for research, payments for distribution and implementation, legal restrictions, information and assistance. Moreover, the general structure of agricultural policy and the amount of assistance is a key Research efforts, farmer's education and training, guidance and information are moving towards combining economic efficiency with environmental and social sustainability. The primary emphasis of study and recommendations was to lead to an increase in profitability, and productivity. Emphasis is placed on attaining those goals in a sustainable way, which involves utilization of technology and altering agricultural methods. The technologies that are made use of in the agriculture industry are not always obvious regarding profitability. Research has been done to identify the technologies that would be helpful to boosting output. These priorities include, biological pest management, biotechnology, information technology, bioremediation, precision farming, integrated and organic agricultural systems. Other problems, relating to the educational and training systems, institutions and the role of public and private research activities are important. Some sustainability problems are not handled via technical elements, but by bringing about changes in the kinds of agricultural output and its places.

## **3. CONCLUSION**

The importance of use of technology in the agricultural sector has been acknowledged with the primary aim of fulfilling the food needs of the people. India has achieved advances in agriculture, although production of the main agricultural and horticultural crops is poor in compared to other nations. There are still inadequacies in the use of technology. Yields per acre of food grains, fruits and vegetables inside the nation are much the below worldwide norms. Even India's most productive states are below the global average. Similarly, the productivity of pulses and oilseeds may be improved, by paying attention to the seeds, soil health, pest control, crop life-saving irrigation techniques and post-harvest technologies.

India's population is projected to exceed 1.5 billion by 2025, making food security most significant social problem and food production would have to be expanded considerably, to

satisfy the needs of an expanding population. Under rural regions, there are number of individuals who are living in the circumstances of poverty and backwardness. Agriculture is the main profession of the people in rural regions, therefore, use of technology and contemporary and creative techniques and methods will show to be beneficial for improvement in the living circumstances of the population and in relieving the issues of poverty. There are many technologies and people working in the agricultural sector and farming techniques require to possess expertise and information, how to make maximum use of them.

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