International Journal of Advanced Research in Engineering Technology & Science

ISSN: 2349-2819

Email: editor@ijarets.org Volume-10, Issue-6 June- 2023 www.ijarets.org

STUDY ON EMPHASIS OF TECHNOLOGICAL MODIFICATION IN THE USE OF LAND AND AGRICULTURAL OPERATIONS

Sachin Kantilal Pise

Annasaheb Vartak College, Vasai road west, Palghar

ABSTRACT

Conventional agricultural production is slipping behind new expectations and requirements as a result of a number of causes, including a rising urban population, a scarcity of arable land, and an overall rise in the pace of population growth. The ever-increasing demand for food is prompting the development of technologies that would increase production while also making more sustainable use of the resources that are now available. An technique that is referred to as "smart agriculture" and that makes use of the Internet of Things (IoT), satellite navigation, mobile communications, and ubiquitous computing has the potential to solve this barrier. In the realm of smart agriculture, the key goals consist of enhancing water utilisation, automating daily chores, carrying out real-time monitoring and analytics, enhancing daily and seasonal forecasts, interacting with suppliers in a more effective manner, and allowing real-time public administration. These objectives are geared at achieving higher returns. This article compares and contrasts the use of drones, big data, and the Internet of Things (IoT) in agriculture with more traditional approaches, discussing both the benefits and the drawbacks of these technologies.

KEYWORDS: *Emphasis, Modification, Agricultural*

INTRODUCTION

We have seen this trend of rapid technological advancement and widespread use throughout the twentieth and early twenty-first centuries before, and it has altered both our daily lives and the natural world. Having said that, there have been several recent developments in fields such as materials science, quantum theory, electronics, computers, communications, and biology. Most of the major scientific breakthroughs in the last ten to thirty years have occurred in the realms of microintegrated circuits, the internet, broad adoption of personal computers and smartphones, and the decipherment of the human genome. A few examples of emerging technologies are blockchain, sensors, the Internet of Things (IoT), artificial intelligence (AI), machine learning (ML), and the Internet of Things (I).

Businesses who can adjust to the changing technological environment will be successful. Companies that are resistant to change or take too long to adjust run the danger of lowering their own production and, in the long run, their own survival. We took a look at some of the most important changes in the agricultural industry and highlighted some of the possible consequences and possibilities that will have long-term impacts on the supply chain. The use of modern technology in farming aims to lessen the negative effects on the environment while simultaneously increasing yields and decreasing harvest times. The notion of Industry 4.0 encompasses a wide range of technology, applications, and solutions that are reshaping production capacity across many sectors, including agriculture. This new era ushers in Modern agriculture's use of new technology improves output and streamlines supply chain management. Sensor technologies—which include weather stations on parcels, humidity sensors, soil scanners, yield mapping, photos from satellites and drones, the Internet of Things (IoT), and big data analytics—are the backbone of digital technology's use in agriculture. Finally, predictive and prescriptive analytics allow for appropriate choices to be made based on sensor data; these technologies allow for optimum sowing, fertilisation, crop protection, irrigation, weed management, and automated harvesting.

The catastrophe created by the coronavirus brought the relevance and promise of digital technology into sharp focus. Digitalization offers great promise for the agricultural sector after the coronavirus epidemic for simplifying the increasingly complex processes of raw material procurement, consultation, and direct communication between farmers and customers. Internet of Things (IoT), satellite navigation, mobile connectivity, and computation hold the key to a worldwide solution to this problem. The effective use of digital technology in agricultural production requires the same criteria as in other industries. Infrastructure, connection, accessibility, the degree of education of users in the future, and institutional support are the main aspects to consider here. Despite the many advantages, small farmers in rural regions still confront significant obstacles when trying to use digital technology to connect with suppliers and access the market. Because fewer people are living in rural areas due to urban migration, educational advancements in these regions are slowing down. Obviously, the absence of information technology infrastructure and the prohibitive price of constructing it in outlying rural areas is the most significant issue. Finally, for underdeveloped and least-developed nations, high poverty rates provide a unique obstacle to the widespread use of digital technology.

Using an empirical study review as a framework, this article will discuss the potential and constraints of the Internet of Things (IoT), big data, and Unmanned Aerial Vehicles (UAVs) in an agricultural setting. Developing a review and research questions, finding appropriate publications to review, and drawing conclusions from those studies are all part of the research approach. Following this is the conclusion and some recommendations for further research. This study's primary objectives were to determine.

Internet of Things in agriculture

Some of the changes that have occurred as a consequence of the introduction of new and better sensors as well as the Internet of Things include the automation of management, the monitoring of protected areas, and the facilitation of farming. The Internet of Things (IoT) makes it possible to manage farms remotely, which leads to increased productivity, accuracy, cost reduction, and time savings. This is especially useful in situations when the farmland is situated at a substantial distance. The Internet of Things (IoT) ushers in a new age with regard to the technological realms of computers and communications. The development of this technology requires the implementation of a wide range of technical developments, ranging from wireless technology to nanotechnology. Maintain that the fundamental concept that underpins the Internet of Things (IoT) is the ability to experience the physical world via the connectivity of physical objects. In order to do this, several types of identification and tracking technology are used. These technologies make it possible to remotely monitor these things even when there is no direct line of sight. It is now possible to monitor the status of any given physical object or its surroundings in real time thanks to the growth of remote sensing and controlling devices. This makes it possible to keep track of the condition of any physical item.

The agri-food industry has been undergoing a technological revolution over the past few decades as a result of a combination of factors. These factors include severe climate change, a particularly rapid population decline, pollution of the air, water, and land, increasing urbanisation and decreasing farmland, and unprecedented demographic shocks. Among the components of this trend are the increased utilisation of digital technology, in particular the Internet of Things (IoT), as well as the automation of repetitive tasks and the utilisation of machines that possess unique capabilities. Farmers will be able to handle their farms more effectively, make any required improvements, and harvest a greater quantity of food as a result of this. Research on the market suggests that uses.

Internet of Things in agriculture are expected to The primary causes that are driving this trend are an increase in demand, an increase in the number of farmers who are adopting the Internet of Things and the technologies that are linked with it, and a general effort to make farming more efficient.

It is possible for smart agriculture to gather data from the field in a reliable and frequent manner by integrating data from the field with information from outside sources (such as weather reports, environmental conditions, and so on) and administrative documents from the food chain (such as invoices and test results). On the basis of the summarised and analysed data, insights are generated in order to provide assistance to farmers in making more informed decisions. These decisions may be implemented by robots and other forms of high-tech equipment, and farmers will be able to monitor everything in real time and get constructive feedback. There is a utilisation of sensing devices, communication networks, edge computing, platforms, unmanned aerial systems (UAS), artificial intelligence (AI), and the Internet of Things (IoT), with the latter functioning as the crucial technology of the future. The Internet of Things (IoT) has a number of benefits for the agricultural and food industry, as shown.

Creating, implementing, and making use of technologies that are connected to the Internet of Things (IoT) in agriculture provides a number of obvious benefits. When viewed just from an economic point of view, it makes perfect sense (greater industry growth, more productivity, less long-term expenditures, and less costly waste). In terms of the environment, it is very evident that there will be a reduction in greenhouse gas emissions, a decrease in food waste, a reduction in the use of herbicides and pesticides, an increase in yields, and an early detection of illnesses that affect plants and animals. For the purpose of encouraging and ensuring the deployment of the Internet of Things, policies, laws, and incentives that are favourable to the Internet of Things should be put into place.

Restrictions imposed by technology made it difficult to adopt and implement solutions for the Internet of Things. It will be necessary for policymakers and technology vendors to collaborate in order to address these severe limitations and discover solutions. Internet of Things (IoT) use cases in the European Union have shown major legislative and technological gaps across member states with relation to areas such as bandwidth, internet access, and IoT solutions. These disparities have been brought to light by the use cases. The fact that there was either no internet access in rural locations, internet that was very costly, or interference with the connection was one of the most significant challenges. Rural areas have long been behind in terms of connection services, despite the fact that they are the locations where the bulk of agricultural operations take place. The advancement of digital agriculture and the practical application of its benefits are both significantly hampered as a result of this.

OBJEACTIVES

- The Study Emphasis of Technological Modification.

- The Study Use of Land and Agricultural Operations.

Potentials and problems of using drones in agriculture

These aircraft are referred to as unmanned aerial vehicles (UAVs) or unmanned aerial systems (UAS). They may be of varied sizes and shapes, and they have the ability to fly on their own or to be controlled remotely. The use of lightweight composite materials in the construction of drones helps to improve their manoeuvrability while simultaneously reducing their overall weight. The use of robust composite materials is directly responsible for their capacity to fly to heights that are quite incomprehensible. In principle, they are compatible with a wide range of recording and navigational equipment, including but not limited to GPS, RGB and infrared cameras, and other similar devices. In addition to their mobility and low weight, drones provide a multitude of other advantages. These include the capacity to take images with a high quality, the ability to modify their flying height to meet the requirements of data collection, and the ability to cross terrains that are inaccessible to drivers of off-road vehicles. The capability to obtain data in a short amount of time is the most important factor, in addition to the aspects that have previously been described.

The unmanned aerial vehicles (UAVs) are distinguished by their miniaturisation, portability, and the possibility of a simple installation in the field. The use of unmanned aerial vehicles (UAVs) in the agricultural industry has the potential to be very beneficial since these vehicles are able to analyse photos and collect a plethora of information on the condition of crops grown on arable land. All of these processes—sowing, fertilisation, and chemical protection—require their use. Unmanned Aerial Vehicles (UAVs) offer a wide range of possible applications in the agricultural sector, including crop condition monitoring, mapping of production areas, plant categorization, monitoring of diseases and pests, detection of pests, mapping of watering and drainage areas, evaluation of plant biomass, and monitoring of weeds.Therefore, unmanned aerial vehicles (UAVs) offer a wide range of potential uses in agriculture. Some of these applications include soil analysis for field planning, irrigation, crop spraying, crop health assessment, crop surveillance, control of weeds, insects, pests, and diseases, estimate of tree and crop biomass, and bird scaring.

Accurate two-dimensional and three-dimensional maps of the soil may be produced by using a number of cameras that are mounted on unmanned aerial vehicles. When it comes to soil quality, crop health, moisture levels, erosion, stressed surfaces, and other topics, these maps provide a wealth of information that is quite useful. In order to increase efficiency while simultaneously minimising the amount of pesticides that are used, unmanned aerial vehicles (UAVS) are able to decontaminate large areas (up to 50 ha per day) with little human interaction (ten minutes of effort on 0.5 ha of surface). As a consequence of this, research using unmanned aerial vehicles (UAVs) aims to reduce the amount of physical effort that farmers rely on. The Chinese company DJI, which holds a substantial percentage of the unmanned aerial vehicle (UAV) sector, is responsible for the introduction of the MG-1 model, which is used for spraying in pesticides. The MG-1 is equipped with eight rotors, a payload of ten kilogrammes, and the ability to spray up to four hectares per hour. Additionally, it is able to automatically adjust the required (minimum) pesticide dose dependent on the speed at which it is flying.

Climate Change & Agriculture

There is a great deal of difficulty, complexity, significance, and disagreement involved in the process of projecting future changes in the environmental climate. Despite the fact that the general public is still split on the issue, they are in agreement that the average annual temperature and precipitation will increase at a rapid pace, and that the weather patterns that occur within different years will become more unpredictable. There are two primary features of climate change: greater average temperatures and increasing volatility. These two aspects are responsible for a number of repercussions, including the melting of glaciers and ice caps, the rise in sea levels, and the frequency and intensity of severe weather events. The majority of locations, for instance, would most likely see an increase in temperature; however, other changes may vary depending on where you are.

For agriculturally relevant agroecological zones, daily high-level weather severe forecasting (including frosts, precipitation intensity and form, extreme temperature, and other factors) is essential, but it is much more difficult to do. Even though there are subtle regional differences in climate change, the majority of forecasts agree that the agricultural practices that are currently being used by many developing countries will become less viable in the future. This is because cooler regions, which are typically located in the north, have a comparative advantage over their warmer and more humid predecessors. In a larger sense, poor countries are at danger from climate change owing to their dependence on agriculture, historically high average temperatures, insufficient infrastructure to cope with increasingly unpredictable weather, and a lack of money to fund innovative answers.

These factors combine to make poor nations vulnerable to the environmental effects of climate change. The World Bank's 2010 World Development Report (2009), which focuses on poor countries, anticipates a 4% decline in Africa's GDP and a 5% drop in India's GDP owing to climate change without offsetting innovations. This is in contrast to the Stern report, which anticipated that a 1% drop in world GDP would occur as a result of a decrease of 2 degrees Celsius in global temperature. If reductions of this magnitude were implemented, they would more than nullify growth-related increases in GDP at the current growth rate. These changes will have a disproportionately negative impact on the disadvantaged, who often depend on farming as their primary means of sustenance in these already destitute regions.

The process of predicting the impacts of climate change on agriculture is a process that adds uncertainty and complexity to models of climate change that are already intricate. Warmer average temperatures and longer growing seasons will be beneficial to temperate crops in Asia, Europe, and North America; nevertheless, they will result in lower yields for the majority of farmers throughout the globe. This is despite the fact that there is a great deal of ambiguity around the impacts of climate change on agriculture. Increasing temperatures will produce longer periods of excessive heat in regions that are already experiencing high temperatures. This will have a negative impact on agricultural productivity and will shorten the growing season. Based on the most recent and accurate projections, it is estimated that these influences will result in a 6% decrease in worldwide agricultural production by the year 2080 in comparison to what would occur otherwise. The agronomic and constrained economic modelling approaches have both contributed to these estimations, which reflect their expectations.

Technologies for Adaptation

Within the context of the United Nations Framework Convention on Climate Change (UNFCCC), the term "adaptation technologies" refers to "the application of technology to reduce the vulnerability, or enhance the resilience of a natural or human system to the impacts of climate change." In order to successfully navigate the complex process of using technology for adaptation, it is vital to integrate a wide variety of issues, parties, and scales. Therefore, it is vital to take into consideration the unique political, economic, social, and ecological context in order to determine the appropriate application of technology. There are a number of possible ways that might be taken into consideration as a part of this process. These include taking into account diversity and maximising cobenefits, supporting the employment, development, and transfer of hard and soft technologies, including knowledge, and building platforms for knowledge and the exchange of experiences. It is possible that, in relation to agricultural adaptation technologies, it may include the discovery and evaluation of farming practices and equipment that enhance resilience, food security, and productivity in specific agro-ecological zones.

It is possible to make use of technology in developing countries thanks to the existence of several processes and institutional frameworks. The first kind of evaluation is called the Technology Needs Assessment (TNA), and it assesses the relevance of different technologies as well as the relative importance of each of those technologies. The second plan is called the Technology Action Plan (TAP), and it is based on the previous plan. It makes use of the obstacles that were discovered in order to prioritise and address those technologies. Also included in the TAP are the objectives, strategies, and budgets, as well as the individuals who are accountable for each technology.

While the TAP of Sri Lanka places an emphasis on crop diversification and site-specific crop management, the TAP of Cote d'Ivoire stimulates the expansion of water-tolerant cassava and plantain varieties, the TAP of Kenya places an emphasis on the creation of drought-tolerant sorghum varieties, and so on. Through their respective contributions of more than 25 percent of their respective budgets, the South-Central Fund (SCCF) and the Least Developed Countries Fund (LDCF) are providing financial help to the agricultural sector as part of the global aid for financing. There are a number of UNFCCC institutions that are working towards the goal of strengthening these supports. Some of these organisations include the Adaptation Committee and the Technology Mechanism, which includes the TEC as well as the Climate Technology Centre and Network.

Lessons Learned

It is possible to meet the goals of improving the efficient and sustainable use of technology and reducing the risk of maladaptation of agricultural systems by drawing on the lessons learnt from the deployment of technologies to assist in agricultural adaptation. Improvements in food security, a reduction in reliance on timely rainfall, and a revolution in agricultural output are all outcomes that have been made possible by irrigation. The mishandling of natural systems in irrigation environments, on the other hand, may have extremely serious consequences. An example of this would be the removal of water from the Aral Sea for the purpose of it being used in cotton production. There were other factors that led to the over-extraction that took place in this instance.

These factors included excessive water diversion, poor irrigation design and maintenance, and a failure to understand the wider picture. Intense dryness and salinity hampered agricultural development, which in turn led to the destruction of fishery supplies, the pollution of water resources, and the occurrence of serious health issues. All of these factors had terrible ramifications for the economy, health, and the environment. When putting technology into action, it is vital to take into consideration all of the components that make up the host ecosystem. This is required in order to discover techniques that are both socially and ecologically sustainable. A good example of this is the act of pastoralism that is practiced in dry locations.

Adaptation Technologies for Agriculture

The following are some examples of agricultural adaptation technologies that are currently in use. There is a short description of each one, with a focus on its applicability, possible advantages and downsides, and a reference to the research, development, or use of the method that is being discussed. It is possible that context-specific cost-benefit assessments might be beneficial in establishing which technologies are most appropriate, despite the fact that the price range for each technology changes substantially owing to the many locations and political, economic, and social contexts in which they are utilised.

Stakeholder Involvement and Collaboration

Through the collaboration of several stakeholders and the coordination of their efforts across scales, it is possible to obtain the best possible performance of a technology in a specific environment. Using citizen science to increase the amount of participatory crop research that is conducted in India is one example of a cooperation that can be found in the agricultural sector. In this context, a coalition of farmer associations works together with non-governmental organisations (NGOs) and academics to test out various technologies suitable for agricultural adaptation. The following is a summary of the roles that were performed by the several stakeholders in the process of implementing adaptation technologies; however, it is essential to keep in mind that the obligations of each stakeholder are just a portion of the overall picture.

Policy Formulation

Regulations may be put in place to ensure that the factors that lead to success are replicated at all levels. This is possible due to the fact that many adaptation ideas are applicable across all contexts. The experiences that we have had in the past with agricultural adaptation technologies have taught us that there are certain rules and recommendations that are required to assist with the proper application of these technologies within the context of climate change.

CONCLUSION

This is the fourth industrial revolution that we are now experiencing as a result of the proliferation of technologies such as ubiquitous computing, sensing, and smart devices. An massive growth in the human population is occurring concurrently with the processes of industrialization, urbanisation, and a substantial change in the global environment. All of these transitions are occurring simultaneously. As the population continues to grow, there is an increasing need for food, both in terms of quantity and quality. This demand is growing more urgent. The production of crops in a way that is both intelligent and precise is the only way to overcome such challenges. The consequences of contemporary industrialization, which ushers in a new age of digitalized production, are not immune to the repercussions that are now being felt in the agricultural sector. One of the ways in which contemporary methods of communication and information might potentially boost agricultural yields is by having this effect.

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