

The Progression in the Agriculture Area By means of IoT

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ABSTRACT- The agricultural industry plays an essential role in overcoming the food scarcity scenarios for food security globally in the rising population scenario. In the agricultural sector, mechanization has improved various crop production, creating a new era for attaining agricultural precision. With the development of agricultural equipment, conventional usage of farm machinery has lately been changed. The realm of precision agriculture has transformed this breakthrough. The numerous types of high-quality efficient sensors have been used in the field of productive irrigation, fungicides, fertilizers and disease control in diverse plant. This approach has increased agricultural yield therefore reducing production costs. In agriculture, the introduction of Internet of Things (IoT) technology has enabled farmers to relieve themselves by utilizing Smartphone applications and high-speed internet. By comparing the data received from a farm with previously recorded standard charts in the database, these systems offer all the information required for a farmer to manage a crop accurately. In order to guarantee precision in agriculture, this innovation in the automation of agricultural equipment also enables farmers to increase production, solving the world's food crisis. This article examines the progress in the agricultural sector by integrating IoT technology for the precision farming.

KEYWORDS- Agriculture, Equipment, Farming, Irrigation, Machinery.

I. INTRODUCTION

Agricultural equipment have been developed at virtually every stage of the agricultural process. Both organic and non-organic farming utilize the same equipment. Agricultural engineers are individuals who have been qualified to develop agricultural equipment, structures, and offer improved facilities for increasing agriculture output [1]. Tilling the soil, planting seeds, producing crops, irrigating the land, guarding it from pests and weeds, harvesting, animal feeding, threshing grains, and processing and packing the products need a broad variety of machinery [2].

A significant push for farmer training is planned in India to support the second Green Revolution. It is inadequate to merely give information to farmers. Farmers must be able to make the correct choices about themselves and

have a clear knowledge of how and what to accomplish in order to optimize agricultural output and improve their economic position. Indian farmers must have access to the finest agricultural information in the world, and they must be encouraged to utilize agricultural equipment in their best interests [3].

The 2018 census has just surpassed 7 billion people in the globe and the world's population is projected to rise up to 9.3 billion by the end of 2050. This fast-growing population requires more food to fulfill the demands. In 2050 the market for food will increase to 60 percent, as predicted by experts. The direct source of food for most living things, including people and animals, is agricultural output. The increasing demand for food also implies a rise in productivity in agriculture [4].

In the agricultural industry, accurate information is essential in regard to changing environmental variables, plant needs, and irrigation demand, among other things. This knowledge allows the farmer to make timely crop management choices. The farmers have utilized the information management approach to address agricultural problems. The objective of this study is to cover recent developments in the mechanical automation field of agriculture. The report also includes developments in IoT technology usage in agriculture, with the aim of improving productivity and overcoming production losses, by providing valuable knowledge in precision agriculture [5-9].

A. Information Technology and Agriculture Services

In India, numerous efforts are being undertaken to absorb and implement information technology for the agricultural industry. The utilization of information technology is highlighted in the National Agriculture Policy. The Department of Agricultural and Cooperation is developing an e-government strategy to focus on e-governance activities in the agriculture sector. Plan has developed a prioritized list of services provided to farmers, as well as a list of procedures that need to be re-engineered for this purpose.

National Informatics Centre Network (NICNET), a government-owned network for sharing government information, is administered by the National Informatics Centre (NIC) (NIC). It contains the bulk of the official data from various agencies. It also administers the webpages of the District Rural Development Agency

(DRDA) (DRDA). In the tenth five-year plan, it started the smart village initiative.

- *Automation of Mechanization in Agriculture Sector:* Agriculture production has increased in recent years as a consequence of improvements in mechanical equipment utilized in farm operations. This section covers the most recent automation of agricultural mechanical equipment:

1) Automation for the evaluation of soil parameters

Normal soil testing is extremely essential since 60 percent of agricultural output relies on soil fertility. Soil testing is extremely essential. Soil productivity in precision agriculture is also considered a significant factor. The use of fertilizer and fertilization patterns of crops relies on soil fertility. Farmers have to take the time consuming and difficult technique for busy farmers at virtually soil testing labs. The soil fertility research facilities are based on soil pH, biological, physical and chemical characteristics. A sensor-based system that accomplishes all criteria via the usage of ESP 8266 to solve this issue of soil testing for farmers has been developed. There is a website technique that compares the parameter gathered by sensors to current database parameters. This online framework enables farmers to acquire information about soil fertility and recommends various crops for different soils depending on the status of soil fertility. Better soil cultivation helps farmers attain optimal output and so forth in precision farmin.

- *Moisture Monitoring System in Precision Agriculture:* Agriculture is a key technology that is being utilized in a developing world to improve agricultural production and relieve food shortages. To raise the quantity and enhance the efficiency of agricultural products, this approach uses a range of coordination and information resources. This system uses automated equipment and sensors to monitor different agricultural machines in order to enhance production (Figure 1). For the automation of a sprinkle irrigation system, Kamelia utilized a YL69 sensor. As the soil moisture level goes below 15 percent, this sensor recognizes it and instantly starts the sprinkling system's pump. When the soil moisture level hits 45 percent, the sprinkle pump is switched off. This machine improves energy efficiency, saves time, and lowers water use. For the farmer, all of the device's readings are displayed on a Liquid Crystal Display (LCD) screen and connected to values on a website system [8].

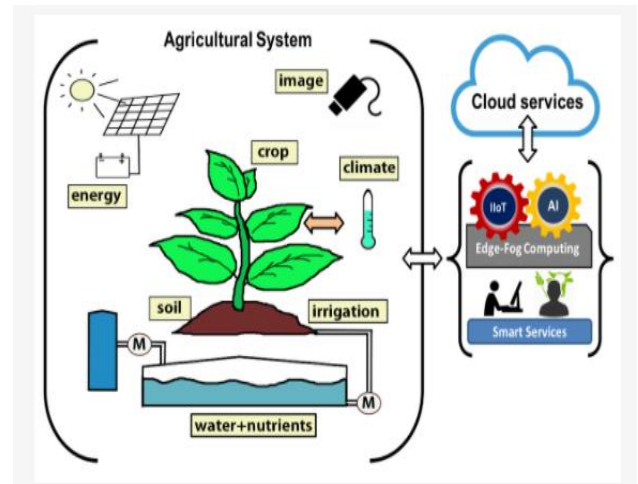


Figure 1: The Layout of Agriculture System. This method employs a variety of coordination and information resources [10]

2) Use of Cyber Physical Monitoring System in Precision Agriculture

In order to improve the efficiency and quantity of agricultural crops, cyber-physical system is a new innovation utilized in the actual world. The mechatronic technique has been updated during the past 20 years using the Current Population Survey (CPS) methodology[11]. The CPS technique plays a significant role for the farmer to improve crop management within precision agriculture in the development of information and communication systems. CPS system utilizes the necessary methods, equipment, sensors; hardware and software programmes that depend on the trans-disciplinary processes and have appropriate prototype ideas and test beds. It enables farmers to improve crop quantity and quality by utilizing an increased information and communication system in the application of precision agriculture through excellent agricultural practices (Figure 2).

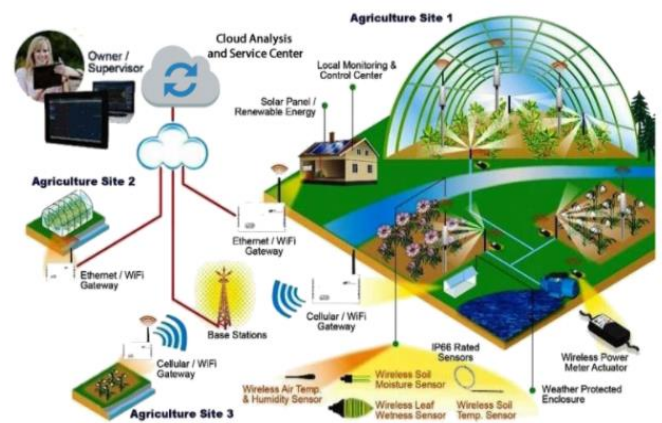


Figure 2: Smart Cyber-Physical Systems for Controlled-Environment Agriculture [12]

B. Modern Agricultural Development

Agriculture, along with its related businesses, is without a doubt India's main source of revenue. Friendly agriculture is important for comprehensive rural development in terms of rural employment, food security, and ecologically sustainable technologies such as sustainable

natural resource management, soil conservation, and biodiversity preservation. The Ministry of Agriculture is placing a lot of emphasis on commercializing agriculture right now, with an aim of achieving a 4 percent annual growth rate. Emphasis on regionally varied strategy, product diversification, future regions, and scientific resource management are just a few of them.

C. Advancements in use of IoT Technology for Precision Agriculture

The IoT is a digital application for precision agriculture and is utilized in the real world. This section covers the recent development in the use of IoT technology to enhance the performance of agricultural and mechanical equipment and systems. *IoT*

D. Based Irrigation System Automation

The irrigation system automation concept was proposed by Rajalakshmi and Mahalakshmi using IoT methods. The IoT is essentially a network that incorporates the Internet, which is used to assess a process. In the agricultural business, it is used to enhance farm productivity in order to raise the return on food production by 9.6 billion people depending on the agriculture sector until 2050. The usage of humidity detecting sensors, temperature sensors, wetness sensors and light intensity sensors have standardized agricultural activities such as irrigation. The measurement data was sent to the web server, which already had the basic charts saved in the data server (Figure 3). The data is automatically evaluated by the online system's programmer, and the findings are subsequently delivered to the farmer's Smartphone app. As a consequence, the farmer may easily assess the condition of his crop and monitor the irrigation equipment remotely.

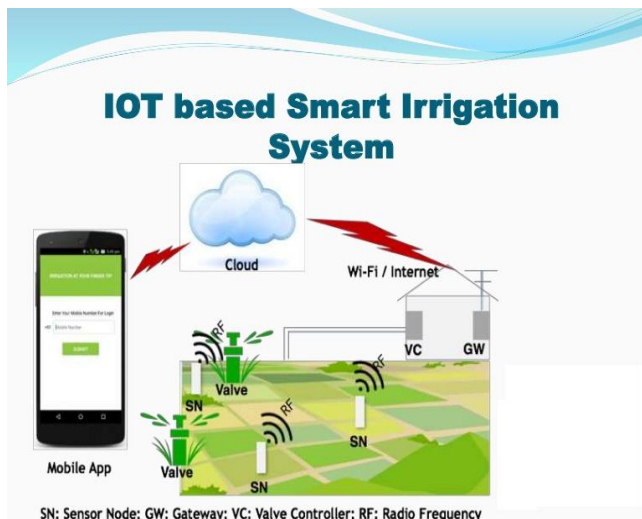


Figure 3: The layout of IoT based Smart Irrigation System. The use of humidity sensing sensors, temperature sensors, wetness sensors and light intensity sensors have standardized agricultural activity such as irrigation [13]

1) On the basis of the IoT approach

A Raspberry Pi-based irrigation model is developed that is automated. This method improves agricultural production by making efficient use of irrigation water in water-scarce regions. This model in the circuit utilizes

two kinds of sensors to monitor temperature, humidity, and sunshine time throughout the day and transmit the findings to a database. During the day, the database determines the crop's irrigation water requirements and automatically starts the irrigation system (Sprinkle or Drip irrigation system) if the crop requires it. This technique minimizes water shortages during irrigation and delivers a sufficient quantity of water for a field, making it perfect for regions where water is limited [14].

2) Application of IoT System in the Disease Prevention of Crops

The primary source of agricultural losses was biotic stressors including mosquitoes, rodents and illnesses. The prevention of illness is a crucial step for a farmer. A sophisticated disease prevention system, known as the Decision Support System (DSS), has been implemented and has proved effective in managing potato illnesses. In addition to the monitoring of fungal conditions in potatoes, this device has been effectively utilized by sensors to prevent environmental conditions [15]. High grade sensors are employed to collect climatic data and are sent through IoT technology to the database via internet connection that analyses data and analyzes findings, this acquired data is delivered to the cloud IoT framework. Subsequently, farmer's mobile gets all information about environment and implementation requirements for a specific disease preventive fungicide. The expense of fungicide treatments is reduced and disease prevention in due course [16].

3) Use of IoT Technique to Enhance Growth and Development in Plants

Scientists and technicians are mainly focusing on IoT based precision agriculture via the deployment of real-time monitoring systems in agricultural fields to improve yield and efficiency of agriculture production. IoT technology utilizes different kinds of high-quality sensors to collect data, which is subsequently sent to a database of a website system through an internet connection. Recent study proposed job cycle data analysis methods that enhance the energy efficiency of a greenhouse farming system on gloomy or sunny days. This technique has been proven to be extremely efficient in managing the energy system in a greenhouse, resulting in reduced energy costs and fewer production losses [17].

II. DISCUSSION

Agricultural output has been enhanced in terms of yield, but efficiency and diversity have been decreased which have ultimately led farmers to suffer in many areas of the state. The drivers of growth therefore played a significant part in the worldwide improvement of agriculture, but they were confined primarily to a few crop that, owing to agricultural success, were not regarded a good indicator of the general development of the State. Agricultural development contributes to both productivity and unemployment increases. For large farms it is helpful, however owing to high prices small farmers cannot afford such equipment. Advancing agricultural machinery is not favorable to balanced development [18-22]. The rising cost of agricultural inputs and the comparatively low

price for agro-food products generates a crisis scenario for Indian agriculture on the world market. Milk and milk products are simpler to buy on international marketplaces than from Indian ones. Small farmers and their family suffer from continuously rising prices of agricultural input. The farmers' debt and stress are on their way. Many Indian farmers are being exposed to the newest available technology, and skilled farmers are hired in foreign agricultural businesses to assist in the spread of improved agriculture technologies in their areas. Increased agricultural exports, increased economic productivity by ensuring the integration of potential and achieved outputs, and value added activities utilizing agricultural produce, and finally improved access to domestic and foreign markets that are either tightly controlled or secured, are the three components of agricultural globalization [23-27].

III. CONCLUSION

It was thus established that agricultural equipment and automation of machinery improved agricultural output compared to the traditional use of agricultural machinery in farming. Different kinds of high-quality sensors and the use of IoT technology and the high-speed internet have revolutionized agricultural production processes. These methods have reduced costs of production and increased agricultural output. Modern robotic methods and high-quality sensors have thus opened a new door in precision agriculture. Globalization in agriculture is a component of the real scientific and economic transformation flow of technology. Advance agricultural equipment relies on the character of farmers some farmers embrace innovation and other farmers prefer traditional farming techniques, especially if they wish to minimize physical work. The continual application of the new ideas and improved technology in agriculture is utilized to enhance output for the purpose of farmers' economic welfare and the preservation of food safety. In India, agricultural information is mainly conveyed to farmers through extension programmer, which include periodicals, radio, one-to-one communication, television talks, and displays of products, fertilizers, and seeds at farmers' fairs. Agriculture's advanced technology helps the economy while still hurting agricultural laborers and increasing causal labor. As a consequence, technical advances in agriculture help large farms while hurting agricultural labor and small farmers. Agriculture should be developed in such a way that it supports a sustainable development of the sector.

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