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Agriculture Sector Improvement Implementing 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, Automation, IoT, Irrigation, Precision Agriculture.

## I. INTRODUCTION

For virtually every stage of the farming process, agricultural machinery has been developed. The same equipment is used by organic and non-organic farming alike. Agricultural engineers are individuals trained to develop agricultural machinery, buildings and facilitate productivity improvements. Tilling the soil, planting seeds, cultivating crops, irrigating the land, guarding it from the pests and weeds, harvesting, feeding animals, threshing grains, processing and packing of products requires a large variety of machines. In the past two to three decades, India has concentrated mostly on organizing pathologies, trials, demonstrations, pilot projects and other practical research. The main features of the post-green revolution crop development strategy are enhanced agricultural strategies including high yield plant types, intensively farmed crops and greater use of fertilizer, improved irrigation and optimum methods for planting, harvesting and planting. Although a number of plants have generated large yields, their effects on growth, efficiency and costs differ between cultures and locations. In India, the most basic agricultural technology is utilized and more sophisticated agricultural equipment like as tractors and harvest combinations is used. Many farmers utilize carts and buckets for bullocks. The UP, Punjab and Haryana countries have irrigation and infrastructure, and they have been aided by the Green Movement [1].

In India, a significant effort is anticipated to be made to promote the second Green Revolution. It is not enough to merely equip farmers with knowledge. Farmers must be able to take the correct choices and understand clearly how and what to do, in order to optimize output of agriculture and improve their economic position. Indian farmers should have access to the world's finest farming expertise and be encouraged to utilize agricultural tools in their best interests. Agricultural development is important to farmers' prosperity and economic success. Farmers should strive to learn new technologies and study more in order to survive and prosper in the age of knowledge-intensive agriculture. Anyone from farming families must have Internet connection, understanding of electronic information resources and the ability to utilize Internet Technology (IT) in agriculture successfully in order to have a continuing access to the latest knowledge about agriculture [2].

The 2018 census just surpassed 7 billion people worldwide and by the end of 2050 the global population is projected to reach 9.3 billion. This rapidly expanding population requires more food to satisfy the demands. In 2050, as scientists predict, the food market will grow to 60 percent. Agricultural production is the direct source of food for most living creatures, including people and animals. The increasing demand for food also implies a rise in agricultural output. Agriculture's importance in the globe increases with food shortages. Productivity in agriculture influences the economy of a country reliant on agriculture. To preserve the reputation of the agricultural industry and satisfy the demand for increased food production, farmers

need to move from conventional farming methods to innovative farming systems. A farmer using contemporary technology in today's agricultural system controls all effects, both biotic and abiotic, in order to optimize production and therefore the financial advantages of farms. This system allows farmers to adjust regularly to new technology and tends to minimize production losses. Today's technique of production aims at reducing production costs while continuing to increase the output from a small piece of land. It focuses mostly on the consistency and amount of the product via efficient supply management [3].

Exact understanding of changing environmental variables, plant needs and irrigation demand are essential in agriculture, among other things. This knowledge allows farmers to make quick choices on crop management. The farmers have used the technique of information management to resolve agricultural problems. In developing nations, information and communications technology is utilized to assist agricultural. Investors seek to develop this technology and assist nations in addressing labor shortages and other resources. In agriculture, significant technical advancements are needed to monitor agriculture's daily production at decreased prices [4]. Mechanization automation in agriculture is, however, the newest innovation, which allows farmers to use their expertise and prompt help to improve agricultural efficiency. Precision farming needs understanding of sustainable farm production. The usage of the web framework is essential if information is to be identified in order to address precision farming issues.

The aim of this research is to explore current advances in the area of mechanical agricultural automation. It also covers advances in the use of IoT technology in agriculture, in order to improve productivity and overcome losses via the provision of precious information in precision farming.

### *A. Agriculture and Information Technology Services*

Various efforts have been undertaken in India to absorb and implement IT for agriculture. The National Agriculture Policy emphasizes the use of information technology. The Agriculture and Cooperation Department plans an e-government strategy to focus on e-government activities in agriculture. Plan has developed a priority list of services to farmers and a list of procedures for which re-engineering is needed. Phase 1 of the National E-Governance Plan is nearing completion in agriculture. Phase 2 describes the position of civil society and the business sector. The Department has previously established a centralized sector system to develop and improve agricultural information systems with an estimated expenditure of €100.00 to promote e-government for agriculture in the center and to support the state and UT centers [5].

Efforts have been undertaken at various levels to establish the knowledge sharing system in India. Mobile telephony continues to grow in India via the introduction of new technology. With pricing competition, mobile telephony is becoming one of the least expensive telephony in the world, enabling rural regions in India to connect to rural areas and encouraging rural people. The impact of mobile phones on rural India is significant and communication between small and marginal farmers is increased. The government's National Farmers Committee has suggested the development of rural knowledge centers across the nation utilizing contemporary information and communication technology (ICT). The 2007 mission was launched by a partnership of almost 80 civil society organizations [6].

The National Informatics Center Network (NICNET) is administered by NICNET, a government-owned information exchange network (NIC). It contains most of the official data from various authorities. It also maintains the rural development agency's webpages (DRDA). In the 10th five-year plan, the Smart Village initiative was started. One of the objectives of the project is to deploy and promote cost-effective and appropriate ICT in rural regions. AGMARKNET is an agricultural commercialization information platform using NICNET to record pricing and arrival data of more than 300 commodities and 2,000 kinds. A total of 1347 agricultural products have been associated with wholesale markets (APWMs). This initiative may extend to about 7,000 wholesale marketplaces worldwide as well as to 35,000 rural markets in India. The Punjab government uses the AGRISNET programme to enhance and promote agricultural information and communications.

### *B. Agriculture Mechanization*

In recent years the productivity of agriculture has increased due to improvements in mechanical equipment utilized in agricultural operations. This section covers the latest automation of agricultural mechanical equipment:

#### *1) Automation for Soil Parameter Assessment*

Standard soil testing is extremely essential, since 60% of agricultural output is dependent on soil fertility. Testing of the soil is extremely essential. Soil productivity is also regarded an important factor in precision agriculture. The administration of fertilizer and plant fertilizer patterns relies on soil fertility. For busy farms, producers have to use the time consuming and difficult approach in virtually soil testing labs. The laboratories for soil fertility are based on the pH, biological, physical and chemical characteristics of the soil. A sensor-based system has been developed that reaches all the parameters by using ESP 8266 to tackle this issue of farmers' soil testing. A website approach compares the sensor gathered parameter to current database parameters. This online architecture enables farmers to get information on soil fertility and recommends various crops for different soils depending on soil fertility status. Better cultivation of the soil enables farmers to obtain optimal yields, etc [7].

#### *2) Agriculture Moisture Monitoring System*

Agriculture is a key technology used in poor countries to improve production in agriculture and relieve food crises.

This technique uses a range of coordination and information resources to enhance the quantity and efficiency of agricultural products. This system uses automated technology and sensors to monitor different agricultural machines to enhance production (Figure 1). Researchers utilized an YL69 sensor to automate a sprinkle watering system. As the level of soil moisture falls below 15%, the sensor detects the soil and starts the sprinkling system pump instantly. When the moisture content of the soil reaches 45%, the sprinkle pump is switched off. This machine improves energy efficiency, saves time and lowers the use of water. All readings of the device are displayed on the LCD screen for the farmer and are connected with values on a website system.

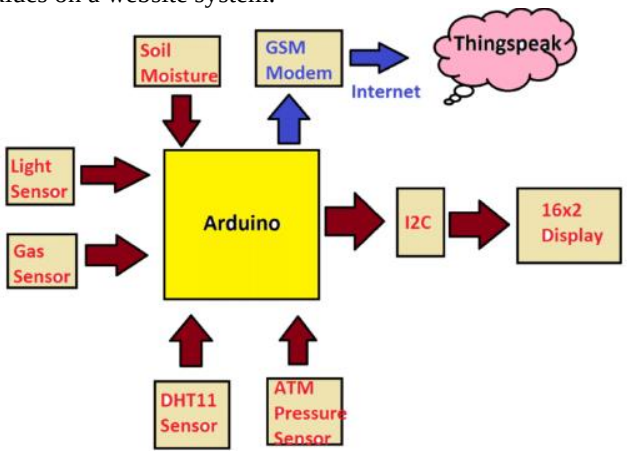


Figure 1: The block diagram of IoT based Agriculture System [Electronics Project Hub]

Cyber-physical surveillance system in precise agriculture: a modern innovation utilized in the real world to enhance efficiency and quantity of agricultural products. In the past 20 years the mechatronic technique was updated using the Current Population Survey (CPS) methodology. The CPS technique plays a significant role for farmers in the development of information and communication systems to improve crop management within precision farming. The CPS system employs the necessary methods, devices, sensors, hardware and software programmes, which depend on trans disciplinary processes and have the corresponding prototype ideas and test beds. It enables farmers to improve their crop volume and quality via the use of an increased information and communication infrastructure to apply excellent agricultural practices in precision agriculture (Figure 2).

Modern agriculture development: agriculture is undoubtedly India's main source of revenue, along with its related sectors. In terms of rural employment, food security and ecologically friendly technologies, sustainable agriculture is important for comprehensive rural development including such sustainable resource management, land management, and biodiversity conservation. The Ministry of Agriculture is now concentrating a lot on commercializing agriculture with the aim of achieving an annual growth rate of 4%. Only a handful emphasize a regionally unique strategy, diversification of commodities, future regions and scientific resource management [8].

Adequate food production and distribution in the fast expanding environment, with increasing global rivalry, has become an important and worldwide need. The utilization of existing natural resources has to be maximized and the newest technology accessible globally need to be used to satisfy local food demand while still aiming at the export market. Northern India, and particularly Punjab and Haryana, is India's most sophisticated and thriving region with regard to the technical progress and adoption of new technologies in agriculture. Punjab is the hub of advanced agricultural gear and equipment in India and across the globe, which are highly demanded. Haryana's technological innovation and acceptance is not trailing behind.

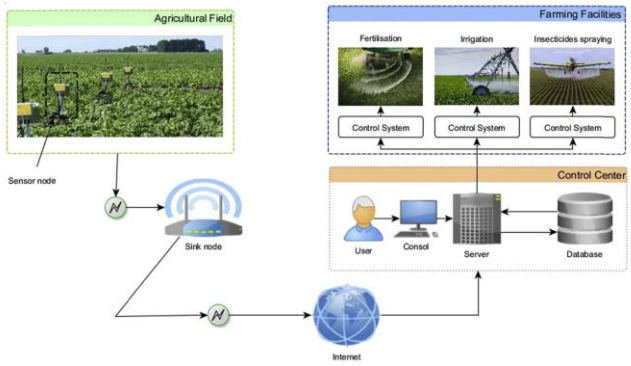


Figure 2: Layout of Smart Cyber-Physical Systems in Agriculture

### *C. Advances in IoT Precision Agriculture Technology*

The IoT is a digital application for precision farming utilized in the real world. This section discusses current advances in the use of IoT technology to enhance agricultural and mechanical equipment and systems performance.

#### *1) Automation of The IoT-Based Irrigation System*

Researchers proposed the irrigation system automation concept using IoT methods. The IoT is essentially a web-based network that evaluates a process. It is used for improving agricultural productivity in the agriculture business to enhance the return on food production by 9.6 billion people depending on agriculture till 2050. Agriculture activities such as watering has been standardized by the use of humidity detecting sensors, temperature sensors and light intensity sensors. The measurement data was sent to the web server, where the basic charts were already saved on the data server. The data are evaluated automatically by the programmer of the online system and the findings are then delivered to the Smartphone app of the farmer. As a consequence, the farmer may easily assess the condition of his crop and remotely monitor the irrigation equipment [9].

Based on the IoT approach, an automated Raspberry Pi-based irrigation model is developed. This system improves agricultural production by using irrigation water effectively in water scarcity regions. The circuit model employs two kinds of sensors for daytime monitoring of temperature, moisture and sunshine and for sending findings to a database. During the day, the database analyses the irrigation water requirements of the crop and, if the crop needs, automatically starts the irrigation system. This technique minimizes irrigation water shortages and delivers a sufficient quantity of water for a field, which makes it perfect for regions where water is limited.

*2) Implementation of The IoT System in Crop Prevention*

Biotic stressors including mosquitoes, rodents and illnesses were the primary cause of agricultural losses. Disease prevention is a crucial procedure for a farmer. A sophisticated system for disease prevention, called DSS, has been implemented and has proved effective in managing potato illnesses. This instrument was effectively utilized by sensors to avoid environmental conditions, in addition to monitoring fungal conditions in potatoes. High grade sensors are utilized for the collection of climatic data and are sent to the database via an Internet connection using IoT technology that analyses data and assesses findings. Subsequently, the mobile farmer gets all environmental information and implementation requirements for specific fungicides for disease prevention. The costs of treatments for fungicides are reduced and disease prevention in due course [10].

### *D. Use of IoT Technology to Improve Plant Growth and Development*

Scientists and technologists concentrate mainly on IoT precision agriculture in order to improve productivity and efficiency in agricultural production via the installation of real-time monitoring systems on farms. IoT technology utilizes different kinds of high-quality sensors to collect data, then sent through an Internet connection to a website system database. Recent study has proposed job cycle data analysis algorithms which enhance the energy efficiency on gloomy or sunny days of a greenhouse agricultural system. The technique has shown great efficiency in managing the energy system in a greenhouse, leading to reduced energy costs and fewer production losses.

## II. DISCUSSION

Agricultural output was enhanced in terms of yield, but efficiency and diversity were decreased and farmers ultimately struggled in many areas of the country. The drivers of growth thus played a significant part in global agricultural improvement, although primarily just a few crops were regarded to be not a good indicator of overall state development owing to agricultural advancement. Progress in agriculture leads to increase in both productivity and unemployment. For large farms, this is helpful, but small farmers cannot afford such equipment because of the exorbitant prices. Advancing agricultural machinery does not lead to balanced growth. The rising cost of agricultural inputs and the comparatively low price of agro-food products create a problem on the worldwide market for Indian farming. Milk and milk products in overseas marketplaces are simpler to buy than from Indian markets. Small farmers and their families are continuously suffering from rising agricultural input prices. The debt and stress of the farmers are on their way. Many Indian farmers are exposed to the newest technology available, and skilled farmers are engaged in multinational farming businesses to support the spread of improved farming methods in their areas. Agricultural globalization comprises three components: increased agricultural exports, increased economic productivity through the integration of potential and achievements, value-added activities using agricultural produce, and improved access to tightly-controlled, secure domestic and foreign markets.

## III. CONCLUSION

It was therefore determined that agricultural equipment and automation of machinery increased agriculture's production relative to the normal usage of agricultural machinery in agriculture. Different kinds of high quality sensors, IoT technology and high-speed Internet have transformed farm production operations. These techniques of automation decreased production costs and improved agricultural yields. Modern robots and high grade sensors have thus opened a new door in the area of precise agriculture. Globalization in agriculture is a component of the true scientific and economic flow of technological change. Farmers are in favor of innovation and other farmers use traditional farming techniques, especially if they wish to minimize physical work, since advancing agricultural equipment relies on farmers' nature. In the interests of farmers' economic well-being and food safety, the continued application of new ideas and improved technology is utilized in agriculture. Farmers are mainly communicated farming information to farmers in India via extension activities, including periodicals, radio, one-on-one communication, talks on television and shows of products, fertilizers and farmers' seeds. The advanced technology of agriculture helps the economy, while still impacting farm laborers and increasing causal labor. As a consequence, technical advances in agriculture benefit large farms while hurting farm workers and small farmers. Agriculture should be promoted in a way that supports sustainable industrial development.

## REFERENCES

[1] Chihana S, Phiri J. Application of IoT in Zambia’s FRA Grain Traceability Process. Int J Recent Contrib from Eng Sci IT. 2018;

[2] Reddy GS. Smart agriculture by monitoring moisture pH levels in soil. Int J Adv Res Idea Innov Technol. 2018;

[3] Amandeep, Bhattacharjee A, Das P, Basu D, Roy S, Ghosh S, et al. Smart farming using IOT. In: 2017 8th IEEE Annual Information Technology, Electronics and Mobile Communication Conference, IEMCON 2017. 2017.
[4] Fresco R, Ferrari G. Enhancing precision agriculture by Internet of Things and cyber physical systems. Atti della Soc Toscana di Sci Nat Mem Ser B. 2018;
[5] Srinivasulu P, Babu MS, Venkat R, Rajesh K. Cloud service oriented architecture (CSoA) for agriculture through internet of things (IoT) and big data. In: Proceedings - 2017 IEEE International Conference on Electrical, Instrumentation and Communication Engineering, ICEICE 2017. 2017.
[6] Vidhya R, Valarmathi K. Survey on Automatic Monitoring of Hydroponics Farms Using IoT. In: Proceedings of the 3rd International Conference on Communication and Electronics Systems, ICCES 2018. 2018.
[7] Mohanraj I, Ashokumar K, Naren J. Field Monitoring and Automation Using IOT in Agriculture Domain. In: Procedia Computer Science. 2016.
[8] Mishra N, Sharma TK, Sharma V, Vimal V. Secure Framework for Data Security in Cloud Computing. In: Advances in Intelligent Systems and Computing. 2018.
[9] Patil B, Panchal H, Yadav S, Singh A, Patil D. Plant Monitoring Using Image Processing, Raspberry Pi & Iot. Int Res J Eng Technol. 2017;
[10] Mukhalipi A. Human Capital Management and Future of Work; Job Creation and Unemployment: A Literature Review. OALib. 2018;