IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 5, June 2023

Internet of Things (IoT) based Smart Agriculture System

Vishal Uttam Nikam and Aditya Santosh Sawant
Students, Department of MCA
Late Bhausaheb Hiray S.S. Trust's Institute of Computer Application, Mumbai, India

Abstract: *The Internet of Things (IoT) based smart agriculture system is an emerging technology that uses sensors, gateways, cloud platforms, and mobile applications to provide real-time data on weather, soil moisture, crop growth, and livestock health to farmers. This research paper focuses on the development and implementation of an IoT-based smart agriculture system. The system offers several benefits, such as increased efficiency, improved resource management, enhanced crop quality, better decision-making, and remote monitoring. However, there are also potential negative impacts, such as cost, technical skills, dependence on technology, data privacy and security, and environmental impact, that must be considered. Careful planning, implementation, and monitoring can help to mitigate these risks and ensure that smart agriculture systems are sustainable and effective. This research aims to give an overview of how predictive analysis and Internet of Things (IoT) devices, along with cloud management and security systems, can be used in agriculture to support multiple crops. It also takes into account the experiences of farmers and highlights the challenges and difficulties that may arise when introducing modern technology into traditional farming practices. By utilizing statistical and quantitative methods, this research seeks to bring about significant and positive changes in the current agriculture system. In simpler terms, this study explores how smart farming can enhance food production, resource management, and labor efficiency, while acknowledging the challenges and benefits of integrating modern technology into traditional farming practices.*

Keywords: IoT, Smart agriculture

I. INTRODUCTION

Smart agriculture is an emerging area that uses the Internet of Things (IoT) technology to monitor and optimize agricultural processes. IoT based smart agriculture system can provide real-time data on weather, soil moisture, crop growth, and livestock health to help farmers make informed decisions. This research paper explores the development of an IoT based smart agriculture system. Connecting multiple interconnected devices, such as several sensors, drivers and smart objects, to mobile devices through the use of the Internet. Many migrants in India who returned to their hometowns during the Covid-19 pandemic have decided to pursue farming as a profession and are not interested in going back to their previous occupations. These migrants now have an opportunity to embrace smart agriculture systems, which can be easier to convince them to adopt compared to traditional farming methods. Smart agriculture systems require less time and effort to implement, making them a more attractive option for these migrants.

1.1 Components of IoT based Smart Agriculture System

The IoT based smart agriculture system comprises several components such as sensors, gateways, cloud platforms, and mobile applications. The sensors are used to collect data on soil moisture, temperature, humidity, and other environmental factors. The gateway collects data from sensors and sends it to the cloud platform for analysis. The cloud platform processes the data using machine learning algorithms to provide insights to the farmers. The mobile application provides a user interface for farmers to access the data and control the irrigation systems remotely.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 5, June 2023

1.2 Benefits of IoT based Smart Agriculture System:

The IoT based smart agriculture system offers several benefits to farmers such as increased crop yields, reduced water consumption, and improved resource management. Farmers can use the system to monitor the growth of crops and adjust the irrigation and fertilizer application accordingly. They can also receive alerts on weather conditions, pest attacks, and diseases, enabling them to take preventive measures in a timely manner.

II. LITERATURE REVIEW

The Internet of things (IOT) are being revamping the agribusiness engaging the farmers by the expansive compilation of techniques, for instance, accuracy and conservative cultivation to go up against challenges in the field. Researchers have proposed different modalities for the agriculture sector with one or multiple technologies mentioned, e.g., irrigation system based on soil water measurement to decide irrigation amount of the water is described in. Agriculture is essential to India's economy and people's survival. The purpose of this project is to create an embedded based soil monitoring and irrigation system that will reduce manual field monitoring and provide information via a mobile app. The method is intended to help farmers increase their agricultural output. A pH sensor, a temperature sensor, and a humidity sensor are among the tools used to examine the soil. Based on the findings, farmers may plant the best crop for the land. The sensor data is sent to the field manager through Wi-Fi, and the crop advice is created with the help of the mobile app. When the soil temperature is high, an automatic watering system is used. The crop image is gathered and forwarded to the field manager for pesticide advice.

Agrarian countries like India rely heavily on agriculture for their development. Agriculture has always been a roadblock to the country's development. Smart agriculture, which comprises modernising present agricultural systems, is the only answer to this challenge. As a result, the suggested strategy attempts to use automation and Internet of Things technologies to make agriculture smarter. Crop growth monitoring and selection, irrigation decision assistance, and other uses are possible thanks to the Internet of Things (IoT). To modernise and boost crop yield, a Raspberry Pi-based autonomous irrigation IOT system has been proposed. This project's main purpose is to produce crops using the least amount of water possible. Most farmers waste a lot of time in the fields in order to focus on water available to plants at the appropriate time. Water management should be improved, and the system circuit's complexity should be minimised. Based on the data collected from the sensors, the suggested system determines the amount of water required. Two sensors detect the humidity and temperature of the soil, as well as the humidity, temperature, and length of sunshine each day, and send the data to the base station. Based on these characteristics, the recommended systems must calculate the irrigation water quantity. The key benefit of the system is the integration of Precision Agriculture (PA) and cloud computing, which will reduce water fertiliser consumption while increasing crop yields and assisting in the evaluation of field weather conditions.

III. RESEARCH METHODOLOGY

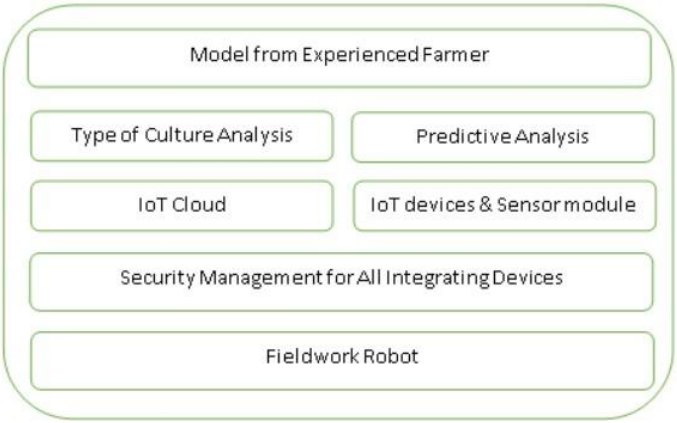

Fig.1 Block diagram of overall proposing concepts

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 5, June 2023

Figure 1 shows a block diagram of proposed concepts. This functional block diagram is consisting the units of culture analysis, predictive analysis, IoT clouds, IoT devices and sensor module, Agri robot, and security management for all integrating devices. The IoT system collects and processes the data from the different sensor outputs with centralized processing servers and provides input to green fieldwork devices in real-time. Thus IoT devices are integrating all other sensor infrastructure. The audio and video interfaces for display output of the system . The sensor data created from raw data from soil or any appropriate places and is processed by IoT central processing unit with optimum scheduled time

3.1 Positive Impacts of IoT based Smart Agriculture System

- Increased Efficiency: IoT based smart agriculture systems improve the efficiency of farming operations by providing real-time data on weather conditions, soil moisture, and crop growth. This data helps farmers to optimize irrigation and fertilization, which leads to increased crop yields and reduced water consumption.
- Improved Resource Management: Smart agriculture systems enable farmers to manage resources more effectively. They can monitor water and fertilizer usage and adjust them accordingly, leading to cost savings and reduced environmental impact.
- Enhanced Crop Quality: IoT based smart agriculture systems help farmers to monitor the growth of crops and detect diseases and pests at an early stage. This enables farmers to take corrective measures in a timely manner, leading to higher crop quality.
- Better Decision Making: Smart agriculture systems provide farmers with real-time data and insights, enabling them to make informed decisions about crop management. This leads to better planning and resource allocation, resulting in increased profitability.
- Remote Monitoring: IoT based smart agriculture systems enable farmers to remotely monitor their farms and make adjustments to irrigation and fertilization systems. This saves time and reduces the need for manual labour, leading to cost savings

Overall, the positive impact of IoT based smart agriculture systems is significant, as they help farmers to optimize resources, reduce costs, and increase yields, while also reducing the environmental impact of agriculture.

3.2 Negative Impacts of IoT based Smart Agriculture System:

- Cost: The implementation of IoT based smart agriculture systems can be costly, especially for small-scale farmers who may not have the financial resources to invest in such systems.
- Technical Skills: Farmers may require technical skills and training to operate IoT based smart agriculture systems, which may be a challenge for those who are not familiar with technology.
- Dependence on Technology: IoT based smart agriculture systems may lead to farmers becoming overly dependent on technology, which could result in reduced resilience to natural disasters or other unforeseen events.
- Data Privacy and Security: Smart agriculture systems collect large amounts of data, which can be sensitive and confidential. Ensuring the privacy and security of this data is essential to prevent it from being misused or hacked.
- Environmental Impact: The use of technology in agriculture may have unintended consequences for the environment. For example, the use of sensors and other devices could lead to increased electronic waste, which may have adverse effects on the environment.

Overall, while IoT based smart agriculture systems offer many benefits, there are also potential negative impacts that must be considered. Careful planning, implementation, and monitoring can help to mitigate these risks and ensure that smart agriculture systems are sustainable and effective

3.3 Challenges of IoT Based Smart Agriculture Systems:

Despite their numerous benefits, IoT based smart agriculture systems also face several challenges. One of the significant challenges is cost. The implementation of IoT based smart agriculture systems can be expensive, especially for small-scale farmers who may not have the financial resources to invest in such systems.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 5, June 2023

Another challenge is the technical skills required to operate IoT based smart agriculture systems. Farmers may require training and technical support to use these systems effectively, which may be a challenge for those who are not familiar with technology.

Data privacy and security is another significant challenge associated with IoT based smart agriculture systems. Smart agriculture systems collect vast amounts of data, which can be sensitive and confidential. Ensuring the privacy and security of this data is essential to prevent it from being misused or hacked.

IV. RESULTS AND ANALYSIS/ DISCUSSION

Figure 2 shows obtained results from fields 1-3. The irrigation data for different sensors like moisture, temperature, humidity. Once it reaches the threshold level, the device provides appropriate action to the fieldwork robot. Figure 8 shows the irrigation of raw data details with moisture, temperature, humidity sensor output. This continuous graph shows well-performed device activities during feedback processing time

Fig.2 obtain result from sensor data

V. CONCLUSION

In conclusion, IoT based smart agriculture systems offer several benefits to farmers, including increased efficiency, improved resource management, enhanced crop quality, and better decision making. However, there are also potential challenges, such as cost, technical skills, data privacy and security, and environmental impact, that must be considered. Careful planning, implementation, and monitoring can help to mitigate these risks and ensure that smart agriculture systems are sustainable and effective

REFERENCES

[1]Gayatri, M.K., Jayasakthi, J. and Mala, G.A., 2015, July. Providing Smart Agricultural solutions to farmers for better yielding using IoT. In 2015 IEEE Technological Innovation in ICT for Agriculture and Rural Development (TIAR) (pp. 40-43). IEEE.

[2]Ananthi, N., Divya, J., Divya, M. and Janani, V., 2017, April. IoT based smart soil monitoring system for agricultural production. In 2017 IEEE Technological Innovations in ICT for Agriculture and Rural Development (TIAR) (pp. 209-214). IEEE.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 5, June 2023

[3]Rao, R.N. and Sridhar, B., 2018, January. IoT based smart crop-field monitoring and automation irrigation system. In 2018 2nd International Conference on Inventive Systems and Control (ICISC) (pp. 478-483). IEEE.
[4]Divani, D., Patil, P. and Punjabi, S.K., 2016, April. Automated plant Watering system. In 2016 International Conference on Computation of Power, Energy Information and Commuincation (ICCPEIC) (pp. 180-182). IEEE.
[5]Vadapalli, A., Peravali, S. and Dadi, V., 2020. Smart Agriculture System using IoT Technology. Publisher: International Journal of Advance Research in Science and Engineering (2319-8354), 9, pp.58-65.
[6]King, T., Cole, M., Farber, J.M., Eisenbrand, G., Zabaras, D., Fox, E.M. and Hill, J.P., 2017. Food safety for food security: Relationship between global megatrends and developments in food safety. Trends in Food Science & Technology, 68, pp.160-175