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Smart Farming Using IOT

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Abstract: ***The efficient use of resources like water, fertilizer, and energy is one of the main issues facing contemporary farming. Farmers may monitor soil moisture levels, analyze weather trends, and improve irrigation and fertilization operations with the use of IoT-enabled sensors, which can cut waste and conserve resources. Monitoring and predicting the weather is important since it can have a big impact on crop production and quality. Farmers may make better decisions about when to plant, harvest, and safeguard their crops by using IoT weather sensors to monitor weather conditions in real-time and forecast changes. Crop destruction and huge financial losses for farmers can result from diseases and pests. Real-time crop health monitoring using IoT sensors can help farmers identify possible problems early on and take action before it's too late.***
Keywords-farming, crop yield, sensor, crop monitoring, smart farming, internet of things, arduino Ide.

I. INTRODUCTION

Smartphone, internet, and soil moisture sensors are the three main types of sensors covered in the research report. Here Its programming is done on the open-source Internet of Things platform with Arduino Ide and C++ or Luna script. Dot Mcu (programming language) A soil moisture sensor measures the amount of moisture in the soil, and NodeMCU uses that information to decide whether or not to water the crop. Calculations are made to determine the average dielectric permittivity along the soil moisture sensor's whole length. The dielectric permittivity of water serves a purpose in this situation. With a 5 volt applied voltage, this sensor can function between 10 and 30 degrees Celsius.

Temperature and humidity sensor - The moisture and temperature sensor provides information on the martian atmosphere humidity and temperature, which help determine if a crop is appropriate for growth. Only certain types of weather and certain temperature ranges were ideal for certain crops' development and yield. A thermistor, a humidity detecting component, and an integrated circuit make up the temperature and moisture sensors. The ability of a thermistor to modify its resistance in response to temperature allows it to determine the temperature of the medium it's located in. The sensor operates between 3.3 and 5 volts, between 0 and 50 degrees Centigrade, and between 20 and 90% humid.

II. LITERATURE REVIEW

A 2020 paper by K. S. Sujitha and S. Selvamani, entitled IoT Smart Agriculture Review: Towards Sustainable Agriculture, explores the potential of IoT-based smart agriculture systems in promoting sustainable agricultural practices.[10] The authors highlight the benefits of such systems in terms of improving crop yield, minimising the impact of agriculture on the environment and the usage of assets such as water and fertilisers. Additionally, this research looks at IoT-based intelligent agroecosystems that are being created and used in many parts of the world and sheds some light on their prospects and challenges.

The paper "IoT-Based Smart Agriculture: A Review" published by M. A. Hossain, N. R. Das and M. A. Matin in 2019 provides an overview of IoT-based smart agriculture systems that can improve crop yield, reduce water consumption And reducing water consumption focuses on its role in reducing volume. Farm management efficiency. [11]The authors describe IoT-based smart agricultural systems that have been developed, including systems for crop monitoring, pest detection, and soil moisture measurement. This paper also considers the challenges associated with the adoption and implementation of these systems, including data privacy and security issues, and discusses future research directions in IoT-based smart agriculture.

Researchers G. I. Deokar, S. B. Shinde, and S. S. Lokhande submitted a study titled "Smart Agriculture: IoT Based Greenhouse Monitoring and Control System" in the 2018 Proceedings of the 2nd International Conference on Computational Methodologies and Communication. An Internet of Things (IoT)-based control system to raise output and product quality. [12] To monitor environmental characteristics like temperature, humidity, and light intensity in real-time, they created a system built up of numerous sensors, microcontrollers, and an IoT platform. Additionally, this system has triggers for automatic greenhouse climate control depending on sensor data. By promoting ideal growth conditions and minimising human effort, the suggested approach has the potential to increase yield and product quality.

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"Smart Agriculture with Internet of Things and Artificial Intelligence" by R. Agarwal, R. Sharma and N. Nigam is a research paper published in Proceedings of the 3rd International Conference on Electronic Communications and Systems, 2018. An AI-based smart farming system to automate various farming operations and improve yield. The proposed system consists of various sensors, a microcontroller and an artificial intelligence-based decision engine for product management.[14] The system uses machine learning algorithms to analyze sensor data and provide real-time feedback to farmers to optimize crop growth. The proposed system can also provide remote access to crop data, allowing farmers to monitor their crops from anywhere. The authors concluded that the proposed system can increase agricultural productivity, reduce labor costs and promote sustainable agriculture.

Smart Agriculture: IoT based solutions for Indian farmers:This white paper proposes an IoT-based solution for Indian farmers to increase agricultural productivity and reduce resource wastage. This system includes the deployment of various sensors and IoT devices such as temperature sensors, humidity sensors, soil moisture sensors, irrigation controllers, etc., which are integrated into a centralized system. Data collected from these devices is analyzed and processed to provide real-time information on crop growth, soil health and water needs. The system also has a decision support system to assist farmers in making informed choices about pest control, fertilizer, and irrigation.

Rajalakshmi P and S. Devi Mahalakshmi, “Agricultural land monitoring and irrigation automation based on IOT”, published in IEEE, 2017.[7] Agricultural practices This system uses various sensors to collect real-time data on crop growth, soil moisture, temperature , humidity and weather conditions. The collected data is analyzed and processed using machine learning algorithms to generate actionable insights that can be used to make informed decisions about crop and irrigation management. This white paper highlights the benefits of using IoT technology in agriculture, including reducing water consumption, improving yields and optimizing resource use. The authors suggest that their system can be easily deployed in the agricultural context and customized to meet the specific needs of farmers.

An introduction to the creation of intelligent agricultural systems in the Internet of Things can be found in Abdullah Na and William Isaac's article, "Developing Human-Centered Agriculture research Models in the Internet of Things Environment," which was included in the proceedings of the 2016 Global Forum on Internet of Things and Applications.[8] Human-centered approach to the environment. This paper describes the challenges faced by smallholder farmers when adopting technology and proposes a system that takes into account farmers' needs and integrates with existing farming practices. The authors also discuss the potential benefits of such systems, such as increased efficiency and productivity in agriculture.

The 2016 IEEE publication "IoT in Agriculture" by Jeetendra Shenoy and Yogesh Pingle focuses on the application of IoT in agriculture.[6] This white paper describes IoT-based systems and technologies that can be used to improve agricultural practices, such as crop monitoring, weather forecasting, and soil analysis. The authors also describe the benefits of these systems, including improved crop yield and reduced water consumption.

"IoT-Based Smart Villages" by Tejas Bangra, Akshar Chauhan, Harsh Dedia, Ritesh Godambe and Manoj Mishra, published in International Journal of Engineering Trends and Technology, 2016, presents an IoT-based smart village model.[5] This paper proposes a system that integrates various technologies such as sensors, automation and data analysis to improve the quality of life in rural areas. The authors describe how the system can be used in fields as diverse as agriculture, healthcare, and education to provide real-time data and insights for decision-making. This paper also highlights the benefits of the proposed system, such as increased productivity and sustainability in rural areas.

"Data Collection in Sensor Networks Using sensor networks for task management and data collecting, the smart farming industry described in "and Project Tracking for Decision - making in Smart Agriculture" by Sinung Suakanto et al.[1]The system is designed to help farmers make decisions by providing real-time data on their crops, such as temperature, humidity and soil moisture. The system also includes a task management component that allows farmers to assign tasks to workers and track their progress. The authors suggest that their system can help improve crop yields and reduce costs for farmers.

"Control System in Smart Agriculture Using Arduino" by Narayut Putjaik et al. describes a control system for smart agriculture that uses Arduino technology.[4]The system includes sensors to monitor temperature, humidity, and soil moisture, as well as actuators to control irrigation and other tasks. The system is designed to be cheap and easy to use, making it affordable even for small farmers. The authors suggest that their system can help improve crop yields and reduce water use in agriculture.

IOT-based Smart Agriculture', Nikesh Gondchwar and R.S. Kawitkar, published in the International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE) in 2016, proposes an IoT-based system for smart agriculture that uses sensors to monitor and control various parameters such as temperature, humidity, soil moisture, and sunlight The proposed system also provides features such as automatic irrigation, pest control, and crop monitoring that help increase crop yield and quality.

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Smart Agriculture Systems Utilizing Sensors for Agricultural Work Automation, Chetan Dwarkani M, R Ganesh Ram, S. Jagannathan, and R. Priyatharshini, 2015 IEEE International Conference on Technological Advances in Information and Communication Technology for Agriculture and Rural Development (TIAR 2015) In 2015, it was announced.[2] It offers a smart farming system that uses sensors to automate various farming tasks such as irrigation, fertilization and pest control. The system also uses data analytics techniques to provide insights to farmers to help them make informed decisions. The proposed system is expected to increase productivity and reduce agricultural costs.

Research articles in diverse branches of science and engineering are published in the peer-reviewed academic magazine International Journal of Advancing Research in Science and Engineering. This journal's goal is to give researchers, academicians, and business experts a venue to publish their research findings and improve science and engineering. [3] The journal publishes original research articles, reviews, and brief communications on a variety of subjects, including environmental science, electrical engineering, computer science, electronics, mechanical engineering, and civil engineering. Journals adhere to a strict peer review procedure to guarantee the calibre and originality of articles published. In general, the International Journal of Advances in Science and Engineering acts as a significant forum for the promotion of research in various branches of science and engineering as well as the dissemination of knowledge in such subjects.

A. Software's Part In The Project

Software's function is to read data from the different sensors we use, including sensors for soil moisture, humidity, temperature, and rain detection. This data will be examined, and using algorithms, we can assist farmers in making the best choices possible to maximize their production. Also, we'll automate various tasks like lighting, watering, etc. Simple graphs will be used to present the data collected by all of these sensors on the website or mobile application. It can display information on things like soil temperature, humidity, and moisture content. This system's use allows for efficient water pumping and effective use of the rain. This system greatly benefits farmers.

III. METHODOLOGY

TOOLS: Arduino UNO, NodeMCU Breakout Board, Spark Fun Soil Moisture Sensor, PCB, SparkFun Multiplexer, DHT11 Temperature & Humidity Sensor, Jumper Wires, USB.

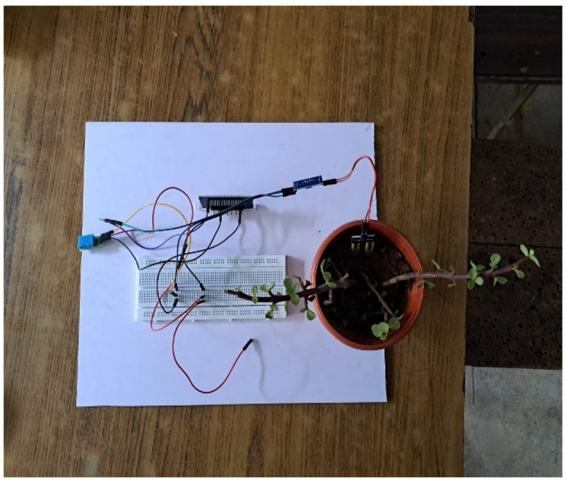
The Internet of Things offers numerous possible breakthroughs that might be applied to smart farming (IoT). Here are a few illustrations:

Precision irrigation could help preserve water and increase agricultural output by using IoT sensors to monitor soil moisture levels and modify irrigation schedules accordingly.

Crop monitoring: By using IoT sensors to keep an eye on vital indicators like temperature, humidity, and light intensity, farmers will be able to optimise growing conditions and spot issues before they become serious.

Controlling pests and diseases: IoT sensors may be used to find pests and illnesses, enabling farmers to act quickly to safeguard their crops.

1) Model



IV. RESULTS

IoT sensors can be used in smart farming to continuously monitor crop health, soil moisture levels, and nutrient levels. To maximise crop production, this information can be utilised to develop exact irrigation schedules, apply fertilisers at the appropriate times, and take other remedial actions.

1) *Crop Disease and Pest Early Detection:* IoT sensors can be used to spot the first indications of crop illnesses and pests. This can assist farmers in acting quickly to stop the illness or infestation from spreading and prevent crop losses.
2) *Resource Management that is Effective:* IoT-based crop monitoring can assist farmers in making the most efficient use of resources like water, energy, and fertilisers. Farmers should decrease the use of fertilisers and avoid overwatering by keeping an eye on the weather and soil moisture levels. IoT sensors can be used to monitor crop development, maturity, and quality, which will result in improved agricultural quality. By doing this, farmers can ensure that their crops are harvested at the proper time and are of the appropriate quality.
3) *Lower Labour Costs:* Several chores that would typically require manual work can be automated by crop monitoring utilising IoT. This can lower labour costs and give farmers more time to concentrate on other elements of their business.

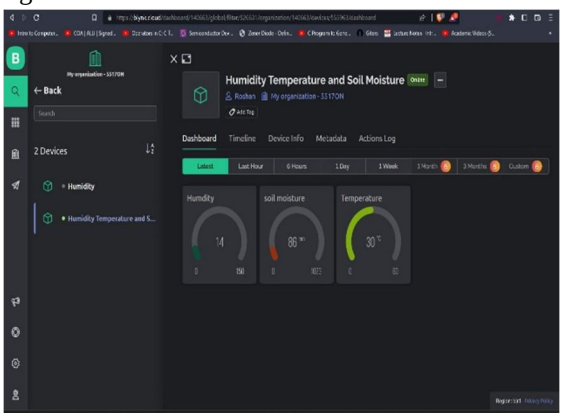


Fig no.1

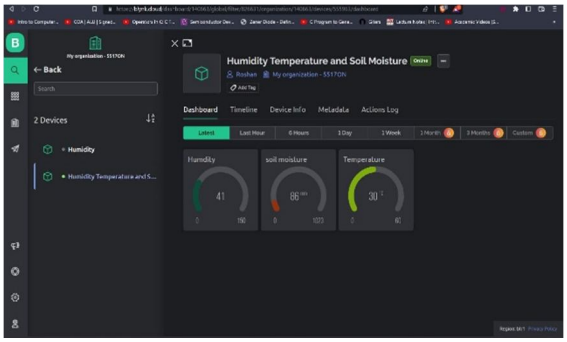


Fig no.2

V. FUTURE SCOPE

Some additional cutting-edge technologies, including IoT, have the potential to improve smart agricultural techniques. Future technological advancements may include some of the following:

Artificial intelligence (AI): AI can be used to analyse data gathered by cameras and sensors, giving farmers suggestions for better agricultural methods. Additionally, it can assist in forecasting agricultural production, identifying plant illnesses, and enhancing the process of farming as a whole.

Big Data Analytics: By analysing vast volumes of data gathered by sensors, big data analytics can offer farmers insightful analysis and suggestions for bettering farming methods.

In conclusion, smart farming has a huge future potential and might combine a variety of cutting-edge technologies. By utilising these technology, farmers can enhance their farming methods, cut expenses, and raise the efficiency and sustainability of the agricultural sector.

VI. CONCLUSION

In order to increase agricultural output and efficiency, smart farming employing IoT and soil moisture and humidity sensors has emerged as a promising alternative. Farmers may gather real-time data on soil moisture, humidity, and temperature using these sensors, which can then be evaluated to help them decide when to water, fertilise, or use pesticides.

Using IoT technology in agriculture offers the potential to boost agricultural yields, lower labour costs, and use less water. Farmers can save time and concentrate on other crucial facets of their business by automating some operations.

In conclusion, IoT-based smart farming using humidity and soil moisture sensors has the potential to completely change how we raise food. It is a promising approach that can assist farmers in increasing output, lowering expenses, and having a less environmental impact.

VII. ACKNOWLEDGMENT

We appreciate Prof. Kalpesh Joshi Sir's contribution DESH Department, VIT Pune College for guiding us in the right direction throughout the project.

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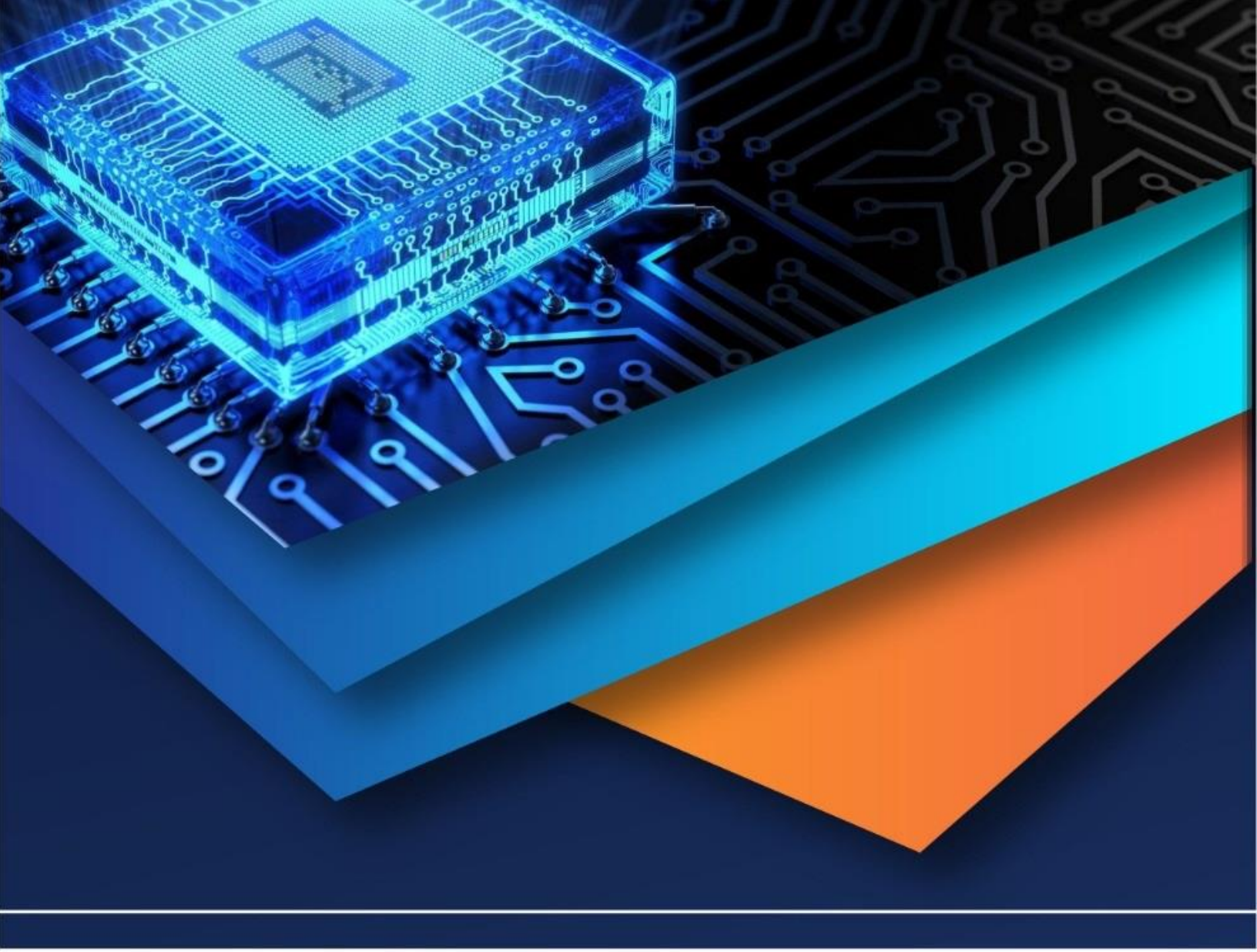
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