WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Agriculture Water Management System using IOT and ML

Susmitha MN[1], Keerthi R[2], Geetha L[3], Dhanalakshmi S[4], Prajeet Das[5]

[1]Assistant Professor, Department of Electronics & Communication Engineering, MVJ College of Engineering, Bangalore, Karnataka, India.
[2,3,4,5]Undergraduate Scholar, Department of Computer Science and Engineering, MVJ College of Engineering, Bangalore, Karnataka, India.

A B S T R A C T

Agriculture production is highly dependent on water. IoT-based agriculture water management system describes how irrigation can be handled smartly using IoT technology. This system can be used to collect data by connecting multiple sensors like Soil moisture, temperature, PIR motion sensor, and other factors the data collected will be sent to the user's mobile phone and also ensure crops receive the correct amount of water and optimize irrigation schedules by monitoring water levels, farmers can identify areas of potential water loss and take action to prevent it. The main aim of our paper is to improve productivity, improve efficiency and reduce water usage, live monitoring, water management, development in crop growth, and potential use of virtual water. Additionally, advances in artificial intelligence and machine learning will enable more sophisticated analysis of agricultural data, leading to even greater improvements in water management and crop productivity. However, it is important to ensure that these technologies are accessible to all farmers, regardless of their location or resources.

Keywords: DHT11 Sensor, IOT, PIR motion sensor, Android, Node MCU-ESP8266, and Arduino IDE.

1. Introduction

Agriculture is an important part of the Indian Economy, it is not wrong to say that the food we eat is the gift of agricultural activities and farmers who work their sweat to provide us with food. Earlier we use to depend completely on monsoons for the cultivation of food grains but now with the advancement of technology, advanced equipment, better irrigation facility and the specialized knowledge of agriculture started improving. Furthermore, our agriculture sector has grown stronger than in many countries.

Agriculture water management system-based IoT saves time and money, by automating irrigation schedules, farmers can reduce labor costs and increase efficiency. IoT included different types of sensors, electronic devices network components, and software. IoT allows users to share their data on networks without human involvement to increase productivity, and efficiency and to minimize the problems in agriculture that are faced by the farmers, there is a requirement to use the latest technology and techniques known as the Internet of things. Nowadays farmers can get a lot of knowledge and information about the latest technology and farming techniques through IoT. In IoT- based smart farming, a system is built for monitoring the crop field with the help of sensors (temperature, soil, moisture, etc.) and automating the irrigation system. farmers can monitor their fields from anywhere, anytime. An IoT-based agriculture water management system typically consists of several components, including sensors, controllers, and communication devices. Sensors are used to measure soil moisture, temperature, and other environmental variables. Controllers are responsible for controlling irrigation valves based on the data collected by the sensors. Communication devices such as cellular modems or Wi-Fi transceivers are used to transmit data between the sensors, controllers, and the farmer's smartphone or computer. By providing real-time data on soil moisture levels and weather conditions, IoT-based systems help farmers make informed decisions about when and how much to irrigate. This reduces water waste and improves crop health, resulting in higher yields and better-quality produce.

Helps farmers in determining the quality of the soil and assessing its many parameters, as well as recommending crops and fertilizers depending on the outcomes acquired through a machine learning technique. To improve the effectiveness of the Crop Recommendations Systems and Fertilizer Recommendation System, the system employs a number of Classification techniques. The assigned soil and fieldwork to anticipate a list of crops that is suited for the soil, as well as knowledge on minerals that are insufficient in the soil again for a crop in question. As a result, the user is free to choose which crop to plant. As a result, the approach aids dilettante farmers in gaining information.

2. Literature Review

[1] Ritika Srivastava et al. propose a Novel Smart IOT-based system. includes the development of a system that can monitor temperature, level of water, moisture, and even the movement if any happens in the field which may destroy the crops in agricultural fields through sensors using Arduino UNO board. describes Internet of Things (IoT) technology has brought a revolution to every field of the common man's life by making everything smart and intelligent. The development of Intelligent Smart Farming IOT-based devices is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage.

[2] Rafi Ullah et al. In this paper, SWAMP(Smart Water Management Platform) is a collaborative project developed for smart irrigation and efficient freshwater utilization in agriculture. The aim is to auto-manage water reserves and avoid over-under irrigation problems. This research improved the SWAMP network's performance by introducing an in-field sink and fusion centre use of the open-source cloud to reduce cost. we called our improved model an energy-efficient water management platform (EEWMP).In the proposed EEWMP, The field sink node collects the data from the field's sensors and sends it to the fusion centre. The fusion centre aggregates the data and removes redundant information, thus reducing communication traffic and energy consumption. FIGARO(Flexible and precise irrigation platform to improve faRam scale water productivity) project was started. The FIGARO project is a decision support system proposed to manage freshwater irrigation and improve production. In this paper, they proposed IoT based elegant farming model that uses mobile devices information processing systems and cloud services. Future interested in developing smart irrigation models for irrigation systems drip, and sprinklers also interested in utilizing other sensors to make smart irrigation models and algorithms for different soil types such as gravel, silt, loam, sand and barren land.

[3] Pratap Singh Solanki et al. Tries to predict rainfall, Flood warnings, water availability, Requirements, etc. based on huge available metadata using various methods. In this paper, they tried to search the use of data mining techniques for predicting the inflow, drought possibility, Weather report, rainfall, Evaporation, temperature, wind speed, etc. In this survey, we found that the thinking offered by the advent of computer technology is highly complementary to some of the goals of water management. Services delivered by technology are interactive, fast, and multi-dimensional. In this way, Data mining offers us a much-needed opportunity to deliver scientific findings and information to stakeholders and decision-makers for providing collective decision-making tools.

The IoT enables things selected recognized or potentially forced remotely crosswise over completed the process of the existing configuration, and manufacture open gateways. The Development of smart agriculture and artificial intelligence can be cutting-edge technology in data compiling and resource optimization. The pest & insect controls that protect damaging crops and also optimize resource utilization can be a breakthrough.This paper proposes a thought of consolidating the most recent innovation into the agrarian field to turn the customary techniques for water systems into current strategies in this way making simple profitable and temperate trimming. Some degree of mechanization is presented empowering the idea of observing the field and the product conditions inside some long-separate extents utilizing cloud administrations. The point of interest like water sparing and work sparing are started utilizing sensors that work consequently as they are modified. This idea of modernization of farming is straightforward, reasonable, and operable. SMART(S-specific, M- Measurable, A-Attainable, R-Realistic, T-Time Bound)

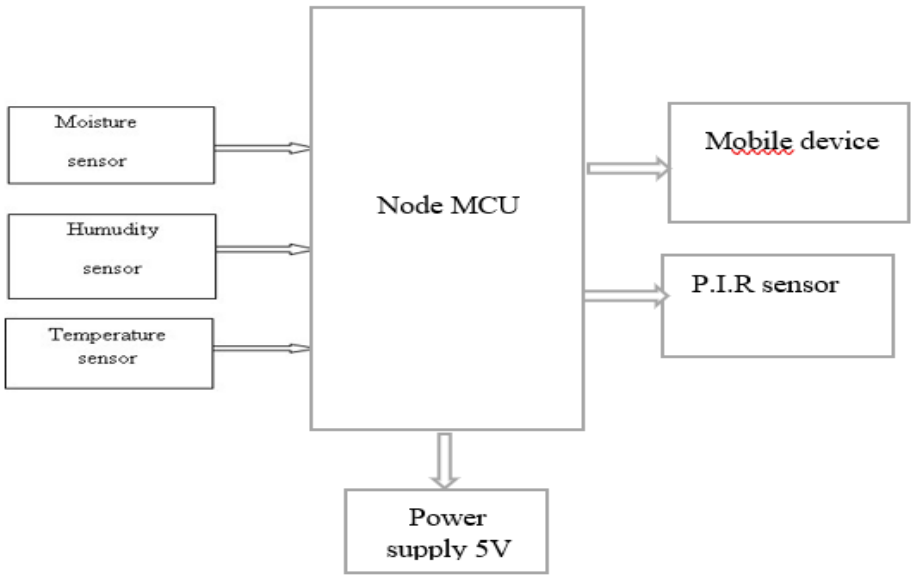
[4] **Haikal Hafiz Kadar et al.** AGRI2L system proposed as a part of the IoT solution. the system architecture and a detailed description of the physical scenario of how the AGRI2L system works for the management as a part of the IoT solution. The System architecture and a detailed description of the physical scenario of how the AGRI2L system allows for being managed and interoperable in the specific context of water resource management processes. AGRI2L system is the proposed system that helps farmers revolutionize current agriculture practices to smart farming practices. Water scarcity, urbanization, and climate change are also treated to the agriculture industry, this purposed system not only helps farmers to be more productive perhaps it will help to preserve nature.

[5] **Pradeepa Bandara et al.** Automating agricultural aspects is a mechanical process with or without human intervention in agriculture. Due to less space of domestic land, it has become an important area of choosing the most suitable crops based on prevailing factors in the selected area. In Sri Lanka even though there are enough knowledge, techniques, and methods which are done manually available in agriculture, there is not any system in which the environmental factors are detected and suggests the user which crop type is best for farming. This paper is consisting of a theoretical and conceptual platform of a Recommendation system through integrated models of collecting environmental factors using Arduino microcontrollers, Machine learning techniques such as Naïve Bayes (Multinomial) and Support Vector Machine (SVM), Unsupervised machine learning algorithms such as K-Means Clustering and also Natural Language Processing (Sentiment Analysis) concerned with the Artificial Intelligence to recommend a crop for the selected land with site-specific parameters with high accuracy and efficiency. It has been a major problem to identify what to grow, any man has adequate space in the owner's land. Not only for domestic lands but also for farming lands. Why it has become a problem is that environmental factors such as temperature, water levels, and soil conditions are uncertain as they change from time to time. Due to these problems, this solution of crop recommendation system predicts to the user, what crop type would be the most suitable for the selected area by collecting the environmental factors for plant growth and processing them with the trained sub-models of the main of the system.

3. Proposed system

Lateral pipes are an essential component of modern irrigation systems, providing a reliable and efficient way to distribute water to crops. These pipes are typically made from high-density polyethylene (HDPE) or PVC and come in a range of sizes and configurations to suit different applications. One of the key advantages of lateral pipes is their flexibility. They can be easily installed and adjusted to suit changing crop requirements, allowing farmers to respond quickly to changing weather conditions and other factors that affect planes. IoT-enabled lateral pipes consist of sensors, actuators, and a central control system. The sensors measure soil moisture levels, weather conditions, and other relevant data. The actuators control the water flow through the pipes based on the data collected by the sensors. The central control system collects the data from the sensors and sends commands to the actuators.

The data collected by the sensors can be used to create a real-time map of the farm, showing which areas require more or less water. This information can be used to adjust the water flow through the pipes, ensuring that each crop receives the right amount of water. The central control system can also be programmed to take into account factors such as the type of crop, the time of year, and the weather forecast.



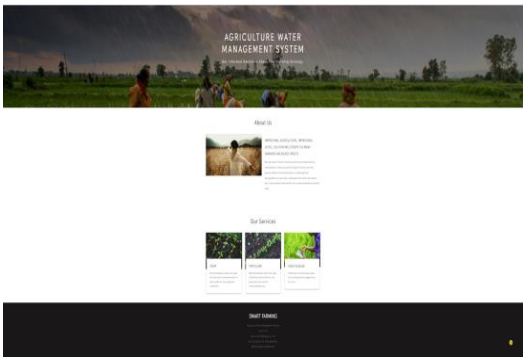
Lateral pipes offer many benefits to farmers and growers. One of the most significant is their ability to conserve water by delivering it directly to the root zone of crops, reducing wastage due to evaporation or runoff. This can result in significant cost savings for farmers, while also helping to protect the environment by reducing water usage. In addition to water conservation, lateral pipes also help to improve crop yields and quality by ensuring that plants receive a consistent supply of water and nutrients. This can lead to healthier plants with stronger root systems, better resistance to pests and diseases, and higher yields of high-quality produce

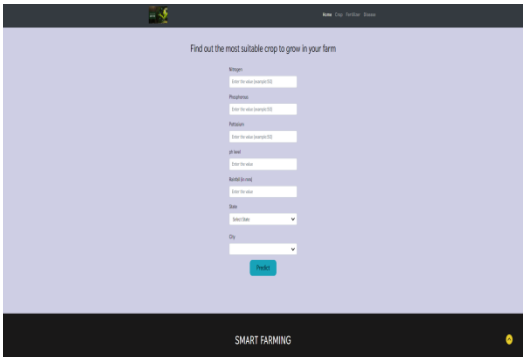
Crop Recommendation for Efficient Water Management In the crop recommendation application, the user can provide the soil data from their side and the application will predict which crop should the user grow. Different crops have varying water requirements, and it is essential to recommend crops that are suitable for the available water resources. For example, some crops like rice and sugarcane require large amounts of water, while others like millet and pulses can thrive with minimal water. Recommending the appropriate crop can help farmers maximize their yields while minimizing water usage. Irrigation techniques also play a significant role in crop recommendation. Different crops require different irrigation methods, and choosing the right one can significantly impact water usage and crop yield.

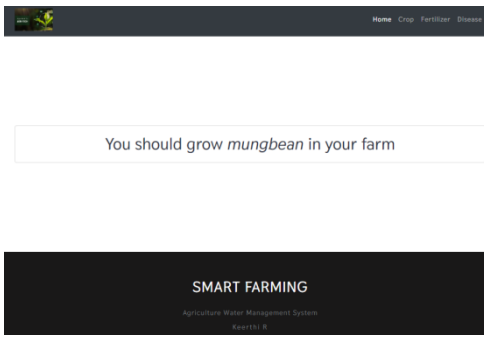
Fertilizer Suggestion System In the fertilizer recommendation application, the user can input the soil data and the type of crop they are growing, and the application will predict what the soil lacks or has an excess of and will recommend improvements. IoT technology has made precision agriculture possible, allowing farmers to collect vast amounts of data about their fields and crops in real-time. This data is then analyzed by sophisticated algorithms to provide insights into soil health, moisture levels, and other key factors that affect plant growth. By integrating fertilizer suggestion systems with IoT, farmers can leverage this data to make informed decisions about when and how much fertilizer to apply. This results in more efficient use of resources, reduced waste, and improved crop quality and yield. While fertilizer suggestion systems have many benefits, there are also some challenges and limitations to consider. For example, these systems rely heavily on accurate and up-to-date data, which can be difficult to obtain in certain regions or under certain conditions.

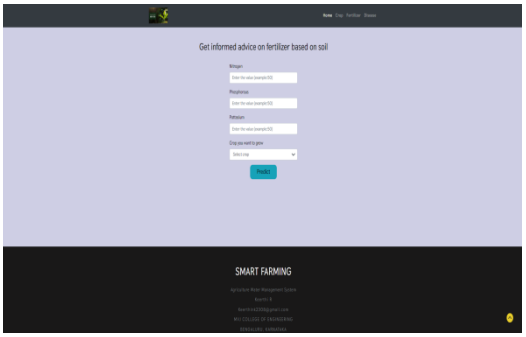
Leaf Disease Detection System For the last application, which is the plant disease prediction application, the user can input an image of a diseased plant leaf, and the application will predict what disease it is and will also give a little background about the disease and suggestions to cure it. Disease detection systems using IoT technology offer several benefits to farmers and the environment. Firstly, they enable early detection of diseases, which can prevent crop losses and reduce the need for pesticides. Secondly, they help farmers optimize their water usage by providing real-time data on water quality and soil moisture levels. This can lead to significant cost savings and reduce the environmental impact of agriculture. Finally, disease detection systems can improve the overall efficiency and productivity of the agricultural sector. By automating certain tasks, such as data collection and analysis, farmers can focus on other important aspects of their business, such as marketing and sales.

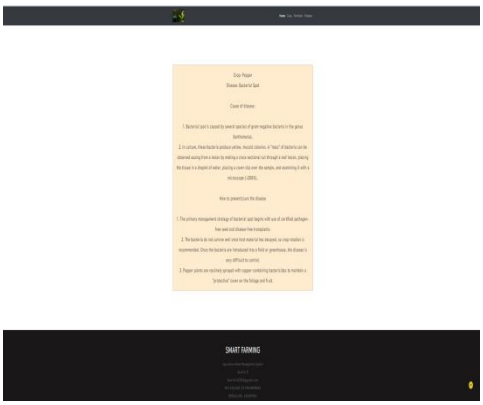
4. Results


AGRICULTURE WATER
MANAGEMENT SYSTEM
About Us
Our Services
SMART FARMING


Find out the most suitable crop to grow in your farm
SMART FARMING


Home Crop Fertilizer Disease
You should grow mungbean in your farm
SMART FARMING
Agriculture Water Management System
Keerthi R


Get informed advice on fertilizer based on soil
SMART FARMING


SMART FARMING


AWMS
Temperature
32.5
0
100
Humidity
41.3
0
100
SoilMoisture
0
0
100
Pir
ON
Motion

By leveraging these technologies, farmers can make more informed decisions about water usage, reduce waste, and increase efficiency. However, it is essential to address the challenges associated with adopting these technologies, such as cost and accessibility, to ensure that all farmers can benefit from them.

5. Conclusion

The Agriculture monitoring System design is very simple to understand and handle. It can be operated by all age groups of farmers. It can be programmable to add more features. It is user-friendly and can also be used by uneducated farmers. The use of IoT technology allows for real-time monitoring and data collection. This can help to detect problems and provide insight into the effectiveness of water management practices this can help to improve water management strategies, this system helps to improve crop yields and provide real-time data for monitoring and analysis. However, it is important to ensure that the system is properly installed and configured and that security measures are in place. In agriculture, the value of irrigation water is dependent on the price of the crops produced, economic research combined with a greater understanding of water/irrigation governance provides the basis for optimism that future advances in agriculture water management, particularly where it is embedded in integrated water management and can lead to a more sustainable irrigation future despite potential climate change and demand growth impact.

In a modern environment with less space and less knowledge of agriculture, all the factors are considered from the perspective of farmer and plant, and the farmer is properly guided until the harvesting. Before selecting any plant to grow it is important to have the knowledge and an understanding of the factors that affect the cultivation and how to maintain or control them. As our farmers presently are not using technology in their farming practices, they are lagging behind in their farming approaches. Hence, we have made this project to encourage farmers to use the current technology instead of relying on old methods. Growing a crop requires a lot of knowledge and insight into many things such as the contents of the soil, the temperature of the place, etc. and hence it would make sense for the farmer to adopt newer technologies as it would make his life easier. Using machine learning algorithms, we predicted an accuracy of 99% in predicting the right crop to grow and if the farmer adopts this technology it would not only make his life easier but also help him in making decisions that do not exploit the environment.

Machine learning algorithms can predict agricultural yields and identify the ideal crops for a given region if they have access to detailed data on soil characteristics, and crop genetics. Farmers can now make data-driven decisions and maximize their crops. One of the main benefits of these systems is their ability to accurately anticipate crop yields and resource requirements. Farmers may also refrain from using excessive amounts of water and other resources in order to promote more sustainable and effective farming. In addition to enhancing productivity, crop prediction, Leaf Disease detection, and recommendation systems can assist in addressing issues related to global food security by ensuring an adequate supply and lowering the risk of crop failure.

References

[1] **Ritika Srivastava1, Vandana Sharma2,** (CSE)Krishna Engineering College, Ghaziabad, Uttar Pradesh July 2020.

[2] **Muthunoori Naresh, P Munaswamy** International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878 (Online), Volume-7 Issue-5, January 2019.

[3] **Rafi Ullah,1ArbabWaseemAbbas,1MohibUllah.** Received 24 January 2021; Revised 17 March 2021; Accepted 26 March 2021; Published 8 April 2021 Academic Editor: Shah Nazir.

[4] **RONALD MARSH1 AND ALI S. ALSHAMI** Received February 21, 2022, accepted March 23, 2022, date of publication March 31, 2022, date of current version April 7, 2022.

[5] **Popovic Et Al.** presented a case study on IoT-based precision agriculture platforms that use different sensors, IoT protocols, and analytic tools for ecology monitoring and precision agriculture.

[6] **Kamilaris Et Al.** proposed a SWAMP-like theoretical framework for IoT-enabled smart farming that facilitates farmers by providing accurate information based on semantic reasoning and real-time stream processing for decision-making.

[7] **Jaiganesh Et Al**,. proposed an IoT-based elegant farming model that uses mobile devices, information processing systems, and cloud services. They also proposed an agriculture cloud (Agro Cloud) module to collect, process, and store the data.

[8] **Li Et Al,.** proposed an IoT-based greenhouse management system that uses various Android applications, sensors, communication protocols, and different hardware. Their proposed system offers general control functions such as temperature, humidity, and light adjustment functions. Furthermore, the system also offers various monitoring functions and weather forecasting functions.

[09] **Karpagam Et Al.** proposed the IoT-enabled intelligent irrigation system for efficient water management and distribution. Their system monitors the water level in the field and supplies the water according to the need automatically with minimal human effort.

[10] **Gupta Et Al.** proposed an IoT-based intelligent irrigation system with a flood prevention system. They proposed a water level analysis system using well-maintained databases that measure the amount of rainfall and humidity level and predict future threats.

[11] **Orazio G. Et Al.,** Used a new data mining technique named Evolutionary Polynomial Regression (EPR) and uses a polynomial structure whose exponents are selected by an evolutionary search, thus providing symbolic expressions. He carried out a case study of the UK water distribution system

to predict the pipe burst failure rate of the water supply system. He identified some parameters viz. pipe age, material and diameter, soil corrosively, meteorological condition, traffic loading, internal pressure, etc., but these data are very difficult to obtain. The same dataset was analyzed by Savic et al. (2003) by means of a classification approach

[12]**Kiani And Seyyed Abbasi,**. proposed a sensor and IoT-based small farm monitoring system that monitors the temperature, humidity, and soil moisture to efficiently schedule the irrigation, harvesting, and cultivation plan.