

# Zero Internet & Hybrid Farming for Water Irrigation

R. Senthil Kumar

Assistant professor, Department of ECE, SSMIET, Dindigul, India

P. T. Raamprasanth, V. Ragul, B. Vijayakumar

Student, Department of ECE, SSMIET, Dindigul, India

**Abstract** - Around world wide , village side which is rural environment often do not have proper stable internet connection. To overcome this , we proposed an offline smart farming without internet which has a web terminal to control it offline without any internet connection where people uses it control inside their farms using a local host address . Basically it works upon large farms using multiple of components that communicate together using the Mesh protocol

**Key Words:** Agriculture, Edge communication, ESP-32, Decentralized systems network, water irrigation .

## 1. INTRODUCTION

Basically ,water becomes an extremely critical resource around globally ,water management in agriculture has become from optional or easily available to a mandatory requirement. Now a days ,precision agriculture aims to optimize water resource utilization, which the modern farming techniques remain largely inaccessible in many rural places . in world , the general infrastructure required for Internet of Things (IoT) systems—such as stable Wi-Fi or cellular networks can not be stable and changes. To overcome this problem, we build a decentralized, less irrigation with ESP32 microcontrollers. As we propose system ensures uninterrupted connectivity between components using the peer to peer communication and we automated water irrigation and also even we built a web terminal where we control them offline

## 2. LITERATURE REVIEW

According to current literature and old researches from few decades, there have been many different methods developed for automated irrigation systems from simple microcontrollers which may be ESP 8266 or even ESP 32 or Raspberry Pi that use the Internet.

Previous decades , systems were developed based on simple and economical hardware devices. The researchers Uddin et al. [1] used an Arduino-based model which uses the soil moisture and rain sensors for controlling water to irrigates plants, although they had faced many problems such as the external shocks from circuit or boards and the availability of hardware which often fails sometimes . Where another researchers developed a system using Raspberry Pi and OpenCV was designed by Balaji et al. [2] for identifying plant diseases. Even , if they use those system , it often needs more power which consume more battery and could not be stable for longer run of

charges. another research had extended to further include automation and monitoring within the house which can be controlled within the range of house . Rajapaksha et al. [3] developed a automation model for households that controls water and fertilizer flow depending on certain temperatures and moisture levels. Their devices lack on physical implementation .Moving towards cloud computing, Sittalatchoumy et al. [4] made use of the Blynk Internet of Things app which is used to monitor and collect real-time that can be used to control the plants environment. The system indeed need to incorporate software measures to detect the sensor inaccuracies or failures .

On recent years , there have been many improvements in agriculture using the control logic to minimize resource such as water and nutrients like urea and others. Ramya et al. [5] have successfully minimized water consumption by 27% using a Wireless Sensor Unit and Processing Unit that computes evapotranspiration and adjusts the watering schedule using a fuzzy rule-based controller which can turn on and off the controller to irrigate the plants.

Every researchers often go for the wired data transfer way than the wireless way which can bring more advanced level of innovations on it .

## 3. EXISTING SYSTEM

On world wide ,smart irrigation systems are designed to use the constant or stable access to internet and stable Wi-Fi networks. In traditional or past few decades , on agricultural where farmers frequently use manual methods or timer-based systems that may sometimes fail to operate on real time soil conditions Currently on world wide , the landscape for agricultural technology is still needed by cloud IoT methods which is way too costly . The architecture of the existing systems relies on a every sensor node must connect to a centralized place, which may be a local Wi-Fi router or a cellular GSM module which is device that provide the internet . so,those gateway generally transfer sensor data to cloud computing servers or chip or board for processing. After those process, the computer or esp process those info and the logic to trigger irrigation which will be executed remotely on the cloud server or manually operated via a farmer-controlled mobile application which is also need internet . even often ,those technologically advanced,lacks internet

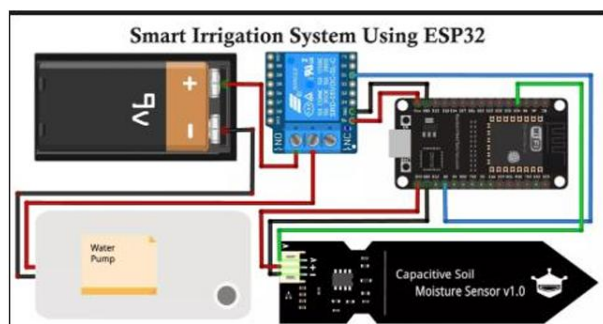


FIGURE 1 : Existing system

#### 4. PROPOSED SYSTEM

Our proposed system introduces a decentralized, internet less irrigation network using the ESP32 microcontroller and the ESP-NOW protocol which is peer to peer communication .This creates a private network that functions entirely offline without external providers

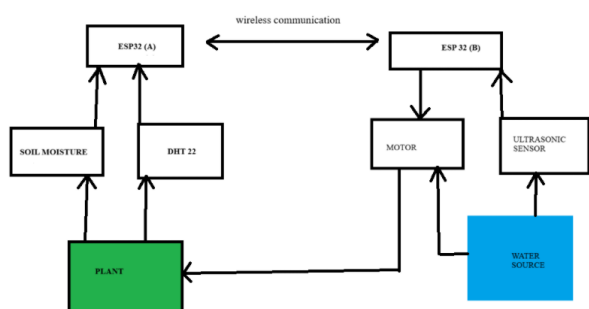


FIGURE 2 : Proposed system

#### 5. COMPONENTS

##### SENSOR NODE (FIELD UNIT):

ESP32 (A): Acts as the Transmitter. It gathers data from the plants and sends it to the main controller.

Soil Moisture Sensor: Measures the water content in the soil. If the resistance is high (dry soil), it triggers a data packet.

DHT22: Measures air humidity and temperature to prevent watering during extreme heat.

##### CONTROLLER NODE (HUB UNIT):

ESP32 (B): Which is the Receiver and Main Controller.  
 Ultrasonic Sensor: Fixed on top of the Water Tank to constantly measure water levels.

Motor (A) & (B): Motor A pumps water to the plants when "Dry" data is received. Motor B refills the main tank from a storage source if the Ultrasonic sensor detects the tank is empty.

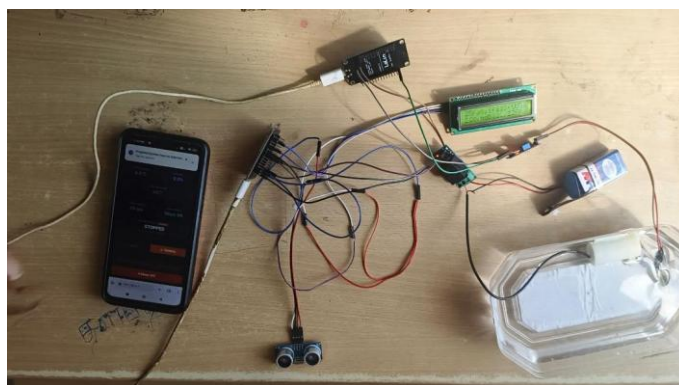


FIGURE 3 : Connection of Components



FIGURE 4 : WEB TERMINAL OF IRRIGATION SYSTEM (AUTO PUMPING)



**FIGURE 5 : WEB TERMINAL OF IRRIGATION SYSTEM  
(MANUAL PUMPING)**

### 3. CONCLUSIONS

Our proposed offline smart farming system is highly efficient to overcome the challenge of needing the stable Internet access in remote areas. So that, the ESP32 microcontrollers used in our system allow them to communicate with each other so that the smart farming working and its function without being connected to the Internet. Therefore, our offline smart farming system can operate on a farm 24/7. The irrigation system in the offline smart farming helps to optimize the usage of water resources and minimize its wastage which leads to prevent the global water scarcity. Offline smart farming systems contribute to agriculture by providing water only to plants that require it which was detected by sensor. An offline web terminal is user-friendly, enabling farmers to control the offline smart farming system. Therefore, offline smart farming systems become convenient for usage by residents in rural areas or even provides more benefits for the farmer who uses the water for agriculture uses. Moreover, offline smart farming systems are budget-friendly and suitable for use on small-scale farms.

### ACKNOWLEDGEMENT

We would like to express our sincere gratitude to all those who have supported and guided us throughout the successful completion of our project. We are highly thankful to the management of SSM Institute of Engineering and

Technology for providing us with the necessary facilities and a supportive environment to carry out this project. We extend our heartfelt thanks to our respected faculty members for their valuable guidance, encouragement and continuous support during the development of this project. We would also like to acknowledge the dedicated efforts and teamwork of our group members R.SENTHILKUMAR, P.T.RAAM PRASANTH, V.RAGUL, B.VIJAYAKUMAR whose cooperation and commitment made this project successful.

### REFERENCES

- [1] S. Aggarwal and A. Kumar, "A Smart Irrigation System to Automate Irrigation Process Using IOT and Artificial Neural Network", in International Conference on Signal Processing and Communication, Coimbatore, 2019, pp. 310-314.
- [2] A. Narayanamoorthy, "Economics of drip irrigation in sugarcane cultivation: case study of a farmer from Tamil Nadu," Indian Journal of Agricultural Economics, vol. 60, pp. 235-248, 2005.
- [3] R.suresh, et al., 2014. "GSM based Automated Irrigation Control using Raingun Irrigation system." International Journal of Advanced Research in Computer and Communication Engineering.
- [4] Kavitha K K, Payal Jain C, Rupendra Pratap Singh, Nishant Kumar, "Early Crop Disease Detection Using Image Processing and Monitoring and Controlling soil Moisture, Salinity and PH Using Sensor", International Journal for Research Trends and Innovation (IJRTI), ISSN: 2456-3315, Volume 3, Issue 5, 2018.
- [5] Yadav, Aditya & Agrawal, Manish & Kushwaha, Abhay & Shah, Saloni & Magar, Shirshak & Sharma, Pankaj. (2022). "Research paper of Automatic Plant watering system using IoT."