IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

IoT-BASED SOLAR POWERED FERTIGATION CUM PANCHAGAVYA(Natural Manure) DISPENSER

[1] Karpagam V, [2] Manoj D, Boopathi T [3], Saran Prabhu S S [4]

[1] Assisant Professor, EIE Dept , Dr. Mahalingam College of Engineering Technology , India.

[2] Student, EIE Dept, Dr. Mahalingam College of Engineering Technology , India

[3] Student, EIE Dept, Dr. Mahalingam College of Engineering Technology , India.

[4] Student, EIE Dept, Dr. Mahalingam College of Engineering Technology , India.

B.E. Electronics and Instrumentation Engineering

Dr. Mahalingam College of Engineering and Technology,Pollachi,INDIA

Abstract: Agriculture is the backbone of any economy, and with the increasing population, the demand for food is also increasing. To meet the food demand, farmers are using various techniques to increase the yield of the crops. One such technique is to use fertilizers and manure. The traditional method of using fertilizers and manure requires manual intervention, which is not only time-consuming but also labor-intensive. Therefore, we have proposed a solar-powered IoT-based fertigation cum panchagavya (natural manure) dispenser, which will automate the process of transferring fertilizers and manure to the crops.

Agricultural technology is gaining momentum these days, and with these updates, it has become much easier for farmers to grow annual and biennial crops. Although science has provided many new insights, the more severe climate change prevailing in most countries is preventing us from achieving the predicted results. In order to reduce these fanciful efforts of farmers, a prototype is designed here, which adopts multiple sensors such as a temperature sensor, soil moisture sensor, pH sensor, humidity sensor, etc., and is mixed with the controller to control. The desired output and this complete configuration can be monitored using batch. This in turn reduces the cost and time spent on labor. There is a high demand for these types of automation systems to meet the growing population of food production.

Index Terms **- Automated Fertigation System, Sensor technology, IoT.**

I. INTRODUCTION

The proposed system is a solar-powered IoT-based fertigation cum panchagavya dispenser, which will be used to transfer fertilizers and manure to the crops. The system will be equipped with a drip irrigation-like unit, which can transfer both fertilizer and panchagavya (natural manure) with water itself. The panchagavya is a mixture of cow dung, cow milk, cow urine, banana, butter, and some of few natural ingredients mixed together in a perfect ratio. This mixture called panchagavya was in a semi-solid stage it was mixed with water and contamination was filtered and converted into a liquid state and then poured into the fertigation system. The fertigation system will be connected to a cloud based IoT platform, which will allow farmers to control and monitor the system remotely.

To overcome this problem, an automatic monitoring system can be used. The system initially collects data from different nodes, processes it, and helps to verify the information in a well-organized manner. In total, this prototype helps farmers to analyze different measurements based on sensor data. This type of surveillance system can be applied in different fields such as security, industrial safety and health, and even the agricultural sector, it seems to have become a part of daily life.

IoT is used as a support system for the monitoring system, and a lot of networking is used. A batch can be simply defined as any communication network between two things rooted in connections between various electronic devices, software, objects, sensors, transducers, and actuators. Until now, we can't find any malfunctioning field. It depicts the rapid growth of many people in every industry. Here in this prototype, a NodeMCU is used as the main controller to monitor temperature, the water level in the tank, soil moisture and humidity, and soil pH. Since this controller is also an integrated Wi-Fi module, it is used to communicate the status to farmers.

Materials and Methods:

II LITERATURE SURVEY

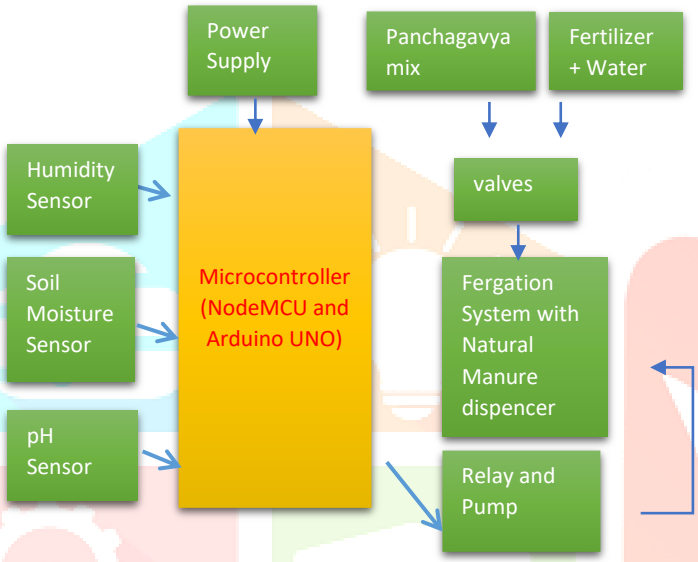
Sujaritha M and Sanjana R proposed a system to supply organic liquid fertilizers such as Panchagavya and Jeevamrutham to fields at the root node of crops. They used an Arduino controller connected to a flow sensor, a temperature sensor, and a water pH sensor to take various corrective actions using motors and solenoid valves based on the current values. This sensor data and actions (motor on and off and valve opening and closing) can also periodically monitored by ThingSpeak using Microcontroller.

Kushal M, Harsha K and Vidhya deliberated a crop monitoring system that maintains proper soil moisture and soil pH level using MSP 430 launchpad.

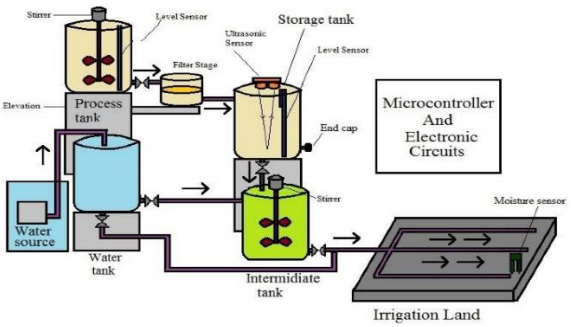
Boopathy S et al., considered horticulture parameters that observe basic parameters like soil characteristics, moisture, pH, water flow, etc. and feed the necessary nutrients for a sustainable environment.

Muhammad Zulhilmi, and Siti Amely suggested a simple agricultural system that enables farmers to monitor soil pH, moisture, and humidity levels to avoid such undesirable consequences. Fig 2: Sensor in Seat and Backrest

III BLOCK DIAGRAM



3. Block Diagram



There is totally two Main tank set-up, the small one for panchagavya and a big one for both panchagavya and water mixing purpose, When the panchagavya get mixed in tank 1, it is then moved to the second one through the filter, which totally filters the sediments from tank 1, in the second tank both water and panchagavya get mixed and supply was given to irrigation land.

IV PROPOSED SYSTEM

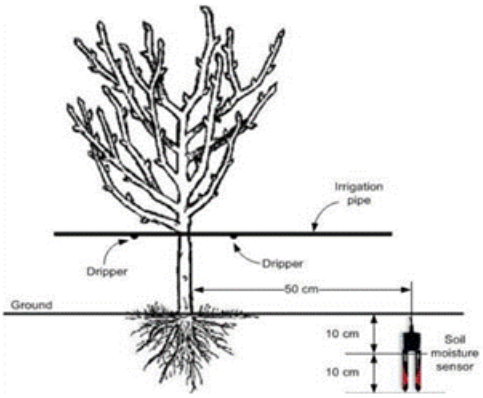
The proposed system is a solar-powered IoT-based fertigation cum panchagavya dispenser, which will automate the process of transferring fertilizers and manure to the crops. The system will consist of a fertigation unit, a panchagavya dispenser, a solar panel, and an IoT platform. The fertigation unit will be used to transfer fertilizers and water to the crops, and the panchagavya dispenser will be used to transfer panchagavya to the crops. The solar panel will provide power to the system, and the IoT platform will allow farmers to control and monitor the system remotely.

Working

The solar-powered IoT-based fertigation cum panchagavya dispenser works on a simple principle. The solar panel generates energy that is stored in the battery. The pump is connected to the battery and is powered by stored energy. The panchagavya and water mixture is stored in the storage tank. The pump is used to transfer the mixture from the storage tank to the drip irrigation system. The drip irrigation system delivers the mixture directly to the roots of the plants.

The reference image for irrigation pipe and soil moisture sensor insertion level.

The IoT (Internet of Things) technology is used to monitor the dispenser remotely. The IoT system is connected to the dispenser through a wireless network. The system can be accessed through a mobile application or a web interface. The IoT system can monitor the battery level, the storage tank level, and the pump status. The system can also send notifications when the battery level is low or when the storage tank is empty.



The reference image for irrigation pipe and soil moisture sensor insertion level.

IV . RESEARCH METHOD:

Here we discuss the hardware and software components of our project below:

Hardware:

The major hardware components include the controller and sensors. Here, the controller used is NodeMCU. It is compatible with several types of sensors. Sensors like temperature sensors, moisture sensors, and pH sensors. These sensors are used to measure the values like temperature, humidity, moisture level of the soil, and the variety of nutrients available in the soil.

IOT- Thingspeak:

Thingspeak database will store information about the Temperature, Moisture, and pH level of the field.

HARDWARE COMPONENTS

- Esp8266
- LCD display
- pH sensor
- Soil Moisture sensor
- DHT11 sensor

ESP8266:

It is called NodeMCU used here as an IoT module. It connects with the IoT platform Thingspeak and stores the data on that webpage.

DHT 11:

Used to detect the temperature.

LCD Display:

16x2 LCD Display is used in this system to display every value of moisture level and temperature

pH sensor:

Used to measure the pH value of the soil, and it is used to determine the fertilizer requirements of the soil.

Moisture Sensor:

It can be used to find out the moisture content in the soil, and thus it is used to calculate the amount of water required for plants.

SOFTWARE ERQUIERD:

- Arduino IDE
- ThingSpeak

Arduino IDE:

It is used to develop the source code for ESP8266 which will be configured to connect with the IoT platform, Thingspeak.

RESULTS

V RESULT AND DISCUSSION:

HARDWARE IMPLEMENTATION & RESULT

The results of the testing phase showed that the proposed system is highly efficient in transferring fertilizers and manure to the crops. The system was able to transfer the required amount of fertilizers and manure to the crops, and the drip irrigation-like unit helped in optimizing the water usage. The panchagavya dispenser was also highly efficient in transferring panchagavya to the crops. The solar panel provided sufficient power to the system, and the IoT platform allowed farmers to control and monitor the system remotely.

The proposed system is highly efficient in transferring fertilizers and manure to the crops. The use of panchagavya as a natural manure can help farmers in reducing the use of chemical fertilizers, which can have harmful effects on the environment. The use of a drip irrigation-like unit can help in optimizing the usage of water, which is a scarce resource in many parts of the world. The solar panel provided sufficient power to the system, which can help in reducing the dependence on the grid. The IoT platform allowed farmers to control and monitor the system remotely, which can help in reducing the manual intervention and can save time and labor. Overall, the proposed system can help farmers in increasing the yield of the crops, which can have a positive impact on the economy.

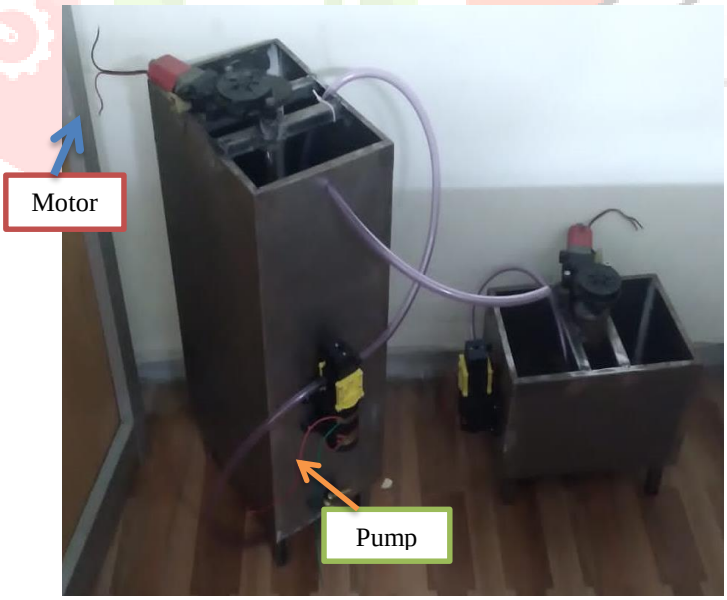


Fig 7.1.1 Larger and smaller containers together

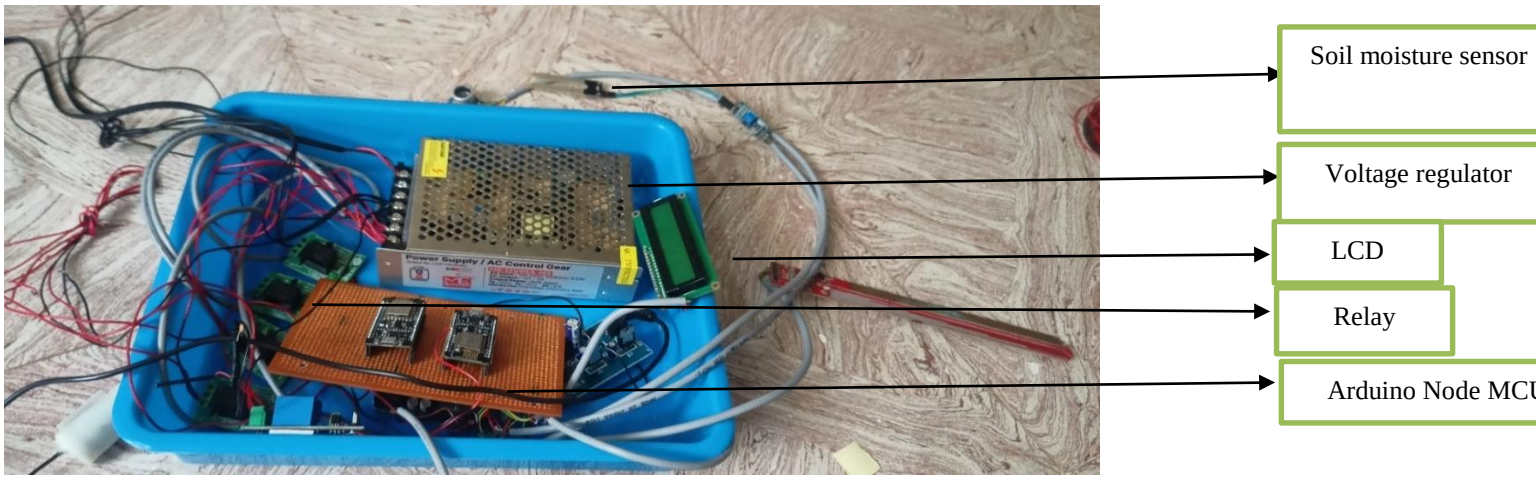
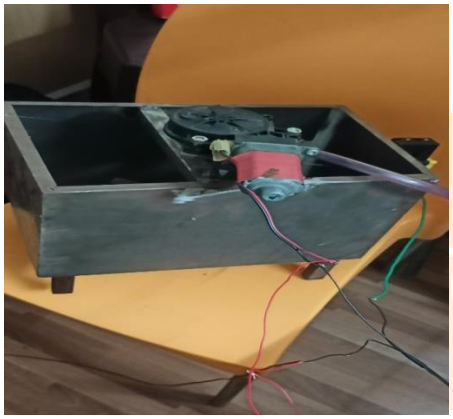


Fig7.1.2 IoT Based Solar powered Fertigation cum Natural Manure(panchagavya) Dispencer



Small container

Larger and smaller containers together

Finally, the solar-powered IoT-based fertigation cum panchagavya dispenser is a promising solution for the agriculture industry. The system is highly efficient and can help farmers in increasing the yield of their crops. The use of panchagavya as a natural manure can also have a positive impact on the environment. The system is easy to use and can be controlled and monitored remotely, which can save time and labor. The proposed system can be further improved by adding more features, which can make it more efficient and effective.

SOFTWARE IMPLEMENTATION & RESULT

The software implementation part is implemented using the ThingSpeak website, and we can monitor the output through the same website. Here in the channel, we can monitor the soil moisture level, air humidity, motor indication, temperature, etc..,

The list above LCD representation indicates the present level of our project.

It indicates several situations that like the panchagavya mixing state.

It also indicates the transfer of panchagavya into a second container, the addition of panchagavya with water, and the mixing of both the panchgavya and water together.

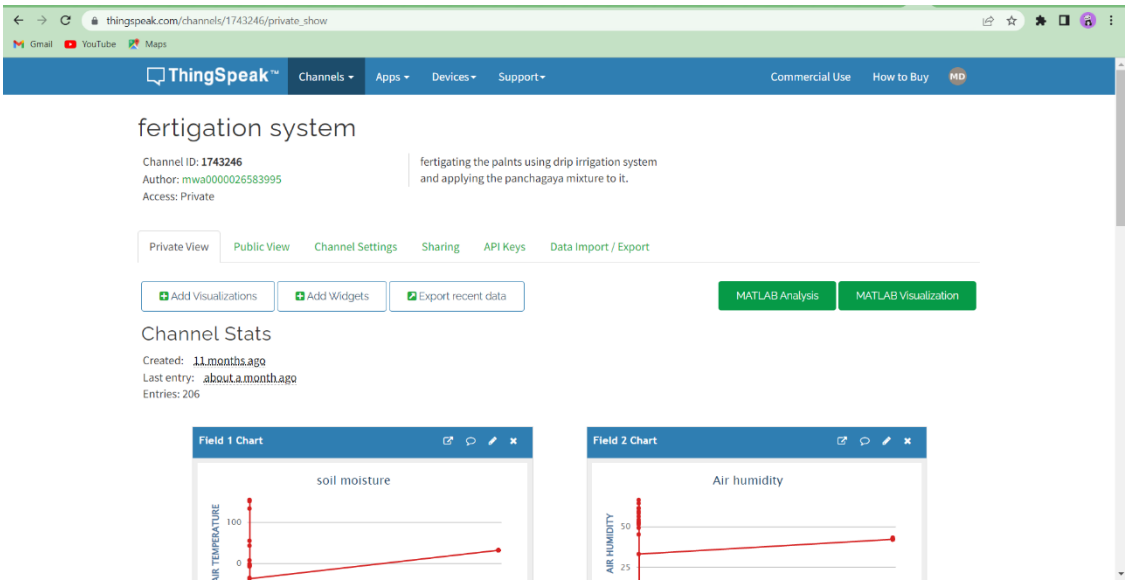


Fig 7.2.1 IoT MONITORING OF OUR PROJECT

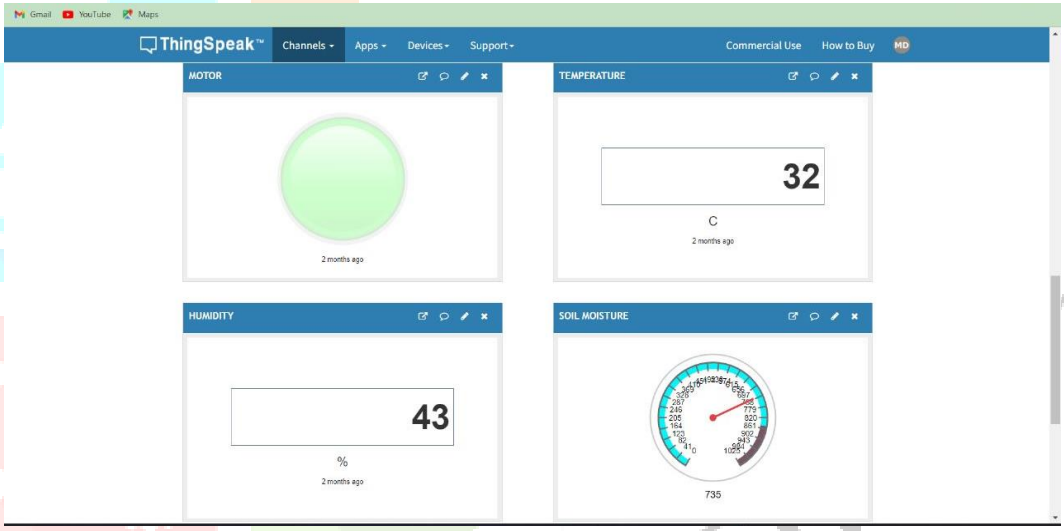


Fig 7.2.2 IoT MONITORING OF OUR PROJECT

Fig 7.3. Panchagavya is mixing

Fig 7.3.1. panchagavya is transferring into second container

Fig 7.3.2 . water is adding to the container

Fig 7.3.3. Panchagavya and water is getting mixed

III CONCLUSION:

In conclusion, the solar-powered IoT-based fertigation cum panchagavya dispenser is a sustainable and eco-friendly way to deliver nutrients to plants. Panchagavya is a natural manure that is free from harmful chemicals. The dispenser is powered by solar energy, which is a renewable source of energy. The IoT system allows farmers to monitor the dispenser remotely, which saves time and effort. The dispenser has a lot of potential for the future and can be improved by adding more sensors and actuators to the IoT system.

This system was tested in a small garden area, and the results were as expected. The moisture sensor, as previously stated, updates the soil moisture level, while the pH sensor updates the soil nutrient level in the controller. The valve is opened based on these values, and either water or fertilizer is drained into the field. Plant growth or crop yield can thus be automated without the need for human intervention. This could be expanded by incorporating loT into the network, allowing the entire process to be monitored from remote locations. This allows our farmers to focus on multiple options.

And the panchagavya was dispensed into the field as per our requirement.

IV FUTURE SCOPE:

The solar-powered IoT-based fertigation cum panchagavya dispenser has a lot of potential for the future. The dispenser can be improved by adding more sensors and actuators to the IoT system. This will allow farmers to monitor the dispenser more accurately and make adjustments as needed. The dispenser can also be integrated with other smart farming technologies such as weather sensors and soil sensors. This will allow farmers to make data-driven decisions and optimize their crop yield.

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