International Journal of Enhanced Research in Science, Technology & Engineering
ISSN: 2319-7463, Vol. 12 Issue 5, May-2023, Impact Factor: 7.957

Hydroponic Fodder Chamber Using IoT

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ABSTRACT

With the factual information being that more than half of the working population of India is involved in agricultural and related activities but still the agricultural sector corresponds to only about 10 - 20% of the country's Gross Value Added (GVA), to improve the agricultural situation in India, Smart Agriculture is very important and effective technique to get increase in agricul- tural output and reduce manual labor simultaneously. With many developments being made in Smart Agriculture or Smart Farming all over the world, we have worked on making a prototype for fodder chamber to grow fodder within mini- mum space using the basics of Hydroponics.

Keywords: ***Hydroponic, Smart Agriculture, Fodder Growth, IoT, Node MCU***

INTRODUCTION

Traditional farming can prove to be difficult and time consuming - with weeds, diseases, and the loss of arable land after harvest being some of the most common issues [1]. Smart agriculture introduced solutions like soilless farming, also known as hydroponics, have been developed in order to address these problems. Hydroponics requires no soil, only water and nutrients, and the traditional system has a single water tank with a recirculating motion [2]. This can help reduce overall water usage by up to 60 percent compared to traditional farming methods [2]. Nutrients added to the water increase yield, and the most famous hydroponic set-up - Nutrient Film Technique (NFT) - is based on a nutrient film created in the recirculating water [3]. However, traditional hydroponics has its own limitations, such as difficulty obtaining live sensing readings. Hydroponics remain a great option for those with limited space for growing plants. [5]

In this project there is use of mobile application which shows all the data collected by sensors. With these data, farmers control the hydroponic chamber as per their need. Among the sensors used are those for measuring water level, pH, tempera- ture, and humidity. Hydroponics is cost-effective and efficient method of producing food that has no impact on the environment. It may be used evewhere.[6].This system is made with minimum use of soil and also water. In this system there is maximum monitoring of nutrients needs for crop to grow. Use of Rhizobacteria to promote better growth of plant. Use of sensors to monitor the whole system.

This assessment of certain issues influencing nutritional solutions in soilless farming systems clearly highlights the main study areas in which the scientific community is involved.[7] In this system they have used four NodeMCU boards with sensors and actuators, programmed to do specific tasks. But there is need of human monitoring the system. Use of AWS cloud helps in storage of all the data collected through sensors. The most prestigious form of farming recycles water use and lowers the cost of farming and land for building a smart farm. [10] The paper uses Raspberry Pi, PH sensor to measure of acidity or alkalinity of the water, turbidi ty sensor to measure the relative clarity of a liquid, DHT22 sensor to measure moisture and temperature and BH1750 sensor to measure intensity of the light.

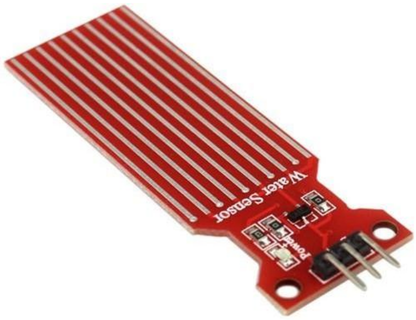
The data collected from the model is transmitted to Google firebase cloud.[11] Raspberry Pi has been used as a micro-controller board, Laser sensor is used to measure the height of the plant, PH sensor and Valve controller are also connected. The data collected through Laser sensor is sent to the microcontroller so that the user knows the correct harvest time. Valve controller automatically transfers the water to the chamber to maintain the level of water.[12] In this paper there are three main blogs. First one is node. The second block is API and backend, it acts as a middle layer to connect the node and frontend and a third blog is a Frontend - GUI provider to the user. The authors have implemented two kind of frontend applications, first one is web application and the second one is an android application. MIT App Inventor has been used to develop the application and website is made through using HTML, CSS and JavaScript.

METHODOLOGY

Components

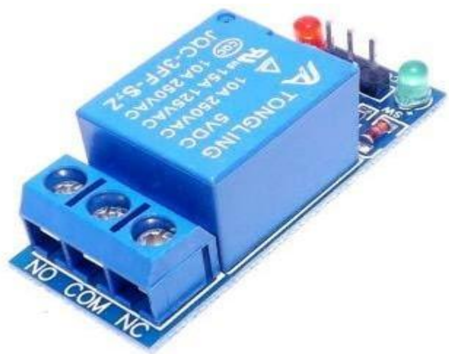
NodeMCU. **–.** ESP8266: For this prototype, ESP8266 is used as amicrocontroller considering the fulfillment of the functionalities required and the cost effectiveness.

Water Sensor: This sensor is used to detect water level to ensure that rightamount water is used for healthy



growth of the fodder.

Relay**:** It has been used for connecting the motor to the microcontroller.



Mini water pump **:** Mini Submersible water pump is used to help watersupply to the fodder.

IMPLEMENTATION

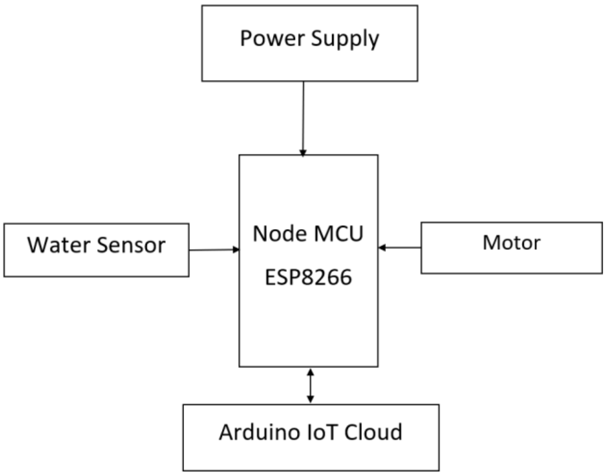
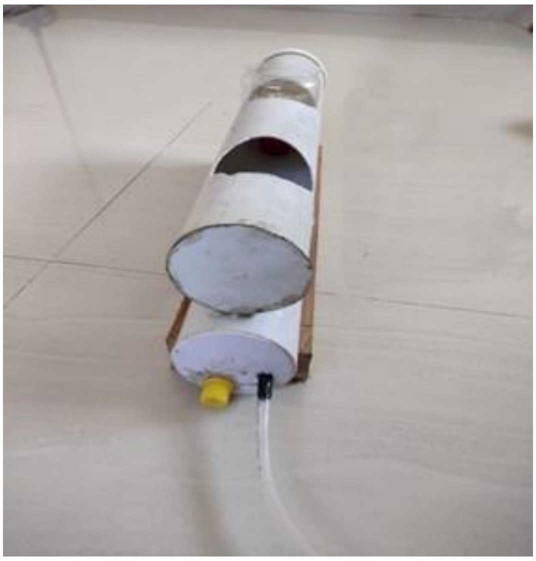
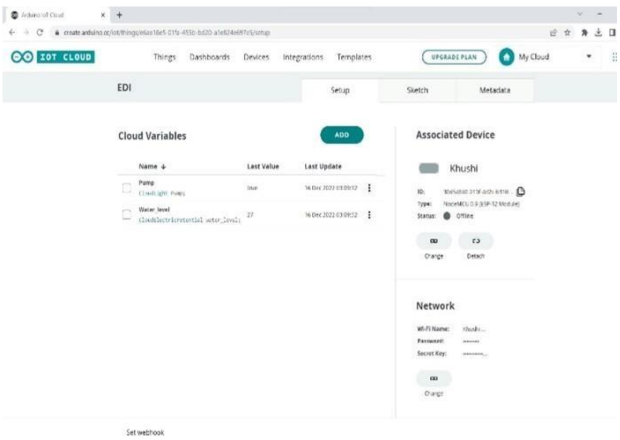


Fig. 1. Block Diagram:

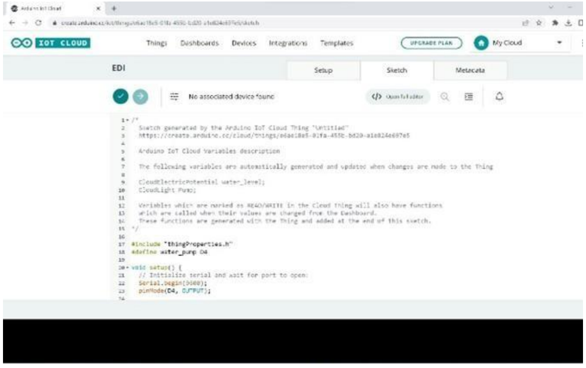
.We have used two PVC pipes together and connected them such that the upper pipe supports the growing fodder while water is provided via the lower pipe.

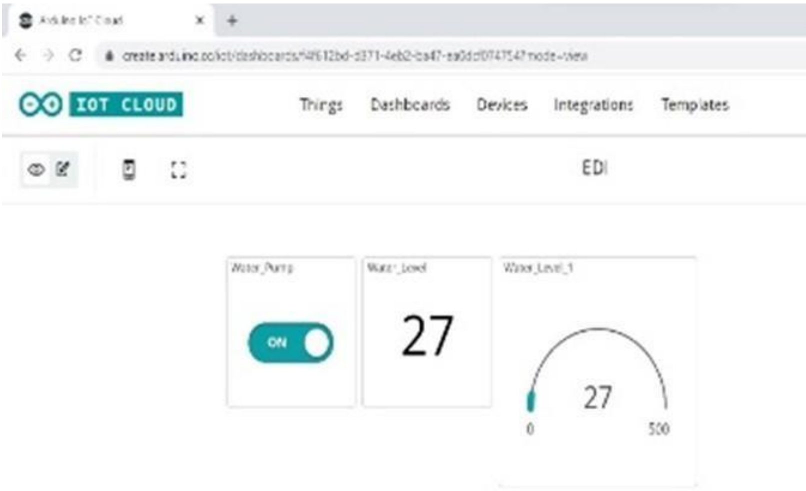


In the electronic hardware assembly, the node MCU is connected to the water sensorand the motor. Motor and node MCU are connected through relay



This image displays the two 'things' created.
This image shows the use of 'Sketch' function of the IOT Cloud platform to form and upload the code for NodeMCU.





This image shows the use of Dashboard of the platform used thatdemonstrates how the water flow can be switched on and off.

RESULTS AND DISCUSSIONS

It takes approximately 8 to 10 days for the fodder to grow to its full capacity.

The water pump can be controlled through the mobile application which also displays the water level detected by the water sensor at real time.

DAY 3:

Day 8:

Mobile app dashboard:

FUTURE SCOPE

Efficiency of the model can be increased by interfacing more sensors like PH sen- sor, NPK Temperature and humidity sensor. The design of the application can also be improved through an especially designed and coded website or android application.

CONCLUSION

For places where land quality is bad and/or space is lacking, the model proposed in this paper can provide an effective and efficient approach for growing fodder rather than traditional farming. The model is worked through using wheat in this model but the same can be successfully implemented using other seeds like corn, maize, bajra, etc

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REFERENCES

[1]. P. Sihombing, N. A. Karina, J. T. Tarigan and M. I. Syarif, “Automated hydro- ponics nutrition plants systems using arduino uno microcontroller based on android”, Journal of Physics: Conference Series,

Volume 978, conference 1,2018.

[2]. L. A. Velázquez, M. A. Hernández, M. León, R. B. Domínguez and J. M. Gutiérrez, “First advances on the development of a hydroponic system for cherry tomato culture”, 10th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE), 30 Sept-4 Oct, 2013.

[3]. Hanna Norn, Per Svensson and Bertil Andersson, “A convenient and versatile hydroponic cultivation system for Arabidopsis thaliana”, Physiologia Plantarum, Vol-ume 121, Issue 3, July2004.

[4]. Ullah, A. , Aktar, S. , Sutar, N. , Kabir, R. and Hossain, A. (2019) Cost Effec- tive Smart Hydroponic Monitoring and Controlling System Using IoT. Intelligent Control and Automation, 10, 142-154. doi: 10.4236/ica.2019.104010.

[5]. Sambo P, Nicoletto C, Giro A, Pii Y, Valentinuzzi F, Mimmo T, Lugli P, OrzesG, Mazzetto F, Astolfi S, Terzano R, Cesco S. 2019 Hydroponic Solutions for Soil- less Production Systems: Issues and Opportunities in a Smart Agriculture Perspective.

[6]. Rasheed, J., Latif, K., Sheraz, M. and Iqbal, A. Building indigenous smart hydroponic farm as lessons from an academic experiment--A review article. International Journal of Agricultural Technology,2021.

[7]. Anurag Shrivastava, Chinmaya Kumar Nayak, R. Dilip, Soumya Ranjan Samal, Sandeep Rout, Shaikh Mohd Ashfaque, Automatic robotic system design and devel- opment for vertical hydroponic farming using IoT and big data analysis 2021.

[8]. M. Rukhiran and P. Netinant, "Mobile Application Development of Hydropon- ic Smart Farm using Information Flow Diagram," 2020 - 5th International Conference on Information Technology (InCIT), 2020.

[9]. Navneet K. Bharti, Mohit D. Dongargaonkar, Isha B. Kudkar, Siuli Das. Hy- droponics System for Soilless Farming Integrated with Android Application by Inter- net of Things and MQTT Broker. International Conference (PuneCon) - Hydroponics System for Soilless Farming Integrated with Android Application by Internet ofThings and MQTT Broker,2019

[10]. Muralimohan G, Arjun S V, Sakthivel G. Design and Development of IoT based Hydroponic Farming Setup for production of Green Fodder. NVEO – Natural Volatiles & Essential Oils. Vol. 9No. 4 (2022)