Renewable Energy Integration Into Cloud and IOT Based Smart Hydroponic System

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Abstract **- Agriculture is an essential field of an economic development of a country. Farming needs to be adopted to satisfy consumers, so by using IoT (Internet of Things) it help to promote the agricultural field. In this setup, the system monitors temperature, humidity, pH, water level sensor by using Arduino UNO controller, nodemcu controller, internet of things (by using cloud), DC motor and solar panel.**

To analyze the effects of growth, production and water saving rate of planting crops using some traditional methods such as hydroponic system. Indoor farming is not a new technology, hydroponic farming is more developed and innovative that rapidly grow crops by excluding all the unnecessary elements of traditional farming.

Keywords: **Hydroponic System, IoT ,Cloud, Renewable Energy.**

I. INTRODUCTION

Hydroponic farming has a lot of promise for assisting agriculture industry in addressing these issues. The capacity to produce crops in near feasible conditions using stabled environment in agriculture technique. Hydroponic system is a method of providing nutrients to the crops and cultivating them with or without the use of an inert medium for example coconut fiber, rock wool. Hydroponic farms provide a route to a food ethic that is more sustainable that promotes the health of plants, bodies, and environment while avoiding the use of harmful chemicals. Hydroponic farming is already being swiftly incorporated into current food networks. This technique will also help to lower the cost of hydroponically farmed vegetables and make hydroponic farms keen with traditional farms as the business becomes more competitive. Hydroponic farms consume a lot of power due to the combination of high-intensity LED lights and climate monitoring and control equipment. It is critical that hydroponic farms invest in solar panels to obtain electricity from renewable sources. Hydroponic farming has a lot of promise for assisting our agriculture industry in addressing these issues. Hydroponics

is a way of growing crops without the presence of soil in a controlled manner by providing necessary nutrients to the crop. The existing systems of farming require regular ploughing and weeding of land, use of large area and enormous of amount of water. All these problems can be eradicated by using hydroponics system of farming, and reduce the work of the farmer by automating the watering processes. Environment under control The cultivation of plants in an indoor setting is what agriculture is (also known as weather and climate-proof farming, or more often indoor vertical farming).This document is a template. An electronic copy can be downloaded from The Research Publication website. For questions on paper guidelines, please contact the Research Publication as indicated on the journal website. Before submitting your paper, check that the format conforms to this template. Specifically, check the appearance of the title and author block, the appearance of section headings, document margins, column width, column spacing and other features.

II. RESEARCH BACKGROUND

In most of the agriculture cropping systems in specific arid regions, irrigation is a necessary activity, and effective water utilization and its applications, management are key problems. In general, self-dependent Irrigation systems distribute water fairly equally, however there are significant differences in characteristics of soil and water availability throughout most fields. The automation system needs multiple measurement sites to track up the local environmental condition parameters at various geographical location in order to function properly in an ultra-modern and large green house. The measurement system would be expensive, vulnerable, and difficult to move the measuring spots if it used cabling for monitoring. A Wireless Sensors Network is described as a group of nodes that can sense certain entities and transmit the sensed information across wireless networks. The information is sent to a control centre, which may be connected to other networks, such as GSM, via a single hop or multiple hops. The system displays the anomalous state of the land continuously (soil moisture, temperature level). Farmers can access the information by using a GPRS modem with G

III. PROPOSED METHODOLOGY

In India, agriculture is a key area of economic development. Internet of Things (IoT) will help to assist in farming is currently one of the recommended possibilities because farming needs to be specified in order to solve the problems of consumers. This methodology suggests using an Arduino Uno, pH sensors, internet, and DC motor to monitor the system's temperature, humidity, and water control.

A. Title and Author details

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B. Figures and Tables

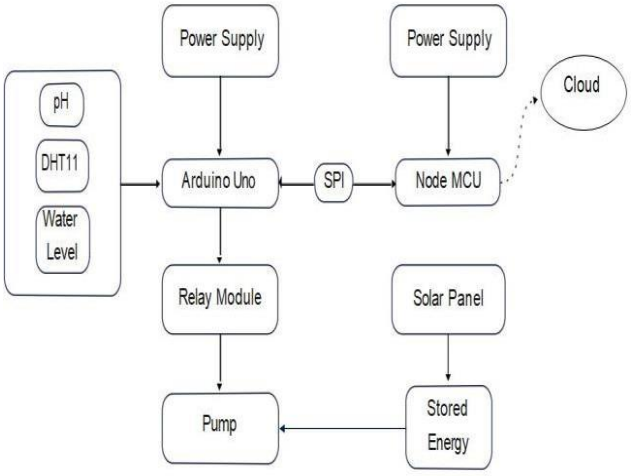


Fig. 1 Block Diagram of the proposed system

Fig 1 shows Arduino UNO is a controller to control all sensors. Arduino UNO uses ATmega328P controller to perform hardware and software functions. Arduino UNO contains a set of analog and digital pins that functions as input and output to the other components. A motor can be

started when it receives a command or signal from Arduino UNO.

DHT11 is a digital humidity and temperature sensor with low cost and easy to operate. It can be easily connected to the controller like Arduino UNO with its analog pins.

pH sensor is used in water quality monitoring and also in determining the water's acidity or alkalinity. pH value has range from 0-14. If water is acidic then pH values fall below seven. The pH sensor will signal a high alkaline level if the value is greater than seven. To determine the quality of the water, different pH sensors function in various ways.

Water level sensors used to detect and measures the amount of solution present in specific areas. The water level sensor will be start working when there is low water supplied in the proposed system. Once detected motor will operate.

Node MCU is used for sending data to cloud. NodeMCU is a compact, inexpensive microcontroller with WiFi capabilities that offers direct sensor communication through SPI. Support for the Arduino Integrated Development Environment facilitates module programming.

Solar system is used for power supply. Water Pumps Powered by Solar Energy. In many locations where the availability of electricity may be limited or non-existent.

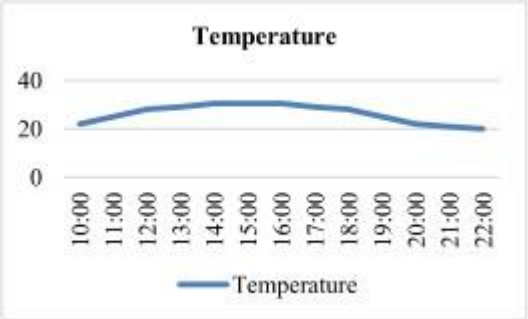
Battery is consumed power from solar system and gives power to the Arduino UNO.

Relay is used as a switch of water pump. We give 12v power supply to the relay. Water pump is placed in tank so the water pump will start when the field needs water.

C. Experimental Results

The data analysis was done by the ThingSpeak which is an IoT analytics platform service that allows you to aggregate, visualize, and analyze live data streams in the cloud. It monitored the pH, temperature and humidity and displayed it in graphical format. Each log is updated on a daily basis and shows the values that were achieved that day. The monitoring was done from 10:00 AM to 10:00 PM. The temperature graph in Fig. 2 shows the progression of temperature from 20◦C to 30◦C as the day leads to the night. Fig. 3 depicts change in humidity level in air from morning to night. It ranges from 50% to 70%. The pH log in Fig. 4 keeps track of the pH level of the water so that it is maintained to ideal range that ranges from 6 to 7. The pH value rises as the plant absorbs more and more nutrients from the water.

Fig. 2. Response of time vs tempreture



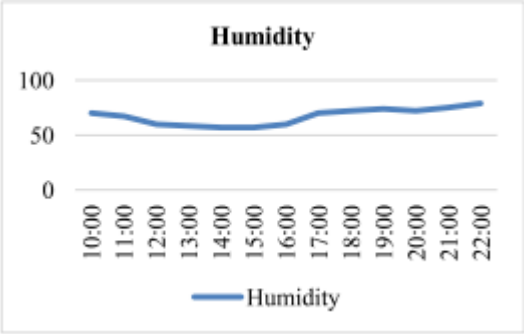


Fig. 3. Response of time vs humidity

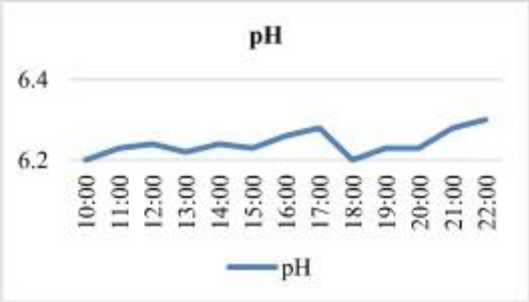


Fig. 3. Response of time vs pH

IV. Conclusion

This proposed model is developed to create a fully automated hydroponic system using renewable energy as a source which is less expensive and easy to handle. With the use of Arduino UNO and Node MCU, renewable energy source like solar panel a perfect board for IoT projects and a few sensors this goal will be achieved. The flow of water was controlled by automating the irrigation process. The need for any human interference in the system was eliminated. The nutritious plants with no use of fertilizers or pesticides were grown.

Acknowledgment

We are greatly indebted to my project guide Prof. Maithili Andhare for her able guidance throughout the course of this work. It has been an altogether different experience to work with him and we would like to thank him for his help, suggestions, and numerous discussions. We are gladly taking this opportunity to thank Prof. Dr. Rahul Mapari (Head of Electronics & Telecommunication Engineering Department) and Project coordinator Mr. Kishor B. Bhangale for their valuable guidance and for providing facilities during the progress of the seminar. We are heartily thankful to Prof. Dr. Harish U. Tiwari (Principal, Pimpri Chinchwad College of Engineering & Research, Ravet) for providing a research environment also for his kind inspiration.

Last but not least we are also thankful to all those who help directly or indirectly to develop this Project work and complete it successfully

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