Moisture Monitoring of Rice Fields in Jogotirto Sleman using Internet of Thing

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Abstract. Indonesia as a country that has a very large farm fields, nearly every resident in indonesia is as farmers of fruits and vegetables. Central Bureau of statistics noted in February 2017 that the total population of Indonesia who work as farmers there is 39.68 million or 31.86% of the population works. In the process of planting until harvest certainly need special care because many specific plants susceptible to the conditions of deprivation and excess water in the soil, the issues facing farmers is more often estimate the conditions just by looking at the State of the ground level one on rice plant. A good rice crops requiring a controlled humidity levels continuously. Based website that is connected directly on the control panel in the rice field area can facilitate the farmers to control or know the condition of the rice field area from a distance. The use of a moisture sensor that is connected with the arduino as a processing data and delivered with wifi module into the website, capable of generating data that can be read in realtime by users. This tool will make it easier for farmers knowing the value soil moisture from a distance , in order to be in the growth of plants grown with good quality.

Keywords: Plants, Moisture, Rice Monitoring, Arduino.

1 Introduction

Rice from rice is the staple food of more than half the world's population, and about 75% of global rice production was produced on low [1]. Rice or with latin Oryza sativa L. is one of the plants in cultivation in Indonesia. Rice in Indonesia itself has various types that are affected by several factors, like the weather, the soil structure of rice field surroundings, soil moisture, soil and water pH of paddy fields, and many other factors. For it is needed for identification in a good handling of every type of paddy. One of them is monitoring moisture rice area in real-time. It can help in realizing the rice farmers – a quality of rice [2].

Soil moisture condition influenced the puddle that is in the rice field. The movement of water and soil moisture in the hydrology system of rice fields can be predicted by a mathematical tool such as hydrological models [3]. Monitoring of soil moisture in different agricultural areas can help overall irrigation management. Different plants require different strategies and use the data real-time soil moisture is measured directly by farmers. The data obtained is used to improve the results by maintaining optimal soil moisture [4].

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In this paper, a device for remote monitoring of the proposed land-based website characteristics. These devices are reliable, cost-effective, power-efficient, and works in real-time. Through sensors installed in moisture fields and several other sensors that connect to the Arduino then obtained data results of sensors that are processed by the tool and delivered through forwarded ESP8266 module provider to the system website.

Several previous studies have conducted research related to agricultural monitoring. Agricultural monitoring systems have studied by implementing the Internet of Thing (IoT). IoT was also applied to the Green House Agriculture Environment by utilizing ZigBee technology and Various sensors are used to record soil properties and environmental factors continuously.

2 Material And Methods

2.1. Hardware

Hardware that is placed in the rice paddies of Jogotirto, Sleman, Yogyakarta, is some of the sensors connected to an Arduino Uno. After that the data processed before sent to users and accepted in the web database. Figure 1 is a visual device that operated in the field.

Fig. 1. The Control Panel

2.2. Sensor

The sensor used for this is the soil moisture sensor. This sensor consists of two probes to process the flow through the ground, then read the values to get the value of the level of humidity. The more water the land would more easily conduct electricity (small resistance), While the dry ground is very difficult to conduct electricity (resistance). The image sensor of moisture can be seen in Figure 2.

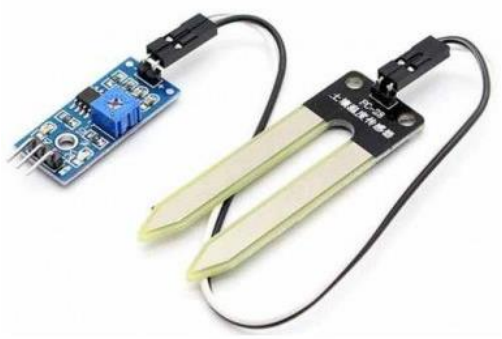

Fig. 2. Soil Moisture Sensor

2.3. Arduino

It is the used microcontroller hardware with chip Atmega8535. Where the minimum circuit using a single chip or chip DT-AVR.

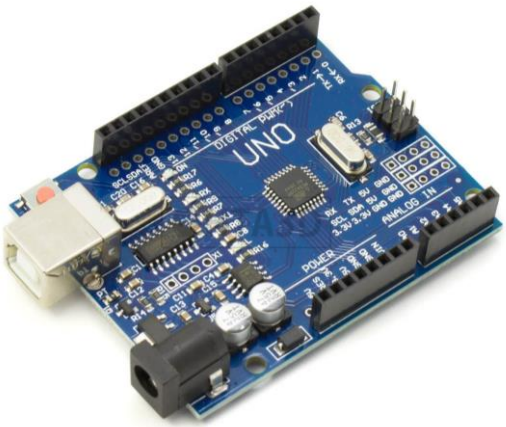

Fig. 3. Arduino Uno

2.4. ESP 8266

A wifi module for transferring data from the right panel field to website users. In this wifi module requires ESP8266. h to connect it with wifi and PubSubClient. h to apply it to users [5]. ESP 8266 schemes can be seen in Figure 3.

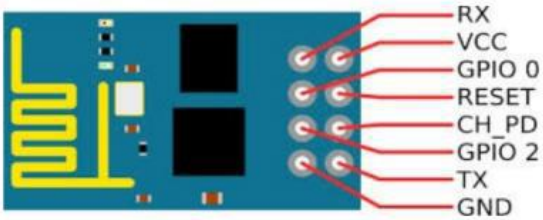

Fig. 4. Module ESP8266

2.5. Website

The use of the web with the web address http://ceerduad.com/kontroler/ is designed to monitor the results of observations of the sensors in an area of rice fields. There are several options that will place in election monitoring by Agrimon on this website. In Figure 4, the display looks home website.

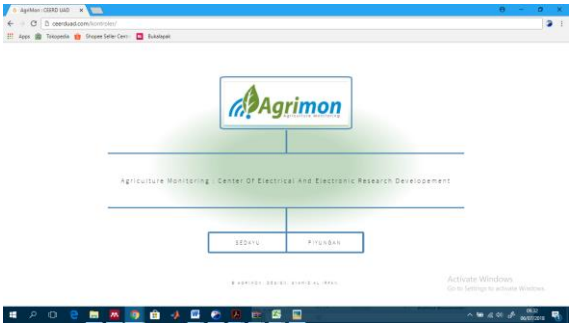

Fig. 5. The display interface of the website

3 Results And Discussion

The initial phase of research begins with doing the design of the system and determines the components that will be used, making the prototype hardware, making the program node and node sensors monitor, and do the testing.

The main part on measurements of soil moisture model for paddy soil moisture sensors and there is ESP 8266 integrated with a website that serves as a database to receive and store metering data.

From the testing done by soil moisture sensor to the Arduino send data to be processed, After that send it to Arduino wifi module ESP 8266 and forwarded to the provider that is then displayed on the web.

The Flowchart shown in Figure research stages 6.

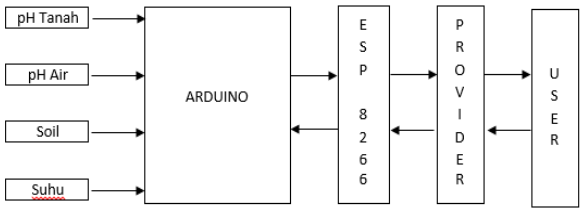

Fig. 6. Agrimon Flow Diagram

In Figure 6 is shown the process of measuring soil moisture using two electrodes with a distance of 50 cm and then measured the value soil moisture sensor use of imprisonment. The first time the two electrodes implanted as deep as 30 cm, then plus the depth of every 2 cm and measured the value of imprisonment then read the values to get the value of the level of humidity.

Fig. 7. Soil moisture Measurement module

In field observations obtained from the results of different moisture early in the morning to the evening and night into the morning. The following graph 3.1 is a result of the observations of humidity in the morning to the evening.

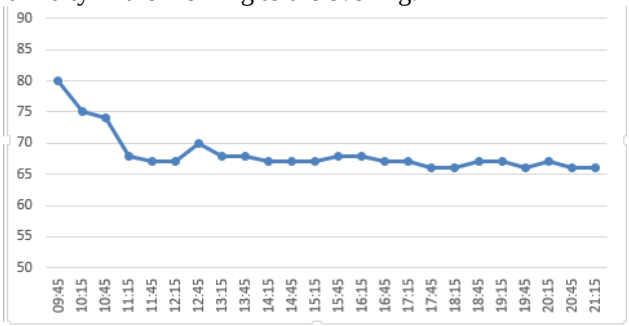

Fig. 8. Graphs of humidity fields area in the morning to the evening

In Figure 8 to see that increased during the soil moisture in the area of rice fields will be more stable. And it causes soil increasingly dry, therefore a good watering is required. While the table is in Figure 9 moisture rice field area in the evening to the morning.

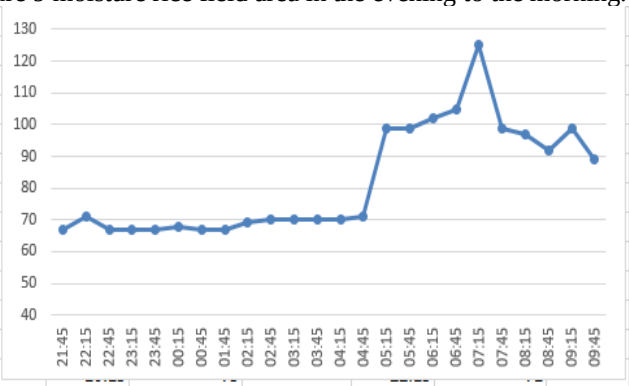

Fig. 9. Graphs of humidity fields area in the morning to the evening

While in Figure 9 visible soil moisture is getting up. It is also seen that the moisture conditions of the rice field area in the evening to the morning more moist than during the day.

From the results of the measurements look increasingly lunch then the higher water content, it is needed to maintain soil moisture in order to avoid the dryness caused by the heat of the Sun. And on the conditions of night moisture content calculated stable, due to the cold temperatures as well as by the absence of heat and the Sun evaporate the water.

The volume of soil that is measured is very important for the measurement of humidity. In some study area cannot be easily associated with a depth resolution for environmental heterogeneity with the depth of soil [6]. In some literature, obtained several studies related to the implementation of remote monitoring, but most developed in the robot [7][8]. Remote monitoring has been conducted in the field of monitoring the existence of new agricultural crops distribution management as in this reference paper [9]

4 Conclusion

By using this soil moisture gauges easier to monitor from a distance using a wifi module, as well as their use can also be accessed in realtime on Web sites that serve as the database to be a reference by farmers as the control area of the rice fields from a distance. Module for measuring soil moisture is still not perfect in terms of hardware due to her lack of outdoor conditions which often change – change. With conditions such as humidity measuring modules making it become out of sync.

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