

SOIL MOISTURE AND PH CONTROL DEVICE IN SPROUT CULTIVATION

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Abstract

Sprout cultivation is one of the practical and economical methods to obtain a type of food rich in nutrients. However, the success of sprout cultivation requires proper control of soil moisture and water pH in the cultivation environment. Watering begins when the moisture of the mung bean plant reaches the specified parameters with a soil moisture of 67 and a pH value of +9. This tool aims to make manual work easier to automate, a benefit in watering sprout plants. This tool uses a water pH sensor and a soil moisture sensor or soil moisture sensor that functions as a soil moisture detector that will send commands to the Arduino uno to turn on the relay so that the water pump can automatically water according to the needs of the soil. The creation of this final project is carried out by designing, making and implementing system components which include Arduino uno as a controller, relay to turn on the water pump and turn off the water pump, LCD (liquid Crystal Display) to display the soil moisture value and water pH value. The results of the research value prove that the tools to be made can function properly and can be developed as expected.

Keywords: *Sprouts (bean sprouts), Arduino Uno, Soil Moisture Sensor, Water pH Sensor.*

INTRODUCTION

In the field of science and technology, it has recently experienced very rapid development, resulting in new innovations that bring significant improvements. This development can be seen in various sectors, ranging from large industries to automotive appliances and also household electrical appliances.

Nowadays, convenience and efficiency of time and effort are the main factors in human activities. Along with the rapid development of technology, human work has become easier to do. Therefore, the author strives to create an automatic watering system for plants and a good water pH for sprout growth. Where in this tool the author uses a soil moisture sensor and a water pH sensor. As the main control and control in the tool.

This appliance is designed to water sprouts automatically by using a soil moisture sensor and an air pH sensor. Based on soil moisture and water pH sensors that have been set according to the needs of sprouts, this tool is

also equipped with an LCD (Liquid Cristal Display) that can display moist or dry soil conditions according to the readings from the soil moisture sensor and water pH sensor in the form of values on the LCD. This tool is also equipped with a water pump to water sprouts so that it is very beneficial for humans today, because with this tool humans do not need to water sprouts manually every day, for that this tool can be applied to humans who like to grow sprouts indoors or grow sprouts in small gardens in front of the terrace of the house and in other closed places. Against this background, a soil moisture controller and air pH sensor will be designed for sprout cultivation, using Arduino Uno and instructed by LCD to display the soil moisture value and the pH value of the water.

LITERATURE REVIEW

A. Sprouts

Sprouts or bean sprouts are vegetables that are young plants that have just germinated and are protected from light. The word bean sprout itself is a loanword from the Hokkien dialect, generally green beans and is often served on food menus from East Asia. Fresh bean sprouts are very rich in vitamin E, and are a dish that is widely recommended for consumption. Bean sprouts provide the benefits of vitamin E needs for the body.

B. Arduino Uno

Arduino Uno is a microcontroller development board that is very popular among electronics and programming hobbyists. It has a crucial role in democratizing access to hardware technology and opening the door for many people to learn and develop various electronic projects. Created by a team in Italy in 2010, the Arduino Uno is designed to be an easy-to-use and flexible platform. The board is based on an ATmega328 microcontroller that can be programmed using the Arduino IDE. The processor has a clock speed of 16 MHz and provides a number of digital and analog input/output pins that can be used to connect sensors, motors, and other devices.

C. LCD (liquid crystal display) 2x16

2x16 LCD, which stands for Liquid Crystal Display 2 columns x 16 rows, is one type of character display that is widely used in various electronic applications. With liquid crystal technology that can display alphanumeric characters, 2x16 LCDs are an ideal choice for displaying text information in electronics

projects. The 2x16 LCD consists of 2 lines, each with the capacity to display 16 characters. The characters that can be displayed are usually letters, numbers, and some special characters, depending on the type and configuration of the display.

D. 5V Relay

5V relays are an important electronic component in the world of controlling electrical devices using microcontrollers or other electronic systems. A 5V relay is an electromagnetic switch that is driven by an electric current. The working principle is similar to that of a mechanical switch, but it uses an electromagnetic field to drive its contacts instead of hand power. These relays are suitable for use within modern electronics circuits because they can be activated with the 5V DC voltage that is commonly available from microcontrollers such as Arduino or Raspberry Pi. 5V relays are a reliable and versatile component in the control of electrical devices in electronics projects.

E. Soil Moisture Sensor

The Soil Moisture Sensor is an important tool in the modern agricultural world and in the development of agricultural automation systems. A soil moisture sensor is an electronic device specifically designed to measure the moisture content in the soil around plant roots. This is important because the right soil moisture greatly affects the growth and health of the plant. These sensors generally consist of two electrodes inserted into the ground, which measure the resistance of the soil or the capacitance of the dielectric to determine the humidity level.

F. Water Pump 12V

Water pump 12v (12V water pump) is a device used to drain or pump water or other liquids using a voltage of 12 volts DC. A 12V water pump is a mechanical device specifically designed to drain liquids by using a 12-volt power source from a battery or other DC power supply. These pumps are made up of several core components, including an electric motor, an impeller (its wheels), and in some cases, valves or automation sensors.

G. Sensor Ph

A water pH sensor is an important device in the field of water quality measurement that functions as a measure of the acidity or alkalinity of a solution, in this context water. Water pH sensors play a crucial role in maintaining good water quality, both for industrial purposes, the environment, and domestic applications. With this technology, users can effectively monitor and control the pH level of water for the sake of environmental health and sustainability of water resources.

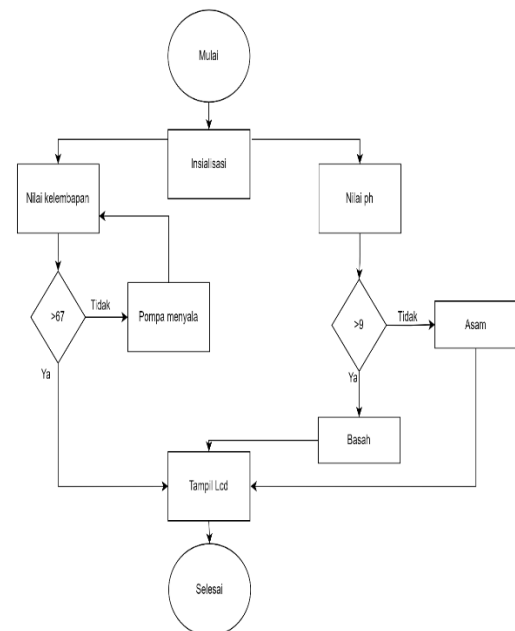
H. Power Supply 12V 5A

A power supply is an electronic device designed to provide a DC voltage of 12v and a current of up to 5 amperes. The input part is generally equipped with an AC cable to connect to an AC power source such as a home or industrial outlet, while the output part has a DC cable connected to a device that requires a voltage of 12V. The 12V 5A power supply is a vital component in modern

electronic systems, providing stable and safe power for a wide range of applications. With the ability to provide the right voltage and current, this power supply supports the reliable and efficient operation of electronic devices that require a voltage of 12V DC.

RESEARCH RESULTS

A. Flowchat



Picture 1 Flowchat

B. Data Analysis Methods

The results of the study will be presented in the form of quantitative data on soil moisture and pH to be stable or real time. This data is to assess the effectiveness of the tool in maintaining optimal conditions.

1. **Planning Stage:** Designing the tool's schematic and selecting the right components. At this stage, various sensors will be selected and tested to ensure compatibility and accuracy.
2. **Manufacturing Stage:** Assemble components and integrate sensors with microcontrollers. A prototype of the tool will be created and tested to ensure all components are working properly.
3. **Testing Stage:** Testing the device on sprout cultivation under controlled conditions. At this stage, the device will be operated in an actual sprout cultivation environment to collect moisture and water pH data.
4. **Evaluation Stage:** Analyze the test result data to determine the effectiveness of the tool in

It	Day	Time	Process	Information	
				Long	Moisture Soil
1.	1	16:00	Planting	± 0.5 cm	67
2.	2	16:00	Planting	± 4 cm	67
3.	3	18:00	Harvesting	± 6 cm	67

maintaining optimal humidity and pH. The data collected will be analyzed to assess the extent to which the tool is able to maintain optimal conditions and increase sprout growth.

It	Day	Time	Process	Information	
				Long	Ph Air
1.	1	16:00	Planting	± 0.5 cm	± 9
2.	2	16:00	Planting	± 4 cm	± 9
3.	3	18:00	Harvesting	± 6 cm	± 9

DISCUSSION

A. Product Results

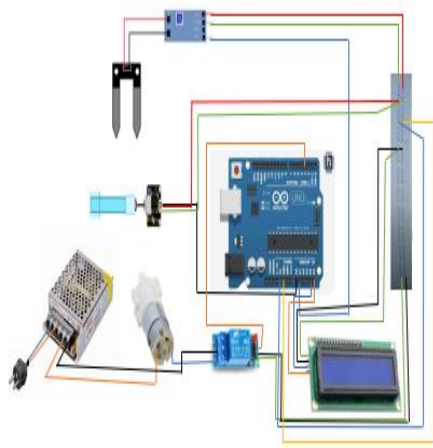


Figure 2 Component Product Design

Components of the tools used:

1. LCD 12x2
2. Arduino Uno R3
3. Soil Moisture Sensor
4. Sensor Ph
5. 5V Relay
6. Water Pump 12V
7. Breadboard
8. Power Supply 12V 5A
9. Junper cable

B. Data Presentation

Once the tool has been tested, the results of soil moisture and water pH measurements will be analyzed. The expected data are soil moisture stability in the optimal range for sprout growth and water pH suitable for sprout cultivation. Testing will be carried out in the same way as sprout cultivation (touge) and carried out manually, namely the process of planting time, automatic watering, stopping, and harvesting.

1. The first day, at 16:00, was carried out at the beginning of the cultivation of sprouts after. Soak the seeds for 10 hours.
2. On the second day, at 16:00 the watering process will automatically work.
3. On the third day, at 16:00 the tool stopped working.
4. The third day, at 18:00 the lifting or harvesting process.

Data Analysis of sprout cultivation or bean sprouts obtained the following data:

Table 1. Results of soil moisture experiments.

Table 2. The results of the ph.

CONCLUSIONS AND SUGGESTIONS

A. Conclusion

Based on the results of the design made, the following conclusions can be drawn:

1. Soil moisture sensors measure the moisture content in the soil. This data is important to ensure plants get the right amount of water and prevent underwatering or overwatering, which can affect plant health and water use efficiency.
2. Designing an Arduino Uno-based tool involves understanding the purpose, selecting components, designing the network, programming, integration, and testing. With a systematic approach and a deep understanding of the components and their functions, you can design effective and reliable tools for a wide range of applications.
3. Designing a water pH controller with the Arduino Uno involves selecting the right components, designing the network, programming, and testing. You can create an effective system to accurately measure and control the pH of water.

B. Suggestion

Based on the results of the research, the researcher suggests the following:

1. It can be developed to use other plants.
2. It is used for student learning in the electrical engineering environment.
3. You can add a good spray of water so that the

- leaves and roots of the plant will get wet.
4. Can add temperature sensor as good air temperature control.

preparation of this report. Hopefully this Thesis Report can be useful. Wassalamua'laikum Wr.Wb.

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