WATER CONTENT TEST TOOL ON DRIED COCOA FRUIT BASED ARDUINO MICROCONTROLLER

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ABSTRACT

Keyword:
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Sensor Soil Moisture
Microcontroller
LED
Lcd Monitor.

Currently cocoa beans (TheobromacacaoL.) is one of the agricultural products that has a fairly high selling price. One of the stages in the processing of cocoa beans is the process of choosing the quality of cocoa bean water content. Here farmers have difficulty in checking water content, because water content is very important in determining prices. Based on this, the author made a cocoa bean water test tool with the implementation of using Soil Moisture sensors to make it easier for farmers to make the decision to sell or dry them back so that farmers do not lose. In addition, the process of testing the water content is very easy to use just stick it into a pile of cocoa beans that have been collected or can also be plugged into cocoa beans that have been put into sacks. This tool is programmed and made using ArduinoIDE. As a link to the commands of the system that has been created, researchers use arduino uno r3 microcontroller, for the results of reading data from the mosture soil sensor researchers use lcd monitors as test results viewer, green ledcolor for good moisture content, yellow LED for moderate water content, and red led for high water content. The results of the study showed that the test that uses a container in which there are already cocoa beans in the amount of 1 kg with good water content conditions resulting from the tool sold is 6% and in the research tool 6.5% so that it can be concluded that the tool made can be used to measure the moisture content of cocoa beans with a small error rate of 0.5%.

1. INTRODUCING

Cocoa is one of the plantation products that can contribute to the increase in Indonesian foreign exchange in addition to cocoa has a high economic value. Cocoa production is increasing and we know the utilization of cocoa is very much, ranging from seeds to fat can be used into products. As one of the cocoa producers, Indonesia must be able to improve the quality of cocoa beans into a product in order to compete with other cocoa producing countries. Cocoa plants are plantation crops that have a high economic value and stable for farmers because they can be harvested every week. In the utilization of microcontrollers, the manufacture of water content test equipment models in dry cocoa-based arduino microcontrollers, testing tools in bottles using water content sensors, and also LCD monitors to display data sent by sensors. This tool will make it easier for cocoa bean entrepreneurs to know the value of the moisture content in a container and to find out the value of good moisture content and developers use partially color-coded LEDs to make it easier to know good quality[1]–[4].

A common problem of farmers that are found in the processing of cocoa beans well is the knowledge of farmers who are lacking with the processing, farmers only have experience but do not race on the correct procedures so that the lack of quality of cocoa beans is good and adversely affects cocoa farmers. The solution in the above description of the importance of an innovation from the development of technology is growing, it is necessary to design a tool that can monitor the water content in cocoa beans. Where this tool can find out the water content and display the data sent by the water content sensor in order to get suitable results for production and quality beans for cocoa farmers.

The grain water content measuring tool that has been made is very much for example MD7822 is this grain measuring tool that is often used by cocoa bean entrepreneurs but the tool is relatively expensive because there are still very few makers of these tools and researchers do innovation to make water content test kits in cocoa beans at a relatively cheap price and their use is very young for beginners.

Research design and manufacturing to make water content test kits on dry cocoa based on arduino microcontroller can provide good benefits, among others, being a new innovation in helping users be it farmers[5]–[7], cocoa entrepreneurs and cocoa managers. Can find out the water content in cocoa beans in order to get quality cocoa beans.

The purpose of this study is to make a water content test tool in dry cocoa based on arduino microcontroller so that it can help farmers and others in need, and understand and apply the use of Soil Mosture sensors in water content test kits in dried cocoa.

2. RESEARCH METHODS

A microcontroller is one of the basic parts of a computer system. Although it has a much smaller form of a personal computer and mainframe computer, microcontrollers are built from the same basic elements. Simply put, the computer will produce a specific output based on the inputs received and the programs being worked on. Like most computers, a microcontroller is a tool that works on the instructions given to it. That is, the most important and main part of a computerized system is the program itself created by a programmer. The program instructs the computer to perform a long tangle of simple actions to perform more complex tasks desired by the programmer.

Arduino is a type of board that contains a microcontroller. In other words, Arduino can be referred to as a microcontroller board.One of the famous Arduino boards is arduino uno. The language "UNO" comes from the Italian meaning ONE, marked by the first launch of Arduino 1.0, Uno in version 1.0 as a reference to the next Arduino, the latest version of Uno series equipped with USB. This microcontroller board is the size of a credit card, equipped with a number of pins used to communicate with other equipment. Interestingly, Arduino is actually a versatile microcontroller that allows it to be programmed. The program on Arduino can be called sketch. By writing sketches, we can give various instructions that will make Arduino able to run the task in accordance with the instructions given. In addition, sketches can be changed at any time.

In addition to arduino uno there is also another type of arduino, namely arduino mega which is larger than arduino uno and has 54 digital pins and16 analog pins. There is also arduino Lilypad which is a type of arduino that can be matched. Then there is the arduino nano where this type has a small size of 0.7 x 1.7 inches, and there are many other types of arduino such as arduino BT, arduino Leonardo, arduino intel galile. The function of the microcontroller in this tool is as a control center to process the input of water content from the sensor. Processing inputs and generating output in the form of commands to actuators. The system will be more compatible with processors that use AVR, which operate with 5V and with Arduino because they operate with 3.3V. The second is an unconnected pin, which is reserved for its development purposes.

As for the stages carried out in the research that will be carried out starting from the analysis of the needs, design and manufacture of sensor laying frameworks, the design of electronic architecture, the design of making cubes as a research room in this final task, assembly and installation and electronics used[8]–[10], after components and sensors have been integrated continued program creation, the programs made include algorithms and data output requirements displayed in the complete er, after the creation of the last stage of the program that is done is the testing and retrieval of data needed in the test [11]–[13].
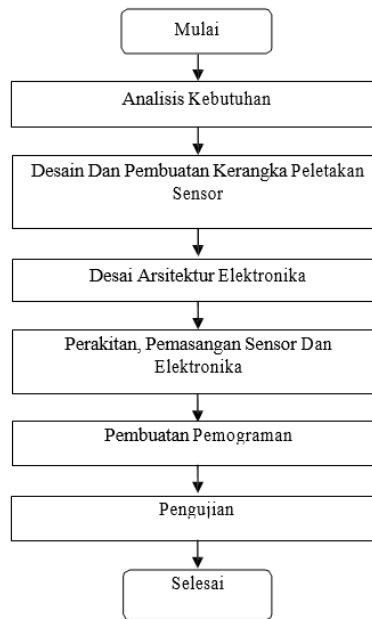
Figure 1. Research Method

3. RESULTS AND ANALYSIS
3.1. Analysis System

At this stage, researchers conduct a needs analysis in designing and building mechanism and electronics needed, mechanisms such as the following table

Table 1. Mechanism of Tools Needed

TOOL	Qty	Information
Soil moisture	1	Detects the moisture content in cocoa beans.
Comparator	1	The link between the sensor and arduino uno.
Arduino uno	1	As a program processing tool that has been created.
Led green	1	To display color code on good moisture content.
Led yellow	1	To display color code
Red led	1	at moderate water content.
LCD monitor	1	To display color code
Breadbord	1	at high water content.
20cm jumper cable	1	Displays information about soil moisture sensor readings.

3.2. Design and Manufacture of Sensor Laying Framework

At this stage, researchers design in 3D, a framework for the laying of sensors that aims to determine the size, shape, position of the sensor used and determine the material to be used. Sketchup Pro 2016 frame laying design can be seen in the following image
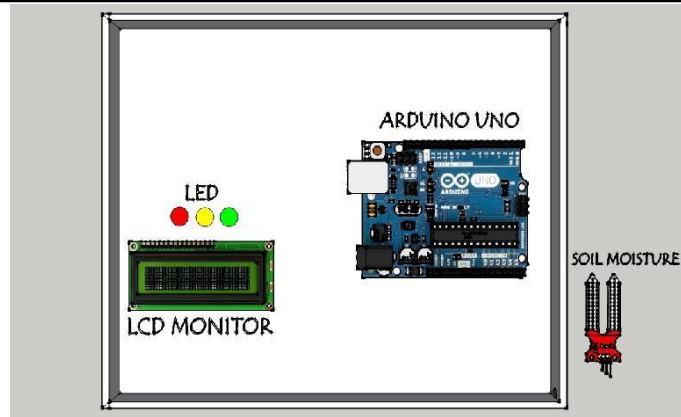
Figure 2. Sensor Laying Framework Design

3.3. Testing

After completing the stages that start from the needs analysis to program design and implementation, the last stage is the testing stage of soil moisture sensors[14]–[16]. Here are the tests that have been done by researchers:

a. Testing the soil moisture sensor reading by placing the sensor on an object that is cocoa beans.
b. Testing the lcd monitor display where the soil moisture sensor has detected a cocoa bean object will send data to the LCD monitor.
c. Testing green LEDs when the sensor detects that the moisture content <7% indicates that the moisture content in cocoa beans is good.
d. Testing yellow LEDs when the sensor detects that the moisture content <12% indicates that the moisture content in cocoa beans is moderate.
e. Doing red LED testing when the sensor detects that the moisture content >12% indicates that the moisture content in cocoa beans is high.

3.4. Tool Trial Results

Researchers conducted testing using 2 cocoa bean water content test tools, namely with tools made by the researchers themselves and tools that have been produced by the company. This trial is to find data from the readings of 2 tools using the same cocoa bean media[17]–[19].

Testing With Good Water Content in the following test is a good water content test that is < = 7%. In figure is the result that illustrates that the sensor works well and correctly in accordance with the system that has been made by researchers and the tools that the company's production works well[20].

Figure 3. Good Water Content Comparison Results

Based on the table depicted in the figure above, the data value of tools that have been made by researchers is 5% and the tools purchased by 6.2%. tool error made by 1.2%.

Moderate Water Content Testing is a moderate water content test that is > = 7 - < = 12%. In figure 4.7 is the result that illustrates that the sensor works well and correctly in accordance with the system that has been made by researchers and tools that the company's production works well.

Figure 4. Comparison Of Moderate Water Content

Based on the table depicted in the figure above, the data value of tools that have been made by researchers is 11% and the tools purchased by 11%. tool error made by 0%.

High Water Content testing is a moderate water content test that is > = 12%. In figure 4.7 is the result that illustrates that the sensor works well and correctly in accordance with the system that has been made by researchers and tools that the company's production works well.

Figure 5. High Water Content Comparison Results

Based on the table depicted in the figure above, the value of tool data that has been made by researchers by 19% and tools purchased by 18.5%. tool error created by + 0.5%.

It can be concluded the overall results of several test points of the average value obtained, namely (6 +7 +6+7)/4=6.5% of the value of the moisture content in the chocolate beans contained in the bath.

4. CONCLUSION

Based on the results of design and testing that has been done both hardware and software, several conclusions can be taken, namely with the tools that have been made using soil moisture

sensors can help reduce pricing errors to provide a suitable price for farmers. With the innovation of tools that have been made using soil moisture sensors not only large companies that can use the tool but among the middle to lower can use the tool at a low price and a very easy way of use, this tool easily knows the water content at that time also with the results of soil moisture sensor readings that will be displayed using LCD monitors and LEDs as a good color code, Medium, high.

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