Monitoring And Control Web Based System For Peanut At The Green House

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Abstract. Madura Island is one of the largest peanut producers in Indonesia, but the production of peanuts produced on average is still relatively low, ranging from 0.7 to 1.5 tons / ha. The low yield of peanuts is caused by several factors, one of which is unstable environmental conditions and pests that attack plants. Efforts to increase production can be done by monitoring plants. A monitoring system and control of peanut growth in a web-based plant house were designed. This system will carry out monitoring in the form of real time video and the detection of temperature and humidity sensors to stabilize the conditions in the plant house based on conditions of temperature and soil moisture. Monitoring system provides 2 control modes, automatic and manual control to handle watering solenoids and heating lights. The results of designing a monitoring and control system obtained data that is real time video capable of monitoring with speeds of 110 kb/s to 420 kb/s, sending sensor monitoring data no later than 1 second from the detected temperature changes, manual controls running according to the command on/off and not affected by environmental conditions day and night. Automatic controls run in accordance with the conditions set based on readings on sensors of temperature and soil moisture, ambient temperature affects the level of soil moisture and operation of the web can be accessed from different laptops but only on 1 network and web can only be accessed by someone who has an ID.

1. Introduction
Madura Island is one of the largest peanut producers in Indonesia. The production of peanuts produced on average ranges from 0.7 to 1.5 tons or ha, relatively low. The low production of peanuts is caused by several factors, one of which is unstable environmental conditions and pests that attack plants [1]. Peanut productivity can be improved by making improvements such as plant monitoring and maintenance.

Monitoring is the process of observing or checking plants that are carried out at any time and continuously from planting seeds to harvest time. Monitoring plants is usually done manually. This has limitations in several aspects, including time and effort. The human physical condition that includes the body is not always fit and exhausted will cause inaccuracy. Not to mention the issue of time allocation for conducting observations at the location, considered very inflexible. This method is not optimal for controlling monitoring continuously, over a long period of time and requires a high level of accuracy of control and high yield productivity.

New methods for monitoring plants can be optimized with the application of technology such as that carried out by several researchers from the field of agriculture by making time lapse or a video of plant growth obtained from photographing plants for a certain period. Data from observations can be used to obtain an analysis of factors
that affect plant growth, such as water, temperature and light requirements. Each plant has different water content, temperature and light requirements so that to get good growth, this portion must be fulfilled with the right portion.

In addition to researchers from agriculture, monitoring was also carried out by Arief C, et al with the research title "Monitoring and Control Systems Micro Environment in the Greenhouse Using Field Servers ". The system being implemented is monitoring plant growth in a green house by taking crop pictures from a webcam and this system can control the detection of conditions in a green house automatically [2].

From the background explanation, the purpose of this study is to design a monitoring system and control the growth of peanuts in a web-based plant house. Plant houses are equipped with cameras, temperature and humidity sensors and incandescent lamps that produce heat. This monitoring system will display data sensing from the environment captured by the temperature sensor and soil moisture sensor and display videos that can later be used as in the use of timelapse. Control that can be done via the web by activating watering when the temperature in the plant's house is too hot, on the other hand activating the heat-producing lights if the temperature is too cold automatically or manually. There are 2 choices of ways to control components in the plant house, automatically and manually which can be adjusted to the needs.

2. Literature Review
In this section there are several research related to the design of web-based peanut growth monitoring and control systems. This research was conducted by Naa C.F, et al. Entitled "Greenhouse Based Monitoring and Control System, Labview and Web Interface". This system using Arduino as a microcontroller, seven sensors each with temperature sensors, soil moisture, light and UV, RTC (Real Time Clock) as the input date on the system, relay as a light switch. The monitoring system is done offline and online, for offline using Labview and online using the Python program. The data displayed from this system is good because it provides an offline and online monitoring system, but the data displayed in the form of physical quantities and watering controls is only done manually through Labview [3].

Qoyyim M.A and Eko Agus S conducted research with the title "Designing Automation of Watering and Monitoring of Plants in Media Hydroponic Webcam". This system uses hydroponic media as an object of monitoring, sensors used are sensors LM35 and DHT11, this system uses a webcam as a catcher of images of plants. This system can know the quality of plants automatically by analyzing plants using a webcam as an image processing method that distinguishes the colors of Red Green Blue (RGB) fresh leaves and wilted leaves. This system monitoring process displays data in the form of plant videos from a webcam, but watering is the same as Naa's C.F is only done manually through Delphi 7 software [4].

The study conducted by Ramdani M, et al entitled "System Design Monitoring of Plants Using Zigbee and M2M Platform ". Compared with the research of Naa C. F and Qoyyim M.A, this system has automatic watering control and monitoring is done through the application. This system uses a wireless sensor network, the sensor used is an ultrasonic sensor as a detector plant growth based on plant height, light sensor and humidity sensor, the microcontroller used is Arduino uno. This system uses the zigbee platform as a remote monitoring data link. The monitoring data displayed by this system is the same as that of Naa CF which is in the form of graphics and monitoring distance is still limited because zigbee has the same system as bluetooth, only zigbee has a wider range of bluetooth and a transfer rate of 250 Kb or s 1 Mb or s [5].

Automatic watering is also found in Sawidin S's research, with the title "Monitoring the Control of Green House for Cultivating Chrysanthemum Flowers with Labview". This system has input from the keypad as a set point at the limit of light intensity, temperature, and humidity. The sensors used are temperature sensors, light sensors and humidity sensors. The microcontroller used by Arduino and Ethernet Shield as data viewers in LAN computer networks with TCP or IP capabilities. The system can display the display data of light signals, temperature and humidity to the LCD and laptop to display system monitoring data with Labview, but the data displayed is in the form of a graph [6].

Continued by Sutiarso L's research, et al entitled "Web-Based Plant Growth Monitoring System Application Using Machine Vision" has used various technologies by relying on image processing. The resulting system is able to provide real time video, displaying computational information in the form of a percentage of plant growth in the form of tables, graphs and charts as well as capture and image storage functions. But this system has no control on plants and image processing is hampered when plants have not yet grown because the soil reflects
sunlight and the intensity of light accepted causes the image processing algorithm to recognize soil as a plant so that it can affect the graph of image processing on monitoring [7].

Arif C’s research, et al” Micro Environment Monitoring and Control System in the Greenhouse Using Field Servers”. This system using a Field Server (FS) is the right instrument for monitoring environmental parameters in real time over the internet. The FS consists of the main components including: Web Server, ADC, DAC, Ethernet Controller, several sensors and IP cameras, so that the system is capable of displaying real time video and environmental parameters on the web. Compared to the previous system, this system does not have image processing and to access data there is a need to write different IP addresses to access between video and environmental parameters [2].

Besides monitoring on plant growth, there is also monitoring for room security, namely research belonging to Firdausy K entitled ”Webcam application for Web-based space monitoring systems”. This system provides security to the room by detecting objects using a transistor photo sensor. In this system, it gives the same output as the other, namely the display on the web, but to access the web is not bothered with a different address, only by accessing a web address can display real time video, capture images and record images when there is movement of the sensor [8].

Based on the above research, it is necessary to conduct further research related to monitoring systems and control of peanut growth in web-based plant houses. This researchhese several sensors, namely DS18B20 temperature sensor and soil moisture sensor as a detector environmental parameters that can affect the growth of peanuts. Arduino uno as a microcontroller, webcam as an image capture on plant growth. This system monitors through the web to display the results of temperature and humidity sensor readings, display real time videos and perform controls automatically or manually via the web.

This research is expected to be able to help researchers in agriculture in conducting research or studying plant growth and helping peanut farmers in monitoring and observing plant growth without having to go down to the field so that later can increase the productivity of peanuts

3. Concept of Monitoring and Control

The concept of the monitoring and control system is to create a web that is capable of displaying real time video from the process of plant growth inside the plant house. The Web is able to display the value of detecting the condition of the temperature and humidity of the soil in the plant house through the detection of temperature sensors and soil moisture sensors. The web provides automatic control and manual control. The general description of the monitoring and control systems in plant houses is shown in Fig. 1 (a). system has several components that are used and parts such as the base of the house plants, house plants as a room for controlling plant growth, the lower faucet for watering directly towards the plant roots, the upper faucet to do watering to cool the room, the lamp is used to keep the room stable on the temperature, the water tank as the height of the plant house to get water pressure so that watering goes well, gallons of water or water reservoir as a storage area for water. This prototype is made of elbow iron for the frame, acrylic for home walls and pvc pipes for watering as shown in Fig. 1. (b).

![Flowchart System](image)

**3.1. Flowchart System**

Flowchart of the entire work system of this research can be seen in Fig. 2. Fig. 2 shows the results of the system flow design. The first thing to do is in the web login process which is useful for logging into the main web page. On web pages there are several menu choices that are directly available on the main page (home), among
others, there is a choice of graphic links from monitoring sensors, real time video display, automatic control, sensor monitoring and manual control on or off.

Fig. 2. Flowchart system

4. Implementation and Testing

4.1. Work System Testing

Testing is done twice on the main laptop or server and on the user's laptop / laptop that is different from the server. Testing using a laptop server needs to be prepared for the software first such as xampp, webcam XP, processing and sketch arduino. After that to operate only need to open a web browser. Testing using a different laptop first connects to the same network as the main laptop, then open the page and enter the web on the login form as shown in Fig. 4 and enter data using the specified ID. The main page display after login can be seen in Fig. 4 (a) and Fig. 4 (b) which is on the main page where there is real time video, sensor monitoring, automatic control and manual control.
The use of this system to run automatic controls, the operator just has to choose the automatic button section, then the automatic control system runs according to the detection of temperature sensors and soil moisture sensors as well as the operation of sensor monitoring shown in Fig. 4. (a) and Fig. 4. (b)

Fig. 4. Monitoring sensor reading graphic

Testing on manual controls, the operator directly gives the order via tombol on the web to switch on or off the lamp and solenoid valve.

4.2. Test Result

The test results consist of several sections, the explanation of which is as follows:

4.2.1. Test results for monitoring soil temperature and humidity

Based on the monitoring tests that have been carried out, the results shown in Table I. and Table. II are obtained. Based on Fig. 1 the test table shows the influence of the heating lamp on the temperature in the room. Use of lamp media because the system uses lights as plant warmers.

| No | testing time | testing media | duration testing | initial temperature | detection result | temperature drop |
|----|--------------|---------------|------------------|--------------------|-----------------|------------------|
| 1  | afternoon    | Lamp          | 5 minute         | 34°C               | 45°C            | ±14 minute       |
| 2  | afternoon    | Lamp          | 10 minute        | 54°C               | 58°C            | ±14 minute       |
| 3  | afternoon    | Lamp          | 15 minute        | 27°C               | 35°C            | ±14 minute       |
| 4  | night        | Lamp          | 4 minute         | 27°C               | 46°C            | ±21 minute       |
| 5  | night        | Lamp          | 10 minute        | 50°C               | 58°C            | ±21 minute       |
| 6  | night        | Lamp          | 15 minute        | 46°C               | 58°C            | ±21 minute       |

4.2.2. Manual control test results

Manual control testing has been done based on orders from the operator the results shown in Table II.

| No | Actuator | Position | Result | Information |
|----|----------|----------|--------|-------------|
|    | Lamp     |          |        |             |
5. conclusion and further research

After doing some testing of this research, it can be concluded that:

1. A webcam camera can capture images well in a room that is bright or daytime and blurry at night and even dark is not visible.
2. The real time webcam or video monitoring system runs well with speeds of 110kb/s to 420kb/s.
3. The sensor monitoring system runs when automatic control is selected and the speed of sending data readings is about 1 second obtained by stopwatch timing.
4. Environmental conditions day and night do not affect the performance of manual controls. Lights, the upper solenoid and the lower solenoid will live if ordered on and die if ordered off.
5. Automatic control runs according to the conditions given, ie the lamp lives when the temperature is below 24 and dies when the temperature is above 27, the solenoid lives when the temperature is above 35 and dies when the temperature is below 30, and the solenoid below lives when the soil humidity is below 65% when it is above 75%.
6. Differences in environmental conditions such as day, night and air temperature can affect the results of the readings of soil moisture sensors.
7. Web can be accessed from different laptops using 1 network

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