Indonesian Vocational Research Journal Volume 1 No 1 2021
Received November 2021 / Revised November 2021 / Accepted Desember 2021

Indonesia Vocational Research Journal

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# Design of Automatic Mujair Fish Feed Based on Arduino And Telegram

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**Abstract.** The need for fish consumption in East Java Province in 2012 reached 24.55 kg/capita/year. With a fish consumption rate of 24.55 kg/capita/year, East Java Province must provide 925,139 tons of fish to meet the fish consumption of its population within a year. However, considering that the production of catch fisheries has decreased due to overfishing. The RPJMN emphasizes the importance of increasing production from aquaculture, because the potential for land that can be developed for cultivation is still large. This makes land fish farming more intensively developed.

Therefore, the final project will be entitled "Design of Automatic Mujair Fish Feed Based on Arduino and Telegram" this system works to regulate the distribution of fish feed automatically. The design of this automatic feeder uses Esp 32 as the main control which is used to regulate the operation of the automatic tilapia fish feed machine. This tool uses a pH sensor and a water turbidity sensor. The blower is useful for spreading feed and the Ph sensor (PH-4502C) as a water level reader if the water content is below average it will turn on the neutralizing water pump, the water turbidity sensor as a reader of the intensity of cloudy water in the pond, after that Esp 32 processes the data and send via telegram to send notification messages.

From this study, it shows effective and efficient results because it can save the time of the pool owner. With the advantage of a data report that can be received directly to the pool owner via the telegram messenger application.

***Keywords***: Ph sensor (PH-4502), Turbidity sensor, Blower, Servo motor, Esp 32, Telegram messenger.

## 1. Introduction

The ideal habitat for tilapia fish is in calm waters such as dams, rivers and freshwater lakes. Although tilapia can be kept in an aquarium, they will not grow as fast as tilapia raised in ponds or the outdoors. In some areas, tilapia fish seeds are sown in the rice fields during the growing season. Tilapia fish seeds will grow to the size of consumption (12-15cm) at the same time when the rice is ready to harvest. Tilapia fish have a relatively fast growth rate, especially in shallow waters. The reason is the very fast growth of aquatic plants in shallow water, so that the tilapia fish get an adequate supply of feed [1].

The need for fish consumption in East Java Province in 2012 reached 24.55 kg/capita/year. With a fish consumption rate of 24.55 kg/capita/year, East Java Province must provide 925,139 tons of fish to meet the fish consumption of its population within a year. Therefore, in addition to maintaining the level of consumption, production must also be increased. However, considering that the production of capture fisheries has decreased due to overfishing, the RPJMN emphasizes the importance of increasing production from aquaculture, because the potential for land that can be developed for aquaculture is still large. This makes land fish cultivation more intensively developed [2].

Application of technology that helps fish farmers to improve time and energy efficiency, including in the field of feeding. Manual feeding takes a lot of energy, time, and wasted material. One of the supporting factors for the success of fishery production is the use of appropriate technology. Technology plays a very important role in increasing production efficiency and supporting the implementation of fishery intensification, which in turn will achieve the implementation of sustainable fisheries [3].

There are several studies that have examined the automatic fish feed. In a study conducted by Astriani Romaria Saragih entitled "Design of Automatic Fish Feeding Devices in Arduino-Based Fish Hatchery Ponds" at Raja Ali Haji Maritime University [4]. The fish feed tool system is built using the Arduino Uno Microcontroller. In this research, there are still shortcomings in the prov ision of feed that is not evenly distributed, for that there are several suggestions that can be given so that in making this system in the future it will be even better. This system can be expanded by adding other sensors, so as to get even better results. The data obtained is only the amount of feed in the fish feeder container [4]. Research conducted by Hendra S Weku et al entitled "Design of Microcontroller-Based Automatic Fish Feeding Equipment" at Sam Ratulangi University [5]. In this research, we still use via SMS to notify the feed level[5].

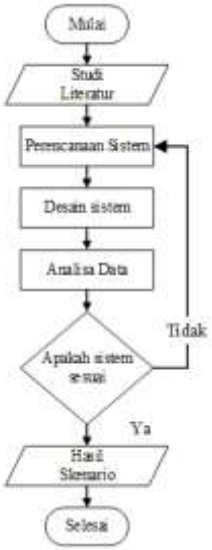
Therefore, the final project will be entitled "Design of Automatic Mujair Fish Feed Based on Arduino and Telegram" this system works to regulate the distribution of fish feed automatically. It is different from other tools in which the feeding is still not evenly distributed. This tool will also use a pH sensor and also a water turbidity sensor. The design of this automatic feeder uses Esp 32 as the main control which is used to regulate the operation of the automatic tilapia fish feed machine. The blower is useful for spreading feed and the pH sensor (PH-4502C) as a water content reader if the water content is below average it will turn on the neutralizing water pump, the water turbidity sensor as a reader of the intensity of cloudy water in the pond, after that Esp 32 processes the data and send via telegram to send notification messages.

## 1. RESEARCH METHODS

### A. Methods

In this study the method used is as described in the flowchart, by carrying out the method as shown in Figure 1, it is hoped that this research can meet the desired results.

**Figure 1.** Research Flowchart




### B. of Literature Study

. theory taken from journals, internet, and books related to the elements used in this research.

The following literatures studied include the following:

a. Sensors Ph
b. . b. Parameters Ph
c. Esp 32
d. Turbidity Sensor
e. Telegram Bot
f. blowers
g. Servo Motor

### C. System Design

At this stage the design of the Mujair Fish Feed tool is carried out. The servo motor is used to open the valve of the container. The blower is used to spread fish feed into the pond using the wind rotation. To identify the water in the pool using a Ph sensor to determine the pH level of the pool water, while for the intensity of the pool water using a Turbidity sensor. To send a notification alert the pool owner using the telegram application.

1. Hardware Design

At this stage, what is done is in the form of making an Arduino and Telegram-based automatic fish feed system. This tool uses a water pH sensor, a Turbidity sensor as input which will send data to Esp 32 which will then be forwarded to the cellphone monitor. And for the distribution of feed on a scheduled basis and will be processed by Esp 32 after that the Servo

opens the valve and turns on the blower according to the schedule for distributing feed. The following is the workflow of the system as in Figure 2.

**Figure 2.** System Workflow

The working principle according to the workflow in Figure 2

a. Esp 32 as the main control which is programmed in the Arduino IDE and can work with a voltage of 3.3V. As sending report data to smartphones via the Telegram application using

the Iot concept.

b. Ph sensor as a tool to measure the pH of the water in the pool.
c. Turbidity sensor as a detector of pool water intensity.
d. The water pump is used to drain the pool with neutralizing water.
e. Telegram application is used for user communication with feed tools.
f. Servo motor functions as a valve between the fish tank and the blower line.
g. Blower serves to spread fish feed in the pond.

The tools and materials used in the design of the Arduino and Telegram-based Automatic Mujair Fish Feed Design Tool are as follows:

1. One Esp 32 microcontroller.
2. One relay.
3. One servo motor.
4. Blowers as many as two
5. Ph
6. one Turbidity Sensor
7. Water Pump, one fruit
8. , other electronic supporting components and cables.

2. Software

Design The software design here is how the system flow and the workings of the tools are described in the flowchart in Figure 4. While the software used is the Arduino IDE application, as a programming or coding application from Esp 32 as a program controller. And to connect to Telegram is to use UniversalTelegramBoot. In the Arduino and Telegram-Based Automatic Mujair Fish Feed Design system, the

following is a flowchart of the Arduino and Telegram-based automatic tilapia fish feed design as shown in Figure 3.

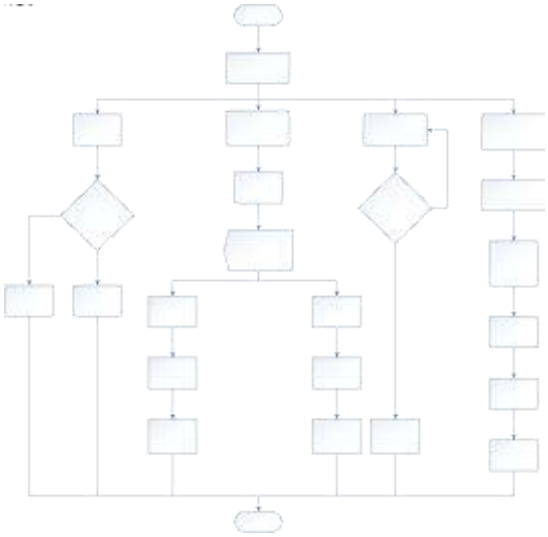


**Figure 3.** Software Design Flowchart part 1

For input and output works automatically while for Servo Motor and Blower will be active when according to the specified hour. While the Ph sensor and Turbidity sensor will always send data to Esp 32 if the Ph sensor detects an abnormal ph level it will activate the pump which will mix it with neutralizing water, turbidity also always detects the level of turbidity in the water in the fish pond if the water in the pond is cloudy then will send a notification to the user. Users can also monitor the pH value and the level of turbidity of the water by selecting an option on the menu.

## 2. RESULTS AND DISCUSSION

### A. The results of the

1. hardware

that have been successfully made in this study are the Arduino and Telegram-based Mujair Fish Feed Design. The prototype of this tool is as shown in Figure 3

**Figure 4.** Prototype of the design Hardware

The hardware of this tool consists of Esp 32, Relay module, Turbidity sensor, PH sensor, Blower, Servo, LED lights, Power Supply, jumper cables and other supporting components. Relay

circuit, PIR sensor, MC38 sensor, Buzzer, LED lights, Power Supply , jumper cables and other supporting components.

2. Software (Software)

The software used in the Arduino and Telegram-based Automatic Mujair Fish Feed Design tool is using the C language, using the Arduino IDE v.1.8.12 software with the addition of the UniversalTelegramBot v1.1.0 Library, ArduinoJson v5.13.5, then on Tools added to Board Esp 32 while the program created for this tool is connecting bots on Esp 32 Telegram controls, Turbidity sensors, Ph sensors, Blowers, Servo, Relay modules, Telegram bot notifications.

**B. Tool**

Testing This test is carried out to find out all inputs and outputs run as expected. First, connect all the circuits together, if the indicator light on the Esp 32 board flashes for 2 times, the Esp 32 board has been connected to Wifi. The Ph sensor will activate the pump when the water in the pool is not neutral. If the adc value is more than -2,000 then the pump will be active which will flow the neutralizing water. To see the adc value, you must send the "/PH" command. The following is the adc value sent via the Telegram application Figure 5


**Figure 5. The** reply to the sentence ph

Turbidity Sensor for its output only sends a notification if the pool water is cloudy at 200 and 40 then the user will receive a notification of cloudy pool water. Here the user receives a notification when the water is cloudy at 100 Figure 5.


**Figure 6.** Reply when the water is cloudy

Command to see the value of the Turbidity Sensor adc "/Turbidity". The following is the adc data sent to Telegram Figure 6.


**Figure 7.** Replies to the sentences of Turbidity

Servo Motor and Blower run every 07.00-12.00-14.00. When the Servo Motor and Blower are active they will be active for 30 seconds. The following Servo Motor opens the feed valve Figure 7.

**Figure 8.** Servo Opens Valve

Testing the entire work system to find out each input output works as expected for 1 month.

Table 1 testing the overall work system to find out each input output works as expected for 1 month.

**Table 1.** Overall Work System Testing

| Tgl | Input | | | Output | | | | keterangan |
|---|---|---|---|---|---|---|---|---|
| | PH ADC | Turbidity ADC | Waktu | Servo Aktif | Blower Aktif | Pompa air | Telegram | |
| 19 | > -2.0000 | 2000 | 07.00 | 30detik | 30detik | Aktif | - | Pompa akan aktif ketika sensor Ph membaca kadar air tidak netral |
| 20 | -3.1374 | 2000 | 12.00 | 30detik | 30detik | Off | /Turbidity Nilai Adc 2000 | Jika mengetik /Turbidity maka akan menerima notif nilai adc turbidity |
| 21 | -3.1374 | 2000 | 15.00 | 30detik | 30detik | Off | /PH Nilai adc -3.1374 | Berjalan sesuai program |
| 22 | -3.1374 | 2000 | 07.00 | 30detik | 30detik | Off | - | Berjalan sesuai program |
| 23 | -3.1374 | 2000 | 10.00 | Off | Off | Off | - | Servo dan blower tidak aktif dikarenakan bukan jadwal pakan |
| 24 | -3.1374 | 2000 | 15.00 | 30detik | 30detik | Off | - | - |
| 25 | -3.1374 | 2000 | 07.00 | 30detik | 30detik | Off | - | Berjalan sesuai program |
| 26 | -3.1374 | 2000 | 12.00 | 30detik | 30detik | Off | - | Berjalan sesuai program |
| 27 | -3.1374 | 2000 | 08.30 | Off | Off | Off | Tidak menerima notif | Berjalan sesuai program |
| 28 | -3.1374 | 2000 | 07.00 | Off | Off | Off | - | Berjalan sesuai program |
| 29 | -2.000 | 2000 | 12.00 | 30detik | 30detik | Aktif | - | Berjalan sesuai program |
| 30 | -3.1374 | 2000 | 15.00 | 30detik | 30detik | Off | - | Berjalan sesuai program |
| 01 | -3.1374 | 2000 | 07.00 | 30detik | 30detik | Off | - | Berjalan sesuai program |
| 02 | -3.1374 | 2000 | 15.00 | 30detik | 30detik | Off | - | Berjalan sesuai program |
| 03 | -3.1374 | 2000 | 07.00 | 30detik | 30detik | Off | /PH -3.1374 | Jika mengetik /PH maka akan menerima notif nilai adc sensor Ph |
| 04 | -3.1374 | 1577 | 07.00 | 30detik | 30detik | Off | - | Tingkat itensitas air turun dikarenakan air |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | tercampur dengan air hujan |
| 05 | -3.1374 | 1577 | 10.25 | Off | Off | Off | - | - |
| 06 | -3.1374 | 1528 | 08.05 | Off | Off | Off | - | Berjalan sesuai program |
| 07 | -2.000 | 1528 | 15.00 | 30detik | 30detik | Aktif | - | Berjalan sesuai program |
| 08 | -3.1374 | 1526 | 18.10 | Off | Off | Off | - | Berjalan sesuai program |
| 09 | -3.1374 | 1526 | 07.00 | 30detik | 30detik | Off | - | Adc turbidity dibuat keruh |
| 10 | -3.1374 | 1526 | 10.00 | Off | Off | Off | - | Berjalan sesuai program |
| 11 | -3.1374 | 1526 | 15.30 | Off | Off | Off | - | Berjalan sesuai program |
| 12 | -3.1374 | 1520 | 07.00 | 30detik | 30detik | Off | - | Berjalan sesuai program |
| 13 | -3.1374 | 1520 | 09.18 | 30detik | 30detik | Off | - | Berjalan sesuai program |
| 14 | -3.1374 | 1520 | 12.00 | 30detik | 30detik | Off | - | Berjalan sesuai program |
| 15 | -3.1374 | 1520 | 14.00 | 30detik | 30detik | Off | - | Berjalan sesuai program |
| 16 | -3.1374 | 1518 | 08.19 | Off | Off | Off | - | Berjalan sesuai program |
| 17 | -3.1374 | 1518 | 14.00 | 30detik | 30detik | Off | - | Berjalan sesuai program |
| 18 | -3.1374 | 1518 | 17.10 | Off | Off | Off | - | Berjalan sesuai program |
| 19 | -3.1374 | 1518 | 07.00 | 30detik | 30detik | Off | - | Berjalan sesuai program |

## C. Discussion

In this research the Arduino and Telegram-based Automatic Mujair Fish Feed Design tool has been successfully built. It can be seen from subsection 4.1.1 that the hardware of the Arduino and Telegram-based Automatic Mujair Fish Feed Design tool consists of Esp 32, a relay circuit, and a power supply circuit. The software consisting of the program on the Esp 32 board has been successfully applied to the hardware circuit.

Furthermore, testing is carried out both in parts and testing as a whole. Based on the test on the Turbidity sensor, the results obtained that the Turbidity sensor works well, on the test on the Ph sensor the data generated by the Ph sensor is in accordance with the test results using a Ph test tool, on the water pump test the pump works according to the Ph sensor reading so when the ph sensor detects the ph level the water is not neutral then the pump will actively flow the neutralizing water, in the Servo Motor test it works according to the specified hour with an active time of 30 seconds, in the Blower test the same as the Servo motor which is active according to the specified hour, in the monitoring test for tilapia fish and the system works with testing for 1 month then the results obtained by the tool work well and for the fish being tested the results are the fish grow evenly with an average size of 1cm, then the overall system test is as in the results obtained that the hardware (hardware) and software ( Software) can work well together according to the original purpose of the tool i this is made.

## 4. CONCLUSION

*Based on the results of the research conducted, it can be concluded:*

1. *This tool works with two systems, the auto system and the manual control system, when the auto system all sensors will work and will send automatic data, when manual control the tool can be controlled according to the command codeMC38*
2. *sensors have been successfully implemented as input so that when operated the tool can operate properly.*
3. *With the IoT concept, this tool has been successfully controlled with auto and manual systems via the Telegram Messenger application*

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