

## Design And Construction Of An Arduino Based Farming Group Watering System

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**Abstract.** *Muncan Village has various farmer groups , one of which is the "Sertile Mentandur Farmers Group," which adopts an organic approach to crop cultivation, especially rice. The irrigation system used in Muncan Village, especially for rice fields, is the pekasih system. This system works by opening irrigation channels from rice fields to rice fields that will receive distribution water when it is their turn, while irrigation channels to rice fields that are not currently receiving distribution will be closed. In the research conducted, researchers used research methodology to examine the problems encountered. In designing the Watering Technology Prototype for the Subur Mentandur Farmer Group in Muncan Village based on Arduino, researchers collected data through observation, interviews and literature studies using the Research and Development (R&D) research method. The aim of this research is to assist the Subur Mentandur Farmers Group in managing the delivery of irrigation water remotely via smartphone using short messages.*

**Keywords :** *Irrigation, Arduino, Short Message.*

### INTRODUCTION

Muncan Village is a village located in Kopang District, Central Lombok Regency. The livelihoods of the residents of Muncan Village are mostly farmers and carpenters and the majority are Muslim. The climatic conditions of Muncan Village are the same as other villages in Central Lombok Regency, namely dry and rainy climates. This certainly influences the agricultural planting patterns in Muncan Village, namely planting rice twice and planting beans or corn once every year.

Muncan Village has several farmer groups, one of which is the "Sertile Mentandur Farmer Group" which applies organic treatment to plants, especially rice plants. Where in the process of providing watering needs to plants can be done with an irrigation system. The irrigation system that is mainly used for rice fields in Muncan Village is with pekasih, by opening irrigation channels from rice fields to rice fields that have distribution shifts and closing irrigation channels that lead to rice fields that do not use distribution shifts . However, currently the Mentandur fertile farmer group is still hampered by the process of distributing water which is still manual, namely by closing and opening irrigation canals by dismantling rice fields, which of course this activity does not escape financing, either costs for water lovers or costs for those whose rice fields are crossed by water channels. irrigation.

*Arduino* -based irrigation technology from the fertile farming group Mentandur Muncan Village with various features, including water *valve control* according to water flow requirements and remote control using short message services from *smartphones*. The

irrigation technology for the Mentandur fertile farming group was created using a simple Atmega328P-U microcontroller circuit.

## LITERATURE REVIEW

### Arduino Uno

Arduino is an open-source electronics platform based on easy-to-use hardware and software [1]

### 12 Volt Power Supply

A power supply is a rectifier circuit or device that can convert an AC (Alternating Current) source into DC (Direct Current). [2]

### Servos

A servo is a device or rotary actuator (motor) that is designed with a closed loop feedback control system (servo), so that it can be set-up or adjusted to determine and ensure the receding position of the motor output shaft. [3]

### Sim800L Module

The Sim800L GSM/GPRS module is the part that functions to communicate between the monitor and *the cellphone* . [4]

### Solenoid Valve

Solenoid Valve is the most frequently used control element in fluidics. The job of the solenoid is to turn off, release, dose, distribute or mix fluids. [5]

## RESEARCH METHODOLOGY

In this research, a design was carried out using the R&D design method. The work flow of R&D can be seen in Figure 1. [6]

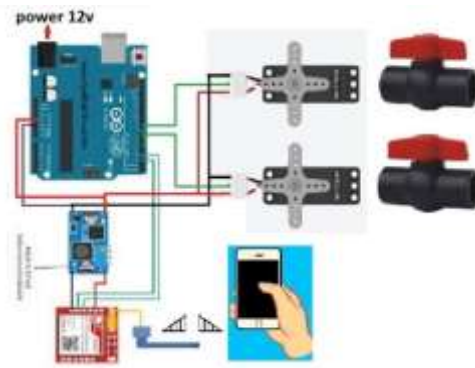


## RESULTS AND DISCUSSION

### Hardware Design

### Electronic Circuit Schematics

The following is a schematic of the electronic circuit for irrigation technology for the Mentandur fertile farmer group.



**Figure 1.** Electronic circuit schematic

**Table 1.** Electronic Circuit Scheme a

ARDUINO	SERVO 1	SERVO 2
PIN 8	DATA PIN	
PIN 7		DATA PIN
ARDUINO	SERVO 1	SERVO 2
PIN 3	TX PIN	
PIN 2	RX PIN	
GND	GND	GND
GND	VCC	VCC

**Table 2.** Electronic Circuit Scheme b

ARDUINO	RELAY 1	RELAY 2
5	DATA PIN	
4		DATA PIN

**Table 3.** Electronic Circuit Scheme c

RELAY 1	RELAY 2	SOLENOID 1	SOLENOID 2	POWER
0	0	(+)	(+)	
(-)	(-)	(-)	(-)	(-)
ON	ON			(+)

a. Arduino Uno

Arduino Uno functions as the core of a watering technology tool which is a place to store programs as well as an executor of program code.

b. Sim Module

The SIM module functions to receive commands from cellphones in the form of short messages.

c. Servos

The servo functions as a tap driver

d. Stepdown

Stepdown to reduce the voltage according to module requirements.

1. Water Flow Design

The irrigation system that is specifically used for rice fields in Muncan Village is the pekasih system, by opening irrigation channels from the paddy fields to rice fields that have

distribution shifts and closing irrigation channels that lead to rice fields that do not use distribution shifts. Figure 2 is a water flow design that will be equipped with an Arduino-based flow technology tool.

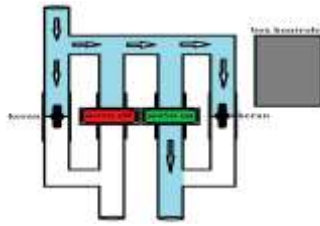


Figure 2. Water drainage design

## 2. Software Design

Figure 3 is a flowchart created by researchers in software design.

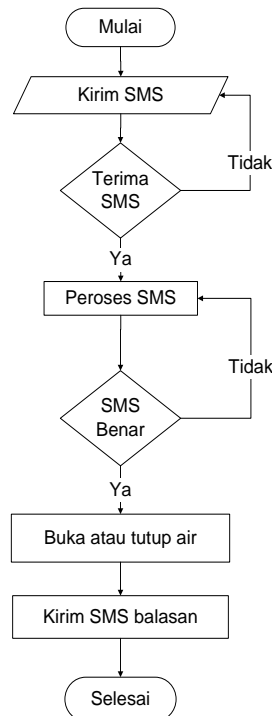


Figure 3. Tool Workflow *Flowchart*

The following is an explanation of the Tool Workflow *Flowchart* :

- a. Farmers send commands in the form of SMS with sentences that have been programmed on the Arduino using *a cellphone*.
- b. After the SMS is sent, the tool will receive the command and then process the command as incorrect or correct.
- c. When the command is correct, the tool will open the tap according to the command received, but if the command is wrong, the device will repeat the previous process.
- d. Once the command received is correct, the tool will send a notification to the recipient that the command has been carried out.

b. Installation of Water Technology Equipment and Electronic Circuits



Figure 4. Tool Installation Process

Description of the installation process for irrigation equipment and electronic circuits

1. Battery connection

As backup power when the power goes out

2. Installing the battery in the box

Adjust battery placement according to the schematic

3. Installation of Arduino, SIM module and stepdown

4. Servo installation on the tap.

a. Product Trial

At the trial stage, the researcher sent a command in the form of an SMS to open the tap via cellphone with the results of the test being that the tool could carry out the command according to the message sent.



Figure 5. Product Trial

**Table 4.** Product Trial Results

No	Testing Criteria	Test result
1.	Send commands (SMS)	Succeed
2.	Execute commands	Succeed
3.	Send notification that the order has been executed	Succeed

## CONCLUSIONS AND RECOMMENDATIONS

Based on the discussion and research results, the author can conclude that by using simple testing media, the irrigation technology *prototype* of the Mentandur fertile farmer group can work well based on the program that has been created. Likewise, the sim800l module can work according to the program created, namely it can send and receive commands well.

The author hopes for further development of the irrigation technology tools created. For further research, the servo motor used should have specifications above the MG996 Metal Gear servo motor. For further research, it is hoped that the algorithm logic will be developed.

## BIBLIOGRAPHY

- A. Faudin, "Sim800L Module," 11-11-2017 , 2017. <https://www.nyebarilmu.com> (accessed May 05, 2021).
- D. Education, "power supply," 2021 . <https://www.dosenpendidikan.co.id/power-supply/> (accessed Mar. 21, 2021).
- E. Ilham, "ARDUINO," 01-13-2021 , 2018. <https://www.it-jurnal.com/pengertian-dan-kebesaran-arduino/> (accessed Apr. 15, 2021).
- Ktoma Indonesia, "Solenoid Valve," 2021. <http://www.kitomaindonesia.com> (accessed Mar. 05, 2021).
- S. Sumarni, "Five-stage research and development (RnD) model (MANTAP)," J. Perelit. and Developer. , vol. 1, no. 1, pp. 1–33, 2019.
- T. Husna, D. Ichwana, and W. Kasoep, "Paddy Irrigation Control System Using Alternate Wetting and Drying Irrigation Method Based on Internet of Things Technology," J. Inf. Technol. Comput. Eng. , vol. 2, no. 02, pp. 92–100, 2018, doi: 10.25077/jitce.2.02.92-100.2018.