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Prototype Of Moisture Content Meter in Grain Using Esp32 Based on Spreadsheet

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ABSTRACT

During the process after the rice is harvested, the rice is then separated from the stalk and referred to as grain which will then be dried. In measuring grain moisture content, an effective and efficient measuring instrument and database storage is needed so that users can find out which grain is suitable for processing and can determine the quality of the grain moisture content. The RnD (Research And Development) method is used in this research. The prototype tool used 2 Esp32 microcontrollers as Master (sender) and slave (receiver) with a Wi-Fi connection this aims at the time of the process of reading sample data and sending data to be able to work properly, In this test using a capacitive soil moisture sensor and using database storage in the form of google spreadsheet. Capacitive soil moisture sensors are also calibrated with conventional measuring instruments (Grain Moisture Meter) by sticking a probe that has been confirmed to be dry or worth (0) on the sample at the same point and carried out for 5 trials and comparing the results of data readings, after which the value of the reading results will calculate the average to find out the sensor can work properly and accurately. The results of this test found that the capacitive soil moisture sensor and conventional tools (Grain Moisture Meter) have a comparison of error values <1. The sample reading data will be displayed on the I2C LCD screen and the data can be sent to the database on Google spreadsheet with a Wi-Fi Tap ID Card connection on the RFID sensor, this aims to make it easier for users to find out detailed data records. In addition, the use of Google spreadsheets is more efficient and easy to access by all people, but data transmission must use a stable/normal Wi-Fi internet connection because the connection speed also affects the data transmission.

Keywords: Grain, Moisture content, Soil moisture capacitive sensor, Monitoring, Google spreadsheet

INTRODUCTION

Indonesia itself is known as an agrarian country, an agrarian country is a country that is known for part of its population working in the agricultural sector, this is inseparable from the country of Indonesia which has a population that consumes the staple food, namely rice (Ayun et al., 2020) (Wibawa et al., 2023). Rice is a form of agricultural product that comes from rice grains where the rice will be separated from the stalk and is usually called grain and then separated from the husk and will form into rice (Sidiq et al., 2022).

Based on GDP (Gross Domestic Product) data at current prices and constant prices of business fields, it shows that the agricultural subsector is one of the high contributors to GDP. In addition, the contribution of the agriculture, plantation and forestry subsectors has increased every year. Meanwhile, based on data from the Central Bureau of Statistics (BPS) Indonesia in 2022 recorded a rice harvest area estimated at 10,452 672 (ha) then for the total production output recorded 54,748,977 (tons), with this it can be seen that the level of rice production in Indonesia itself is very abundant. This makes the reason for the government to always increase development in the agricultural sector, especially the food crop subsector because food crops, especially rice crops, are very important to support the lives of the people of Indonesia (Badan Pusat Statistik, 2022) (Kusumaningrum, 2019).

The population in Indonesia is inseparable from all food needs in order to fulfill nutrition in the body of each individual. In fulfilling our body's nutrition, we also need carbohydrate nutrients, one of which is found in rice (Erizon et al., 2021) (Tanjung et al., 2023). The process after rice harvesting most farmers in Indonesia still use manual methods to dry the harvested grain (Gunawan et al., 2020). Grain will be dried under the hot sun for a certain time to produce dry grain, the weather is also very influential in the drying process (Kusumawardani et al., 2023). In this process, farmers still rely on the five human senses which are relative and less accurate so that there is no standard value to determine whether the rice or grain is dry or not, according to Umar (2011) the standard moisture content in grain to be processed into rice ranges from 13-14% (Lestari & Kurniawan, 2021). These problems can trigger the good or bad quality of rice seeds and the quality of rice produced. According to Salvatierra-Rojas (2017) drying that is not maximized can have a negative impact on grain quality. According to Sahari (2018) the drying process of grain that is not maximized results in white rice quality and head rice yield. According to the National Standardization Agency

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(2015) if the grain is dried too much the resulting rice will be crushed, on the other hand if the grain is not dry enough the resulting rice will be cracked (Mukaromah et al., 2022).

Therefore, it is necessary to balance and increase the rate of management in the scope of agriculture, one form of effort to increase the rate of the scope of agriculture is the need for a tool that is able to monitor the water content in the quality of grain (Arsyad & Saud, 2020). " Prototype Of Moisture Content Meter In Grain Using Esp32 Based On Spreadsheet ". Monitoring the moisture content of grain is very important in improving the efficiency and yield management in food agriculture. The right moisture content in grain can have an impact on the quality of the harvest and storage process. One way to improve the monitoring of moisture content in grain is to use tools or technology that can provide real-time and accurate information. This tool will be controlled using Esp32 as a microcontroller and using a Soil Moisture capacitive sensor to measure the water content in the sample, the amount of water content in the grain will be displayed on the LCD and the data sent to Google Sheets using an internet connection(Ashari et al., 2022). By showing the moisture of the grain sample in percentage values ranging from 0% - 100% if there is no Wi-Fi connection the data cannot be sent to Google Sheets but the tool is still able to work with the I2C LCD provided to monitor manually. With the development of IoT technology, grain moisture monitoring systems can achieve a level of depth and accuracy that traditional methods struggle to achieve. This opens the door to a significant transformation in agricultural efficiency and provides farmers with more powerful tools for decision-making that using spreadsheets is also easy to access with smartphones, laptops, computers, etc (Andriyanto et al., 2023) (Ashari et al., 2022). This is utilized to monitor sample data in real time from grain which will make it easier for us to know the water content in the quality of each sample so that it can facilitate information properly, efficiently and accurately (Wisaksono et al., 2020) (A'afi et al., 2022) (Faleva et al., 2021). The tool that will be made in this research is expected to be able to detect the water content in grain and can improve the quality of staples. This can also be an alternative for consumers who are less concerned about the nutritional content of food and post-harvest cases that occur in the surrounding environment.

LITERATURE REVIEW

Based on the research "ARDUINO UNO-BASED WATER CALCITY MEASUREMENT TOOL IN TREES" by Bangun Krishna, Adi Wisaksono, Galang Surya Kusuma, Iqbal Naufaldhi in 2022, it can be concluded that the research runs according to its function, but does not yet have a database for storing sample reading results, and this tool still uses batteries as its power supply.

METHOD

The method used in this study utilizes research and development (RnD) in this study, used to update and develop previous research. This approach involves an in-depth analysis of previous research to make improvements and innovations, with the aim of producing findings that are effective and beneficial to the wider community (Arif & Mukhaiyar, 2020). This chapter includes three steps, namely making block diagrams, preparing flowcharts, and designing wiring diagrams that will be implemented (Hidayatullah & Sulistiyowati, 2023). In a research and development stage, it is a cycle that contains research studies on products developed from previous research, making prototypes that function optimally so that they provide significant benefits to the wider community (Hamidi et al., 2020) (Safitri et al., 2019).

Block Diagrams

The diagram depicted in Fig. 1 serves the purpose of streamlining the development and production of tools within the research framework.

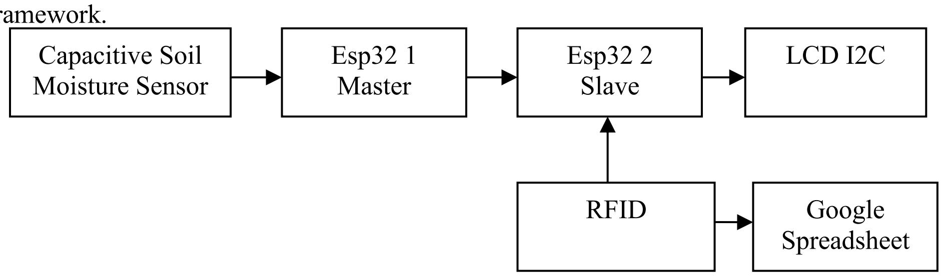

Fig. 1 Block Diagram
Source: (personal document)

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In Figure 1 the hardware consists of 5 parts namely Capacitive soil moisture sensor, 2 microcontrollers; Esp32 Master, Esp32 Slave, RFID, and LCD I2C. In the block diagram there is an input from the Capacitive soil moisture sensor which functions as a reader of the water content in the sample to be measured when the sample is indicated to be moist, the capacitance of the sensor will increase and the resulting output signal is an analog signal which will be processed on the Esp32 Master into a digital signal by going through the ADC process and the results of the digital signal will be converted into a form.

As a data processor there are 2 Esp32 microcontrollers, namely Esp32 Master (sender) and Esp32 Slave (receiver). This aims to maximize the process of reading data and sending data to the Google Spreadsheet database so that each component is able to work optimally and minimize the data transfer process so that it is not too long.

There are 2 LCD I2C and RFID outputs, both components function as recipients of the signal output obtained from the sensor in the form of a serial conversion signal that will be sent and displayed on the LCD I2C, for the process of sending data to the Google spreadsheet a Wi-Fi connection is required and the ID Card tap action on the RFID then the signal will be processed on the Esp32 Slave the data will be sent to a database that has been prepared.

System Flowchart

Flowchart is a research flow chart from the beginning of the process to the end which is made to facilitate the implementation of research.

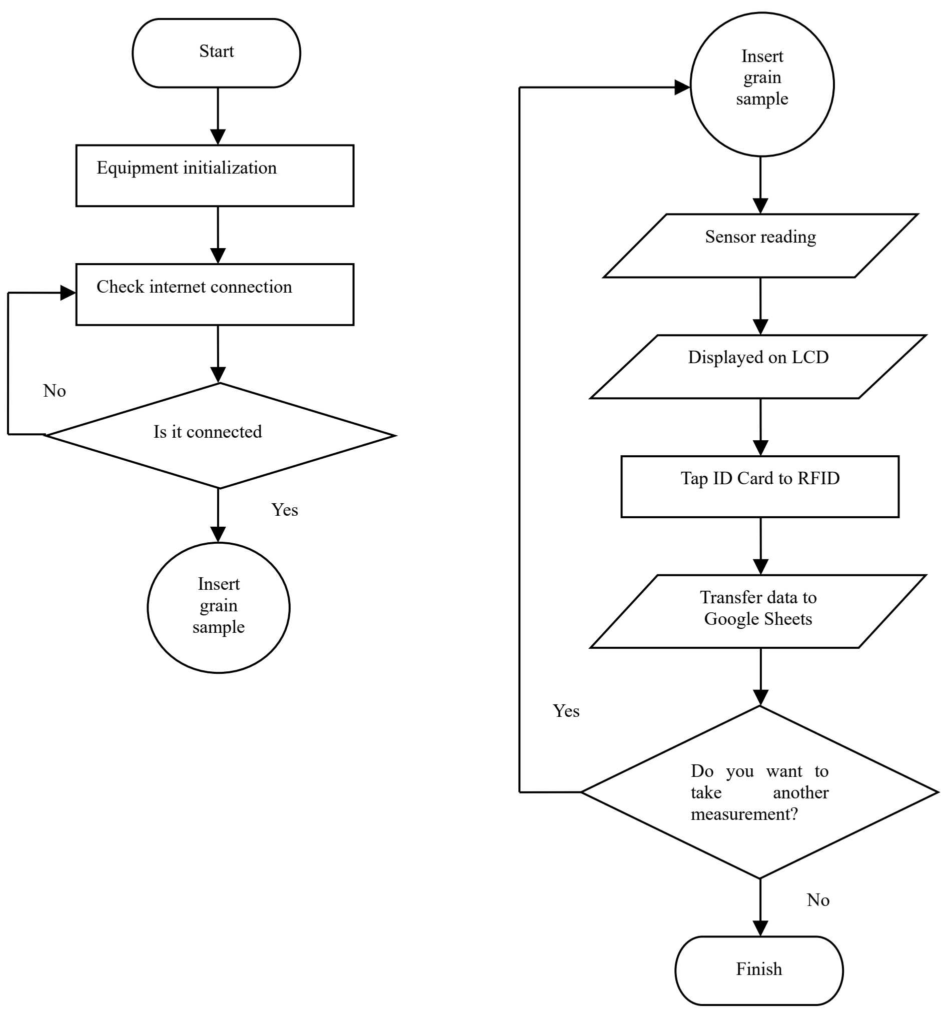

Fig. 2 Flowchart system
Source: (personal document)

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In Figure 2 Flowchart begins with the stage of checking the entire tool then after that checking the Wi-Fi connection When it is connected the LCD layer will display a "Connecting to Google" warning if it is connected then placing the sample in the toolbox, then the capacitive Soil moisture sensor will read the water content in the test sample in this process make sure the sensor is fully stuck on the sensor probe, after that Esp32 will process the data to be displayed on the I2C LCD and Tap ID Card (sample owner) the data will be transferred to Google Sheets, if it is not connected then the data cannot be sent to the Google Sheets database. reading of sample water content with a percentage of 0% - 100%. If you want to take measurements again, repeat the steps as recommended in Figure 2.

3.3 Wiring Diagram

The wiring diagram in Fig 3 is a wiring circuit used in this study, in the picture it can be seen that all components used as input and output are connected by 2 microcontrollers used, namely Esp32, each of which has a different function.

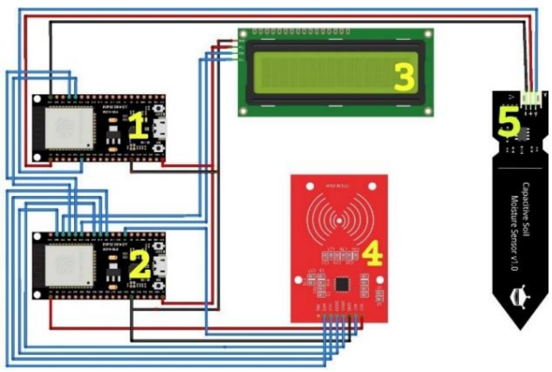

Fig. 3 Wiring diagram

Source: (personal document)

In Fig 3 there are several components used and their uses as follows:

1. Esp32 (1) Master: 1. Esp32 (1) Master: Used as a sender of data from sensor readings and the processed data will be transferred to the Esp32 slave by connecting the RX pin and TX pin.
2. Esp32 (2) Slave: Used to receive and process the data sent from the Esp32 master. The data received will be processed again and then displayed on the LCD when there is a signal from the RFID with an ID card tap, this microcontroller will work and send data to the Google dspreadsheet.
3. LCD I2C: Used to display connection information and water content readings on the sample.
4. RFID: Used to send the reading data to google spreadsheet by tapping the ID Card (sample user) that has been prepared.
5. Capacitive Soil Moisture Sensor: This sensor is used to read the water content in the sample (grain).

The pin addresses on the master microcontroller can be seen in Table 1:

Table 1

Esp32 master port usage

No.	Esp32 Master Port	Usage
1.	GND	GND Capacitive soil moisture
2.	3V3	VCC Capacitive soil moisture
3.	D35	Aout Capacitive soil moisture
4.	5V	VIN Esp32 Slave
5.	GND	GND Esp32 Slave
6.	TX	RX Esp32 Slave
7.	RX	TX Esp32 Slave

The pin addresses on the slave microcontroller can be seen in Table 2:

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Table 2

Esp32 slave port usage

No.	Esp32 Slave Port	Usage
1.	5V	VCC LCD I2C
2.	GND	GND LCD I2C
3.	D21	SDA LCD I2C
4.	D22	SCL LCD I2C
5.	D5	SDA RFID
6.	D18	SCK RFID
7.	D23	MOSI RFID
8.	D19	MISO RFID
9.	GND	GND RFID
10.	D4	RST RFID
11.	3,3V	3,3V RFID
12.	VIN	5V Esp32 Master
13.	GND	GND Esp32 Master

This design consists of five main parts, namely Capacitive soil moisture sensor, Esp32 (Master), Esp32 (Slave), RFID, and LCD I2C. In the connecting diagram, the Capacitive soil moisture sensor component functions to read the moisture content in the sample, Esp32 (1) functions as the Master sending the processed data to Esp32 (2) the receiver. After that, the RFID, LCD I2C, and Esp32 (2) components act as slaves or signal receivers.

The working process of the capacitive soil moisture sensor produces an analog output signal, which is then converted into an ADC (Analog-to-Digital Converter) signal on the Esp32 Master. The result of this digital signal is then converted into serial form and sent as output from Esp32 (Master) to Esp32 (Slave). The data received from the Esp32 Slave will be reprocessed to display information on the LCD. In addition, the RFID communicates with the Esp32 Slave, to send a signal which is then sent to Google Sheets when reading the ID card presented on the RFID module.

RESULT

The results of the research on the prototype of a grain moisture meter using Esp32 based on spreadsheets that have been carried out can be seen in the Fig 4, all components used will be numbered as follows: 1. Esp32 1 (Master), 2. Esp32 2 (Slave), 3. LCD I2C, 4. RFID, 5. Push Button (ON/OFF), 6. capacitive soil moisture sensor.

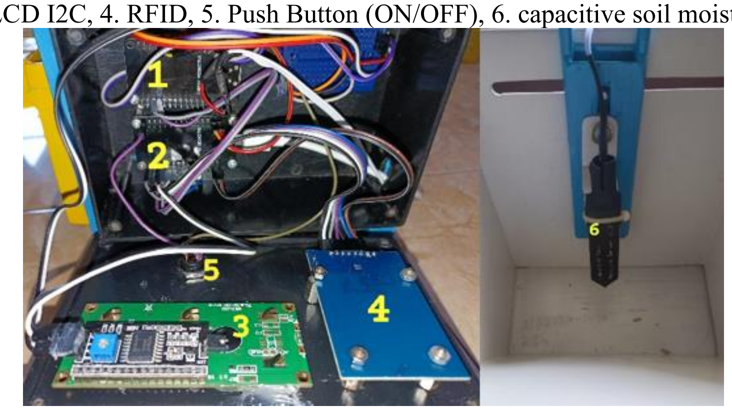

Fig. 4 Tools realization
Source: (personal document)

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Fig. 5 Prototype front view

Source: (personal document)

How to operate the prototype as follows:

1. Connect the USB cable to the 5V DC adapter/power supply.
2. Turn on the device by pressing the push button (on/off).
3. Make sure the device is connected to a Wi-Fi internet network so that the data can be transferred to Google Sheets.
4. Put 1 grain sample into the toolbox.
5. Plug the capacitive soil moisture sensor into the sample in the toolbox.
6. The measured moisture content of the grain sample will be displayed on the I2C LCD.
7. Tap the ID Card on the RFID sensor, to send the reading data to google spreadsheet.
8. For the comparison process with conventional tools, plug the Grain Moisture meter probe into the sample, measure the sample moisture content 5 times and record the measurement results manually.

Test Esp32 connection with Wi-Fi

This test is carried out to find out how long it takes to connect between the Esp32 microcontroller and the Wi-Fi internet network.

Fig. 6 Esp32 testing with Wi-Fi connection
Source: (personal document)

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In Figure 6, it can be seen on the I2C LCD screen there is a description of "Connecting to Google", this test is done by measuring how long it takes to make a connection between the Esp32 microcontroller and the internet connection on Wi-Fi. Measurement of time duration using a stopwatch on a cellphone and the connection results will be recorded can be seen in table 3.

Table 3

Esp32 testing with Wi-Fi connection

Testing to	Wi-Fi Esp32		Accuration
	Condition	Time (s)	
1	Connected	5	Medium
2	Connected	5	Medium
3	Connected	6	Medium
4	Connected	6	Medium
5	Connected	5	Medium

Based on Table 3, it can be seen that testing Esp32 with a Wi-Fi connection 5 times, using a Wi-Fi network in a house. testing obtained results in connected conditions within a period of time obtained an average result of 5.4 seconds with moderate accuracy. changes in connection speed occur due to several factors that can affect such as the range of signals and from consumers who are using Wi-Fi access. testing the duration of Wi-Fi speed is also useful during the process of sending data from Esp32 to Google Spreadsheeet.

Test Esp32 connection with Google Spreadsheet

This test is conducted to find out whether the process of sending the reading data to google spreadsheet is successful.

Table 4

Google Spreadsheet submission result data.

Date	Time	Name	Moisture (%)
12/3/2023	14:41:18	Suryadi	13
12/3/2023	14:39:51	Suryadi	13
12/3/2023	14:39:38	Suryadi	13
12/3/2023	14:39:14	Suryadi	13
12/3/2023	14:39:08	Suryadi	12
12/3/2023	14:37:09	Purwanto	15
12/3/2023	14:37:03	Purwanto	16
12/3/2023	14:36:20	Purwanto	15
12/3/2023	14:35:32	Purwanto	16
12/3/2023	14:34:28	Purwanto	16
12/3/2023	14:32:41	Tohairi	17
12/3/2023	14:31:54	Tohairi	17
12/3/2023	14:31:24	Tohairi	17
12/3/2023	14:30:44	Tohairi	16
12/3/2023	14:30:01	Tohairi	16
12/3/2023	14:27:21	Chamidun	13

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12/3/2023	14:25:30	Chamidun	12
12/3/2023	14:25:00	Chamidun	12
12/3/2023	14:23:52	Chamidun	13
12/3/2023	14:23:12	Chamidun	12
12/3/2023	14:21:24	Misto	12
12/3/2023	14:21:10	Misto	12
12/3/2023	14:19:31	Misto	12
12/3/2023	14:19:01	Misto	12
12/3/2023	14:16:52	Misto	11

In Table 4, it can be seen that the results of sending sample readings use the name of the grain sample owner, the speed of the internet connection from Wi-Fi is also very influential for sending data reading results.

RFID-RC522 Test

This test is carried out to ensure that the RFID-RC522 component works properly. Testing is done by tapping the card on the RFID-RC522 sensor.

Fig.8 Card Testing with RFID-RC522 sensor

Source: (personal document)

In Figure 8, the test is carried out using a card that has been named according to the owner of the grain sample to be tested, this aims to find out and make it easier for users to see the reading result data in Google spreadsheet.

Table 5
RFID-RC522 Testing

Testing to	RFID-RC522		Precentage of success (%)
	RFID Card	Distance (Cm)	
1	Misto	1	100
2	Chamidun	1	100
3	Tohairi	1	100
4	Purwanto	1	100
5	Suryadi	1	100

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In Table 5 testing was carried out for 5 times with a distance of 1 cm with a success percentage of 100%, the use of an ID card as the identity of the owner of the sample to be tested. The card will be tapped on the RFID-RC522 sensor to read the information on the ID Card, after which the ID card information will be processed on the Esp32 Slave and the data will be transferred to Google Sheets. in this test we take a distance of less than 1 cm in addition to convenience because the optimal distance to read and ensure accurately.

4.4 Test capacitive soil moisture sensor with Grain moisture Meter

This test is carried out whether the sensor is able to read the water content in the grain sample and is calibrated using a Grain moisture meter, as a comparison of whether the sensor is able to work properly.

Fig. 9 Sensor testing with conventional measuring instruments
Source: (personal document)

In Fig 9, the measurement of the water content of grain samples using capacitive soil moisture sensors and conventional measuring instruments (grain moisture meters), this aims to determine whether the sensor is able to work properly. At the time of calibration, the comparison value can be seen in table 6.

Table 6
Calibration of sensor testing with conventional measuring instruments

No.	Sample Owner	Testing to	Moisture (%)		Error (%)
			Capacitive soil moisture	Grain moisture meter	
1.	Misto	1	11	12,0	1
		2	12	12,2	0,2
		3	12	12,5	0,5
		4	12	12,0	0
		5	12	12,6	0,6
	Average		**11,8**	**12,26**	**0,46**
2.	Chamidun	1	12	13,0	1
		2	13	12,0	1
		3	12	12,6	0,6
		4	12	12,2	0,2
		5	13	12,2	0,2

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	Average		**12,4**	**12,4**	**0,6**
3.	Tohairi	1	16	16,5	0,5
		2	16	16,5	0,5
		3	17	16,0	1
		4	17	16,2	0,8
		5	17	16,0	1
	Average		**16,6**	**16,24**	**0,76**
4.	Purwanto	1	16	15,5	0,5
		2	16	15,6	0,4
		3	15	16,0	1
		4	16	15,8	0,2
		5	15	15,6	0,6
	Average		**15,6**	**15,7**	**0,54**
5.	Suryadi	1	12	12,8	0,8
		2	13	12,5	0,5
		3	13	12,5	0,5
		4	13	12,8	0,2
		5	13	12,8	0,2
	Average		**12,8**	**12,68**	**0,44**

The test was conducted to assess the accuracy of the capacitive soil moisture sensor in measuring the level of grain moisture content. Conventional tools (grain moisture meter) are used as a comparison to measure the level of grain moisture content manually. Testing was carried out on one sample from an owner, tested 5 times. Data from the conventional tool was recorded manually, and data from the sensor was taken through sending it to Google Sheets. The average error value is calculated to evaluate the extent of the difference between the measurement results of the sensor and conventional tools. The difference in results between sensors and conventional tools can be caused by factors such as grain storage and drying process. Although there are differences, the error value level <1 indicates that the sensor has good accuracy and is not much different from the conventional measuring instrument. The range of error values from 0.6 to 0.76 indicates that the capacitive soil moisture sensor has good sensitivity in measuring soil moisture levels. With a relatively small error value, it can be concluded that the capacitive soil moisture sensor has adequate and reliable accuracy in measuring the level of grain moisture content. The use of capacitive soil moisture sensors can provide benefits in monitoring and measuring grain moisture levels in a more automated and integrated way.

DISCUSSION

Suggestions for future researchers to maximize this research, besides that, it can improve the prototype where this prototype still uses a 5V DC adapter to be recommended to use a battery or other more efficient power supply to minimize the occurrence of power outages so that the prototype cannot be used besides that the sample tub door still uses the next manual to be more efficient it can use an automatic system to make it easier for users to take measurements again and also minimize damage to samples that have been tested because they are pinched in the door of the tool tub.

CONCLUSION

Based on the testing that has been done, it can be concluded that each component is able to work well, although there is a difference from each time duration experiment but not too much, this is due to the distance from the Wi-Fi connection that is a bit far and the use of several consumers is also an influence on the speed of the Wi-Fi connection used. If the slow connection also affects the data transfer on the Google spreadsheet then there will also be a delay. If there is no Wi-Fi connection, the reading data is only displayed on the I2C LCD and cannot be transferred to Google Sheets.

The design with two microcontrollers can provide flexibility and ease of maintenance, the use of 2 microcontrollers functions for Master (sender) and Slave (receiver) of measurement data, aims to maximize data transmission and data reading on samples, This can optimize time and maximize system efficiency, especially in the case of measurements that require simultaneous processing and monitoring. During the test, normal results were

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obtained even though the connection speed changed.

In the results of testing the Capacitive Soil Moisture sensor with database storage using Google Sheets which is calibrated with conventional measuring instruments (Grain Moisture Meter), when testing 5 samples from 5 grain owners (farmers) are needed with a testing process of 1 sample tested for 5 times testing, this aims to determine the accuracy of sensors and conventional tools. Data from conventional tools is recorded manually, for data from sensors taken via sending from Google Sheets. After that the data will be recapitulated and calculated the comparison of the error value of each test. The results that have been obtained are quite accurate with an error value of <1. Thus, in this test, the capacitive soil moisture sensor can be said to be successful in measuring the water content in grain samples.

The results obtained from this reading that have a moisture content that is not in accordance with the standardization are recommended to be dried again or pay attention to grain storage in a dry place, to get a moisture content value that is in accordance with the regulations / standardization that is ready for further processing. If the results of grain processing are good, it will provide benefits as well as a positive impact on farmers and the acceptability of the selling market.

This test is carried out in a shady and dry place because the prototype is part of an electronic design that should not be exposed to water or wet. This test is only used for grain that is ready to be processed into rice so that measurements are only applied to dry samples It is important to pay attention to the environmental conditions where the prototype is tested and ensure that the test parameters match the specific needs of the application.

REFERENCES

A'afi, A. M., Jamaaluddin, & Anshory, I. (2022). Implementasi Sensor Pzem-017 Untuk Monitoring Arus, Tegangan Dan Daya Pada Instalasi Panel Surya Dengan Sistem Data Logger Menggunakan Google Spreadsheet Dan Smartphone. *Prosiding Seminar Nasional Teknik Elektro, Sistem Informasi, Dan Teknik Informatika (SNESTIK)*, *1*(1), 191–196.

Andriyanto, D., Ahfas, A., & Sulistiyowati, I. (2023). Sistem Monitoring Dan Protection Smart Charger Baterai Mobil Listrik Lithium Ion Berbasis Telegram. *JEECOM Journal of Electrical Engineering and Computer*, *5*(2), 200–207. https://doi.org/10.33650/jeecom.v5i2.6876

Arif, A., & Mukhaiyar, R. (2020). Pengembangan Multimedia Interaktif pada Mata Pelajaran Dasar Listrik dan Elektronika Kelas X Teknik Instalasi Tenaga Listrik di SMK Muhammadiyah 1 Padang. *JTEV (Jurnal Teknik Elektro Dan Vokasional)*, *6*(1), 114. https://doi.org/10.24036/jtev.v6i1.107717

Arsyad, M., & Saud, M. (2020). Evaluasi Tingkat Kualitas dan Mutu Beras Hasil Penggilingan Padi di Kecamatan Duhiadaa Kabupaten Pohuwato. *Jurnal Pertanian Berkelanjutan*, *8*(1), 8–18.

Ashari, R. F., Wicaksono, A., Sulistiyowati, I., & Ahfas, A. (2022). Paid Board Prototype With Monitoring Google Sheet. *Procedia of Engineering and Life Science*, *3*. https://doi.org/10.21070/pels.v3i0.1308

Ayun, Q., Kurniawan, S., & Saputro, W. A. (2020). Perkembangan Konversi Lahan Pertanian Di Bagian Negara Agraris. *Vigor: Jurnal Ilmu Pertanian Tropika Dan Subtropika*, *5*(2), 38–44. https://doi.org/10.31002/vigor.v5i2.3040

Badan Pusat Statistik. (2022). *Luas Panen, Produksi, dan Produktivitas Padi Menurut Provinsi 2020-2022*.

Erizon, N., Irzal, & Yufrizal. (2021). Peningkatan Gairah Pertanian Padi di Kenagarian Andiang Melalui Inovasi Mesin Perontok Padi Sistem Lorong Hembus. *Ilmiah Pengabdian Masyarakat*, *21*(3), 294. https://doi.org/10.24036/sb.01670

Faleva, M. R., Santoso, D. B., & Nurpulaela, L. (2021). Sistem Monitoring Energi Listrik Pada Kompor Penghasil Listrik Dengan Teknologi Internet of Things (Koliss-Iot. *Jurnal Elektro Dan Telekomunikasi Terapan*, *7*(2), 857. https://doi.org/10.25124/jett.v7i2.3191

Gunawan, I. K. W., Nurkholis, A., Sucipto, A., & Afifudin. (2020). Sistem Monitoring Kelembaban Gabah Padi Berbasis Arduino. *Jurnal Teknik Dan Sistem Komputer*, *1*(1), 1–7. https://doi.org/10.33365/jtikom.v1i1.4

Hamidi, E. A. Z., Effendi, M. R., & Ramdani, M. R. (2020). Prototipe Sistem Keamanan Rumah Berbasis Web dan SMS Gateway The Prototype of Home Security System Based on Web and SMS Gateway. *Telka*, *6*(1), 56–65.

Hidayatullah, M. I., & Sulistiyowati, I. (2023). *Automatic Roof Design with Based Telegram Case Study On Aviary*. *5*(2), 239–250. https://doi.org/10.12928/biste.v5i2.8214

Kusumaningrum, S. I. (2019). Pemanfaatan Sektor Pertanian Sebagai Penunjang Pertumbuhan Perekonomian Indonesia. *Jurnal Transaksi*, *11*(1), 80–89.

Kusumawardani, D., Izzudin, A., Hikmah, N., & Sunyoto, A. (2023). *RANCANG BANGUN ALAT PENGERING GABAH BERBASIS ARDUINO UNO*. *2*(1), 43–47.

Lestari, S., & Kurniawan, F. (2021). Pemutuan Fisik Gabah dan Beras Menurut Standar Nasional Indonesia (SNI).

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Agriprima : Journal of Applied Agricultural Sciences, *5*(2), 159–168. https://doi.org/10.25047/agriprima.v5i2.438

Mukaromah, S. A., Haryanto, A., Suharyatun, S., & Tamrin. (2022). Jurnal Agricultural Biosystem Engineering Effect of Raw Rice Moisture Content on the Rice Milling Unit. *Jurnal Agricultural Biosystem Engineering*, *1*(1), 81–94.

Safitri, V. A., Sari, L., & Gamayuni, R. R. (2019). Research and Development, Environmental Investments, to Eco-Efficiency, and Firm Value. *The Indonesian Journal of Accounting Research*, *22*(03), 377–396. https://doi.org/10.33312/ijar.446

Sidiq, A. Z., Kurniawan, I., & Jejen. (2022). Perancangan Mesin Perontok Padi yang Ekonomis untuk Membantu Petani di Desa Sukarame Tasikmalaya. *Cipasung Techno Pesantren …*, *16*(1), 20–25. https://journal.sttcipasung.ac.id/index.php/CTP/article/view/6%0Ahttps://journal.sttcipasung.ac.id/index.php/CTP/article/download/6/4

Tanjung, M. M., Yulianti, E., & Wahyuningsih, L. (2023). Pengaruh Negatif Akibat Mengkonsumsi Karbohidrat Secara Berlebihan Menurut Alqur ' an dan Hadist. *ISTISYFA : Journal of Islamic Guidance and Conseling*, *2*(1), 207–214.

Wibawa, N. C., Ardini, H., Hermawati, G., Firdausa, R. N., Anggoro, K. B., & Wikansari, R. (2023). Analisis Impor Beras Di Indonesia Dan Faktor-Faktor Yang Memengaruhi Impor Beras. *Jurnal Economina*, *2*(2), 574–585. https://doi.org/10.55681/economina.v2i2.337

Wisaksono, A., Purwanti, Y., Ariyanti, N., & Masruchin, M. (2020). Design of Monitoring and Control of Energy Use in Multi-storey Buildings based on IoT. *JEEE-U (Journal of Electrical and Electronic Engineering-UMSIDA)*, *4*(2), 128–135. https://doi.org/10.21070/jeeeu.v4i2.539

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