The 5th International Symposium on Material, Mechatronics and Energy The 5th ISMME 2018

To cite this article: 2019 *IOP Conf. Ser.: Mater. Sci. Eng.* **619** 011001

IOP Conf. Series: Materials Science and Engineering **619** (2019) 011001 doi:10.1088/1757-899X/619/1/011001

The 5th International Symposium on Material, Mechatronics and Energy The 5th ISMME 2018

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November 2018

Foreword

First, we would like to thank all researcher who are already send the results of scientific research papers and participated in the 5th International Symposium on Material, Mechatronics and Energy 2018. All papers in this volume has presented at ISMME 2018 by oral presentation. The papers have been peer reviewed through processes administered by the proceedings Editors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal published by IOP Publishing.

Our theme is Challenges and Opportunities of Materials Engineering, Mechatronics and Energy towards independence of independent and sustainable technology products. Themes have been given an important role of Indonesian Development of Industrial Manufacture strategic plan, where the Indonesian people are still in desperate need of technology in these areas, material, mechatronics and energy.

Today Issues is still on Industry 4.0, they are five items should be considered:
1. Scalability; The automation principle of Industry 4.0 could help to facilitate improved scalability among companies in the manufacturing sector.
2. Security; One of the foremost concerns about Industry 4.0 among manufacturers is the possibility of mishaps due to glitches in cognitive computing.
3. Control and Visibility; As manufacturing networks globalize, it is crucial to make digital processes visible to all points of a system. When fully implemented, the principles of Industry 4.0 support responsiveness by making information available worldwide within a fraction of a second.
4. Customer Satisfaction; The process will be fully transparent along all stops on the manufacturing chain, from the moment someone places an order or submits a design until the moment when shipments arrive. Industry 4.0 will facilitate co-creation capabilities between manufacturers and related entities on a global scale.
5. Customization; Industry 4.0 could take customization to new levels with the use of commercial 3-D printers, which there are 23,000 of in use worldwide.

We hope many researchers play on such conditions. Finally, thanks to all of my college in Faculty of Engineering Hasanuddin University, Okayama University, Graduate School of Unhas, Research and Community Services Institute of Unhas and Polytechnik State of Ujung Pandang.

Makassar-Gowa, November , 2018
Yours

Dr. Ir. Muhammad Arsyad Thaha, MT
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Peer Review Statement

All papers published in this volume of Journal of Physics: Conference Series have been peer reviewed through processes administered by the proceedings Editors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal published by IOP Publishing.

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Prototype Development of Portable Head Feed Harvesting Robot

Prototype Development of Portable Head Feed Harvesting Robot

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Abstract. This study aims to develop a prototype of portable head feed harvesting robot that can be installed in a tractor so that the users of tractors that initially only function during the farming season can also function during the harvesting season. This machine is divided into 3 main parts. In the first part there is a cutting mechanism that functions to cut rice using a DC electric motor with a crank mechanism connection to the cutting shaft. The second part is a rice lifting mechanism which functions to lift the rice cut into the conveyor belt position. The third part is a connection that connects the rice cutting machine to the used tractor using a bolt connection. The machine has been tested on rice field and work successfully.

1. Introduction

The application of the science of mechatronics in agriculture, agro-mechatronics, increasingly sophisticated and modern, it can be found in various regions in Indonesia. Some of the technology in the field of agriculture are tractors used by farmers in the planting and harvesting machines are used in the harvesting process. The machine has several drawbacks one of which is the price that is relatively expensive and have only one purpose[5-7].

In this study, researchers conducted a design prototype cutting machine rice that are portable and can be mounted on tractors owned by farmers so that tractors were initially work only when the process of planting after pairing with a machine that researchers designed, the tractor can function well during the process of harvesting the rice.

2. Literature Review

2.1. Rice

Rice is a plant that is very easy to find, especially we who live in rural areas. Expanse of rice fields are filled with rice. Most make rice as a staple food source[2].

2.2. Harvester Machine / Cutting Type Rice Combine Harvester

This type rice harvester machine is a machine that can melaukan process of cutting rice paddy harvesting, threshing rice and the latter was able to enter the results of threshing rice into a sack and is ready to be marketed.

Figure 1. Rice

Figure 2. Machine Harvesters / Cutting Rice *Combine Harvester*

2.3. DC Electric Motor

The motor of the regulator rotates clockwise or opposite direction and is equipped with a transmission gear box. DC motors using DC electric energy and magnetic energy to produce mechanical energy. Motor operation depends on the interaction of two magnetic fields. In simple terms it is said that the electric motor works on the principle that two magnetic fields can be made to interact to produce movement or torque [1].

Figure 3. Motor DC

Figure 4. Driver Motor

2.4. Driver Motor

Driver used is current driver with 12 VDC inputs, functioning as inverting the direction of rotation of DC motors as well as set the rotation speed of the DC motor[3].

2.5. Eye Knife Rice

The blade used in cutting machine rice generally use the same rotating blade to blade mower is moving in rotation.

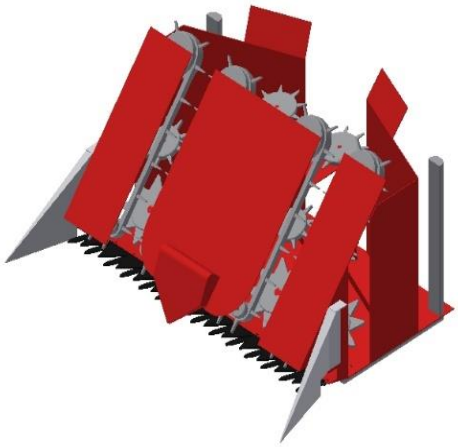


Figure 5. Design of Harvesting Machine

3. Research Methods

To obtain a good tool in terms of quality as well as considering the economic aspect, the design steps taken to make Portable Cutting Machine Rice is found below:

3.1. Design

The design of the cutting machine rice portabe like in the picture below

3.2. Procedure Machine Working System

The design of this portable rice cutting tools necessary preliminary picture of how systems work on the tool created. Broadly speaking, it can be seen in the Figure 8, below

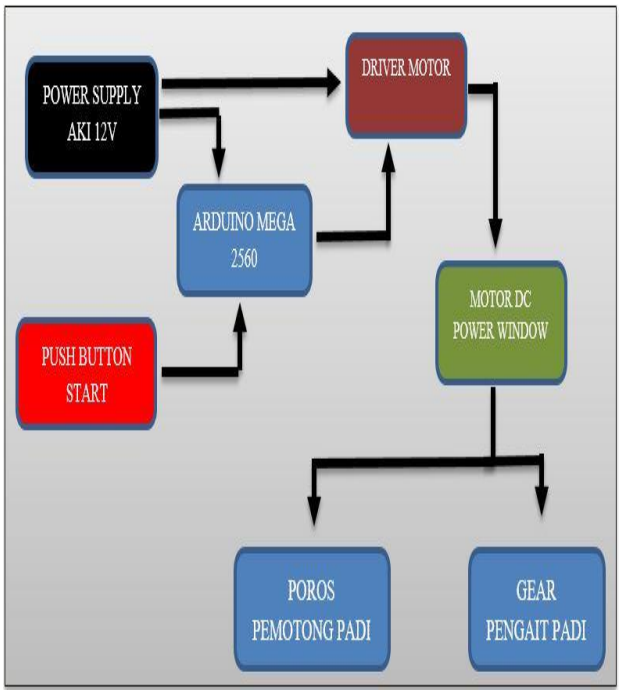
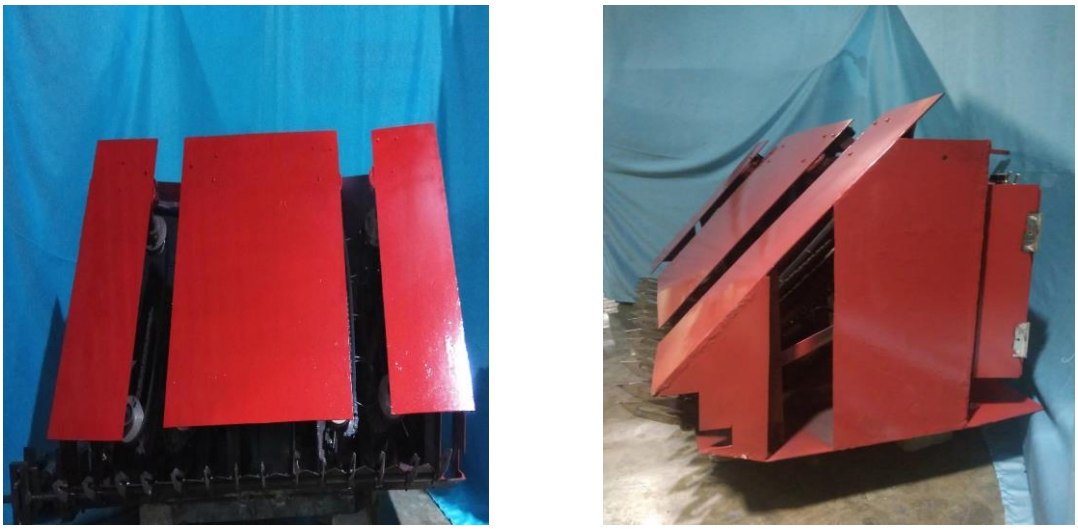


Figure 6. Procedure Machine Operating System

4. Result and Discussion

4.1. Mechanical Design Result

After doing some research, the researchers got a prototype portable cutting machine rice as shown below:



(a) (b)

Figure 7. Design of Harvesting System

4.2. Electronic Design Result

In designing the electronics in these machines is quite simple because it uses open control system, this machine uses only the input of rotary switch that serves to regulate the entire motor speed on the machine and two switches, one of which serves to activate and deactivate the microcontroller and the other function to activate and deactivate the motor[5].

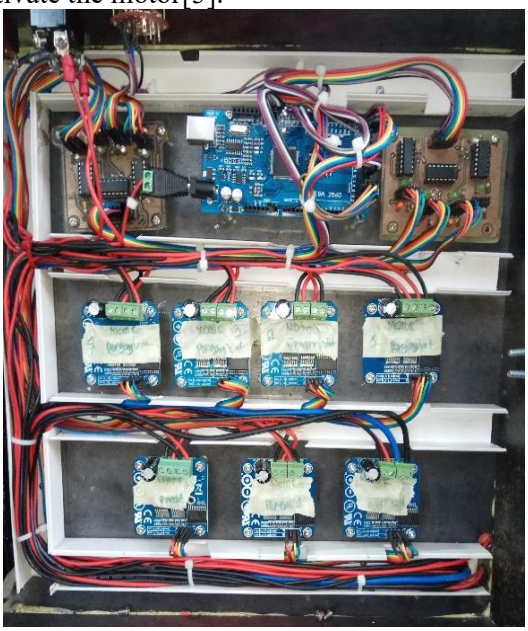


Figure 8. The circuit design Results Electronics

4.3. Result of Program Design

For programming is done on the Arduino software that governs the workings of all the equipment that has been made. The type of program movement imposed on the microcontroller arduino as follows.

1) Setup settings input output pins on the Arduino.
2) The main program of motor speed regulation with input from the rotary switch.
3) Sub program to activate the motor cutter rice.
4) Sub program to activate the motor hook rice.
5) Sub program to activate the motor lifter rice.
6) Sub program to disable the entire motorcycle.

4.4. Testing Results Rice Portable Cutting Machine

In this test machine test machine installed in the tractor hands of farmers and examine the cutting mechanism of rice.

(a) (b)

Figure 9. (a) Rice Cutting Machine Assembly (b) Rice Cutting Machine Connection Mounted on tractor farmer

4.5. Testing Analysis

In the results of the tests the researchers have conducted in Julupamai village and Bontoala village, the palangga sub-district of the stranded Gowa district there are 2 test analyzes, namely the testing of the installation on the tractor and testing of the rice cutting mechanism without the installation of a tractor.

4.5.1. Analysis of Machine Testing with Instalations on Farmer's Tractor. Result is testing the installation of rice cutting machine portable type feed head in the farmer's hand tractor, the cutting machine is installed properly but due to the excessive cutting machine load makes the hand tractor difficult to control, so testing by installing the device in the farmer's hand tractor is not optimal.

4.5.2. Analysis of Cutting Mechanism Testing Without Installation in Farmer's Tractor. Result of testing the rice cutting mechanism without installing the machine into the tractor, it runs well on speed testing, cutting the initial stage of rice can be cut well, but it takes 7-8 cutting movements to be able to cut 1 rice clump perfectly. While at the speed of cutting the second stage, rice can be cut well but it takes

4-5 cutting movements to be able to cut 1 rice clump perfectly. While at the speed of cutting the third stage, rice can be cut well but it takes 1-2 cutting movements to be able to cut 1 rice clump perfectly.

(a) (b)

Figure 10. Results of Cutting Rice

5. Conclusion

From the result and discussion of this study, some conlusions can be drawn as follows:

- Design of prototype rice cutting machine portable type head feed has been carried out. Testing of the machine without a tractor has also been carried out, where the test results show that the rice can be cut well.Testing Analysis.
- Testing prototypes of rice cutting machines for portable head feed types on farmers' hand tractors has also been carried out. However, the test results have not been maximized because the excess tractor load causes the tractor to be difficult to control.

References

[1] R Syam, K Watanabe, K Izumi 2005 Adaptive actor-critic learning for the control of mobile robots by applying predictive models Soft Computing 9 (11), 835-845.
[2] Anonym, Arduino 2012. *Arduino Mega*. (https://www.arduino.cc/en/Main/arduinoBoardMega).
[3] Efendy, Syahrul. 2016. The Meaning of Rice Plant (Original inBahasa:*Pengertian Tanaman Padi*). (https://petaniindomodern.wordpress.com/2016/02/10/pengertian-tanaman-padi-3/).
[4] Kho, Dickson. 2016. Understanding Relay and Function (Original in Bahasa: *Pengertian Relay dan Fungsi Relay*).(http://teknikelektronika.com/pengertian-relay-fungsi-relay/).
[5] Muslikin, Chusnan and Nanda Kusuma Arum. 2017. Papers Know the Tool and Machine Paddy Harvesters (Original In Bahasa: *Makalah Mengenal Alat dan Mesin Pemanen Padi*). Gresik. Agrotechnology Study Program Faculty of Agriculture, University of Muhammadiyah Gresik. Indonesia.
[6] Riadi, Muchlisin. 2012. Push Button (Push botton) (Original in Bahasa: *Tombol Tekan*). http://www.kajianpustaka.com/2012/10/ tombol -tekan-push-botton.html).
[7] Sulistiaji, K., 2007. Book Tool and Engineering (Alsin) Harvest and Threshing Rice in Indonesia (Original in Bahasa: *Buku Alat dan Mesin (Alsin) Panen dan Perontokan Padi di Indonesia*). Serpong. Agricultural Engineering Research Center for Agricultural Research and Development Agency Indonesia.