**JTEP Jurnal Keteknikan Pertanian,**
Vol. 13 No. 2, p 211-226, 2025
P-ISSN 2407-0475 E-ISSN 2338-8439

Available online:
http://journal.ipb.ac.id/index.php/jtep
DOI: 10.19028/jtep.013.2.211-226

# Time Study Analysis on Rice Milling Process at Rice Milling Unit (RMU) "Teaching Industry" Unsoed

**Dian Novitasari[1*], Mutiara Selli Aprilina[1], Masrukhi[1], Ali Maksum[2], Abdul Mukhlis Ritonga[1], Sawitania Christiany Dwi Utami Boru Situmorang[3]**

[1]Department Department of Agricultural Engineering, Faculty of Agriculture, Jenderal Soedirman University, Dr. Soeparno Street No. 63, Karang Bawang, Grendeng, North Purwokerto District, Banyumas Regency, Central Java 53122, Indonesia.
[2]Department of Food Science, Faculty of Agriculture, Jenderal Soedirman University, Dr. Soeparno Street No. 63, Karang Bawang, Grendeng, North Purwokerto District, Banyumas Regency, Central Java 53122, Indonesia.
[3]Department of Agricultural Social Economics, Faculty of Agriculture, Jenderal Soedirman University, Dr. Soeparno Street No. 63, Karang Bawang, Grendeng, North Purwokerto District, Banyumas Regency, Central Java 53122, Indonesia.
*Corresponding author, email: diannov.tep@unsoed.ac.id

**Article Info**

***Submitted: 26 September 2025***
***Revised: 15 April 2025***
***Accepted: 5 Mey 2025***
***Available online: 2 June 2025***
***Published: June 2025***

***Keywords:***
*rice milling unit, standard time, time study, work elements*

***How to cite:***
*Novitasarii, D., Aprilina, M. S., Masrukhi., Maksum, A., Ritonga, A. M., Situmorang, S. C. D. U. B. (2025). Time Study Analysis on Rice Milling Process at Rice Milling Unit (RMU) "Teaching Industry" Unsoed. Jurnal Keteknikan Pertanian, 13(2): 211-226. https://doi.org/10.19028/jtep.013.2.211-226.*

**Abstract**

*Rice is a major food crop in Indonesia that requires special attention in the milling process to ensure working time efficiency. This study aimed to identify the division of work elements in the rice milling process, determine the standard time used by operators, and provide recommendations for improving the work system in the Unsoed "Teaching Industry". Data was collected by measuring the time of each work element in the rice milling process using a stopwatch. The work elements were divided into two groups: rice milling and rice packaging elements. The analysis methods included data adequacy and uniformity tests, as well as calculations of the normal time and standard time. The results of the analysis showed that the standard time for the rice milling process was 5,920.55 seconds per 100 kg of rice, while the standard time for the rice packaging process reached 27,549.81 seconds per 100 kg of rice. The time required was still relatively long compared to previous studies; therefore, several improvements were recommended, including eliminating unnecessary work elements, thoroughly maintaining the tools in the RMU, and placing a bucket in the outlet hole when changing sacks to reduce the time to collect scattered rice. In addition, the elements of rice sorting can be eliminated in the rice packaging process. Other recommendations include improving the working environment by encouraging workers to wear masks during rice milling.*

Doi: https://doi.org/10.19028/jtep.013.2.211-226

## 1. Introduction

The Rice Milling Unit (RMU) "Teaching Industry" is a business unit owned by Universitas Jenderal Soedirman (Unsoed) and engaged in postharvest rice production. RMU "Teaching Industry" has been operating since 2019 in Purwokerto. Problems in working time management at RMU "Teaching

Available online:
http://journal.ipb.ac.id/index.php/jtep
DOI: 10.19028/jtep.013.2.211-226

Industry" include various aspects that affect efficiency and productivity. One of the main obstacles is time inefficiency in the milling process, which is caused by the waiting time between production stages, variations in work speed between operators, and technical disturbances in the machine.

Grain milling process in RMU "Teaching Industry" is one of the important stages in post-harvest. If the milling process is carried out effectively, the selling value and quality of the final rice product can be increased. The grain milling process also plays a role in supporting national food security by supplying rice of adequate quantity and quality (Directorate General of Agricultural Processing and Marketing 2009). To support this, efforts are needed to optimize the milling process, accompanied by an understanding of the elements of the working time, to increase productivity and achieve effective production targets.

Based on these problems, the principle of ergonomics, which focuses on human interaction and the work environment, is important for RMU to create comfortable, safe, and productive working conditions (Manopo & Kristanto, 2010). Ergonomic studies, especially time analysis or time study, can help in determining the standard time of each work element needed by operators to complete tasks under standard conditions (Wignjosoebroto, 2000). Research conducted by Prayuda (2020) shows that increasing productivity and quality of production is closely related to optimal work time planning, which also supports production capacity planning.

This study aims to: (1) identify work elements in the grain milling process at RMU "Teaching Industry," (2) determine the standard time for each work element at RMU "Teaching Industry," and (3) provide recommendations for work system improvements based on time analysis at RMU "Teaching Industry." This research can contribute to the time management and work system of RMU "Teaching Industry" as well as the development of ergonomic studies in the field of grain milling.

## 2. Material and Methods

The research material used to support the implementation of these activities is milled dry grains (MDG). Research support tools included the Rice Milling Unit (RMU), stopwatch, laptop, stationery, cellphone, and Microsoft Excel. The variables measured in this study were the work elements in Unsoed's Teaching Industry.

This research can be divided into several stages, including the observation of rice milling activities, followed by the division of work elements, measurement and recording of time on work elements, data uniformity test, data adequacy test, recording work environment conditions, calculation of standard time and normal time, work system analysis, and recommendations for improving the work system. The research stages can be seen in Figure 1.

P-ISSN 2407-0475 E-ISSN 2338-8439
Available online:
http://journal.ipb.ac.id/index.php/jtep
DOI: 10.19028/jtep.013.2.211-226

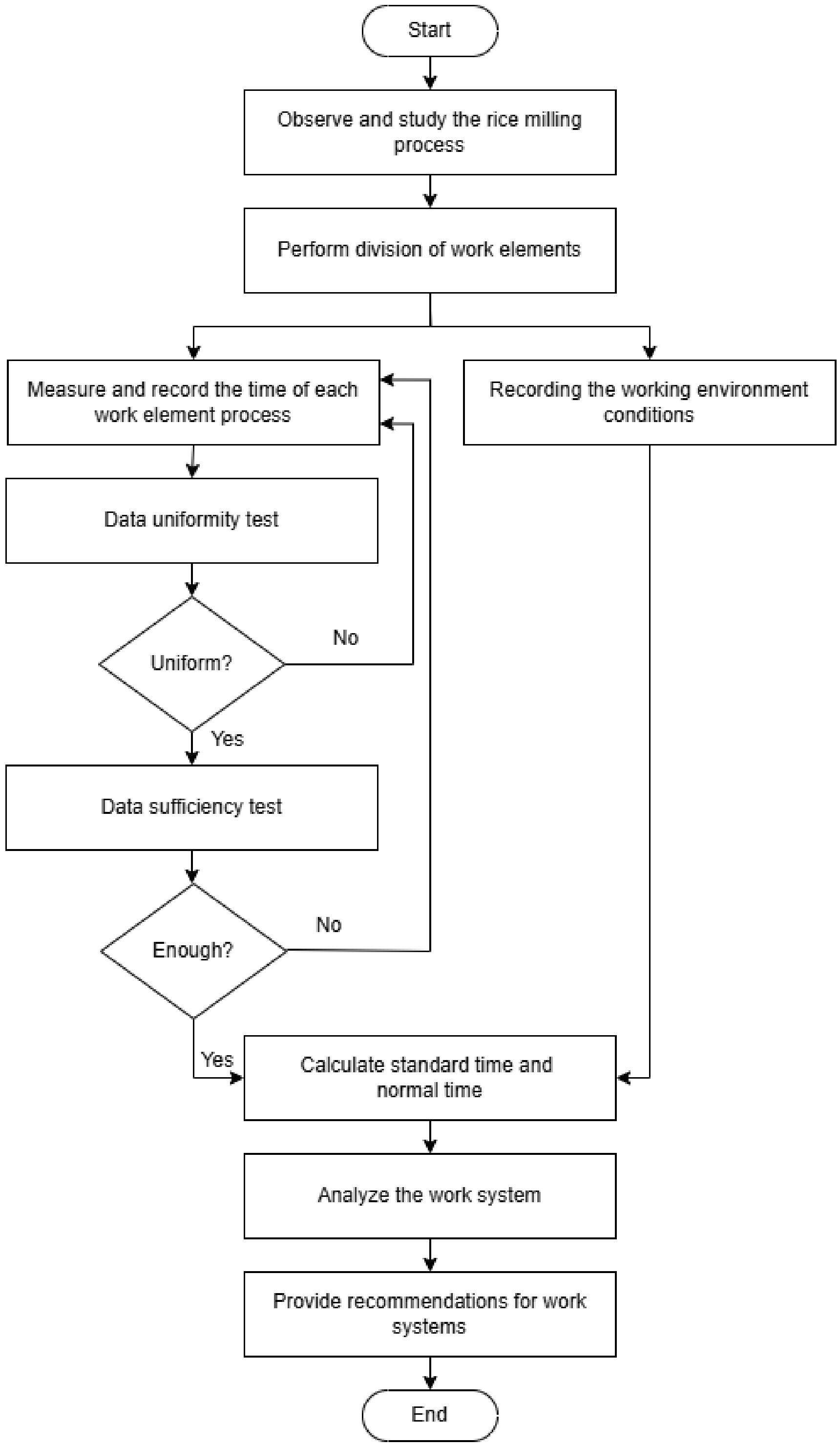


**Figure 1.** Research flow chart.

Available online:
http://journal.ipb.ac.id/index.php/jtep
DOI: 10.19028/jtep.013.2.211-226

Based on the research flow chart above, the details of the research stages are as follows.

2.1 Observation

The observation stage was performed by systematically observing and studying the grain milling process from start to end. The observations were recorded using observation sheets and cameras to obtain accurate data.

2.2 Elements Division of Work Elements

The work elements were divided to determine the elements that were measured in each process from start to finish. This breakdown aims to clarify the work method records, adjust each element to the skills of the workforce, facilitate the observation of non-standard elements, and improve standard time data in the workplace. In addition, the division of work elements must be accompanied by the determination of the subject responsible for each work element so that tasks can be distributed clearly and in accordance with the skills of the workforce.

2.3 Measuring and Recording Time on Work Elements

The data collection process was carried out by measuring the time of each work element in the grain mill to analyze the time. Time measurement was performed using a stopwatch in a hidden manner so as not to affect the workers while working. Furthermore, the time is recorded in the observation table, and data uniformity and sufficiency tests are conducted.

2.4 Data uniformity test

The data uniformity test determines whether the measured data are uniform and whether the data used are not extreme at the Upper Control Limit (BKA) and Lower Control Limit (BKB). BKA and BKB are the "uniform" limits of the work element. If the average element is within the BKA and BKB, all data obtained can be used to calculate the number of measurements required. The data uniformity test was performed at the 95% confidence level. Data uniformity can be calculated using Equations 1-4 (Sutalaksana et al. 2006).

$$\bar{x} = \frac{\sum xi}{n} \quad (1)$$

$$SD = \sqrt{\frac{\sum (xi-\bar{x})^2}{n-1}} \quad (2)$$

$$BKA = \bar{x} + 3SD \quad (3)$$

$$BKB = \bar{x} - 3SD \quad (4)$$

Description: $\bar{x}$ = Average value in repetition time, xi = Cycle time to (1, 2, 3, ..., i), SD = Standard deviation value and work cycle time, n = Number of observations, BKA = Upper control limit, BKB = Lower control limit.

Available online:
http://journal.ipb.ac.id/index.php/jtep
DOI: 10.19028/jtep.013.2.211-226

2.5 Data sufficiency test

A data sufficiency test is needed to determine how many observations are needed (N') and can be calculated at the 95% confidence level and 5% accuracy level. The data sufficiency test was calculated using Equation 5 (Sutalaksana et al., 2006):

$$N' = \left[\frac{40\sqrt{N\sum xi^2 - (\sum xi)^2}}{\sum xi}\right]^2 \quad (5)$$

Description: N = Number of measurements taken, N' = Number of measurements required, xi = Cycle time to (1, 2, 3, ..., i).

2.6 Recording of Work Environment Conditions

The environment, working conditions, and layout of the workplace were recorded during the measurement to determine adjustment and allowance factors. The environmental conditions referred to in recording during measurement include various physical and ergonomic factors that can affect labor performance and the efficiency of the production process. Some of the main aspects that need to be recorded are air temperature and humidity, noise level, light intensity, layout and movement space, ergonomic factors, and physical workload.

2.7 Calculation of Standard Time and Normal Time

The data were processed using Microsoft Excel to test the data uniformity, data sufficiency, adjustment factors, normal time, allowance factors, and standard time. The calculation of normal time requires an adjustment factor to consider the reasonableness of the work completion. The adjustment factor in determining normal time accommodates irregularities that may occur during the work process. This adjustment was performed using the Westinghouse method, which assesses four aspects: skill, effort, working conditions, and consistency. Each aspect is categorized into classes with specific values (Sutalaksana et al., 2006). The assessment was conducted through direct observation of labor activities.

However, the standard-time calculation requires an allowance factor. Allowances are given to labor to complete their work, in addition to the normal time. Allowances are provided for three reasons: personal needs, relieving fatigue, and disturbances that may occur. Factors that will be assessed in the allowance factor are work performed by labor, work attitudes, work movements, eye health, workplace temperature conditions, atmospheric conditions, good environmental conditions, and personal needs (Sutalaksana et al., 2006). The assessment of the allowance factor can be determined by observing labor activities and the work environment.

The values of the adjustment factor, normal time, allowance, and standard time can be calculated following Equations 6-9.

Available online:
http://journal.ipb.ac.id/index.php/jtep
DOI: 10.19028/jtep.013.2.211-226

$$\mathrm{P} = 1 + (Skill + Effort + Condition + Consistency) \quad (6)$$

$$\mathrm{Wn} = \bar{x} \text{ x P} \quad (7)$$

$$\mathrm{A} = (\mathrm{T} + \mathrm{S} + \mathrm{G} + \mathrm{Km} + \mathrm{Kt} + \mathrm{Ka} + \mathrm{Kl} + \mathrm{Kp})\% \quad (8)$$

$$\mathrm{Wb} = \mathrm{Wn}\ (1 + \mathrm{A}) \quad (9)$$

Description: P = Adjustment factor, Skill = Skill to follow the established way of working, Effort = Effort shown or given by the operator, Condition = Work environment conditions, Consistency = Time consistency, Wn = Normal time (seconds), $\bar{x}$= Average value in repetition time, A = Allowance, T= Labor performed (%), S= Work attitude (%), G= Work movement (%), Km= Eye health (%), Kt = Workplace temperature conditions (%), Ka= Atmospheric conditions (%), Kl= Good environmental conditions (%), Kp= Personal needs (%), Wb= Standard time (s).

### 2.8 Work System Analysis

The calculation results were analyzed to identify their relationship with the work system. This process aimed to identify the possible causes of errors in improving worker comfort and productivity.

### 2.9 Recommendations for Work System Improvement

The recommendations for possible work system improvements include eliminating unnecessary operations or elements, eliminating unnecessary time, and adding objects or tools to facilitate workers.

## 3. Results and Discussion

### 3.1 Division of Work Elements of RMU " Teaching Industry" Unsoed

The grain milling process at RMU "Teaching Industry" Unsoed is conducted using a series of machines that work sequentially to produce high-quality rice. The milling machine configuration consisted of several stages.

1. Dry-harvested dry grain (GKP), which has a high moisture content, was dried using a Vertical Dryer to achieve optimal moisture content before milling.
2. The cleaning Grain is cleaned from dirt and foreign objects using a Blower Cleaner to ensure the quality of the raw materials.
3. Pulping: Grain husks are peeled off using a husker, resulting in cracked husked rice (CPC).
4. CPC and unpeeled grains were separated using a separator.
5. Polishing: CPC is then processed in a polisher to remove the bran layer, resulting in white rice.
6. Sifting: The polished rice was sieved using a sieve to separate the rice based on size and quality.

RMU "Teaching Industry" Unsoed has 3 workers, namely 1 management and 2 operators. Work activities start around 09.00 WIB until completion. The work activities in the process of milling grain RMU "Teaching Industry' Unsoed are shown in Figure 2.

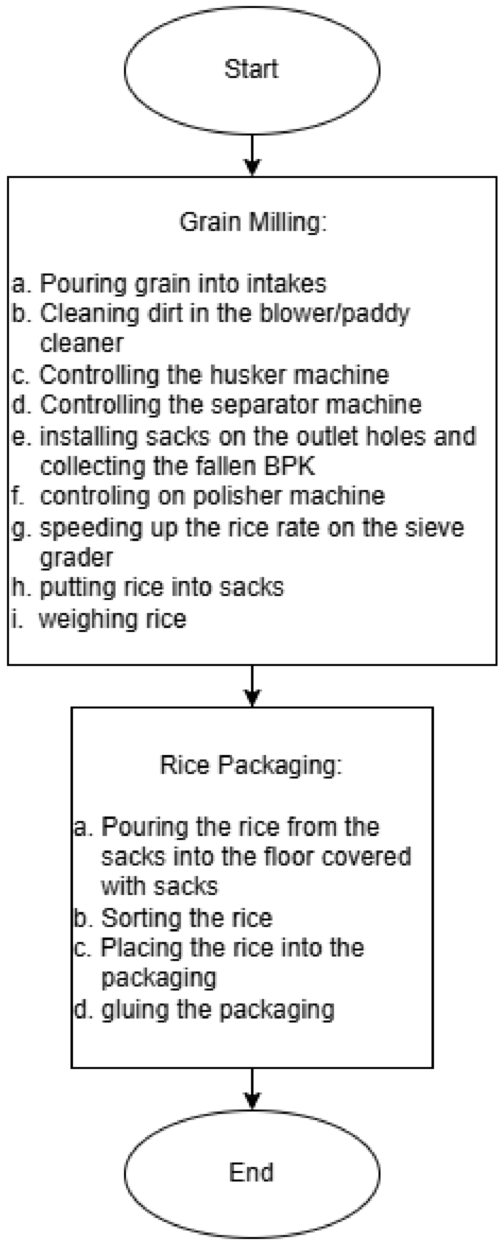


**Figure 2.** Flowchart of the grain milling process of RMU "Teaching Industry".

Based on this data, the work elements in this study were divided into two groups: grain milling and rice packaging. Division of work elements: (1) Grain Milling, which consists of (a) pouring grain into the intake, (b) cleaning impurities in the blower/paddy cleaner, (c) controlling the husker machine, (d) controlling the separator machine, (e) installing sacks on the outlet hole and collecting

**JTEP** Jurnal Keteknikan Pertanian,
Vol. 13 No. 2, p 211-226, 2025
P-ISSN 2407-0475 E-ISSN 2338-8439
Available online:
http://journal.ipb.ac.id/index.php/jtep
DOI: 10.19028/jtep.013.2.211-226

fallen CPC, (f) controlling the polisher machine, (g) accelerating the rice rate on the sieve grader, (h) putting rice into sacks, and (i) weighing rice; and (2) Rice Packaging, which consists of (a) pouring the rice from the sacks onto the floor covered with sacks, (b) sorting the rice, (c) placing the rice into the packaging, and (d) gluing the packaging.

3.2 Working Time

The recapitulation results of the data uniformity tests are presented in Table 1. Table 1 displays the results of the data sufficiency test.

**Table 1.** Data uniformity and sufficiency tests.

| No | Work Element | Average time (sec) | Standard Deviation | BKA (sec) | BKB (sec) | N | N′ | Data adequacy |
|---|---|---|---|---|---|---|---|---|
| **Grain milling process** | | | | | | | | |
| 1 | Pouring grain | 20,11 | 0,82 | 21,74 | 18,47 | 6 | 2 | Enough |
| 2 | Cleaning debris in the blower | 156,99 | 8,55 | 174,10 | 139,88 | 3 | 3 | Enough |
| 3 | Controlling on husker machine | 1.223,51 | 52,62 | 1.328,75 | 1.118,28 | 3 | 2 | Enough |
| 4 | Controlling on separator machine | 1.230,91 | 49,84 | 1.330,59 | 1.131,23 | 3 | 2 | Enough |
| 5 | Putting up sacks and collecting fallen CPC | 285,03 | 12,33 | 309,68 | 260,38 | 3 | 2 | Enough |
| 6 | Controlling on polisher machine | 486,74 | 22,81 | 532,36 | 441,12 | 3 | 2 | Enough |
| 7 | Speeding up rice on sieve grader (by hand) | 527,65 | 24,36 | 576,36 | 478,94 | 3 | 2 | Enough |
| 8 | Putting rice into sacks | 58,88 | 3,11 | 65,10 | 52,66 | 3 | 3 | Enough |
| 9 | Weighing rice | 47,24 | 2,19 | 51,63 | 42,85 | 3 | 2 | Enough |

Continue

Available online:
http://journal.ipb.ac.id/index.php/jtep
DOI: 10.19028/jtep.013.2.211-226

Continue

| No | Work Element | Average time (sec) | Standard Deviation | BKA (sec) | BKB (sec) | N | N′ | Data adequacy |
|---|---|---|---|---|---|---|---|---|
| **Rice packaging process** | | | | | | | | |
| 1 | Pouring rice from the sack into the sack-covered floor | 39,80 | 2,03 | 43,87 | 35,73 | 3 | 3 | Enough |
| 2 | Rice sorting | 5.437,41 | 235,65 | 5.944,71 | 5.002,12 | 3 | 2 | Enough |
| 3 | Putting rice into 5 kg bags | 37,48 | 2,88 | 43,25 | 31,71 | 13 | 9 | Enough |
| 4 | Gluing the packaging | 28,49 | 2,61 | 33,72 | 23,27 | 13 | 12 | Enough |

All the time measurement data for each work element in Table 1 are uniform. The data can be said to be uniform because they are between BKA and BKB. Sutalaksana et al. (2006) revealed that the BKA and BKB formed from a group of data are the limits of uniformity or not. A group of data can be considered uniform if they are between the two control limits (BKA and BKB). The data required are data from BKA and BKB, because all data will be included in further calculations.

In addition to the uniform data, the amount of time measurement data for each work element listed in Table 1 was sufficient. The data can be considered sufficient if the number of observations required (N') is smaller than the number of observations carried out (N). However, if N' > N, it is necessary to add observations by taking further measurements (Wijaningrum et al., 2018). A data sufficiency test was conducted to ensure that the obtained data were sufficiently objective. Thus, the data obtained can be included in further calculations (Purnomo 2004).

After data uniformity and data sufficiency tests were carried out, the normal and standard times were calculated. The normal time was obtained by considering the adjustment factor, and the standard time was obtained by considering the allowance factor. A recapitulation of the adjustment factor, normal time, allowance factor, and standard time is shown in Table 2.

Available online:
http://journal.ipb.ac.id/index.php/jtep
DOI: 10.19028/jtep.013.2.211-226

**Table 2.** Normal time and standard time.

| No | Work Element | Adjustment Factor | Normal Time (sec) | Allowance Factor | Raw Time (sec) | Raw Time 100kg (sec) |
|---|---|---|---|---|---|---|
| **Grain milling process** | | | | | | |
| 1 | Pouring grain | 0,05 | 21,12 | 0,245 | 26,29 | 52,58 |
| 2 | Cleaning debris in the blower | 0,03 | 161,70 | 0,31 | 211,82 | 211,82 |
| 3 | Controlling on husker machine | 0,11 | 1.358,10 | 0,31 | 1.779,11 | 1.779,11 |
| 4 | Controlling on separator machine | 0,11 | 1.366,31 | 0,31 | 1.789,87 | 1.789,87 |
| 5 | Putting up sacks and collecting fallen CPC | 0,06 | 302,13 | 0,225 | 370,11 | 370,11 |
| 6 | Controlling on polisher machine | 0,12 | 545,15 | 0,325 | 722,32 | 722,32 |
| 7 | Speeding up rice on sieve grader (by hand) | 0,03 | 543,48 | 0,30 | 706,52 | 706,52 |
| 8 | Putting rice into sacks | 0,05 | 61,82 | 0,19 | 73,57 | 121,91 |
| 9 | Weighing rice | 0,05 | 49,60 | 0,415 | 70,19 | 166,31 |
| **Rice packaging process** | | | | | | |
| 1 | Pouring rice from the sack into the sack-covered floor | 0,05 | 41,79 | 0,24 | 51,82 | 171,74 |
| 2 | Rice sorting | 0,11 | 6.075,49 | 0,275 | 7.746,24 | 25.672,47 |
| 3 | Putting rice into 5 kg bags | 0,09 | 40,85 | 0,16 | 47,39 | 947,80 |
| 4 | Gluing the packaging | 0,09 | 31,05 | 0,22 | 37,89 | 757,80 |

The results of the normal and standard times were considered using the adjustment factor and allowance factor. Darmawan and Sari (2020) revealed that a work system is closely related to two aspects: provision of adjustment factors and allowances. The adjustment factor is considered to determine the reasonableness or unreasonableness of a work. The following four factors were assessed for adjustment: work skills, effort, working conditions, and consistency. The leniency factor is needed for personal needs, relieving fatigue and unexpected obstacles.

Available online:
http://journal.ipb.ac.id/index.php/jtep
DOI: 10.19028/jtep.013.2.211-226

Table 2 shows that the normal time and the smallest standard time in the grain milling and rice packaging processes are for pouring grain, and the work element with the largest normal time and standard time in the grain milling and rice packaging process is sorting rice. This is because the rice sorting process requires high accuracy, it is not automatic (manual), the volume of materials is large, and the quality of the raw materials is not uniform (Nurhikmat et al.; Prambudi et al., 2021). Sutalaksana et al. (2006) revealed that standard time is the time required by normal labor to complete a job in the best work system. The standard time sought is the time required by a normal worker to complete a job in the best work system (Nevenda & Wulandari, 2023).

### 3.3 Recommendations for Work System Improvement

Working time is highly influential on the course of the production process, and recommendations for work system design are required to obtain the optimal working time. The design of a work system is necessary to obtain better results. The work system consists of four components: humans, materials, equipment (machines and auxiliary tools), work environment (room and air), and the state of the other jobs around it. These components affect productivity (Sutalaksana et al., 2006). In addition, the design of the work system must focus on health, comfort, and safety factors at work. The design of the work system requires improvement in the work system to help a company obtain a better work system. Improvements in work systems are expected to provide health, safety, and comfort for workers.

Recommendations for improving the work system at RMU "Teaching Industry' Unsoed include the following.

#### 3.3.1 Grain Milling Process

The grain milling process at RMU "Teaching Industry" Unsoed has elements of cleaning dirt on the blower/paddy cleaner and accelerating the rice rate. The element of cleaning dirt on the blower/paddy cleaner is done to clean various dirt that are quite large in size, such as straw stalks, and the element of accelerating the rice rate is done so that the rice is quickly collected in the bucket. Prastyo's (2018) research shows that there is no such element, so the elements of cleaning dirt on the blower/paddy cleaner and accelerating the rate of rice can be eliminated. The element of cleaning dirt on the blower can be eliminated if the grain to be used has been cleaned beforehand. This can be achieved by buying grains that pass the initial sorting stage at the farm level (Umar and Alihamsyah, 2014). While the blower machine can work by itself without the help of labor, it is the same as speeding up the rate of rice on the sieve grader. Rice will still flow on the sieve grader without being accelerated by hand. This is because blower machines and sieve graders are designed to work automatically without requiring direct labor intervention (Tandel et al., 2023).

In addition to taking impurities in the blower and accelerating the rate of rice production, there is also a controlling element in the husker and separator machine, which takes a long time. The results showed that in the grain milling process at RMU "Teaching Industry" Unsoed, there is a controlling

Available online:
http://journal.ipb.ac.id/index.php/jtep
DOI: 10.19028/jtep.013.2.211-226

element on the husker machine because there is damage to the engine sensor on the husker so that workers must continue controlling the work of the husker machine to determine when the grain must enter the separator. Subelements of work on controlling husker and separator machines are conducted owing to damage to certain components or parts. Supposedly, the controlling process on the husker machine to determine when the grain should enter the separator can run automatically; however, because the sensor on the machine is damaged, workers must perform it manually. If the sensor on the husker machine is repaired, the controlling elements of the husker machine can be eliminated.
In addition, the results show that there is a controlling element in the separator machine owing to damage; therefore, workers must adjust the vibration manually. In fact, vibration on the separator machine should work optimally if the machine receives regular maintenance and repair. Thus, if the maintenance or replacement of damaged components is carried out, the controlling sub-elements on the husker and separator machines are no longer required in a series of milling work elements. Therefore, maintenance, repair, and overall rechecking of all machine tools at the RMU "Teaching Industry" Unsoed is needed to improve production time. Repairing and maintaining husker machines and separator machines can eliminate the controlling elements on the husker machines and reduce the controlling work time on separator machines.

Paramitha et al. (2022) stated that maintenance and repair of machine tools in an industry is very important to maintain machine performance so that the machine is always in optimal condition. Irregularity in machine tool maintenance results in non-achievement of production targets, loss of production process time, higher repair costs, and overtime costs owing to lost production time. Isbandi (2021) stated that machine/equipment maintenance requires several activities, such as inspection/checking, lubrication, repair/repair on damage, and replacement for parts or components. However, at RMU, the Teaching Industry is still lacking in carrying out maintenance activities, often at RMU "Teaching Industry" Teaching Industry' Unsoed only repairs when damage occurs.

The grain milling process also includes the installation of sacks on the outlet holes and the collection of fallen CPC. This element should be improved by workers putting the bucket quickly while installing a second sack so that the CPC does not fall scattered. This improvement can reduce the work time and losses owing to scattered fallen CPCs. Indaryani and Hasbullah (2009) revealed that scattered grains or rice during harvest and postharvest can cause shrinkage or yield loss, which can reduce the amount of rice produced.

Eliminating the elements of cleaning dirt on the blower/paddy cleaner, controlling the husker machine, and accelerating the rice production rate can save up to 2,697.45 seconds/100 kg. The raw time of the grain grinding process after improvement is listed in Table 3.

Available online:
http://journal.ipb.ac.id/index.php/jtep
DOI: 10.19028/jtep.013.2.211-226

**Table 3.** Proposed raw time for the grain milling process after improvement.

| No | Work Element | Raw time (seconds/100 kg) | Raw time after improvement (seconds/100 kg) |
|---|---|---|---|
| 1 | Pouring grain | 52,58 | 52,58 |
| 2 | Cleaning debris in the blower | 211,82 | - |
| 3 | Controlling on husker machine | 1.779,11 | - |
| 4 | Controlling on separator machine | 1.789,87 | 1.789,87 |
| 5 | Putting up sacks and collecting fallen CPC | 370,11 | 370,11 |
| 6 | Controlling on polisher machine | 722,32 | 722,32 |
| 7 | Speeding up rice on sieve grader (by hand) | 706,52 | - |
| 8 | Putting rice into sacks | 121,91 | 121,91 |
| 9 | Weighing rice | 166,31 | 166,31 |
| | Total | 5.920,55 | 3.223,10 |

3.3.2 Rice Packaging Process

The results showed that the rice packaging process had a high raw time jump for the rice-sorting element. However, in the research conducted by Prastyo (2018), there was no rice sorting element. This is why the standard time of the packaging process obtained is still relatively long compared with in that previous studies. Rice sorting should be eliminated because of the large amount of time spent on this element.

Sulwahyudi (2018) revealed that the process of milling grain involves the preparation of quality grain raw materials, breaking the skin, shucking rice, packaging, and storage. This process does not include rice sorting, because the raw materials used are of high quality. According to the SNI (2023), the criteria for foreign objects in premium grain quality are a maximum of 0.01%, medium grain quality I is a maximum of 0.05%, and medium quality II is a maximum of 0.10%. So that RMU "Teaching Industry" Unsoed should buy milled dry grain with quality quality in order to minimize the number of foreign objects and no longer need rice sorting by implementing SOPs in determining grain suppliers. Eliminating the rice sorting element can save up to 25,672.47 seconds/100 kg. The standard times for the rice packaging process after the improvement are listed in Table 4.

Available online:
http://journal.ipb.ac.id/index.php/jtep
DOI: 10.19028/jtep.013.2.211-226

**Table 4.** Proposed standardized time for the rice packing process after improvement.

| No | Work Element | Raw time (seconds/100 kg) | Raw time after improvement (seconds/100 kg) |
|---|---|---|---|
| 1 | Pouring rice from the sack into the sack-covered floor | 171,74 | 171,74 |
| 2 | Rice sorting | 25.672,47 | - |
| 3 | Putting rice into 5 kg bags | 947,80 | 947,80 |
| 4 | Gluing the packaging | 757,80 | 757,80 |
| | Total | 27.549,81 | 1.877,34 |

3.3.3 Work Environment

The process of milling grain causes a large amount of flying dust that can interfere with workers' health; therefore, it is expected that workers will use masks. Flying dust can disrupt the focus of workers because when dust flies, workers must repeatedly close their eyes and nose. In addition to disrupting the performance of workers, dust can interfere with their health.

Research conducted by Katherine et al. (2014) showed that dust exposure and lung function capacity are closely related; the more dust, the more workers whose lung function is abnormal. Dust levels can decrease the lung function capacity of workers at grain mills. Their research indicated that the habit of using masks is closely related to the lung function capacity of grain mill workers. Workers who do not always use masks have a 15 times greater risk of decreasing lung function capacity than workers who always use masks (Nurcandra et al., 2023).

## 4. Conclusion

The division of work elements in this study is grouped into two groups, namely the grain milling process and the rice packaging process, namely: (a) the grain milling work element consists of pouring grain into the intake, cleaning dirt on the blower/paddy cleaner, controlling the husker machine, controlling the separator machine, installing the sack on the outlet hole and collecting the fallen CPC, controlling the polisher machine, accelerating the rice rate on the sieve grader, putting the rice into the sack, and weighing the rice; and (b) the rice packaging work element consists of pouring rice from the sack to the base of the sack, sorting the rice, putting the rice into the packaging, and gluing the packaging. The standard time in the grain milling process is 5,920.55 seconds/100 kg of rice, and the rice packaging process is 27,549.81 seconds/100 kg of rice. Recommendations for improving the work system include reducing several subwork elements to reduce the standard time of the grain milling work element by 45.56% and the rice packaging work element by 93.19% of the previous standard time.

**Acknowledgements**

We thank the UNSOED Research and Community Service Institute for providing research funds for the Competency Improvement Research Scheme (Number: 26.610/UN23.35.5/PT.01/II/2024).

## 5. References

Badan Standarisasi Nasional Indonesia. 2023. Standar Nasional Indonesia Mutu Gabah. Indonesia, BSNI: Badan Standarisasi Nasional Indonesia.

Darmawan, M. M. & Sari, E. M. 2020. Pengukuran Waktu Baku dan Analisis Beban Kerja pada Proses Filling dan Packing Produk Lulur Mandi di PT. Gloria Origita Cosmetics. Jurnal ASIIMETRIK, 2(1): 51-61.

Ditjen Bina Pengolahan dan Pemasaran Hasil Pertanian. 2009. Proses Pembangunan Usaha Penggilingan Padi. Jakarta: Pustaka Jaya.

Indaryani, R & Hasbullah, R. 2009. Penggunaan Teknologi Perontokan untuk Menekan Susut dan Mempertahankan Kualitas Gabah. Jurnal Keteknikan Pertanian, 23(2):111-118.

Manopo, R. & Kristanto, A. 2010. Perancangan Ulang Fasilitas Kerja pada Stasiun Cutting yang Ergonomis guna Memperbaiki Posisi Krja Operator sebagai Upaya Peningkatan Produktivitas Kerja. Jurnal Informatika, 4(2): 467–479.

Munir, A., Mulyawan, D. P., & Iqbal. 2018. Uji Kinerja Mesin Pemecah Kulit Gabah (Husker) Tipe Rol Karet pada Penggilingan Gabah Kecil. Jurnal AgroTechno, 11(1): 40–48.

Nevenda, M., Wulandari, L.M.C. 2023. Analisis Perhitungan aktu Standart untuk Menetukan Jumlah Tenaga Kerja Optimal pada Proses Produksi PT. NRZ Prima Gasket. Satukata Jurnal Sains, Teknik, dan Studi Kemasyarakatan. 1(5): 211-222.

Nurcandra, F., Pristya, T.Y.R., Fitri, A.M. 2023. Identifikasi Faktor-Faktor yang Mempengaruhi Penurunan Fungsi Paru Masyarakat di Sekitar Pembangkit Listrik Tenaga Uap. Jurnal Biostatistik, Kependudukan, dan Informatika Kesehatan. 4(1): 44-56.

Nurhikmat, N., Kardiman, Fauji, N. 2021. Rancang Bangun Alat Sortasi Gabah menggunakan Motor Bakar dengan Kapasitas 5 Hp. JUrnal Mechanical. 12(1): 23-28.

Nurmianto, E. 2003. Ergonomi : Konsep Dasar dan Aplikasinya. Surabaya: Prima Printing.

Paramitha, A., Sitohang, M. Z. F., & Daulay, I. N. 2022. Pengaruh Preventive Maintenance terhadap Reliability Maintenance pada Mesin Pengolahan CPO di PKS PTPN V Lubuk Dalam. JOM FEB, 9(2): 1-15.

Patiwiri, A. W. 2006. Teknologi Penggilingan Padi. Jakarta:Gramedia Pustaka Utama.

Prambudi, T.C., Ulfiyah, L., Hadiwijaya, L. 2021. Rancang Bangun Alat Penyortir Besar dengan Sistem Penggerak Motor Listrik. Journal of Applied Mechanical Engineering and Renewable Energy (Jamere). 1(1):20-23.

Vol. 13 No. 2, p 211-226, 2025 http://journal.ipb.ac.id/index.php/jtep
P-ISSN 2407-0475 E-ISSN 2338-8439 DOI: 10.19028/jtep.013.2.211-226

Prastyo, W. 2018. Perancangan Tata Kerja pada Penggilingan Padi menggunakan Analisis Studi Waktu (Time Study). Skripsi. Fakultas Teknologi Pertanian, Institut Pertanian Bogor, Bogor.

Prayuda, S. B. 2020. Analisis Pengukuran Kerja dalam Menentukan Waktu Baku untuk Meningkatkan Produktivitas Kerja pada Produksi Kerudung Menggunakan Metode Time Study Pada UKM Lisna Collection di Tasikmalaya. Jurnal Mahasiswa Industri Galuh, 1(1): 120–126.

Purnomo, H. 2004. Pengantar Teknik Industri. Yogyakarta: Graha Ilmu.

Sinaga, J., Pangaribuan, O., Tambun, B., Panjaitan L., M., & Mutiara, P. 2022. Peranan Ergonomi di Tempat Kerja. Jurnal Pengabdi. Kpd. Masy. 2(1): 26– 35.

Sulwahyudi, M. 2018. Faktor-Faktor yang Mempengaruhi Masyarakat Menggunakan Jasa Penggilingan Padi Sri Rahayu. Skripsi. Fakultas Ekonomi, Universitas Islam Riau, Riau.

Sutalaksana, I. Z., Anggawisastra, R., & Tjakraatmadja, J. H. 2006. Teknik perancangan sistem kerja. Bandung: Jurusan Teknik Industri ITB.

Tandel, S., Shetty, A.B.m LOnde, N.V., Shenoy S. 2023. Design and Fabrication of Paddy Cleaning Machine Review Paper. International Journal of Innovative Research in Electrical, Electronic, Instrumentation and Control Engineering. 11(7): 43-47.

Umar, S., Alihamsyah, T. 2014. Mekanisasi Pertanian untuk Produksi Padi di Rawa Pasang Surut. Jakarta: IAARD Press.

Wibawa, T. & Ristyowati, T. 2018. Perancangan Sistem Kerja untuk Meningkatkan Hasil Produksi Melalui Pendekatan Macroergonomic Analysis and Design di Sentra Industri Batik Ayu Arimbi Sleman. Jurnal OPSI, 11(2): 115–123.

Wignjosoebroto. 2000. Ergonomi, Studi Gerak dan Waktu: Teknik Analisis untuk Peningkatan Produktivitas Kerja. Surabaya: Guna Widya.

Wijaningrum, P., Norita, D., Junaedi, D., & Hutasoit, J. 2018. Pengukuran Waktu Baku Proses Mixing, Filling, dan Packing Mood Lipstick Menggunakan Metode Pengukuran Waktu Jam Henti di PT. X. Jurnal Teknokris, 12(1): 15– 21.