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Analysis of Rice Milling Machine Maintenance in The Bahagia Village Farmers' Group

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Abstract

This study aims to analyze the implementation of rice milling machine maintenance at the Bina Kasih Farmers Group in Bahagia Village, Palolo District, Sigi Regency. The research method used is a qualitative approach with data collection techniques through in-depth interviews with machine owners and operators and direct observation of the condition and maintenance activities of the rice milling machine. The results show that the Bina Kasih Farmers Group implements two types of machine maintenance: preventive maintenance and corrective maintenance. Preventive maintenance is carried out primarily at the beginning of the harvest season, including machine cleaning, lubrication, and component inspections, while corrective maintenance is carried out after damage occurs, such as replacing filters, drive belts, and husk fans. However, the implementation of maintenance is not supported by a regular and systematic schedule. Lack of attention to machine cleanliness during operation, limited access to spare parts, and a lack of human resources with technical skills are the main obstacles in machine maintenance. These conditions have an impact on machine performance decline, increased repair costs, and potential operational disruptions. Therefore, it is necessary to increase awareness of the importance of regular maintenance, develop a structured maintenance schedule, and strengthen human resource capacity to maintain machine performance and increase farmer group productivity in a sustainable manner.

INTRODUCTION

Technology has evolved over time, from being manual and relatively time-consuming to now being instant and fast. As technology advances, the resulting products are of higher quality.(Debby Armadani & Ali, 2025), the ability of a product to perform its function, such as durability, reliability, strength, and ease of packaging and repair, is called quality. According to(Jasasila, 2017) To produce quality products, we must be able to efficiently manage the factors in production, consisting of labor (man), machines and tools (machines), materials (materials), and funds (money). If management is inefficient, it can hinder the operational process. In the operational process, machines have a significant influence on producing product quality, therefore machines must always be in prime condition. To achieve this, machine maintenance activities are needed. Moreover, if the machine is operated frequently, it requires extra care to prevent the machine from easily breaking down. Machine maintenance can also prevent the risk of work accidents. According to(Nuryanti, 2025)Risk is anything that can happen unexpectedly. Organizational or company growth factors include risks, both internal and external, that impact objectives. Therefore, risk management is crucial for business success, as risk is unavoidable in the business world.

Developments in rice processing have advanced considerably. Initially, rice had to be pounded using a pestle and mortar to separate the rice from the husk. This process, with limited capacity, required a significant amount of labor, and resulted in poor quality rice with a high rate of damage. Today, rice is milled using a rice milling machine, a process that is significantly faster than traditional methods. The resulting yield is also significantly higher quality than traditional methods.

A rice mill is a mechanical device used to process paddy into rice. The rice mill in the Bahagia village farmer group is quite active, especially during the harvest season, because the group's members are not only from the village itself, but also from neighboring villages in the Palolo sub-district. The smooth operation of the machine is very important for the farmer group, so that members in the group are comfortable, satisfied, and have increased confidence. Many companies or factories cannot survive amidst competition due to obstacles in the middle of the production process, for example, machine damage that causes the machine to jam and cannot be operated. In production activities, machine reliability is very important. With a reliable machine, products can be produced that meet the established quality and output standards.(Print et al., 2025)

The owner of the rice mill and the operator of the rice milling machine provided information, from the results of the interview, that the rice milling machine of the Bina Kasih farmer group was established in 2020. Since its inception, the rice milling machine has never been replaced with a new machine. It is located in Bahagia Village, Palolo District, Sigi Regency, Central Sulawesi. This farmer group is funded by the Tani Jaya Bersama cooperative, which consists of 35 members. Based on the interview results, this farmer group has a 30 HP rice milling machine referring to the driving force equivalent to 30 horsepower. The machine has a capacity and power that is quite large in the milling process. With the number of group members reaching 35 people, the group leader has an important role in managing its members, where the mill owner must be able to schedule the rice milling, so that the milling does not exceed the machine's operating capacity. According to(Tondowala et al., 2025), leadership is the process of influencing and directing tasks related to group members.

The Bina Kasih farmer group's rice mill implements two types of maintenance: preventive maintenance and corrective maintenance. Maintenance is essential to maintain machine performance and prevent damage. Preventive maintenance is performed before damage occurs.(Christian Maritha et al., 2024) preventive maintenancehas a primary focus on suppressing or reducing unexpected costs due to machine failure. According to(Siregar et al., 2022), proactive preventive maintenance aimed at preventing damage to machinery and production equipment. This is done through regular monitoring of machine conditions, known as condition monitoring. This monitoring allows early identification of deviations or anomalies in machine performance, so that corrective action can be taken before more serious damage occurs. In contrast, corrective maintenance is reactive, where corrective action is taken after the machine experiences damage or disruption to its function. According to Ahyari in(Putra et al., 2020), the benefits that can be obtained if machine maintenance is carried out, namely: Good maintenance will extend the life of machines and production equipment. Production operations run smoothly and efficiently. Regular maintenance can reduce the risk of damage and repair costs. The quality control process and production process occur more effectively and controlled. Proper maintenance and management prevent major damage to the machine, thereby avoiding high repair costs. A good system prevents deviations in the use of raw materials, thereby minimizing waste. Optimal machine load planning ensures the production process runs smoothly and efficiently.

The rice milling machine of the Bina Kasih farmer group with its specifications, branded Yanmar with the YMM20 model has dimensions of 1280 mm in length, 1,495 mm in width, and 1,750 mm in height. The weight of this machine when empty is 272 kg, uses diesel power with 19-23 hp, the main shaft rotation of this machine reaches 750-800 rpm, its milling capacity to become white rice reaches 500-700 kg / hour. Based on the results of interviews with the mill owner, the advantage of the Yanmar YMM20 rice milling machine is that it peels the husk of the grain faster with satisfactory results. Operators can adjust the speed of the machine themselves, it is easy to move with its medium size and does not take up space, this machine is also very easy to operate compared to other branded machines, thus providing greater benefits compared to other machines.

Interviews revealed that the rice milling machine used is of the same brand, Yanmar. This diesel engine powers the rice milling process. The advantage of a diesel engine is its reliability, allowing the mill to operate without interruption, even during power outages. The downside is that diesel engines produce loud noise, which can disturb the surrounding community. Therefore, to avoid disturbing the surrounding area, the rice milling machine in the Happy Village farmer group is located far enough away from residents' homes to avoid disturbing them with its noise.

Observations led the author to believe that machine maintenance is crucial for smooth production processes. Indonesia boasts vast agricultural land, with rice as a staple food, leading to a large population growing rice. However, many rice milling businesses, particularly in rural areas, pay little attention to machine maintenance. This led the author to investigate this issue.

METHODS

The research method used is a qualitative research method. Qualitative research methods are research methods based on the philosophy of post-positivism, used to research in natural object conditions (as opposed to experiments) where the researcher is the key instrument, data collection techniques are carried out through triangulation (combination), analysis, data is inductive/qualitative, and qualitative research results emphasize meaning rather than generalization.(Sugiyono, 2023)The data obtained in this study came directly from relevant sources involved in the researcher's research. There are two types of data collection in this study: observation and interviews. Direct observation, which means conducting direct observations to identify maintenance activities, is used. Here, the researcher observed and conducted direct observations of the rice mill of the Bina Kasih farmer group. The data collection technique chosen was interviews, which were conducted through direct question and answer sessions related to machine maintenance activities.

RESULTS AND DISCUSSION

The important components found in a rice milling machine and their functions obtained from the interview results include the following.

Table 1
Components of the Yanmar YMM20 Rice Milling Machine

Component Name	*Preventive Maintenance*	*Corrective Maintenance*	Function
Grain Tank (Hopper)	✓		As a place to store rice, before the rice goes through the milling process.
Hulling Head	✓		*Hulling head*The hulling head is used to remove the husk from the rice kernels. The hulling head also serves as a tool for attaching the roller roller.
Winnower	✓		*Winnower*The winnower fan functions as a fan to separate the chaff from the rice after the hulling head process. When the winnower fan is used, only clean rice is fed as raw material.
Overflow outlet	✓		*Overflow outlet*functions as a safety feature, preventing machine damage due to excess material buildup.
Husk Blowing Fan		✓	This fan is important to separate the chaff from the rice after the hulling process making the chaff removal process faster and keeping the unit clean.
Rice Husk Pipe	✓		The husk produced from the rice milling process is collected and removed through a husk hopper to a storage or disposal area.
Main Pulley		✓	Its function is to transmit rotation from the drive motor to various other engine components.
Feed Shutter Grain Husker	✓		*Feed shutter*regulate the amount of grain entering the huller and prevent overloading excessive.
Screen		✓	Functions for separate the chaffaccording to size.
Ruble Roll	✓		*Rubber roll*It is used to remove the husk, or skin, from rice grains. This is done by pressing and grinding the rice between two rubber bands. *roll*that rotates.
Flat Belt		✓	*flat belt*Also known as flat belts, they are commonly used as conveyor belts or power transmission media in various machines and equipment. They are also commonly used to transfer power from one pulley to another and are also used as conveyor belts to move materials.
Cooling System (Radiator)			A rice milling machine has a radiator, which is crucial for cooling the engine

		✓	and preventing overheating. Its function is similar to a car radiator: it releases the heat generated by the engine into the air, maintaining a stable engine temperature and preventing damage from overheating.
Gear Case	✓		*Gear case*as a place to store oil in the engine.
Steel Cylinder	✓		Steel cylinders are used with rubber rollers for hulling and whitening/polishing. These cylinders provide the necessary pressure to effectively remove the hull without damaging the rice kernels.
Screw Conveyor	✓		A tubular device with a rotating screw, or auger, inside is called a screw conveyor. Its function is to transport material from one part of the machine to another.
Feeding Shutter	✓		Its function is to regulate the quantity and speed of grain entering the hulling head space.
Retaining Plate	✓		This disc works with a pressure spring behind it to prevent the broken rice from coming out of the hopper directly.
Peeler Knife	✓		This knife is positioned around the discharge port of the hulling head. After the initial process with the rubber roll is complete, the thin husk still attached to the rice grains is scraped off with the rubber.

Based on research findings obtained through interviews, the rice mills in the Bina Kasih farmer group use two types of maintenance: preventive maintenance and corrective maintenance. The interviews revealed that the rice mills in Bahagia village implement preventive maintenance to prevent damage and corrective maintenance to repair damage. The preventive maintenance carried out by the rice mill operators in the Bina Kasih farmer group in 2024 is as follows:

1. Remove dust and dirt from the polishing screen and any accessible parts of the machine. Operators typically clean the inside of the machine using a cloth, sponge, or brush. Cleaning is performed when the operator feels dirt has accumulated in the rice mill. Cleaning the inside of the tank is done using a soft brush to remove dust and remaining grain, to prevent mold and blockages.
2. Screen inspection, a clean screen produces higher quality rice production by ensuring the screen is clean from bran, husks, dust and small grains every day.
3. Check whether there are any loose bolts and need to be tightened on the locking bolts on the winnower fan, fan shaft and pulley, and check all bolts and nuts on the hulling head, hopper and all lager locks by using an L key to tighten them and the check is carried out every harvest season.
4. If the gap is <1 mm → the roll will grind the gearbox. If the gap is >1 mm → it will result in a lot of broken rice when peeling. Every two to three days, the worn surface of the roll on the right can be swapped to the left to ensure even wear. When replacing the roll, it is

important to note that after loosening the pin bolt, pull the roll from the main shaft if the roll is thin or cracked. Before installing the new roll, clean the shaft from dirt and apply grease. After installing the new roll, adjust the gap and tighten the bolt.

5. Check the lubricating oil in the gear case. The gear case must always have lubricating oil. Lubricating oil is applied every three months during harvest. Lubricating oil is also very important and can have fatal consequences if neglected.
6. After use, clean the steel cylinder with a dry cloth, soft brush, or if necessary a mild anti-rust product to prevent dirt and moisture that could potentially cause corrosion.
7. Sharpen or replace the paring knife to maintain its sharpness. This helps minimize broken rice. Use a soft nylon brush to clean the surface of the knife to remove husks and bran debris to prevent damage to the blade.

Post-breakdown (corrective) maintenance is performed when the machine experiences specific problems, such as unexpected problems or breakdowns. The corrective maintenance performed by rice mill operators in the Bina Kasih farmer group includes the following.

1. Replace damaged sieves. Damaged sieves prevent proper separation of the rice grains, resulting in the rice being mixed with impurities. This reduces the quality of the rice and can lower its selling price.
2. Replacing the air filter: a damaged air filter can cause engine damage. The air filter ensures clean air is supplied to the mill.
3. Replacing the drive belt, a damaged drive belt is indicated by cracks, excessive vibration, stretching, or making a noisy sound.
4. Every harvest season, the air suction fan (chaff ejector fan) is inspected. The bolt heads on the fan shaft are constantly worn away by friction with the chaff, potentially causing the fan to come loose. Damaged fans should be replaced immediately, and welding should be avoided. Welding on the fan can cause imbalances in the machine's performance, potentially damaging other parts.

Table 2
Characteristics of damage and maintenance carried out

No	Component Name	Characteristics of Damage	Maintenance Performed
1	Grain Tank	Leaks, cracks, dirt builds up at the bottom.	Clean regularly, check for leaks and cracks, repair or replace if damaged.
2	*Hulling Head*	Worn out, unable to peel the grain properly, noisy sound.	Check for wear, clean from remaining grain, replace if badly worn.
3	*Winnower*	Excessive vibration, ineffective in separating chaff, damaged propeller.	Check the propeller balance, clean it from dirt, replace the damaged propeller.
4	*Overflow outlet*	Blocked, the flow of grain is not smooth.	Clean regularly from blockages, ensure smooth flow.
5	Rice Husk Fan	High vibration, worn/broken fan blades, unable to remove husks.	Check and clean the fan blades, replace if there is serious damage.
6	Rice Husk Pipe	Clogged, leaking, cracking.	Clear from blockages, check and repair any leaks/cracks.
7	Main Pulley	Worn out, rusty, doesn't spin smoothly, loud noise.	Lubricate regularly, check for wear, clean from rust.

No	Component Name	Characteristics of Damage	Maintenance Performed
8	*Feed Shutter*	Jammed, cannot be opened/closed properly, grain flow control is not accurate.	Clean from dirt/remaining rice, lubricate the mechanism, repair if it is stuck.
9	Screen	Torn, clogged, dirt stuck.	Clean regularly, replace if torn or damaged.
10	*Ruble Roll*	Worn out, unable to rub against the grain skin, cracked.	Check for wear, clean, replace if badly worn.
11	*Flat Belt*	Loose, cracked, broken, worn.	Check tension, replace if cracked/broken/severely worn.
12	Radiator	Engine overheating, coolant leaks, dirty/damaged fins.	Check coolant level, clean fins, check for leaks.
13	*Gear Case*	Oil leak	Oil leaks, noise, overheating, worn gears.
14	Steel Cylinder	Worn, scratched, cracked.	Clean, check for wear/damage, replace if necessary.
15	*Screw Conveyor*	Worn on the thread, jammed, unable to move the grain/chaff.	Check thread wear, clean from blockages, lubricate bearings.
16	Retaining Plate	Worn, bent, cracked, unable to hold other components.	Check for wear and shape, replace if badly damaged.
17	*Peeler Knife*	Blunt, broken.	Sharpen regularly, clean, replace if too blunt/damaged.

Table 3
Cost of Damage and Type of Damage to the Yanmar YMM20 Rice Milling Machine

No	Engine components	Maintenance Costs		Type of Damage		
		Preventive Maintenance	***Corrective Maintenance***	**Light**	**Currently**	**Heavy**
1	Grain Tank (Hopper)	4x Rp. 10,000				
	Hulling Head	Rp 0				
4	*Winnower*	Rp 0				
5	*Overflow outlet*	Rp 0				
6	Husk Blowing Fan		1x Rp. 400,000		✓	
7	Rice Husk Pipe	Rp 0				
8	Main Pulley		1x Rp. 1,100,000			✓
9	*Feed Shutter*	Rp 0				
10	Screen		2x Rp. 100,000		✓	
11	*Ruble Roll*					
12	*Flat Belt*		2x Rp. 125,000			✓

No	Engine components	Maintenance Costs		Type of Damage		
		Preventive Maintenance	***Corrective Maintenance***	**Light**	**Currently**	**Heavy**
13	Radiator		1x Rp. 500,000		✓	
14	*Gear Case*	4x Rp. 50,000				
15	Steel Cylinder	Rp 0				
16	*Screw Conveyor*	Rp 0				
17	Retaining Plate	Rp 0				
18	*Peeler Knife*	Rp 0				
	Total:	Rp. 240,000	Rp. 2,450,000	0	3	2

Based on the data above, the costs incurred by the Bina Kasih farmer group in carrying out preventive maintenance amounted to Rp. 240,000, while the costs for repair maintenance amounted to Rp. 2,450,000. Preventive maintenance costs (*Preventive Maintenance*) on the grain tank includes purchasing soap and sponges to wash the inside and outside of the machine. Soap and sponges can also be used to clean other machines, thus saving costs. Grease is purchased to lubricate machine parts that require lubricating fluids for smooth production. Maintenance and repair costs (*Corrective Maintenance)*The table above includes the replacement of damaged machines with new ones. Based on the data above, the total costs incurred by the Bina Kasih farmer group amounted to Rp. 2,690,000. In 2024, the Bina Kasih farmer group's repair maintenance costs were greater than the costs of preventative maintenance.

There are 17 core machine components, five of which are undergoing repair maintenance, while the rest are undergoing preventative maintenance. Two of the preventative maintenance tasks require funds to complete, while the others are free of charge. Mr. Yono stated, "When purchasing soap for the grain tank, the soap is also used for other machine components to save money. However, not all machines require soap for maintenance. Most only need to be cleaned with a cloth, sponge, or brush."

Rice milling machines can be categorized as having minor, moderate, or major damage based on the severity of the damage and its impact on the machine's function. Minor damage typically occurs when there is only a minor disruption to a specific component, such as a loose bolt, a loose belt, or wear on a minor part, allowing the machine to operate with minimal repairs. Moderate damage is characterized by damage to more critical components, such as worn gears, loose bearings, or oil leaks, which prevent the machine from functioning optimally and require repairs or replacement of spare parts. Meanwhile, major damage occurs when core components such as the dynamo, drive motor, or main milling system are so damaged that the machine cannot operate at all. In this condition, the machine requires a complete overhaul or even replacement of a new unit. This classification is important so that the machine owner or operator can determine the appropriate handling steps and estimate the required repair costs.

Figure 1
Image of the Bina Kasih farmer group's rice milling machine

Figure 2
Image of the Bina Kasih farmer group's diesel rice milling machine

Obstacles in Maintenance

The main obstacle in carrying out machine maintenance in this case is the maintenance schedule. In the Big Indonesian Dictionary on the website(KBBI, nd)Another word for obstacle or the definition of obstacle is a hindrance. So the obstacle faced in this case is the lack of a specific maintenance schedule, preventive maintenance is carried out at the beginning of each harvest season or when the operator feels the need for maintenance. After the harvest season is over, the rice milling machine receives less attention and is simply left unattended. Bolt inspections, inspections of the husk throwing fan, air filters, screens, and other inspections are carried out only at the beginning of the harvest. Once the harvest season is over, the rice mill does not receive any additional maintenance. The harvest period ranges from 3-4 months after planting rice. From 3-4 months of harvest, the rice milling machine is actively operating for one month with large-scale rice production. The following month, small-scale milling operations are carried out.

After conducting direct field observations, researchers realized that machine maintenance here focuses solely on the initial harvest, with maintenance rarely performed during active operation. This is evident in the dirty exterior of the machine. Researchers also noticed that, despite the obvious dirt on the rice milling machine used by the Bina Kasih farmer group in Bahagia village, rice husks are often overlooked and left unattended.

Mr. Yono (operator) said, "The thing that hinders preventative maintenance and machine repair is the distance to purchase machine tools, although damage that requires replacement is very rare." In the past year, machine damage has never required replacing damaged machine parts. However, there have been cases where machine tools have broken and had to be replaced. However, because some shops in the surrounding area do not fully stock rice milling machine components, they have to be ordered from the city. Machine orders also do not arrive immediately

and take 2-3 days.

The engine component that is often damaged here is the filter.(Screen) Damage to the Yanmar YMM20 rice milling screen can be identified by various visible signs, both in the milling results and the physical condition of the machine. The most obvious sign is a decline in the quality of the resulting rice. The rice coming out of the machine will be mixed with bran or dirt because the holes in the screen are worn or enlarged, so they are no longer able to filter the bran effectively. In addition, the resulting rice may also look less clean or have many broken grains, indicating that the milling process is not taking place optimally due to an uneven or unsuitable screen.

Damage can also be seen from the presence of foreign objects that escape with the rice. If hard objects such as gravel, nails, or metal shavings enter, the filter can tear or break. This condition can be checked visually by turning off the machine and removing the part where the filter is installed to check for physical damage, such as tears, cracks, or excessively large holes. Furthermore, machine productivity can also decrease. A filter clogged with sticky dirt—especially during the rainy season—will hinder the smooth milling process and reduce the machine's production capacity. If these characteristics are found, replacing the filter with a spare part that meets Yanmar standards is essential to restore milling quality and prevent further damage to other components. According to Astuti (2020), performance management is about managing performance to achieve success. The decline in performance of the Bina Kasih farmer group's rice milling machine is like an overheated engine, resulting in a decrease in milling capacity. The machine's actual capacity of 700 kg/hour drops below that. This frequent decline in machine performance is due to accumulated rice husks, dust, and rice residue that interfere with the air filter. There have also been cases of machine operations stopping due to suboptimal performance. This was all due to irregular maintenance, particularly machine cleanliness.

Frequent obstacles include budget constraints for routine maintenance, a lack of skilled human resources in asset management, and recording and monitoring processes that are not supported by an ideal management system. Because of these conditions, asset maintenance is often reactive—performed after damage occurs—rather than proactive—which seeks to prevent damage before it occurs. As a result, machine equipment assets tend to experience rapid declines in value and functionality, which in turn increases maintenance costs and the risk of long-term operational disruptions. Resources are everything a company has to achieve its goals. A company's resources can be categorized into four types: financial, physical, human, and technological capabilities (Suherman & Siska, 2024). Several days after the interview, researchers observed a rice milling machine in the Happy Village. There, researchers found the machine stopped operating even though there was still a large amount of grain that needed to be milled. This occurs because the machine lacks additional maintenance. And neglecting trivial matters such as machine cleanliness can shorten the machine's lifespan.

CONCLUSION

This study shows that in the Bina Kasih rice milling machine maintenance group in Bahagia Village, Palolo District, Sigi Regency, there are two main forms of rice milling machine maintenance: preventive maintenance and corrective maintenance. Preventive maintenance is performed every harvest season. This includes checking bolts, filters, lubrication, cleaning the machine, and checking the condition of machine components. On the other hand, when the machine experiences damage, repairs are carried out incidentally, such as replacing screens, air filters, and drive belts. However, this study reveals several significant obstacles to carrying out maintenance, such as the lack of a regular maintenance schedule after harvest, a lack of attention to maintaining machine cleanliness during operation, the inability to obtain replacement components due to remote shop locations, limited human resources experienced in technical maintenance, and decreased machine performance. Decreased machine performance, such as

overheating, reduced production capacity, and sudden shutdowns, are all impacts of a weak maintenance system. Although major damage is rare, this risks shortening the machine's lifespan and reducing the farmer group's productivity in the long term. Consequently, the machine maintenance management system must be improved through: Increasing human resource capacity in technical and managerial areas, creating a standard and integrated maintenance schedule, and increasing operator awareness of the importance of regular maintenance. These efforts are crucial to ensure proper operation of rice milling machines and to sustainably increase farmer group productivity.

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