ADAPTATION ACTIONS OF RICE HARVESTING LABORS TOWARD THE IMPACT OF USING HARVESTER COMBINE MACHINE (HCM) IN DURIAN SEGINIM VILLAGE SOUTH BENGKULU REGENCY INDONESIA

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ABSTRACT

Agricultural mechanization used provides benefits in farming, namely cost efficiency. Harvester Combine Machine (HCM) use in rice farming can eliminate harvesting labor. Therefore, this study aims to analyze the impact of HCM use to the rice farming laborers in Durian Seginim Village, and to analyze the adaptation actions taken by the laborers because of the impact of using HCM. The research was conducted in October 2022. The number of respondents was 100 and the data was taken randomly from 192 rice farmers who use HCM. The data analysis method used is descriptive qualitative analysis. The results showed that the use of HCM in rice farming provides benefits for farm owners in savings in harvesting costs of 23.99 percent. However, the use of HCM reduced employment opportunities by 58.72-time allocation of labor/Ha (36.78% of the total farming workforce). Specifically for harvesting workers, labor absorption decreased by 42.70 time allocation of labor/Ha (25.91%) which was dominated by female workers from outside the family. Female workers experienced a decline in their income and contribution to household income by 46.99 percent. The three adaptation actions most frequently carried out by harvesting workers are working in the on-farm agricultural sector outside rice farming (21%), working on land that does not use HCM (17%), and selling large or small of rice stock, user savings, etc. (13%).

Keywords: adaptation action, Harvester Combine Machine (HCM), impact, labor, Bengkulu
INTRODUCTION

Agricultural mechanization aims to create efficiency in farming, especially efficiency in time and labor costs. Sulaiman et al. (2018) added that the policy for developing agricultural mechanization in Indonesia has the principle of being selective, which means that the introduction of machinery must be adapted to the socio-economic conditions of local communities. The implementation of agricultural mechanization has an impact on labor savings (70%-80%) and production cost savings (30%-40%).

Nurdin & Sriwahyuningsih (2021) stated that the use of machines in rice farming, especially during harvesting, is very helpful for farmers. Shani & Musa (2021) also argue that mechanization is something that is needed in the agricultural sector. Mechanization is then followed by changes in the use of various production inputs so that in the end it will increase agricultural production.

Agricultural mechanization that is generally applied in lowland rice farming is tractors for cultivating land and harvesting machines. According to Ramya (2016), the application of tractors increases agricultural productivity. The use of tractors for tillage means the beds are better prepared, as does the application of other inputs such as seeds and fertilizer. Using a tractor also makes work easier and faster so that time, energy, and costs are more efficient.

Meanwhile, another application of agricultural mechanization is the use of a combine harvester or Harvester Combine Machine (HCM), which also makes things very easy for rice farmers. This tool is equipped with slashing/cutting, threshing, and winnowing tools. Another advantage of HCM is that it can reduce the shrinkage of production results so that it can increase farmers’ income. Harvesting with HCM can be done more quickly so it is efficient in terms of time and costs and is also more economical (Amirrullah, 2016). However, the introduction of effective, efficient, adaptive, and environmentally friendly agricultural systems must be adapted to the preferences and social culture of farmers (Yunianti et al., 2022).

Agricultural workers/laborers are a very important group in this sector. Mechanization is a substitute for human labor and definitely affects the level of wages and employment opportunities for agricultural workers/laborers. The type of workforce that may be affected by mechanization depends on which stage of work is being mechanized (Rahman et al., 2011). According to Purwantini & Susilowati (2018), the adoption of mechanization technology in harvesting activities is more efficient in terms of labor, costs, and time. Apart from that, it also reduces yield losses. Meanwhile, the bad impact is the system of cultivating land from clearing to cultivation which is carried out by oneself. Some agricultural workers will experience job loss, decreasing the share received by agricultural workers. This negative impact can be overcome by efforts to create various alternative employment opportunities for the affected agricultural workforce.

South Bengkulu Regency, Bengkulu Province has 11 sub-districts that have the potential for developing lowland rice farming. South Bengkulu BPS data (2020) shows that Seginim District, South Bengkulu Regency has the largest wetland rice farming area, namely 3,950
Ha, and contributes the highest lowland rice production (18,052 tons). The eleven villages in Seginim District generally use hand tractors and HCM, but in Durian Seginim Village there are around 70 percent of farmers have used HCM machines when harvesting their produce, the rest still use conventional methods, namely combing, threshing, and winnowing manually.

HCM was first introduced by the Seluma Regency Food Crops Agriculture Service in Durian Seginim Village in 2018. Lowland rice farmers did not immediately adopt HCM in their farming. HCM was adopted gradually by lowland rice farmers in Durian Seginim Village so that by 2021 as many as 70 percent of farmers would apply HCM in the harvesting process.

Some farmers have also harvested their produce with HCM. Harvesting lowland rice using HCM only requires two workers within 1-2 hours for one Ha of rice field. The costs incurred for renting this HCM are IDR 50,000 for one sack of Harvested Dry Grain (HDG) production. One sack contains 120 kg HDG. Meanwhile, harvesting one ha of rice fields using the conventional method requires 10 workers who work for three days. Wages for harvesting labor are IDR 75,000/day workforce. The implementation of agricultural mechanization certainly results in agricultural workers losing their jobs, and they try to adapt to various adaptation measures so that they still have a source of income to meet their living needs.

Based on this background, the aim of this research is to analyze the impact of using HCM on workers, especially harvesting workers, in lowland rice farming in Durian Seginim Village as well as the adaptation actions taken by these workers for the impacts experienced.

RESEARCH METHODE

The research was carried out in Durian Seginim Village, Seginim District, South Bengkulu Regency. The location of this research was determined deliberately. The underlying consideration is that South Bengkulu Regency is the center of rice production in Bengkulu Province with an area of 10,658.78 Ha (21.67%) and a total production of 50181.73 tonnes. Seginim District is a rice production center that has the largest rice fields (3,950 Ha) and the highest production (18,052 tons). At least 90 percent of rice farmers in eleven villages in Seginim District have adopted HCM, but only 70 percent of rice farmers in Durian Seginim Village have adopted it since it was introduced in 2018. This research was conducted in October – November 2022.

Rice farmers in Durian Seginim Village carry out farming three times a year or three planting seasons, namely April, August, and November. All farmers carry out farming simultaneously during these planting season periods. The data analyzed in this research is rice planting season data which starts in April and May and ends in June and July 2022.

Rice farmers in Durian Seginim Village started using HCM quite variedly, namely between 2018 and 2021. The population of farmers who use HCM is 192 people. Respondents consisted of two groups, namely farmer respondents and rice farming worker respondents. Farmer respondents totaled 66 people, determined using the Slovin formula, and taken randomly.
There were also 66 labor respondents determined using snowball sampling which started from interviews with farmers who employed the workers.

The method used to analyze the impacts experienced by rice farming workers and adaptation actions is a qualitative descriptive method. The impact is measured by comparing several changes in conditions in rice farming and rice harvesting labor due to the use of HCM. These changes include changes in the amount of harvesting labor absorbed, changes in harvesting costs, and changes in income as well as the contribution of harvesting labor to family income.

The adaptation actions taken by the labors were adopted from Declaro-Ruedas & Bais (2020), namely the actions taken by the labors when facing the negative impact of the use of mechanization. These actions are: 1) Working in the on-farm agricultural sector outside of rice farming, 2) Working in the off-farm agricultural sector, 3) Working outside the agricultural sector, 4) Working on land that does not use HCM, 5) Utilizing village credit, 6) Reducing expenditure on food and other necessities, 7) Seasonal migration to other areas in search of work, 8) Children sent to families to receive proper needs and care, 9) Dependence on the government for financial assistance, education, and health, 10) Sell large or small portions of rice supplies, savings or household assets, etc., 11) Children are asked to participate in livelihood activities, and 12) Become members of cooperatives to obtain microloans.

RESULTS AND DISCUSSIONS

Respondent Characteristics

The characteristics of research respondents which include the variables age, length of formal education, main job, number of family dependents, land area, and land tenure status are presented in Table 1.

Age is one of the supporting factors in increasing work productivity so it will indirectly influence the development of a region. The older a person is, the more mature their ability to carry out agricultural activities will be to increase production and the quality of the products produced. Based on the table below, it can be seen that the rice farmers who were respondents in Durian Seginim Village, Seginim District had an average age of 50.4 years and as many as 52 percent were classified as medium-aged. This age is still considered a productive age for a rice farmer. The research results of Intiaz et al. (2022) also show that farmers who apply combined harvester technology in their rice farming are farmers of productive age.

A person’s level of education will greatly influence a person’s knowledge, especially in this research in the field of rice farming. Education will be very necessary for the progress of the rice farming business. Education can be obtained through formal education and non-formal education from various sources. According to Kumiasih et al. (2013), the higher a person’s level of education, it is possible that the more rational the perception or response given will be compared to those with lower formal education. However, farmers who have higher education do not always have a better mindset than farmers who have less education.
### Table 1 Characteristics of lowland rice farmer respondents in Durian Seginim Village

<table>
<thead>
<tr>
<th>Variables</th>
<th>Percentage (%)</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age (Years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 25-42 (Young)</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>• 43-59 (Middle)</td>
<td>52</td>
<td>50.4</td>
</tr>
<tr>
<td>• 60-75 (Old)</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>2. Formal Education (Years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 0-6 (Low)</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>• 7-12 (Medium)</td>
<td>65</td>
<td>9.1</td>
</tr>
<tr>
<td>• 13-16 (High)</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>3. Main Job</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Rice farmer</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>• Palm Oil Farmer</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>• Teacher</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. Number of Family Dependents (People)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 0-1 (Less)</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>• 2-3 (Medium)</td>
<td>51</td>
<td>2</td>
</tr>
<tr>
<td>• 4-5 (Many)</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>5. Land Area (Ha)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 0.06-0.34 (Narrow)</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>• 0.35-0.68 (Medium)</td>
<td>42</td>
<td>0.43</td>
</tr>
<tr>
<td>• 0.69-1.00 (Wide)</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>6. Land Tenure Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Own (Buy)</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>• Own (Inheritance/Grant)</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>• Rent</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>• Sakap (Profit-sharing System)</td>
<td>26</td>
<td></td>
</tr>
</tbody>
</table>

There are times when farmers with lower education have a better mindset and perspective, this is also influenced by a person’s experience, patience, and perseverance as a farmer. An adequate level of education will have an impact on improving the performance and business management abilities of rice farmers. On average, lowland rice farmers in Durian Seginim Village have only received formal education for 9.1 years or only completed junior high school. However, this level of education is considered adequate compared to the opinion that in general, the majority of farmers’ formal education is only 6 years or the equivalent of elementary school.

Work is the main source of income for every individual, and the type of work can indicate social status. The research results are in Table 5.1. Almost all respondents (96%) have their main job as rice farmers, some farmers have other main jobs and use rice farming as a side job. Farmers who make paddy farming their main job will certainly make efforts to obtain maximum-quality production results.

The number of family dependents is the number of family members a person has. Owned family members can have a positive impact on agricultural businesses because these family members can be used as labor (Takasenserang et al., 2021). The large number of family dependents can influence farmers in carrying out farming. The number of family members will influence farmers in making decisions. The
greater the number of family dependents, the greater the burden of life that must be borne by farmers. The number of family dependents is one of the economic factors that needs to be considered in determining income to meet needs.

Land is one of the factors of production, namely the place where agricultural products are produced which contribute to farming, where the amount of production from farming is influenced by the small area of land used. Based on this research, farmers in Durian Seginim Village have a land area of 0.06 to 1 Ha with an average of 0.43 Ha. The area and condition of the land greatly influence agricultural production and also the agricultural mechanization implemented. According to Kurniawan et al. (2022) Farmers who have larger areas of land show opportunities to apply innovation in order to obtain better rice farming production results. Even though it is relatively narrow, paddy farming land in Seginim Village is generally located on land with flat topography, and stretches of rice fields between farmers are located side by side or next to each other and separated by embankments. The flat land conditions with a large total expanse and access to agricultural equipment in Durian Seginim Village, enable farmers to adopt hand tractor mechanization technology and also HCM.

Most farmers have their own land obtained from inheritance or grants. Farmers who have their own land have more freedom to carry out their farming business. Tenant farmers are a group of farmers who cultivate other people's land by renting, and the length of the contract depends on the agreement between the land owner and the tenant. The status of renting land is that there are only 2 percent of farmers from the total respondents in this study.

Manatar et al. (2017) said that Land tenure status influences the average income received by lowland rice farmers. The highest average income is for farmers with leased land ownership status.

The Sakap land tenure system used in Durian Seginim Village is a profit-sharing system between the land owner and the land owner in the ratio 1:2. Farming capital in the form of land processing and harvesting costs as well as input costs are borne jointly by the farmer and the land owner.

The Impact of Using HCM on Rice Farming Labors Absorption

Rice farmers in Durian Seginim Village became familiar with HCM in 2018. However, the farmers implemented it in stages. There are those who immediately use new tunes in 2021 adopting them. As many as 99 percent of farmers know about HCM from fellow rice farmers, and only 1 percent know about it from Field Agricultural Extension Officers.

The number of HCM operating in Durian Seginim Village is three units. Two units are owned by individuals and one is owned by a group of farmers. When the harvest season arrives, namely around November and April, farmers in Durian Seginim Village rent HCM imported from Lampung. Farmers use HCM every time they harvest, only 2 percent harvest using HCM and a combination of conventional harvesting methods.

Before using HCM, lowland rice farmers harvested conventionally. The labor used is male
and female labor, both from within the family and from outside the family. The rice stalks are cut using a scythe or serrated scythe. As many as 80 percent of farmers use serrated sickles and the rest use ordinary sickles. Next, the cut rice stalks are collected in one place for threshing of the grain. All farmers use rice threshing machines. Apart from threshing the grain, the rice thresher machine also separates it from the panicles. Harvested Dry Grain (HDG) is transported to residential areas to enter the drying process either at the farmer’s house or in the drying field available at the rice mill. Milled Dry Grain (MDG) is then ground into rice. Lowland rice farmers sell their products in the form of rice.

Rice farmers in Durian Seginim Village have known about HCM since 2018. However, not all farmers immediately started using it. The beginning of the use of HCM by farmers was between 2018 and 2021. After three years of using HCM in Durian Seginim Village, all rice field farmers used HCM to harvest rice, except for a few farmers who did not use HCM because the land was far away and the land contour was not possible for HCM managers to reach the rice fields.

The impacts of using HCM felt by rice farmers in Durian Seginim Village are: 1) Harvesting can be done in three stages at once because HCM has tools, namely cutters, threshers, and winnowers, as well as packers, 2) The number of harvesting workers is reduced so costs can also be saved, and 3) Income increases due to reduced harvest costs. After using HCM, the activities of cutting rice stalks, threshing, and separating grain from straw and packaging are no longer carried out by human workers, either TKDK or TKLK.

Figure 1 shows changes in the total absorption or use of human labor in rice farming before and after the use of HCM.

The average number of working days for female workers is greater than for male workers both before and after using HCM. The amount of labor absorbed in rice farming before using the HCM machine is greater than after using the HCM. Female labors dominate, namely around 60 percent of all farming workers. This proportion of the female workforce is contrary to research findings of Kawengian et al. (2019) where in rice farming in Lowian Village, Mahesan District, South Minahasa Regency, the number of male workers is actually greater (66.56%) than female workers.
After implementing HCM the number of workers absorbed decreased from 164.77 HOK/Ha to 106.05 HOK/Ha. Both male and female workers experienced a reduction in working hours. The decline in labor absorption in rice farming indicates that there have been fewer job opportunities for farmers to work in rice farming. Amare & Endalew (2016) stated that the use of HCM had replaced the use of labor by 15 HOK/Ha which caused many labors to be unemployed. As a result, solidarity among rural residents and labors is decreasing, and many farmers are moving to cities to look for new jobs (Medrano et al., 2016).

The use of HCM technology for rice harvesting has an impact on reducing the workforce in rice farming in Durian Seginim Village, namely 34.95 (60%) or 25.91 percent of the total farming labor force (Figure 2). Dambe et al. (2021) stated that the use of HCM resulted in a reduction in labor use by 80 percent-90 percent.

The decrease in labor use due to the implementation of HCM results in a decrease in human labor costs. Specifically for harvesting activities, male labor costs are IDR 1,344,186.05/Ha and female labor costs are IDR 1,462,790.70/Ha, so the total harvest labor costs are IDR 2,806,976.74/Ha Ha. Another cost incurred when harvesting manually/conventionally is renting a grain threshing machine. The threshing machine rental is IDR 15,000.00/bag of GKP. One sack contains an average of 120 kg. The total cost of harvesting using the conventional method is the sum of the labor costs for harvesting and the cost of renting a threshing machine, which is IDR 1,040,533.00/Ha. Thus, the total cost of harvesting rice using the conventional method is IDR 3,847,509.74/Ha.

Figure 3 shows a comparison of harvesting costs before using HCM (conventional) and after using HCM. The amount of the HCM rental is IDR 50,000.00/bag of harvested grain.
The research results show that the average harvest cost with HCM is IDR 2,924,543.00/Ha. This cost is lower than the cost of conventional harvesting. Using HCM is more efficient because it saves farming costs, namely harvesting costs, which are 23.99 percent. On the other hand, Pundising et al. (2021) stated that the use of a Combine Harvester for rice farmers in Gowa Regency...
obtained more benefits in terms of time and labor efficiency. Farming income also increased by around 15 percent compared to when harvesting was done conventionally or manually.

The difference between the costs of conventional/manual harvesting and using HCM is quite large. Added to this are other costs that farmers have to incur during harvesting activities, namely preparing workers’ consumption (eating and drinking). Conventional harvesting takes longer, up to 2-3 days, with a lot of labor. Meanwhile, harvesting with HCM only takes a few hours and only requires 2-3 operators, so there are no consumption costs, etc.

This is in line with opinion Purwantini & Susilowati (2018a) which states that the use of mechanization technology in rice harvesting activities is indeed more efficient in terms of energy, time, and costs. However, there are also negative effects, namely, farm workers lose their jobs. The use of agricultural mechanization can reduce farming costs, thereby increasing farming income. This is certainly beneficial for farmers. However, its implementation must be preceded by mapping needs and their impact on agricultural institutions (Aldillah, 2016).

Figure 4 shows a comparison of the contribution of female rice harvester labor income to household income before and after the use of HCM.

The research results show that harvesting activities absorb 25.91% of the total working days. The use of HCM reduces harvesting labors, especially female labors. The consequence experienced is a decrease in the income received by the workforce. These female labors, through the income they earn, contribute to household income. After the use of HCM, female labor’s income decreased. As a result of the use of HCM, the income of female labors decreased by 46.99 percent. Thus, the contribution of female labors, who have the status of wives, to household income has also decreased.

![Figure 4 Labor Income of Female Harvesters (Wife) and Their Contribution on Household Income](image-url)
Adaptation Actions Taken by Labors Toward the Impacts of HCM Use

The use of HCM has reduced employment opportunities for workers in rice farming in Durian Seginim Village, especially workers who come from outside the family. As a result, these workers experience a decrease in income, which also affects the fulfillment of family needs. Farmers then do various things to overcome the difficulties that arise due to reduced income due to reduced employment opportunities as seen in Figure 5 as adopted from Declaro-Ruedas & Bais (2020). Adaptation actions taken by rice harvesting labors in Durian Seginim Village to overcome difficulties, especially due to reduced income (Figure 5).

Adaptation actions are carried out by harvesting workers who are marginalized due to the use of HCM, generally in the form of actions to obtain income to replace lost income or actions to save on household expenses. The most common adaptation action taken by harvesting labors is shown in Figure 5.

**Figure 5** Adaptation Actions Taken by Harvesting Labors

**Information:**

- **A:** Working in the on-farm agricultural sector outside of rice farming
- **B:** Working in the off-farm agricultural sector
- **C:** Working outside the agricultural sector
- **D:** Working on land that does not use HCM
- **E:** Utilizing village credit
- **F:** Reducing expenditure on food and other necessities
- **G:** Seasonal migration to other areas in search of work
- **H:** Children are sent to families to receive proper needs and care
- **I:** Dependence on the government for financial assistance, education, and health
- **J:** Sell large or small portions of rice supplies, savings or household assets, etc.
- **K:** Children are asked to participate in livelihood activities
- **L:** Become members of cooperatives to obtain microloans
workers affected by the use of HCM is working in the on-farm agricultural sector outside of rice farming (21%), namely cultivating corn, growing vegetables in the yard, working on a neighbor’s corn farming land, and raising laying ducks. The second most common adaptation action is working on land that does not use HCM (17%). Harvesting workers are still needed by farmers who do not use HCM so that these workers can still earn income when harvest time arrives. The third most common adaptation action is selling large or small portions of rice supplies, savings/household assets, etc. (13%). Households that experience the impact of agricultural mechanization in the form of reduced income will implement these adaptation strategies. Kumaraswamy et al. (2020) stated that households that experienced economic shocks due to reduced income due to job loss due to the implementation of mechanization, carried out detrimental strategies, including liquidating productive assets. This causes the supply of assets owned to become increasingly depleted and will make the household experience poverty.

Only a small portion (10%) of the workforce seeks income from off-farm agricultural work and non-agricultural work. The limited employment and non-agricultural opportunities in Seginim Village are the cause. The dominant activity is rice farming. There are several other farming activities, but the same as rice, they are only dominated by the production of raw materials. Subsystem activities downstream and upstream are very lacking or almost non-existent. Downstream activities such as tool making and other agricultural inputs do not exist in this village. Likewise, agro-industrial activities processing agricultural products are also very lacking. Agro-industrial activities can be an option to diversify farmers’ income sources in rural areas. Arischa et al. (2022) stated that for farmers who also process the agricultural products they produce, household income increases and 46 percent is contributed by income from the agro-industry.

Non-agricultural activities or businesses in Durian Seginim Village are still few and only a few people are involved in them. However, farmers cannot only rely on income from their farming to meet household needs, so they will carry out other economic activities outside of agriculture. However, the most frequent action is to reduce spending on food and some household members undertake seasonal migration in search of additional work (Declaro-Ruedas & Bais, 2020).

CONCLUSIONS AND SUGGESTIONS

Conclusions

Based on the results and discussions, it can be concluded as follows:

1. The use of HCM in rice farming provides benefits for rice farmers in the form of harvest cost savings of 23.99%. However, the use of HCM eliminates employment opportunities amounting to 58.72 HOK/ha (36.78% of the total rice farming workforce). Harvesting labor absorption decreased by 42.70 HOK/ha (25.91%), which was dominated by female labors from outside the family. These female harvesting labors then experienced a decline in their
income and contribution to household income by 46.99 percent.

2. The three adaptation actions most often carried out by harvesting labors are working in the on-farm agricultural sector outside rice farming, working on land that does not use HCM, and selling large or small portions of rice supplies, stored goods, etc.

Suggestion

Job opportunities need to be created both in the on-farm and off-farm agricultural sectors, as well as outside the agricultural sector. In this way, affected workers can continue to earn income to meet their household needs.

REFERENCES


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