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THE IMPACT OF USING COMBINE HARVESTER TECHNOLOGY ON SOCIAL ECONOMIC CONDITIONS OF SWAMP RICE FARMERS AND HARVEST WORKERS IN SOUTH SUMATERA

Indri Januarti[*)][1], Yulian Junaidi[*)], and Elly Rosana[*)]

[*)] Agribusiness Department, Faculty of Agriculture, University of Sriwijaya
Jl.Palembang-Prabumulih KM.32 Ogan Ilir, Sumatra Selatan

Abstract: The objectives of this research were: (1) to analyze the use of labor allocation, productivity and income of swamp rice farmers of users and non-users of combine harvester technology; (2) to explore the impact of combine harvester technology and other factors on rice farm income; and (3) to analyze the impacts of using combine harvester technology on the socio-economic condition of farmers and harvest workers. From the result of the research, it can be seen that the amount of labor allocation in swamp rice farming conducted by farmer users of combine harvester is smaller than that of the non-users, that is 57,60 HOK and 117,63 HOK respectively. The productivity of swamp rice farming on the users is 4.543.56 kg per hectare per year in the form of dry grains whereas that of the non-users only reached 4,423,33 kg per hectare per year. Income of swamp rice farming using combine harvester is larger if compared with that of the non users that is equal to Rp14,942,737.16 per hectare per year for the users and Rp9,954,095.76 per hectare per year for the non-users. From the result of regression analysis, it can be seen that dummy variables of combine harvester technology, experience of farming, productivity, fertilizer cost, pesticide cost and labor cost have significant impacts on rice farmer income. Combine Harvester technology has both positive and negative impacts on social, economic and technical conditions in swamp rice farming for the farmers and worker harvesters.

Keywords: combine harvester, social, economy, rice, swamp

Abstrak: *Tujuan dari penelitian ini adalah (1) menganalisis penggunaan alokasi tenaga kerja, produktivitas dan pendapatan petani padi rawa pengguna dan non-pengguna teknologi combine harvester, (2) menjajaki pengaruh teknologi combine harvester dan faktor-faktor lainnya terhadap pendapatan usahatani padi, dan (3) menganalisis dampak penggunaan teknologi combine harvester terhadap kondisi sosio-ekonomi petani dan buruh panen. Dari hasil penelitian, dapat diketahui bahwa besarnya alokasi tenaga kerja pada usahatani padi rawa lebak yang dilakukan oleh petani pengguna combine harvester lebih kecil daripada non pengguna, yaitu 57,60 HOK dan 117,63 HOK. Produktivitas hasil usahatani padi rawa lebak pada petani pengguna sebesar 4.543,56 kg per hektar per tahun dalam bentuk gabah kering panen (GKP), sedangkan petani non pengguna hanya 4.423,33 kg per hektar per tahun. Pendapatan usahatani padi rawa lebak dengan menggunakan combine harvester lebih besar jika dibandingkan dengan non pengguna, yaitu sebesar Rp14.942.737,16 per hektar per tahun untuk petani pengguna dan Rp9954.095,76 per hektar per tahun untuk non pengguna. Dari hasil analisis regresi, dapat dilihat bahwa variabel dummy teknologi combine harvester, pengalaman usahatani, produktivitas, biaya pupuk, biaya pestisida dan biaya tenaga kerja berpengaruh signifikan terhadap pendapatan usahatani padi. Teknologi Combine Harvester berdampak pada kondisi sosial, ekonomi dan teknis dalam usahatani padi rawa lebak, baik dampak positif maupun negatif pada petani dan buruh panen.*

Kata kunci: *combine harvester, sosial, ekonomi, beras, rawa lebak*

[1] Corresponding author:
Email: in_drykrenz@yahoo.co.id

INTRODUCTION

Food is a fundamental necessity for human survival; furthermore, it has an important role as a provider of business field for most of the Indonesian, national income, economic stability, social and society. One of the important food commodities concerning the national interest is rice as staple food for most Indonesians (PTPH, 2015).

The population increase will have an impact on food needs. One of the efforts to meet the increasing demand of food from year to year is by increasing rice production (Balitbang, 2010). According to Yurisinthae (2012), the increase in paddy production that has been carried out is achieved by intensification (use of improved varieties and improved cultivation techniques) as well as by extensification (expansion of agricultural land). Increased rice production is expected to increase food security towards food self-sufficiency and achieve sustainable self-sufficiency. To increase rice production through the expansion of agricultural land is by not only cultivating rice in rice fields but also in swamplands.

Moreover, to strengthen food security towards food self-sufficiency, Ministry of Agriculture declared the importance of agricultural mechanization. Mechanization of agriculture is expected to play a role in increasing productivity and work efficiency, quality and competitiveness of products and can suppress loss and reduce production costs (Akatiga, 2015). Therefore, the government provides a variety of agricultural technology assistance to farmers, one of which is combine harvester.

Combine Harvester is a complete and sophisticated rice harvesting machine in operation. This machine can work quickly on large rice fields. The time required for rice harvesting is relatively short. Technology of Combine Harvester is equipped with cutting tools, and threshing and packing of rice can be done in one work process only (Hasibuan, 1999).

Through the 2012 the National Budget Plan funds, the Directorate General of Food Crops began to allocate the budget for postharvest facility to Gapoktan/Poktan until 2017. Provision of assistance of combine harvester machine is expected to match the postharvest handling objectives in order to reduce the shrinkage of food crops commodities, maintain the quality of results, maintain and extend the shelf life, and improve their competitiveness.

South Sumatra Province is one of the areas of food barns in Indonesia. Rice production in South Sumatra Province from 2011 to 2015 tended to increase with an average growth of 6.13 percent per year. The amount of rice production of South Sumatera Province from 2011 to 2015 amounted to 3,384,670 tons, 3,295,247 tons, 3,676,723 tons, 3,670,435 tons and 4,247,922 tons respectively (BPS, 2016).

To increase rice production in South Sumatera Province, the local governments have been trying to improve the utilization of swamp land that is indeed a considerably potential area. Various efforts have been made by the central and local governments to increase rice production in rainfed and irrigated rice fields as well as in swampland, including the application of mechanization with the use of combine harvester technology.

Technology is a means to achieve effectiveness, efficiency and high productivity; however, determining which type of technology to use is closely related or depends on the scale and type of business, cost capability, human resource capability, and needs and desires of consumers. Therefore, the technology chosen must be appropriate. According to Muthohirin (2014), technology is called to be appropriate if it has the following criteria: (1) the technology must use the available resources as much as possible; (2) the technology is in accordance with the economic and social conditions of the local community; and (3) if the technology helps solve the real problem in the society, not a technology that only dwells in the head of its planner. Therefore, technology is expected to have more positive impacts than the negative impacts on the socio-economic conditions of the community. Likewise, it also with the use of combine harvester technology, whether it is suitable for use in swamp rice farming and give a positive impact or more benefit to the socio-economic condition of the user community, in this case the farmer of owner land. On the other hand, there are harvest workers who also feel the impact of the use of combine harvester technology because their energy is replaced by the technology.

Based on the previous description, the researchers were interested in conducting a research on the impact of the use of combine harvester technology on the socio-economic conditions of farmers and harvest workers in swampland in South Sumatera. The objectives of this research are as follows: Analyzing the use of labor allocation, productivity, and income of swamp rice farming conducted by the farmer users and non-users of combine harvester technology; exploring the impact of using combine harvester technology and other factors on the income of swamp rice farming; and analyzing the impact of using combine harvester technology on the socio-economic condition of the farmers and harvest workers.

METHODS

This research was conducted in 3 (three) regencies, Ogan Komering Ilir (OKI), Ogan Ilir (OI) and Banyuasin of South Sumatera Province. The location of the study was determined purposively. The research location using purposive method was determined with the consideration that the three districts are the regions that own the largest swampland in South Sumatera Province (BPS Sumsel, 2012). Furthermore, these areas have an average rice production reasonably high among the entire districts in the Province of South Sumatera. In each district, 1 (one) village was selected for each regency, namely, Kuro Village (District Pampangan, Ogan Komering Ilir), Pelabuhan Dalam Village (District Pemulutan, Ogan Ilir) and SakoVillage (District Rambutan, Kabupaten Banyuasin). These areas are the major rice production centers. The research was conducted in 2017, where data collection from the sample farmers was conducted from August to September 2017. The research method used in this research was survey method. The sampling method used in this research was dispropotionated stratified random sampling where the first layer was the rice swamp land owners who used the combine harvester technology, the rice swamp of land owners who did not use the combine harvester technology, and harvest workers. The number of samples taken was as many as 90 samples consisting of 30 samples per layer.

To answer the first objective required to analyze the use of labor allocation, productivity, and income swamp rice farming conducted by the farmers using the technology and by non-users using some a number of formulas or calculations. The size of the combine harvester technology used by the rice swamp farmers is large because if it has a smaller specification, the machine will be immersed in soil that contains lots of water, thus making it difficult to operate properly. To calculate the working time allocation for households, the average amount of time for each activity for one year was calculated and described descriptively. Mathematically (Suratiyah, 2008), the formulas are as follows:

$$JK\ total = JO \times HK \times JK$$
$$HOK = JK\ total/JKS.$$

Where: JO (Number of people (people)); HK (Day work (day)); JK (Working hours (hour)); JKS (Standard working hours (hour)); HOK (Day of people work (HOK)).

Meanwhile, the allocation of working time of farming activities of swamp rice farmingis as follows:

$$W\ Up = \sum^{8}_{(i=1)} Wi$$

Where: WUp (Allocation of working time of swamp rice farming (HOK/year)); Wi (Allocation of working time of swamp rice farming, which includes land treatment, seeding, planting, fertilizing, weeding, plant pest organism control, and harvesting (HOK/year));

To calculate the productivity of swamp rice farming, the following formula was used:

$$Y = Q/L$$

Where: Y (Land productivity (Kg/ha)); Q (Total productin (Kg)); L (Farming land (Ha))

The incomes of the farms conducted by swamp rice farmers using the technology of combine harvester and the non-users were calculated using the following formula (Soekartawi, 2002):

$$Pn = Q \times Hj$$
$$Pd = Pn - BTp - BV$$

Where: Pn (Total Revenue (Rp/ ha/year)); Q (Total Production (Kg/ ha/year)); Hj (Price (Rp/Kg)); Pd (Income (Rp/ha/year)); BTp (Total Fixed Cost (Rp/ha/ year)); BV (Total Variable Cost (Rp/ha/ year)).

To answer the second objective i.e. to explore the impact of the use of combine harvester technology and other factors on the income of swamp rice farming, multiple linear regression test was used. The regression equation for the income of swamp rice farming is as follows:

$$Pd = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11} + b_{12}X_{12} + b_{13}D_1 + u$$

Where: Pd (Income of swamp rice farming (Rp/ year)); X1 (Age of Farmers (year)); X2 (Experience of swamp rice farming (year)); X3 (Education (year)); X4 (Number of family members (people)); X5 (Farming land (Ha)); X6 (Allocation of working time (HOK)); X7(Productivity (kg/ha)); X8 (Non-farm income (Rp/ year)); X9 (Seed cost (Rp)); X10 (Fertilizer cost (Rp)); X11 (Pesticide cost (Rp)); X12 (Labor cost (Rp)); D1 (Use of combine harvester technology, The value of D is 1 if technology is used;The value of D is 0 if technology is not used).

To answer the third objective, a descriptive analysis of the data was conducted, and information was obtained from in-depth interviews (indepth study) with the farmers of the land owners who use the technology, non-users and harvest workers, and other interested parties.

One of the agricultural mechanization that is being promoted by the government is the use of harvesting machine technology (combine harvester). The technology has also been applied or used by some swamp rice farmers, but there are also some who have not used the technology. Both farmers, the users of combine harvester technology and the non-user farmers are conducting rice farming in swamp land. However, the farmers using combine harvester machine have substituted the harvest workers into by the combine harvester machine in the harvesting process of their products. The use of such technology will affect the allocation of labor, and the amount of labor allocation will affect productivity. In addition to labor allocation and use of technology, there are also other production factors that allegedly affect the productivity of swamp rice.

The yields of production with the alleged differences in productivity between farmer users and non-users are marketed with a certain selling price. From the results of the marketing, the total revenue which is the result of multiplication between production and selling price was obtained. After deducting the total production cost, consisting of fixed and variable costs, the income of swamp rice farming was obtained. It is assumed that there is a difference of swamp rice farm income earned by the farmer users and non-users of combine harvester technology. In addition, this study will also discuss other variables that affect income.

Differences in the amount of labor allocation, productivity and income are the economic impacts of combine harvester technology. Then, there will be another economic impact on the rice farmers of swampland through the indepth study. Besides giving an economic impact, technology will also cause social impact because economic and social factors are closely related to each other.

On the other hand, there are harvest laborers whose energy is replaced by a combine harvester engine power. With the substitution, labor with the power of the machine causes farmers to lose job opportunities that result in lower household incomes. In addition, income factor will also be explored in depth other socio-economic impact on harvesters due to the use of combine harvester technology. From the above descriptions, we can develop strategies and policies for the development of appropriate technology-based rice farming in the swamp land that still has the potential to be developed, to support the achievement of resilience toward food self-sufficiency and the welfare of the community, especially farmers. The research framework is shown in Figure 1.

RESULTS

Allocation of Labor in Swamp Farmer Users and Non-Users of Combine Harvester Machine

The use of labor for both layers is similar, but there is a difference in the process of the activity. The process begins with the processing of land, seeding, planting, maintaining and harvesting. The Use of labor of user farmers and non-users of combine harvester machine can be seen in Table 1. Based on Table 1, it can be seen that the average amount of labor allocation (in units of HOK) in the swamp rice farming by the farmers using the Combine Harvester engine is smaller than that of the non-user farmers i.e. with a difference of

60.03 HOK. Less work time or work time allocation has an effect on reducing labor costs on harvesting, production, and threshing activities on rice farming in swamp if combine harvester technology is used.

Based on Table 1, it is known that the use of labor in the family on farming activity on farmer users of combine harvester is smaller than that of the non-user farmers that is 3,11 HOK for farmer users and 15.02 HOK for non-users. According to the experience of rice farmers in the swamp land, if harvesting activity uses harvesting machine (combine harvester), the cultivation of land for the next planting season cannot be carried out traditionally but it must use the machine. Therefore, the number of labor in the family is smaller than that of the farmers who do not use combine harvester.

A very large difference in the number of labor employed by the farmer users and non-user farmers is in the harvesting activity. Harvesting activity by the farmer users requires 2.13 HOK while the non-users requires 61.37 HOK. This difference is because the non-users in their harvesting activity still employed laborers with simple tools, and there are some farmers who also do the threshing activity traditionally but using the rice thresher machine.

Productivity of Swamp Rice Farming by Users and Non-Users of Combine Harvester Machine

The productivity of swamp rice farming calculated is in the form of dry grain of harvest (GKP), with the unit per kilogram per hectare per year. The average difference between the productivity of farmer users and non-users of Combine Harvester machine can be seen in Table 2. Based on Table 2, the average annual productions per farming by the farmer users of the Combine Harvester machine and the non-users are 7,078.33 kilograms and 4,833.33 kilograms per hectare per year respectively, and the harvested yields are in the form of dried grains (GKP) with an average land farming of 1.56 hectares for the users of the Combine Harvester Combine and 1.13 hectares for the non-users of the technology.

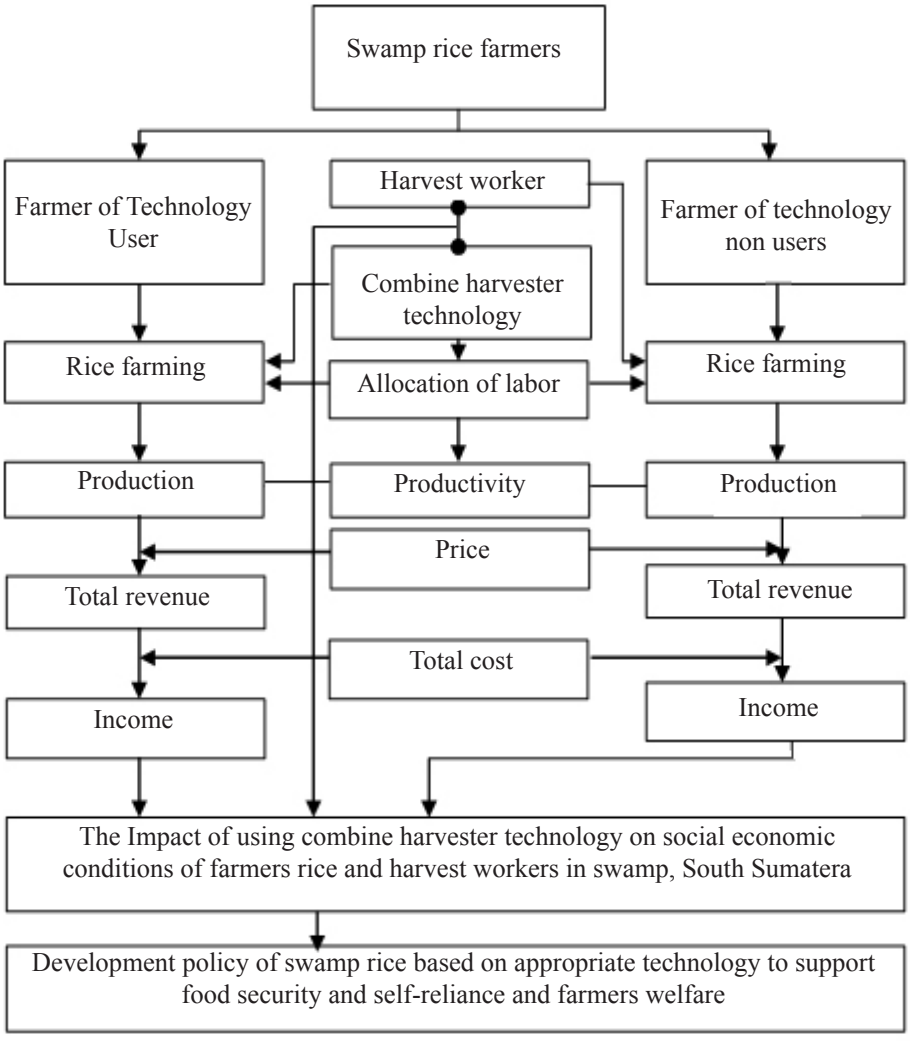

Figure 1. Research framework

The productivity obtained by the users of Combine Harvester machine is 4,543,56 per hectare per year, and the value of rice productivity can indicate that every 1 hectare of land cultivated by rice farmers using Combine Harvester Machine and other production factors will produce rice production of 4,543.56 kilograms per year. Meanwhile the productivity gained by non-users of Combine Harvester is 4,423.33 per hectare per year meaning that on every 1 hectare of land cultivated by the non-users will produce rice production of 4,423.3 kilograms per hectare per year. This productivity difference is caused by fewer scattered crops when using a combine harvester machine.

Production Costs of Users and Non Users of Combine Harvester Machine

Production costs consist of fixed costs and variable costs. Fixed costs in swamp rice farming include the cost of depreciation of agricultural equipment i.e. the costs of shrinkage hoes, sickle, handsprayer, machetes and tunjem. The value of depreciation of these farming tools was obtained using the straight-line method. The average fixed costs of rice farming can be seen in Table 3.

Table 1. Average of labor usage in swamp rice farming by users and non-users of combine harvester technology

Activity	Day of people work (HOK/Ha/year)	
	Users	Non Users
Land Processing	3.11	15.02
Seeding	11.03	7.86
Planting	26.07	25.71
Fertilization	4.34	3.43
Weeding	2.16	1.17
Plant Pest Control	3.89	3.07
Harvest	2.13	61.37
Total	57.60	117.63

Table 2. Average productivity of users and non-users of combine harvester machine

Description	Farmer		Difference
	Users	Non-Users	
Land Farming (Ha)	1,56	1,13	0,43
Production (Kg/ year)	7,078.33	4,833.33	2,245.00
Productivity (Kg/ha/year)	4,543.56	4,423.33	120.23

Table 3. Average fixed cost of swamp rice farming conducted by users and non-users of combine harvester technology

Fixed Cost Components	Depreciation Value (Rp/ha/year)	
	Users	Non Users
Hoes	76,777.22	55.838.10
Sickle	0.00	21.962.96
Handsprayer	138,992.10	283.347.62
Machetes	35,502.38	109.662.86
Tunjem	0,00	7.893.15
Total	243.995.20	478,704.68

The cost variables in swamp rice farming include the costs incurred by the sample farmers who run one production process in one season planting, such as the costs of purchasing seeds, fertilizers, pesticides and sacks, labor costs as well as transportation. The average cost variables of wetland rice farming in South Sumatra can be seen in Table 4.

Based on Table 4, the average cost variables of farmers using Combine Harvester machines amounted to Rp4,789,801.58 per hectare per year and the average variable cost of non-users is Rp8,145,185,56 per hectare per year. Average cost of farmers using Combine Harvester is smaller compared to that of the non-users, and this is because the labor cost for the farmer users of Combine Harvester machine is much smaller than that of the non-users. The difference in labor costs is not only due to differences in costs on harvesting activities but also on land processing activities.

From all of the fixed costs and variable costs that exist, the total cost of production of swamp rice farming conducted by farmer users and non-users in South Sumatera can be obtained. The total production cost incurred by each sample farmer varies depending on the size of land and the economic capability of each sample farmer. The average total cost of rice production is shown in Table 5. Based on Table 5, the average total cost of farmers' production of Combine Harvester machine users is smaller than that of non-users which is Rp5,033,796.79 per hectare per year and Rp8,623,890.24 per hectare per year.

Total Revenue of Swamp Rice Farming for Users and Non-Users

Revenue from swamp rice farming is calculated from the amount of output generated from the cultivation of the rice. For the calculation of the revenue of rice farming, the calculated component is the sale of rice for one year using current prices in order to make an appropriate comparison. Average revenue of swamp rice farming users and non-users of Combine Harvester machines can be seen in Table 6.

Based on Table 6, the average number of production per planting season per hectare in the sample farmers using the Harvester Combine machine reached 4,543.56 kilograms per year and for the non-users, it reached 4,423.33 kilograms per hectare per year in the form of Dried Rice of harvest (GKP) with a selling price of Rp4,396.67 per kilogram for the users and Rp4,200.00 per kilogram for the non-users. Total revenue earned by the users is Rp19,976.53.95 per hectare per year whereas that earned by non-users amounted to Rp18,577,986.00 per hectare per year.

Table 4. Average cost variables in swamp rice farming in South Sumatera

Variable Cost Components	Cost (Rp/ha/year)	
	Users	Non Users
Seed	582,293.65	531,400.00
Fertilizer	563,458.22	457,833.33
Pesticide	127,109.88	330,244.44
Sack	68,175.00	70,850.00
Labor	3,348,790.97	6,650,944.44
Transportation	99,958.37	103.913.33
Total	4,789,801.58	8,145,185.56

Table 5. Average cost of swamp rice farming in South Sumatera

Component	Cost (Rp/ha/year)	
	Users	Non Users
Fixed Cost	243,995.20	478,704.68
Variable Cost	4,789,801.58	8,145,185.56
Total	5.033.796.79	8,623,890.24

Income of Swamp Rice Farming for Farmer using Combine Harvester and Non Users

Income of swamp rice farming for farmers using combine harvester and those who do not use the technology in South Sumatera is obtained from the revenue minus the total cost of production. The average income of users and non users can be seen in Table 7. Based on Table 7, it is known that the average income of users is Rp14,942,737.16 per hectare per year while the average income of non-users is Rp9,954,095.76 per hectare per year.

Impacts of Combine Harvester Technology and other factors on Swamp Rice Farming Income

In Table 8, it can be seen that the dummy variables of combine harvester technology: experience, productivity, fertilizer cost, pesticide cost and labor cost have significant effects on the income of swamp rice farming. The dummy variables of combine harvester technology has a t-count value of 3.216 where this value is greater than the t-table value, meaning that Ho is rejected for that variable. Thus, there is a real or significant relationship individually among the dummy variables of combine harvester technology and income of swamp rice farming. The regression coefficient value for dummy variables of combine harvester technology is 4,521,821.539, meaning that if the farmers use combine harvester technology, the income will be greater by Rp4,521,821.54 per hectare per year compared to that of the non-users.

The productivity variable has a t-count value of 5.749 where this value is greater than the t-table value, meaning that Ho is rejected for that variable. Thus, there is a real or significant relationship individually between the variables of productivity and income of rice farming in swamp land. Regression coefficient value for rice productivity variable is 2,302.907, meaning if the productivity increases by 1 kg per hectare per year, the income will also increase by Rp2,302.91 per hectare per year. The results of regression analysis are in accordance with the economic theory, where if the amount of production or productivity increases, the total revenue will increase as well as the income will increase.

The Impacts of Using Harvester Combine Technology on the Socio-Economic Conditions of Users and Harvest Workers in Swamp Rice Farming

Combine Harvester technology has both positive and negative impacts on social, economic and technical conditions in the cultivation of rice in swampland. The positive impacts of the use of combine harvester technology on the socio-economic conditions of the farmer users are: (1) The allocation of labor or work time in the farm is reduced, thus increasing the leisure time that can be used for other productive activities, (2) production cost decreases, (3) more income is earned from increased rice farming, (4) productivity is slightly higher, although insignificant, because fewer crops are lost, and (5) harvest is faster and rice is cleaner, but the result of research shows that there are no significant differences in rice yields.

Table 6. Average revenue of swamp rice farming in South Sumatera

Description	Unit	Farmers	
		Users	Non Users
Production	Kg/ha/year	4,543.56	4,423.33
Price	Rp/kg	4,396.67	4,200.00
Reception	Rp/year	19,976,533.95	18,577,986.00

Table 7. Average income of swamp rice farming for users and non-users

Variables (Rp/ha/year)	Farmers		Difference
	Users	Non Users	
Total Revenue	19,976,533.95	18,577,986.00	1,398,547.95
Total Production Cost	5,033,796.79	8,623,890.24	3,590,093.45
Income	14,942,737.16	9,954,095.76	4,988,641.4

Table 8. Result of regression analysis on the impacts of combine harvester machine and other factors on swamp rice farming income

Variable	Coefficient	t-count	Sig	
Constants	-2,735,051.411	-0.829	0.412	
Age	28,585.518	0.412	0.682	
Experience	-126,710.235	-2.263	0.028	**
Education	-196,702.720	-1.005	0.320	
Number of family members	-8,664.273	-0.022	0.983	
Labor Allocation	-40,292.938	-1.644	0.107	
Productivity	2,302.907	5.749	0.000	***
Seed Cost	2,755	1.493	0.142	
Fertilizer Cost	4,252	2.978	0.005	***
Pesticide Cost	-4,311	-2.171	0.035	**
Labor cost	1.333	2.833	0.007	***
Dummy of Combine Harvester Technology	4,521,821.539	3.216	0.002	***

Note: **** = Significant in α = 1 %; ** = Significant in α = 5 %

The negative impacts of combine harvester technology on socio-economic conditions of farmers are: (1) conflict between farmers and harvest workers, (2) spending of a small fee to dry rice when the rice is harvested in very large quantities and there is no place to dry, (3) damage to embankment, and (4) land cultivation for the next planting period cannot be performed traditionally.

The positive impact of combine harvester technology on the socio-economic conditions of harvest workers is the emergence of new livelihoods as wage laborers for rice drying activities while the negative impacts of combine harvester technology on the social economic condition of harvest workers are (1) conflict between farmers and harvest workers (2) loss of their jobs as harvest workers or becoming unemployed workers.

Managerial Implications

From the results of the study, it can be seen that the use of combine harvester technology has a significant effect on rice farming in swampyland. The farmers who use a combine harvester will get a larger rice farming income compared to non-users. In addition, the use of a combine harvester also has other positive impacts for the users, including: (1) labor allocation or depletion of work time in farming is reduced, thus increasing free time that can be used for other productive activities, (2) production costs decrease, (4) productivity is slightly higher although not significant, because fewer yields are lost, and (5) harvesting is faster and rice is cleaner. From the description above, there are many benefits obtained from the use of a combine harvester; therefore, it is necessary to have more socialization for non-users to use the technology. Also, it is necessary to have training and guidance on effective and efficient rice farming in swampland, and the need for training on the operation and maintenance of combine harvester, as well as the importance of developing the UPJA group (Alsintan Service Management Business) organized by the young people in the village. In addition, the government and the private sector should make a community empowerment program to increase the household income of harvest workers who lose their jobs and to utilize the farmers' free time.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based on the results of this study, it can be concluded that the amount of time spent in work or labor allocation on the rice farming of swamps carried out by the farmers using combine harvester is smaller than that by the non-users. The labor allocation is specifically used for managing land, seeding, planting, fertilizing, weeding, controlling plant pest and harvesting. The productivity of swamp rice farming using combine harvester technology is larger than that of the non-users. The income of the swamp rice farming using combine harvester technology is larger when compared with that of the non- users. The dummy variable of combine harvester technology, experience in business, productivity, cost fertilizer cost, pesticide cost and labor cost have significant effects on income of swamp rice

farming. Technology of Combine Harvester has both positive and negative impacts on social, economic and technical conditions in the cultivation of swamp rice. The impacts of using combine harvester technology to socio-economic condition of farmer user: (1) the allocation of labor or work time in the farm is reduced, thus increasing the spare time that can be used for other productive activities; (2) production cost decreases; (3) earning more income from increased rice farming; (4) productivity is slightly higher, although insignificant, because fewer crops are lost, and (5) harvest is faster and rice is cleaner, (6) conflicts between farmers and harvest workers, (7) small amount of fee to pay when drying the rice harvested in very large quantities, and there is no place to dry, (8) damage to the embankment, and (9) land cultivation for the next planting period cannot be carried out traditionally. The positive impact of combine harvester technology on the socio-economic condition of harvest workers is the emergence of new livelihoods as wage laborers for rice drying activities. The negative impacts of combine harvester technology on the socio-economic condition of harvest workers are: (1) conflicts between farmers and harvest workers; (2) loss of the their jobs as harvest workers/unemployed workers.

Recommendations

Based on the results of this study, a number of recommendations can be given follows: (1) it needs more socialization for the non-users to use combine harvester technology, (2) it needs an alternative business opportunity and work or community empowerment program to increase household income of harvest workers who lost their jobs; (3) there should be training and guidance on rice farming in swamp land so that it can be effective and efficient; and (4) there should be training on the operation and maintenance of combine harvester as well as the importance of developing the UPJA (Organizational Service Management) group organized by young people in the village.

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