Factors Affecting the Productivity of Swampy Land Rice Farming and Its Contribution to Household Income

Agoes Thony Ak[a,*], Yudhi Zuriah Wirya Purba[a], Faisal Daud[a]

[a]*Department of Agribusiness Science, University of Sjakhyakirti, Jl. Sultan Muh.Mansyur Kebon Gede, Palembang, Indonesia*
Corresponding author: [*]agoesthonyak@gmail.com

***Abstract*— Indonesia's national agriculture strategy is to increase farming production through optimizing wetland farming, particularly in swampy land. However, the main problem is the labor allocation and productivity and its impact on swampy land farmers' total household income. This research aims to analyze: 1) the productivity and income of swampy land rice farming, 2) the Factors affecting the productivity of swampy land rice farming, and 3) the contribution of income from swampy land rice farming to the household income. This research was conducted in Awal Terusan village of Sirah Pulau Padang District in Ogan Komering Ilir Regency, Indonesia. By applying a disproportionate stratified random sampling, 90 sample farmers drawn from the population of both farmer-group and non-farmer-group members in the area. The result showed that the average productivity of swampy land rice farming of the farmer-group members was 2,741.45 kg, and the non-farmer-group members were 3,097.08 kg per hectare per year. On average, the farmer-group members' income was IDR 12,459,222.23, and the non-farmer-group members were IDR 10,662,689.58 per hectare per year. The result of multiple linear regression of Cobb Douglas type showed that the farming area's variables, outside labor, and institutional factors were significantly affecting the productivity of swampy land rice farming; meanwhile, the variable of family labor was insignificant. The contribution of income from swampy land rice farming to household income was categorized as low, subsequently for the farmer-group members of 20.54 percent and the non-farmer-group members of 13.83 percent.**

***Keywords*— Swampy land rice farming; productivity; income contribution.**

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I. INTRODUCTION

Agriculture stands as a key-sector for Indonesian's economy. From 2010 to 2015, the agriculture sector's average contribution to domestic gross income was 11.26 percent, with an annual growth of 4.90 percent [1]. In 2016 its contribution reached 17.58 percent. Recently, national agriculture was aimed to increase farming production for food and industry, increase exports, increase farmers' welfare, create and expand job opportunities and entrepreneurship [2]. According to Grabowska [3], Indonesia is estimated to be in shortage of more than 9 million tons of staple food in 2020. The projection of national food needs during 2010-2050 was emphasized only to the six most common staple foods: rice, corn, soy, cassava, sugarcane, and meat. Nevertheless, rice is still the most important staple food. Annually, national rice demand increases significantly, which is projected up to 33,065,000 trillion in 2010 and 48,182,000 trillion in 2050.

Limited fertile land and the increasing demand for rice due to the population growth required the Indonesian government to expand rice fields throughout the country. Due to Java's massively populated island that is entirely unfeasible for further farming expansion, the wetland that is still broadly procurable away from Java should be the right solution. However, some are sub-optimal farmlands but still decently potential for rice production. Wetlands in Indonesia are mostly found in Sumatra, Kalimantan, and Papua Islands [4]. Almost entire wetlands in the world have been converted into agricultural land or industrial and urban areas. Around 50 percent of the world's wetlands have been utterly drained.

Meanwhile, agricultural land has been developing in several areas for thousands of years, especially in sub-optimal tidal riverine land, so-called Tidal Swampy land [5]. Tidal Swampy land has more prospects for rice production due to its regular inundations. The peat layer is relatively shallow and suitable for rice fields, which still adequate for the large-scale agriculture program to support national food security, improving the economy through agribusiness development, which also creates more jobs for people. However, generally, the farming productivity rate on wetlands is still relatively inferior to arable lands due to its physical condition, volatile.

The problem on wetlands is often related to soil conditions. According to Nursyamsi et al. [6], the high acidity, low soil fertility, and unpredictable climate would be the most precarious problems on wetlands. Unpredictable weather abnormally causes long drought in some time and heavy rain some other time. Furthermore, biological problems such as weeds, pests, and diseases regularly tend to occur as well. All these problems in certain deter productivity of those swampy land farming.

South Sumatra is one of the provinces in Indonesia located in a lowland area mostly covered by wetlands suitable for rice farming. The province is among the biggest rice producers in the country. In 2016, the rice production was 4,259,104 tons, which increased 588.67 thousand tons or 16.04 percent from the previous year, and its productivity increased 7.93 percent by 359 kg per hectare. The province contributed 6.43 percent to the whole national rice production. Approximately 58 percent of its population or 1,986,034 persons are working in the agriculture sector, especially in the District of Sirah Pulau Padang Ogan Komering Ilir Regency [7]. The increase of rice production is affected by factors, including land area availability and its types or typologies, labor, and capital. The constraint of rice production includes the internal and external problems of the agriculture sector. According to Fuller, et al. [8], the internal problem such as water quality, is essential for rice farming, particularly in swampy land [9].

According to Heriyanto et al. [10], farms that only operate 0.5 hectares or less are categorized as small-scale farming. Unfortunately, the trend shows increasing numbers of these small farming annually. The average arable land in the wetland area is 1.08 hectares. Small scale farming has its limit on production rate, thus hamper their income and overall land productivity [11]. The production rate significantly affects the productivity, that the smaller scale makes lower productivity [12].

Smaller-scale farming also requires fewer workforce. Some agricultural centers are burdened by disguised unemployment with extremely underpaid workers [13]. Presumably, the employment rate in agricultural areas is still considerably low, only around 30 percent from its full capacity [14]. The farming size determines the number of workers and the investment required. The farming scale determines the quality of workers and the farming method, likewise [15]. The shortage of workforce available to support agriculture when more people chose to work in a non-agriculture sector would hamper the agriculture production rate [16]. Therefore, the surviving farmers should improve their skills and innovate more to optimize those remaining resources to increase productivity and improving their economy.

However, to encourage those farmers' capacity, it is quite strategic to incorporate social capital, particularly the local institution. Besides, agricultural expansion is essential through social capital approaches to increase farmers' knowledge, visions, skills, and access to information, innovations, and networks needed to improve the business. These are essential because the development of the agricultural sector is integrated with the broader economic system. The boost on the agriculture sector would downwardly stimulate both its subsectors and simultaneously other sectors.

In the farming business, the increase in production and productivity is vital. The community-based local institution known as a farmer-group held a prominent role in the agriculture sector. Farmer-group could initiate and manage to sustain general productivity through workforce management. Considering the fluctuating trend that may both stimulate or curb the production rate required some wise adjustments. For instance, the swampy-land farming activities, which only possible in the dry season, would allow those farmers to work elsewhere in the next season. Based on these circumstances, this study would set its goal to analyze the correlation of the arable land area and the labour allocation to productivity. Furthermore, to simulate how it impacts on the farmer's income in Sirah Pulau Padang District, Ogan Komering Ilir Regency.

According to the study of Capstick [17], the low productivity on land would lead to relatively low income on swampy land rice farming. Moreover, the study of Zilberman (2019) stated that the differences in productivity, in general, can be caused by several factors: arable land area, labor allocation, and other inputs (seeds, fertilizer, and pesticides), which significantly affects farmers' income [18]. Besides, Su et al. [14] added that the development of social capital in the rice production area encouraged productivity.

Farmer's family income depends on rice farming and other income to sustain their living, including both from diversified crops and non-farming jobs. Other research conducted by Antara et al. [19], stated that labor allocation plays a vital role to sustain the needed income of those vacant farmers to work elsewhere out of farming sector.

Presumably, swampy land rice farming productivity relies on some variables: the size of arable land, family labor, non-farming jobs, and local institution (farmer-groups). These are assumed to affect farmers' family income in the District of Sirah Pulau Padang Ogan Komering Ilir Regency, South Sumatera, Indonesia. Therefore, the objectives of this research are as follows:

- Analyzing the productivity and income of swampy land rice farmers.
- Analyzing the factors that influence the productivity of swampy land rice farming.
- Analyzing the contribution of swampy land rice farming to the whole family income.

II. Material and Method

A. Research Method

This research was conducted in Awal Terusan village, Sirah Pulau Padang District, Ogan Komering Ilir Regency. The location selected from a purposive method considering its importance as a center of rice production, and most people produce rice for living on swampy land farming. The research method used was a survey [20] through a direct interview with the farmers supported by questionnaires. The respondents are rice farmers which purposively divided into two groups, those who were attached as a member to a farmers group (to be called as "grouped farmers") and those who were not (or "non-grouped farmers").

The sampling method used was disproportionate stratified random sampling to grouped farmers and non-grouped farmers. The following Table 1 shows the number of samples.

TABLE I
NUMBER OF FARMER SAMPLES IN AWAL TERUSAN VILLAGE, SIRAH PULAU PADANG DISTRICT, OGAN KOMERING ILIR REGENCY, 2018

Farmer	Number of Population (HH)	Percentage (%)	Number of Samples (farmers)
Grouped Farmers	400	11.25	45
Non-Grouped Farmers	100	45	45
Total	**500**		**90**

B. Data Processing Method

Data obtained from the field are analyzed by tabulation and then processed with mathematical calculations and descriptively elaborated to answer the hypothesis. For instance, to calculate productivity by the following formula:

$$Y = \frac{Q}{LI} \quad (1)$$

Where Y is productivity (Kg/Hectare), Q is total rice production (Kg), and LI is yields area (Hectare). To measure the allocation of labor or workforce quantity:

$$JK\ Total = JO \times HK \times JK \times HKP \quad (2)$$

$$HKSP = \frac{JK\ Total}{JKS} \quad (3)$$

Where:

HKSP: Working days (working days)
JO: Number of workers (worker)
HK: Working days (days)
JJK: Working Hours (hours)
HKP: Man's Working Day (days)
JKS: Standard Working Hours (hours)

Winarti et al. [21] stated that the HKP equals to:

- A male worker: 1.0 HKP
- A female worker: 0.7 HKP
- An under-age worker: 0.5 HKP

Furthermore, to analyze the independent variable or "X" (arable land area, family labor, non-family labor, and farmer-groups) and its correlation to the dependent variable (productivity of swampy land) by Cobb-Douglas production function method. The formulation was rendered through the SPSS 16.0 program for Windows with the following equation [12]:

$$Y = \alpha.\ X\ ^\wedge\ b_1.X\ ^\wedge\ b_2.X\ ^\wedge\ b_3.X\ ^\wedge\ b4.E\ ^\wedge\ U \quad (4)$$

This function is changed in logarithm with the following formula:

$$Ln\ Y = Ln\ a + b_1 LnX_1 + b_2 LnX_2 + b_3 LnX_3 + d_1 D_1 + u \quad (5)$$

Where:

Y : Productivity (kg / ha / year)
A : Intercepts
X_1 : Area of arable land (ha)
X_2 : Allocation of family worker (HKSP/Ha/Year)
X_3 : Allocation of non-family worker (HKSP/Ha/Year)
D_n : Farmers-groups is a dummy variable,
D_1 : 1 for grouped-farmers
D_0 : 0 for non-grouped farmers
d_1 : Estimator parameter / dummy variable regression coefficient
b_1- b_3 : Estimator parameter / regression coefficient for each factor of production
u : Interference error

In order to analyze whether the multiple linear regression model used in this study meets the classical assumptions or not, a classic assumption test is performed by using the Normality Test, the Multicollinearity Test, the Heteroscedasticity Test, and the Autocorrelation Test, using the SPSS computer program for Windows release 16.0. In order to see the fitness of the model above, it can be seen from the value of R^2 (coefficient of determination) to see how much the independent variable explains the dependent variable, while the F test shows whether all independent variables entered in the model have a joint influence on the variable bound. T-test determines the effect of partial regression coefficients of each independent variable on the dependent variable.

To calculate income, the formula is the revenue minus total production costs incurred. Revenue is obtained from production multiplied by the product selling price, while the total production cost is the total amount of variable costs plus fixed costs during the production process [12]. Meanwhile, to analyze family income contribution, the total income from swampy land rice farming was divided by the total household income (both the income from other crops farming and outside farming. Those criteria, according to Syaukat and Julistia [22] are 0.00 - 33.33 (Low), 33.33 - 66.66 (Medium), and 66.67 - 99.99 (High).

III. RESULTS AND DISCUSSION

A. Labor Allocation in Swampy Land Rice Farming

Most of the sampled farmers work as a family and non-family workers, especially during seeding and harvesting season. The seeding and harvesting season will not be accomplished when they rely only on family workers. The allocation of labor can be seen in Table 2 and Table 3 below.

TABLE II
AVERAGE ALLOCATION OF LABOR ON SWAMPY LAND RICE FARMING IN AWAL TERUSAN VILLAGE, SIRAH PULAU PADANG DISTRICT, OGAN KOMERING ILIR REGENCY, 2018

No	Description	Allocation of Labor (HKSP / parc/year)		Allocation of Labor (HKSP / ha/ year)	
		Grouped -Farmers	Non-Grouped Farmers	Grouped -Farmers	Non-Grouped Farmers
1	Family Workers	35.48	32.67	58.22	84.59
2	Non-Family Workers	33.5	25.79	47.60	62.82
Total		**68.98**	**58.46**	**105.82**	**147.41**

Based on Table 2, the farmers tend to allocate more family workers than those who were non-family. Mostly those are male workers.

B. Analysis of Productivity and Income of Swampy Land Rice Farming

From the sampled farmers, the area of land managed or cultivated varies in the range of 0.10 hectares to 2.02 hectares which makes the average of 0.70 hectares. The grouped-farmers averagely owned 0.8 hectares, while the non-grouped

only 0.6 hectares. The average owned land and productivity rate of these sampled farmers can be seen in Table 3.

TABLE III
AVERAGE PRODUCTIVITY OF SAMPLE FARMERS OF SWAMPY LAND RICE FARMING IN AWAL TERUSAN VILLAGE, SIRAH PULAU PADANG DISTRICT, OGAN KOMERING ILIR REGENCY, 2018

No	Description	Land Size	Production Rate	Productivity Rate
		(Ha)	(Kg/Parc/Year)	(Kg/Ha/Year)
1	Grouped Farmers	0.73	2,300.00	2,741.45
2	Non- Grouped Farmers	0.63	1,739.00	3,097.08

According to the Table 3, the average land size owned by the Grouped Farmers is 0.73 hectare with the production rate of about 2,300.00 kilograms of paddy-rice of each arable area plot annually 2,741.45 Kg/Ha/Year of productivity rate. The non-grouped farmers averagely owned only 0.63 hectares, which likewise produced 1,739.00 kilograms annually or only 3,097.08 kilograms per hectare of productivity rate. The difference of only 0.1 Hectare on land size could make the annual production rate of about 355.63 kilograms each hectare.

C. The Analysis of Factors Affecting Swampy Land Rice Farming Productivity

The estimating model used in this study is the Cobb-Douglas multiple linear regression model. The variables of land area, family workers, non-family workers, and institutional factors are assumed to influence the increase in rice productivity in the village. Data is processed using the Statistical Package for the Social Sciences (SPSS) program (see Table 4).

TABLE IV
RESULTS OF REGRESSION ANALYSIS OF FACTORS INFLUENCING THE PRODUCTIVITY OF SWAMPY LAND RICE FARMING IN AWAL TERUSAN VILLAGE, SIRAH PULAU PADANG DISTRICT, OGAN KOMERING ILIR REGENCY, 2018

No	Variable	Regression Coefficient	T-count	Sig.	Description
1	Intercepts	7.650	63.535	0.000	
2	Area of arable land (X_1)	- 0.431	- 6.956	0.000	**
3	Family workers (X_2)	0.024	0.903	0.369	TS
4	Non-family workers (X_3)	0.042	3.001	0.004	**
5	Institutional (D_1)	0.028	1.597	0.114	*
	R square	**40.80 %**			
	F statistic	**14.616**			
	Sig. (F-stat.)	**0.000**			
	Adjusted R square	**38.00 %**			

Based on Table 4, the F test value can be seen from the F count of 14.616, which means it is greater than the F table of 3.548, stating H0 is decline. It means that simultaneously all the independent variables influence the dependent variable. The results of the regression analysis presented an R square of 40.80 percent. It is interpreted that the independent variables have 40.80 per cent influence on the increasing or decreasing of the productivity of swampy land rice farming, while the remaining 59.20 per cent is explained by other factors that are not included in the model.

Out of several independent variables in this study, not all significantly affect the dependent variable. Based on partial tests using the t-statistic test, the level of influence can be seen in Table 4. Those 3 out of 4 variables are significant both on $\alpha = 0.01$ or $\alpha = 0.15$ to the dependent variable. This regression model is free from the classic assumption test. The results of data analysis are presented in the following Table 4.

D. The Effect of Arable Land Area

Regression results show that the arable land area is affecting the productivity of Swampy land rice farming with the t-count value of -6.956 and the significance value of 0,000. This value implies that land area's variable has a significant negative effect on the productivity of swampy land rice farming at $\alpha = 1$ percent. The regression coefficient value of the land area variable is -0.431 meaning that each additional area of arable land by one per cent will reduce the productivity of swampy land rice farming by 0.431 percent, assuming the other variables are constant. This information shows that the first hypothesis in which the area of arable land significantly affected swampy land rice farming productivity was accepted. It is commonly known that the greater the area of land cultivated for farming, the greater the costs required by farmers to purchase production facilities or inputs. In the case that farmers cash is depleted, they tend to reduce the production inputs. It would cause a reduced rate of production and eventually hindered the productivity rate. This statement is supported by research by Cullu *et al.* [23], which states that, even though the larger land size the farmers could yield, yet they still unable to sustain.

E. The Effect of Family Workers

Regression results show that there is an influence of family workers to the productivity rate of swampy land rice farming with a t-value of the family labor variable of 0.903 and a significance value of 0.369. This value means that the variable allocation of family labor does not significantly affect swampy land rice farming productivity. The regression coefficient value of the family worker variable of 0.024 indicates that each increase in the allocation of a family worker by one percent will increase swampy land rice farming productivity by 0.024 percent, assuming the other variables remain constant.

This number indicates that the first hypothesis where the factor of family worker allocation significantly influences the productivity rate of swampy land rice farming is rejected. In general, perennial crops such as rice require more labor than annual crops. Particularly for certain planting process of rice crops, such as the planting and harvesting stages, it requires much energy so that it often cannot be handled by the family workers themselves. Thus, more family workers are available; the production yield will rise. This result is in line with Iskandar's statement [13], which is the higher the supply of worker than its demand, would create disguised unemployment in the farmers family. Generally, family worker participation in the agricultural sector is still averagely low, merely about 30 per cent from its full capacity [14].

F. The Effect of Non-family Workers

Regression results show that non-family workers' influence on the productivity of swampy land rice farming with t-value of 3.001 and a significance value of 0.004. This means that outside labor's variable allocation has a significant positive effect on swampy land rice farming productivity at $\alpha = 5$ percent. The regression coefficient of non-family workers variable of 0.042 indicates that each non-family worker added to the workforce by one percent will increase the productivity rate by only 0.042 percent with presumably other factors are constant (*ceteris paribus*). This statement implies that the first hypothesis that the allocation of non-family workers factors significantly affects swampy land rice farming productivity is accepted.

According to McGuire [24], the worker is one of the agricultural sector's determining elements, especially for seasonal crops. It is essential to emphasize the workforce on the completion of each stage of farming starts from the seeding to the harvesting process in time to maintain productivity and quality of the product. The number of workers required in farming varies depending on the type of crop. Most farmers employ non-family workers to achieve the needed number to achieve the optimal working rate. The scale of the business will affect the size of the workforce needed. Usually, small-scale farming business allocates only family workers. On the contrary, larger-scale farming requires more workers, and more non-family workers would be employed. The regression results of the influence of the non-family workers variable have a significant effect.

G. The effect of local institutions

Regression results show an institutional effect on the productivity of swampy land rice farming with a t-test value of the variable of 1.597 and a significance value of 0.114. This value means that the institutional variable has a significant positive effect on swampy land rice farming productivity at $\alpha = 15$ percent. The regression coefficient of an institutional variable of 0.028 indicates that each institutional increase by one percent will increase swampy land rice farming productivity by 0.028 percent, assuming the other variables are constant (*ceteris paribus*). This information implies that the first hypothesis, where institutional factors significantly affect swampy land rice farming productivity, is accepted.

The regression analysis results show that the institutional variable significantly influences the decrease or increase in the productivity of swampy land rice farming. The institution is where farmers achieve new knowledge, change attitudes, and add skills. Based on the survey, the sampled farmers who are grouped-farmers tend to increase their productivity. It was concluded that the sampled farmers who are grouped-farmers have many advantages such as obtaining production facilities, counseling, and facilitating access to knowledge; thus, they would be more able to run the business properly and wisely. This result is supported by Tostes' research [25] that farm management of the grouped-farmers is relatively better than non-grouped ones. Hence, the productivity and income of grouped-farmers are higher than those of non-grouped. The farmers-group enabled the farmers of the better management system and better income for the family.

H. Analysis of Income of Swampy Land Rice Farming

Each samples farmer requires a budget for the cost of production to operate. Production costs in the farming of swampy land rice farming are all incurred starts from the seeding to the harvesting. The production costs will affect the farmer's profit.

1) Fixed cost: Fixed cost consists of depreciation costs on farming equipment. The average cost of depreciation of equipment can be seen in Table 5 below. Based on the Table 5 below, the grouped-farmers' average fixed cost is IDR 98,287.57 for each parcel of land annually, while the non-grouped average cost IDR 99,802.50 for each parcel annually. Their difference in fixed costs is IDR. 1,514.93 per arable area per year or about IDR. 78,937.41 per hectare per year.

TABLE V
AVERAGE FIXED COSTS OF SWAMPY LAND RICE FARMING IN AWAL TERUSAN VILLAGE, SIRAH PULAU PADANG DISTRICT, OGAN KOMERING ILIR REGENCY, 2018

No	Equipment Depreciation	Grouped-Farmers		Non-grouped-Farmers	
		IDR/Parc/ Year	IDR/Hectare/ Year	IDR/Parc/ Year	IDR/Hectare/ Year
1	Hoe	4,190.90	7,212.29	2,120.00	5,261.57
2	Machetes	31,688.89	59,384.46	32,447.22	91,517.76
3	Sickles	11,671.11	19,805.63	18,023.33	49,241.56
4	Hand sprayer	16,470.00	30,579.26	14,267.50	26,645.90
5	Tarps	34,266.67	57,108.32	32,944.44	79,820.58
	Total	**98,287.57**	**174,089.95**	**99,802.50**	**252,487.36**

2) Variable Cost: Variable cost in this study consists of fertiliser costs, pesticide costs, labour wage costs, seed costs, land rent and sack cost. The average variable costs for the grouped-farmers and the non-grouped farmers can be seen in Table (6 and 7).

TABLE VI
AVERAGE VARIABLE COSTS OF SWAMPY LAND RICE FARMING IN AWAL TERUSAN VILLAGE, SIRAH PULAU PADANG DISTRICT, OGAN KOMERING ILIR REGENCY, 2018

No	Description	Average Variable Costs	
		(IDR /Plot/Year)	(IDR/Hectare/Year)
1	Farmer Group Members	3,337,783.33	5,137,033.046
2	Non-Farmer Group Members	2,325,032.17	4,994,211.70

Based on Table 6, the costs variable incurred by sampled farmers who are grouped-farmers is higher than those non-grouped-farmers, with a difference of IDR 1,012,706.16 each parcel of land or around IDR 148,821.76 per hectare, both annually. The members of farmer-groups have more cultivated land than the non-members. Consequently, they need sufficient capital to buy production inputs in specific quantities so that farming can run efficiently. The details of the variable costs are shown in Table 7.

Based on Table 7, labor costs are the most costs incurred in this variable cost component, and this is due to the allocation of many outside laborers in their farming. The grouped-farmers spent IDR 2,350,600.00 on each parcel of land or around IDR 3,584,537.44 per hectare, both annually, while the non-grouped farmers spent IDR 1,496,733.33 each parcel of land or around IDR 3,178,589.73 per hectare annually.

TABLE VII
DETAILS OF AVERAGE VARIABLE COSTS OF SWAMPY LAND RICE FARMING IN AWAL TERUSAN VILLAGE, SIRAH PULA U PADANG DISTRICT, OGAN KOMERING ILIR REGENCY, 2018

No	Production Facilities/ Inputs	Grouped-Farmers		Non-grouped-Farmers	
		Cost (IDR/Parc / Year)	Cost (IDR/Hectare /Year)	Cost (IDR/Parc /Year)	Cost (IDR/Hectare /year)
1.	Fertilizers (Kg)	165,933.33	240,877.44	50,166.67	115,834.10
2.	Pesticides (L)	260,583.33	480,348.06	158,516.67	354,393.07
	Herbicides	144,350.00	250,444.90	92,466.67	211,591.74
	Insecticide	116,233.33	229,903.16	66,050.00	142,801.33
3.	Labour (HKSP)	2,350,600.00	3,584,537.44	1,496,733.33	3,178,589.73
4.	Sacks (Units)	82,666.67	126,424,52	57,225.50	118,257.73
5.	Seeds (Kg)	118,666.67	186,272.49	218,523.33	472,766.70
6.	Land Rent (Ha)	359,333.33	518,573.51	343,866.67	754,370.37
Total Cost		**3,337,783.33**	**5,137,033.46**	**2,325,032.17**	**4,994,211.70**

3) Total production cost: The total production cost is all production costs (fixed costs and variable costs) incurred by farmers in their swampy land rice farming. The detail of the average total production cost is shown in Table 8.

TABLE VIII
AVERAGE TOTAL PRODUCTION COSTS OF SWAMPY LAND RICE FARMING IN AWAL TERUSAN VILLAGE, SIRAH PULAU PADANG DISTRICT, OGAN KOMERING ILIR REGENCY, 2018

No	Cost	Average Production Costs			
		Grouped-Farmers		Non-grouped-Farmers	
		(IDR/Parc /Year)	(IDR/Hectare /Year)	(IDR/Parc /Year)	(IDR/Hectare /Year)
1	Fixed Cost	98,287.57	174,089.95	99,802.50	252,487.36
2	Variable Cost	3,337,783.33	5,137,033.046	2,325,032.17	4,994,211.70
Total Production Costs		**3,436,070.90**	**5,311,123.42**	**2,424,834.67**	**5,246,699.07**

Based on Table 8 above, the grouped-farmers' average fixed cost is IDR 98,287.57 for each parcel of land per year, while the non-grouped-farmers are IDR 99,802 for each parcel of land per year. Their difference in fixed costs is IDR. 1,514.93 each parcel of land or around IDR 78,937.41 per hectare annually.

Based on Table 8, the sampled farmers' variable costs are more significant than the fixed costs. The grouped-farmers' average total production cost was IDR 3,436,070.90 per arable area per year (IDR 5,311,123.42 per hectare per year), while the average total production cost of the non-grouped farmers was IDR 2,424,834.67 each parcel of land per year (IDR 5,246,699.07 per hectare per year). The difference in total production costs was IDR 1,875,052.52 for each parcel of land per year (IDR 2,821,864.40 per hectare per year).

4) The revenue and income of swampy land rice farming: If the amount of production is multiplied by the selling price, revenue will be obtained. Meanwhile, income is the net profit obtained after revenue is deducted by total production costs. The average income of sampled farmers is shown in Table 9.

TABLE IX
AVERAGE INCOME OF SWAMPY LAND RICE FARMING IN AWAL TERUSAN VILLAGE, SIRAH PULAU PADANG DISTRICT, OGAN KOMERING ILIR REGENCY, 2018

Description	Grouped-Farmers		Non-grouped-Farmers	
	Average (Plot/Year)	Average (Hectare/Year)	Average (Plot/Year)	Average (Hectare/ Year)
Selling Price (IDR/Kg)	4,660.00	4,660.00	4,466.67	4,466.67
Revenue (IDR/kg)	11,447,733.33	17,770,345.65	7,625,233.33	15,909,388.65
Production Costs (IDR/Kg)	3,436,070.90	5,311,123.42	2,424,834.67	5,246,699,07
Income (IDR/Kg)	8,011,662.43	12.,459,222.23	5,200, 398.67	10,662,689.58

Based on the Table 9 above, grouped-farmers' income is IDR 8,011,662.43 per parcel of land per year, while non-grouped-farmers income is IDR 5,200,398.67 per hectare per year with a difference in income of IDR 2,811,263.76 per parcel of land per year or about IDR 1,796,532.65 per hectare per year.

5) Total Income of Swampy Land Rice Farming: According to Adriani et al. [26], the agricultural sector is not the only sector to rely on for living. Although its dominance in rural areas, in fact, the socio-economic life there was not determined only by the agricultural sector alone. Thanks to the information technology that has been more accessible, including those who live in the suburbs, farmers also experience changes in learning, knowledge, and behavior in their daily lives. Farmers start to learn not to depend on one sector. They are open to any other jobs available and be productive.

Total farmer's family income is the sum of total farm income derived from the farming core business, subsidiary business, and non-farming. Their core business income comes from swampy land rice farming. The subsidiary income comes from chili and fruits farming, fisheries, and livestock. The non-farming income comes from working on elsewhere, such as in construction, industry, transportation, services, and trading. The total income is essential to sustain the whole family's living: food, clothing, housing maintenance, transportation, health, education, and recreation. The total income of sampled farmers is presented in Table 10.

Table 10 shows the average total income for both grouped-farmers and the non-grouped-farmers. The core business from swampy land rice farming annually earns IDR 8,011,662.43. As from subsidiary earns IDR 7,404,833.33 annually. Eventually, the annual average income from non-farming was IDR 23,592,333.33, making the total income of IDR 39,008,829.10.

On the other hand, the non-grouped-farmers from swampy land rice farming annually earn IDR 5,200,398.67. As from subsidiary earns IDR 960,000.00 annually. Eventually, the annual average income from non-farming was IDR 31,440,666.67, making the total income of IDR 37,601,065.33 per year. The total income difference of both farmers is IDR. 1,407,763.77 per year.

TABLE X
TOTAL INCOME OF SWAMPY LAND RICE FARMING IN AWAL TERUSAN VILLAGE, DISTRICT OF SIRAH PULAU PADANG, OGAN KOMERING ILIR REGENCY, 2018

Average Income	Sampled Farmers			
	Grouped-Farmers	Contributions (%)	Non-grouped-Farmers	Contributions (%)
Rice Farming (IDR /Year)	8,011,662.43	20.54	5,200,398.67	13.83
Other Farming (IDR/Year)	7,404,833.33	18.98	960,000.00	2.55
Non-Farm (IDR /Year)	23,592,333.33	60.48	31,440,666.67	83.20
Total Income	**39,008,829.10**	**100.00**	**37,601,065.33**	**100.00**

Based on the Table 10 above, rice farming income contribution to the total household income was 20.54 percent for Grouped-Farmers and 13.83 percent for non-Grouped Farmers, and this is classified as low. This low contribution can be caused by the typology of land owned by farmers, namely the type of swampy land that is a suboptimal land that does not fully obtain good results, price levels, production levels and productivity.

IV. CONCLUSION

The average productivity of swampy land rice farming subsequently for the grouped-farmers and the non- grouped-farmers are 2741.45 kilograms per hectare per year and 3097.08 kilograms hectare per year. The factors of arable land area, non-family workers, and institutions significantly affect the productivity rate of swampy land rice farming, while family workers did not. The annual average income of swampy land rice farming for the grouped-farmers and the non- grouped-farmers are IDR 12,459,222.23 and IDR 10,662,689.58 each hectare, respectively. The contribution of rice farming income is 20.54 percent and 13.83 percent for the grouped-farmers and non- grouped-farmers, respectively, which is classified as low income.

The researchers suggest that farmers regulate the use of inputs/factors of production (land, seeds, fertilizers, pesticides, allocated labor) to optimize their swampy land rice farming activities. They need to adopt and apply the advice or new knowledge spread by the agricultural extension workers. It is also necessary for farmers to be able to apply technology or machinery in their farming. The government should provide capital through "*koperasi*" or local cooperation to scale up their farm to earn more income. Finally, agricultural extension workers' role in socializing the importance of using organic liquid fertilizers and the use of straw in farming activities needs to be considered. These aim to improve soil fertility for better farming productivity.

REFERENCES

[1] A. Bashir and S. Yuliana, "Identifying Factors Influencing Rice Production and Consumption in Indonesia," *J. Ekon. Pembang. Kaji. Masal. Ekon. dan Pembang.*, vol. 19, no. 2, Jan. 2019, doi: 10.23917/jep.v19i2.5939.

[2] S. J. Rachmawatie, L. Widiastuti, J. Sutrisno, and E. S. Rahayu, "Integrated Farming System Development based-on Local Potential to Improve Food Security and Increase The Farmers Income: Case Study in Jatisari Village, Jatisrono Sub-District, Wonogiri Regency," in *IOP Conference Series: Earth and Environmental Science*, Nov. 2019, vol. 347, no. 1, doi: 10.1088/1755-1315/347/1/012094.

[3] A. Grabowska *et al.*, "Application of Modern Agronomic and Biotechnological Strategies to Valorise Worldwide Globe Artichoke (Cynara Cardunculus l.) Potential : an Analytical Overview," *Ital. J. Agron.*, vol. 13, no. 4, pp. 279–289, Oct. 2018, doi: 10.4081/ija.2018.1252.

[4] A. Sofyan Nirawati and M. A. Biba, "Profitability and Profit Factors of Rice Farming in Rainfed Lowland Based on Land Tenure," *Int. J. Sci. Technol. Res.*, vol. 7, no. 5, pp. 80–84, May 2018.

[5] J. T. A. Verhoeven and T. L. Setter, "Agricultural Use of Wetlands: Opportunities and Limitations," *Annals of Botany*, vol. 105, no. 1. pp. 155–163, Jan. 2010, doi: 10.1093/aob/mcp172.

[6] D. Nursyamsi, Y. Sulaeman, and M. Noor, "Management Package of Tri-Kelola Plus for Increasing Production and Productivity in Wetland Development for Agriculture," in *Tropical Wetlands Innovation in Mapping and Management- Proceedings of the International Workshop on Tropical Wetlands: Innovation in Mapping and Management, 2018*, 2020, pp. 63–72, doi: 10.1201/9780429264467-11.

[7] S.-S. BPS, *Sumatera Selatan Province in Figures 2016*. 2016.

[8] S. J. Irmawati, Ehara H, Suwignyo R, "Swamp Rice Cultivation in South Sumatra, Indonesia," *Trop. Agric. Dev.*, vol. 59, no. 1, pp. 35–39, 2015, doi: 10.11248/jsta.59.35.

[9] D. Q. Fuller *et al.*, "The Contribution of Rice Agriculture and Livestock Pastoralism to Prehistoric Methane Levels: an Archaeological Assessment," *Holocene*, vol. 21, no. 5. 2011, doi: 10.1177/0959683611398052.

[10] H. Heriyanto and Asrol, "Simultaneous Equation Model for Economic Calculation of Households of Independent Rubber Farmers in Mineral Land in Kampar Regency, Riau Province," *J. Geosci. Eng. Environ. Technol.*, vol. 5, no. 2, pp. 82–86, Jun. 2020, doi: 10.25299/jgeet.2020.5.2.3791.

[11] M. Weltin, I. Zasada, C. Franke, A. Piorr, M. Raggi, and D. Viaggi, "Analysing Behavioural Differences of Farm Households: an Example of Income Diversification Strategies based-on European Farm Survey Data," *Land use policy*, vol. 62, pp. 172–184, Mar. 2017, doi: 10.1016/j.landusepol.2016.11.041.

[12] R. Kotulic, "Managerial View on The Production Analysis in Agriculture : The Application of The Cobb-Douglas Production Function," in *SGEM 2014 Scientific SubConference on Political Sciences, Law, Finance, Economics and Tourism*, Sep. 2014, vol. 4, doi: 10.5593/sgemsocial2014/b24/s7.059.

[13] J. Iskandar, B. S. Iskandar, and R. Partasasmita, "Review: The Impact of Social and Economic Change on Domesticated Plant Diversity with Special Reference to Wet Rice Field and Home-Garden Farming of West Java, Indonesia," *Biodiversitas*, vol. 19, no. 2. Society for Indonesian Biodiversity, pp. 565–577, Mar. 2018, doi: 10.13057/biodiv/d190227.

[14] F. Su and Y. juan Yin, "Optimal Livelihood Strategy for Different Poverty Groups among Farmers: a Case Study of The Qin-Ba Mountain Area in South-Shaanxi, China," *J. Mt. Sci.*, vol. 17, no. 5, pp. 1206–1220, May 2020, doi: 10.1007/s11629-019-5566-9.

[15] T. Kondraszuk, "The Theory of Economics and Organization of Agricultural Farms in The Context of National Accounting Standard No.12. 'Agricultural Activities,'" *Ann. Polish Assoc. Agric. Agribus. Econ.*, vol. XXI, no. 2, pp. 153–161, Jun. 2019, doi: 10.5604/01.3001.0013.2081.

[16] N. R. Duvvuru and V. Motkuri, "Declining Labour Use in Agriculture : a Case of Rice Cultivation in Andhra Pradesh," no. 49204, pp. 1–38, 2013, doi: 10.13140/RG.2.2.16594.04809.

[17] M. Capstick, *The Economics of Agriculture*, vol. 11. Taylor and Francis, 2019.

[18] D. Zilberman, "Agricultural Economics as a Poster Child of Applied Economics: Big Data & Big Issues," *Am. J. Agric. Econ.*, vol. 101, no. 2, pp. 353–364, 2019, doi: 10.1093/ajae/aay101.

[19] M. Antara and Effendy, "Allocation Optimization of Farmer's Resources to Achieve Maximum Income in Parigi Moutong Regency," *Asian J. Sci. Res.*, vol. 11, no. 2, pp. 267–275, 2018, doi: 10.3923/ajsr.2018.267.275.

[20] W. Griga and W. Griga, "Quantitative Research Design and Methodology," in *Managing Inpatriation*, Springer Fachmedien Wiesbaden, 2017, pp. 73–91.

[21] L. Winarti, R. Permadi, and I. Mahfud, "Analysis of Factors that Influence Production of Rice Farming Variety of Siam Epang at Sub-

District of Seruyan Hilir," *J. Agribest*, vol. 3, no. 2, p. 105, Sep. 2019, doi: 10.32528/agribest.v3i2.2359.

[22] Y. Syaukat and D. R. Julistia, "Analysis of Income and Factors Determining The Adoption of Integrated Rice-Fish Farming System in Seyegan District, Sleman Regency, Yogyakarta, Indonesia," *J. Int. Soc. Southeast Asian Agric. Sci.*, vol. 25, no. 1, pp. 66–79, Jun. 2019.

[23] M. A. Cullu, M. Teke, N. Mutlu, U. Turker, A. V. Bilgili, and F. Bozgeyik, "Integration and Importance of Soil Mapping Results in The Precision Agriculture," Jul. 2019, doi: 10.1109/Agro-Geoinformatics.2019.8820527.

[24] A. M. McGuire, "Agricultural Science and Organic Farming: Time to Change Our Trajectory," *Agric. Environ. Lett.*, vol. 2, no. 1, p. 170024, 2017, doi: 10.2134/ael2017.08.0024.

[25] M. Tostes, C. Motta, and A. Villavicencio, "The Plan of Action of The Agriculture and Irrigation Sector Against Climate Change: an Opportunity to Articulate Efforts," *Eur. J. Sustain. Dev.*, vol. 6, no. 4, Oct. 2017, doi: 10.14207/ejsd.2017.v6n4p444.

[26] D. Adriani, I. Zahri, E. Wildayana, Maryadi, M. Hamzah, and Yulius, "Farmer's Welfare in Telang's Integrated Independent City: Lesson Learned from Migrant and Local Farmers in Tidal Land, South Sumatera," in *IOP Conference Series: Earth and Environmental Science*, Mar. 2018, vol. 122, no. 1, doi: 10.1088/1755-1315/122/1/012013.