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Factors Affecting Low Income of The Non-Smallholder Paddy Farmers in South Kalimantan

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Abstract:*The fact shown that the life of farmers nowadays is no longer an attractive profession in Indonesia. In the past decade, the number of workers working in the agricultural sectorwas decreased. Data of BPS-Statistics in 2018 Indonesia illustrated that49 %of the poor householdsin both urban and rural areasSouth Kalimantan province dominates from the agricultural sector.In 2019, 64.23 % of them were dominates in the rural areas. Data shown that 51.22% of the poor population above 15 years were found in the agricultural sector.The result of ST2013 (Agricultural Censuses) shown that 33.57 % of agricultural land were used by smallholder paddy farmer households, while non-smallholder households were 66.43 %.If examined more deeply about the income of non-smallholder paddy farmers (land area ≥ 0.5 ha), it turns out that non-smallholder paddy farmers earn less income than the average income of smallholder paddy farmers (<Rp 3,353,230). The proportion of non-smallholder paddy farmers who are low income reaches 59.45 % compared to the total of non- smallholder paddy farmers in South Kalimantan. Generally, this research aims to explain and analyze factors affecting the low income of the non-smallholder paddy farmers (farmers with a land area greater than 0.5 ha) in South Kalimantan, and to find out the model probability of non-smallholder paddy farmers using the binary logistic regression model. The results show that the head of household's highest education, farming land type, fertilizer use, pest attacks, farmingtools facilities, participation in agricultural guidance and counseling, crop sales, and land area, are significantly affecting the low income of the non-smallholder paddy farmers. The odds ratio for a low income of non-smallholder paddy farmers tend to be greater for the farmers which have the low education's level, having non-irrigated land, not using fertilizer, the agricultural land is infected by the pests, having traditional farming facilities/tools, is not following guidance and counseling, and is not selling the yields. While the odds ratio for low-income non-smallholder paddy farmers tend to be smaller to the farmers which his land area is below the average.*

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I. Introduction

The fact shown that the life of farmers nowadays is no longer an attractive profession in Indonesia.In the past decade, the number of workers working in the agricultural sector was decreased. Also, Indonesia's proud claims as an agrarian country most of its population work as farmers, ironically the majority are also low-income. The Indonesians who work in the agricultural sector are far behind the developed countries in managing agriculture, both in terms of economic life and the modernization of agricultural tools. Even imports of rice and other agricultural products are still occurring, which further makes the lives of farmers far from being peaceful and prosperous even though the government has programmed food self-sufficiency.

Data of BPS-Statistics in 2018 Indonesia illustrated that 49 % of the poor households in both urban and rural areas South Kalimantan province dominates from the agricultural sector. In 2019, 64.23 % of them were dominates in the rural areas. This indicates that the agriculture sector still dominates poor households in Indonesia, compared to the other sectors.

Likewise, the poor people in South Kalimantan Province are dominated by the people who work in the agricultural sector. Data shown that 51.22% of the poor population above 15 years were found in the agricultural sector. Meanwhile, the non-agricultural sector contributed around 48.57 %. The information shows that the agricultural sector dominates the contribution of the percentage of the poor.

Based on the 2013 Agricultural Census (ST2013), farm households that use land can be classified into two major groups. The first is smallholder paddy farmers who use land less than 0.50 ha and second is Non-smallholder paddy farmers who use 0.50 ha or more of land. ST2013 shows that 33.57 % are smallholder households (145,129 households), while Non-smallholder paddy farmers households are the rest (287,199 households).

Based on the results of the Cost Structure of Paddy Cultivation Household Survey 2017 (SOUT2017) in South Kalimantan Province, the income of smallholder paddy farmers and Non-smallholder paddy farmers is

not significantly different. It is Rp3.353.230 per ha for smallholder paddy farmers and Rp3.417.090 per ha for non-smallholder paddy farmers.

In more detail, there are a lot of non-smallholder paddy farmers who earn less than the average income of smallholder paddy farmers (Rp3,353,230). The proportion of low-income non-smallholder s reaches 59.45 % compared to the total of non-smallholder s in South Kalimantan. So that the author is interested to know about which factors affect numbers of non-smallholder paddy farmers who tend to have low incomes.

This research aims to understand the odds ratio of non-smallholder paddy farmers who have low income in South Kalimantan Province. Based on the results of SOUT2017, most of the non-smallholder paddy farmers in South Kalimantan Province have a lower income than the smallholders. This research also aims to explain a general picture of the odds ratio of non-smallholder paddy farmers who tend to have low income in South Kalimantan Province.

This research uses binary logistic regression models to answer the questions:

1. How can we explain the social and economic characteristics of low-income Non-smallholder paddy farmers in South Kalimantan Province?
2. What are the factors affecting the probability of Non-smallholder paddy farmers to have low-income in South Kalimantan Province?

II. Material And Methods

This research uses secondary data from the results of the Cost Structure of Livestock Household Survey of South Kalimantan Province in 2017 (SOUT 2017). SOUT 2017 was conducted to collect information on the food crops sub-sector in the form of the business cost structure, business profile, and the socio-economic situation of food crop business households. In this research, the data are sorted by Non-smallholder paddy farmers (farmers whose land area is more than 0.5 hectares) and based on income status. This research uses 4,907 samples. The type of research used is explanatory research, namely research that explains the probability of trends between variables through hypothesis testing. The data used in this research is categorical.

To describe the socio-economic conditions of Non-smallholder paddy farmers who earn less than the income of smallholder paddy farmers in South Kalimantan, cross tables are made between each characteristic with the low-income status of Non-smallholder paddy farmers. Demographic, social, and economic characteristics including the highest education of household heads, land types, fertilizer use, pest attacks, agricultural facilities/tools, participation in guidance and counseling, crop sales, and land area. While the variable income status of Non-smallholder paddy farmers is a response variable.

The second, inference analysis is used to explain the relationship of each variable in the research. Inference analysis in this research uses logistic regression models. Logistic regression is the statistical technique used to predict the relationship between predictors (independent variables) and a predicted variable (dependent variable) where the dependent variable is binary and to know which variables significantly influence the income status of Non-smallholder paddy farmers in South Kalimantan. From these results, it is expected to explain what factors are affecting the low income of Non-smallholder paddy farmers in South Kalimantan Province.

The binary logistic regression model in this research is:

$$g(x) = b_0 + b_1 Pddk + b_2 Jns + b_3 Ppk + b_4 Hama + b_5 Srna + b_6 Suluh + b_7 Jual + b_8 Luas$$

This can be interpreted below:

g(x) = Log-odds. The tendency of Non-smallholder paddy farmers who are at low-income risk to Non-smallholder paddy farmers who have low income

b_0 = constant

b_i = Coefficient of the i^{th} explanatory variable

Pddk = Non-smallholder farmer with the highest education of Head Household is Junior High School or lower, compared to the highest education of the head household is high school and above

Jns = Non-smallholder paddy farmers with irrigated paddy field compared to the irrigated paddy field type

Ppk = Non-smallholder paddy farmers who don't use fertilizer compared to non-small paddy farmers who use fertilizer

Hama = Non-smallholder paddy farmers whose pests are attacked by pests compared to who are not attacked by pests

Srna = Non-smallholder paddy farmers who use traditional agricultural facilities/tools compared to modern agricultural tools facilities

Suluh = Non-smallholder paddy farmers who do not attend the counseling or guidance compared to non-smallholder paddy farmers who take counseling/guidance.

Jual = Non-smallholder paddy farmers who do not sell their crops compared to Non-smallholder paddy farmers who sell their crops.

Luas = Non-smallholder paddy farmers whose land area is below average compared to Non-smallholder paddy farmers whose land area is above average.

For inferencing analysis, it is necessary to make operational definitions of explanatory variables that are hypothesized influence on the probability of the low-income of Non-smallholder paddy farmers.

Response variable (dependent variable) income status of Non-smallholder paddy farmers who are categorized as:

1. Non-smallholder paddy farmers with low income with dummy variable 1.
2. Non-smallholder paddy farmers do not have low income with dummy variable 0.

Non-smallholder paddy farmers are paddy farmers whose land area is more than or equal to 0.5 hectares. While for low-income Non-smallholder paddy farmers in this research are categorized as paddy farmers whose area is more than or equal to 0.5 hectares, but their income is less than the income of smallholders, which is Rp. 3,353,250. This limit is based on SOUT2017 data processed with the assumption that the average value of smallholder income is low-income farmers, with coverage in South Kalimantan.

Explanatory variables (independent variable)

1. The highest education of household head (Pddk); junior high school and below (category 1), and high school and the above (category 2)
2. Types of land irrigation (Jns); Non-irrigated paddy fields (categorized 1) and irrigated paddy fields (categorized 2).
3. Use of fertilizers (Ppk); do not use fertilizer (categorized 1), use fertilizer (categorized 2)
4. Pest attack (Pest); There is a pest attack (category 1), there is no pest attack (category 2)
5. Agricultural Facilities/Tools (Srna); traditional (categorized 1), modern facilities (categorized 2)
6. Counseling or Guidance Participation (Suluh); Not following (category 1), following (category 2)
7. Crop sales (Sell); not for sale (category 1), for sale (category 2)
8. Land Area (Lhn); below the average (categorized as 1); above the average (categorized 2)

III. Resultand Discussion

Descriptive Analysis

Non-smallholder paddy farmers in South Kalimantan are dominated by the household heads which their highest education in junior secondary school or below, it is at 87.49 %. While the proportion of the well-educated non-smallholder paddy farmers is 12.51 %.

Non-smallholder paddy farmers who use non-irrigated paddy fields are 93.52 %, most paddy fields in the province of South Kalimantan are contoured lowlands or swamps dominated by tidal paddy fields which are also vulnerable to seawater intrusion. While the remaining 6.48 %, non-smallholder paddy farmers use irrigation in their fields.

The results show that most of the non-smallholder paddy farmers in South Kalimantan use fertilizer in managing their agricultural land, around 72.41 %. The rest, only 27.59 % did not use fertilizer.

SOUT 2017 data also illustrate that only 10.92 % of farmers' agricultural land is not attacked by pests, the rest is 89.08 % affected by pests.

There are 69.33 % of non-smallholder paddy farmers who use traditional agricultural, and 30.67 % of non-smallholder paddy farmers use modern land tools.

At 75.69 % of non-smallholder, paddy farmers do not participate in agricultural guidance or counseling. This figure is far different than non-smallholder paddy farmers who have attended agricultural guidance and counseling, which is 24.31 %.

Most of the non-smallholder paddy farmers in South Kalimantan sell their crop production, which is 70.67 %. Farmers sell their own crops or sell them to collectors, wholesalers, or “pengijon” traders. While 29.33 % of paddy farmers' yields are not sold because they used for own consumption or animal feeding.

There were 68.07 % of non-smallholder paddy farmers with an area under 1,269 ha (non-smallholder land area), and 31.93 % of farmers controlling land area in more than 1,269 hectares.

Logistic Regression Analysis

This research conducts statistical tests to obtain a good logistic regression model. Statistical tests include the multicollinearity test, the goodness of fit, the simultaneous test of the binary logistic regression model (Overall Test), the explanatory variable parameter test (Partial Test), the estimated parameter of the binary logistic regression model.

Goodness of Fit

Hosmer and Lemeshow Test are conducted to see whether the regression model can explain data or the model fits. The test results are explained as follows:

Hypothesis:

H_0 : The model is fit and can explain the data
H_1 : The model is not enough to explain the data

Table 1. Goodness of Fit by Hosmer and Lemeshow Test

Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	13.132	8	.107

With a significance level ($\alpha = 0.05$), the statistical tests show that Chi-Square oftable is 13,132 $< \chi^2_{(0,05;8)}$ of 15,507 or the significance value is 0.107 > 0.05, then H_0 cannot be rejected. This means that with a 95 % confidence level, it can be concluded that the logistic regression model used in the research is appropriate and able to explain the data.

Simultaneous Test of Binary Logistic Regression Models (Overall Test)

Overall test can be done by the Omnibus Test. Hypothesis for the simultaneous test of a binary logistic regression model:

H_0: There are no explanatory/independent variables that significantly affect the response/dependent variable
H_1: There is at least one explanatory/ independent variable that significantly affects the response/ dependent variable

Table 2. Omnibus Test of Model Coefficients

Omnibus Tests of Model Coefficients		
Chi-square	Df	Sig.
432.953	8	.000

The omnibus test shows that the test statistic of significance value is equal to 0,000 which means less than 0.05, so H_0 is rejected. It means that there is at least one explanatory variable (independent variable) that affects the response variable (dependent variable). In other words, it can be concluded that the model can be used for further analysis.

Partial Test

Partial test can see the significance of each independent variable on the dependent variable. The level of significance of each explanatory variable (independent) partially on the response variable (dependent) can be measured using a partial test.

In this research, an explanatory variable significantly affects the low-income of non-smallholder paddy farmer variable (response variable) if the null hypothesis is rejected (sig. P-value <0.05).

The hypothesis for the partial test of explanatory variables, is:

H_0:$b_j = 0$ (there is no effect of the j-th explanatory variable to the response variable)
H_1:$b_j \neq 0$ (there is an effect of the j-th explanatory variable to the response variable)
where j = 1,2, ..., 8 (j-explanatory variable)

Table 3. Partial Test by Wald Test

Independent Variables	Hypothesis	Wald	Significance	Decision	Conclusion
Pddk	$H_0 : b_1 = 0$ $H_1 : b_1 \neq 0$	11,296	0,001	Tolak H_0	Significant
Jns	$H_0 : b_2 = 0$ $H_1 : b_2 \neq 0$	21,565	0,000	Tolak H_0	Significant
PPk	$H_0 : b_3 = 0$ $H_1 : b_3 \neq 0$	15,587	0,000	Tolak H_0	Significant
Hama	$H_0 : b_4 = 0$ $H_1 : b_4 \neq 0$	75,420	0,000	Tolak H_0	Significant
Srna	$H_0 : b_5 = 0$ $H_1 : b_5 \neq 0$	8,987	0,003	Tolak H_0	Significant
Suluh	$H_0 : b_6 = 0$ $H_1 : b_6 \neq 0$	12,589	0,000	Tolak H_0	Significant
Jual	$H_0 : b_7 = 0$ $H_1 : b_7 \neq 0$	140,717	0,000	Tolak H_0	Significant
Luas	$H_0 : b_8 = 0$ $H_1 : b_8 \neq 0$	47,427	0,000	Tolak H_0	Significant

The Partial Test (Wald Test) interprets that the 8 (eight) explanatory variables (independent) can be described as follows:

The test on the highest education of the head of the household (Pddk) shows the number at 11.296>$\chi^2_{(0,05;1)}$= 3.84 with Wald significance value of p-value 0.001 <α = 0.05. It concludes that the hypothesis H0 is rejected. In other words, it the non-smallholder paddy farmers who have junior high school education and below differ statistically significant from the non-smallholder paddy farmers who have high school education in terms of the low income earned.

The test on land irrigation (Jns), Wald test shows the number at 21.565>$\chi^2_{(0,05;1)}$= 3.84 with Wald significance value at 0,000 <α = 0.05 with the conclusion that the hypothesis H0 is rejected. In other words, there is a difference between the irrigation of non-smallholder paddy farmers to smallholder paddy farmers in terms of the low income earned.

In the fertilizer use (Ppk), Wald's test result shows a number at 15,587>$\chi^2_{(0,05;1)}$= 3.84 with Wald's significance value of p-value 0,000 <α = 0.05 with the conclusion of the hypothesis H0 is rejected. So, the presence of fertilizer use by non-smallholder paddy farmers is significantly makes a difference to the income earned.

In the attack of the pest (Pest), Wald test results show a number at 75.420$\chi^2_{(0,05;1)}$= 3.84 with Wald significance value of p-value 0,000 <α = 0.05 with the conclusion of hypothesis H0 is rejected. It means that the presence of pest or pest attacks on non-smallholder paddy farmers' land is significantly different from the low income earned.

On the agricultural tools(Srna), Wald test results show a figure at 8.987>$\chi^2_{(0,05;1)}$= 3.84 with Wald significance value of p-value 0.003 <α = 0.05 with conclusion H0 hypothesis was rejected. In other words, the non-smallholder paddy farmers who use mechanized agricultural land traditionally differ significantly from non-smallholder paddy farmers who use modern tools in terms of the low income earned.

The counseling or guidance participation (Suluh), Wald test results show a number at 12,589>$\chi^2_{(0,05;1)}$= 3.84 with Wald significance value of p-value 0,000 <α = 0.05 with the conclusion of hypothesis H0 is rejected. In other words, the participation or guidance of non-smallholder paddy farmers' guidance by agricultural workers is significantly different.

In the harvest utilization (Sell), the Wald test results show a figure at 140,717>$\chi^2_{(0,05;1)}$ = 3.84 with a Wald significance value of p-value 0,000 <α = 0.05 with conclusions H0 hypothesis was rejected. In other words, the non-smallholder paddy farmers who do not sell their crops, differ significantly from non-smallholder paddy farmers who sell their crops in terms of the income of farmers obtained.

In the area of the land variable (Area), Wald test results show a number at 47,427>$\chi^2_{(0,05;1)}$= 3.84 with a Wald significance value of p-value 0,000 <α = 0.05 with the conclusion of the hypothesis H0 is rejected. It means that non-smallholder paddy farmers who do not sell their crops differ significantly from non-smallholder paddy farmers who sell their crops in terms of the low income of farmers obtained.

Binary Logistic Regression Model Estimation

The estimated maximum likelihood model parameters can be seen from the equation. The logistic regression model in this research is as follows:

$$g(x) = ln\frac{P_1}{P_0} = -1{,}512 + 0{,}305\ Pddk + 0{,}584\ Jns + 0{,}296\ Ppk + 0{,}842\ Hama + 0{,}214\ Srna + 0{,}252\ Suluh + 0{,}916\ Jual - 0{,}470\ Luas$$

The equation is a model formed from binary logistic regression analysis in which the significance of each coefficient has been described previously. Non-smallholder paddy farmers have low-income opportunities and are significantly affected by the education of household heads, types of land irrigation, fertilizer use, pest attacks, agricultural tools, agricultural counseling and guidance, utilization of harvests, and land area.

The following is a tabulation of the results of SPSS 21.0 processing output which shows the constants, coefficient values (B) of each explanatory variable and EXP (B) which can provide interpretations of the analysis of the tendency of low-income non-smallholder paddy farmers

Tabel 4. Logistic regression analysis test results of the enter method

Variable	B (Coefficient Value)	Standard of Error	Exp(B)/Odss Ratio
Pddk	0,305	0,091	1,357
Jns	0,584	0,126	1,794
Ppk	0,296	0,075	1,345
Hama	0,842	0,097	2,320

Srna	0,214	0,071	1,239
Suluh	0,252	0,071	1,286
Jual	0,916	0,077	2,500
Luas	-0,470	0,068	0,625
Constant	-1,512	0,178	0,220

Interpretation of the constants

The logistic regression equation constants can be interpreted using coefficient values (B) and the exponent, it is known as the odds ratio.

The negative constant value is 1.512 and Exp (B) is 0220, meaning that the non-smallholder paddy farmers have a lower probability of earning a low income if all explanatory variables are coded 0 (zero). In other words, if all explanatory variables are in category 0, then the non-smallholder paddy farmers tend to have low-income opportunities of 0.220 times compared to non-smallholder paddy farmers who have all explanatory variables coded 1 (one).

Interpretation of the variables

The logistic regression model can explain the probability of the non-smallholder paddy farmers with low-income opportunities with certain characteristics as follows:

The education of the household head has a positive coefficient value of 0.305 and Exp (B) of 1.357, meaning that non-smallholder paddy farmers have a greater probability to earn a low income if the highest education of the household head is a junior high school or below. Probabilities for non-smallholder paddy farmers with household heads educated at junior high school and below to have low income is 1,357 times compared to non-smallholder paddy farmers whose household heads have high school education and above.

The type of irrigation has a positive coefficient of 0.584 and Exp (B) of 1.794, meaning that non-smallholder paddy farmers have a greater probability to get low income if the type of land irrigation is in the form of irrigation. Non-smallholder paddy farmers with a non-irrigated paddy field will have a low-income probability of 1,794 times compared to non-smallholder paddy farmers in the form of irrigation.

The fertilizer use has a positive coefficient of 0.296 and Exp (B) of 1.345, meaning that non-smallholder paddy farmers have a greater tendency to get low income if they do not use fertilizer in their land management. Probabilities for non-smallholder paddy farmers who do not use fertilizer will earn a low income is 1,345 times bigger than non-smallholder paddy farmers who use fertilizer.

The pest attack has a positive coefficient value of 0.842 and Exp (B) of 2.320, meaning that non-smallholder paddy farmers have a greater tendency to get low income if their farmland is attacked by pests. Probability for non-smallholder paddy farmers who have pests attack will have a low income of 2,320 times bigger than non-smallholder paddy farmers who have no pest in their farm.

The agricultural toolshave a positive coefficient value of 0.214 and Exp (B) of 1.239, meaning that non-smallholder paddy farmers have a greater tendency to earn low income if the tools of land is still traditional. Non-smallholder paddy farmers who still use traditional agricultural facilities/tools will have a low-income probability of 1,239 times bigger than non-smallholder paddy farmers who have used modern tools facilities.

The guidance/counseling participation has a positive coefficient value of 0.252 and Exp (B) of 1.286, meaning that non-smallholder paddy farmers have a greater tendency to get low income if they do not follow agricultural guidance/counseling. Non-smallholder paddy farmers who do not participate in agricultural guidance/counseling activities will have a low-income probability of 1,286 times bigger than non-smallholder paddy farmers who participate in agricultural guidance/counseling.

The harvest utilization has a positive coefficient value of 0.916 and Exp (B) of 2.500, meaning that non-smallholder paddy farmers have a greater tendency to get low income if the yield is only used for own consumption (without being sold). Non-smallholder paddy farmers who use their crops only for self-consumption have a low-income probability of 2,500 bigger than to non-smallholder paddy farmers who sell their crops.

The land area has a negative coefficient value of 0.470 and Exp (B) of 0.625, meaning that non-smallholder paddy farmers have a smaller probability to have a low-income opportunity if the area of agricultural land is below average. Non-smallholder paddy farmers with a land area below the average low income 0.625 times (has a smaller probability) compared to non-smallholder paddy farmers whose agricultural land area is above the average.

This is contradictory to the research hypothesis that non-smallholder farmers who have less than average agricultural land have a greater probability of low income compared to non-smallholder farmers whose agricultural land area is above average. According to Shinta (2011), that the area of agricultural land will affect the risk of farming, and the accuracy of the management of this business will affect the production costs incurred by an agricultural business. Often found, the more land that is used as an agricultural business, the higher the risk of land

management efforts. The narrower the land, the risk of loss when there is a pest attack or crop failure due to climate tends to be lower.

IV. Conclusion

The condition of non-smallholder paddy farmers in South Kalimantan according to income status, namely the proportion of non-smallholder paddy farmers with lower education is greater than those with high education, non-irrigated paddy fields is greater than irrigated fields, which use fertilizer is greater than do not use, plants are attacked by pests are bigger than those that are not, traditionally facilities/tools of agriculture are bigger than the modern ones, not following agricultural guidance/counseling is greater than those who follow, sell their crops are greater than consume it themselves, and the land area is below average are greater than those above average.

The highest education of the household head, land type, fertilizer use, pest attacks, agricultural facilities/tools, participation in guidance and counseling, crop sales, and partial land area are significantly affecting the probability of the low income of non-smallholder paddy farmers' in South Kalimantan Province.

Empirically, non-smallholder paddy farmers whose lower education of the household heads, the type of irrigation in the form of non-irrigation, not using fertilizer, the land is attacked by pests, using traditional farming tools, not participating in guidance/counseling, and not selling their crops, are having a risk to have a low income. It proves that the management of farming in South Kalimantan Province has a high risk, the non-smallholder paddy farmers tend to have a crop failure or harvest with unsatisfactory results.

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