IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 14, Issue 9 Ser. II (September 2021), PP 57-62
www.iosrjournals.org

Factors Affecting Participation of Rice Farmers in Tidal Land on the Rice Farmer Insurance Program (RFIP) in Banjar Regency

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Abstract
This research was carried out to know factors affecting participation of rice farmers in tidal land on rice farmer insurance program (RFIP) in Aluh-aluh district, Banjar Regency. 60 farmers of wetland rice in tidal land were chosen to be respondents of this research. To analyze factors influencing the participation of farmers in the Rice Farming Insurance Program (RFIP) this research uses binary logistic regression model. Based on the logistic regression model 5 the characteristics of the farmer's household characteristics affect the participation of farmers in the RFIP, which are: the education duration, the number of meetings attended by farmers, business land, rice farming income, and the risk of possible crop failure.

Keywords: *Rice Farming Insurance, Tidal Land, Logistic Regression, Binary Logistic Regression*

Date of Submission: 10-09-2021 Date of Acceptance: 25-09-2021

I. Introduction

Agriculture plays an important role in the economy of Indonesia. The majority of Indonesians work as farmer, so this happens in Banjar regency. This situation can be explained that its contribution (share) to the formation of Gross Regional Domestic Product (GRDP) in 2016 which reached 18.61 percent, the largest share in the formation of GRDP in Banjar Regency. (Statistics of Banjar Regency, 2017).

More directed agricultural development program is very important and necessary because national food security is an important part of national development (Pasaribu et al, 2010). Development in the agricultural sector needs to be accelerated as a result of the increasing number of populations, which means that there is also an increase in primary needs (food) of the population. Global climate change is a challenge in food security which can be said to be very worrying at this time. Global climate change greatly affects the agricultural process and results in a disturbed ecological balance. In aggregate based on calculations, the estimated consequences of global climate change cause total costs and risks equal to 5% of total world GDP per year (Sumaryanto and Nurmanaf, 2007)

Based on the challenges faced in the agricultural sector, it is necessary to take actions that are carried out systematically, planned and institutionalized in an effort to reduce the risk of losses that occur based on threats contained in the agricultural sector, namely agricultural insurance as an alternative instrument to minimize risk. RFIP is a program organized by the government in order to protect farmers from the threat of crop failure and to provide farmers new insights regarding the existence of farming protection systems.

In South Kalimantan, RFIP has been running for 3 years. The RFIP target in South Kalimantan in 2017 was 20,000 ha and 22.5 percent of the target was in the Banjar Regency area. The government targets 4,500 ha in Banjar Regency insured rice farming. However, on August 2017, the insured farming was 1,258.14 ha. This condition indicates that the awareness of rice farmers in Banjar Regency to participate in the RFIP is low. Whereas Banjar Regency is an area that is prone to flooding during the harvest season so that it is very vulnerable to failure, this reflects on 41.25 percent claims of RFIP are from Banjar Regency farmers.

This research amis to analyze factors influencing the participation of rice farmers in the Rice Farmer Insurance Program (RFIP).

II. Materials And Methods

Sample

Data for this research come from 60 rice farmers in tidal land, conducted in Aluh-aluh district form October to December, 2017. Aluh-aluh district was chosen purposively as rice farming center and become one of the areas that has a lot of insurance allocation for rice farming.

Data

The data used in this study are primary data and secondary data. Primary data obtained from the results of direct interviews to the farmers. Secondary data obtained based on institutional literature studies and related institutions in this study, such as the Statistics of South Kalimantan Province, the Statistics of Banjar Regency, the Department of Food Crops and Horticulture, South Kalimantan Province, the Office of Food Crops and Horticulture of Banjar Regency, and Extension Center District.

Methods

Banjar Regency was chosen because it has the biggest RFIP target in South Kalimantan Province in 2017. From 19 sub-districts, 1 sub-district was selected which had the criteria of having a large number of rice farmers, namely 5,939 households (Statistics of Indonesia, ST2013 result) and having the largest farming insurance participants, which is 480 farmers with insured land area of 780.47 ha (Department of Agriculture and Horticulture Crops, South Kalimantan Province, 2016). The research sample is a portion of the population of farmer households who cultivate rice plants. The sampling process is carried out through stages as:

1. The first stage: choosing the sub-district (District of Aluh-Aluh) of 6 districts in the Banjar Regency, which is Rice Agricultural Insurance Development Area.
2. The second stage: selecting villages in the chosen sub-district based on the Farmers' group who are the most participants.
3. The third stage: choosing 60 households of paddy rice farmers as a sample unit in each selected village purposively. These 60 respondents were divided into 30 AUTP participants who were proportional from the total RFIP participants in the six selected villages and 30 proportional farmers who were not RFIP participants in each village because there were no data that stated how many rice farmers did not participate RFIP in each village in Aluh-aluh sub-district.

Research Variables

1. Participation of Rice Farmers
   a. Farmers who participate on the RFIP
   b. Farmers who not participate on the RFIP

2. Factors affecting the Participation of Rice Farmers in the RFIP
   a. Formal Education Duration
   b. Participation in Farmers' Groups
   c. Cultivated Land Area
   d. Experience of Rice Farmers
   e. Rice Farming Income
   f. Harvest Failure Risk

Data Analysis

The analytical method used to analyze factors influencing the participation of farmers in the RFIP is Logistic Regression analysis. Logistic regression is a regression analysis that is used to describe the relationship between a response categorical variable and one or several explanatory variables (Agresti, 1990).
The dependent variable in the logistic regression is expressed as:

$$Y = \pi(x) + \varepsilon \quad \text{.....(1)}$$

If Y = 1 then ε =1 – π(x), while the probability π(x)
If Y = 0 then ε = - π(x), while the probability [1- π(x)]
Where ε has null mean with variance as π(x).[1- π(x)]
So, the Y variable has mean and variance as below

$$E(Y) = E[\pi(x)] + E(\varepsilon) \quad \text{.....(2)}$$
$$= \pi(x) + 0$$
$$= \pi(x)$$

$$V(Y) = V[\pi(x)] + V(\varepsilon) \quad \text{.....(3)}$$
$$= 0 + \pi(x)[1 - \pi(x)]$$
$$= \pi(x)[1 - \pi(x)]$$

The general form of logistic regression probability model with *k* variables is formulated as follows:

$$\pi(x) \frac{\exp(\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k)}{1 + \exp(\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k)} \quad \text{.....(4)}$$

As π(x) is the probability of success or the probability of an event/case determined by *y*=1, β_j is the parameter value. Logit transformation of π(x), obtained a simpler equation which is a linear function, that is:

$$g(x) = \ln\{\frac{\pi(x)}{(1-\pi(x))}\} \quad \text{.....(5)}$$

$$= \beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k$$

With $\{\frac{\pi(x)}{(1-\pi(x))}\}$ is a risk of *y* = 1 to certain *x*.

The formula is a linear function in its parameters. If some of the independent variables are discrete and scaled as nominal, the variable will not appropriate to be included in the model. This is due to the values used to indicate the level as identification and not having a numerical value. In this situation, a variable is needed; dummy variables as much as k-1. Suppose the variable to j is xj has kj level, then the dummy variable is kj-1. Suppose the independent variable to j, that is xj has kj level, then the kj-1 dummy variable is denoted Dju with the coefficient βju, u = 1,2,3, ... kj-1. Then the logit transformation model becomes:

$$g\ (x) = \beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k \ + \sum_{u=1}^{k_{j-i}} \beta_{ju} D_{ju} \text{.....(6)}$$

Model Significance Test

To determine the role of all independent variables in the model or to test the significance of the simultan model, using the following hypothesis:

H_0 : β1 = β2 = β3 =… = 0 (there is no influence between independent variables simultaneously with dependent variables)

H_1 : There is at least one βj ≠ 0

With the test statistics $G = -2\ ln\frac{L_0}{L_k}$

where

L_0 = Likelihood without independent variable

L_K = Likelihood with all independent variables

This G statistics follows the chi-square distribution with degrees of freedom p so the hypothesis is rejected if G>$\chi^2_{(0,1,db\ (r-1)(k-1))}$ or p-value < 0,1.

Test of Model Parameter

In general, the purpose of the analysis is to find a model that matches a robust correlation between the model and the available data. According to Hosmer and Lemeshow (2000), the test of the significance of parameters (β coefficient) can be partially used by the Wald test using the following hypothesis:

H_0 : βj = 0 (the independent variable -j does not significantly influence the dependent variables)

H_1 : βj ≠ 0 (independent variable -j has a significant effect on the dependent variables)

With the test statistics:

$$W = \left[\frac{\widehat{\beta_j}}{Se(\widehat{\beta_j})}\right]^2 \text{..... (7)}$$

The hypothesis is rejected if *W* > $\chi^2_{(0,1,db\ (r-1)(k-1))}$ atau *p-value* < 0,1.

Odds Ratio

The odds ratio denoted by θ, is the ratio of the odds for x = 1 to x = 0. This odds ratio explains the level of risk of the effect of observation with x = 1 ie how many times compared to case observations showing changes in log odds for each change in one-unit variable x. The value of the model dependence Y on x can be seen in the table below:

Model dependence *Y* on *X*

	X =1	X = 0
Y =1	Π (1)	Π (0)
Y = 0	1- Π (1)	1- Π (0)

So, the division *θ* between two logit value on x = 1 and x = 0 is

$$\theta = \frac{[\pi(1)/[1-\pi(1)]}{[\pi(0)/[1-\pi(0)]} \text{……..…..(8)}$$

If $\pi(x) = \frac{\exp(\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k)}{1 + \exp(\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k)}$

as:

$$\theta = \frac{\left[\frac{\exp(\beta_0 + \beta_1)}{\exp(\beta_0 + \beta_1)}\right]\left[\frac{1}{1 + \exp(\beta_{0)}}\right]}{\left[\frac{\exp(\beta_0)}{1 + \exp(\beta_0)}\right]\left[\frac{1}{1 + \exp(\beta_0 + \beta_1)}\right]}$$

$$= \frac{\exp(\beta_0 + \beta_1)}{\exp(\beta_0)} = \exp(\beta_1) \text{…….……....(9)}$$

So, the number of θ = exp (β_i x)…..…… (10)

To find out the factors influencing the farmers' response to the RFIP, logistic regression analysis is used because the dependent variable (farmer response) is categorical. In this study households categorized as Farmers Do Not Participate RFIP = 0, while Farmers Participate on RFIP = 1.

Logistic regression model of farmer response to the RFIP:

$$Y_i = Z_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6$$

Where:

Z	:	probability of farmer's response to the RFIP
α	:	intercept
β	:	logistics coefficient (from 1,2,...,6)
X_1	:	education duration
X_2	:	participation on farmers' group
X_3	:	land area (ha)
X_4	:	experience of rice farming
X_5	:	income of rice farming
X_6	:	harvest failure risk

III. Result And Discussion

Simultanous test in logistic regression model uses Chi-Square test, which is the difference between -2 log likelihood before the independent variables enter the model and -2 log likelihood after the independent variable enter the model. This test is also called the Maximum likelihood test. As for the results of the analysis with the Omnibus Test of Model Coefficient shows that the model produced is fit. This is based on the smaller sig. Value (0,000) with the confidence level α = 10% (0,1), with the Chi-square value calculated as 59,625> Chi-square table 10,64.

Cox & Snell R Square and Nagelkerke R Square values are used to assess the ability of independent variables to explain the dependent variable. These values are also referred as Pseudo R-Square, in the OLS (Ordinary Least Square) model it is known as R-Square. The value of Nagelkerke R Square in this research is 0.840 or 84.0%, which means that the ability of the independent variable explaining the dependent variable (farmer's participation) is 84.0%, while the remaining 16.0% is explained by other factors outside the model.

Goodness of fit (GOF) test finds Chi-Square Hosmer and Lemeshow values to determine the fits of formed model. Chi-Square Hosmer and Lemeshow in this research shows the number 2.702 with the sig. value of 0.952, which is greater than the value of the confidence level of α = 10% (0.10). So, the model fits.

The number of rice farmers participating in the RFIP is 30 farmers. While the number of farmers who actually joined the RFIP was 27 farmers and those who should not have participated in the RFIP, but joining program were 3 people. So that the percentage correct value (percentage of classification accuracy) is 90.00% which means from 30 observations there are 27 observations that are precise in the logistic regression model.

Table 1. Value of Parameter test

Independent Variable	Coefficient	Wald	Sig.	Exp(B)
Constant	-14,936	4,751	0,029	0,000
Formal education duration (X_1)	0,671	4,001	0,045	1,956
Participation in farmers' group (X_2)	1,718	4,506	0,034	5,572
Cultivated Land Area (X_3)	-22,147	4,541	0,033	0,000
Experience of Rice Farmers (X_4)	0,128	0,849	0,357	1,136
Rice farming income (X_5)	0,848	3,062	0,080	2,334
Harvest failure risk (X_6)	0,329	2,763	0,096	1,390

The equation of binary logistic regression model obtained is as follows:

$$logit\ [P] = \ln\left[\frac{p}{1-p}\right] = -14{,}936 + 0{,}671X_1 + 1{,}718X_2 - 22{,}147X_3 + 0{,}128X_4 + 0{,}848X_5 + 0{,}329\ X_6$$

Table 1 shows that there are 5 variables significantly affecting the dependent variable, such as education duration, participation in the farmers' group, the area cultivated, farm income and the risk of possible crop failure.

The experience of farming has no significant effect because farmers who have more experience know how to anticipate crop failure and they think that they can cope with a crop failure or damage. These conditions make rice farming experience does not affect significantly the participation of farmers in the RFIP.

The education duration calculated based on the length of farmers' formal education (years), the model shows that it has a significant effect on the farmers' participation on RFIP in Aluh-aluh District, Banjar Regency. It is explained from the sig. value of 0.045, which means smaller than the confidence level (α) of 10%. In addition, the Odds Ratio of the education duration is 1.956. This means that every increase in one year of education, will increase the chances of farmers participating on RFIP for 1,956 times from farmers who did not join the RFIP.

The participation in the farmers' group is calculated based on the number of farmer group meetings followed. The model indicates that it has a significant effect on the farmers' participation on RFIP in Aluh-aluh District, Banjar District. It can be explained from the sig. value of 0.034, which means smaller than the confidence level (α) of 10%. In addition, the Odds Ratio is 5,572. Every increase in one unit of the number of meetings followed by farmers, will increase the chance of farmers participating on the program by 5,572 times from farmers who did not join the RFIP. The opportunity to increase the chances of farmers participating in the RFIP on this variable is the highest opportunity value, this is because through farmers' participation on their group, the farmers will get more information related to the RFIP, so farmers will be able to understand the benefits of joining the program.

The area of land cultivated is calculated based on the amount of land cultivated for rice crops and other crops, this variable indicates that it has a significant effect on the farmers' participation on the program.

IV. Conclusion And Suggestion

Conclusion

Logistic regression model concludes that there are 5 variables that significantly effect the participation of farmers in RFIP. Each variable shows as below:

1. Every increase in one year of education duration, will increase the chances of farmers participating in the RFIP.
2. Each increase in one unit of the number of meetings attended by farmers will increase the chances of farmers participating in the RFIP.
3. Every increase of one hectare of land for the business, will increase the chances of farmers participating in the RFIP.
4. Every one million rupiah increase in rice farming income will increase the chances of farmers participating in the RFIP.
5. Every increase of one percent risk of possible crop failure, will increase the chances of farmers participating in the RFIP.

Suggestion

Suggestions that can be proposed to local government are:

1. The improvement the quality of education can not wait, considering that farmers are old, but can be done through informal education which is increasing the frequency of counselling and training, so the farmers get both of knowledge and experience.
2. The importance of the role and approach of group leaders or administrators to invite their members to be more active in each meeting, and at least to be more frequent in attending each farmer group meeting.
3. The extensification of farmland that is still closed.
4. The farmers can also undertake rice farming intensification efforts to increase the rice farming income.
5. Minimize the risk of possible crop failure to avoid reducing the value of income received by farmers.

Acknowledment

The authors would like to thank the Department of Agriculture for Food Crops and Plantations of Banjar Regency, BPS-Statitistics Indonesia, Department of Agriculture for Food Crops and Plantations of South Kalimantan and other related institutions for supporting the availability of data in this study. Also thanks to the Master Program of Agricultural Economics, Faculty of Agriculture, Lambung Mangkurat University for its support during the implementation of this research.

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