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The Affecting Factors of Jajar Legowo Planting Systems Adoption in Barumun Tengah District, Padang Lawas Regency

Rini Eli Anida[1], Sri Fajar Ayu[2], Rulianda Purnomo Wibowo[2]

[1,2]Program Studi Magister Agribisnis Fakultas Pertanian Universitas Sumatera Utara

Corresponding Author: Rini Eli Anida

ABSTRACT

Many things affect the increase in rice production, starting from the use of superior seeds, fertilizing the right target, proper irrigation, controlling pests and diseases, and so on. One way that farmers can choose is by planting lowland rice with the Jajar Legowo system. The main objective of the Jajar Legowo system is to increase the plant population by adjusting the spacing and manipulating the location of the plants, as if the rice plants were on the edge (edge crops). This study analyzes the effect of age, formal education, length of farming, land area, number of family dependents, land ownership, irrigation and income on the adoption of the Jajar Legowo planting system in Barumun Tengah District, Padang Lawas Regency. In this study, samples were taken as many as 120 lowland rice farmers who applied the Jajar Legowo planting system and those who did not apply the Jajar Legowo planting system. The data obtained through the distribution of questionnaires were processed using logistic methods and logit methods with SPSS tools. The results of this study indicate that the variables age, formal education, length of farming, land area, number of family dependents and land ownership status do not partially significantly increase the adoption of lowland rice farmers using the jajar legowo planting system technology innovation in Barumun Tengah District, Padang Lawas Regency. Irrigation and income variables have a significant effect on partially increasing the adoption of lowland rice farmers using the Jajar Legowo planting system technology innovation in Barumun Tengah District, Padang Lawas Regency.

Keywords: Rice Production, Jajar Legowo, Farmers, Planting Systems, Adoption

BACKGROUND

Barumun Tengah District is one of the districts in Padang Lawas Regency. In 2018 the production of lowland rice in Barumun Tengah District was 20,542.43 which is the second largest in Padang Lawas Regency. However, the average lowland rice production in Padang Lawas Regency is still low among other regencies / cities in North Sumatra Province. One of the efforts to increase food production is through innovation so that food self-sufficiency can be achieved. The government in Indonesia is looking for new breakthroughs to obtain optimal yields, namely by creating an agricultural system through agricultural intensification techniques, agricultural diversification, and agricultural extensification. One way that farmers can choose is by planting lowland rice with the Jajar Legowo system. The main objective of the Jajar Legowo system is to increase the plant population by adjusting the spacing and manipulating the location of the plants, as if the rice plants were on the edge (edge crops). Peripheral plants will get more sunlight which is very much needed in the growth of rice plants so that it has an effect on increasing rice production. That is why the Jajar Legowo system is an option in the process of increasing grain production.

The development of the Jajar Legowo farming system really depends on

the awareness of the farmers towards the Jajar Legowo farming system. The level of farmer adoption of the Jajar Legowo farming system influences correct practice. Adoption is the decision to use a new idea entirely as the best way of acting. Of the total population of lowland rice farmers in Barumun Tengah District as many as 4250 people, farmers who have implemented the Jajar Legowo planting system are 60.83%. Because there are still few farmers who apply the Jajar Legowo planting system, therefore it is necessary to conduct research on the adoption of the Jajar Legowo planting system in Barumun Tengah District, Padang Lawas Regency.

Factors Affecting Innovation Adoption

Age

According to Soekartawi (1999), the average Indonesian farmer tends to be old and has a big influence on the productivity of the Indonesian agricultural sector. Older farmers usually tend to be very conservative (maintain) in response to changes to technological innovation. It's different with young farmers. According to Hasyim (2006), the age of the farmer is one of the factors that is closely related to the ability to work in carrying out farming activities, age can be used as a benchmark in seeing someone's activities at work if the age conditions are still productive, it is likely that someone can work well and maximum.

Formal education

According to Singarimbun and Penny in Soekartawi (1999), the number or length of school / education a person receives will affect his / her skills in a particular job. Of course, these skills will result in a greater ability to generate income for households. According to Hasyim (2006), the level of formal education that farmers have will show a broad level of knowledge and insight for farmers to apply what they get to improve their farming. Regarding the level of education of farmers, where those with higher education are relatively faster in implementing innovation adoption.

Farming experience

According to Soekartawi (1999), all experiences in the length of doing business play a very important role in determining individual judgment in order to move on to the next production process. The longer you work, the more experiences that are beneficial will encourage the individual to be more motivated to carry out optimal activities.

Land area

According to Soekartawi (1999), land area will affect business scale. The more land is used by farmers in agricultural business, the less efficient the land is. This is due to the idea that the size of the land will reduce efforts to take actions that lead to efficiency. On the other hand, on narrow land, efforts to control the use of production factors are getting better, so that agricultural business like this is more efficient. However, land that is too small tends to result in inefficient business as well.

Number of Family Dependents

According to Hasyim (2006), the number of family dependents is one of the factors that need to be considered in determining income in meeting their needs. The large number of family dependents will encourage farmers to carry out many activities, especially in seeking and increasing their family income. The more family members, the greater the burden of life that will be borne or must be fulfilled. The number of family members will influence farmers' decisions in farming (Soekartawi, 1999).

Land Ownership Status

Farmers who have large areas of land tend to have a positive response to new innovations because they have better economic capacity (Mardikanto, 1996) and the more land they cultivate, the greater the productivity of agricultural products they

achieve. Apriani et al., (2018) stated that the more farmers who have status as land owners or not as cultivators, it will reduce technical inefficiency. Haryani, (2009) also states that landowners will achieve maximum results in managing their farms.

Irrigation

Irrigation is generally an activity related to obtaining water to support agricultural activities such as rice fields, fields or plantations. This effort involves making irrigation facilities and infrastructure, namely in the form of buildings and canal networks to carry and share water regularly to irrigation plots which are then used for the needs of the plants themselves (Pasandara and Tylor, 2007).

Income

Farming income and costs are influenced by internal and external factors. Internal factors consist of farmer age, education, knowledge, experience, skills, number of workers, land area and capital. External factors in the form of prices and availability of production facilities. The availability of production facilities and prices cannot be controlled by individual farmers even though the funds are available. If one of the products is not available, farmers will reduce the use of these production factors, as well as the price of production facilities, for example, the price of fertilizers is very high and even unreachable will affect costs and income (Suratiyah, 2015).

Conceptual Framework

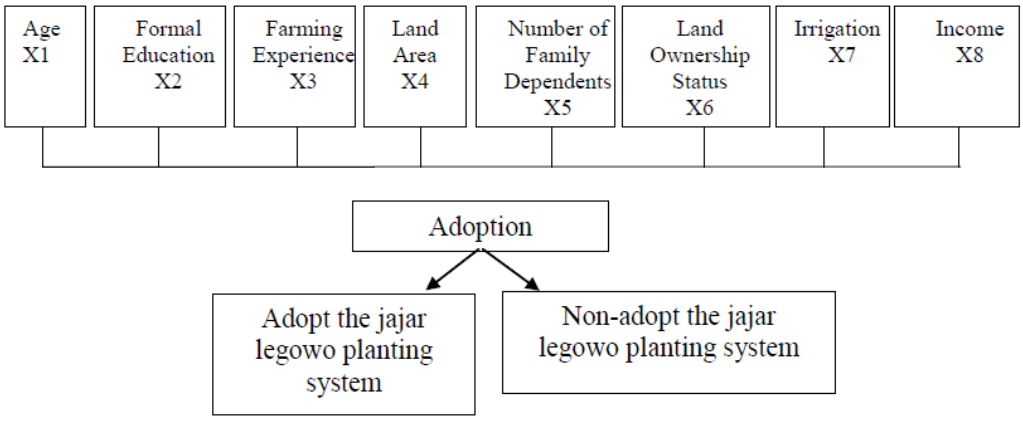

Figure 1. Schematic Framework

Research Hypothesis

Based on previous studies and problem identification that have been carried out, the following research hypothesis can be formulated: there is an effect of age, formal education, length of farming, land area, number of family dependents, land ownership status, irrigation and income on the adoption of the Jajar Legowo planting system.

RESEARCH METHODS

In this study the samples taken were lowland rice farmers who applied the Jajar Legowo cropping system and those who did not apply the Jajar Legowo cropping system. The number of samples in this study amounted to 120 samples, representing the population using purposive sampling method. The data obtained through the distribution of questionnaires were processed using logistic regression methods and to analyze problem identification the logit method with SPSS tools.

RESULTS AND DISCUSSION

The model used in the study of the factors that influence the adoption of the Jajar Legowo planting system in Barumun Tengah District, Padang Lawas Regency is

a binary logistic regression model. The binary logistic regression model is used because the dependent variable is categorical data that is grouped into two categories, namely Y = 1 (applying the Jajar Legowo) and Y = 0 (not applying the Jajar Legowo).

Independent variables that are thought to affect the adoption of the Jajar Legowo planting system include age, formal education, length of farming, land area, number of family dependents, land ownership status (1 = self-owned, 0 = rent), irrigation (1 = using irrigation. , 0 = not using irrigation), and income. Based on the results of data processing using SPSS 20, the results are as in Table 4.10.

Table 1. Logistic Regression Analysis Results

Variabel	B	S.E.	Wald	df	Sig.	Exp(B)
Farmer Age	-0,016	0,084	0,037	1	0,848	0,984
Formal education	0,390	0,252	2,398	1	0,121	1,477
Farming Experiences	0,054	0,075	0,511	1	0,475	1,055
Land area	-1,303	4,160	0,098	1	0,754	0,272
Number of Family Dependents	0,111	0,301	0,137	1	0,711	1,118
Land Ownership Status	-0,711	1,343	0,280	1	0,597	0,491
Irrigation	-2,490	1,542	2,607	1	0,106	0,083
Income	0,004	0,000	10,475	1	0,001	1,095
Constant	-15,742	5,834	7,281	1	0,007	0,000

From the results of the logistic regression analysis, the following logistic regression equation is obtained:

$$\mathbf{Y = Ln\ \frac{p}{1-p} = -15{,}742 - 0{,}016X_1 + 0{,}390X_2 + 0{,}054X_3 - 1{,}303X_4 + 1{,}111X_5\ 0{,}711X_6 - 2{,}490X_7 + 0{,}004X_8}$$

The Level of Adoption of Farmers to the Technological Innovation of the Jajar Legowo Planting System

Table 2. Farmers' Adoption Rate

No	Category	Number	Percentage (%)
1	Adopted	73	60,83
2	Non Adopted	47	39,17
Total		120	100

Table 2 shows that lowland rice farmers in Barumun Tengah District, Padang Lawas Regency, are dominant (60.83%) adopting the innovative Jajar Legowo planting system technology. This is because the lowland rice farmers in the study location can feel that the income is classified as medium-high, around 59.17% (Table 4.9). This is in accordance with the research of Herlina et al. (2019) which states that farmers' perceptions of Jajar Legowo technology innovation have an impact of 98.82% and as many as 62.5% of farmers have applied it to their agricultural land.

Model Suitability Testing
Hosmer and Lemeshow test

Table 3. Hosmer and Lemeshow Test Results

Test	Hosmer dan Lemeshow
Chi-square	2,836
Sig.	0,944

Table 3 shows that the Chi-square value obtained is 2.836 with a significance value of 0.944 (0.944> 0.05), then accept H0, reject H1, meaning that there is no real difference between the data and the results of the logistic regression model prediction, or the model can predict the observation value of the logistic regression model and the appropriate model.

Nagelkerke R Square test

Table 4. Nagelkerke R Square test results

Step	-2 Log likelihood	Cox & Snell R Square	Negalkerke R Square
1	36,275	0,645	0,875

Table 4 shows the Nagelkerke R Square value of 0.875, this indicates that the ability of the independent variable to explain the dependent variable is 87.5% and the other 12.5% is explained by other variables outside the model.

Model Significance Testing
Omnibus Test

Table 5 Omnimbus Test Results

Omnibus Tests of Model Coefficients		Chi-square	df	Sig.
Step 1	Step	124,402	8	0,000
	Block	124,402	8	0,000
	Model	124,402	8	0,000

Table 5 shows that the Chi-square value obtained is 124.402 with a sig value of 0.000 <0.05, so there is at least one independent variable that significantly affects the dependent variable in the logistic regression model.

Wald test

Table 6 Wald test of lowland rice farmers adoption rate in use Jajar Legowo planting system technology innovation.

Variabel	B	S.E.	Wald	df	Sig.	Exp(B)
Farmer Age	-0,016	0,084	0,037	1	0,848	0,984
Formal education	0,390	0,252	2,398	1	0,121	1,477
Farming Experiences	0,054	0,075	0,511	1	0,475	1,055
Land area	-1,303	4,160	0,098	1	0,754	0,272
Number of Family Dependents	0,111	0,301	0,137	1	0,711	1,118
Land Ownership Status	-0,711	1,343	0,280	1	0,597	0,491
Irrigation	-2,490	1,542	2,607	1	0,106	0,083
Income	0,004	0,000	10,475	1	0,001	1,095
Constant	-15,742	5,834	7,281	1	0,007	0,000

From the above results, it is obtained a significant value for the age variable of 0.878 where the significant value is greater than α (0.878> 0.05), so accept H0 reject H1, meaning that the age variable (X1) has no effect on the adoption of the Jajar Legowo planting system (Y) . This shows that the higher or older the farmers are, the higher the adoption of the Jajar Legowo planting system. The adoption of the Jajar Legowo planting system can be applied by anyone regardless of age.

The significant value of the formal education variable is 0.121 where the significant value is greater than α (0.121> 0.05), so accept H0 reject H1, meaning that the formal education variable (X2) has no effect on the adoption of the Jajar Legowo planting system (Y). The insignificant relationship between formal education and the adoption of the Jajar Legowo planting system shows that formal education does not affect the application of the Jajar Legowo because whatever the level of formal education of farmers, whether low or high levels of education have the same opportunity to implement the Jajar Legowo planting system.

The significant value of the old variable farming is 0.475 where the significant value is greater than α (0.475> 0.05), so accept H0 reject H1, meaning that the old variable farming (X3) has no effect on the adoption of the Jajar Legowo planting system in Barumun Tengah District. This is because the farming activities carried out by farmers are in accordance with hereditary experiences or habits, so that farmers already have their own concept or way of doing farming. Whereas jajar legowo is a new technology, so farmers tend not to apply it right away.

The significant value of the variable land area is 0.754 where the significant value is greater than α (0.754> 0.05), so accept H0 reject H1, meaning that the variable land area (X4) has no effect on the adoption of Jajar Legowo planting system (Y). The insignificant relationship between land area and adoption of Jajar Legowo planting system shows that land area does not affect farmers in adopting Jajar Legowo planting system. Farmers who have wide and narrow land have the same opportunity to apply the row planting system. According to Soekartawi (1999), land area will affect the business scale. The more land is used by farmers in agricultural business, the less efficient the land will be. Conversely, on narrow land, efforts to control the use of production factors are getting better, so that agricultural business is more efficient.

The significant value of the variable number of family dependents is 0.711 where

the significant value is greater than α (0.711> 0.05), so accept H0 reject H1, meaning that the variable number of family dependents (X5) has no effect on the adoption of the Jajar Legowo planting system (Y). According to Hasyim (2006), the number of family dependents is one of the factors that need to be considered in determining income in meeting their needs. The large number of family dependents will encourage farmers to carry out many activities, especially in seeking and increasing their family income.

The significant value of the variable land ownership status is 0.597 where the significant value is greater than α (0.597> 0.05), then accept H0 reject H1, meaning that the variable land ownership status (X6) has no effect on the adoption of Jajar Legowo planting system (Y). Farmers with their own or leased land have the same opportunity to adopt the Jajar Legowo planting system.

For irrigation variables, there is a significant effect at the significant level of 10% (0.1) on the adoption of the Jajar Legowo planting system (Y). This means that the irrigation variable has a significant effect on increasing the adoption of the Jajar Legowo planting system in Barumun Tengah District. Farmers with irrigated paddy fields have the opportunity to adopt the Jajar Legowo planting system by 0.083 times compared to farmers who do not get irrigation. Fuadi (2016) in his research on the study of water needs and water productivity of lowland rice with an SRI and conventional water supply system using pipe irrigation, states that the combination of using pipe irrigation with a water supply system can increase rice productivity. This study shows that water productivity is high in the presence of efficient water use.

From the above results also obtained a significant value for the income variable of 0.001, where the significant value is smaller than α (0.001 <0.05) so accept H1 reject H0, meaning that the income variable (X8) has a positive and significant effect on increasing the adoption of the Jajar Legowo planting system. in Barumun Tengah District, Padang Lawas Regency. For every one rupiah increase in income, the adoption rate of lowland rice farmers has increased by 1.095 times.

Interpretation of Odd Ratio Value

The method used to interpret the logistic regression parameters of categorical variables is the odds ratio. There are also categorical variables in this study, namely the variable of land ownership status (X6) and irrigation (X7). The magnitude of the odds ratio for a predictor variable k - k is the value of Anti ln of (βi) or exp (βi) for i = 1, ..., k.

Odd ratio = exp (βi)

Meanwhile, the covariate variables are interpreted based on the Marginal Effect value. The covariate variables in this study were age (X1), formal education (X2), length of farming (X3), land area (X4), number of family dependents (X5) and income (X8). The following is the odd ratio value of each variable.

The following is a table of the odds ratio and marginal effect values of each variable in this study:

Table 7. Exp Value B, B, Pi, 1-Pi, and Ci

No.	Variable	B	Exp B	Pi	1-Pi	Ci
1.	X1	-0,016	0,984	0,495	0,505	-
2.	X2	0,390	1,477	0,596	0,404	-
3.	X3	0,054	1,055	0,513	0,487	-
4.	X4	-1,303	0,272	0,213	0,787	-
5.	X5	0,111	1,118	0,527	0,473	-
6.	X6	-0,711	0,491	0,329	0,671	-
7.	X7	-2,490	0,083	0,076	0,924	-
8.	X8	0,004	1,095	0,329	0,671	0,026

Table 7 shows that the marginal effect value of the income variable is 0.026, meaning that each increase in farmer's income of 1 rupiah will increase the opportunity for farmers to adopt the Jajar Legowo planting system by 2.6%. The size of the profits obtained becomes a consideration for farmers in deciding to adopt the Jajar Legowo planting system in Barumun Tengah District, Padang Lawas Regency.

CONCLUSION

The variables of age, formal education, length of farming, land area, number of family dependents and land ownership status did not have a significant effect on partially increasing the adoption of lowland rice farmers using the Jajar Legowo planting system technology innovation in Barumun Tengah District, Padang Lawas Regency. Irrigation and income variables have a significant effect on partially increasing the adoption of lowland rice farmers using the Jajar Legowo planting system technology innovation in Barumun Tengah District, Padang Lawas Regency.

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