Analysis of Factors Influencing Farmers' Decisions in Lemongrass Farming in the City of Solok

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Abstract

This research aims to determine the factors influencing farmers' decisions in lemongrass farming in the city of Solok. The method used in this research is a case study method, and sampling is done through census method. The data used are primary and secondary data. The analysis used is Multinomial Logit analysis using SPSS. From the research results, it is known that the significant factors influencing farmers' decisions in lemongrass farming in the city of Solok are the variables of farming experience, the role of agricultural extension officers, and interaction among farmers, while variables such as land area, education level, age, and gender do not significantly affect farmers' decisions in lemongrass farming in the city of Solok. 58.1% of farmers engage in farming out of desire, 32.3% participate due to influence, and 9.7% due to invitation.

Keywords: Decision, Farmer, Lemongrass.

A.   INTRODUCTION

Essential oil is a high foreign exchange earner commodity in Indonesia. The high global demand for essential oils provides significant benefits for our country. Indonesia is a tropical country with a climate suitable for the development of essential oil-producing plants with good quality and quantity. Out of the 70 essential oil-producing plants worldwide, approximately 40 types can be produced in Indonesia. Currently, Indonesia is one of the world's largest suppliers of essential oils (Yusmarni, 2018).Indonesia's large supply of essential oils comes from several regions that serve as suppliers in the country. There are 7 provinces, namely West Java, Central Java, Yogyakarta, East Java, Banten, West Sumatra, and North Maluku, which produce the largest amounts of essential oil plants with 7 commodity crops: Cananga, Vetiver, Nutmeg, Patchouli, Clove, Ylang-ylang, and Lemongrass. In Sumatra, only West Sumatra province serves as the largest supplier of Indonesian Essential Oils with commodities such as Lemongrass, Nutmeg, and Patchouli. In the global market, essential oils originating from West Sumatra, particularly Solok City, are known for their excellent quality, hence they tend to fetch higher prices compared to similar oils from other regions (Yusmarni, 2018).

Regarding the content of Lemongrass plants, research conducted by the Indonesian Spice and Medicinal Plant Research Institute (BALITTRO) on Lemongrass in Solok City indicates that Solok City is the best producer of Lemongrass essential oil in Indonesia, as it contains citronella with a content of 45% to 50%, compared to the Indonesian standard of 35%, and geraniol with a content of 90% to 93%, compared to the Indonesian standard of 85% (Ridho, 2019). Thus, Lemongrass could be a highly considerable commodity and a stimulus for farmers to cultivate Lemongrass plants in Solok City.Solok City has a relatively large area of shrubs and grasslands. Based on percentage, 23.56% of the land in Solok City consists of shrubs and grasslands. The largest area is found in Lubuak Sikarah Subdistrict with a total of 842.89 hectares. Utilizing these extensive shrub and grassland areas properly could have significant economic value. This situation allows for the potential development of Lemongrass plants in Solok City.

With the availability of vast land, the increasing selling price of Lemongrass oil every year, such as in 2018 when the selling price reached Rp. 340,000/liter, doubling from the price in 2015 which was Rp. 160,000/liter, and the relatively stable prices, make essential oils increasingly promising in boosting the economy. This is particularly interesting because high selling prices can improve the welfare of Lemongrass farmers. Although Lemongrass cultivation is potentially lucrative in Solok City, with the support of available land, suitable soil conditions, good selling prices for the oil, the existence of groups that have developed Lemongrass cultivation, and government regulations supporting the development of this plant, the number of Lemongrass farmers in Solok City is still relatively small. Considering this situation, the author is interested in conducting research on "Analysis of factors influencing farmers' decisions in Lemongrass cultivation in Solok City".

Based on the research problem outlined above, the objectives to be achieved in this study are to determine whether factors such as land area, farming experience, level of education, age, the role of agricultural extension officers, interaction among farmers, and gender of farmers influence farmers' decisions in engaging in Lemongrass cultivation in Solok City, and iidentify the decisions made by farmers in Lemongrass cultivation in Solok City

B.   METHOD

This research is conducted in Solok City. The reason for selecting this area as the research location is based on the consideration that Solok City is one of the areas developing Lemongrass cultivation in West Sumatra. This study utilizes a Case Study method. Since the population of Lemongrass farmers in the research area is only 31 individuals, all farmers are considered as respondents for analysis purposes (Saturated sample method). The data used in this research consist of primary and secondary data. Primary data includes the condition of Lemongrass farming businesses and factors influencing farmers' decisions in Lemongrass cultivation obtained through direct interviews with respondents using a prepared questionnaire. Secondary data in this research are obtained from relevant institutions such as the Central Bureau of Statistics and the Department of Agriculture in Solok City.

To address the research problems, analysis is conducted using Multinomial Logit regression. According to Sumodiningrat (2007), the Multinomial Logit regression equation model can be mathematically expressed as follows:

$$Pi = \int(Zi) = (\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7\ X_7 + \beta_8 X_8 + e)$$

$$Pi = \frac{1}{1+e^{-Zi}} = \frac{1}{1+e^{-(b_0+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\beta_4 x_4+\beta_5 x_5+\beta_6 x_6+\beta_7 x_7+\beta_8 x_8+e)}}$$

Whereas to calculate Zi using the formula:

$$Zi = \frac{1}{1 - (Ln\ \alpha + \beta_1 lnX_1 + \beta_2 lnX_2 + \beta_3 lnX_3 + \beta_4 lnX_4 + \beta_5 ln\ X_5\ +\ \beta_6\ lnX_6 + \beta_7 lnX_7 +\ \beta_8 ln\ X_8 + e}$$

Explanation:

Pi = The probability of Lemongrass farmers to make a decision

Zi = The probability of the i-th Lemongrass farmer to make a decision,

where:

α = Regression coefficient

β_0 = Intercept

β_1-β_5= Coefficients

X1 = Land area (Ha)

X2 = Farming experience (Years)

X3 = Level of education (Years)

X4 = Farmer's age (Years)

X5 = Role of agricultural extension officer (Score value)

X6 = Interaction among group members (Score value)

X7 = Gender (dummy)

e = Error term

Inside the Pseudo R-Square, three values are generated: Cox and Snell, Nagelkerke, and McFadden. Cox and Snell's R-Square. The Pseudo R-Square value is calculated using the following formula:

a. Psedo R-Square Cox and Snell

$$R_{cs}^2 = 1 - \left[\frac{L(0)}{L(B)}\right]^{2/n}$$

b. Psedo R-Square Nagelkerke

$$R_N^2 = \frac{R_{cs}^2}{1 - L(0)^{2/n}}$$

c. Psedo R-Square Mc Fadden

$$R_M^2 = 1 - \left[\frac{L(B)}{L(O)}\right]$$

Where L(0) is the log-likelihood of the model with only the intercept, L(B) is the log-likelihood of the estimated model, and n is the number of observations.

The odds ratio is a measure of the risk or tendency to experience a particular event between one category and another. The odds ratio value is indicated by the equation (Harlan, 2018):

$$OR = \frac{\mathfrak{p}(1) / [1 - \mathfrak{p}(1)]}{\mathfrak{p}(0) / [1 - \mathfrak{p}(0)]}$$

With the interpretation of the OR value:

OR < 1: There is a negative relationship between the two variables

OR > 1: There is a positive relationship between the two variables

OR = 1: There is no relationship between the two variables

Therefore, the statistical hypothesis for OR is:

H_o: OR =1 (there is no relationship or influence between the two variables)

H_1: OR # 1 (there is a relationship or influence between the two variables)

Determining the accuracy of classification can be assessed through the following classification table:

Table 1. Classification

Observed	Predicted		
	$y = 1$	$y = 2$	$y = 3$
$y = 1$	n_{11}	n_{12}	n_{13}
$y = 2$	n_{21}	n_{22}	n_{23}
$y = 3$	n_{31}	n_{32}	n_{33}

$$APER(\%) = \frac{n_{12} + n_{13} + n_{21} + n_{23} + n_{31} + n_{32}}{n_{11} + n_{12} + n_{13} + \cdots + n_{33}} \times 100\%$$

n_{11} = The number of Y_i for $y = 1$ correctly classified as $y = 1$

n_{12} = The number of Y_i for $y = 1$ correctly classified as $y = 2$

n_{13} = The number of Y_i for $y = 1$ correctly classified as $y = 3$

n_{21} = The number of Y_i for $y = 2$ correctly classified as $y = 1$

n_{22} = The number of Y_i for $y = 2$ correctly classified as $y = 2$

n_{23} = The number of Y_i for $y = 2$ correctly classified as $y = 3$

n_{31} = The number of Y_i for $y = 3$ correctly classified as $y = 1$

n_{32} = The number of Y_i for $y = 3$ correctly classified as $y = 2$

n_{33} = The number of Y_i for $y = 3$ correctly classified as $y = 3$

C.   RESULT AND DISCUSSION

The results of the Multinomial Logit regression analysis using SPSS regarding the factors influencing farmers' decisions in Lemongrass farming in Solok City are outlined as follows:

1. Overal Model Fit

In multinomial logit regression, the overall model fit test is found in the model fitting information table:

Table 2. Results of Analysis Using Likelihood Ratio Model Fitting Information

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	56.210			
Final	16.602	39.609	14	,000

Source: Processed from the Research Findings, 2021

Based on the table, it can be observed that the value of -2log likelihood with only the intercept is 56.210, whereas by including independent variables, the -2log likelihood decreases to 16.602, or there is a decrease in chi-square value of 39.609 with Df of 14 > (Chi-square table 23.68), and (Sig 0.000 < α = 0.05), therefore, reject H0 and accept H1, which means at least one independent variable significantly influences the dependent variable, indicating that the model with independent variables is better for predicting farmers' decisions in Lemongrass farming in Solok City.

2. Pseudo R-Square Test

The Pseudo R-square table evaluates the degree to which the model elucidates the variability present in the data. Nagelkerke's index spans from 0 to 1, with values nearing 1 denoting a more pronounced level of variability elucidated by the model.

Table 3. Results of Analysis Using Pseudo R-Square Test

Cox and Snell	.721
Nagelkerke	.862
McFadden	.705

Source: Processed from the Research Findings, 2021

The estimation results of the logit model in the table above show a Nagelkerke R Square value of 0.862, indicating that the model used can be considered good in explaining the proportion of data variation. This is consistent with Ghozali as cited in Afifah and Afrianto (2015), who stated that the closer it gets to 1, the more variation the model can explain. Having a Nagelkerke R Square value of 0.862, it suggests that 86.2% of the variability in the dependent variable is accounted for by the independent variables included in the model, whereas the remaining 13.8% is attributed to additional independent variables not encompassed within the model.

Based on the above description, it can be concluded that the variables Land Area (X1), Farming Experience (X2), Level of Education (X3), Farmer's Age (X4), Role of Agricultural Extension Officer (X5), Interaction Among Farmers (X6), and Gender (X7) in the multinomial logit model are capable of explaining farmers' decisions in Lemongrass farming by 86.2%, while the remaining 13.8% is explained by other variables not examined in this study.

3. Likelihood Ratio Test

The Likelihood Ratio Tests table provides information about the individual test of the influence of each independent variable on the dependent variable (Anwar 2018).

Table 4. Results of Analysis Using Likelihood Ratio Test

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	16.602[a]	.000	0	.
X1	19.198	2.596	2	.273
X2	23.024	6.422	2	.040
X3	20.798	4.196	2	.123
X5	26.577	9.976	2	.007
X6	33.042	16.440	2	.000
X7	22.405	5.803	2	.055
X4	17.345	.743	2	.690

Source: Processed from the research findings, 2021

Based on the Likelihood Ratio Tests table above, the results are as follows:

1. Land Area (X1)
   In the significance column for the land area variable (X1), the value is $0.273 > \alpha\ 0.05$ and chi-square is 2.596 with df of 2 < (Chi-square table 5.991), therefore accept H0 and reject H1, concluding that the land area variable has no significant influence on farmers' decisions in Lemongrass farming in Solok City.

2. Farming Experience (X2)
   In the significance column for the farming experience variable (X2), the value is $0.040 < \alpha\ 0.05$ and chi-square is 6.422 with df of 2 > (Chi-square table 5.991), therefore reject H0 and accept H1, concluding that the farming experience variable has a significant influence on farmers' decisions in Lemongrass farming in Solok City.

3. Level of Education (X3)
   In the significance column for the level of education variable (X3), the value is $0.123 > \alpha\ 0.05$ and chi-square is 4.196 with df of 2 < (Chi-square table 5.991), therefore accept H0 and reject H1, concluding that the level of education variable has no significant influence on farmers' decisions in Lemongrass farming in Solok City.

4. Age (X4)
   In the significance column for the age variable (X4), the value is $0.690 > \alpha\ 0.05$ and chi-square is 0.743 with df of 2 > (Chi-square table 5.991), therefore accept H0 and reject H1, concluding that the age variable has no significant influence on farmers' decisions in Lemongrass farming in Solok City.

5. Role of Agricultural Extension Officer (X5)
   In the significance column for the role of agricultural extension officer variable (X5), the value is $0.007 < \alpha\ 0.05$ and chi-square is 9.976 with df of 2 > (Chi-square table 5.991), therefore reject H0 and accept H1, concluding that the role of agricultural extension officer variable has a significant influence on farmers' decisions in Lemongrass farming in Solok City.

6. Interaction Among Farmers (X6)
   In the significance column for the interaction among farmers variable (X6), the value is $0.000 < \alpha\ 0.05$ and chi-square is 16.440 with df of 2 > (Chi-square table 5.991), therefore reject H0 and accept H1, concluding that the interaction among farmers variable has a significant influence on farmers' decisions in Lemongrass farming in Solok City.

7. Gender (X7)
   In the significance column for the gender variable (X7), the value is $0.055 > \alpha\ 0.05$

and chi-square is 5.803 with df of 2 < (Chi-square table 5.991), therefore accept H0 and reject H1, concluding that the gender variable has no significant influence on farmers' decisions in Lemongrass farming in Solok City.

D.   CONCLUSION

From the research results, it can be concluded that variables such as farming experience, the role of agricultural extension workers, The interaction between farmers plays a significant role in influencing farmers' decisions regarding Lemongrass cultivation in the city of Solok. Meanwhile, other variables such as land area, level of education, age, and gender do not have a significant effect. Furthermore, 58.1% of farmers engage in farming out of personal interest, 32.3% participate due to involvement, and 9.7% due to invitation.

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