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Analysis of Factors in Decision Making of Ex-Rubber Farmers Regarding the Conversion of Rubber Plantations to Oil Palm (Case Study in Muara Jalai Village,Kampar Regency)

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ABSTRACT

The cutting of rubber trees is increasingly carried out by rubber farmers in Muara Jalai Village. However, rubber planting is one of the social livelihoods that has long been done by some people. To do this, a questionnaire was distributed to a former rubber farmer and the validity of the questionnaires was tested, and the results showed that all the statements in the questionary were valid for use. After the validity test, proceed with the t test. The t test results show that the $t_{count} > t_{table}$ values for the three independent variables. It can be concluded that the independent variable rubber income, rubber maintenance, and rubber production influence the rubber farmer's decision to cut rubber trees. In addition, the F test is performed. The F test results show the value of $F_{count} > F_{table}$. It can be concluded that these three independent variables overall influence the decisions of rubber farmers in cutting rubber trees.

Keywords: *Ex-rubber farmers, F test, rubber plants, t test.*

Introduction

Muara Jalai Village is one of the villages in North Kampar District, Kampar Regency, Riau, with a population of 3,830 people. The area is 3,699 hectares which consists of community settlements, agricultural land, plantation land, yards and cemeteries. The livelihoods of the Muara Jalai Village community are quite diverse, ranging from farmers, fishermen, civil servants, factory workers, army, police, health workers and also entrepreneurs. The profession that is quite widely practiced by community members is farming, be it rubber farmers, rice field farmers, vegetables or nuts. Generally, the villagers depend on the agricultural sector for their livelihoods [1, 2].

Indonesia is an agricultural country, so the livelihood of the population is mostly as farmers [3]. One part of the agricultural sector is plantations. The plantation business is carried out by the community as an additional business so that it can increase community income [4]. As for what is included in the plantation business, one of them is rubber plantations. Data from the Central Bureau of Statistics shows that the area of rubber plantations in Indonesia is quite extensive, amounting to 3.83 million hectares in 2022. For rural communities, rubber plantations are generally still excellent. Especially in Muara Jalai Village, rubber plantations have been going on for a long time, passed down from generation to generation from ancient parents. The underlying reasons for the community to open rubber plantations include land that is large enough to be used as a plantation, seeds that are easy to find, planting that does not require maintenance such as fertilizers, as well as a fairly long *lifetime*. In addition, rubber sap can be tapped every day, except on rainy days. Therefore, rubber gardening is one of the professions that is considered safe enough for people to support their lives.

One of the things that can minimize the negative impacts of environmental exploitation is to implement sustainable agricultural practices by maximizing the use of productive land. [5, 6]. The role of farmers is very important, especially in terms of conceptualizing, designing and implementing land use decisions. Of course, this decision has consequences and ties to the market, local communities, national economy, food security, water resources and environmental quality [7]. Farmer decision making takes place in a dynamic and complex environment where farmers are faced with economic, political, social and ecological changes. Fluctuating market forces where input and output prices fluctuate coupled with uncertain weather conditions, contribute to this complexity [8]. [9] In paper shown that attitude, intrinsic and extrinsic motivation, injunctive norms, behavioral beliefs and perceived risk and uncertainty, and subjective knowledge are important behavioral factors that influence farmers' decision making in the transition. We also saw that Circular Agriculture high farmers are triggered more by social and environmental values, which can be expected if farmers are more intrinsically motivated

Along with the times, today a new phenomenon has emerged in Muara Jalai Village, namely, the number of rubber farmers who cut down their rubber trees. Even though when viewed, the rubber tree is still productive and there is no natural factor that requires the farmer to cut down the rubber tree. Initially, only one farmer cut down the rubber trees, but to this day, this behavior has been followed by many other rubber farmers. This logging activity is not only during the day, but even at night, it is still common to hear logging senso machines operating in rubber plantations.

In the past, when walking around Muara Jalai Village, many rubber plantations would be found, but lately, rubber trees have been found less and less. After paying attention, it turns out that the behavior of cutting down rubber trees is carried out by farmers with the aim of replacing rubber plants with oil palm plants. According to [10, 11], the reasons for rubber farmers to change the function of rubber land to oil palm plantations include: rubber trees that are getting old so that their productivity has begun to decline, expensive fertilizer prices, because quite a lot of fertilizer is needed in rubber plantations, rubber work is more complicated than oil palm because it must be done every day and also the results of oil palm plantations are more promising than rubber. The results of research [12, 13] on the behavior of rubber farmers in Padang Sawah Village, Kampar District, Kampar Regency who converted rubber land into oil palm plantations, that there are three aspects that caused the rubber farmers to convert the land function, among others: first, the economic aspect which is influenced by the difference in prices and the comparison of the harvest time of rubber with oil palm which is much different. Second, environmental aspects influenced by the weather, because rubber tapping is very dependent on the weather. Third, the existence of supporting facilities and qualified knowledge.

In the past, palm oil plantations could be found in forests far from residential areas. But today, the area around where we live is filled with oil palm plants [14, 15, 16]. So, there is no longer a difference between residential land and plantation land. Since it is phenomenal to cut down rubber trees to replace them with oil palm plants around Muara Jalai Village, therefore the author wants to conduct research on ex-rubber farmers who change their plantation land to oil palm plants. The author wants to know what factors influence ex- rubber farmers in making decisions to replace rubber plants with oil palm. [7]

Research Methods

This research seeks to analyze the factors that play a role in ex-rubber farmer decision making regarding the conversion of rubber plantations to oil palm. The research was conducted in Muara Jalai Village, North Kampar District, Kampar Regency, Riau. This location was chosen based on the author's observations of the phenomenon of rubber trees being cut down which is currently being carried out by rubber farmers to replace them with oil palm plantations. So, the research samples were only ex-rubber farmers who had cut down rubber trees and replaced them with oil palm plantations in the area. To visually represent the steps in this research process from start to finish to help in understanding and planning the research workflow systematically, the flowchart for this research can be seen in Figure 1.

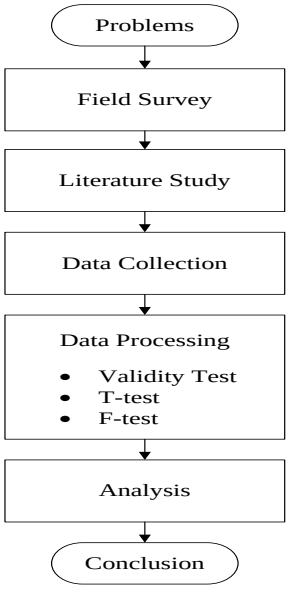

Figure 1. Research Flow Chart

Data Collection Technique

The population in this study are all ex-rubber farmers who have cut down trees, both those who will plant oil palm and those who have planted oil palm. The sampling technique used is *purposive sampling*. The sample set in this study is a saturated sample, where all the population is used as a sample in the hope that the perceptions of ex- rubber farmers can be known. The types and sources of data used in this study include primary data and secondary data. The technique in collecting data related to this research was carried out through a questionnaire. Questionnaires are an important tool in this research which is used to collect data from respondents systematically. Using questionnaires allows this research to [17] collect data from many respondents efficiently and all respondents answer the same questions, ensuring consistent and comparable data. In addition, the questionnaire is filled out independently by the respondent, thereby saving time and research costs. Questionnaires often allow respondents to provide answers anonymously, which can increase honesty and openness. Furthermore, data from the questionnaire is processed statistically to facilitate quantitative analysis.

Some of the variables contained in this research are:

- The Rubber Income variable is symbolized by X1
- The Rubber Maintenance variable is denoted by X2
- The Rubber Sap Production variable is symbolized by X3
- The Rubber Tree Logging Decision variable is denoted by Y

Data Analysis Technique

a. Validity Test

Validity tests aim to ensure that a measurement instrument (such as a questionnaire or test) measures what it is supposed to measure. Following are the main uses of validity tests:[18]

- Improve Data Accuracy: Ensure that the data collected reflects the reality being measured.
- Ensuring Relevance: Confirming that all items in the instrument are relevant to the concept being measured.
- Increases Research Reliability: High validity increases confidence in research results.
- Helps in Decision Making: Valid data provides a solid basis for making informed decisions.

In this research, validity test aims to determine whether a questionnaire is valid or not. The validity test technique is by correlating the score of the question items with the total variable score with the following provisions in:

- If $r_{count} < r_{table}$ (2-sided test with sig. 5%), then the question items are significantly correlated to the total score (valid items).
- If $r_{count} > r_{table}$ (2-sided test with sig. 5%), then the statement items are not correlated to the total score (invalid items).
- By referring to the Corrected Item-Total Correlation colon, if the value of each variable isgreater than r table, it can be concluded that the questionnaire items are valid, and vice versa.

b. T-test

The T test (T-test) is used in statistics to compare the means of two sample groups. Here are some of its uses:[19]

- Testing a Hypothesis: A t test helps determine whether the difference in means between two groups is statistically significant or simply due to chance.
- Assessing Group Differences: Used to assess differences in various situations, such as differences before and after an intervention in an experimental study.
- Measuring Effectiveness: Assessing the effectiveness of a treatment or intervention by comparing average results between groups.
- Assumption Validation: Helps validate the assumption that the two samples come from a population with a normal distribution.

The T statistical test is carried out with the aim of seeing how far the influence of the independent variable on the dependent variable. The test uses a significance level of 0.05 (α = 5%). Then:

- If the significant value > 0.05, it is considered that factor X has no significant effect on decision making,and vice versa.
- If the significant value <0.05, it is considered that factor X has a significant effect on decision making.

c. F test

The F test (F-test) is used in statistics to compare variability between two or more groups. Here are its uses:[20]

- Analysis of Variance (ANOVA): The F test is used to determine whether there is a statistically significant difference between the means of three or more groups.
- Regression: Testing the significance of the overall regression model, seeing whether the independent variables collectively influence the dependent variable.
- Homoscedasticity Testing: Evaluates whether the variances between groups are the same.

The F test is carried out to see whether the independent variables equally affect the dependent variable based on:

- If $F_{count} > F_{tabel}$, with a significance level of 0.05 (α = 5%), it means that each independent variable together has a significant effect on the dependent variable.
- If $F_{count} > F_{tabel}$, with a significance level of 0.05 (α = 5%), it means that each independent variable together has no significant effect on the dependent variable.

Results and Discussion

A. Questionnaire Distribution

The variables in this research are rubber income, rubber care and rubber latex production on the decision of ex-rubber farmers to replace rubber plants with oil palm plants. To obtain information related to what factors influence ex-rubber farmers in making decisions related to cutting down their rubber trees and replacing them with oil palm plants, the questionnaires that have been distributed are processed data by conducting validity tests, t-tests and F-tests. Questionnaires have been distributed to the population in this study, all of whom are ex-rubber farmers who have cut down trees, both those who want to plant oil palm and those who have already planted oil palm, with a total of 21 ex-rubber farmers.

B. Validity Test

The measuring instrument used in validity testing is a list of questions that have been filled in by respondents and will be tested to show whether a questionnaire is valid or not. The validity of a questionnaire can be seen from the questions on the questionnaire that are able to reveal something that will be measured by the questionnaire. A test can be said to have high validity if the test performs its measuring function or provides accurate results precisely and in accordance with the purpose of imposing the test. The questionnaire is said to be valid if $r_{count} > r_{table}$ and the questionnaire is said to be invalid if $r_{count} < r_{table}$. The validity test carried out is on the rubber income variable, the rubber maintenance variable, the sap production variable and the rubber tree felling decision variable. Table 1 contains of validity test questionnaire for variable rubber income (X1):

Table 1. Rubber Income Variable Validity Test (X1)

Variables	Calculated r value	Table r value	Probability	Description
X1.1	0,795	0,369	0,000	Valid
X1.2	0,669	0,369	0,001	Valid
X1.3	0,894	0,369	0,000	Valid
X1.4	0,820	0,369	0,000	Valid
X1.5	0,867	0,369	0,000	Valid

Based on the table 1, it can be seen that the rubber income variable (X1) has a very strong validity test value. This can be seen from the r_{count} value of all questionnaires greater than the rtable value. For the value of r_{table} obtained from the value of df = 21 - 2 = 19, with r table 0.369. Of the five questionnaire statements on the rubber income variable, it shows the value of $r_{count} > r_{table}$. Likewise, the probability value

of the five questionnaire statements is smaller than 0.05. So, it can be concluded that the entire questionnaire statement for the rubber income variable (X1), valid to be used as a questionnaire.

Table 2. Rubber Maintenance Variable Validity Test (X2)

Variables	Calculated r value	Table r value	Probability	Description
X2.1	0,796	0,369	0,0000	Valid
X2.2	0,739	0,369	0,0000	Valid
X2.3	0,941	0,369	0,0000	Valid
X2.4	0,848	0,369	0,0000	Valid
X2.5	0,916	0,369	0,0000	Valid

Based on the table 2, it can be seen that the rubber maintenance variable (X2) has a very strong validity test value. This can be seen from the r_{count} value of all questionnaires greater than the r_{table} value. For the value of r_{table} obtained from the value of df = 21 - 2 = 19, with r_{table} 0.369. Of the five questionnaire statements on the rubber income variable, it shows the $r_{count} > r_{table}$ value. Likewise, the probability value of the five questionnaire statements is smaller than 0.05. So, it can be concluded that the entire questionnaire statement for the rubber maintenance variable (X2), valid to be used as a questionnaire.

Table 3. Validity Test of Rubber Sap Production Variables (X3)

Variables	Calculated r value	Table r value	Probability	Description
X3.1	0,800	0,369	0,000	Valid
X3.2	0,794	0,369	0,000	Valid
X3.3	0,728	0,369	0,000	Valid
X3.4	0,835	0,369	0,000	Valid
X3.5	0,838	0,369	0,000	Valid

Based on the table 3, it can be seen that the rubber sap production variable (X3) has a very strong validity test value. This can be seen from the r_{count} value of all questionnaires greater than the r_{table} value. For the value of r_{table} obtained from the value of df = 21 - 2 = 19, with r_{table} 0.369. Of the five questionnaire statements on the rubber income variable, it shows the $r_{count} > r_{table}$ value. Likewise, the probability value of the five questionnaire statements is smaller than 0.05. So, it can be concluded that the entire questionnaire statement for the rubber sap production variable (X3), valid to be used as a questionnaire.

Table 4. Validity Test of Rubber Tree Logging Decision Variables (Y)

Variables	Calculated r value	Table r value	Probability	Description
Y.1	0,775	0,369	0,000	Valid
Y.2	0,691	0,369	0,001	Valid
Y.3	0,710	0,369	0,000	Valid
Y.4	0,883	0,369	0,000	Valid
Y.5	0,803	0,369	0,000	Valid

Based on the table 4, it can be seen that the rubber tree logging decision variable (variable Y) has a strong validity test value. This can be seen from the $r_{count} > r_{table}$ value of five questionnaire statements greater than the value of r_{table} based on the df value = 21 - 2 = 19, with an r_{table} value of 0.369. From the five questionnaire statements on the rubber tree logging decision variable (variable Y), showing the value of $r_{count} > r_{table}$. Likewise, the probability value of the five questionnaire statements is smaller than 0.05. So, it can be concluded that the entire questionnaire statement for the rubber tree logging decision variable (Y), is valid to be used as a questionnaire.

C. T test

Table 5 is the result of the t test of the effect of rubber income on the decision to cut down rubber trees to oil palm using the SPSS application. It is known that the Sig. value for the effect of rubber income (X1) on the decision to cut down rubber trees (Y) is 0.000 and smaller than 0.05. The t value is 2.574 and the t table value is based on the formula n - k - 1 = 21 - 3 - 1 = 17, then the t table is 1.740. This means that the t value is greater than the t table, so it can be concluded that the rubber income variable (X1) has an effect on the decision to cut down rubber trees (Y) into oil palm plants.

Table 6 is the result of the t test of the effect of rubber maintenance on the decision to cut down rubber trees to oil palm from the SPSS application. It is known that the Sig. value for the effect of rubber income (X1) on the decision to cut down rubber trees (Y) is 0.000 and smaller than 0.05. The t value is 3.600 and the t table value is based on the formula n-k-1 = 21 - 3 - 1 = 17, then the t table is 1.740. This means that the value of t count> from t_{table} so it can be concluded that rubber maintenance (X2) affects the decision to cut down rubber trees (Y) into oil palm trees.

Table 7 is the result of the t test, the effect of rubber sap production on the decision to cut down rubber trees to oil palm from the SPSS application. It is known that the Sig. value for the effect of rubber sap production (X3) on the decision to cut down rubber trees (Y) is 0.000 and smaller than 0.05. The t value is -2.549 and the t table value is based on the formula n-k-1 = 21 - 3 - 1 = 17, then the t table is 1.740. This means that the t value is greater than the t table so it can be concluded that rubber sap production (X3) affectsthe decision to cut down rubber trees (Y). into oil palm plants.

Table 5. Variable t-test of Rubber Income Vs Rubber Switching DecisionCoefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.490	2.199		4.770	.000
	RUBBER INCOME	.405	.157	.508	2.574	.019

a. Dependent Variable: RUBBER CHANGE DECISION

Table 6. T-test of Rubber Maintenance Variable Vs Rubber Cutting DecisionCoefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.792	2.050		4.290	.000
	RUBBER MAINTENANCE	.449	.125	.637	3.600	.002

a. Dependent Variable: RUBBER CHANGE DECISION

Table 7. Variable t-test of Sap Production Vs Rubber Logging DecisionCoefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	21.654	2.239		9.672	.000
	RUBBER LATEX PRODUCTION	-.488	.192	-.505	-2.549	.020

a. Dependent Variable: RUBBER CHANGE DECISION

D. F test

The F test is conducted to see if there is an influence between the independent variables (rubber income,rubber maintenance and sap production) on the dependent variable (decision to change rubber) to oil palm. To see the effect or not the variable, it can be done by testing the F test, in this case done with the help of SPSS The following are the results of the F test data from these variables.

Table 8. F Test of Dependent Variables Against Independent Variables ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48.517	3	16.172	6.187	.005[a]
	Residuals	44.435	17	2.614		
	Total	92.952	20			

a. Predictors: (Constant), RUBBER GARBAGE PRODUCTION, RUBBER CARE, RUBBER INCOME

b. Dependent Variable: RUBBER CHANGE DECISION

Based on the F test results in the table 8, it can be seen that the Significance value is 0.005. This means the Sig. value is <0.05 In a statistical context, this indicates that the F test results are significant at the 95% confidence level. This means that there is strong enough evidence to reject the null hypothesis (H0) which usually states that there is no simultaneous influence of the independent variable on the dependent variable. In addition, the $_{calculated}$ F value > from the F table, 6.187 > 0.313. Because the calculated F (6.187) is greater than the F table (0.313), this indicates that the independent variables together have a significant effect on the dependent variable.

So,it can be concluded that the X variables, including rubber income, rubber maintenance and rubber sap production, simultaneously affect the decision to cut down rubber trees (Y) by rubber farmers. This means that changes in rubber income, rubber care, and rubber sap production will jointly influence farmers' decisions about cutting down rubber trees. In this research, the results of the F test show that the three independent variables together have a significant influence on the dependent variable. This is important to consider in decision making and policy planning related to the rubber industry.

Conclusion

After data processing of questionnaires that have been distributed to ex-rubber farmers, the results of the questionnaire validity test show that the questionnaire distributed is valid to be submitted as a questionnaire. The results of the t test show that independent variables such as rubber income, rubber maintenance and rubber sap production are influential on the decision of rubber farmers in cutting down theirrubber plants. Likewise, the results of the F test show that, the three independent variables, equally influentialon the decision of rubber farmers in cutting down the rubber plant.

References

[1] D. Dahar dan Fatmawati, "Socio-economic Analysis of Farming Communities in Randangan District, Pohuwato Regency," *Scientific Journal of Economic Sciences*, vol. 1, no. 12, 2016.

[2] D. Knowler dan B. Bradshaw, "Farmers' Adoption of Conservation Agriculture: A Review and Synthesis of Recent Research," *Food Policy*, vol. 32, no. 1, pp. 25-48, 2007.

[3] S. Sadewo dan Novitasari, "Livelihood Changes in Young Farmer Communities in Sidomulyo Village, Lamongan Regency," *Surabaya State University*, vol. 115, 2022.

[4] S.F. Haya dan K. Tambunan, "The Impact of Declining Palm Oil Prices on the Welfare of Oil Palm Farmers in North Padang Lawas North Sumatra," *The Impact of Declining Palm Prices on the Welfare of Oil Palm Farmers in North Padang Lawas North Sumatra*, vol. 1, no. 1, pp. 129-138, 2022.

[5] M.K. Jhariya, R.S. Meena, dan A. Banerjee, *Ecological Intensification of Natural Resources for Sustainable Agriculture*. Springer, 2021.

[6] E.D. Setsoafia, W. Ma, dan A. Renwick, "Effects of sustainable agricultural practices on farm income and food security in northern Ghana," *Agric Food Econ*, vol. 10, no. 9, 2022.

[7] M. Githinji, M. van Noordwijk, C. Muthuri, E. N. Speelman, dan G. J. Hofstede, "Farmer land-use decision-making from an instrumental and relational perspective," *Curr Opin Environ Sustain*, vol. 63, 2023.
[8] M. T. Hayden, R. Mattimoe, dan L. Jack, "Sensemaking and the influencing factors on farmer decision-making," *J Rural Stud*, vol. 84, pp. 31-44, 2021.
[9] C. de Lauwere, M. Slegers, dan M. Meeusen, "The influence of behavioural factors and external conditions on Dutch farmers' decision making in the transition towards circular agriculture," *Land Use Policy*, vol. 120, 2022.
[10] V. K. Sari, "Switching Crop Commodities from Rubber to Palm Oil (Case Study: Farmers Switching Planting Commodities in Nagari Sungai Limau Asam Jujuhan District, Dharmasraya Regency)," *PGRI University of West Sumatra*, 2015.
[11] P. P. Marenya dan C. B. Barrett, "State-Conditional Fertilizer Yield Response on Western Kenyan Farms," *Am J Agric Econ*, vol. 91, no. 4, pp. 991-1006, 2009.
[12] M. Z. Umaroh, "Factors Influencing Farmers to Change Rubber Crops to Palm Crops in Padang Sawah Village, Kampar Kiri District, Kampar Regency," *J Ilm Mhs*, vol. 7, no. 1, pp. 1-13, 2020.
[13] T. T. Deressa, R. M. Hassan, dan C. Ringler, "Perception of and Adaptation to Climate Change by Farmers in the Nile Basin of Ethiopia," *J. Agric. Sci.*, vol. 149, no. 1, pp. 23-31, 2011.
[14] A. K. Gupta dan M. K. Singh, "Farmer's Perception of Climate Change and Adaptation Strategies in Madhya Pradesh and Haryana, India," *J. environ. res. dev.*, vol. 10, no. 4, pp. 912-919, 2016.
[15] S. S. Meijer, D. Catacutan, O. C. Ajayi, G. W. Sileshi, dan M. Nieuwenhuis, "The Role of Knowledge, Attitudes and Perceptions in the Uptake of Agricultural and Agroforestry Innovations among Smallholder Farmers in Sub-Saharan Africa," *INT J AGR SUSTAIN*, vol. 13, no. 1, pp. 40-54, 2015.
[16] J. F. Morton, "The Impact of Climate Change on Smallholder and Subsistence Agriculture," *Proceedings of the National Academy of Sciences*, vol. 104, no. 50, pp. 19680-19685, 2007.
[17] L. Cohen, L. Manion, dan K. Morrison, *Research Methods in Education*, Routledge, 2018.
[18] J. W. Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, SAGE Publications, 2014.
[19] J. T. McClave dan T. Sincich, *Statistics*, Pearson, 2017.
[20] D. C. Montgomery, *Design and Analysis of Experiments*, Wiley, 2017.