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# Factors Influencing Rubber Land Conversion to Oil Palm in Benteng Hulu Village Mempura District and Siak District

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**ABSTRACK**

Farmers convert land from rubber to oil palm in order to increase their revenue. The purpose of this study is to identify the factors that influence rubber land conversion to oil palm in Benteng Hulu Village, Mempura District, Siak Regency. The sampling approach employed was simple random sampling, with 60 sample farmers, 30 of whom converted land and 30 of whom did not convert land to oil palm. Descriptive analysis and logistic regression were employed in the analysis. According to the findings of the study, farmers' ages are still in the productive range, their land area is typically 0.1-3.5 ha, The bulk of their education is at the high school/equivalent level, they have more than 10 years of agricultural experience, and the maximum number of dependents a farmer has is 0-2 individuals. The model feasibility test results show that there is no discrepancy between the two estimates of the logistic regression model and the observation data, indicating that the model is feasible and appropriate for usage. The Omnibus test of model coefficients was performed to ensure that the independent variables are FIT with the model, which means that they have a real influence on the model when combined. The R square value indicates a 51.2 percent chance that the independent variable influences the dependent variable. The Wald test reveals that the factors of rubber production and oil palm farming revenue have a minor impact on land conversion.

Keywords: Rubber, Palm Oil, Land Use Transformation

## INTRODUCTION

Agriculture in the sector of oil palm plantations has increased. Oil palm has become a farmer's dream, particularly in Riau Province, and many rubber farmers have shifted from rubber plants to oil palm plants (Central Statistics Agency, 2020). Many districts in Riau Province, including Kuantan Singingi, Rokan Hulu, and Siak, used to farm rubber but have since transitioned to oil palm plantations. The total production of oil palm plants in Siak Regency was 1,193,289 tons in 2018, above the objective of 1,106,120 tons. Total production of oil palm plants increased by 53,889.52 tons in 2018 compared to 1,139,400 tons in 2017. This rise was due by increasing output in various sub-districts, including Kandis. The ongoing decline in the area of rubber and oil palm plantations in Siak Regency also contributes to the growth (Siak Regency Agricultural Service, 2019).

Rubber is an important product for farmers to earn a living before land conversion happens. For a long time, the rubber industry operated in the traditional manner. Rubber is reported to be one of the top commodities after palm oil, which is not consistent with the conditions that exist in rural communities. Rubber growers face a number of challenges when it comes to managing their rubber plants. Due to the challenges that have arisen, farmers in a number of regions in Siak Regency, particularly in Mempura District, have been forced to convert rubber plantation land. Rubber growers in Mempura District have recently gradually transformed land that was formerly utilized for rubber plantations into oil palm crops. Based on the background, the purpose of this study is to identify the characteristics of farmers who convert rubber land to oil palm and to investigate the factors that influence rubber land conversion to oil palm in Benteng Hulu Village, Mempura District, Siak Regency.

## RESEARCH METHOD

The study was conducted in Benteng Hulu Village, Mempura District, Siak Regency. The location was chosen because Benteng Hulu Village is one of the places where farmers have

transformed rubber land into oil palm plantations. The study lasted from June 2022 to September 2022. The research sites were chosen with care in Benteng Hulu Village, Mempura District, Siak Regency, taking into account places with substantial plantation areas and where rubber land has been transformed into oil palm plantations. The research sampling method used was simple random sampling. The study included 60 samples, 30 from farmers who converted and 30 from farmers who did not move land functions. Sugiyono (2016) defines data analysis as the process of grouping data based on variables and respondent type, tabulating data, displaying data, and doing calculations to answer the suggested problem formulation and hypothesis. This study's data was analyzed using descriptive and logistic analysis.

**Test for Validity and Reliability**

The estimated r is compared to the r table to determine correctness. If r count is more than r table, the question item or indication is considered to be valid (r count > r table), and vice versa, the measuring instrument used can be declared invalid (r count r table). Using SPSS for Windows, reliability testing can be performed using the Cronbach's Alpha approach. If the Cronbach's Alpha of an instrument is more than 0.60, it is deemed to be dependable.

**Model Feasibility Analysis**

The Goodness of Fit Test developed by Hosmer and Lemeshow was used to determine the feasibility of the regression model. The Goodness of Fit Test developed by Hosmer and Lemeshow evaluates the null hypothesis that the empirical data fits or fits the model (there is no difference between the model and the data, therefore the model may be considered to be fit). If the statistical value of the Hosmer and Lemeshow's Goodness of Fit Test is greater than 0.05, the null hypothesis cannot be rejected, indicating that the model can predict the observed value or that the model is acceptable since it matches the observation data.

**Model Coefficient Omnibus Tests (Simultaneous F Test)**

Because the significance threshold is 5%, the decision-making criteria are as follows:

1. If f count > f table and (P-Value) 0.05, H0 is rejected and H1 is accepted, indicating that the independent variable influences the dependent variable at the same time.
2. If f count f table and (P-Value) > 0.05, H0 is accepted and H1 is denied, indicating that the independent variables do not influence the dependent variable concurrently.

**R Squared is the coefficient of determination.**

The R2 value of Nagelkerke can be read as the R2 value in multiple regression. A low number indicates that the independent variables' ability to explain fluctuations in the dependent variable is very limited. A close to one value indicates that the independent variables supply nearly all of the information required to forecast variations in the dependent variable.

**Wald (Partial t) Test**

Ghozali, A. (2018) The Wald test (t) essentially reveals how much the independent variable influences the dependent variable. The significance level for determining the Wald test (t test) value is 5%.

1. If t count t table and p-value > 0.05, H0 is accepted, indicating that one of the independent variables has no effect on the dependent variable.
2. H0 is rejected if t count > t table and p-value 0.05, indicating that one of the independent factors influences the dependent variable.

Logistics examination

The Logit regression equation is as follows:

Li = Ln $\left(\frac{pi}{1-pi}\right)$= Ln Y= β0 + β1X1 + β2X2 + β3X3 + β4X4 + β5X5 + β6X6 + β7X7+β8X8+ε..... (1)

Information :

Li : $\left(\frac{pi}{1-pi}\right)$ = Y : is the farmer's conversion decision. Farmers who decide to convert are assigned a value of 1, while those who do not convert are assigned a value of 0.X1 : Umur Petani (Tahun)
X2 : Education (no school – College)
X3 : Farming Experiance (year)
X4 : Rubber Productivity (kg)
X5 : Price rubber (IDR)
X6 : Rubber of Farming income (IDR)
X7 : Palm Oil Productivity (Kg)
X8 : Palm Oil Price (IDR
X9 : Palm Oil of Farming Income (IDR/month)
β0: intercept
β1-β9: Regression coefficients of variables X1-X9
ε: nuisance error/ error term

**Probability Ratio**

The odds ratio is the probability of an event happening divided by the probability of the event not happening. A moment's odds ratio is defined as the chance of an event occurring divided by the probability of an event not occurring.

## RESULTS And DISCUSSION

The attributes of the respondent/farmer also determine ability or talents as a farmer. Dewi and colleagues (2018), Demographic characteristics include the farmer's age, education level, and the number of dependents in the farmer's household; socio-cultural characteristics include the farmer's work.

Table 1. Farmers' characteristics in Benteng Hulu Village, Mempura District, Siak Regency

| No | Age (year) | Amount | Persentase (%) |
|---|---|---|---|
| 1 | 21-30 | 10 | 16,67 |
| 2 | 31-40 | 14 | 23,33 |
| 3 | 41-50 | 15 | 25,00 |
| 4 | 51-60 | 19 | 31,67 |
| 5 | 61-70 | 2 | 3,33 |
| | **Land Areal (ha)** | | |
| 1 | 0,1-3,5 | 39 | 65,00 |
| 2 | 3,6-6,5 | 14 | 23,33 |
| 3 | 6,6-9,5 | 1 | 1,67 |
| 4 | 9,6-12,5 | 3 | 5,00 |
| 5 | 12,6-15,5 | 2 | 3,33 |
| 6 | 15,6-18,5 | 1 | 1,67 |
| | **Education** | | |
| 1 | No school | 3 | 5,00 |
| 2 | Primary | 14 | 23,33 |
| 3 | Junior High School | 12 | 18,33 |
| 4 | Senior High School | 24 | 40,00 |
| 5 | College | 8 | 13,33 |

| | | | |
|---|---|---|---|
| | **Experiance(year)** | | |
| 1 | 1-10 | 18 | 30,00 |
| 2 | 11-20 | 19 | 31,67 |
| 3 | 21-30 | 15 | 25,00 |
| 4 | 31-40 | 7 | 11,67 |
| 5 | 41-50 | 1 | 1,67 |
| | **Numbers of family dependents (person)** | | |
| 1 | 0-2 | 32 | 53,33 |
| 2 | 3-5 | 28 | 46,67 |

*Source: Processed Data 2022*

Age is a significant component in encouraging farming productivity; if you are still in a productive position, you can affect parts of farming. Productive age is defined as the age at which a person is able to produce goods and services in the manufacturing process (Sukmaningrum, 2017). Table 1 reveals that farmers aged 51-60 years account for 31.67 percent of all farmers, with a total of 19 persons. Overall, the majority of farmers are of productive age, with only a few farmers above productive age. Farmers of a productive age are often better able to manage their farming business and convert land.

Land is a production location for carrying out farming operations; having a vast amount of land can also influence farming product production. Land is a means of production for farming enterprises, as well as one of the production variables and agricultural product factories that play a critical role for farmers (Mandang et al., 2020). The greatest land ownership area is 0.1-3.5 ha, with a proportion of 65.00 percent and a total of 39 persons, according to Table 1. The more land that each farmer owns and manages, the better the production outcomes and the greater the income.

Education is something that everyone learns in school, and the amount of education can be understood as the farmer's expertise in carrying out commodities farming to achieve the best outcomes. According to Manyamsari (2014), education truly determines farmers' level of competence in carrying out agricultural tasks. Table 1 shows that the majority of farmers, with a total of 24 persons, have a SMA/Equivalent education level. High school education is a fairly advanced degree of education, particularly for farmers. It is hoped that the huge number of farmers with this level of knowledge will be able to accept new technologies and will have made the correct option in converting rubber land to oil palm in order to boost the economy. According to Harahap et al. (2018), the higher level of education that farmers have completed, the more rational they will become and the dangers that will emerge when implementing changes in the agricultural industry.

Farming length refers to the farmer's experience in carrying out farming tasks. According to Mandang et al. (2020), farming experience is the amount of years of experience that farmers have gained as part of the learning process in cultivation, production, and the intricacies of business and crop selling in order to earn a living. Farming experience is most prevalent in the 11-20 year age group, accounting for 31.67 percent of the total, or 19 persons. The high percentage of farmers with more than ten years of experience managing plantations shows that farmers already have a lot of expertise managing rubber plantations and are likely to be able to quickly adjust to the conversion of rubber land to oil palm. According to Harahap et al. (2018), the longer a farmer has been farming, the more likely he is to have higher abilities, and a farmer with experience is more likely to learn, establishing a concept and consideration of what he does.

Dependents are any individuals who are dependent on the farmer or whose daily life is still dependent on the farmer. According to human requirements, the more members a family has, the larger the wants that will be addressed (Mandang et al., 2020). According to the data in Table 1, the number of dependents in group 0-2 is 53.33 percent, with a total of 32 persons. Farmers with a large family can also have an impact on land conversion. Farmers will prefer items that are indicated to suit the needs of farmers and their families.

### Driving Factors

Driving factors are the factors that urge farmers to convert rubber land to oil palm.

Table 2. Driving Factors Change of Land Use

| No | Rubber Productivity | Score | Category |
|---|---|---|---|
| 1 | Descreasing Production | 4,42 | Very High |
| 2 | Damage Plants | 3,40 | High |
| | Average Score | 3,91 | Tinggi |
| | **Proce Rubber** | | |
| 1 | Low Price Ribber | 3,40 | High |
| 2 | Rubber prices are reduced significantly by collecting traders. | 3,08 | High Enough |
| | Average Score | 3,24 | High Enough |
| | **Rubber of Farming Income** | | |
| 1 | Descreasing rubber of farming income | 4,22 | Very High |
| 2 | Does not suit the demands of the family | 4,78 | Very High |
| | Average Score | 4,50 | Very High |

*Source: Primary Data, 2022*

Productivity is the amount of rubber produced per hectare by farmers. Due to low rubber yield, farmers are shifting their focus from rubber to oil palm. Table 2 contains data. Rubber productivity demonstrates that the average score for rubber productivity is 3.91, placing it in the high category. Rubber production has declined over time, as has the amount of oil palm plants planted by farmers. According to Randa Saputra and Amnilis (2017), one of the factors prompting rubber farmers to convert to oil palm in their research is that many of the rubber plants are old and no longer yield optimally, thus they must be replaced, so rubber farmers are more motivated to plant oil palm.

The price of rubber is the amount of money obtained by farmers when they sell their rubber produce. The price of rubber received is inequitable, encouraging farmers to transfer acreage to oil palm plantations. Table 2 contains data. Rubber prices have an average score of 3.24, placing them in the very high category. In the study, the price of rubber was roughly IDR 9,000. The low price of rubber at the farmer level, along with only a little increase over time, has created an incentive to shift the role of rubber land.

Rubber farming revenue is the monthly profit from rubber cultivation. One of the motives for changing functions is that farmers' income from rubber cultivation is less than commensurate with expenses. Table 2 contains data. The average score for rubber farming income is 4.50, placing it in the very high category. Farmers' incomes are diminishing in the implementation of rubber farming and tend to be tiny each month, prompting the majority of rubber farmers to convert their land to oil palm. Rubber farming income is insufficient to cover the demands of farmer households (Syarifa et al., 2016).

### The Pull Factors

Pull factors are the variables that entice farmers to switch rubber land to oil palm.

Table 3. Distibution of Productivity Palm Oil

| No | Component | Score | Category |
|---|---|---|---|
| | **Rubber Productivity** | | |
| 1 | Land utilization increases production. | 4,65 | Very High |
| 2 | Maintenance and harvesting are less frequent. | 4,02 | High |

| | | | |
|---|---|---|---|
| | Average Score | 4,33 | Very High |
| | **Price Palm Oil** | | |
| 1 | Prices fluctuate and tend to rise. | 3,58 | High |
| 2 | Ease of obtaining customers (buyers) | 3,45 | High |
| | Average Score | 3,52 | High |
| | **Palm Oil Farming Income** | | |
| 1 | Increasing farmer income | 4,27 | Very High |
| 2 | Capable of meeting family demands | 4,60 | Very High |
| | Average Score | 4,43 | Very High |

*Source: Primary Data, 2022*

Productivitas kelapa sawit adalah productivitas yang dihasilkan oleh petani dari lahan kelapa sawit per hektarnya. When compared to karet, the productivity of kelapa sawit is higher, causing the petani to perform a different function. Data from Table 3 show that the average productivity of kelapa sawit is 4.33, which is quite high in this category. Produksi dari hasil usahatani kelapa sawit yang lebih tinggi dan bahkan dua kali lipat lebih besar jika dibandingkan dengan karet yang kecil pada lahan tersebut. Hasil produksi kelapa sawit dalam sebulan petani dapat berupa hasil produksi kelapa sawit 2-3 ton perhektar per bulan. The maintenance of a large amount of sawit is done twice a year.

The price of palm oil is the amount of money obtained by farmers when they sell their palm oil production. The price of palm oil is thought to be high enough to entice farmers to convert their land to oil palm plantations. Table 3 contains data. Palm oil prices have an average score of 3.52, placing them in the top category. Palm oil prices rise, leading rubber producers to switch their land to oil palm. At the time of the study, the price of palm oil at the farmer level was roughly IDR 1,700/kg.

Palm oil farming revenue is the monthly profit from palm oil farming. Farmers earn more from oil palm cultivation than from rubber cultivation, which is one of the incentives for land conversion. Table 3 contains data. The average income from palm oil farming is 4.43, placing it in the extremely high category. Farmers' income grew because oil palm growing yielded twice as much as rubber in the research village. Farmers earn an average of IDR 2,082,500 per hectare each month from oil palm production. Farmers' revenue from oil palm planting is sufficient to cover household consumption expenses as well as production costs (Wulandari, 2022).

**Model Feasibility Analysis**

This model feasibility test was performed to determine whether or not the model chosen was appropriate. The resulting probability of significance is then compared against the significance level of 5%.

Table 4. Model Feasibility Analysis

| Step | Chi-square | Df | Sig. |
|---|---|---|---|
| 1 | 10.548 | 8 | .229 |

*Source: Primary Data, 2022*

The data in Table 4 reveal that the Hosmer and Lemeshow's Goodness test model feasibility criteria has a chi square of 10.548 and a significant value of 0.229. A significance score larger than 0.05 indicates that there is no difference between the two logistic regression model estimates and the observation data, indicating that the model is adequate and appropriate for usage. This can be regarded as the model being adequate for explaining the data.

### *Omnibus Tests of Model Coefficients*

The overall model test is performed thoroughly or simultaneously and is used to test all variables in the model at the same time. In other words, if the sig value in the Omnibus Test of Model coefficient is 0.05, it means that the variables entered into the model collectively have an effect on the variable. response

Table 5. test the entire model

| | | Chi-square | Df | Sig. |
|---|---|---|---|---|
| Step 1 | Step | 26.049 | 9 | .002 |
| | Block | 26.049 | 9 | .002 |
| | Model | 26.049 | 9 | .002 |

*Source: Primary Data, 2022*

Table 5 shows that the significance value is 0.002 0.05, rejecting H0, or it is FIT with a meaningful model by adding the variables age, education, experience, rubber productivity, rubber price, rubber farming income, palm oil productivity, palm oil price, and palm oil farming income.

Table 6. R-Square

| Step | *-2 Log likelihood* | *Cox & Snell R Square* | *Nagelkerke R Square* |
|---|---|---|---|
| 1 | 57.129[a] | .352 | .512 |

*Source: Primary Data, 2022*

According to the data in Table 6, the Nagelkerke R Square value is 0.512. The Negelkerke R square score indicates that the independent variable (X) has a 51.2 percent chance of influencing the dependent variable (Y).

**Wald test (partial test)**

The Wald test or partial test is used to determine whether the independent variables age (X1), education (X2), experience (X3), rubber productivity (X4), rubber price (X5), rubber farming income (X6), palm oil productivity (X7), palm oil prices (X8), and palm oil income (X9) influence the transfer of function (Y) from rubber farming to oil palm.

Table 7. Regresi logistik

| Variables | B | Sig. | OR |
|---|---|---|---|
| X1 Age | .072 | .212 | 1.074 |
| X2 Education | -.115 | .117 | .891 |
| X3 Experiance | .890 | .145 | 2.435 |
| X4 Rubber Productivity | 1.185 | **.004** | 3.270 |
| X5 Rubber Price | .191 | .610 | 1.210 |
| X6 Rubber of Farming Income | .258 | .434 | 1.295 |
| X7 Palm Oil of Productivity | -.112 | .749 | .894 |
| X8 Palm Oil Price | -.397 | .183 | .673 |
| X9 Pal Oil of Farming Income | -.654 | **.034** | .520 |
| Constant | -6.439 | .116 | .002 |

*Source: Primary Data, 2022*

The Logistic Regression Analysis equation model that resulted (see Table 7) is as follows:

Yi= -6.439+0.072X1-0.115X2+0.890X3+1.185X4+0.191X5+0.258X6-0.112X7-0.397X8-0.654X9

**Odd Rasio**

The rubber production variable (X4) has an Odd Ratio value of 3,270, indicating that the variable Variable X4 has a strong influence on land conversion. Farmers at the research site changed land usage from rubber to oil palm because they believed rubber production had fallen and they wanted to plant oil palm. According to Nurhidayat et al. (2018), low rubber production is the root reason of the trend of converting rubber plantation land to other plants, particularly oil palm.

The oil palm farming revenue variable (X9) has an Odd Ratio value of 0.520, indicating that the variable Variable X9 has a strong influence on land conversion. Increased income from oil palm planting leads farmers to modify the function of their land. According to Herudin et al. (2021), the higher income from palm oil compared to rubber stimulates the conversion of rubber land to oil palm.

## CONCLUSION

The majority of sample farmers (31.67 percent) are between the ages of 51 and 60 and are considered to be of productive age. The area of 0.1-3.5 ha has the highest rate of land ownership (65.00 percent). The majority of farmers (40.00 percent) have a high school diploma or equivalent. The biggest percentage of farming experience is 11-20 years (31.67 percent), with experience above 10 years dominating the norm. The 0-2 person group has the highest proportion of dependent farmers (53.33 percent).

Rubber productivity and oil palm farming revenue are two factors that influence the conversion of rubber land to oil palm in Benteng Hulu Village. Low rubber productivity will force farmers to shift their focus to other commodities in order to achieve higher production results. The money from oil palm growing will entice farmers to convert land in order to increase their income and meet their demands.

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