The Ist International Conference On Indigenous Knowledge For Sustainable Agriculture 2022
ISBN : 978-623-331-387-2

Factors Influencing The Conversion Of Cocoa Land Into Oil Palm In Sebatik Island Nunukan Regency Of Indonesia

Hendris[1*], Adi Sutrisno[1], Rayhana Jafar[1], Muhammad Arbain[1], and Andi Ibrahim[1]
[1]Departement of Agribusiness, Borneo Tarakan University, Indonesia
*email : hendris@borneo.ac.id

ABSTRACT

Cocoa and oil palm are the leading plantation commodities that have been cultivated by farmers in Sebatik Island of Nunukan Regency. However, in its development during 2013-2019 there has been a decrease in the area of cocoa land caused by the conversion of land from cocoa to oil palm. This study aimed to analyse the factors that influence the conversion of cocoa land into oil palm in Sebatik Island of Nunukan Regency. The sampling method used a combination of purposive sampling and convenience sampling. Data analysis has used binary logistic regression. The results showed that the factors that have significantly influenced farmers decisions to change land use are land size and cocoa pest and disease attacks, and the factors that did not significantly influence the decision of farmers to change land use were age, level of education and income. Through related institutions, it's necessary to conduct agricultural counselling and training to overcome the problems of pests and diseases that cause the conversion of farmers land.

Keywords:

Binary Logistic Regression, Cocoa, Land Conversion, Palm Oil, Sebatik Island

INTRODUCTION

Efforts to develop the plantation sector are inseparable from the role of the government as a policy determinant. Therefore, policy analysis with coverage across commodities, sub-systems and sectors is needed to assist the government in policy formulation. The policies taken are policies needed to develop plantation systems and businesses or the plantation sector. Policy analysis is also needed to capture actual issues both nationally and internationally related to plantations and the government requires the results of this analysis for purposes formed for one purpose only (ad hoc) [1].

In Indonesia's macroeconomic economy, the palm oil industry has a strategic role, including the largest foreign exchange earner, the locomotive of the national economy, energy sovereignty, the drivers of the people's economic sector, and employment. Indonesia's oil palm plantations are growing rapidly and reflect the oil palm plantation revolution. The two main islands of oil palm plantation centres in Indonesia are Sumatra and Kalimantan. Approximately 90% of Indonesia's oil palm plantations are located on both palm oil islands, and both islands produce 95% of Indonesia's crude palm oil (CPO) production [2].

ISBN : 978-623-331-387-2
Managed By: Faculty Of Agriculture, University Of Borneo Tarakan

Based on data from the Directorate General of Plantations, the development of cocoa plantation land area in Indonesia during the period 2016-2020 has decreased, namely from 2016 by 1,720,773 Ha to 1,582,406 Ha in 2020, while on the contrary, the area of oil palm plantations has increased from 2016 of 11,201,465 Ha to 14,996,010 Ha in 2020 [3].

One of the areas that has oil palm plantation land in Indonesia is North Kalimantan Province, in 2018 the area of oil palm plantations in North Kalimantan was 36,520 ha. There was an increase of 7.68% compared to the previous year. For palm oil production in North Kalimantan Province in 2018 was 512,478 tons, there was an increase in production of 28.52% when compared to the previous year's production [4].

Nunukan Regency was the area with the largest area and production of oil palm in North Kalimantan Province in 2018, with an area of 32,550 ha and production reaching 488,203 tons of oil palm. The production of other plantation crops in Nunukan Regency is coconut at 3,389 tons, cocoa at 3,043 tons, coffee at 2,744 tons, and rubber at 825 tons [5].

Sebatik District is one of the areas in Nunukan Regency that has several types of plantation crops, namely oil palm, cocoa, coconut, pepper, and coffee. Palm oil is the largest commodity cultivated in Sebatik Subdistrict and contributes a better and more secure income to farmers compared to other agricultural commodities [5]. The development of land area and production of smallholder oil palm plantations in East Sebatik District in the last seven years has continued to increase. The increase is due to farmers in East Sebatik District converting their agricultural land into oil palm plantations, one of which is the conversion of cocoa land into oil palm.

Land conversion is something that is often done by farmers and it is normal to happen, but in reality land conversion is a problem because it occurs on agricultural land that is still productive and its availability is limited. The process of agricultural land conversion is caused by internal factors, external factors, and policies [6]. The factors driving the conversion of cocoa land to oil palm were land area, pest and disease attacks, and farmers' incomes while the farmer's experience had no effect [7].

The conversion of cocoa land to oil palm in Sebatik District is caused by damage to cocoa fruits and many cocoa plants that die due to pests and diseases, resulting in a decrease in production and quality of cocoa produced which affects farmers' incomes. Cocoa plant maintenance is carried out almost every month, some cocoa farmers in Sebatik District who switch or convert their land into oil palm commodities, reasoned that the care of cocoa plants is quite difficult and economical so that many farmers convert land into oil palm commodities, this is also influenced by the age factor of farmers who are old and the distance to land is far enough so that farmers spend less time in trying to farming. Moreover, the level of education of cocoa farmers, which on average only takes education up to the elementary and junior high school levels so that the level of knowledge about how to cultivate and try to farm is not productive.

ISBN : 978-623-331-387-2
Managed By: Faculty Of Agriculture, University Of Borneo Tarakan

In addition, the conversion of land from cocoa plants to oil palm is also due to Sebatik as the border area of Indonesia and Malaysia so that the transaction of buying and selling agricultural products, one of which is palm oil, is the largest commodity exported to Malaysia, the selling price of palm oil which tends to be higher than the price of cocoa, which affects the income of farmers, causing some cocoa farmers in Sebatik District to switch their land to crops oil palm.

Based on the background of these problems, this study aims to (1) analyse the difference in income between cocoa and palm oil farming businesses as well as the difference in income between cocoa farming businesses before switching functions and after switching functions to palm oil; (2) analyse what factors influence the conversion of cocoa land to oil palm.

METHOD

1.1. Research Location and Time

This research was conducted in Sebatik District, Nunukan Regency, North Kalimantan Province. The selection of the location is determined deliberately (purposive) which is based on the consideration that Sebatik District is one of the centres of production of cocoa plants and oil palm crops, this is also based on the consideration that farmers have converted the land function of cocoa plants into oil palm plants. The implementation time of this study starts from January to May 2021.

1.2. Sample Determination Methods

The sample selection method used is non probability sampling which is a sampling method that does not allow to calculate the chances of selection of members of a particular population into the example [8]. The population in this study is cocoa farmers and oil palm farmers who have switched functions from cocoa plants, with a sampling method using a combination of purposive sampling and convenience sampling methods. The sample was taken by 50 respondents including 25 cocoa farmers and 25 respondents of oil palm farmers who had transferred functions from cocoa, referring to the rules of thumb.

1.3. Data Collection Methods

The data used in this study are primary data and secondary data. Data were collected by interview using questionnaires, observations, documentation and literature studies. The data used in this study are primary data and secondary data. Data were collected by interview using questionnaires, observations, documentation and literature studies.

1.4. Data Analysis Methods

The logistic regression method is used to analyse the relationship pattern between a set of independent variables of categorical or qualitative type dependent variables, of which the many categories of dependent variables can consist of two possible values (dichotomies) [8]. The factors affecting farmers to perform land conversion are used logistic regression with the following equation:

$$Z_i = 1n \frac{P(X_i)}{1 - P(X_i)} = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5$$

Description :

ISBN : 978-623-331-387-2
Managed By: Faculty Of Agriculture, University Of Borneo Tarakan

$P(X_i)$ = Opportunities for farmers to cultivate cocoa land (1= land converted into oil palm; 0 = land not converted)

X_1 = Area of land for cocoa / oil palm farming (hectares)

X_2 = Farmer Age (Years)

X_3 = Cocoa pest and disease attack (1 = high and 0 = low)

X_4 = Education Level (Years)

X_5 = Revenue (2 = high, 1 = medium and 0 = low)

At the first stage, it is necessary to test the logistic regression model to see if the resulting logit model as a whole can explain the qualitative choice decision. Model testing consists of likelihood test statistics and goodness of fit test.

RESULT AND DISCUSSION

Binary Logistic Regression Analysis

Logistic regression is one of the classification methods that is often used to predict probability probabilities under a certain condition. In this study, it used binary logistic regression analysis using a data processing application program, namely SPSS version 25. The results of regression analysis in this study can be seen in Table 1.

Table 3. Binner Logistic Regression Analysis Results

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	X_1 Land	1.433	.480	8.925	1	.003	4.192
	X_2 Age	-.004	.039	.010	1	.922	.996
	X_3 Pest and Disease Attacks	2.402	1.161	4.280	1	.039	11.045
	X_4 Education Level	.181	.242	.562	1	.453	1.199
	X_5 Income	-1.320	.708	3.478	1	.062	.267
	Constant	-5.466	3.115	3.079	1	.079	.004

Ket: Output SPSS versi 25, data diolah 2021.

Based on the results of binary logistic regression analysis in Table 1, the following regression equation is obtained:

$$g(x) = \text{Ln}\left[\frac{Pr(x)}{1-PrPr\,(x)}\right]$$

$$Y = -5.466 + 1.433\ X_1 - 0.004\ X_2 + 2.402\ X_3 + 0.181\ X_4 - 1.320\ X_5$$

$$\text{Pr}\,(x) = \frac{1}{1+e^{-y}} = \frac{e^{y}}{1+e^{y}}$$

$$= \frac{e^{(-5.466\ +\ 1.433\ X1\ -\ 0.004\ X2\ +\ 2.402\ X3\ +\ 0.181\ X4\ -\ 1.320\ X5)}}{1+e^{(-5.466\ +\ 1.433\ X1\ -\ 0.004\ X2\ +\ 2.402\ X3\ +\ 0.181\ X4\ -\ 1.320\ X5)}}$$

Based on the binary logistic regression equation, it can be explained that the value of the coefficient indicates the relationship of the free variable (X) with the bound variable (Y). If the coefficient is marked positive, the increase in the free variable will increase the log of odds (long chance) of farmers converting land functions to oil palm. Meanwhile, the coefficient marked negative indicates an increase in a free variable will reduce the log of odds for farmers to convert land functions into oil palm.

Based on the results of the analysis in Table 1, it shows factors that have a significant influence on farmers' decisions to change land functions as well as an odds ratio value that estimates the chances of farmers doing land conversion (Y = 1) influenced by certain factors, factors that have a significant effect on the real level of 5% show a sig value of < 0.05 so that it can be concluded that there are 2 factors that have a significant

ISBN : 978-623-331-387-2
Managed By: Faculty Of Agriculture, University Of Borneo Tarakan

influence on the decision of cocoa farmers to switch functions being oil palm, namely land area (X_1) and pest and disease attacks (X_3), while factors of age (X_2), level of education (X_4) and income (X_5) are influential.

Land area (X_1) is one of the factors that significantly affects farmers' decisions in carrying out land function change, with a significant value of 0.003 which indicates that the value is smaller than 0.05 (<0.05), the long of odds on the land area factor has a positive value coefficient of 1,433 which means that the greater the farmer's land area, the greater the probability of farmers carrying out land conversion. The odds ratio in this factor is 4,192 which means that land that increases by one unit area (Ha) has a possibility of land conversion 4,192 times higher than farmers who have a narrow land area.

Based on the results of observations in the field, the land area of cocoa plants from year to year continues to decline, this is due to the large number of cocoa plants that have died and the absence of efforts to plant cocoa cocoa again causes farmers to change to oil palm plantations so that the land they are trying can remain productive. In contrast to the area of oil palm plantations which continues to increase in line with the ease of obtaining oil palm plant seeds from cooperatives at prices of 30,000 to 50,000 / plant as well as geratis seed assistance from the government.

Age (X_2) is one of the factors that does not affect the decision of farmers in carrying out land conversion, with a significant value of 0.446 which indicates that the value is greater than 0.05 (<0.05), the long of odds on the land area factor has a negative value coefficient of 0.004 which means that the higher the age of the farmer, the less likely the farmer is to change land function. The odds ratio in this factor is 0.996 which means that if there is an increase in age by 1 year, then the probability of farmers carrying out land conversion is 0.996 times lower.

The age of farmers who continue to grow cocoa has an average age of 48.20 years while those who change their function to palm oil have an average age of 50.72 years. The average age of cocoa farmers is lower than that of oil palm farmers and in general the age characteristics of farmers are not significantly different because there are 36% of cocoa farmers and 48% of oil palm farmers who are over the age of 50. This shows that the age of farmers of the two commodities is not much different and is not one of the factors that influence the decision of farmers to convert to oil palm.

The results of observations in the field showed that the average productive age of cocoa farmers who were still surviving was more than 21 respondents and compared to the productive age of oil palm, only 18 respondents. Farmers at a young or productive age are not at risk of land conversion, in contrast to most cocoa farmers who carry out land conversion where they are at an age that is no longer productive but still carry out land conversion. This is because farmers have long experienced trying to farm and have felt a sense of saturation in trying to grow cocoa.

Pest and disease attack (X_3) is one of the factors that significantly affects farmers' decisions

ISBN : 978-623-331-387-2
Managed By: Faculty Of Agriculture, University Of Borneo Tarakan

in carrying out land conversion, with a significant value of 0.039 which shows that the value is smaller than 0.05 (<0.05), the long of odds on pest and disease attack factors has a positive value coefficient of 2,402 which means cocoa plants experience high pest and disease attacks, then it is likely that farmers will carry out land conversion. The odds ratio on this factor is 11,045 which means that cocoa plants with high pest and disease attacks have a 11,045 times higher probability of land conversion than cocoa farmers whose pest and disease attack rates are low.

In general, there are more types of pests and plant diseases in cocoa compared to oil palm or other plantation crops. In cocoa, there are as many as 15 stem and branch borer pests, eleven leaf borer pests, eight leaf sucking pests, and one type of fruit pest and six types of diseases that can attack cocoa plants in Indonesia.

The significant effect of pest and disease attack factors on cocoa plants in Sebatik District is in line with the results of observations in the field, where farmers have difficulty treating cocoa plants that are attacked by disease. The symptoms felt by farmers are the difficulty of separating the seeds and skin of the cocoa fruit, the blackening of the cocoa fruit even though the fruit packaging has been carried out to avoid pest and disease attacks, the duration of the process from harvesting to the sale of cocoa beans, and even pest attacks and diseases that cause death to cocoa plants even though they have been given treatment. The absence of special handling of pest and disease attacks on cocoa plants is appropriate, causing farmers to gradually change their crops to oil palm, whose risk of pests and diseases is smaller.

Education Level (X_4) is one of the factors that does not affect the decision of farmers in carrying out land conversion, with a significant value of 0.453 which indicates that the value is greater than 0.05 (<0.05), the long of odds on the pest and disease attack factor has a positive value coefficient of 0.181 which means that the higher the farmer's education, the more likely the farmer will carry out land conversion. The odds ratio on this factor is 1,199 which means that farmers with high education have the possibility to carry out land conversion by 1,199 times higher than farmers whose education level is low.

The insignificant effect of the factor of the level of education of farmers in the conversion of cocoa land to oil palm in East Sebatik District is in line with the results of observations in the field, where cocoa farmers who have switched to oil palm on average only study at the junior high school level and the transfer of cocoa commodities to oil palm begins with a limited effort and participation without basic knowledge and guidance from extension workers related to the management of plantation crops oil palm. In contrast to cocoa farmers who still survive, where the level of education is higher.

Income (X_5) is one of the factors that does not affect the decision of farmers in carrying out land conversion, with a significant value of 0.062 which indicates that the value is greater than 0.05 (<0.05), the long of odds on the income factor has a negative value coefficient of 1,320 which means that the higher the farmer's income, the less likely

ISBN : 978-623-331-387-2
Managed By: Faculty Of Agriculture, University Of Borneo Tarakan

the farmer is to change land function. The odds ratio on this factor is 0.267 which means that farmers with high incomes have the possibility to carry out land conversion by 0.267 times higher than farmers whose income levels are low.

There is no significant effect of income on land conversion in sebatic sub-districts based on observations in the field because the income of cocoa farmers before changing functions has a higher average income compared to the income of farmers who are still surviving today.

CONCLUSION

Significant factors affecting the conversion of cocoa land into oil palm in Sebatik District, Nunukan Regency are land area and attacks of cocoa pests and diseases. This means that the higher the land area and the attack of cocoa pests and diseases, the higher the probability of farmers changing land functions from cocoa plants to oil palm crops. As for age, education and income factors did not have a significant effect on farmers' chances of converting land from cocoa crops to oil palm crops and were judged inappropriately based on the results of binary logistic regression analysis.

REFERENCES

[1] Hendris, and Januar, J. (2012). Peranan dan Strategi Pengembangan Sektor Perkebunan Terhadap Pembangunan Wilayah Kabupaten Malinau. Agritrop Jurnal Ilmu-Ilmu Pertanian. 3(2), 231–238.

[2] Purba, J. H. V., and Sipayung, T. (2017). Perkebunan Kelapa Sawit Indonesia dalam Perspektif Pembangunan Berkelanjutan. Jurnal Masyarakat Indonesia, 43(1), 81-94.

[3] Direktorat Jenderal Perkebunan. (2020). Statistik Perkebunan Indonesia 2016 - 2020 Kakao. Jakarta, Kementerian Pertanian.

[4] Badan Pusat Statistik. (2018). Provinsi Kalimantan Utara Dalam Angka 2018.

[5] Badan Pusat Statistik. (2019). Kabupaten Nunukan Dalam Angka 2018.

[6] Ridwan, I. R. (2009). Faktor-Faktor Penyebab Dan Dampak Konversi Lahan Pertanian. J. Geogr. Gea, 9(2), 1–12.

[7] Supriana, T., Nasution, S. K. H., Pane, T. C., and Hanum, S. S. (2020). Factors Influencing the Conversion of Cocoa Lands into Oil Palm in Asahan District of North Sumatra. ICOSTEERR, 31–36.

[8] Rosadi, D. (2012). Ekonometrika dan Analisis Runtun Waktu Terapan dengan Eviews. Yogyakarta: CV. Andi Offset.

[9] Soekartawi. (2002). Analisis Usahatani. Jakarta: UI-Press.