

# Socioeconomic Factors Influencing the Welfare of Peatland Community in Pelalawan Riau

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## Abstract—

The peatland becomes a source of living by the people around it which causes an exploitation that triggers the fire so that it damages peatland ecosystem. The aims of this study are to identify the social economic condition of the people living in peatland area and to determine the socioeconomic factors that influence welfare. The research location is Bunut sub-district and Kerumutan sub-district, Pelalawan district which are two of fire point areas in 2015. Three-Stage Least Square is applied to analyse the data. The main result of this study shows that socioeconomic conditions of the peatland community in Pelalawan District, Riau has a productive age and low education level. The majority of the community's livelihood as oil palm farmers, so that the largest income derived from oil palm cultivation. This income is used more to meet non-food needs.

The community welfare of peatland is influenced by asset possession and income. The biggest asset owned by the community is peatland, which is mostly used for rubber and oil palm cultivation. Exploitation of peatland has caused damage and the income of peatland communities is not optimal. The welfare of peatland community can be improved without exploitation the peat and with rubber and palm oil cultivation. In addition, welfare can be increased if the peatland community can create non-farm livelihoods, so that the peatland ecosystem can remain sustainable.

**Keywords—** Peatland, Welfare, Community, Asset, Income.

## 1. Introduction

People's activity in Pelalawan district majorly depends on peatland. Their main livelihood as a part of peatland community is rubber and palm oil farmer. The peatland becomes a source of living by the people around it which causes an exploitation that triggers the fire so that it damages peatland ecosystem. Therefore, the people's awareness and supports from the government through Peat Restoration Agency (BRG) are needed to preserve the peatland ecosystem in the effort of peatland community's welfare improvement. Wet land as agricultural land plays an important role as the availability of agricultural land gets limited. Wet land is the area of swamp, peat, and water, whether it is made naturally or artificially, permanent or temporary, containing stagnant water or flowing water which is plain, brackish, or salty, and covering water area that exists within it not more than six meters during low tide [1]. Peatland is a wet land ecosystem formed by the accumulation of organic matters on the forest's floor that come from vegetation residue above it in a long time period [2].

The area of tropical peatland reaches 40 million hectares, 50% of it is located in Indonesia, which is spread in Sumatera, Kalimantan, and Papua [3]. The area of peatland in Indonesia reaches 15,932,438 hectares. Sumatra has the greatest area of peatland which reaching 5,965,220 hectares, the second greatest is owned by Kalimantan with the area of peatland reaching 5,036,164 hectares, and the third greatest is owned by Papua

with the area of peatland reaching 4,931,054 hectares [4]. The area of Palalawan district, Riau has the area of peatland reaching 1,276,060 hectares [5].

The potential of peatland for agriculture highly depends on the type of vegetation and its substratum or the base of the soil, and also the condition of its hinterland [6]. This condition is utilized by the people around it to earn a living in order to improve their household economic condition. Peatland area can contribute to economic function for the people around it (wooden and non-wooden products) continuously, and also the function of peatland ecology as the regulator of temperature, air humidity, and area hydrology will continue to exist as the consequence from the ecosystem so that it will not change. The exploitation of peatland has caused further damage to ecosystem, moreover, people are less aware of the danger caused upon the damaged peatland. In fact, if peatland can be managed well, it will produce maximum outcome so that it can support the community's economy.

The degradation of peatland in Indonesia is getting worse each year, particularly because of forest fire. In 2015, 40% of the fire points in Indonesia were located in peatland [7]. At least 1,052 hectares of land and forest in Riau was burned [8]. The coverage of peat swamp natural forest Riau in 2002 was still 2,280,198 hectares. In 2007, the peat swamp natural forest in this Province was only 1,603,008 hectares, during the period of 2002-2007, Riau had an average loss of 135,438 hectares/year [9]. One of the worst fire was located in Pelalawan district. The effort of peatland restoration was needed in order to restore its function as ecosystem support, climate guard, and source of living for the people around it.

Peat Restoration Agency did several efforts in conserving and restoring the condition of the degraded land. Those efforts were in the form of implementation of the degraded peatland restoration activities, development of peatland utilization, and empowerment of farmer groups and people around peatland. It was expected that those conservation activities could improve the social economic condition of the community particularly in Pelalawan district, Riau. Therefore, this study aims to identify the social economic condition of the people living in peat land area and to determine the socioeconomic factors that influence welfare. To the best our knowledge, this is the first study that investigates the relationship between the socioeconomic factors and the welfare of peatland community. This study also attempts to examine whether revitalization of livelihood in Riau peatland community is possible to be implemented or not.

## **2. Methods**

### **2.1. Location Decision Method**

Peatland community can be assumed as a household that maximize the resources with the existing limitations to fulfill its economic needs. Peatland community has to maintain and preserve the environment for the next generation so that welfare can be achieved. The possession of asset and income influences welfare [10]. The research location decision is done purposively (purposive sampling) which is based on certain considerations so that the data obtained will be more representative [11]. This research was done in Pelalawan district, Riau which is an area that became one of the peatland restoration priorities due to the fire in 2015 [5]. The research location is Bunut sub-district and Kerumutan sub-district, Pelalawan district which are two of fire point areas in 2015.

### **2.2. Sampling Method**

The sampling method used in this research is purposive sampling. Purposive sampling method is a sampling method with certain considerations. Sample is a part of number and characteristics possessed by a population [12]. Bunut sub-district represented mainland peatland area and Kerumutan sub-district represented coastal

peatland area. The number of respondent samples in this study is 45 people. The respondents in this research are taken from the population sample of peatland community who work as palm oil farmer, rubber farmer, fisher, and swallow breeder in Pelalawan district, Riau.

### 2.3. Data Analysis Method

The analysis methods used in this research is descriptive method with a qualitative approach to describe the social economic condition of the peatland community in Pelalawan district, Riau Province. Descriptive method is a method in a status research of a group of human, an object, a condition, a thinking process, or a class of recent event. The aim is to make a description or portrayal systematically, factually, and accurately [13].

Three-Stage Least Square (3SLS) is applied to analyse the data. It used to determine the influence of socioeconomic factors toward welfare of peatland community which is included in the simultaneous equation. The simultaneous equation models are used because the variables studied are related to each other [14]. The form of structural equation in this research is mathematically formulated as defined in equation (1) and (2).

$$\text{LnY1} = \alpha_0 + \alpha_1 \text{LnX1} + \alpha_2 \text{LnX2} + \alpha_3 \text{LnY2} + \varepsilon_1 \quad (1)$$

$$\text{LnY2} = \beta_0 + d_1D1 + d_2D2 + \beta_1 \text{LnX1} + \varepsilon_2 \quad (2)$$

Whereas:

Y1 = Asset Possession (Rp)

Y2 = Household Total Income (Rp)

$\alpha_0, \beta_0$  = Constant

$\alpha_1, \alpha_2, \alpha_3$  = Regression Coefficient in equation (1)

$\beta_1$  = Regression Coefficient in equation (2)

X1 = Peatland Possession (Hectars)

X2 = Education (Years)

$d_1, d_2$  = Regression Coefficient Dummy Variable

D1 = Dummy Variable of Government's Support

If the respondent has ever received government's support = 1

If the respondent has never received government's support = 0

D2 = Dummy Variable of Fire

If the respondent has ever experienced fire in peatland = 1

If the respondent has never experienced fire in peatland = 0

$\varepsilon$  = Standard Error

Several tests were also done in this study. The hypothesis test was done by using Chi2 test and Determination coefficient test. First, Chi2 test is one of the test instruments in statistics widely used in practice. In the field of non-parametric statistics, hypothesis test toward the difference of two population proportions cannot use t distribution or f distribution but it can use Chi2 distribution instead, Chi2 test was done in a certain significance level ( $\alpha$ ) ( $\alpha = 0,05$ ) [15].

The hypothesis of this research is formulated as follows:

Ho = Regression coefficients simultaneously are not significantly influential toward dependent variables.

Ha = Regression coefficients simultaneously are significantly influential toward dependent variables.

Decision making criteria:

1) If the value of  $(\text{Prob} > \text{Chi}2) > \alpha (0.05)$ : Ho is accepted while Ha is rejected meaning that all independent

variables used as presumption are simultaneously not really influential toward dependent variables.

2) If the value of  $(\text{Prob} < \text{Chi}^2) < \alpha (0.05)$ :  $H_0$  is rejected while  $H_a$  is accepted meaning that all independent variables used as presumption are simultaneously really influential toward dependent variables.

Second, the determination coefficient is a measurement to determine the appropriateness or accuracy between the presumption value or regression line and sample data. Goodness of Fit is done measure how much variance from the dependent variables' value that can be explained by the variance value from the independent variables [16]. The determination coefficient (Goodness of Fit) is noted with R-squares ( $R^2$ ) which is an important measurement in regression, because it can inform whether the regression model estimated is good or bad.

### 3. Results

#### 3.1. General Condition of the Study Area

Pelalawan district is located in the coastal area of East Coast of Sumatera Island. This district is one of biggest peatland fires spot in Riau Province that creates ecological problems. Furthermore, the peatland in Pelalawan district has high utilization of land resources for agriculture, plantation, and timber plantation. The agriculture developed in Pelalawan district is the cultivation of crops, plantation, livestock, and fishery. Plantation sector particularly palm oil and rubber gives a significant contribution toward the economy of Pelalawan district. However, those activities cause environmental degradation and forest fire in the dry season [17].

#### 3.2. Characteristic Respondent

The characteristics respondent that show the social and economic condition of peatland community can be seen in Table 1.

**Table 1.** Characteristics respondent in Pelalawan district.

No	Category	Average Result
1.	Respondents' Age (years)	<b>15-64</b>
2.	Education (years)	<b>6</b>
3.	Number of Family Member (people)	$\geq 4$
4.	Income (IDR/month)	<b>5,080,444</b>
5.	Expense (IDR/month)	<b>4,820,755</b>
	Food	2.123.210
	Non-Food	2.697.545
6.	Asset (IDR)	<b>235,827,326</b>
	Peatland	111,288,888
	Others	124,538,436
7.	Livelihood	<b>Rubber Farmer and Palm Oil Farmer</b>
	Primary	Rubber and Palm Oil Farmer
	Secondary	Others
	Tertiary	Not Having Any

Source : Household Survey, 2017

Variable of age is used to determine the effect on the productivity of sample families in their work. Productivity will increase as age increases, but will decrease after passing through the productive period. According to BPS 2017 the productive age group is between the ages of 15-64 years [12]. The average percentage results of the age of all respondents were between the ages of 15-64 years (Table 1). Most of the sample farmers have either primary education level.

One of the characteristics of rural communities is having a large number of household members. Based on Table 1 the respondent has more than 4 household members. The average income of respondents is 5,080,444 IDR / month and the average expenditure is 4,820,750 IDR / Month. Expenditures consist of food and non-food.

Survey result show that the most assets owned by respondents are peatland ownership in the form of palm oil and rubber plantation. Farm households in peatland (Central Kalimantan, West Sulawesi and Riau) 90.6% are highly dependent on the agricultural sector [18]. Hence, the main livelihood of the majority of respondents as a farmer palm oil and rubber farmers.

### 3.3. Influential factors toward the welfare of peatland community in Pelalawan simultaneously (3SLS approach)

The estimation result is depicted in Table 2. The welfare indicators in this study are asset possession and household income. In this research, asset possession variable is influenced positively by peatland possession variable and negatively influenced by education variable. However, asset possession is not influenced by income. Income variable is influenced positively by government support variable and negatively influenced by fire variable, while income is not influenced by peatland possession variable. That result indicated that peatland is the most important asset possessed by the farmers' household. Based on the result, the area of peatland possession of the community in Pelalawan district is around 1-2 hectares, the quite great land possession showed that there was welfare of peatland community. That land was dominated by palm oil and rubber area.

**Table 2.** 3SLS Regression analysis Result of socioeconomic factors influencing the welfare of peatland community in Pelalawan district.

Variable	Coefficient	Standard Error
<b>Asset Possession</b>		
Peatland Possession	0.880***	0.139
Education	-0.199**	0.097
Income	0.203 <sup>ns</sup>	0.274
Constant	15.564***	4.104
R <sup>2</sup>	0.503	
Chi <sup>2</sup>	45.06	
Number of Observation	45	
<b>Income</b>		
Government Support	0.509**	0.206
Fire	-0.574***	0.202
Peatland Possession	0.015 <sup>ns</sup>	0.129
Constant	15.227***	0.233
R <sup>2</sup>	0.259	
Chi <sup>2</sup>	15.72	
Number of Observation	45	

Source: Primary Data Analysis, 2017

Note:

- \*\*\* : significance in the trust level of 99%
- \*\* : significance in the trust level of 95%
- \* : significance in the trust level of 90%

ns : not significant

### **3.4. 3SLS regression analysis results**

Chi2 test data analysis result on dependent variable asset ownership have a value  $(\text{Prob} < \text{Chi}^2) = 0$ . This means that  $(\text{Prob} < \text{Chi}^2) > \alpha (0.05)$ , then  $H_0$  is accepted while  $H_a$  is rejected, meaning that all independent variables that are used as estimators together do not have a significant effect on the dependent variable that is asset possession. The results showed that household asset possession was influenced by peatland possession variables with confidence level of 99% and the coefficient value of peat land ownership variable 0.880 (Table 2). Educational independent variable affecting asset possession variable with a confidence level of 95% with a regression coefficient value education -0.199 (Table 2). Meanwhile, the trust level of the independent variable income is not significant to the asset possession dependent variable (Table 2). The coefficient of determination ( $R^2$ ) is a tool to measure how far the ability of the model in explaining the variation of the dependent variable [19]. Coefficient of determination is between zero and one. R-Squared value on asset possession variable 0.503 indicates all independent variables that are used to explain dependent variable effect 50.03%. While the remaining 49.97% is explained by other variables that are not used in the model. These factors may consist of total family members, age of household head, food and non-food expenditure and so on. The constant value is 15,564. This value can be interpreted without the influence of the variables of peatland possession, education, and income, the amount of asset possession is 15,564. The results showed that household asset possession is influenced by peatland possession variable with trust level of 99%. Coefficient value of peatland possession variable is 0.880, means for each increase of peatland possession can increase probability of asset possession by 0.880 units. Education variable of household head affects household asset possession with trust level of 95%. Results showed coefficient value of education -0.199 means that increasing education level there will be a decreasing asset possession of 0.199 units. Meanwhile, the trust level of income variable is not significant to asset possession in Bunut and Kerumutan, Pelalawan, Riau.

Chi2 test data analysis result on dependent variable income have a value of  $(\text{Prob} < \text{Chi}^2) = 0$ . This means that  $(\text{Prob} < \text{Chi}^2) > \alpha (0,05)$ , then  $H_0$  is accepted while  $H_a$  is rejected, meaning that all independent variables that are used as estimators together do not have a significant effect on the dependent variable income. The results showed income was influenced by the independent variable of government support with 95% confidence level of the coefficient value variable government support 0.509 (Table 2). Fire independent variable affecting income variable with a confidence level of 95% with regression coefficient value education -0.574 (Table 2). Meanwhile, the trust level of independent variable peatland possession is not significant to income variable (Table 2). R-Squared value on income variables of 0.259 indicates all independent variables that are used to explain dependent variable income effect 25.9%. While the remaining 74.1% explained by other variables that are not used in the model. These factors may consist of food and non-food expenditure, total family members, age of household head, type of job and so forth. The constant value is 15.227. This value can be interpreted without the influence of the variables of fire in peatland, government support, and peatland possession, the amount of asset possession is 15.227. The results showed that income is influenced by peatland possession variable with trust level of 95%. Coefficient value of government support variable is 0.509, it means for each increase of government support may increase probability of land possession by 0.509 units. Fire variable affects land possession with trust level of 95%. Results showed coefficient value of fire variable -0.574. It means that each increase of fire there will be a decrease peatland possession of 0.574 units. Meanwhile, the trust level of peatland possession variable is not significant to household income in Bunut and Kerumutan, Pelalawan, Riau.

## **4. Discussion**

#### ***4.1. Interlink between dependent variable asset possession and independent variables land possession, education, income***

Asset possession is affected by land possession and education variable, while the income variable is not significant toward asset possession. The land possession area that owned by peatland communities affects total asset. The results of this study are following the research of Muttakin et al (2014), Manatar et al (2017), and Parvin et al (2012) that increased peatland area that owned by each household will lead to increased asset as well, and vice versa [20,21,22]. Community in Bunut and Kerumutan have above average 1-2 hectare of land area, this extensive land ownership indicates the peatland communities' welfare. The land area is dominated by palm oil and rubber plantation. In addition to land possession, household head education also influences asset possession. Respondents education level on peatland have negative influences to asset possession (Table 2). The results of this study contradict with Bizimana et al (2004) that if level of higher education will increase its assets [23]. In this study, the average respondent's education level in Pelalawan was not attending school and primary school graduates were classified as low but farmer's household had high assets.

The trust level income variable is not significant to the asset possession of community in Pelalawan (Table 2). The reason of income not significant toward asset possession is the income is not used to buy asset or invest, the income obtained by farmers is used to fulfill their primary and secondary needs. Furthermore, their low community resources that cannot optimally utilize peatland or just follow trends. For example, where the farmer's majority are planting palm oil the other farmers will also be planting palm oil. The lack of human resources also causes farmers to lack creativity in processing agricultural products.

#### ***4.2. Interlink between dependent variable income and independent variables government support, fire, asset possession***

Income variable is affected by government support and fire variables, while the asset possession is not significant toward household income. Government support toward peatland communities affects the income that household received. Increased government support will lead to rising income of peatland communities, and vice versa. This study results are accordance with the research of Hisham (2014) and Wim (2018) [24,25]. Based on the research results there, government support in the form of fertilizers, seeds, and counseling, infrastructure improvements, etc. This kind of support is very helpful to increase community income.

Moreover, fires in peatland area affect the amount of income that household gain. This study results are accordance with research of Beukering et al (2008) increasing the number of fires in peatland causes decreasing of community income [26]. Peatland fires have negative influences to household income (Table 2). Due to plantation community which is normally used to make a living, can be reduced or even disappear caused by fires. In addition, peatland fires make it difficult for community to do activities due to heavy haze or a prohibition on entering the forest because of fire.

The trust level asset possession variable is not significant to the household income (Table 2). Farmer's land ownership is fixed, but the income changes depending on factors affect crops cultivated on peatland. These factors such as successful plant growth, weather, and season. Total peatland area owned by farmer will have an effect if they can maximize the utilization of the land. Whereas in Pelalawan majority farmer only cultivate one type of plant. If a failure occurs, the farmer does not earn income.

#### ***4.3. The influence of asset possession and income toward the welfare of peatland community in Pelalawan simultaneously (3SLS Approach)***

Education is negatively influential toward asset possession. It showed that the higher the farmers' education was, the less willing those farmers had to choose to increase peatland possession. Therefore, the asset possessed would be decreased because most assets were dominated by peatland possession. Asset possession is defined as the possession of productive devices by a household which at the end can influence the income that will be received by the household from that asset possession. Highly educated farmers would choose non-peatland as productive device to earn or influence income [27]. The average education of the respondents in Pelalawan district was quite low, most of them did not finish schools and only finished elementary school, in which the farmers' household had high asset due to the high possession of peatland. The head of the household in this peatland village, improved his social status by having great amount of asset particularly in the form of peatland, while the highly educated farmers improved their social status by having higher education. High education would improve the community's resource quality, so that the farmers were open-minded. Higher education achievement of the head of the household would improve the household welfare.

The type of primary job in the household is a factor that can influence welfare. It is the determining factor of how much income received and expense spent by the household. It can encourage farmers to take the risk in exploiting peatland potential by cultivating various plants besides plantations or can shift into horticultural plants. The insignificant income toward asset possession due to that income is not allocated to buy more asset or to invest, but the income obtained by the farmers is used to fulfill primary or secondary needs. Whereas the insignificant peatland possession toward the household income is caused by the low human resource so that the people cannot utilize the peatland maximally or just following the existing trend if the most people plant palm oil, the farmer will also plant palm oil. The indecent human resource also causes the farmers have less creativity in manufacturing the agriculture product. If the peatland farmers want to increase the number of asset, they will have to improve their income by finding various other jobs besides palm oil and rubber farmer. For instance, by planting the horticultural plant of pineapple, then the farmers can manufacture the pineapple into candied pineapple which sales value is higher than the unprocessed pineapple.

Income in the form of money or other forms that can be turned into money from the work done by the family member or wide community is used to fulfil their life need whether it is morally or materially or can be said as primary need and secondary need [28]. The farm household income in Pelalawan district is mostly spent for non-food expenditures, such as gasoline, clean water, and electricity. The government's support in the form of infrastructure development such as road, transportation, clean water, and electricity can help the peatland community to reduce their great expense on electricity and clean water. The support in the form of fertilizer and seeds can help peatland farmers reduce their expense on land manufacture and plant cultivation, and also the application of proper fertilizer will help improving the product of peatland cultivation. Agricultural education about peatland utilization can expand the community's knowledge about peatland utilization so that it will result in the income improvement of peatland community. The existence of an education program can change the behavior of cultivation practices so that farmers understand the importance of protecting soil fertility and productivity [29]. However, due to of low education, the exploitation of peatland by doing excessive peatland forest fire to free up the land causes the ecosystem of peat forest obstructed and the chance for the people to do other agricultural activities besides palm oil will be reduced even more for instance cultivating horticultural plants, catching fish (fisher), breeding swallows, and etc.

Therefore, the income of peatland community is only limited to the product of palm oil and rubber cultivation, whereas other activities can also be done to improve the income obtained by peatland farmers. The peatland possessed by the farmers is not influential toward the farmers' income because they don't have the willingness to be creative in utilizing the existing land to cultivate plants that produce higher income than rubber and palm oil. The main result of this research shows that the welfare of peatland community can be improved without

having to exploit the peatland with rubber and palm oil cultivation. However, it still can be improved through other productive economic activities while maintaining the peatland ecosystem.

## 5. Conclusion

This study attempts to identify the farmers' social economic and the factors influencing the welfare of peatland community in Pelalawan. The main result shows that socio-economic conditions of the peatland community in Pelalawan District, Riau has a productive age and low education level. Most of farmers in Pelalawan have productive age group is between the ages of 15-64 years and low education level. The main livelihood of the peatland community is from the cultivation of palm oil and rubber plantations. Hence, the largest asset owned by the community is land used for crop cultivation. The majority of the community's livelihood as oil palm farmers, because the largest assets owned by the community in the form of oil palm land so that the largest income derived from oil palm cultivation. Farmer households earn income from crop cultivation on peatland area, that income is used for food and non-food expenditure. This income is used more by the community to meet non-food needs. The community welfare of peatland in Pelalawan District, Riau Province is influenced by asset possession and income. Exploitation of peatland has caused peatland to be damaged and the income of peatland communities is not optimal.

Factors that influencing the welfare are determined by asset possession and household income. The average education of the respondents in Pelalawan district was quite low, most of them did not finish schools and only finished elementary school, in which the farmers' household had high asset due to the high possession of peatland. High education would improve the community's resource quality, so that the farmers were open-minded. The insignificant income toward asset possession due to that income is not allocated to buy more asset or to invest, but the income obtained by the farmers is used to fulfill primary or secondary needs.

Whereas the insignificant peatland possession toward the household income is caused by the low human resource so that the people cannot utilize the peatland maximally or just following the existing trend if the most people plant palm oil, the farmer will also plant palm oil. Agricultural education about peatland utilization can expand the community's knowledge about peatland utilization so that it will result in the income improvement of peatland community. The welfare of peatland community can be improved without having to exploit the peat and with rubber and palm oil cultivation. In addition, welfare can be increased if the peatland community can create non-farm livelihoods, so that the peatland ecosystem can remain sustainable.

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