LAND TENURE DYNAMIC ON THE FOREST AREA OF JOMPI WATERSHEDS, INDONESIA

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Abstract: The main objective of this research is to know the land tenure largeness of the society within the forest area of Jompi watersheds as well as factors influencing land tenure largeness of society in the aforementioned area. A depth interview method was used in this research. Purposive and snowball sampling methods were employed as the technique for research sample determination. Data analysis in this research were descriptive analysis and double natural logarithm regression. The research findings showed that the land tenure largeness of society on the researched area was about 0.08-0.75 ha per person with the average land tenure largeness was 0.34 ha per person. Influencing factors of land tenure largeness of society on the forest area of Jompi watersheds were household income per capita, the number of family members, respondent knowledge about forest functions, land area outside the forest area of Jompi watersheds, transportation expenses to the nearby market, distance from house to forest, and side job of respondent. The relevant policies to stop the deforestation on the forest area of Jompi watersheds, i.e.: (1) law enforcement; (2) elimination of fuel subsidies; (3) the restriction of birth rate through the family planning program; (4) an increase in the delivery of information about the benefits of forests as well as the negative impacts of deforestation through printed and electronic media; (5) job opportunities for the rural societies through labor intensity program; and (6) the development of new settlement far away from the forest area.

Key Words: Jompi Watersheds, Forest Area, Land Tenure Largeness, Deforestation
1 Introduction

The land clearing is very dynamic and changes fast, which alter the condition of forest and reduce land tenure largeness. The data in period of 1996-2006 showed that the forest area has been reduced about 5758.78 ha or 7.26% of total area in Muna Regency. The rate of the forest clearing was about 1151.76 ha/year. There are several activities causing land tenure largeness including illegal logging, illegal land occupation, forest fires, and forest conversion for plantation, settlement and public area.

Deforestation phenomena in Muna Regency existed due to the developing of seasonal farming activities in the forest area, co-occurred illegal occupancy of ex-illegal logging by the society. These phenomena are related to society demand for increasing household income as well as enlarging land tenure. Several factors causing forest conversion into farming area are population growth, unknown ecological functions of forest, economical value of forest, low social income or poverty, high economical value of agricultural commodities, and law enforcement.

[1] stated that the deforestation in Indonesia is highly influenced by rainfall, palm oil price, wood price, rate of interest, exchange rate, existing forest area, percentages of concession land and oil palm plantation, population density, and the distance of the land tenure to the nearby city. As an example, [2] pointed out that deforestation in South Sumatera is affected by the coffee price, rural poverty, and dummy law enforcement. This research employs the aforementioned variables as well as household income on investigating the impact of society land tenure largeness in forest area of Jompi watersheds to the income changes, which has not been applied yet in other studies.

Previous study by [3] Forest Watch Indonesia sampled province level as one variable influencing deforestation. Data of regency is useful for overcoming data shortage at the National level on estimating the cause of deforestation by using time series data [4]. Modelling of this research is different from previous studies [5; 6; 7; 8; 9; 10; 11; 12] because of application of data at the farmer level. This research applies two models of analysis, i.e. OLS-ordinary least squares and heteroscedasticity models which has not been explored in the previous studies on estimating society land tenure largeness and forest deforestation areas.

The Jompi watersheds area has important goods in the society’s life of Muna Regency as the water source, tourist destination, irrigation, charcoals, wood, medicinal plants, handicrafts, as well as buffering zone. Land tenure largeness on forest area in Jompi watershed is about 10143.83 ha that located on various topography levels. Each slope has different land tenure largeness, i.e. the slopes of 0′-8 %, 8-15 %,15-25 % and 25-45 % constitute respectively to 3078.69 ha, 1,702,58 ha, 5,230,56 ha, and 132 ha of land tenure largeness.

The farming-system having various weaknesses includes the topographic levels, cultivated plants (e.g. corn and various tubers like cassava, sweet potatoes and taro), seasons and soil fertility. The main orientation of farmers in plant cultivation is merely for food sources and causing economical marginal communities that are prone to illegal logging practices. As a result, conversion of existing forest by illegal occupants and land farming increases year by year. Therefore, the objective of this research is to apply the necessary data of the farmer level for modelling of land tenure dynamics on the forest area watersheds.
2 Materials and Methods

2.1 Study Site

This research was carried out at Jompi watersheds area of Muna Regency, Southeast Sulawesi, Indonesia. The Jompi watersheds is located in Raha City and has various topographic levels ranging from 0 to 45%. The land tenure largeness on this area varies 3078.69 ha, 1.702,58 ha, 5.230,56 ha, and 132 ha.

2.2 Methods

The population samples of this study were the society on forest area of Jompi watersheds and local government. Snow-ball sampling method was used to determine the sample number, which was 31 persons.

Descriptive analysis method was used to determine the land tenure largeness of society in forest area of Jompi watersheds. This method was expected to give well description of the land uses on this region. Determinant factors influencing the land tenure largeness include farmer’s demography, farmer’s socio-economy, and physical condition of land. The following equation was established for the analysis:

\[ LTLFA = \left( \frac{INCOME}{C}, LTLOFA, LCEFA, TENM, FA, EHH, NFM, KFF, DVHF, DVSFA, DVSI \right) \]  

By taking logarithm, Equation (1) become in form of eq.(2) as follows:

\[ \ln (LTLFA) = \beta_0 + \beta_1 \ln \left( \frac{INCOME}{C} \right) + \beta_2 \ln LTLOFA + \beta_3 \ln LCEFA + \beta_4 \ln TENM + \beta_5 \ln FA + \beta_6 \ln EHH + \beta_7 \ln NFM + \beta_8 \ln KFF + d_1 \ln DVHF + d_2 \ln DVSFA + d_3 \ln DVSI + u \]  

where:

- \( LTLFA \) : Land Tenure Largeness in Forest Area (ha)
- \( INCOME/C \) : Family Income per Capita (IDR/Capita/Year)
- \( LTLOFA \) : Land Tenure Largeness Outside Forest Area (ha)
- \( LCEFA \) : Land Clearing Expenses of Forest Area ( IDR/ha)
- \( TENM \) : Transportation Expenses to the Nearby Market ( IDR/Year)
- \( FA \) : Farmer’s Age (Year)
- \( EHH \) : Education of Household Head (Year)
- \( NFM \) : The Number of Family Members (Person)
- \( KFF \) : Knowledge of Forest Function
- \( DVHF \) : Dummy Variable between House and Forest ( 1 = Distance Between House and Forest ≤ 2 km; 0 = Distance Between House and Forest > 2 km)
- \( DVSFA \) : Dummy Variable for the Slope of Forest Area ( 1 = slope > 15%, 0 = slope 0-5%)
- \( DVSI \) : Dummy Variable for Side Job ( 1 = Having Side Job; 0 = Not Having Side Job)
- \( \beta_0 \) : Intercept
- \( \beta \) and \( d \) : Regression Coefficient of Independent Variable
- \( u \) : Error

Models of OLS and heteroscedasticity were used to prove the equation (2). This OLS model was used when the data showed normal distribution and the violation of classical assumption (multicollinearity, colinnearity, autocorrelation, and heteroscedasticity) on the using of double linear regression model did not happen. However, heteroscedasticity model was used...
when the violation of classical assumption happened.

3 Results and Discussion

3.1 The land tenure largeness

Recently, the land plantation on forest area of Jompi watersheds was largely ex-illegal logging area. The land tenure largeness for plant cultivation (Table 1) vary ranging from 0.08 ha to 0.75 ha, while the average of land tenure largeness each farmer was about 0.34 ha.

Table 1. Land tenure largeness of society on forest area of Jompi watersheds

<table>
<thead>
<tr>
<th>No.</th>
<th>Land Tenure Largeness (ha)</th>
<th>Number of farmers</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0.08-0.30</td>
<td>18</td>
<td>58.06</td>
</tr>
<tr>
<td>2.</td>
<td>0.31-0.53</td>
<td>8</td>
<td>25.81</td>
</tr>
<tr>
<td>3.</td>
<td>0.54-0.75</td>
<td>5</td>
<td>16.13</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>31</td>
<td>100.00</td>
</tr>
</tbody>
</table>

The differences of land tenure largeness were caused by three reasons including (1) motivation for using ex-illegal logging land; (2) the land tenure largeness; and (3) people agreement. The second reason of the people was induced the higher of land tenure largeness than another reasons. The people cleared the land during the period from 2003 to 2009 had larger land (0.5-0.75 ha) than afterwards (0.08-0.4 ha) since 2010. There was small land that remains uncontrolled by local communities. However, the people in groups who cleared the land had similar land tenure largeness because of the existence of the agreement in group of the society themselves.

3.2 Determinant Factors of Land Tenure largeness

Testing result with the OLS model towards the factors that influenced the society’s land tenure largeness on forest area of Jompi watersheds showed a phenomenon of homoscedasticity assumption violation. However, there was applicability of multicolinnearity and autocorrelation. Correlation of inter independent variables and R² auxiliary of regression of inter independent variables are both less than 0.80. This means that there was applicable multicolinnearity. The values of Durbin-Watson Test (DW-test) were higher than dU values on statistics d for autocorrelation test that was applicable autocorrelation.

Testing of non heteroscedasticity assumption towards equation (1) was done by using regression of Varlin model (variance is a linear function of exogenous variable). Result of the model regression analysis showed that the heteroscedasticity was shown by the existence of significant independent variable statistically. The testing result consistently showed that there was unaplicability of heteroscedaticity assumption violation, so that the using of OLS model was inefficient.

Based on the explanations above, so the model of heteroscedatisity was used to explain the effect of independent variable towards the society’s land tenure largeness in forest area of Jompi watersheds. This was shown by the value of significant Likelihood Ratio (LR) on the level of mistake 5%, statistically. The value of determination coefficient (R²) was 0.6635 which means...
about 66.35 % of variation of the society’s land tenure largeness in forest area of Jompi watershed influenced by the variation of independent variable while there about 33.65 % only was affected by variable variation.

Table 2. Analysis of the Factors Influencing the Society’s Land Tenure Largeness on Forest Area of Jompi Watersheds

<table>
<thead>
<tr>
<th>No</th>
<th>Variation Resource</th>
<th>OLS</th>
<th>Heteroscedasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Household Income per Capita ($INCOME/C$)</td>
<td>0.188**</td>
<td>0.194***</td>
</tr>
<tr>
<td>2.</td>
<td>Square of Household Income per Capita ($INCOME/C^2$)</td>
<td>0.376***</td>
<td>0.547***</td>
</tr>
<tr>
<td>3.</td>
<td>Land Tenure outside Forest Area ($LTOFA$)</td>
<td>-0.146ns</td>
<td>-0.413***</td>
</tr>
<tr>
<td>4.</td>
<td>Opening Expense of Forest Area ($Oefa$)</td>
<td>0.127ns</td>
<td>-0.013ns</td>
</tr>
<tr>
<td>5.</td>
<td>Transportation Expense to the Nearby Market ($TENM$)</td>
<td>0.325*</td>
<td>-0.365***</td>
</tr>
<tr>
<td>6.</td>
<td>Farmer’s Age ($FA$)</td>
<td>0.249ns</td>
<td>0.341ns</td>
</tr>
<tr>
<td>7.</td>
<td>Education of Household Head ($EHH$)</td>
<td>-0.083ns</td>
<td>-0.114ns</td>
</tr>
<tr>
<td>8.</td>
<td>Number of Family Member ($NFM$)</td>
<td>0.186ns</td>
<td>0.425***</td>
</tr>
<tr>
<td>9.</td>
<td>Knowledge of Forest Function ($KFF$)</td>
<td>0.142ns</td>
<td>-0.264**</td>
</tr>
<tr>
<td>10.</td>
<td>Dummy Distance of House to Forest ($JDHF$)</td>
<td>0.253ns</td>
<td>-0.262**</td>
</tr>
<tr>
<td>11.</td>
<td>Dummy Slope of Forest Area ($SFA$)</td>
<td>-0.065ns</td>
<td>-0.192ns</td>
</tr>
<tr>
<td>12.</td>
<td>Dummy Variable Side Job ($SJ$)</td>
<td>-0.099ns</td>
<td>-0.253*</td>
</tr>
<tr>
<td>13.</td>
<td>Costanta</td>
<td>3.368***</td>
<td>5.235***</td>
</tr>
</tbody>
</table>

$R^2$ = 0.6521

$F_{stat} = 23.188$  $LR = 88.328^{**}$

Source: primary data analysis

where: * = significant at $\alpha = 10\%$; ** = significant at $\alpha = 5\%$; *** = significant at $\alpha = 1\%$; ns = insignificant at $\alpha = 10\%

Household income per capita had positive and significant impact towards the society’s land tenure largeness in forest area of Jompi watersheds with error rate, $\alpha =1\%$. This shows that an increasing on household income could increase the society’s land tenure largeness in forest area of Jompi watersheds. In addition, a higher household income encouraged the society to allocate their income on land clearing activities to increase their cultivation area, primarily for corn plants.

Cultivation area largeness outside the forest had negative but significant relationships towards the society’s land tenure in forest area of Jompi watersheds with error rate, $\alpha =1\%$. An excessive farmer’s land largeness outside the forest contributes to the reduction of society’s land largeness within forest area. This is understandable because the increasing of land largeness outside the forest area can trigger the society to intensively cultivate the aforementioned area. Besides, the limited number of labor resources in the household caused the whole family members allocated for cultivating the land outside the forest area. This condition would discourage the farmers in expanding their land tenure by converting forest area into farming land.

Transportation expenses to the nearby market had negative but significant impact towards farmer’s land largeness in the forest area of Jompi watersheds, with error rate, $\alpha =1\%$. An increasing transportation expenses to the nearby market caused reduction of land in forest area. The transportation expenses from the farming land to the nearby market...
was one of the society considerations in converting the forest area into the farming land. A long distance between land and forest area caused the increasing of transportation expenses to the nearby market. The elimination of the fuel subsidy policy on the type of option premium was the right policy for farmers to halt deforestation.

The number of family member had positive and significant impacts towards the land largeness of society in forest area of Jompi watersheds with error rate, $\alpha = 1\%$. This number showed that the increasing of the family members also accounted for the increasing of land tenure largeness in forest area. The number of family members is one of the determinant factors of the society decision in expanding the land largeness. The increasing number of family members led to the increasing of the need on farming-land and will be passed down to the descendants. If the land outside the forest area was limited, then the forest area became the only alternative to fulfill the needs of the farming-land, and later to be inherited to the next family members. Therefore, the restriction of birth rate through the family planning program must be intensified particularly in rural areas so that land needs can be reduced as well as deforestation.

The knowledge of forest functions had negative but significant influence towards the society’s land tenure in forest area of Jompi watersheds, with error rate $\alpha = 1\%$. Improved knowledge about the forest functions caused reduction of land largeness in forest areas. In relation to the forest functions, the society knows that forest has social, economic, and environmental functions. The knowledge of forest functions was obtained from various sources, such as forestry guide, television media, newspaper, and internet. Increased knowledge of the forests functions could inspire the society to reduce the conversion activities from forest area into farming-land. For that reason, the government must increase the spreading of information concerning the benefits of forest as well as negative impact of forest damage to the farmers through printed and electronic media.

The distance from house to forest had negative but significant impact towards the society’s land tenure in forest area of Jompi watersheds, with error rate, $\alpha=1\%$. The increasing distance of the society’s house to forest caused the reduction of the land tenure largeness of the society in forest area. The far distance from house to forest led the society to reduce the forest area converted into the farming-land. The large distance from house to forest caused the society to spend more in order to convert the forest into the farming land such as transportation expenses. Therefore, the developing of new settlement must be located far away from the forest area.

Another job had negative but significant influence towards the society’s land tenure in forest area of Jompi watersheds, with error rate $\alpha=1\%$. The society having another job owned a relatively small land tenure largeness in forest area as compared to the society without side job. Another job gave incentives for the society not to expand the farming land that they owned. However, the society without side job tended to expand the land by converting the forest into farming-land for improving household income. However, the society having side job tended not to convert the forest area into the farming land because they have had income source outside the farming. Thus, the government should provide jobs for society in rural areas by allocating budget for the job requiring many labors (labor intensive), such as the making of farm roads and villages.

Deforestation activities done by the society in forest area of Jompi watersheds caused the environmental damage and forestry conflict involving the government and society that occupied the land in forest area of Jompi watersheds. The environmental
damage could be overcome by law enforcement for the deforestation actor as well as implementation of environmental conservation program (e.g. social forestry affairs and rehabilitation movement on forest and land) involving the society having land in the forest areas. With regard to the forest conflict, it was expected that the local government of Muna Regency to immediately act decisively and wisely to resolve the conflict. One of the alternatives that could be done was the agreement to borrow and use the land. By this system, the government could control over the society in order not to expand the farming land in forest area. Besides, the society had the responsibility to convert the forest area used as the farming-land.

4 CONCLUSIONS

The society’s land tenure largeness in forest area of Jompi watersheds was about 0.08-0.75 ha each person with the average of land area was 0.34 ha each person. Factors influencing the society’s land tenure largeness in forest area were the household income per capita, family members, knowledge of forest function, the land tenure largeness of society, transportation expenses to the nearby market, distance from house to the forest, and side job. The effort of reducing the impact of environmental damage resulting from forest clearing in Jompi watersheds must be implemented into the environmental conservation program (e.g. social forestry affairs and rehabilitation movement on land and forest) facilitated by the government. Relevant policies to stop deforestation/forest clearing of Jompi watersheds comprise: (1) law enforcement; (2) elimination of fuel subsidies; (3) the restriction of birth rate through the family planning program; (4) an increase in the delivery of information regarding forest benefits as well as negative impacts of deforestation through printed and electronic media; (5) job opportunities for rural societies through labor intensity program; and (6) development of the new settlement must be located far away from the forest area.

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