



The Analyses of Household Income and Dependence on Forest Resources

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Abstract

The objectives of this study are; (1) to identify the probability of paid work options, (2) to analyze variables affecting the income of the farmers, and (3) to analyze and measure variables that affect the farmers dependence over forest resources. This result indicates that the physical capacity variables affecting the decision for working in the forest. The other influencing reasons in the decision making process to work in the forest is the age of the head of the family, working time which is spent in the forest, the width of the areas, and values of the assets. Generally, the dependence of the farmers over the forest is spatially influenced by the income from non-forest work, the land-owned width, household's head education, number of dependents, and access to the forest, and access to the forest. However, the variable of asset values do not essentially play important role. A new finding is the occurrence of the income inequality. It is driven by the inequality of the width of the land as a result of sale and lease of the right to the land in the forest, the conflicts happens through the years, and the disobedience of the farmers over the working period.

Key words : Household Income, Dependence, Choice

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INTRODUCTION

Every person or group of persons such as the household always has to choose how to allocate time as the household sources for having various activities. The time can be used for various activities such as the activities that can yield money and the activities which are not for earning money such as gardening, household activities and etc. (William A Mc Eachren, 2001; Rania Antonopoulos, 2008; Dribe Martin, 2009).

The importance of forests for the community, especially rural communities around the forest can not be separated from various activities that people can do in the forest. Forest provides natural resources which are beneficial for the society. They can do many things that have economic value, for example collecting firewood, grass, honey and plants for making medicine.

The process of small-scale forest products (industry) which is outside the agricultural sector also becomes an important source for earning a living. Poverty has made the villagers live around the forest really exploit the forest. North Kedu Forest is a largest production forest in Central Java Provinces. Peoples who lives around there tend to rely on the forest activity for their livelihood. However, the dependency towards forest make some damaged and causing the environmental problems.

People's dependence to the forest resources shows that forest resources become sources for earning a living. CS Shylajan and G Mithili (2003) state that there are three main factors of people's dependence to the forest; they are socioeconomic factors, cultural and institutional mechanisms of

forest management. The dependence occurs in many variations, such as between households both in rural communities and among villagers live around the forest. Dependence on forest resources are discussed by Shilajan and Mithili (2003). They explain that society dependence on the forest can be seen from what they have done to forest resources. Community empowerment program in and around the forest is conducted for preventing forest degradation and deforestation. Moreover, by having the program, the society will also have better lives.

The program relates to the forest policies which is known as community empowerment program is classified into: providing opportunities to cultivate forest land for agriculture and providing employment for various jobs in the forest such as plant maintenance, seeding, harvesting and etc providing trainings for strengthening the communities in managing the forest, just like skills training, giving loans, involving forest communities in forest management, and providing an easy access to the public in managing the forest resources. There are two important aspects of this study; they relate to: forest and the allocation of time which can be seen from the labor supply for an activity. As a matter of fact there is no connection or interaction between forests and forest communities (Winters, 2009).

The general objective of this study is to determine the condition of empirical villagers around the forest, to explore the forest villagers in choosing their work which is in the forest, forests and farm income, and forest resource dependence on forest resources and to understand the characteristics of forest rural farmers in exploring the forest resources.

Table 1. The Coverage of North Kedu Forest

Forest	Large (Ha)	Damaged (Ha)	Percentage
Ambarawa	6.014,52	76,70	1,27
Magelang	3.705,56	15,60	0,42
Temanggung	5.430,46	21,50	0,39
Wonosobo	9.928,46	78,70	0,79
Candiroto	11.274,39	119,20	1,05

Source : KPH North Kedu 2017

Work forest income includes wages as workers working on various jobs in the forest of Perhutani, employment income from farm forests. As well as employment income by utilizing sources resources. Employment income is any non-forest activity resource forest peasant households that generate revenue. Both employment income from forest and non-work income - forests are influenced by internal factors include the forest farm household characteristics (1) socio-demographic include: a. Sex, b. Age, c. Education; d. And skills. Then (2) include socioeconomic aspects: a. Land ownership; b. Other household assets. External factors include (1) economic (wage), (2) demographics (location of residence), (3) environment (access to forest resources).

RESEARCH METHOD

The population of the study is people pesanggem (forest village farmers) in the northern Kedu KPH totaling 2500 people spread across five (5) Resort Pemangkuan Forest (RPH) in the territory of the Unitary Pemangkuan Forest (BKPH) Candiroto. This study uses a sampling study approach means that the data collected from some population elements (samples).

Proportional multistages random area are used determine the sample. Pesanggem

samples are taken from the five sub-populations residing in areas pesanggem work Tlogopucang RPH, Jumo, Candiroto, Petung and RPH Kenjuran which are all working areas of BKPH Candiroto. Having determined the location BKPH Candiroto , then the next step is to determine the observation area. In this case, all RPH were selected. Furthermore, each village was randomly selected at RPH. While farmers were randomly selected in each RPH. Decision income households choose to work in the woods = f (reward, R; occupational risk, RK; household resources, physical capacity, KF) were estimated by the regression equation logit model. Logit model (logistic regression) regression model is used to analyze the dependent variable with a probability between 0 and 1. The interpretation or estimation of the logit model indicate that the likelihood of an event that is indicated by the percentage of probability has value of 0% to 100%. These equations are presented in the logit model.

$$L_i = \ln \left(\frac{P_i}{1-P_i} \right) = \alpha_0 + \alpha_1 R + \alpha_2 RK + \alpha_3 KF + e_i \dots (1)$$

P is the probability of a person to choose the value of the dependent variable 1. The formula for calculating P can be calculated by the formula below:

$$L_i = \ln \left(\frac{P_i}{1-P_i} \right) = \alpha_0 + \alpha_1 X_1 + e_i \dots (2)$$

Household income estimation model of forest farmers uses semi-logarithmic model of Ordinary Least Square method (OLS). Basic use of these equations transform into semi-logarithmic or semi-log the independent variable logarithmic form remains. This was done because of the semi-logarithmic models can produce the best estimate of the model, as well as having a high level of accuracy. Semi-log model shows that changes in absolute X Y resulting in the change of proportion or percentage of the constant (Gujarati, 2003). Shape functions the income of household is: Household Income = f (age, education, number of employees, , non-forest working time, job type, area of land cultivated, social capital). The formula of the model used is a semi-logarithmic (semi-log) follows :

$$\ln PRT = \beta_0 + \beta_1 U + \beta_2 P + \beta_3 JAD + \beta_4 CWH + \beta_5 C \\ WNH + \beta_6 LLO + \beta_7 NA + \beta_8 MS \dots \dots \dots (3)$$

Dependence Against Forest Resources = f (non-forest income households, household assets, location of residence, education, number of adult household members are not working, the number of dependent household members, access to forest resources).

$$KSH = \gamma_0 + \gamma_1 PNH \gamma_2 NA + + + \gamma_4 \gamma_3 LM \\ \gamma_5 JT + P + + AH \gamma_6 \gamma_7 JR \dots \dots \dots (4)$$

RESULTS AND DISCUSSION

BKPH Candirototo - North Kedu KPH has a forest area of 11,274.39 hectares. Forest condition today can be divided into three types: (1) forest protection / conservation / natural jungle, (2) production forest and (3) non-forest production and open forest conservation. Protected forests or forest conservation or natural jungle forest does not function for production or conservation but

rather to protect the environment. Forest type is not explored. Plants that grow in this land is a plant that grows wild, it grows by itself and left alone. Natural rain forests are forest areas which are not cultivated and they grow by their own meaning that the function of forest are forest conservation.

Land dispute demands quick resolution otherwise it will create the potential conflict because of its implications and conditions can cause adverse excesses and emotional actions which could lead to anarchist act. Conflict definitely harm either directly or indirectly, not only for the parties involved in the conflict, but other people often have to bear the consequences. The root of the problem of land disputes is "claim rights" of the disputed land or land where each party claiming they own the rights to the land or the disputed land. In an effort to increase the income of rural communities around the forest, Perhutani allow some land uncultivated forest communities in agricultural intercropping. Forest area under cultivation forest village communities is illustrated in the following table 2.

Based on Table 2, forest land in the region BKPH Candirototo is most widely cultivated forest villagers in the area RPH Candirototo, the extent of 24% of the forest land in the area to be treated by the villagers around the forest. The number of cultivators of forest land in RPH Candirototo is the widest among other RPH. This seems to be caused by the differences in the population. In this area of research at RPH Candirototo population reached 47,980 inhabitants (BKPH Candirototo, 2012). The previous studies showed that generally society income especially forest village farmers income is multiple. It means that income does not only come from one source, but more than one source. It is similar to household income of farmers in *Candirototo* forest village.

Table 2. Proportion of Forest Area The area of land that Ordinary People Prepared

No	RPH	Forest Width	Cultivated area (Ha)	% cultivated area	workers
1	Tlogopucang	1.592,32	120,2	7.54	405
2	Jumo	2.395,54	162.4	6.77	645
3	Canditoro	2.706,46	1.578,0	58.3	975
4	Petung	2.225,04	108,2	4.86	432
5	Kenjuran	2.355,03	10,6	0.45	43
Total		11.274,39	1.979.4	17.55	2.500

Source : BKPH Candiroto 2017

The probability of household decision to choose income is affected significantly by the constant and variables of physical capacity owned by the farmers. It means that the physical capacity such as the amount of land owned, the agricultural tools owned, and others give negative influence toward the household decision. It means that when a farmer has high physical capacity, it will lower his decision to choose household income from the forest.

Whereas, reward and risk of work does not affect the probability of household decisions. It may show that the farmers do not consider the reward or even forest village farmers do not get reward at all. The risk instead associated with non-forest work, for example, farmers whose spacious farming area but failing to harvest.

The sources of their income can be divided into two groups: (1) source of income from forests activities and (2) source of income from non-forest activities. Source of income from forest activities can be divided into two groups. It can be seen from the table below.

The average household income of village forest farmers is Rp. 8.887.252. The average income of activities in the forest is Rp.5.938.433.33 per year. It is 66.81% of average household income of village forest farmers. It consists of the average of forest farmers income, Rp. 5.480.975 /year and the average of forest labor income, Rp. 458.458 .33/year. The percentage of the average income of farming forest reaches 8.36% of average income working in the forest.

Table 3. Income Based on the Activities in the Forest and the Number of Forest Village Farmers in BKPH Candiroto (Rupiah)

No	Villages	Income sources		Amount
		Forest farmers	Forest labours	
1	Tlogopucang	20.318.000	9.040.000	29.358.000
2	Jumo	499.755.000	10.544.500	510.299.500
3	Candiroto	94.954.000	19.576.500	114.530.500
4	Petung	34.670.000	14.654.000	49.324.000
5	Kenjuran	9.100.000	1.200.000	10.300.000
Amount		658.797.000	55.015.000	713.812.000

Source: analyzed primary data

Based on t-test statistics, it is found that H_0 which states that there is no influence of age, spending work time in the forest, the breadth of farming area, and asset value is rejected. It is because the t-value on each variable above is higher than t-table. It means that age, spending work time in the forest, the breadth of cultivated area and asset value influence significantly toward the household income of forest village farmer. Table of parameters estimation for age, spending time in the forest, the breadth of farming area, and asset value variables are appropriate to the model. It means that the variables above give direct (positive) influence toward household income of forest village farmers. If those variables increase, so household income also increases, *vice versa*.

Based on t-test statistics, it is also found that H_0 which states that there is no influence of education, the number of adult member household, non-forest spending time, and social capital is accepted. Therefore, Based on the t-test statistics, it is known that H_0 which states that there is no influence of non-forest household income, area of land owned, education level of household head, number of dependents and access to the forest resource utilization is rejected because the t-value on each variable above is higher than t- table. It means that those variables influence the dependency level toward forest resources. From five (5) variables which partially have significant influence, four of them are similar to or same with the mark on the model, except the access to the forest resource (AH). The access to the forest resource (AH) is not appropriate to the model because even the data marked positive but from empirical data, it is negative.

Farming land in forest areas is the most important asset for the economic life of forest village society. The forest village society has high dependency on forest resource. It is in line with study of Winters et al. (2009) which states that the land is one important asset in supporting economic activities due to the limitations of land. As we know that many forest farmers in RPH Candiroto do not have private land. Eventhough, they cultivate forest land because forest becomes the source of their income.

Regression estimates of model 1 indicate that physical capacity or land ownership is an important variable that affects the farmers' to work in and generate income from the forest. This means that the more limited physical capacity ownership the stronger tendency for people to work in the forest. This is understandable as physical capacity is a source of income.

The decision to work in forest farming reflects the expectations of the community to get income from the activity work in the forest. This condition is supported by research that income from work in forest contributes approximately 66.81% of the total income of forest farmers. Therefore, the decision to choose to work in the forest is a rational decision. Furthermore, estimation results in the second equation model shows that the variables that determine household income are time of work and land width for farming business. These two variables have positive coefficients. This statistically supports the association between the first and the second model. The first model that farmers tend to work in the forest, because they have enough physical capacity. Moreover, the second model shows that time for working in the forest farming and the land width have positive impact on forest farmers household income.

This finding is consistent with Balcels (2009), Kraft (2009), that they more likely to work in the forest farming than to work in non-forest farming areas.

The source of income of forest village farmers consists of activity income: (1) Source of forest income and (2) income from non-forest. This reflects that the income source of income for rural communities is not just from one source. (Multi source of income). This finding is in line with research findings from Edna Angeles - Reyes in the Philippines (1997). The existence of multiple income sources. Indicates that rural communities cannot rely on a single source because they cannot meet the cost of living of a household. Furthermore, based on research findings, the contribution of income from the forest reached 66.81% of households. This shows that the biggest contribution to the income of forest village farmer households is from activity income in the forest both from farming and from laborers in the forest. Because the majority of farmers' choices in forest villages to choose to work income in the forest is a reasonable decision and can be understood economically. Both regression coefficients have negative sign meaning that farmers with higher incomes and wider land ownership tend to be less dependence on forests and vice versa. There is a key of association among the three models. The linkage among first, second and third models is the ownership of farm land as a source of forest farmer income. Therefore, to ensure the sustainability and prosperity of the forestry community Perhutani needs to provide forest-farm land. Forest village farmers relatively depend on forest resources.

Some of the causes of this condition : poverty, education, employment opportunities outside the forest are limited and the strong contribution of forest resources to household income. The majority of forest village farmers in this region still live below the poverty line. For this reason, it is only natural that they try to maximize existing environmental resources including forest resources.

Another factor that causes dependence on forest resources is low education. The majority of the education of forest village farmers in this region is elementary school. Education provides at least three things: (1) Knowledge, (2) Values and (3) skills. This provision can be used to increase the capacity of human resources to create business opportunities. Education will increase the opportunities of households to increase income from the non-agricultural sector and their ability to start various activities outside agriculture.

However, the limited employment opportunities outside the forest also contribute towards forest dependency. The limited employment opportunities can be seen from the small proportion of forest village farmer household income from forest. Dependence on forest resources is also caused by the strong contribution or role of forests to the lives of people around the forest.

The opportunity to cultivate forested land areas that government gave to village communities around the forest is one form of empowerment program for rural communities around the forest to support their welfare. The land area given is an average of 0.25 hectares per farmer's household. However, as explained in the results of the study, it was found that there were farmers who owned arable land in the forest area

of more than 0.25 hectares and some even had 1.50 hectares. This ownership is presumed as a result of the practice of buying and selling rights between the farmers.

This fact is clearly not in accordance with the objectives of the village community empowerment program around the forest because it will have implications for the potential for inequality or inequality in income distribution. Therefore, government should monitor and evaluate this matter. Steps that can be taken include (1) asserting that the agreement on the right to work can not be transferred, (2) giving strict sanctions against violations of the transfer of rights, (3) field officers (forest foreman) conducting coaching with the Forest Village Community Institute to prevent the tendency to transfer rights.

Furthermore, as explained in the previous chapter, the purpose of community empowerment in addition to supporting the welfare of rural communities around the forest is also intended to create forest security from various disturbances. In this case, government is hoping for a commitment from the village community around the forest to participate in maintaining forest security. The reality in the commitment field is not optimal. This case is same with Sultana (1994) that states the low commitment from the farmer society in developing contry is weak.

New farmers are limited to giving attention to the security of the forest on the land around their farms, not yet touching other forest areas. In other words, "expectations or expectations" of government as a goal of community empowerment programs to its partners, namely village communities around the forest have not or

have not achieved. Providing opportunities to cultivate land in forest areas is a definite decision or policy irrespective of expected goals or benefits (Becker, 1965) and rational choice are choices that are believed to provide support for achieving goals Mukul (2016) and Tilahun (2015).

Therefore it is necessary to develop a new strategy so that the community's commitment to grow and develop for forest security and environmental sustainability. The commitment can caused by various possibilities such as: (1) unclear operational guidelines or guidelines for community involvement in maintaining forest security, (2) still weak Forest Village Community Institutions as a forum for forest village farmers to manage their members to develop the commitment, (3) lack communication between Perhutani officials and village communities around the forest with all of its equipment.

According to the results of the regression estimation of the first model it is known that the variable physical capacity which is nothing but a land ownership asset is a variable that influences the decision to work income choices in the forest. This means that if ownership of physical capacity is increasingly limited, the stronger the tendency of people to choose to work in the forest. This is understandable considering that physical capacity source of community income.

Based on the results of the study it was stated that household decisions to choose work income were significantly affected by the constants and physical capacity that owned by forest farmers. However, the effect is negative. When farmers have high physical capacity, the decisions of households to work in the forest will decrease. It is in line with L'Roe (2014). Households will tend to choose not to work in the forest if they have large physical capacity. This implies that forest village people tend to not

choose to work in the forest if they have large physical capacity. For those who work in the forest, it is actually less profitable when compared to other economic activities. But because that is all they can do, this is what they keep trying to do. They are accessing forest resources.

The decision on income employment choices in the forest reflects the expectation of the community to get income from the work activities in the forest. This condition is proven by the results of research that show that income from working in the forest contributes 66.81% of the total income of forest village farmers.

Therefore, the decision to choose to work income in the forest is a rational decision. Furthermore, the estimation results in the second equation model show that the variables that determine household income include outpouring of work time in the forest and the area of forest farming land and these two variables have a positive coefficient value. This strengthens the link between the first and second models. Where in the first model it is known that people tend to choose to work in the forest due to ownership of physical capacity and in the second model the outpouring of work time in the forest and the area of farmland in the forest have a positive effect on the income of forest village farmers. Bowler (2012) and KM (2013). The findings of this study are consistent with the first model. Where the outpouring of working time in the forest and the area of cultivated forest land affect forest village household income and both reflect higher employment choices in the forest than non-forest. Work orientation in the forest can lead to dependence on forest resources. Based on empirical findings show

that dependence on forest resources is relatively high. The estimation results in the third equation show that the variable area of own land and non-forest income have a significant effect on the dependence on forest resources. The coefficient value of these two variables is negative. The meaning is that the higher the non-forest income and the wider the land owned by itself, the lower the dependence on the forest and vice versa. Regarding the three models, the key to the relationship between the first, second and third models is the ownership of farming land as a source of income for forest village farmers. Therefore, to ensure forest sustainability and community welfare, government needs to provide forest farming land.

Furthermore, as explained in the previous explanation, the purpose of community empowerment in addition to supporting the welfare of rural communities around the forest is also intended to create forest security from various disturbances. In this case, Government is need a commitment from the village community around the forest to participate in maintaining forest security. The reality in the commitment field is not optimal. Government purposes of community empowerment programs to its partners, namely village communities around the forest have not or have not been achieved. Providing opportunities to cultivate land in forest areas is a definite decision or policy irrespective of expected benefit and rational choice are choices that are believed to provide support for achieving goals. Therefore, it is necessary for government to develop a new strategy so that the community's commitment to grow and develop for forest security and environmental sustainability. The low commitment can caused by various possibilities : unclear operational guidelines or guidelines for

community involvement in maintaining forest security, (2) still weak Forest Village Community Institutions as a forum for forest village farmers to manage their members to develop the commitment, (3) lack of communication between Perhutani officials and village communities around the forest with all of its equipment.

Furthermore, there are linkages to the research model, namely the model (1) choice, (2) household income and (3) dependence on forest resources. The choice decision to work in the forest aims to earn income. Based on empirical findings it is known that income from working in the forest is very significant contribution to forest village farmer households. Therefore, it is clear the connection between the two models. Furthermore, based on the hypothesis test it is known that the outpouring of working time in the forest, the area of land cultivated, namely farming land has a significant influence on household income. Thus it is clear that working income in the forest creates more time-consuming implications and has a significant impact on income.

The large amount of time spent working in the forest and income that can contribute significantly has led to the dependence of forest village farmers on forest resources. Dependence on forest resources is influenced by the variable area of own land and non-forest income. The coefficient value of these two variables is negative. The meaning is that the higher the non-forest income and the wider the land owned by itself, the lower the dependence on the forest and vice versa. Regarding the three models, the key to the relationship between the first, second and third models is the ownership of farming land as a source of income for forest

village farmers. Therefore, to ensure forest sustainability and forest security and the welfare of the community, government needs to provide forest farming land for rural communities around the forest.

CONCLUSION

Household income sources of forest farmers located in North Kedu KPH are as follow: (1) income working in the forest; and (2) income from working outside the forest. The biggest contribution of forest farm household income in North Kedu KPH is still income from working in the forest (66.81%). Therefore, the choice of working in the forest farm is a rational decision since forest provides bigger contribution on their household income variables influencing income of farmers located in KPH Kedu Utara are as follows: (1) The Age of household head; (2) Time for working in the forest farming; (3) The width of land use for farming; and (4) Assets value. Statistical analysis shows that farmers in all RPH have high dependence on forest ranging from 85% to 90%. The study also shows that there is tendency of farmers not to obey agreement with Perhutani. The agreement mainly relates to the period of using forest land for farming activities. Based on regulation, farmers are allowed to use the forest land for two years only. In fact, farmers use the land for more than two years.

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