Analysis of Factors Affecting the Poverty Level of Farmers Post-Tsunami in Aceh

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Abstract

Purpose – The main objective of this study was to analyze the factors that affect the poverty level of the farming community after the tsunami that occurred in Aceh. After the conflict and tsunami, Aceh has faced severe poverty. However, the long years of conflict, political struggle, economic transformation, and natural disasters have caused Aceh to become one of the poorest provinces in Indonesia today.

Design/Methodology/Approach – The research was conducted in five districts in Aceh province: Aceh Barat, Aceh Besar, Pidie Jaya, Bireuen, and Aceh Utara. The total sample used in this study amounted to 280 farmers who were taken by stratified random sampling method. This research used primary data and secondary data. The analysis model used a logistic regression model with maximum likelihood.

Findings – The results showed that the poverty level of farmers is influenced by seven factors: education, experience, income, the number of family dependents, planting area, side job, and work motivation. The other factors such as age, farming tools, land ownership, and position in the community have no significant effect on the poverty level of the farmers.

Research Limitations/Implications – Implications of the results of this study show that financial assets are the most important factor in influencing each strategy implemented by farmers. The main obstacles faced by them are generally difficult to get credit because agricultural produce is uncertain.

Keywords Aceh, community, farmers, Post-tsunami, Poverty

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1. Introduction

After the post-conflict and the tsunami, Aceh have faced severe poverty. The events that have taken place in Aceh recently are the last in a long and turbulent history. However, the long years of armed and political struggle and with constant changes in economic conditions and natural disasters have made Aceh one of the poorest provinces in Indonesia at that time. This condition is more difficult with less favorable natural conditions and the threat of various disease outbreaks and natural disasters that come at any time. In addition, the impact of conflict and tsunami on economic infrastructure

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and social facilities is also quite severe. More than half of wharves or seaports, fish and shrimp ponds, rice millers, agricultural land, rice fields are damaged, along with loss of livestock (UNDP, 2010).

There is also a problem of poverty related to vulnerability, where the poverty of farmers is a very complex phenomenon and difficult to explain with just one factor. Vulnerability means high current opportunities for future shortfalls, while poverty means deficiencies in the present (Christiansen and Richard, 2000). The lack of access and loss of property and life is a serious problem faced by the poor in rural areas. The factors of vulnerability and ownership of assets by communities or individuals greatly affect the results of their lives; either they may live their lives better or they may fall into poverty (Mukherjee *et al.*, 2002). Poverty is a systemic process due to the vulnerability that occurs in many factors (Sulistiyani, 2004).

Based on the various definitions and research results, there are several factors that cause poverty of farming communities in Aceh. Poverty can also cause vulnerability both economically and socially. The purpose of this study is to analyze the factors that affect the level of poverty in the farmering community after the tsunami in Aceh.

2. Methodology

The population of this research is the farmers from the post-tsunami Aceh province which covers five districts: Aceh Barat, Aceh Besar, Pidie Jaya, Bireuen, and Aceh Utara. Elections in five areas were doing by purposive. The reason for sampling in the area is because the district has an impact of the tsunami and the worst conflicts. This study used a stratified random sampling method in which is a sample taken prior to isolating the basic elements in the population into several sub-populations and are not suppressed based on the information available. After dividing the population into strata, the researchers will pull a random sample from each strata using simple random sampling or systematic sampling (Neuman, 1997). Based on the available sampling frame, the sample of 280 farmers was used for this study.

Logic regression function is the equation where the dependent variable is qualitative and can have two classes (binary) or more than two classes or multinomial (Widarjono, 2010). That logic model is often used in classification data (Gujarati, 2003):

$$L_i = Ln\left(\frac{pi}{1-pi}\right) = Z_i \tag{1}$$

where $Z_i = \Sigma\beta_1 + \beta_2 X_i$ and $Pi/(1-Pi)$ is called the likelihood ratio (odds ratio) of the category with a value of 1. Then, by applying the natural logarithm of the odds ratio will result in the following equation:

$$L_i = Ln\left(\frac{pi}{1-pi}\right) = Z_i = \beta_1 + \beta_2 X_2 + \ldots + \beta_i X_i \tag{2}$$

The logistic regression model for this study can be written as follows:

$$\begin{aligned} L_i &= Ln\left(\frac{pi}{1-pi}\right) = Zim \\ &= \beta_1 + \beta_2 X_1 + \beta_3 X_2 + \beta_4 X_3 + \beta_5 X_4 + \beta_6 X_5 + \beta_7 X_6 + \beta_8 X_7 + \beta_9 X_8 + \\ &\quad \beta_{10} X_9 + \beta_{11} X_{10} + \beta_{12} X_{11+e}\ \beta_1 > 0,\ \beta_2 < 0,\ \beta_3 > 0,\ \beta_4 > 0, \beta_5 < 0, \beta_6 > 0, \\ &\quad \beta_7 > 0, \beta_8 > 0, \beta_9 > 0,\ \beta_{10} > 0, \beta_{11} > 0, \beta_{12} > 0 \end{aligned} \tag{3}$$

Likelihood is the probability that gives an observation value for the dependent variable estimated from the observed value of the independent variable. Likelihood differs from 0 to 1. Log likelihood (LL) is log and is different from 0 to negative infinity. LL is calculated through iteration using the maximum probability estimate (maximum likelihood). The likelihood log is an alternative to two alternative tests of the logistic model, deviance chi square and it is used more extensively in the two chi-square test models shown as follows:

$$x^2 = -2LL_R - (-LL_F) = -2\ln\left(\frac{Likelihood\,R}{Likelihood\,F}\right) \quad (4)$$

The test model χ^2 is also called a likelihood log exam or a probability test based on $-2LL$ (deviance). It is an alternative to Wald statistics. If this likelihood log statistic test shows a small p value (≤ 0.05) for a large model, it is necessary to avoid the opposite analysis results based on Wald statistics and model assumptions are good and appropriate. Measurements of R^2 Cox's and Snell play a role as a determinant of coefficients in measuring good model density, such as the role of R^2 in multiple regressions (Hair *et al.,* 2006).

3. Results and discussion

The results of this study found that the average age of respondents is 38 years and is a very productive age for farming. The age factor has important implications for the process of advancing the agricultural sector, by showing the aging group rather difficult to accept change and prefer to run activities traditionally (Nor Diana, 2011). The education level is an indicator of socioeconomic status. The study found that most respondents are categorized as those with low education level, who receive school education for seven years. While the farmers who have relatively long experience that is for 10 years, and this shows that they have experienced in the agricultural sector. The number of dependents also shows that the number of farmers' dependents is relatively high in Aceh as many as four people (Table 1).

The analysis results for the logistic regression model to estimate the determinants of poverty of farmer were found to be very satisfactory. Omnibus test of model coefficients indicate that the test χ^2 statistic for testing the null hypothesis in which all relationships and expectations coefficients equal to zero is $\chi^2 = 55.146$ with 11 degrees of freedom and $p < 0.00$, indicating that the logistic regression is highly significant in the dependent variable associated with each independent variable and the overall model is statistically significant. Overall model tested is significant, although it does not reflect the entirety of each of the variables studied (Table 2).

The age variable (X_1) has a negative relationship with poverty. This shows that a high age of farmers can reduce the ability to work so as to reduce the poverty. The results of the study showed that an increase in age in 1 unit (year) will reduce the inequality of 0.017 units in coefficient value with the assumption that all other factors are fixed. The opportunity value indicates that the farmer who has an older age has the opportunity, of 0.983 times, to become non-poor compared with the younger peasants. The older a person becomes, the

Table 1. Characteristics of Respondents' Farmers

Characteristics	Farmer (average)
Age of farmer (years)	38
Level of education (years)	7
Experience of farmer (years)	10
The number of dependents (people)	4

lesser the productivity at work. However, it is not statistically significant at the level of $\alpha \leq 0.01$. The age factor and the educational phase contribute to poverty in rural areas, especially to the farmers (Othman, 2004; Fauzi *et al.*, 2006).

The education variable (X_2) has a positive relationship and this indicates that the higher a person's education is the higher the chances of becoming non-poor. The results show that farmers with higher education have the opportunity, of 1,600 times, to become non-poor compared with those with low education and significant at $\alpha \leq 0.05$ level. As predicted that the educational factor plays an important role as a determinant of poverty among farmers. The educational level of farmer who receive at least low school level is more productive than illiterate farmers and education also has an effect on reducing the poverty (Lipton, 1996; Randal and Susan, 1997; Shireen, 1998).

Experience factor (X_3) has a positive relationship and this shows that the more the experienced a person is, the higher the chances of poverty reduction. The results of the study indicate that peasants with more experience have the opportunity, of 1,235 times, to become non-poor compared with those with fewer experience. However, it is not statistically significant at the level of $\alpha \leq 0.05$. Variable income (X_4) also shows a positive relationship which means the higher the income of a person is, the higher the chances of poverty reduction. The results of the study indicate that peasants with higher income have a chance, of 1,301 times, to become non-poor compared to low income farmers and it is significant at $\alpha \leq 0.01$ level. The high poverty stage occurs among low income households levels (Nor Diana, 2011; Chamhuri, 2014; Zargustin, 2015).

The dependent variable number (X_5) denotes the relationship negatively. The increasing number of dependents will further increase the poverty. The results of the study indicate that with the increasing number of dependents, poverty problems among farmers and rural communities who have agricultural activities also increase. Farmers with a large number of dependents have an opportunity, of 0.636 times, to become non-poor compared with small

Table 2.
Results of the Logistic Regression Analysis for Farmers: $P^i = 1$ If Farmers Are Not Poor and $P^i = 0$ If Farmers Are Poor

Independent Variable	*B*	SE	Wald	Sig.	Exp (*B*)
Age (X_1)	−0.017	0.017	1.019	0.313	0.983
Education (X_2)	0.095[b]	0.045	4.433	0.035	1.600
Experience (X_3)	0.034[b]	0.020	3.003	0.038	1.235
Income (X_4)	0.002[a]	0.003	10.460	0.001	1.301
The number of dependent (X_5)	−0.453[a]	0.093	23.724	0.000	0.636
Farming tools (X_6)	0.087	0.349	0.062	0.803	0.917
Land ownership (X_7)	0.081	0.292	0.077	0.781	1.084
Planting area (X_8)	0.615[b]	0.253	5.933	0.015	1.850
Ancillary work (X_9)	0.308[b]	0.351	0.768	0.046	2.361
Position in society (X_{10})	0.089	0.355	0.074	0.613	0.925
Work motivation (X_{11})	0.619[b]	0.255	6.103	0.013	1.925
Constant	−0.225	0.926	0.059	0.808	0.798
N (sample)	280	Log-likelihood		332.959[a]	
χ^2	55.146	Cox and Snell R^2		0.179	
Significant	0.000	Nagelkerke R^2		0.238	
Hosmer and Lameshow χ^2	17.507 ($p = 0.250$)				

[a]Significant at $\alpha = 0.01$ level.
[b]Significant at $\alpha = 0.05$ level.

numbers of dependents and statistically significant at $\alpha \leq 0.01$. The results suggest that poor households tend to have more household members (Kumala, 2013).

The next factor of agricultural equipment (X_6) has a positive relationship indicating that the ownership of agricultural equipment in the form of a water pump machine can increase the chances of becoming non-poor and can reduce poverty among farmers. The result of the study shows that an increase in 1 unit of agricultural equipment ownership of water pump machine will reduce poverty by 0.087 units in coefficient value with the assumption that the ratio of all other factors is fixed. The opportunity value indicates that the farmer who owns the own water pump machine is 0.917 times has the opportunity, of 0.917 times, to become non-poor compared to farmers who do not have water pump machines. However it is not significant at the level of $\alpha \leq 0.01$

Subsequent land ownership factor (X_7) has a positive relationship and this indicates that own land ownership can increase the chances of being non-poor. The results show that an increase in 1 unit of land ownership alone will reduce poverty by 0.081 units in coefficient value with the assumption that all other factors are fixed. The opportunity value indicates that the farmer who owns his own land has the opportunity, of 1,084 times, to become non-poor compared to the peasants owning the land other than their own, such as land rent, taxes and profit sharing, and others. The results of this study, gaining the absence of land ownership rights and the size of land ownership became the determinant of poverty among rural populations (Othman, 2004).

However it is not significant at the level of $\alpha \leq 0.01$. The plant extent factor (X_8) has a positive relationship. This shows that crop breadth can reduce poverty among farmers and can increase the chances of becoming non-poor. The results show that an increase in 1 unit of plant size will reduce poverty by 0.615 units in coefficient value with the assumption that the constants of all other factors are fixed. The probability value indicates that the farmer who has a large cultivated area has the opportunity, of 1,850 times, to become non-poor compared to farmers who have a small amount of plant size and it is significant at the level of $\alpha \leq 0.05$. The results of this study found that the extent of the plant can reduce poverty levels (Nor Diana, 2011; Zargustin, 2015).

Ancillary work variables (X_9) have a positive relationship and show that side jobs will reduce poverty among farmers or can increase the chances of becoming non-poor. The results show that an increase in one unit of side work will reduce poverty by as many as 0.308 units in the budget coefficient with the assumption that all other factors are fixed. He also illustrates that the opportunity to become non-poor among farmers is 1.361 times higher compared to farmers who have no side job and it is significant at the level of $\alpha \leq 0.05$. Thus side jobs can increase the opportunities of rural communities to be non-poor. The results of this study found that side jobs can increase the opportunities of rural communities to be non-poor (Nor Diana, 2011; Simanuhuruk, 2012; Kumala, 2013; Zargustin, 2015).

The position in society variable (X_{10}) has a positive relationship and shows that someone who holds office in society will decrease the poverty among farmers. The opportunity value indicates that the farmer who has a position has the opportunity, of 0.925 times, to become non-poor compared to peasants who do not have a position in the community. However it is not significant at $\alpha \leq 0.01$ level. Farmers whose have positions in the community would make it easier for them to increase the chances of being non-poor. The results of this study found that having positions in the community would make it easier for them to increase the chances of being non-poor (Nor Diana, 2011; Zargustin, 2015).

The work motivation variable (X_{11}) has a positive relationship and shows that someone who has high motivation to work can increase the chances of becoming non-poor. The results show that the opportunity to become non-poor among farmers is 1.925 times higher

compared with non-motivated farmers and it is significant at the level of $\alpha \leq 0.05$. The results of this study found that motivation can encourage someone to work harder to increase the income so as to increase the chances of society to become non-poor (Simanuhuruk, 2012; Kumala, 2013).

4. Conclusions

The conclusions of this study are based on the results of logistic regression analysis, which found that the stage of farmer's inadequacy is influenced by seven factors, namely, education, experience, income, number of dependents, planting area, ancillary job, and work motivation. While four other factors, namely, age, farming tools, land ownership, and position in society are not significant. Multivariate analyses indicate that a change in education, experience, income, land ownership, planting area, and side work have an odds ratio greater than 1 that is intended to change this is positively related to non-poor. In contrast to others, age-changing riders and the number of variable responses are negatively related to being non-poor, or in other words, these variables contribute to increasing poverty of the farmers.

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