

Analysis of Poverty Level Fishermen Community Post Tsunami in Aceh, Indonesia

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Abstract- This research was conducted in five districts in the province of Aceh, West Aceh district of Aceh Besar, Aceh Pidie, Bireuen, and North Aceh. The total sample for this study was 274 fishermen using stratified random sampling method. This research using primary and secondary data. The main objective of this research is to analyze the factors that determine the level of poverty of fishing communities in Aceh, Indonesia after the tsunami. The analysis model used is the logistic regression model using Maximum Likelihood (MLE). The results of this research, it is known that the level of poverty fishermen affected by six factors are education, income, number of dependents, type of fishing vessels, ship ownership and ancillary works. Meanwhile, three other factors as age, experience and type of fishing gear is not significant.

Index Terms- Poverty, Fishermen Community, Post Tsunami and Aceh

I. INTRODUCTION

There are two very important events that affect the economic situation of the Acehnese people first; Tsunami disaster which has destroyed part of the province of Aceh on 26 December 2004. Second; Memorandum of Understanding (MoU-Memory of Understanding) between the Government of the Republic of Indonesia and the Free Aceh Movement (GAM) signed in Helsinki on August 15, 2005. This situation resulted into one of the poorest provinces in Indonesia today.

While the armed conflict between the Free Aceh Movement (GAM) and the Government of the Republic of Indonesia that occurred more than 30 years, has caused the deaths of over 15,000 people and has more than 30,000 to leave the family (PPK-World Bank, 2007). The conflict has also led to the destruction of physical infrastructure widely and has hindered the provision and maintenance of public services by the government to have a bad impact on the social structure of Aceh, as well as increased lameness live among the population. The impact of conflict on economic infrastructure and social facilities are quite severe. More than half of the docks or seaports, dams and embankments fish and shrimp, markets and milling rice (rice miller) also suffered damage, farmland, fields, factories, shops and livestock (UNDP, 2010). The conflict has also destroyed the source of income for a large number of families in Aceh, including most of the poor families which it was most difficult to recover from their losses. Social facilities greater damage to occur in physical assets including schools and village health

clinic. However, these figures can not reflect the damage to the social fabric of the community very seriously.

Conflict and natural disasters tsunami also changed the structure of the family in Aceh. The number of women who became refugees reached 167,000 people and 4,319 of them are widows, while 20,751 people as head of the family. More broadly, according to the data, there are about 148,000 widows in Aceh in 2007. The proportion of families in the province's widow higher than the national average (UNDP, 2010). This is another consequence of the conflict, which killed more likely male. Similarly, the percentage of households that widows are significantly higher than national in Aceh.

Conflict and tsunami have caused most of the people especially in the rural areas have lost many assets live like human capital, natural capital, financial capital, physical capital, social capital and culture. This situation has created a new lameness inequality in income distribution between groups of people who are rich and the poor. They are homeless, wealth in the form of vehicles, livestock and agricultural produce, relatives, also lost their endeavor, but has damaged agricultural land, the dam of fish and shrimp, and so on. Loss of various assets is accompanied by a lack of education and skills they have will make it difficult to bounce back, and they will be in the lowest income bracket, and finally they are getting stuck in poverty. In addition to limited access and livelihood resources is a serious problem facing them, especially the poor in rural areas.

Aceh post-conflict and tsunami have been exposed to severe conditions of poverty. The World Bank report (2008) shows that poverty in Aceh after the tsunami disaster rose, from 28.4 percent in 2004 to 32.6 percent in 2005. However, the poverty rate has decreased in 2006 to 26.5 per cent, lower than the rate of poverty before the tsunami. This situation shows that the increase in poverty associated with the tsunami did not last long and most likely reconstruction activities have facilitated the decline. Although by 2014 the poverty rate in Aceh declined to 16.98 per cent, but poverty in Aceh remains much higher than other provinces in Indonesia. The poverty rate in Aceh during the period 2008-2014 showed a decline, and in 2014 the poverty rate in Aceh ranked seventh highest in Indonesia. However, the poverty rate is still above the national average where in the same time frame from 2008 to 2014.

As we know that most of the poor are in rural areas and nearly 70 percent of them have major work as farmers and fishermen. The agricultural sector is able to absorb the labor force by 35 per cent of the total labor force stood at 2,487,426 people (Aceh in Figures, 2015). The rural population is highly vulnerable to poverty because of their very limited access to the various resources available. In addition, in rural areas is still

prevalent social services are still poorly accompanied by wage lower than in urban areas. While in urban areas, social services and find better jobs with higher wages (UNDP, 2010). Poverty mainly farmers and fishermen is a very complex phenomenon and difficult to be explained by only one factor.

But once past the emergency, recovery and reconstruction for nearly 10 years by spending budget trillion rupiah, and many things have been done mainly in the areas of reconstruction, such as the construction of housing affected the impact of the tsunami, the development of infra-structure of the public, and repair in the field of community economic (livelihood). Recovery in agriculture and fisheries, have caused potential fisheries and agriculture in Aceh experienced various improvements in some aspects. Although its impact on economic recovery in the wider community is not significant and has not been able to give power and a stronger role for economic growth and rising income and prosperity and sustainable society (Agussabti, et.al., 2010).

In the fisheries sector, for example, the economic situation of fishermen fishing or aquaculture fishing remains only still poor, no better or equal to the condition before the tsunami. While it is known that many aid livelihood from the government and NGOs to this sector (fisheries and aquaculture) when the rehabilitation and reconstruction of Aceh after the tsunami a few years ago, such as the provision of ship or boat, fishing equipment, operating costs, rehabilitation of dams and irrigation water, help agro-inputs, etc. (Agussabti, et.al., 2010). In general, they rely on the exploitation of marine and coastal resources that require large investments and are highly dependent seasons. Most of them work as fishermen, laborers fishermen, small-scale fish processors and petty traders because it has limited investment capabilities. Small fishing only able to utilize resources in coastal areas that tend to catch continued to decline due to competition from large vessels and degradation of coastal resources. Perishable fish catch thus weakening their bargaining position in the sales transaction (Febrianto & Rahardjo (2005) in Slamet Widodo (2011). In addition, the relationship between the owners of capital and the exploitation of workers and fishermen, as well as the fishing effort which is seasonal and unpredictable cause of the poor in coastal areas tend to be difficult to get out of poverty and winding debts to merchants or ship owners.

Poverty is measured based on the household's gross income per month compared to the poverty line income that have been set by the government. Poverty line consists of two components are the poverty line food and non-food. Central Bureau of Statistics in September 2015 stipulates that the poverty line for Aceh Province is Rp 377.049 per month. Where people who have an average monthly per capita expenditure below the poverty line are classified as poor.

Poverty is a condition that is dynamic, in which a person can enter into poverty and out of poverty over time for various reasons. Therefore, every time someone has a chance to become poor. Baulch and Hoddinot (2000) in Christiansen and Boisvert (2000) suggests that a person can be poor and not poor. Mukherjee (2001) explains that the factors of vulnerability and asset ownership in the communities or individuals have great influence on the results of their lives so they can live their lives better or they will fall into poverty. The lack of access and loss of property and life is a serious problem faced by the poor in rural

areas. Therefore it is necessary to do an analysis of the level of poverty of fishing communities in Aceh after the tsunami.

II. METHODOLOGY

2.1 Location and Time

This research was conducted in the province of Aceh, Indonesia after the tsunami that covers five districts of West Aceh, Aceh Besar, Pidie Jaya, Bireuen and Aceh Utara. Elections to the five areas were purposive. The reason for sampling in the area because the district is experiencing the impact of the tsunami and the worst conflicts. This research was conducted from May 2014 to February 2015.

2.2 Types, Sources and Methods Data Collection Data

Base on data type, data to be collected in this study included primary and secondary data. Primary data collection technique to be uses in this study were interviews with using a structured questioner. Secondary data collection conducted at institutions such as the Provincial and Regency Agriculture Office, Center Agency of Statistic of Province and Regency, District Office, Agriculture Extension Center, Village Office, and related agencies. Literature study was also conducted to obtains literature that linkage to this study.

Population that will be used in this study is a fishing community individually. This study used a stratified random sampling method. Stratified random sampling is a sample taken prior to isolating the basic elements in the population into several sub-populations 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 for this study is that the sample of 274 farmers.

2.3 Methods Data Processing and Analysis

Analysis of data to be used in this study consisted of qualitative and quantitative analysis. Qualitative analysis using the tabulations that interpreted descriptively. Descriptive analysis is used to describe characteristics of the observed variable. Quantitative analysis using logistic odds function (logic). Logic regression function is the equation where the dependent variable is qualitative, can have two classes (binary) or more than two classes or multinomial (Widarjono A.2010). The logic model is often used in data classification (Gujarati. 2003). Logic model in this study were selected to see the probability of a poor fisherman based on the effect of certain independent variables. In this model, the dependent variable is a poor fisherman in Aceh province were categorized into two, namely poor fishermen who were not coded as 1 and a poor fisherman who coded as 0 (zero). According to Gujarati (2003), the general form logic model can be written as follows.

$$L_i = Ln \left(\frac{P_i}{1-P_i} \right) = Z_i \quad (1)$$

Where $Z_i = \sum \beta_1 + \beta_2 X_i$ and $P_i / (1-P_i)$ 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.

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = Z_i = \beta_1 + \beta_2 X_2 + \dots + \beta_i X_i \quad (2)$$

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

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = Z_i = \beta_1 + \beta_2 X_1 + \beta_3 X_2 + \beta_4 X_3 + \beta_5 X_4 + \beta_6 X_5 + \beta_7 X_6 + \beta_8 X_7 + \beta_8 X_8 + u_i \quad (3)$$

$$\beta_1 > 0, \beta_2 < 0, \beta_3 > 0, \beta_4 > 0, \beta_5 > 0, \beta_6 < 0, \beta_7 > 0, \beta_8 > 0, \beta_8 > 0$$

where :

- Pi = probability of a poor fisherman is not (1 = not poor)
- 1-pi = probability of a poor fisherman (0 = poor)
- X₁ = age of fishermen (years)
- X₂ = level of education (years)
- X₃ = experience of fishermen (years)
- X₄ = household income level of fishermen (Rp/year)
- X₅ = the number of dependents of fishermen

- X₆ = the type of fishing gear (1 = trace, 0 = other)
- X₇ = type motorized fishing vessels (1 = yes, 0 = no)
- X₈ = ownership of the vessel (1 = yes, 0 = no)
- X₉ = ancillary works (1 = available, 0 = no)
- β₁ = constant or intercept
- β₂, β₃, ... β₈ = guess parameter / logistic regression coefficients

Existing data is entries, validated, and tabulated using Excel software program, while for data analysis using the logic function of SPSS version 16.0

III. RESULTS AND DISCUSSION

3.1 Poverty in Aceh: Descriptive analysis

The poverty rate in Aceh during the period 2008-2014 showed a decline, and in 2014 the poverty rate in Aceh ranked seventh highest in Indonesia. However, the poverty rate is still above the national average from 2008 to 2014. This situation can be seen in the table below.

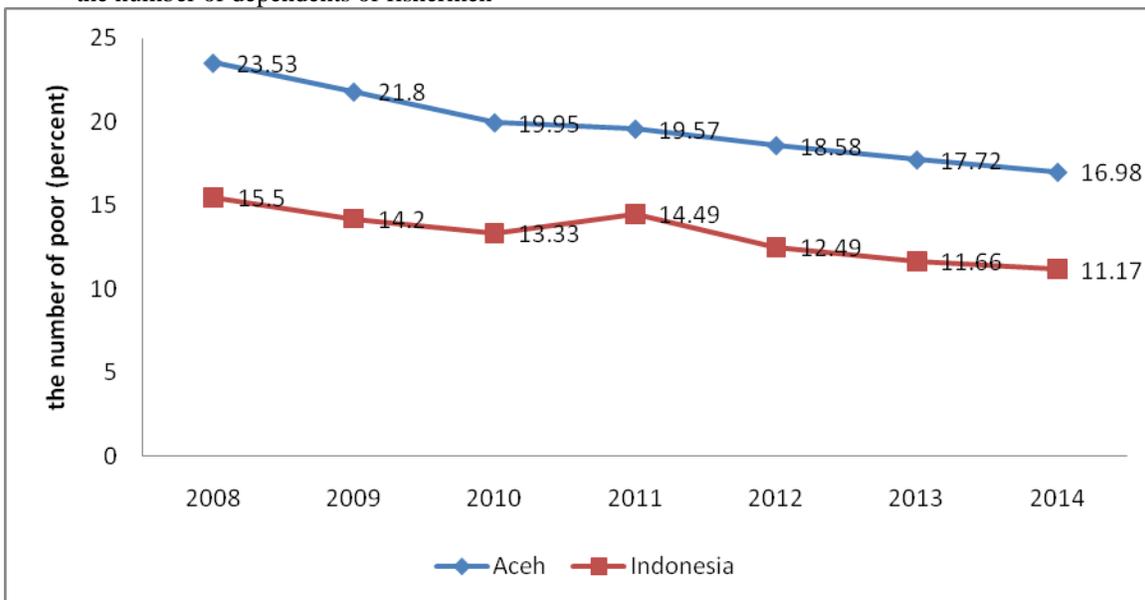


Figure 1. Percentage of Poor People in Aceh and Indonesia in 2008-2014

However, if the review of the distribution of poor people in Aceh during the period 2008 - 2014, there has been a change in the composition of the number of poor people in urban areas and poor rural population. In 2005, the poor in rural areas reached 32.60% while its only 19.00%. Aceh poor population decreased from 959.7 thousand people in 2008 to 837.7 thousand in 2014,

where most of them are in rural areas, which accounted for 679.4 thousand people (81.67 percent). In 2014 the number of poor people in Aceh were 837.4 thousand or 16.98%. This situation illustrates that the rapid development activities in rural areas have a positive impact on poverty reduction. Rural areas are pockets of poverty in Aceh, and almost 80 percent poverty in Aceh are in rural areas during 2008-2014.

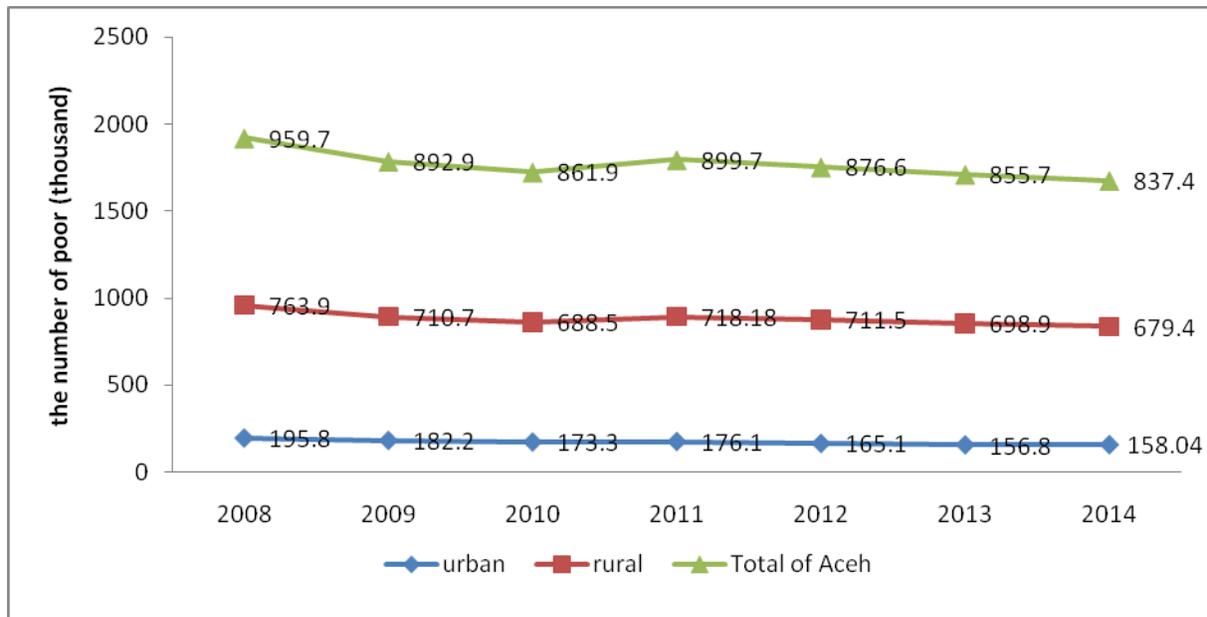


Figure 2. Number of Poor People by Area (thousand) , 2008-2014

3.2 Characteristics of Respondents Fishermen

Characteristics of respondents in this study is based on age of fishermen, level of education, experience of fishermen, as well as the number of dependents.

Table 1. Characteristics of respondents fishermen

No.	Characteristics	Fishermen (average)
1	Age of fishermen (years)	39
2	Level of education (years)	7
3	Experience of fishermen (years)	12
4	the number of dependents (people)	4

Base on Table 1 above, the study found the average age of respondents was 39 years old and is very productive in the field of fisheries. Age has important implications to the process of modernization of the fisheries sector, in view of the elderly is difficult to accept the changes and more comfortable with their traditional (MIER, 1999; Adhiana, 2005; Suryadi et al.2008). The education level is an indicator of socioeconomic status, the study found that most respondents categorized as those with low education level of the receiving school education for 7 years. Fishermen have relatively long experience of over 12 years in running events as fishermen catch. This shows that they experienced in the fisheries sector. Total liabilities also showed relatively high liability in Aceh of 4 people.

3.2 Results of the analysis of poverty fisherman

The analysis results for the logistic regression model to estimate the determinants of poverty fisherman found to be very satisfactory. Omnibus test of model coefficients indicate that the test chi-square statistic for testing the null hypothesis in which all relationships and expectations coefficient equal to zero is $\chi^2 = 49.314$ with 9 degrees of freedom and values $\rho < 0.00$,

indicating 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.

Model estimates of Hosmer and Lemeshow statistic provides calibration information model. Significant level of observation for the chi-square value obtained was 16,730 (Hosmer and Lemeshow test) and value ρ is $0.301 > \alpha$ (0.05), this means that the null hypothesis is rejected by the model which means there is no difference between the estimates and observations. Therefore, the model can show a good match and reasonable data.

To test the validity and accessibility of the budget authority for the model, the classification table for the expectations built correctly or not correctly will greatly depend on the expected probability of becoming poor. Results obtained in the classification table is the model sensitivity (the percentage of the poor is not the case, estimated by the model) is 60.9 percent while the specific model (the percentage of poor fishermen is true as estimated by the model) is 74.6 percent. Errors positive rate for fishermen who are classified as not poor by model is 39.1 percent which means that 39.1 percent of fishermen were estimated by the model are not poor but are actually poor. While the negative levels for fishing offenses classified as poor by the model is 25.4 percent, which means 25.4 percent of fishermen estimated by the model are not poor but are actually poor. Overall model can estimate 80.0 percent of cases for these two categories of poor and poor cannot be proven with a high coefficient of power budget.

To measure the strength of the relationship between the dependent variable and the independent variables were also estimated Cox and Snell's R^2 and Nagelkerke's R^2 . Nagelkerke's is a further modification of the Cox and Snell's coefficient to ensure that the value is in the range of 0 and 1. Typically Nagelkerke's value is greater than the value of Cox and Snell's. There are two estimates of high-value R Cox and Snell's

calculation of the 0.194 and 0.261 Nagelkerker's value that indicates the power of the model. While the correlation matrix for the variables are also estimated to determine the incidence multicollinearity. In this study, the model does not apply multicollinearity confirm that there are no applicable bilateral relations between variables that have a correlation coefficient greater than 0.80.

Multivariate analysis showed that the variables age of fishermen (X_1), level of education (X_2), income (X_4), fishing gear (X_6), and ancillary works (X_9) has a probability (odds ratio) is greater than 1, which means that these variables are positively related to the probability of becoming poor. Instead of other variables, namely the number of dependents (X_5), type of motorized fishing vessels (X_7) and ownership of the vessel (X_8)

has a ratio of probability of less than 1 means that the variables are correlated negatively to become poor or in other words these variables contribute to poverty reduction fishermen. And by implication, exponential coefficient indicates the ratio of the probability of becoming poor fishermen in one unit change in the independent variable. Value of the significance shows the effect of the significance of each of the variables studied and high scores only for variables education (X_2), income (X_4), number of dependents (X_5), the type of ship (X_7), and ancillary works (X_9) is significant at the level of $\alpha = 0.05$.

The results of logistic regression model for fishermen found in Table2, while SPSS output for the model are provided in the appendix. Results of logistic regression equation is as follows.

Table 2. Results of the logistic regression analysis for fishermen (Pi = 1 if fishermen are not poor and poor Pi = 0)

Variables	Coefficient	S.E.	Wald	Sig.	Exp(B)
Age (X_1)	-.012	.016	.494	.482	1.012
Education (X_2)	.002 ^b	.047	.002	.049	1.002
Experience (X_3)	.033	.025	1.749	.186	.968
Income (X_4)	.003 ^a	.004	19.373	.000	1.002
The number of dependent (X_5)	-.544 ^a	.112	23.762	.000	.580
Fishing gear (X_6)	.153	.318	.231	.631	1.165
Type of motorized fishing vessels (X_7)	.799 ^b	.321	6.191	.013	.450
Ownership of the vessel (X_8)	.889 ^b	.293	1.350	.010	.711
Ancillary works (X_9)	1.150 ^a	.395	8.469	.004	3.159
Constant	-.609	.946	.413	.520	.544
N (sample)	= 274	-2Log-likelihood	= 321.356 ^a		
Chi-square	= 49.314	Cox dan Snell's R square	= 0.165		
Significant	= 0.000	Nagelkerke R square	= 0.222		
Chi-square Hosmer dan Lameshow = 10.749 ($p = 0.216$)					

Nota : 1. ^{a,b} denote significant at the $\alpha = 0.01$ and $\alpha = 0.05$ level

Source : Primary data , processed 2015

Base on Table 2 above, age of fishermen (X_1) has a negative relationship and showed that increasing age, the chance to become poor productivity is greatly increased because of an aging person will be reduced. In other words this means that the old man will lose the chance to become poor. The results showed an increase in the age of 1 unit (years) will increase by 0.012 units poverty in assumed coefficient with all other factors are constant. Estimates show that the probability of a fisherman who has an older age is 1.012 times has the opportunity to increase poverty compared with fishermen who have a younger age. However it is not statistically significant at the level of $\alpha = 0.01$.

Level of education (X_2) has a positive correlation indicates that higher education can increase the chances of reducing poverty among the fishermen. The results showed an increase in one unit will increase the chances of education for reducing poverty by 0.002 units in the coefficient assuming all other factors are constant. Probability estimates indicate that the fishermen who have a higher education is 1.002 times have the opportunity to become poor or reduce poverty compared to fishermen who have low education, and it is significant at the

level of $\alpha = 0.05$. According to BPS (2008), better educated people will have a lower chance of becoming poor.

Factors of experience the fishermen also has a positive relationship and this shows that the more experience a person can reduce poverty among the fishermen or increase the chances of becoming poor. The results showed an increase in one unit of experience will reduce poverty by 0033 units in the coefficient assuming all other factors are constant. Probability estimates indicate that farmers who have more experience is 0.968 times have a chance to be poor than the fishermen who have less experience. However it is not statistically significant at the level of $\alpha = 0.05$.

While the faktor of income have positive relationship and this shows that the more the amount of revenue can increase the chances of becoming poor or reducing poverty among the fishermen. The results showed that 1 unit increase in income will increase the chances to become poor or poverty reduction of 0.003 units in the coefficient assuming all other factors are constant. Probability estimates indicate that the fishermen who have a higher income is 1,002 times has a chance to be poor

compared to fishermen whose incomes are less and it is statistically significant at the level of $\alpha = 0.01$.

The number of dependents (X_5) shows the relationship negatively and it is stated that the more the number of dependents and the increase of poverty among rural communities associated with fishing activities. The findings show that it is as expected as the growing number of dependents is increasing poverty among the fishermen and reduce the chances of becoming poor. Probability estimates indicate that the fishermen have a lot number of dependents is 0.580 times have diminishing opportunities to be poor compared with the number of dependents of fishermen who have little and it is statistically significant at the level of $\alpha = 0.01$ level.

The factor of fishing gear has a positive relationship and this shows that the fishermen who have a net ring gear will increase the chances of becoming poor. The results showed that fishermen have fishing gear is 1.165 times have a chance to be poor than the fishermen who have fishing equipment such as fishing rods only. But it is not significant at the level of $\alpha = 0.01$. Where fishing is only able to catch fish in a very small amount compared with other fishing gear such as nets, cages and nets that can catch more fish at a time. So if fishermen only have fishing gear it will contribute to poverty compared with other fishing gear.

Factors type of vessel has a positive relationship and this shows that the ownership of a boat can reduce poverty among fishermen. The results showed an increase in unit 1 motor vessel ownership of poverty reduction in the coefficient unit 0.891 assuming all other factors are constant. Estimates show that the probability of having a boat fishermen is 0.410 times have a chance to be poor than the fishermen who have no motor boat or canoe and it is significant at the level of $\alpha = 0.01$.

While the variable ownership of the vessel (X_8) has a positive relationship and this shows that the private ownership of the vessel to reduce poverty among the fishermen. The results showed an increase in one unit of private ownership of the vessel will reduce poverty by 0.889 units in the coefficient assuming all other factors are constant. Probability estimates indicate that the fishermen have boats privately is 0.711 times have a chance to be poor than a fishing vessel, other than a private rental, shared or overlapping and it is significant at the level of $\alpha = 0.01$.

There are variables ancillary works (X_9) has a positive relationship and this shows that the fishermen who have a side job will be to reduce poverty among them, or can increase the chances of becoming poor. The results showed an increase in unit 1 ancillary works will reduce the poverty of 0.860 units in the estimated coefficients assuming all other factors are constant. It also illustrates that the probability to be poor among fishermen is 3.159 times compared to the fishermen who do not have a side job and it is significant at the significance level $\alpha = 0.05$ level.

The results of this study show similarities with the discovery made by Febrianto & Rahardjo (2005) in Slamet Widodo (2011). People residing in coastal areas, for example, face a variety of problems that cause poverty. In general, they are dependent on the exploitation of marine and coastal resources which require large investments and are highly dependent seasons. Most of them work as fishermen, laborers fishermen, small-scale fish processors and petty traders because it has limited investment capabilities. Small fishing only able to utilize

resources in coastal areas that tend to catch continued to decline due to competition from large vessels and degradation of coastal resources. The catch is also easily damaged thereby weakening their bargaining position in the sales transaction. In addition, the relationship between the owners of capital and the exploitation of workers and fishermen, as well as the fishing effort which is seasonal and unpredictable cause of the poor in coastal areas tend to be difficult to get out of poverty and winding debts to merchants or ship owners.

IV. CONCLUSIONS AND IMPLICATIONS

Based on logistic regression analysis model estimates that the level of poverty fishermen affected by six factors: education, income, number of dependents, type of fishing vessels, ship ownership and ancillary works. Meanwhile, three other factors as age, experience and type of fishing gear is not significant. Multivariate analysis showed that the variables of age, education, income, type of fishing gear, and the side has a probability (odds ratio) is greater than 1, which means that these variables are positively related to the probability of becoming poor. Instead other variables experience, number of dependents, type of fishing vessels, and the ownership of the vessel has a probability value ratio of less than 1 means that this variable is negatively related to the non-poor or in other words these variables contribute to increased poverty of farmers.

Implications

Based on the analysis found among the major problems facing the fishing is high production costs but not followed by the selling price of the product. For fisheries most fishers market their produce to middlemen or the boss and the price is determined by their employer. To overcome this problem, the government should specify a limit price to wholesalers, namely by setting a minimum price. In addition, one of the most important recommendation is to improve human assets namely to encourage fishermen to attend courses related to fisheries. The presence of fishermen to fishery-related courses is an important medium for them to improve knowledge of fisheries activities. In addition to this study found that the financial assets is the most important factor in influencing the strategies implemented fishermen to increase their income. The main obstacle that they are generally difficult to obtain credit and overall fishermen using its own financial resources and tend to borrow from relatives compared to the banking financial institutions. The strengthening of the financial assets fishermen have to be prioritized by facilitating the access to credit to those who want to do the activity of fishing. Credit institutions, especially rural banks (BPR) and Bank Rakyat Indonesia (BRI) should review the requirements and procedures for credit or a loan scheme taking into account the interests of small farmers and fishermen.

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