

## **THE FACTORS AFFECTING THE VULNERABILITY INDICATORS OF FISHERMEN HOUSEHOLD IN TANGGAMUS REGENCY OF LAMPUNG PROVINCE, INDONESIA**

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### **ABSTRACT**

The limitation of traditional fishery business is caused by many factors, e.g., weather and climate, capital, a still simple technology, and internal issues of fishermen households causing low fish production. This can further lead to the low income of traditional fishermen which making it difficult to meet the minimum needs of households, and causing their vulnerability. This research intended to describe the vulnerability condition of fishermen households and analyze the factors causing it. Data used in this research were primary data and secondary data. Data results were obtained by counting the score numbers on the respondents. From the data results, it was found that most of the incomes of fishermen households using motor boats were on the low vulnerability score levels while the average of the incomes of fishermen households using outboard motor boats were on the medium and high vulnerability score levels. Whereas the significant variables causing vulnerability for motor boat fishermen households were (1) production variable with t-value of -1.949 and significant level of 0.055, (2) capital variable with t value of -1.997 and significant level of 0.051, (3) fishery income variable with t value of -2.032 and significant level of 0.045. Whereas the non-significant variables for motor boat and outboard motor boat fishermen were age, total of labor, and dummy.

**Keywords:** Vulnerability, Household, Fishermen

### **INTRODUCTION**

Fishery sector plays an important role in the Indonesian economy. The importance of fishery sector role is indicated by several things, i.e., (1) fishery resources are declining while the very abundant waters have not been optimally utilized, (2) fishery sector contribution to the Gross Domestic Product (GDP) is still relatively small, but tends to increase, (3) fish demand is

increasing year by year, but not balanced with the supply, (4) the community is increasingly selective in meeting the nutritional needs from the fishery sector, and (5) the still high population growth which has the potential to emerge fishery production centers (Kusumaatmadja, 2000). Based on data from 2004-2014, it appears that the number of sea fishermen is dominated by full time fishermen, i.e., fishermen with fishing as their only livelihood. The number of full-time fishermen in 2004-2014 was increasing by an average of 1.84% per year, whereas the numbers of major and minor part-time fishermen were reduced by averages of 2.22% and 0.23% per year, respectively (BPS, 2016).

These conditions have resulted in uncertainty in the income level of fishery sector, and in the absence of capital owned by fishermen, they have to sell their fish to *langan* at a lower price than selling it directly to consumers or through auction process at Fish Auction House (TPI). This situation causes the fishermen to be in a state of poverty. Poverty dimension can be formed from the aspects of economy, human resource, environment, and household. Seasonal fishing jobs resulted in a non-permanent job for traditional fishermen, and many fishermen still do not have capital that they are forced to borrow capital from *langan* before they can go to sea. Fishermen who borrow capital from *langan* must sell their fish to the *langan* at a relatively cheaper price than the selling price in TPI.

The use of simple or traditional technology in sea fishing and still many fishermen working as fishermen laborers in Tanggamus Regency lead to vulnerability in fishermen households. Most of the fishery business of the traditional fishermen are still dominated by small businesses, simple technology, season and weather, and the fishing products are limited to local consumption only. Local traditional fishermen work themselves in sea fishing and do not use rent labor from outside the households.

## **LITERATURE REVIEW AND HYPOTHESES**

The difference in the vulnerability of poverty and incidence of poverty according to Chaudhuri (2001) is; "Vulnerability is a forward-looking ex-ante measure of a household's well-being; poverty is an ex-post measure of a household's well-being (or lack thereof)", a household is deemed vulnerable to poverty if the probability of falling under poverty condition is equal to or greater than 50 percent. This vulnerability to poverty can be quantified by calculating or quantifying the possibility or risk of falling into poverty or being in a state below the poverty line. The vulnerability based on the Headcount Poverty Rate is also the Vulnerability to Poverty Line.

A vulnerable condition may fall below the poverty line if there are factors that drive or trigger. According to Islam (2001), these factors may be a shock in micro/household level, e.g., the wage

earner falling ill or dying, and in meso/community level, e.g., crop failures, product price fluctuations and environmental degradation; and in macro/economy-wide level like the financial crisis in 1997.

Determining vulnerability indicators takes into account the factors affecting vulnerability at the individual, community, territorial and institutional levels. Social scholars agree on several key factors affecting social vulnerability, e.g., lack of access to resources (information, knowledge and technology), limited access to political power and representation, social capital, connections and social networks, customs and cultural values (Cutter, Susan L; Bryan J. Boruff; and W. Lynn Shirley, 2003).

Thus, measuring vulnerability is not only by measuring the current income and consumption in terms of money, but also measuring the assets and changes over time in an effort to gain an in-depth understanding of chronic poverty in the concept of money-metric of poverty dominated by recent poverty literature.

Vulnerability is a probability or risk of becoming poor or poorer over time. This vulnerability concept is forward looking and implicitly takes into account the uncertainty of future events. Vulnerability means high recent probability for future shortcomings, while poverty means shortcoming in the present (Baulch and Soddinot, 2000 in Christiaensen and Boisvert, 2000).

Poverty and the vulnerability of poverty are two different things, though interrelated. The linkage between them also can not be exempted from the dynamics of poverty. It is because poverty is a dynamic condition. A person can get into and get out of poverty all the time for various reasons. Therefore, at any point in time a person has a probability to fall into poverty.

Baulch and Hoddinot (2000) in Christiaensen and Boisvert (2000) suggest that a person can get into and get out of poverty. Consequently, if we only focus on recent poverty, it will eliminate the important points, i.e., a person who is not poor today, may be poor the next day. In relation to poverty measurement, vulnerability is identified as a very important dimension of poverty (Kanbur and Squire, 1999 in Christiaensen and Boisvert, 2000).

Vulnerability developed in coastal areas due to several factors: (1) coastal resources are often open access, at least de facto, (2) they are the most depressed areas due to various development activities and impacts, and (3) they are less-watched areas in terms of the availability facilities and public infrastructure. In addition, the factors affecting poverty development on coastal area are the dense population, low quality of population, and lack of access to capital resources, technology and market (Dinas Kelautan dan Perikanan Propinsi Lampung, 2000).

The result of Mussawir (2009) research shows the poverty of traditional fishermen in Padang Panjang Village is caused by 3 (three) factors: (1) quality factor of human resources, (2) economic factor, (3) institutional factor. The research method used in this research is descriptive qualitative using secondary and primary data.

Traditional fishermen are characterized by a mental attitude that is not easy to accept new technological innovations, possessing very minimum productive assets, relatively low incomes, having only a non-motor boat with simple fishing gear or with only labor capital. Traditional fishermen are the bottom strata in fishing village. Fishery business to date is still dominated by small-scale enterprises heavily influenced by the season and aimed at local consumption. These result in a fluctuating income that during the famine season, the fishermen are in a vulnerable condition.

The causes of poverty in fishing communities according to Kusnadi in Yustika (2003) are based on the natural structure of village economic resources and fluctuations in fishing season, and unbalanced relations among the economic actors. Community poverty in forest agro-ecosystems zone is characterized by a lack of access to public services, and low quality of human resources. Geographical factors and remote topographical conditions make other economic opportunities are difficult to be achieved.

The dominant factors causing the poverty of small fishermen households according to (Tain, 2011) in overfishing areas are: (1) disadvantageous institutions toward small fishermen, (2) impartial programs toward small fishermen, (3) a life-oriented view of the afterlife, 4) limited resources, (5) incompatibility of fishing gear, (6) low investment, (7) debt bonded, (8) extravagant behavior, (9) limited fishing season, (10) ecosystem damage, (11) fishing areas grabbing, (12) lack of law enforcement, (13) competition to surpass other fishermen, (14) the use of illicit tools/materials and, (15) arresting behavior. To get the dominant factor causing the poverty of outboard motor boat fishermen households, factor analysis is used. The identified factors are derived from the common property theory for fisheries, the grand theory of poverty, i.e., the theory of modernization adopted by the liberal (cultural poverty) and the theory of dependence adopted by the radicals (structural poverty).

(Retnowati, 2011) research shows that in terms of economy, fishermen's income is still very low, that is why they are poor. This is due to limited capital and skill, and pressure from capital owners (unfair fishery income sharing system). Based on the previous researches, this research proposes hypothesis as follows:

1. Fishermen households are still suspected in vulnerable condition based on several vulnerability indicators.

2. The factors affecting the vulnerability of fishermen households are demographic, internal, and external factors.

**DATA AND METHODS OF RESEARCH**

This research was conducted in Tanggamus Regency of Lampung Province, Indonesia. The determination of this location was purposively done, considering that there were many traditional fishermen in Tanggamus Regency.

This research was descriptive verificative. Descriptive verificative research is a research aimed to test the influence between two or more variables. Data were collected from the existing fishermen households at the time of the research. In this research, the data were discretized about the factors affecting the vulnerability of fishermen households.

Sampling technique was done by using simple random method. The methods of data collection techniques used are observation, interview, documentation, and questionnaire. The sample size of 200 respondents for each of research location was determined proportionally with Slovin formula with alpha ( $\alpha$ ) of 1% or 0.01% (Sugiyono, 2012).

The vulnerability analysis of traditional fishermen households was done by weighting and rating on the indicators for each condition of the risk elements found in the field. Indicators of the vulnerability variables of traditional fishermen households used in this research included income, education, employment, spare time, work time, technology, location accessibility, house ownership, number of family members, and number of children. Each indicator had its own attributes derived from the field conditions. In detail, the rating and weighting for each variable can be seen in Table 1.

**Table 1: Increasing and Weighting Indicators of vulnerability**

Indicator	Quality*	Vulnerability Category Each Variable		
		low 1	Medium 2	High 3
Income	4	>Rp. 2.000.0000	Rp 1.000.000 s/d Rp. 2.000.000	< Rp. 1.000.000
Education	3	Graduated high school	Graduated Elementary / Junior High	Not Graduate Elementary School / No School
Employment	3	Entrepreneurs,	Farmers, fishermen	Only fishermen

		farmers, traders, fishermen		
leisure	2	Use for work	Sometimes use for working	Does not use For working
Working Time	2	1,5 working days	1 working days	0,5 working days
Location accessibility	2	< 20 km from city center	20 km to 40 km from city center	> 40 km from City Center
Homeownership	2	private property	Family house	Rent / contract
Number of Household Members	1	1-3	4-6	>6
Number of children	1	1-2	3-4	>5

Note: Developed from (Setyaningrum & Giyarsih 2012)

The data analysis used to obtain the factors causing the vulnerability of traditional fishermen households was linear regression. This analysis described the relationship of the vulnerability of fishermen households and the factors affecting it. These factors included the age of the household head, number of household members, fish production, capital, total income, and technology. The model of linear regression analysis can be described as follows:

$$KER = \beta_0 + \beta_1US + \beta_2JAR + \beta_3P + \beta_4M + \beta_5YRT + \beta_6D + e \dots\dots\dots (1)$$

Where :

- KER : Vulnerability score of fisherman's household
- $\beta_0$  : intercept
- $\beta_1... \beta_6$  : Parameter coefficient
- $\beta_1$  : Age of Household Head (Years)
- $\beta_2$  : Number of Household Members (People)
- $\beta_3$  : Fish production (ton/year)
- $\beta_4$  : Financial Capital (Rupiah/year)
- $\beta_6$  : Fishery income (Rupiah/year)
- $\beta_5$  : Technology, in dummy
- 0 : Motorboat Fishermen
- 1 : The Outboard Motorboat Fishermen

**EMPIRICAL RESULTS AND DISCUSSION**

**1. Analysis of the Vulnerability Condition of Fishermen households**

The vulnerability analysis of traditional fishermen households was done by weighting and rating the indicators for each condition of the risk elements found in the field. Indicators of the vulnerability variables of traditional fishermen households used in this research included income, education, employment, spare time, work time, technology, location accessibility, house ownership, number of household members, and number of children in the household.

The weighted value indicated the potential value of increasing the vulnerability of fishermen households. Analysis of household vulnerability with local scale conducted through household surveys, making weighting and rating of each indicator of households vulnerability could be identified from the characteristics of the community in Tanggamus Regency. The score results of vulnerability were then grouped into three (3) vulnerability level categories: (1) low vulnerability level with a score of 30-40, (2) moderate vulnerability level with a score of 41-50, and (3) high vulnerability level with a score of 51- 60.

From data results by counting the score on the motor boat fishermen of 112 respondents and the outboard motor boat fishermen of 88 respondents, the vulnerability level of fishermen households varied and became the determinant variable of the vulnerability score level of fishermen households in Tanggamus Regency. The distribution of the household respondents of motor boat fishermen and outboard motor boat fishermen based on vulnerability level can be seen in Table 2.

**Table 2: The Household Respondents of Modern Fishermen and Traditional Fishermen At Vulnerability Level in Tanggamus Regency, 2017, in percent (%).**

No	Variables	Modern Fishermen			Traditional Fishermen		
		Percentage of vulnerability level			Percentage of vulnerability level		
		Low	Medium	High	Low	Medium	High
1	Income	56	38	6	5	75	20
2	Education	11	85	5	3	76	21
3	Employment	46	49	5	26	51	23
4	leisure	28	56	16	9	46	45
5	Working Time	92	8	0	74	24	2
6	Location accessibility	61	27	12	38	24	39
7	Homeownership	56	38	6	64	34	2
8	Number of household Members	9	90	1	22	77	1

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9	Number of children	79	20	1	72	28
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Sumber : Data Primer, Diolah, 2017

From data results it was found that the income of most of the modern fishermen households were on the score level of low vulnerability while the average of the traditional fishermen households were on the score level of medium vulnerability. It was because the modern fishermen had bigger boat, that during bad weather and large waves, they were still able to go to sea as usual and generate income to meet the needs of the fishermen households. In addition, the modern fishermen usually had a large capital to pay for labor and expenses during fishing, thus the average of modern fishermen had large incomes around IDR 1,000,000.00 up to IDR 3,000,000.00. Whereas the traditional fishermen only had a small boat with the capacity of 2 to 3 people and the income ranged from IDR 500,000.00 until IDR 1,000,000.00. At the time of big waves, the fishermen could not go to sea, so the traditional fishermen were very vulnerable to be poor.

The average of modern fishermen had other jobs like farming, trading and service providing. Thus the fishermen had other source of incomes to meet the minimum needs of the fishermen households. The vulnerability score level of modern fishermen was at low level of 46 percent (%) and at a moderate level of 49 percent (%) in Tanggamus Regency. The traditional fishermen had high vulnerability score level of 23 percent (%), it was because only a few of the fishermen had other job. The fishermen only relied on fishing in meeting the needs of their households. This was also due to the lack of opportunities for the fishermen having other job e.g., the limited capital, expertise to work in other fields, and other experience than fishing.

The spare time of the traditional fishermen was only occasionally done for work, only 9 percent (%) of them using the spare time to work outside fishing. Moreover, only 46 percent (%) of the traditional fishermen occasionally used the spare time to work outside fishing. The traditional fishermen were on the medium vulnerability level score with the tendency of vulnerability. It was because the fishermen were not yet mature economically, still do not have enough capital, not fully able to work outside fishing during bad weather and high waves for approximately two (2) to three (3) months. When the fishermen could not go to sea, the fishermen who only occasionally work outside fishing had moderate vulnerability levels and easily entering the high vulnerability level category.

Working time affected the vulnerability score level of fishermen households, 92 percent (%) of the modern fishermen used average work time of 1 man-day. The modern fishermen had a lot of time to go to sea because the boat and its motor were big, e.g., the fishermen would work in two (2) trips. On the first trip, the fishermen went to sea from 03.00 PM and would come home in the

morning at 07.00 AM, and on the second trip, the fishermen would go to sea at the afternoon around 03.00 PM and would come home at 07.00 AM. However, the trips to sea were not always the same in every area in Tanggamus Regency.

Location accessibility determined the vulnerability level of fishermen households. The average of the modern fishermen had low vulnerability level score. It was because 61 percent (%) of the modern fishermen had close access to the Capital City of Tanggamus Regency, and most of them were in Kotaagung District which had port and Fish Auction House (TPI) facilities. Such facilities helped the fishermen in marketing their fish. The presence of TPI would automatically make the selling price of fish higher than in areas with no TPI. The average of the traditional fishermen had low accessibility from the Capital City of Tanggamus Regency by 39 percent (%). From the result of the research, it was found that location accessibility affected the vulnerability score level of fishermen households.

The number of children in the family also determined the vulnerability level, in which households with few children tended to be low in vulnerability. This was due to the role of wives who could help increasing the family economy with their income contribution. Fishermen households with a larger number of children had a high level of vulnerability. It was because the wives spent more time at home taking care of the children that they could not contribute to the household income.

Fishermen who belonged to high vulnerability category usually owe money from siblings and neighbors to meet the minimum needs of the fishermen households for not being able to go to sea. At the time of fishing season and the weather improves the fishermen could pay the debt from the fishery income. This behavior that made fishermen in already high vulnerability level difficult to change, and the bad habit of debt behavior made the fishermen difficult to get out of poverty.

## **2. Analysis of Factors Causing the Vulnerability of Fishermen households.**

In multiple regression analysis, regressions were performed two (2) times for dependent variables, i.e., modern fishermen and traditional fishermen with 6 independent variables, i.e., age of the household heads, number of family members, fish production, capital, technology in the form of dummy, and total income.

Analysis of the traditional fishermen resulted in F value of 18.721 with F significance of 0.000. A very small F Significance value indicated the regression model could explain the diversity of fishermen households vulnerability. The result of goodness of fit ( $R^2$ ) was 0.581, meaning 58,1%

of the model could explain the dependent variables, while the rest was explained by other variable not included in model.

After all statistical tests had been performed, the results showed that the model was feasible and there was no deviation of the linear regression assumption. The next step was the interpretation of the results obtained for each variable. The coefficient value obtained described the elasticity of each variable. The following was the interpretation of the coefficients for each of the independent variable. Vulnerability model estimation results can be seen in Table 3 below:

**Table 3: Estimation of Vulnerability Model**

No	Variables	Modern Fishermen		Traditional Fishermen	
		Coeffisient	Significant	Coeffisient	Significant
1	Constants	26,318	,000	27,497	,000
2	Age of Household Head	-,004	,848	-,002	,922
3	Number of Household Members	,059	,806	,218	,345
4	Production	-,001	,055*	-,001	,008*
5	Capital	-3,705	,051*	-3,704	,050*
6	Fishery Income	-7,588	,045*	-1,123	,609
7	Dummy	-,837	,257	-,270	,025*

**1. Age of Household Head**

Variable of the age of the household head in both modern fishermen and traditional fishermen did not significantly affect the vulnerability of fishermen households. It was because the average age of respondent household heads was 41-year-old or in productive age that the increasing age of household heads had not significantly influenced yet.

The result of this research was in accordance with the research of (Thabane 2015), which states otherwise that the increasing age of household heads in Maphutseng causing the status of household vulnerability increased or higher. The household heads with younger age tend to have low vulnerability status.

**2. Number of Household Members**

Variable of the number of household members in both modern fishermen and traditional fishermen did not significantly affect the vulnerability of fishermen households and was positive. This was due to the large number of household members, the need for food and non-food

consumption would increase that the probability of the fishermen being poor would also be higher. In Tanggamus Regency, for fishermen with more than five (5) household members, the average economy of the fishermen households was below the poverty line.

This result was in accordance with the research of (Abebe, 2016). In Abebe's research, the coefficient of household member numbers is positive and statistically significant at 1% level of significance. This implies that the large number of family members increase the consumption. According to this research, with the increasing number of family members, the probability of being poor or the vulnerability to poverty increased significantly.

### **3. Production**

Variable of production in both modern fishermen and traditional fishermen significantly affected the vulnerability of fishermen households and was negative with the coefficient value - 0.001, meaning that when production increased it would decrease the vulnerability score level. This was in accordance with the research hypothesis that fish production positively affected the vulnerability level score of fishermen households.

The fishermen in Tanggamus Regency with high production were the modern fishermen, it was because they had large boats and motors that even in bad weather the fishermen still can do activity as usual. In addition, the modern fishermen used nets, and hired between 5 to 10 crew to transport the net that the production of the modern fishermen was higher than the traditional fishermen. This research was in accordance with (Yang, 2014), in which the result of his research indicates that fishery production is a factor causing poverty and vulnerability.

### **4. Capital**

Variable of capital in both modern fishermen and traditional fishermen significantly affected the vulnerability of fishermen households. Capital significantly affected the vulnerability score of fishermen households and was negative. Capital was much needed by fishermen to be able to go to sea, because the process of fishery production required capital for the costs of consumption during fishing, labor, and fuel. If the fishermen had large capital, they could go to other place further and had higher production.

This result was in accordance with the research hypothesis which stated capital negatively affected the vulnerability score of fishermen households. The result of this research was in accordance with the research of (Edoumiekumo et al. 2014). Expenditures on education, health and food are the determinant factors of poverty vulnerability. The result of Yang's (2014)

research also states that household structures, capital, education, and location play an important role in determining whether the household is poor or not.

### **5. Fishery Income**

Variable of fishery income in both modern fishermen and traditional fishermen significantly affected the vulnerability of fishermen households. This result was in accordance with the research hypothesis that income negatively affected the vulnerability score of fishermen households. Fishery income in Tanggamus Regency became the determinant factor of the vulnerability of fishermen households, it was because the average of the fishermen only relied on fishing as the main livelihood. Only a portion of the fishermen had job outside fishing or as much as 60 percent (40%) of the fishermen did not have job outside fishing.

The result of this research was in accordance with (Kakota et al. 2015) research which indicates that the main determinants of household vulnerability are income, size of household, land area and access to climate information.

### **6. Dummy Technology**

Variable of dummy in both motor boat fishermen and outboard motor boat fishermen did not significantly affect the vulnerability of fishermen households. The results of this research were in accordance with the research hypothesis that technology negatively affected the decrease in vulnerability scores of fishermen households. The technology used by the fishermen greatly affected the fish catch. Modern technologies such as the use of nets greatly affected the fish catch, the fewer amount of labor, and the less fishing time in comparison with the fishermen using simple technology.

## **CONCLUSION AND FURTHER RESEARCH**

The conclusions obtained from this research are:

1. The vulnerability level condition of traditional fishermen households in Tanggamus Regency is high on the variables of income, education, employment, spare time, and location access. Whereas the average of the vulnerability level condition of modern fishermen households are moderate and low.
2. The factors causing the vulnerability of fishermen households are (1) number of Household members, (2) production, (3) capital, (4) fish income and (5) technological dummy.

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