



Fishermen's Adaptation Due to Global Climate Change

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Abstrak. World climate change is a real phenomenon that occurs today. The impact of climate change is certainly significant enough to affect all human life so the purpose of this article is to describe fishermen's adaptation to climate change and the strategies needed as conceptual solutions to current problems, especially in traditional fishermen. This article uses a literature study method where the data obtained are compiled, analyzed, then draw conclusions. Data type, is secondary data. Data collection techniques through stages are data from libraries. Then it is read, recorded, then processed. The results of the study show that fishermen's adaptation strategies in facing famine due to climate change can be done through several strategies, such as adaptive behavior, adaptive Strategies, and adaptive processes. For this reason, the ability of all family members is needed to manage the various assets they have for their survival, by managing labor assets and human capital assets, such as involving wives and children and utilizing the status or capacity of other family members according to their skills and education. However, for traditional fishing families with low socioeconomic level conditions, in order to sustain to meet the needs of their families, a coping strategy is needed, namely, by increasing income through the use of other resources or reducing expenditure through reducing the quantity and quality of goods or services. In addition, it can also use a family livelihood strategy by applying a dual income pattern which is part of the economic strategy.

Kata kunci: *Adaptation; Strategy; Traditional Fishermen; Climate Change*

A. INTRODUCTION

Since a long time ago, Indonesia has been known as an archipelagic country and characterized by a maritime country. As an archipelagic country, it is known as a country with a lot of natural resource potential. Natural resource management in Indonesia, especially in coastal and marine areas, is important for the community and the Government. The vast area of the ocean in Indonesia which reaches 70 percent can be utilized to manage aquatic and marine resources optimally in order to produce fishery products optimally as well. This depends on the quality of the human resources of coastal communities and the fishermen who manage them.

Human resources who manage the production of marine products are commonly known as fishermen. According to Retnowati (2011), fishermen are people who actively fish in waters or at sea. The working environment of fishermen is in coastal areas, coastal areas are villages located in the coastal range where some of the residents work as fishermen. Therefore, as an archipelagic country that most Indonesian people who live in coastal areas generally make a living as fishermen. According to the Ministry of Marine Affairs and Fisheries, the number of fishermen at sea in 2016 was 2,265,859 people, the majority of whom were coastal communities. In addition, 25.14 percent of Indonesia's total poor population are fishermen.

The obstacle faced by fishermen when going to sea today is a natural obstacle called climate change. World climate change is a real phenomenon that occurs today. Climate and weather anomalies can be seen through rising temperatures at sea and land level which make it difficult to form rain-bearing clouds. The uncontrollability of global warming has been revealed through a UN report. It is based on 14,000 scientific studies, and IPCC reports on how climate change is changing nature – and what risks the future holds. The impact of climate change is certainly quite significant affecting all human life.

Climate change on the other hand causes fishermen to experience famine periods. According to Rindayati (2013) that climate change is a change that refers to the average variation in climatic conditions of a place with a long period of time. Climate change is something that can interfere with their work activities to go to sea. Climate change is a phenomenon that is often experienced by fishing communities that has a broad impact on their work, because this extreme weather is a very dangerous condition for fishermen because it is very vulnerable to disasters, especially accidents such as sinking boats during fishing operations.

Meeting the needs of traditional fishing households requires income, especially from fishing as their basic work. In the lean season, the production of traditional fishermen's catches (outboard motorboats and non-motorized boats) on the west coast of Barru Regency will affect the level of fishing business income, so that the impact on fishing business income will naturally also have an impact on the welfare of fishermen's families. The low catch results caused by the famine season and the fishing season when the moon is bright were reported by Rahim (2016). In addition, that one of the complaints or problems faced by fishermen in Barru Regency is the plummeting income caused by the entry of a number of bagang boats from outside the Barru area.

The decline in fishermen's income can be seen in that season, sometimes even losing money. On the other hand, the increasing number of vessels from outside the area exploiting Barru waters is considered by them as one of the factors. Although the most basic problem as an obstacle for them / fishermen is climate change which affects the income and sailing activities of these fishermen. There is no other choice for fishermen especially in times of extreme weather while they have to go to sea to cover the needs of their families. In addition, it is necessary to make adaptations for fishing families.

Adaptation in this case as an adjustment measure in reducing vulnerability according to a certain scale in fishing communities and coastal communities. According to Owombo et, al (2014) that adaptation is one of the policy options to reduce the negative impacts of climate change. Adaptation is important considering that fishermen are still quite difficult to change the work patterns that have been applied so far and choose a vacuum if weather conditions do not support fishing activities. Meanwhile, that women fishermen dominate working in processing fishery products and selling fish.

Based on the results of TribunBarru.com monitoring in the coastal area of one of the fish-producing areas in South Sulawesi Province, namely Barru Regency reported that a number of fishing boats were seen idle during the transition season. The boats can only be displayed or parked along the coast of Ujung Batu. One of them admitted that he had not gone to sea since the end of December 2019. That's because of extreme weather and large wave currents. Similarly, the atmosphere at the Fish Auction Place (TPI) located in the coastal area of Barru Regency looks quiet. These obstacles are problems that are often faced in the lives of fishermen, especially traditional fishermen. To overcome problems like this,

fishermen's adaptation to climate change and strategies are needed as conceptual solutions to current problems for traditional fishermen.

B. METHOD

This article uses a literature study method where the data obtained are compiled, analyzed, then get conclusions (Mardalis, 1989). Type of data, which uses secondary data. Data collection techniques, namely through the stages of taking data from the library, reading, recording, then processing data.

C. RESULTS AND DISCUSSION

1. Fishermen's Adaptation Strategy

In essence, strategy means things related to the way and effort of the community, or a nation achieves its goals (Moertopo, 1974). Furthermore, (Kadarisman & Jannah, 2015), interpret strategy as a calculation of a series of policies and implementation steps but Wahyudi (1996) said that strategy is to do something right.

Adaptation is an adjustment to the environment. In general, adaptation leads more to self-adjustment in the physical, physiological and biological sense. Where people must be able to adapt themselves to the environment and nature. Life in the world is inseparable from changes in an environment. The physical, biological, and social environment of humans will always change from time to time. For these changes, humans and even all living organisms in the world need to make adjustments so that they can still maintain their lives, in the sense of the word they can still meet the needs of life they need. So adjustment to changes or groupings in a surrounding environment is an act of adaptation (Fuad, 1989).

The adaptation of the community as a whole is more promising to result from the pressure of variation selection on which it is subject and from the degree of variation in resistance to adaptation in different objectives. Adaptation is not always linked to normative affirmations of the environment, but in some way to patterns of the environment or simply to conditions that are ethretized. Adaptation should be seen as a cultural response or a process open to a process of modification in which it countermeasures the conditions for life by selective reproduction and extends it. Measures work based on the adaptation involved, and more importantly, on the hazards / risks where change is adaptive. In this study, researchers wanted to know how fishermen adapt as a survival strategy when facing uncertain seasons due to climate change that occurs.

According to Kaplan (2002) adaptation is one of two central concepts in cultural ecological theory. A feature in cultural ecology is concern with adaptation at two levels: first, with respect to the way the cultural system adapts to its total environment, second, as a systemic adaptive consequence it is concern with the way institutions within a culture adapt or adapt to each other.

The process of adaptation is one part of the process of cultural evolution, which is a process that includes a series of human efforts to adapt or respond to changes in the physical and social environment that occur temporarily. Environmental changes that greatly affect human adaptation are environmental changes in the form of disasters, namely events that pose a threat to the survival of organisms including here are humans.

Human self-adjustment is generally called adaptation. Adaptability has value for survival. The greater the adaptability of man, the more he can occupy diverse habitats. Adaptation is needed in seeing the relationship between humans and the environment. The concept of adaptation as a process that occupies humans as actors who strive to achieve goals

and needs to face changing environments and social conditions in order to survive. While in the process of adaptation to achieve goals and needs individually or in groups, he can move or utilize the social, material, technological resources and knowledge he has, both holding social relations with parties inside or outside his community (Pudja, Malonda, AM, & Wangke, 1989).

Adaptation according to Bennet is not just a question of how to get food from a particular region, but also includes the problem of transforming local resources by following models and standards of common human consumption standards, as well as costs and prices or modes of production at the national level. Adaptation has indeed become very broad and can even be said to cover almost all patterns of human behavior in everyday life (Lampae, Sairin, & Ahimsa-Putra, 2005).

Bennet also explains that only behavior related to goal achievement or problem solving can be said to be adaptive. More specifically is the behavior to overcome difficult obstacles, which include limited or scarce resources to achieve certain goals or realize desired expectations (Lampae et al., 2005). Based on the understanding of adaptation proposed by Bennet, it can be seen that adaptation covers a wide range of things, it can even be said to cover almost all patterns of human behavior in everyday life. Adaptation strategies themselves are divided into the following sections, namely adaptive behavior, adaptive Strategies (adaptive strategies) and adaptive Proseses (adaptive processes) (Lampae et al., 2005). The explanation of the three forms of adaptation according to Bennet is:

a. *Adaptive Behavior*

Adaptive behavior is the main mechanism or way of relating to people that aims to achieve goals and solve problems.

b. *Adaptive Strategies*

Adaptive strategies are patterns formed from the separate adjustments that people find and aim to obtain and use resources and to adapt to the problems that attack them.

c. *Adaptive Proseses*

Adaptive processes are changes that occur over a relatively long period of time that are carried out repeatedly with various strategies or make various adjustments.

There are two different ideas regarding the term survival (survival strategy of a society). According to Sajogyo (1982), Mosher talks about survival by upper and middle layer farmers while Scott (1993) discusses lower/poor farmers. Survival as the ability of all family members to manage various assets they have. Based on this concept, it created an analytical framework that covers various asset management including:

- a. *Labour assets*, For example, increasing the involvement of women and children in the family to work to help the economy in the household (labor in the family-TKDK and Labor Outside the Family-TKLK).
- b. *Human capital assets*, for example, utilizing health status that can determine people's capacity to work or skills, and education that determines return or work results (Return) to the labor expended.

Coping strategies are as a series of actions chosen standardly by individuals and households who are middle to lower socioeconomically. Through a strategy carried out by a person, can increase income through the use of other sources or reduce expenditure through reducing the quantity and quality of goods or services.

In addition, survival strategies apply a dual livelihood pattern that is part of the economic strategy. In addition, Suharno (2003) stated that survival strategies (coping strategies) in overcoming economic shocks and pressures can be done in 3 ways, namely:

- a. Active strategy, which is a strategy that optimizes all family potential. For example, doing their own activities, extending working hours, utilizing wild resources or plants in the surrounding environment and so on.
- b. Passive strategy, which is to reduce family expenses. For example, costs for clothing, food, education and so on.
- c. The networking strategy is to make connections with others. For example, establishing relationships, both formal and informal, with the social environment and institutional environment. For example, borrowing money with neighbors, owing money at stalls, taking advantage of poverty programs, borrowing money from banks and so on.

2. The Impact of Famine Due to Climate Change for Fishermen

Being in an area that is mostly water, does not necessarily mean that Indonesian fishermen experience a significant increase or welfare in life. One of them is due to the famine season caused by some damage to marine ecology accompanied by extreme climate change recently. Climate change refers to changes that occur in the climate over time either naturally or caused by human activities. This has an impact on reducing living income for fishermen.

According to Diposaptono et al., (2009) there are four impacts of climate change that cause famine on fishermen's activities. First, there is a change in fish migration patterns due to changes in sea surface temperature. Second, there is a stratification of the water column that affects the upwelling process which is positively correlated with fish schooling, and in itself makes it difficult for fishermen to catch fish. Third, there is a change in fishing ground. Fourth, the fate of fishermen is getting worse due to the need for greater time and costs to go to sea due to migration and damage to fishery habitats and fishing grounds. Thus, fishermen's catch is reduced which causes a decrease in their livelihood.

This is exacerbated by damage to coral reefs which are the place where marine life lives. The damage caused to coral reef ecosystems ultimately affects fish populations and can have implications for marine activities and the economy of fishermen which can prolong the occurrence of famine seasons. In addition, according to Patriana and Satria (2013) that there are several impacts of climate change that cause famine seasons on the lives of fishermen, namely:

- a. Impact on environmental health and community settlements . In some areas there is drought, while in some other places there is good quality water. Meanwhile, if the rainy season is prolonged, the amount of water will be abundant, but the quality decreases. The resulting water is milky white with a high lime content. Another impact of climate change is the increase in extreme weather that has the potential to endanger the lives of coastal residents.
- b. Impact on capture fisheries activities In fisheries, famine causes a decrease in fishermen's catches triggered by the difficulty of determining fishing areas, difficulty determining fishing seasons, increased risk of fishing and disruption of access to marine activities. According to Yuliana, et al (2016) that if bad weather comes, most of the fishermen can only stay at home while waiting for the weather to return to good. During that period some of the fishermen did not work at all so they had no income for their households.
- c. Another impact of global climate change is the phenomenon of El Niño (rising temperature of the Pacific Ocean) and La Nina (decreasing temperature of the Pacific Ocean) which affects oceans around the world. The occurrence of El

Niño and La Nina will result in changes in ocean circulation and change marine habitats (Allison et al., 2009). They found that rising seawater temperatures would limit primary production, increase coral bleaching and reduce the biodiversity of some ecosystems.

The La Nina anomaly causes average ocean waves reaching three meters in the period April to September. This condition has enormous consequences for fishing for fishermen. Fishermen will need more fuel to be able to sail well during high waves. High waves also have the impact of not being able to sail fishermen's jukung. Rising sea surface temperatures have consequences for coral bleaching, shifting habitats and the loss of marine species. In addition to the direct impact on fisheries, increasing sea wave height has implications for aquaculture activities and water supplies of coastal communities (Moegni, Rizki, & Prihantono, 2014).

Losses due to the impact of famine suffered by coastal communities, capture fishermen, and cultivators including fishermen require greater time and costs to go to sea due to migration of fishery habitats and fishing grounds (Nurlaili, 2012). Plus sea level rise results in high sea wave intensity. This is in the destruction of coastal buildings and infrastructure and threatens the safety and lives of fishermen (Yao-Dong et al., 2013). Kusnadi (2003) revealed several patterns carried out by poor fishermen such as the involvement of family members, job diversification, and the use of social networks.

So it can be concluded that the famine season in the aquatic environment can change coastal management procedures and socio-economic stability there. This condition makes capture marine fisheries management must develop strategies to be able to adapt to climate change.

3. Fishermen's Family Livelihood Strategy Facing Famine

Strategy is an overall approach related to the implementation of ideas, planning, and execution of an activity over a period of time. Work as a fisherman basically contains many risks and uncertainties. The existence of these risks and uncertainties is recommended to be circumvented by developing adaptation patterns in the form of specific economic behaviors that affect economic institutions (Azril Mohamed Shaffril, Abu Samah, Lawrence D'Silva, Sulaiman, & Yassin, 2013). The livelihood strategy of fishermen's families is an effort by fishermen on the coast to adjust their conditions to climate change that occurs in order to continue working in the midst of existing changes. According to Patriana and Satria (2013) here are some forms of strategies carried out by fishermen:

- a. Climate Strategy . The difficulty of obtaining catches in a fishing area encourages fishermen to adopt an adaptation strategy that among fishermen is commonly referred to as the "fish season chasing strategy". This strategy is a form of adaptation carried out by fishermen if the surrounding waters experience a famine period.
- b. Strategy for coastal resources . Strategy on coastal resources Coastal resources is a form of economic strategy through the use of coastal resources to produce various commodities of economic value without going to the high seas. One potential resource is mangroves. Although not in very good condition, the waters in this mangrove area still provide fishery products that are useful for fishermen. One of the commodities of mangrove areas with high economic value is mangrove crabs. This mangrove crab search activity is also one of the alternative adaptation patterns carried out by fishermen. When weather

conditions do not allow to go to sea. Even in lean seasons, many fishermen look for mangrove crabs as a substitute commodity to cover their daily needs.

- c. Strategies in using the allocation of human resources in the household
- d. When the fish season is erratic and the frequency of fishing is decreasing, fishermen's children often look for catches in mangrove areas, either with fishermen (fathers) or with other fishermen's children. Fishermen's wives also play a role in saving the family economy by doing other businesses such as full-pressure processing.
- e. Livelihood strategy through escaping from fisheries. Dharmawan (2007) suggests that in the sociology of living, the notion of livelihood strategy leads more to the understanding of livelihood strategy than means of living strategy. A livelihood strategy is a livelihood consisting of assets (natural, physical, human, financial capital, and social capital), activities, and access (mediated by institutions and social relations) that together determine the lives of individuals or households.

From day to day, income from the sea that is increasingly insufficient for the family's economic needs, as well as limited facilities owned causes some fishermen to decide to no longer work as fishermen and look for new jobs. There are two jobs that are usually the purpose of this profession, namely factory workers and farmers. Work as a laborer is in demand because of the certainty of income obtained. Second is the farmer. Fishermen tend to choose to change professions to become farmers based on the availability of available resources.

Indonesia is a country that has great marine wealth, so it is expected to contribute food and economic contributions to society. Fishermen are one of the jobs that play a big role in processing existing marine resources so that they can be utilized properly. However, the current climate change conditions have caused many fishermen to adapt to climate change.

Diposaptono (2009) defines climate change as an effort to overcome the impacts of climate change both reactive and anticipatory. While climate change mitigation as an effort made to reduce greenhouse gas emissions from the source or by increasing nature's ability to absorb these emissions. The following presents a number of adaptation strategies that can be done by communities in dealing with climate change in coastal areas.

From several strategies that have been described above, what is often done by the community in Barru Regency is a strategy in using the allocation of human resources in the household. As stated by Rahim (2016) that in improving the household economy, it is necessary to have the role of fishermen's wives in working to meet their needs through empowerment such as fisherwomen institutions, access to capital, community-based capture fisheries resource management because if fishermen find it increasingly difficult to earn income, the party who most burdens to bear life in fishermen's households is the fisherman's wife or women / women.

According to Widodo (2009) explained that the role of women is also one of the hopes in the development of sustainable livelihood strategies. Women are required to be able to carry out productive activities to earn additional income in addition to maintaining the household and children. So it is concluded that, the forms of strategies carried out by these fishermen are expected to continue to cover economic life in meeting the needs of life.

D. CONCLUSION

Fishermen's adaptation strategies in facing famine due to climate change can be done through several strategies, such as adaptive behavior, adaptive Strategies, and adaptive processes. For this reason, the ability of all family members is needed to manage the various assets they have for their survival, by managing labor assets and human capital assets, such as involving wives and children and utilizing the status or capacity of other family members according to their skills and education.

However, for traditional fishing families with low socioeconomic level conditions, in order to sustain to meet the needs of their families, a coping strategy is needed, namely, by increasing income through the use of other resources or reducing expenditure through reducing the quantity and quality of goods or services. In addition, it can also use a family livelihood strategy by applying a dual income pattern which is part of the economic strategy.

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