Marine Resource Conservation for Sustainable food security in Indonesia

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Abstract. This paper examines the local wisdom of fishing groups on local marine resource conservation for sustainable food security. Pariaman is a region of coastal areas and have small islands tend to have limited agricultural resources and access to food from outside. The problem that forced a fishing community to commit acts of adjustment so that the food needs can be met sustainably. Data were collected from a small number of fishing households in the village of Pariaman Tengah in Pariaman city, using mainly qualitative research methods. At the village, traditional fishing areas have been properly benefited by local fishermen. Together with the government, they have conserved the area, where sea turtles, some species of finfish, coral reefs are protected. It was found that the local wisdom use consists of determining the season of fishing, making traditional fishing gear and sustainable food security for the household. They have the local wisdom for resource conservation are using no harmful gears, a commitment not to catch and kill the turtles and commitment not to throw rubbish into the sea. Based on these results, it can be concluded that fish as a critical food source by fishing groups in ensuring sustainable food security system in agricultural production systems, distribution, and food consumption. Industrial fisheries can also contribute to the food security and nutrition of the poor in Pariaman fishing groups, especially when they favor the wide commercialization of cheap, easily stored and transported nutritious pelagic fish such as sardine, pilchard, herring, anchovy or even tuna. Over the years, indirectly to food security through employment creation where legislation to protect decent working conditions is in place become a tradition.

Keywords: West Sumatra, Fishing Groups, Fish, Coastal Area, Local Government

1. Introduction

Indonesia is a world’s largest archipelagic state, boasting 17,480 islands and 95,181-mile coastline, approximately 18.4% of the world’s coastline. Indonesia marine area are known for its wealth and diversity of natural resources, both renewable natural resources such as fisheries, mangrove forests, coral reefs and others, and unrenewable such as minerals [1] [2]. In principle, all elements of marine natural resources are interdependent and influence each other as a unified system of life support. Conservation efforts are important in maintaining sustainable natural resources, by establishing enclaves of natural areas that are considered representative of various types of ecosystems and managed as conservation areas.

Pariaman is a part of the management as a conservation area from West Sumatra Province administrative area in accordance with Law No. 12 Year in 2002. Pariaman is a very strategic area in
the future because six small islands, namely the Kasiek Island, the Angso Island, the Tangah Island, the Ujung Island, the Bando Island and the Gosong Sibarat Island, support it [1]. This coastal area faces directly with the Indonesian Ocean or Indian Ocean, it consists of 4 sub-districts are Pariaman Timur, Pariaman Barat, Pariaman Selatan and Pariaman Tengah, with 84,709 inhabitants with a population density of 1,001 inhabitants/km² [3]. The people are Muslim (100%), due to the homogeneous community that mainly comes from Minangkabau ethnic and the Malays [4], see Map I.1. The marine potential resources are quite rich in this region; there are many types of seafood such as tuna, mackerel, grouper fishes, super anchovies, seaweed, and pearl shell.

Map I.1 Geografical Position of Pariaman
In West Sumatra of Sumatra’s island

Pariaman has about 12 km of coastal where artisanal fishing is an important economic activity. However, fishery resources have been coming under increasing pressure. Major increases in fish catches are unlikely in the near future. Artisanal fishermen are contributing to the degradation of marine resources because intensive fishing in certain areas can affect the ecological balance and result in a loss of fish stock [4]. Many coastal inhabitants depend on marine resources for their livelihoods, with coral reefs playing a particularly important role [5].

In addition to providing construction materials, ornamental objects and medicinal products, coral reef harbor many fish species. Coral reefs provide feeding, spawning and breeding grounds, as well as shelter and refuge from predators for the young fish and form the backbone of artisanal fishing along this coast. Based on the results of Bung Hatta University in 2001 [1], live coral cover in this region is 20.92% in the Kasiek Island, 12.47% in the Angso Island, 9.67% in the Ujung Island, and 14.48% in the Tangah Island. The coral consists of Acropora and non-Acropora. While there are other biotas in the Pariaman waters, among them have the commercial value such as oysters, scallop, mussels, and clams.

Pariaman contains some of the most biologically diverse coral reef habitats. This research has generated a significant contribution to the scientific literature, predominantly written from a conservation angle. Where these hotspots overlap with significant fishing communities, the relationship between fisheries and conservation has been reported ([6][7][8]. But outside of these research hotspots, peer-reviewed published research exploring poverty in Indonesian fisheries is limited. Much of the published research available since 2005 can be divided into a response to the
Asian tsunami [9][10][7], global overviews of fisheries that touch on Indonesia [11][12][13][7], and lessons learned from Integrated Coastal Zone Management in Indonesia and the Philippines [14][15][7].

Faced with reduce catches and more competition from fellow artisanal fishermen as we as newcomers, local fishermen and actually tourism, a possible livelihood alternative lies in income diversification. Many fishermen are already involved in other income-generating activities. Based on research in 2014, Zamzami [16] report that four-five of the fishers in a household had diversified their income in some way. Dermawan [1] mention that household in Pariaman has a mean of 2.1 occupations per household.

Income diversification is a survival strategy in rural households across Indonesia [10][5] and is also a favored strategy for reducing risk. Diversification is expected to improve a household’s income, resulting in higher income and/or a better income spread. Not only fishermen have started to diversify their livelihoods, many coastal farmers are now also seeking to diversify their sources of income. An increasing number of households are turning to fishing and in one of the companion surveys, more than 80% of Pariaman fishers were first-generation fishers with the father not being a fisherman [8].

Once a part of the Malay peasant economy [17][18][19], the fishing economy in Pariaman coastal has now lost its basic peasant characteristic. Their mode of production has been replaced by a new mode of production based on capitalism in the sphere of both production and exchange. The social relations of production were transformed traditional, information, family, kinship or communal-based ties were transmuted into the new formal labor-capital relationship. The economic transformation of the Pariaman coast, fishing economy led to the disappearance of traditional small scale production, which was replaced by relations of production and exchange pertinent to capitalism, especially exist of marine conservation and tourism.

Pariaman coastal is an important fishing settlement located at the West Sumatra coast and become a tourist area. Coastal communities in Pariaman based on socio-cultural of the Minangkabau ethnic built on a blend of sea maritime culture that is restricted to the values of local wisdom. In an effort to harmonize, maintain, and preserve cultural values and local wisdom in the context of spatial planning, the government needs to do some efforts on various aspects of the levels of spatial planning [20][21]. In addition, the relationship between culture and the potential of spatial planning, a need to accommodate local cultural values/customs into positive law. Along with the improvement of technology and cultural transformation towards modern life and the influence of globalization, the cultural heritage and local wisdom values of the indigenous peoples to face challenges to its existence [22]. Care should be taken because of the cultural heritage and local wisdom values that contain a lot of local knowledge that is still very relevant to current conditions, and should be preserved, adapted or developed even further. In addition, studies on fisheries cultural heritage and local wisdom have been carried out by Mubyarto [23] who studied Fishermen and Poverty; Syarifuddin [24] studied the Magic Words of Bajo Fishermen; Fernandez [25] studied Category and Linguistic Expressions in the Javanese language as a reflection of the speakers

The focus in this paper is on the access that the fishing groups have local wisdom, their identity once they start fishing, the fishing gear they use and the fishing grounds they frequent. The central research question concerns the livelihood, local wisdom strategies, and sustainable food security of the fishing groups and what their entry in the marine resource conservation, implies for the state of fishery resources.

2. Research Methods
This study used a qualitative approach with an ethnographic analysis. The aim is to describe in detail and interpret the livelihood strategies, local wisdom, and sustainable food security of the fishing groups and related with the marine resource conservation. The data collection is done by observation and in-depth interviews. As in ethnographic studies, this research will produce descriptive data in the form of words, written, oral and behavioral in the fishing community. Subjects were local fishermen and traditional leaders. Field research conducted by using the following steps: (1) the initial
observation roomy introduction, (2) the collection of field data, (3) the analysis of field data [26][27][28]. Field data analysis carried out simultaneously in line with the findings of field data and research stage.

3. Results and Discussion

3.1 Pariaman Geography and Marine Resource Conservation Area

The research location is in Pariaman city. Administratively, Pariaman has marine protected areas are the Ujung Island, the Tangah Island, the Angso Island, and the Kasiak Island. See picture 1.1. While geographically, the Ujung Island, the Tangah Island, the Angso Island, and the Kasiak Island are located at the geographical position 100°05’58”- 100°06’66” South Latitude and 0°34’21”- 0°39’54” East Longitude, has a total area of approximately 2,298.35 hectares. Pariaman and the small islands surrounding it has a tropical climate with temperatures ranging from 25°C-26°C or an averaged of 25.59°C, the average humidity is 85.59%, average air pressure of977.18, rainfall average of more than 298 mm/year and wind speed ranges from 1.0 -1.7 knots. The temperature of coastal waters and small islands in Pariaman ranged from 30-31 °C, with an average salinity of the waters around 33-34 ppm, and brightness levels ranging from 5-8 meters [1].

According to BPS Pariaman [3] on the fishery, the highest number of fishermen is in the Central District of Pariaman about 646 fishermen from a population of approximately 31,582 inhabitants. The fishing fleets consist of 105 units fishing a boat, 161 units of outboard boats, and 129 units of boat without a motor. In terms of fishing gears, the most widely used is gill nets (8 units), lift net (7 units), seine (3 units), and trolling line (23 units). There are five categories of fishermen in Pariaman Coastal, such as (1) Fishpond Businessmen can be considered as upper medium-scale investors, they are the owners of the farm, doing fish farming for export, this class fishing is relatively advanced and produces relatively large quantities, employing 5-15 workers fishermen. (2) Fishermen as a skipper, his business organization is not yet well structured and has not been legally established, (3) Fishermen as a fish catcher, fishermen in this class is the biggest in number, (4) Fishermen as a collector or intermediate trader, and (5) Fishermen as a worker or labor. In marine resource conservation was determined by Pariaman is mainly the small islands for turtles nesting and coral conservation. The destruction of coral reef ecosystems about 25% supports the
decision. Pariaman natural beauty is designated by its white sandy beaches and clean environment, such as the Teluk Belibis Beach, North Pariaman to the Sumur beach, South Pariaman; also, Kasiekg Island the nesting place for endangered turtles; and Angso Island, Ujing Island as coral-reef conservation area [1]. In addition, there are religious attractions such as Tabuik religious event and also the experience of walking down religious history in the 8 century when Syekh Burhanuddin brought Islam to the region, will be a major tourist all year long for the local, national and international tourist.

Pariaman as Minangkabau ethnic who adhere to the matrilineal system. Every child born will be a direct family member of the tribe of the mother, because in Minangkabau descent lines drawn on the basis of mother's family, there are some other characteristics inherent to the tribe of Minangkabau. In tradition, their responsibility to be there. He is a trustee of the line-protective of their offspring and lineage property that even if he had to restrain herself from enjoying the fruit of the ground by his people because he was not able to claim part of anything for herself. Nor was he given a place at the home of her parents (maternal/matrilineal)because for all booths reserved for female family members, namely to accept their husbands at night. The position of men who are that motivates shaky Minangkabau men to migration. The migration of Minangkabau society is a process of interaction with the outside world. This activity is an adventure experience and geography, by leaving home to try his fortune abroad. The family has long had the tradition to go abroad, usually have relatives in almost all major cities in Indonesia and Malaysia.

3.2 The Local Wisdom In Fishermen Community

Some of the functions of the local wisdom are the conservation and preservation of nature, as the adage, trust, ethics and moral meaning, able to control, able to integrate elements of foreign culture into the native culture [29][30]. Local wisdom is life values inherited from one generation to generation, the form of religion, culture or customs, in general in oral form in a social system form a society. The existence of local wisdom in society is the result of the adaptation process to the next in a very long period of time, to an environment that is usually inhabited, or environments where frequent interactions therein. Ridwan [31] states local wisdom can be understood as a human effort to use cognition to act and behave towards things, objects, or events that occur in a given space. The definition above, arranged in etymology, understand the wisdom as a person's ability to reason his mind, to act or behave as a result of an assessment of things, objects, or events. As a term, it is often defined as wisdom. In particular, locally refers to limited interaction space with a system of limited value. Interaction space has been designed in such a way which involves a relationship patterns between man and man or man and his physical environment.

Sulaiman [32] defines a more detailed local wisdom as "knowledge built by the community for generations, related the relationship with nature and natural resources". The local wisdom of society includes all knowledge related to social sciences, politics, and geography. According to Christy [33], there are six things that must be met as conditions of a local wisdom for environment management, including a) Condition of natural resources should have obvious characteristics, eg in the form of the coral reef or mangrove ecosystem. b). Boundaries must be clearly owned and are predetermined, for example, the extent to which we may catch fish. c). Catching technology have determined the type of equipment and the type of catch that will be set in the local wisdom. d). Culture, local culture must be modeled is according to indigenous empowerment so it will not clash. e). Wealth distribution must protect existing institutional model. f). Government authorities and agencies. Government authority and assertiveness should also be able to make decisions that should be integrated the other agencies concerned.

Some areas of Indonesia country already has a lot of local wisdom as an example of environmental management. The examples are the Panglima Laot, Awig-Awig and Mane'. Wisdom is applied almost fell down by the local community, such as Panglima Laot in Aceh and Awig-Awig in Buleleng, Bali. Its presence greatly affects the local environment preservation. It was contrasted with today, where the foreign culture started to go fast in the modern era of globalization [24]. Coastal communities at
Pariaman area, the majority of the livelihoods of fishermen, on the basis of its citizens are Muslim, is possible to have local wisdom. Basic Islamic religion can be used as profile coastal indigenous native of Pariaman fishermen community, as a reference in the management of the pro-environment. The lives economy, religion and environmental sustainability can go hand in hand with no one left out.

Being a fisherman perceived as only a secondary livelihood, however, today it has gradually evolved to be the main livelihood for most of them. Even though, the ancestors of Pariaman fishermen community formerly began to live as farmers who were much dependently live through the heritage of a customary land which was completely tied with the local knowledge. This is primarily explained in the local wisdom and traditions indicating that the choices of living as farmers could not be completely replaced by being a fisherman.

Beliefs in supernatural powers exclusively related to the local wisdom especially their economic life are very important to members of fishing community, regardless of their ethnic. Nevertheless, these beliefs are relatively more deeply rooted among the Pariaman fishing community. They believe ecology system is like sea, mangrove, river have spirits or souls. This belief signifies their conviction that their economic lives are not merely determined by how well they use their skills, boats and fishing gear in exploiting the sea, but also by how well they interact with the supernatural forces which are an important part of their world.

In Pariaman coastal, an effort coastal environmental sustainability by empowering local wisdom, there are two roles: (1). The role of the government to undertake structural changes in the framework of laws and political practices of natural resource management, in this case, the government favored the local community, such as the employment contract system and the results are also on the migration of fishermen tricken Exclusive Economic Zone. (2). The Role of Non-Government is the strategy of strengthening local institutions, such as the presence of investors in the tourism sea quotation, also strengthening capital and market information for small fishermen.

The local fishermen very dependent on income from the arrest, if the level of income a little fishing in areas of origin, then the fishermen will find other areas, in order to better revenue, as happened in Philippines. Fishing is a strong working relationship in order to overcome difficulties in marketing the catch of fishermen and because of limited capital. On the other hand, fishermen are always disadvantaged in partnership, particularly the amount of prices and services specified by the fishermen [34]. Employment contracts applicable to the fishing communities, there is a competition between ship owners to compete for labor available. Symptoms begin to appear in the presence of such vessels requires more manpower, so no fishing opportunities as workers doing a job on the ship option that gives better results section.

The local wisdom, traditions, and cultures in the society of Pariaman coastal has a great opportunity to be managed and empowered again, so could to regulate the daily lives end the norms and rules that favor on the environment, in the context of coastal and marine resource management. According to several informants and sources encountered by the author, the communities in the study had high enthusiasm when the Tabuik event will take place. It is also not much different from the adherence conditions to property rights despite being in communal open access. The existence of systems that have formed a strong and entrenched society will help incorporate mindset how to take the best advantage of natural surroundings. Therefore, people should become culture and tradition wealth and the most potentially beneficial in community-based management. This can be one of the important instruments in building social forces to attempt the management and utilization of coastal and marine resources [35].

The fishing groups have had tremendous impacts on local marine resource conservation along the coasts of the province of West Sumatra. The number of fishing groups increased to another coastal place all the time, an effect by a migration. Kato [36] said, migration is the movement of a collection of people from one region to another region to improve people's lives and their economy. Migration is the process of moving from one place to go to live or work in another [37][38][39]. It also can be defined as the movement from city to another city or town. Definition of migration is very different from the flight that brought a set of human intention to move from one place to another place that is
moving to a safer for them to continue to live after suffering a miserable life due to the outbreak of war habit or natural disaster.

The number of fishing groups has continued to grow rapidly over the past twenty years reaching 30-50 fishermen in 2015. The fishing groups come to the Pariaman coast from other region. People from the West Sumatra also emigrate to another province [2]. Immigration is not new and the Pariaman coast has been a multicultural society for twenty years. Many people in the Pariaman are descended from previous settlers and invaders such as the Pesisir Selatan fishermen, Padang fishermen, Agam fishermen, and Pasaman fishermen. Pariaman coast population distribution describes how people are spread out across the coastal zones. The human population is not spread evenly. Few people live in locations that are sparsely populated and densely populated places have many.

The most fishing group were aware of the degradation of marine resources and mentioned declining fish catches in this respect. The fishermen themselves stated different reasons for declining catches but the primary cause, according to them, was the increased number of fishermen. Other reasons mentioned were the gazetting of the Marine Ecotourism Area, unpredictable weather patterns and the annual visits of migrating fishers from another region. The increased number of fishing groups put more pressure on already limited marine resources, particularly in the case of Pariaman coastal. The choice of gear was influenced by the fisherman’s knowledge and experience as well as economic and environmental considerations. Fishermen were flexible in their use of gear, although they usually had strong preferences based on experience, their expected catches and use the local wisdom. The newcomers of fishermen, due to their involvement in other income-generating activities, were often non-migrant fishermen or seasonal migrants. Exceptions did occur if, for example, someone’s son started fishing because he would have more freedom and fewer responsibilities at home. Most of the fishermen in Pariaman coastal reported that they used to fish at other landing sites when they were young and had, in effect, been migrant fishermen.

The fishing groups are one who leaves his natural community and moves from one habitation to another in fulfillment of his occupation. He moves in search of fish as dictated by the type of fish required, the movement of the tide and season of the year (Tawari, 2002:2). Rajan (2002) identifies two dimensions of mobility being time and direction. Forms of fishermen spatial mobility are as follows: commutation is “the expansion of workspace”, in terms of fishermen moving out of their community of origin and landing their catch in another. Circulation is “the expansion of workspace for a longer period and the residence of the mover, may also be shifted for a longer period in connection with the occupation” and migration entails permanent settlement in which the mover settles in the destination village with family i.e. both places of work and place of residence are shifted.

The fishing groups have flowed into the fishing village of Pariaman coastal. Being mobilized from other districts in the province of West Sumatra uxorilocally, they have succeeded in establishing their own identity, new groups, and then in having economic powers inside the fishing community as local autonomy. Along with increasing the number of their households and with the growth in income, they are becoming leading actors there to be involved with the local resource conservation for national interest. The fishing groups have the local wisdom for resource conservation are using no harmful gears, the commitment not to catch and kill the turtles and commitment not to throw rubbish into the sea.

3.3 Prospects of Sustainable Food Security in The Fishing Groups

Food security is defined as food available in enough quantity and quality, was distributed with affordable price and to be safe to be consumed by the community. In addition to food consumed, as important basic needs, as well as basic component, embody high-quality human resources. Pariaman has the most potential of marine resource because most area in Pariaman is coastal areas, where of the population works on fisheries products. Fishermen as the fishing groups still in the poverty line and they have low welfare because do not have rice and they must have the power to buy rice. As a result, household security has become vulnerable.

There was a positive and significant relationship between welfare levels with food security at poor fishermen both urban and rural. In addition, there was positive and significant relationship: (1)
between health and nutrition with using of food and accessibility of food; (2) between wealth with using of food; and (3) between availability of food, accessibility and using of food. In addition, a knowledge aspect was important factor for increasing food security besides health and nutrition and wealth factors. Therefore, the policy for increasing food security for poor fishermen can be focused on not only increasing fishermen knowledge but also increasing accessibility of food especially by a recovery of channel material food.

Fish plays a crucial role in food security and nutrition as a rich source of nutrients, particularly for vulnerable fishing group populations. It also provides jobs and income especially through small-scale fisheries and aquaculture in Pariaman. However, these roles have often not been fully recognized nor integrated into food security and in fisheries policies. Fish deserves a central position in food security and nutrition strategies.

Conclusion

Existence the local wisdom tradition as a form of marine resource conservation includes control gear, using no harmful gears, commitment not to catch and kill the turtles and commitment not to throw rubbish into the sea and seeding and planting mangrove. Furthermore, conservation measures coastal and marine environment carried out by newcomers in Pariaman can be roughly divided into two: (1) In the sector of marine resources includes control gear, using no harmful gears, commitment not to catch and kill the turtles and commitment not to throw rubbish into the sea; (2) In the resources sector includes planting mangrove coast and make the cultivation of seaweed. Various forms of marine and coastal conservation is carried out by fishing groups in Pariaman seen in the behavior: Not only catch fish but also maintaining and developing the fish seedlings. Various activities are based on the values and culture of local wisdom in the fishing community. The findings of this research are fish as a critical food source for sustainable food security. Fish provides a similarly significant proportion of protein in the human diets in Pariaman fishing groups. Industrial fisheries can also contribute to the food security and nutrition of the poor in Pariaman fishing groups, especially when they favor the wide commercialization of cheap, easily stored and transported nutritious pelagic fish such as sardine, pilchard, herring, anchovy or even tuna. As noted in relation to fish trade, revenues generated by large-scale operations can also contribute indirectly to food security through employment creation where legislation to protect decent working conditions is in place. However, small and large scale fleets can compete for resources, fishing zones, and gear, leading to conflicts in zones where they jointly operate, which in most cases increases small-scale operators’ vulnerability, threatens their well-being, incomes, and food security. Such competition can also negatively impact on coastal habitats.

Declaration of Conflicting Interests

This research was conducted as a joint research with LPPM Andalas University in Indonesia. There is no conflict of interest.

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