COMMUNITY PARTICIPATION OF MANGROVE FOREST PRESERVATION IN BATANG GASANG PADANG PARIAMAN DISTRICT

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ABSTRACT

The purpose of this study is to study community participation in the preservation of mangrove forests located in Nagari Gasan Gadang and Nagari Malai V, Batang Gasang Sub-District, Padang Pariaman Regency, West Sumatra Province. The indicators consist of (1) Description of Community Aspects, Measured parameters of community participation that are linked to 3 socioeconomic status, namely Level of Education, Employment and Income; (2) Description of Biological Aspects, Parameters measured by the level of density of mangroves by making Measuring Plots measuring 20 x 20 m totaling 10 Measuring Plots that are spread evenly. Primary data obtained directly in the field and interviews with 65 respondents while secondary data is supporting data obtained from relevant agencies. The data analysis technique used is the analysis of community participation and the analysis of mangrove species density using the Mann-Whitney Test statistical analysis for testing the difference in species density and the Kruskal-Wallis Test statistical analysis for testing the level of community participation with the SPSS 15 Program. The results showed that the results of the hypothesis test of differences in density revealed that the Z value for density was -2,243 (p <0.05), meaning that the density of mangrove forests showed an average difference, that there were significant differences in the level of density of mangrove forests. While the Difference Test Results of Community Participation with Chi-Square based on education amounted to 0.513 (p> 0.05), meaning that community participation on the preservation of mangrove forests at the educational level did not show any difference, while based on the Chi-Square value of 16,203 (p <0 , 05), means that there are significant differences in community participation between work. for Chi-Square income of 0.248 (p> 0.05), there was no significant difference in community participation between income levels. Based on the socio-economic aspect, that community participation whose income <1 million is very low, people's income 1 - 1.5 million participation is low while the community's income> 1.5 million participation is high in maintaining the preservation of mangrove forests in Batang Gasang District.

Keywords: Community Participation, Mangrove Forest, Preservation In Batang Gasang

INTRODUCTION

Mangrove Forests are forests that have a tropical coastal area vegetation community (Hermon et al, 2017; Hermon et al, 2018) dominated by several species of trees that are able to grow and develop in low tide areas on muddy beaches. Mangrove forests have a very important role in determining the existence of coastal ecosystems. Mangrove forests are formed in flat coastal areas, where land can gradually form and avoid waves. One of the characteristics of the place of growth is a period of standing water. Species composition will be determined by perodicity, duration and height of standing water, salinity and soil conditions (Weidelt, 1995 in Agus 2007; Hermon, 2015; Hermon, 2016; Hermon, 2017). Mangrove forests in addition to being one of the buffer ecosystems between land and sea also have important potential in supporting the productivity of the sea around the mangrover (Annonimus, 2002; Hermon, 2010; Hermon, 2012)). But mangrove forests are vulnerable to damage if the environment is out of balance. Even the damage to mangrov is not only caused by natural processes but also due to human activities (Pramuji, 2000; Hermon, 2016; Hermon, 2017). Mangrove ecosystem damage generally occurs as a result of human activities that utilize mangrove forests without regard to the ability and carrying capacity of environmental sustainability. The development of human life is increasing rapidly in line with current technological developments, as well as communities around the coast. The development of coastal areas with infrastructure development, agriculture, ponds, urbanization, and other industrial activities put pressure and threats in the presence of mangrove forests. This will result in the condition of mangrove forests will change because of the pressure caused by human civilization that uses mangrove forests to meet the needs of life. Mangrove forest based on economic function is a producer of wood and its derivatives (non-wood) (Hermon, 2016; Kristian and Oktorie, 2018), which can be in the form of sawn wood, a source of fiber for pulp and paper, energy in the form of charcoal and fuel wood, producing tannin, raw materials for medicines, sources of food for humans and animals and honey producers. While the ecological function of mangrove forests is the protection of the land from abrasion and intrusion, the protection of ecosystems in its original form, the

protection of wind and tsunami waves, the source of seeds for marine and terrestrial fishery products, the protection of animals and communities where flora and fauna develop and environmental sanitation between the sea and the mainland (Marsoedi, 1996; Hermon, 2019; Oktorie et al, 2019).

Kompas (2000) in Urip (2008) states that the area of mangrove forests in West Sumatra is 36,550 ha, spread in Pasaman District (3,250 ha) with a damage rate of 30%, Pesisir Selatan District 325.7 ha 70% damage rate, Mentawai Islands District 32,600 ha, the damage rate is 20%, Agam Regency 55 ha the damage rate is 50%, Kota Padang 120 ha the damage rate is 70%, Padang Pariaman District is 200 ha the damage rate is 80%. Meanwhile Kamal (2006) states that the natural resources of coastal areas, especially the potential area of mangrove forests in West Sumatra Province currently covers 36,550 hectares with a level of damage of 53.54% and prediction of less catches of fish as much as 8,320 tons / year, where the total area of mangrove forests The area of 200 hectares is located in Padang Pariaman Regency.

Mangrove Forest Area in Batang Gasang District has an area of ± 40.70 ha or around 20.15% of the total area of mangrove forests in Padang Pariaman District (covering an area of 202 Ha). The problem that occurs in the status of this mangrove forest area is experiencing a massive quality decline due to rapidly increasing population with various activities in the region. This affects the sustainability of mangrove forests due to activities that utilize mangrove forests to meet the needs of the local population. As a result of these community activities, the mangrover forest area becomes an empty area that is inundated by water when it is high tide. The mangrove trees are only remnants that cannot be used anymore, fishermen are forced to go far out to sea to be able to catch fish, shrimp, and crabs and take firewood to other places to meet their needs.

Judging from the physical and biotic existence of several mangrove forest locations in Padang Pariaman District, the location of mangrove forests in Batang Gasan District in general the potential of mangrove forests has a low species diversity with the level of damage being "damaged" and "heavily damaged" and the potential of mangrove forests that are spread out so that it requires enrichment with a mangrove planting system which in its implementation requires high participation from the local community.

METHOD

The method used in the research is descriptive analytical research, namely descriptive researching of two aspects and the interrelationship of the two aspects consisting of 1. Description of Community Aspects with the measured parameters are community participation that is linked to 3 socioeconomic status namely Education, Employment and Income; 2. Description of the Biological Aspect with parameters measured by the level of density of mangroves contained in the Batang Gasang District by making a 20 x 20 m measuring plot totaling 10 evenly distributed plots. Where in each plot will be observed the level of mangrove density, by deliberate placement of PU (purposive random sampling); 3. The Relationship between Community Aspects and Biological Aspects, at this stage a qualitative study was conducted on the relationship between aspects of community participation and biological aspects.

Data collected in this research are primary data and secondary data. Primary data obtained directly in the field and interviews with 65 respondents while consisting of: (1) physical environmental profile, (2) mangrove density profile, (3) community participation, secondary data is supporting data obtained from relevant agencies consisting of forest area mangrove, administrative maps of Gasang Subdistrict, climate and rainfall data, community education level data, employment level data and community livelihood level data in Nagari Gasang Gadang and Malagraph V Malai V Tribe of Gasang District. While the measured and observed objects are (1) Community Participation Data obtained from the results of questionnaires and interviews with the community around the study site as many as 65 respondents; (2) Data on tree species density are obtained by direct field measurements. The data analysis technique used is the analysis of community participation which is analyzed based on three indicators consisting of (a) the principles of all components of society, namely efforts to increase community participation involving and covering all components of society, and not only certain individuals or components of society; b. The principle of togetherness and mutual respect: Communities will participate when they feel part of the community, and they feel that their involvement is needed, therefore the principle of togetherness and mutual

respect needs to be developed. c. The principle of benefit balance: Community participation is influenced by their belief that the benefits obtained are balanced with the costs or efforts that are incurred, therefore the effectiveness and efficiency of the program need attention. As for the Analysis of Mangrove Species Density are (Hermon et al, 2018; Hermon et al, 2019):

a. Kerapatan Suatu jenis (Density)

$$Kr.s \quad \frac{Jumlah\ Individu\ Suatu\ Jenis}{Luas\ Seluruh\ PU}$$

b. Kerapatan Keseluruhan Jenis

$$Kr.k = \frac{Jumlah\ Keseluruhan\ Jenis}{Luas\ Seluruh\ PU}$$

c. Kerapatan Relatif

$$Kr.r = \frac{Kerapatan\ Suatu\ Jenis}{Total\ Kerapatan\ Seluruh\ Jenis} \times 100\%$$

Furthermore, the data above is carried out the Mann-Whitney Test statistical analysis to test differences in species density and the Kruskal-Wallis Test statistical analysis to test the level of community participation with the SPSS 15 Program.

RESULTS AND DISCUSSION

The location of this research is in the area of Batang Gasan District, Padang Pariaman Regency. The socioeconomic conditions of the community in this sub-district are based on the number, growth, density, and livelihoods, as well as the average level of education of the community around the study site as follows. The total area in Gasan Gadang Kenagarian is 17.64 square kilometers with a population of 5.4141 people so that it has a population density of 307 people per square kilometer. Whereas in Malagasy V Malai V Tribe with an area of 22.67 square km and a population of 5,926 people with a population density of 261 and a spread of 4.41%. The condition of population density shows that the kenagarian is higher which will have an impact on the existing land in this Kenagarian, so the pressure on mangrove forests for the future needs to be a concern because the higher the population the higher the need for land and the more the production of household waste is also high. High population growth is one threat to the existence of mangrove forests in this area.

Mangrove Habitat General Conditions

The extent of mangrove forest distribution in Batang Gasan Sub-district based on the Padang Pariaman Regency's Maritime and Fisheries Service (2009) reached 40.70 ha, spread over two locations, namely Nagari Gasang Gadang with an area of 35 Ha and Nagari Malai V with an Area of 5.70 Ha. The coastal and coastal areas of Batang Gasan District are affected by two seasons, namely the rainy season and the dry season. The rainy season occurs from November to May, while the dry season is from June to September. Batang Gasan District has climate type A with an average rainfall of 2,013 - 3,399 mm per year. The average temperature of 26.7 C with a difference in the maximum and minimum temperatures ranging from 81% - 86% and 100% sunlight range of 8 hours

Picture 1. Mangrove Plants of Sonneratia caseoloris and Aegiceras corniculatum on the Field of Pond Pond Trench Empang Pattern in Batang Gasan District.

Mangrove forest vegetation in this estuary region is specific to the condition of vegetation cover that is quite good. Mangrove forest zoning is influenced by salinity, soaking time and tidal period. Decreased diversity and size of mangrove forests are found in each zoning illustrated by changes in ecological conditions from the edge of the sea to the mainland. Decreased diversity and size of mangrove forests are found in each zoning illustrated by changes in ecological conditions from the edge of the sea to the mainland. The limiting factors for the growth of mangrove forests are: (1) Water supply, both fresh and salt water; (2) An adequate supply of nutrients to support growth; (3) Substrate

stability. The transition zone between mangrove forests and lowland forests is usually overgrown by Nipah (Nypa Fruticans). The mangrove area is very dynamic and its evolution is relatively fast mainly due to changes in river channels, coastal abrasion, coastal sedimentation and changes by human intervention. Therefore mangrove ecosystems are very volatile and easily swayed. With the taking / theft of wood continuously from the mangrove forest resulting in the reduction of certain types of vegetation. In the table below shows the types of coastal vegetation found in Batang Gasan District.

Table 1. Types of Plants in Mangrove Forests based on Vegetation Types in Batang District Lascivious

No	Mud Substrate Vegetation
1.	Bakau Hitam (*Rhizophora mucronata*)
2.	Bakau Putih (*Rhizophora apiculata*)
3.	Api-api (*Avicennia* sp)
4.	Tancang (*Bruguiera gymnoorrhiza*)
5.	Jeruju (*Acanthus ilicifolus*)
6.	Nibung (*Oncosperma tigillaria*)
7.	Nipah (*Nypa fruticans*)
No	**Sand Substrate Vegetation**
1	Cemara Laut (*Casuarinaequisetifolia*)
2	Kelapa (*Cocos nucifera*)
3	Waru (*Hibuscus tiliaceus*)
4	Melinjo (*Gnetum gnemon*)

Source: Padang Pariaman District DKP Service, (2009)

Quantitative Description Of Mangrove's Voltage

Suryanto, (2007) explains that in estuarine marine areas there are high or slightly alkaline pH levels compared to river pH due to the presence of CO_2 and the strong alkaline nature of the K, Na and Ca ions. Besides photosynthesis, the pH of the waters is influenced by temperature and the presence of ions. If water contains a lot of $H+$ ions it will have a low pH and is acidic, but water will be alkaline and have a high pH if the concentration of $H+$ ions it contains is small.

Based on observations in the field around the location there are residential settlements that are likely to dump their waste into these waters, this is supported by the presence of an oil layer and solid waste in the form of household waste around the study site. The result is a reduction in dissolved oxygen in the water because it is used for decomposition of these organic materials. The more organic content in waste, the dissolved oxygen needed for decomposition activities increases, so that the content of dissolved oxygen in the waters will decrease. In addition, because rivers tend to be deeper, this condition allows for a slight exchange between oxygen-rich surface waters and deep waters. The concentration of heavy metals in locations without mangroves shows a high value compared to other locations. According to (Connel, 1995 in Suryanto, 2007) The concentration of heavy metals in water can increase with the entry of household and industrial waste. Dahuri, et al (1996) added that aside from household and industrial waste, heavy metals from agricultural, mining and shipping waste. Sediments in the Batang Gasan estuary are clay and silt mixed with organic material. The source of sediments in this estuary region comes from sediments transported through the Batang Gasang River. Where sediment deposition then develops into new plains and arises. In sediment deposited areas that have begun to develop are mostly overgrown by the Floating / Pedada (Sonneratia caseoloris) and Male / Teruntum (Aegiceras corniculatum) and Tancang (Bruguiera gymnorrhiza) areas.

Species Density and Relative Density

Mangrove vegetation in the mangrove forest area in Batang Gasang District is a natural resource that has sufficient / undamaged vegetation when compared to mangrove forest resources found in other areas in Padang Pariaman Regency (BPDAS Agam Kauntan, 2006). Density is the size of an individual in a vegetation over the area of land it occupies expressed in the number of trees per hectare, while relative density is a percentage of the number of individuals of an existing species. Density is measured based on 10 Compartments (PU) that are spread evenly at locations with a size of 20 x 20 meters.

Average Species Density

Based on the results of the study, the average level of density in the form of diagrams per plot can be seen in the following figure:
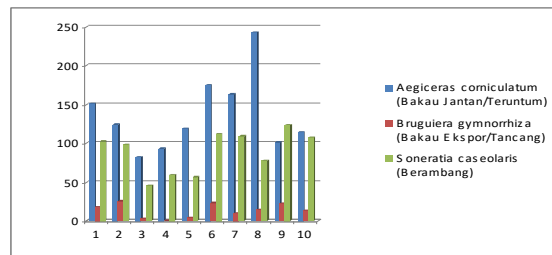

Figure 2. Average Bar Diagram of Species Density Level Based on Measure Plots (20 x 20 M) at the Gadang Gagarian Kenagarian Research Site.

The average magrove density per plot has a level of relative density that does not differ between measuring plots 1 to 10. These conditions illustrate that the level of damage is still low or in other words the effect of the effectiveness of a portion of the local community has not led into the mangrove forest. Community activities are found on the edge of a relatively dry (inland) mangrove forest location. The dominant vegetation types of mangrove forest are Aegiceras corniculatum, Bruguiera gymnorrhiza, and Sonneratia caseoloris while other types are not found in the plots that have been made.

Density Difference Test Results

To find out whether or not there was a significant difference in average diversity at each plot location in this study which was divided into 10 (ten) 20 x 20 meter plots, the Mann-Whitney Test statistical analysis was used as shown in the following table this:

Table 2.Density Difference Test Results

Mann-Whitney Test	Kerapatan
Nilai Z	-2,243
N	28
Asymp. Sig. (2 tailed)	0,025

Source: Field Data

The table above shows the results of the hypothesis test that the Z value for the density was -2,243 (p <0.05), meaning that the density of the mangrove forest between the study sites showed an average difference. These results state that there are significant differences in the level of density of mangrove forests between the study plot locations, as many as 10 PU.

Quantitative Description Of Community Participation

Population growth at the study site in Kenagarian Gasan Gadang ranged from 0.86 to 2.11. with a growth of 0.86 percent less than the population growth in Kenagarian Malai V Suku with a growth of 2.11 percent. Business fields that are publicly traded as a source of income are in the fields of fishermen, agriculture, trade, employees and others. The majority of the community is engaged in the field of fisheries, this is because this field is a legacy from parents, habits, and the environment.

Based on the agreement of the local community that the mangrove forest in their area is needed to support fishery habitat, especially for mangrove crabs, as an area that is maintained in a healthy condition and protected from disturbance that can cause damage. Mangrove forest area of 40.70 Ha which needs to be maintained both diversity and density of the stand and its status is determined as a mangrove forest area with good condition (BPDAS, 2006). Current conditions in mangrove forests can be described as follows: (1) Ex-Damaged Ponds / Ponds, in the form of inactive ponds that have been left dormant have already begun to be destroyed, both in the form of permanent buildings and non-permanent ponds. Management of degraded ponds is directed to become forest again by rehabilitating mangroves; (2) Mangrove forest area which is relatively good. Based on the foregoing, this area needs to be preserved and preserved. And in this area based on information obtained from the local Mangrove Observer (Mr. Muslim), that the type of male mangrove (Aegiceras corniculatum) for the West Sumatra region is only found in this area.

Social Economic Community

Awareness of the decline in existing natural resources, due to the rapid management of natural resources that ignores the principle of sustainable nature. The level of education is one of the parameters that can show people's insight in seeing the

positive and negative impacts on the utilization of natural resources. Therefore parameters about the level of education are very important to know in the application of developing sustainable use of natural resources.

In general, the livelihoods of the people in the research location are dominated by fishermen. From the diagram above it can be seen that the people whose livelihoods are fishermen have moderate participation in preserving the mangrove forest, the farming community has a high participation, the people who work as traders have low participation, the people who work as civil servants / employees have high participation while the other community has low participation in maintaining the preservation of mangrove forests in Batang Gasang District.

Community Participation Test Results

To find out whether or not there is a significant difference in average community participation at the study site divided into three variables, namely education, employment, and income, the Kruskal-Wallis Test statistical analysis is used. The results of the hypothesis test that the Chi-Square value for education is 0.513 ($p > 0.05$), meaning that community participation in the preservation of mangrove forests at the research location in Batang Gasang District results does not show any average difference. The results stated that there was no significant difference in community participation between their education levels, namely not going to school, elementary school, junior high school, high school and university. Chi-Square value for the level of work was 16,203 ($p < 0.05$), it was stated that there was a significant difference in community participation between work, namely fishermen, farmers, traders, employees and others towards the preservation of mangrove forests. The Chi-Square value for income was 0.248 ($p > 0.05$), so it was stated that there was no significant difference in community participation between the levels of income in the preservation of mangrove forests.

CONCLUSION

The existence of mangrove forests in Batang Sagan Subdistrict, Padang Pariaman Regency is generally understood by the people living in the research location. The

average magrove density per plot has a level of relative density that does not differ between measuring plots 1 to 10. These conditions provide an illustration that the level of damage is still low or in other words the effect of local community activity has not led to the mangrove forest. Community activities are found on the edge of a relatively dry (inland) mangrove forest. There are differences in quantitative descriptions of community participation when related to differences in education and socio-economic levels in the mangrove forest area in Batang Sagan District. The level of community participation is largely determined by the status of the community's work.

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