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To cite this article: M L Salampessy *et al* 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **891** 012024

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Community knowledge and involvement in mangrove ecosystem management in the coastal of Muara Gembong Bekasi

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Abstract. Mangrove ecosystems have experienced pressure and decreased function due to abrasion and high land conversion activities for pond expansion. The government has tried to increase the role of the community for mangrove conservation but this effort has not obtained optimal results. This study aims to determine the understanding of coastal communities about Mangroves and community involvement in Mangrove ecosystem management. Methods of data collection using a questionnaire instrument, field observations, and in-depth interviews. Data analysis was done descriptively tabulated. The selection of respondents using purposive sampling. The results of the study stated that 60% of the community understood the importance of mangroves for their lives. The community understands that mangroves are a source of livelihood for the community and protect the coast from waves and abrasion. The community is actively involved in Mangrove planting program activities (53%) but based on activities initiated by the government in certain groups. Knowledge and community involvement in mangrove forest management are closely related to important community decisions to participate actively in mangrove forest management. Therefore, efforts to increase knowledge need to be increased through outreach activities and development of community empowerment programs.

1. Introduction

Mangrove forests have an important role both ecologically and economically for the surrounding community [1]. Damage to mangrove forests will have implications for losses for the community because mangroves are one of the economic sources for the local community [2]. The knowledge and management of mangroves carried out by the community varies in each region according to the conditions of the area and the community. The community is a determining factor in carrying out and participating in the sustainable management of mangrove forests [3,4] and the importance of increasing local knowledge for the conservation of these mangrove forests [5].

Efforts to involve and increase community knowledge in mangrove management need to be continuously improved because it is the community who will benefit directly and indirectly from these activities [6]. Several studies have been conducted on community perceptions and participation in mangrove forest management, including [7] explaining that mangroves have an important responsibility for the coastal environment and its management is a shared responsibility of all parties; [8] argues that the level of community perception of the function of mangrove forests is very good and the importance of increasing their participation; [7] explained that the community must participate in conserving the mangrove forest, because if it is damaged, the local community will lose the economic benefits and services of the forest. For this reason, efforts to identify knowledge and community involvement in



mangrove forest management in the Muara Gembong area need to be carried out, because this area in the last 5 years has shown fluctuations in changes in mangrove forest area.

2. Methods

2.1. Research time and location

This research was conducted from Mei to Juni 2020 in this research was conducted in Pantai Bahagia Village, Kampung Beting, Muara Gembong District, Bekasi Regency. The research location can be seen in figure 1.

2.2. Data collection

The sampling method was purposive sampling with the age range of respondents between 18-60 years. The number of samples is 60 people. The selected community is determined by the criteria of actively utilizing mangrove natural resources, both in cultivating and processing mangrove products. Data collection methods used were interviews, observation and literature study.

2.3. Data processing

Data analysis serve it out quantitatively. Data analysis by way of classifying, calculating answers and percentage based on the answer category.

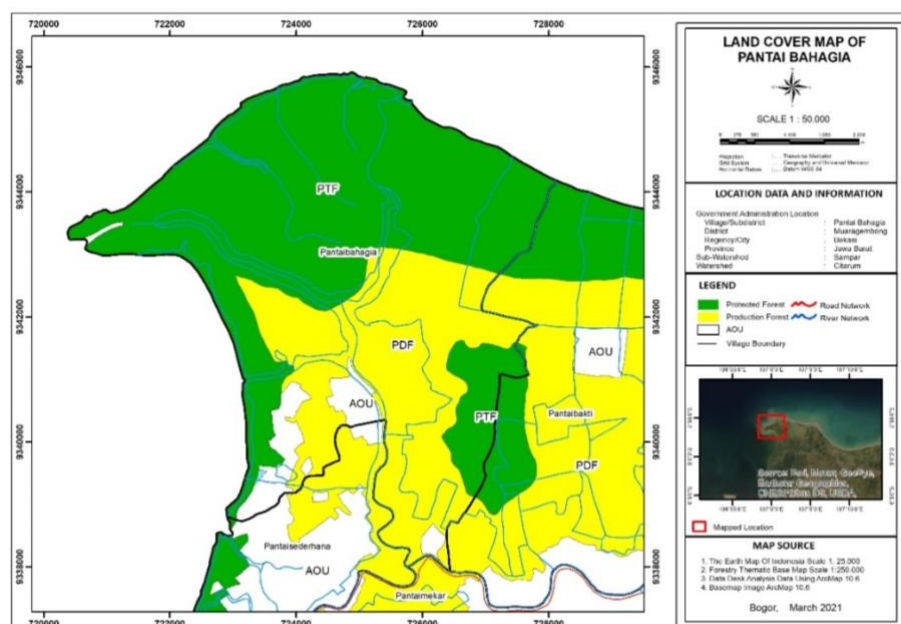


Figure 1. The research location in Pantai Bahagia Village, Muara Gembong Bekasi, West Java

3. Result and Discussion

3.1. Overview of research location

Muara Gembong is one of the sub-districts in Bekasi Regency, West Java Province, Indonesia. Muara Gembong District is located at $6^{\circ} 00' - 6^{\circ} 05'$ South Latitude and $106^{\circ} 57' - 107^{\circ} 02'$ East Longitude. The area of Muara Gembong District is 140.09 km² with a population of 35,503 people. This sub-district has 6 villages, namely Jayasakti, Pantai Harapan jaya, Pantai sederhana, Pantai Bahagia, Pantai Bakti, and Pantai Mekar.

Pantai Bahagia Village is located in the lowlands with the following regional boundaries in the north bordering the Java Sea, in the south bordering the Simplified Beach Village, in the west bordering the Jakarta Bay and, in the east, bordering the Bakti Beach Village. The village area is about 3,020 Ha,

consisting of three hamlets. Pantai Bahagia Village is also traversed by the Citarum River which directly empties into the Java Sea.

The topography of Pantai Bahagia Village is relatively flat with an elevation of around 2m above sea level. The soil type is alluvial, the soil material is predominantly mud and sedimentation is found around the Citarum River. The land use pattern in Pantai Bahagia Village is dominated by ponds with an area of 2,619 ha, residential areas covering an area of 250 ha, and rice fields covering an area of 151 ha.

Pantai Bahagia Village experienced a reduction in the area of mangrove forest in 2009-2014 with a mangrove area of 312.93 ha to 245.35 ha but then experienced an increase in land area in 2014-2019 to 390,36 ha. [9]. The largest mangrove area is found in this Pantai Bahagia Village.

Mangrove land areas in Muara Gembong Sub-district have changed from 2009-2019 in the form of area additions, reductions, and mangrove lands that persist. The addition of the dominant mangrove area occurred in areas close to river mouths and directly adjacent to the waters facing Jakarta Bay. The reduction in the area of mangrove land occurs in many areas of mangrove land around fishponds and community settlements, as well as mangrove lands that are directly adjacent to the waters facing the Java Sea. Most of the mangrove land located in dense mangrove areas directly adjacent to marine areas in 2009-2019 remained intact

Most of the people who live in the Muara Gembong area are fishermen, both fishing and pond fishermen [10], so that the mangrove area becomes one of the resources to support the economy of the community in Muara Gembong District, so that changes in mangrove land area can have an impact on the economy of the community

3.2. Community Knowledge

3.2.1. *Knowledge of the characteristics of mangrove trees.* The people of Pantai Village are happy to know and understand well the characteristics of the mangrove trees around them. 43% of the public know that it is characterized by a tree with a height of up to 16 m, having conical roots, and round green fruit with a diameter of 3-8 cm. smooth bark, cracks / fissures in the longitudinal direction, skin color is beige to brown, 24% of the population stated that the characteristics of the tree height reached 16 m, 16% described trees with conical respiratory roots, and round green fruit with a diameter of 3-8 cm. , and 17% explained that the bark was smooth, the bark color was beige to brown. This shows that the community is very familiar with the characteristics of the mangrove trees around them. In line with what [11] this knowledge is good because the mangrove forest is around where the residents live.

3.2.2. *Knowledge of Mangrove Types.* The community has good knowledge about the types of Mangroves. 47% of the community stated that there are several types of mangroves in this village, namely the api-api mangrove (*Avicennia marina*), jangkar mangrove species (*Rhizophora mucronate*), pidada putih (*Sonneratia alba*). Meanwhile, 27% of the community stated that there was a type of mangrove *Sonneratia.sp.* Furthermore, 20% of the community stated that there were mangrove species of mangrove (*Rhizophora mucronate*) and *sonneratia alba*, and 6% of the community explained that there was a type of mangrove mangrove ringworm/anchor (*Rhizophora mucronate*). The community develops knowledge of this type of mangrove based on the community's purpose to utilize this species. This type of ringworm/anchor mangrove is very well known because it is often used by community groups for mangrove forest rehabilitation activities, which in recent years have been actively promoted.

3.2.3. *Knowledge of the use of mangrove forest products by the community.* The results of the study explained that 83% of the community stated that it was used as a food ingredient such as; dodol, wajik, lempok, syrup, candy, 6% of the community explained that the use of mangrove nursery seeds for rehabilitation activities, 7% of the community explained the use of processed chips, and 4% of the community stated that the fruit can be used as a children's play tool. In this village community, there is already a group of mothers who specialize in managing mangrove food and drink products known as the KEBAYA group. Mangrove fruit can be processed into flour and various processed food ingredients such as syrup, chips, lunkhead, and other processed snacks, as shown in figure 2. The community has

carried out processing activities for various products such as lunkhead and mangrove syrup with attractive packaging and ready to be marketed. good quality and supported by good promotions.



Figure 2. Products Dodol and syirup processed by mangroves

3.2.4. Knowledge of the benefits of mangrove forests for the community, the results of the study show that 60% of the community knows the role of mangrove forests as a source of processed food and beverages that have economic value, as well as a barrier to coastal abrasion, resisting sea waves and as a habitat for marine and land biota, 16% of the community stated that as a source of life for the preservation of the area from abrasion, 20% of the community stated that it was a coastal protection and 4% of the community stated that it could be developed as a tourist spot. Village communities better understand mangrove forests as a source of processed food and beverage materials as well as abrasion resistance. This is based on the fact that in the last 5 years the community has been assisted by various government programs to improve the community's economy as well as active forest rehabilitation activities in overcoming high abrasion and tidal flooding that often happens in the village.

The knowledge of the people of Pantai Bahagia village about the mangrove forest is knowledge obtained from various observations through the five senses. This knowledge can be obtained from formal or informal learning. Having good knowledge can have implications for good actions as well. As stated by [13] that public knowledge of mangrove forests is obtained from the results of community interactions with the environment that have been going on for a very long time, where the complexity of environmental changes that continue to occur in the long term will affect the perception of the community.

3.3. Community Involvement in Mangrove Forest Management

3.3.1. Efforts to conserve mangroves by the community. The results of the study explained that 50% of the community stated that mangrove conservation efforts had lasted for 5 years, 30% of the community stated that mangrove conservation efforts had been carried out >10 years, 16.67% of the community stated that mangrove conservation lasted <1 year, and 3.33% of the community stated that mangrove conservation activities had just been carried out. Mangrove forest conservation activities have been quite active in the last 6 years. Although this effort has not been fully initiated by the community, it is strongly supported by various parties who are actively developing the CRS program, both from the private sector and the government. The village already has an Alibatha group that is active in replanting damaged forest areas and educating the community to actively carry out efforts to conserve mangrove forests.

For mangrove planting activities, the Alibatha group has divided 3 (three) local forest areas for planting locations, namely locations for visitor groups, research sites, and locations for communities. The planting location for visitors is determined from the coast of about 1 km, the planting location for research is devoted to the area between the coast and residential areas and the planting location for groups is specifically on the coast. This is in line with what was conveyed by [14] that local ecological knowledge is closely related to decision making in tree planting and maintenance.

3.3.2. Involvement of various parties in mangrove conservation. The results of the study explained that 43.33% stated that it was the community who played a role in mangrove conservation, 36.67% stated that the parties that played a role in mangrove conservation were the community, government, and

private parties (NGOs), activists, and researchers), 13.33% stated that the party that plays a role in mangrove conservation is the government and 6.67% of the community stated that the parties involved were various communities from outside the village who were willing to come to support mangrove conservation. This is in line with what was stated by [5] that the management of mangrove forests should not exclude local communities, but open access to local communities for the distribution of benefits, either directly or indirectly, so as to improve community welfare. The opening of this access will make people aware of the importance of resource management and in turn will ensure the sustainability of these natural resources. Management of coastal and marine resources including mangrove resources is an approach to managing coastal areas that involves two or more ecosystems, so that its implementation is more complex because it involves many institutions.

Given the complexity of the typology of coastal resources (mangroves), synergistic coordination between relevant stakeholders is very important. One of the efforts that can be done is through the development of partnership models for the use of ecosystems and mangrove species between the parties related to the management and utilization of mangroves, either directly or indirectly [15]. In this village, various parties actively support rehabilitation activities, for example, community collaboration with the Citarum Ciliwung Watershed Management Center. Active participation in forest management by various parties is a vehicle for facilitating interest and influence between parties that support success in working together [16,17,18]. Communities need to be assisted to increase their capacity in building partnerships so that they can increase the partnership efforts that have been developed for the preservation of the area and the improvement of the community's economy.

4. Conclusion and Recommendations

Community knowledge and involvement in mangrove forest management are closely related to important community decisions to actively participate in mangrove forest management. Community knowledge shows that 43% understand well the characteristics of mangrove trees, 47% can explain well several types of mangroves in the vicinity, 83% explain that the potential of mangroves is used as food and protects the area from abrasion and tidal waves, and 60% explains that the role Mangrove forest as a source of food that has economic value and as a barrier to coastal abrasion. Community involvement in mangrove management shows that 50% of mangrove conservation efforts have been going on for 5 years and 43.33% explain that it is the community that plays an active role in mangrove conservation. Efforts to increase public knowledge need to be increased through outreach and development activities regarding the role and conservation efforts that the community needs to do to increase forest Sustainability and develop the community's economy.

Acknowledgments: The author would like to thank the Institute for Research and Community Development, University of Nusa Bangsa Bogor, which has provided support for this research and also thanks to the Community of Pantai Bahagia Village.

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