TROPICAL DRYLANDS
Volume 4, Number 1, June 2020 E-ISSN: 2580-2828
Pages: 1-4 DOI: 10.13057/tropdrylands/t040101

Short Communication: Willingness to participate in planting and protecting mangrove forest: community response related to mangrove fruit product utilization in Pariti, Timor Island, Indonesia

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Manuscript received: 6 January 2020. Revision accepted: 23 March 2020.

Abstract. *Kurniadi R, Koeslulati EE. 2020. Short Communication: Willingness to participate in planting and protecting mangrove forest: community response related to mangrove fruit product utilization in Pariti, Timor Island, Indonesia. Trop Drylands 4: 1-4.* Mangrove forests provide a wide range of goods and services so that protecting them is of great importance. In some areas in Indonesia, there is some utilization of mangrove fruit as cookies or any kind of food, however, it was not the case in Pariti, Kupang Regency, Nusa Tenggara Timur (NTT) Province. This form of utilization might serve as stimulus for mangrove restoration and protection by local community. This research aimed to investigate the attitude of local communities in mangrove conservation which is reflected by their willingness to restore and protect the forest stimulated by fruit utilization for cookies. A total of 27 respondents were interviewed using a questionnaire, purposively selected. The result showed that the willingness of communities to protect the mangrove forest was low (3.7%) as well as the willingness to plant mangrove trees (3.7%). Despite the acceptance to develop cookies from mangrove fruit was high (100%), but they need to see its market. They will be motivated to plant mangroves if the market for fruit products exists or when there is a program. Unless the market of mangrove fruit cookies is developed, it could not serve as the stimulus for planting and protecting mangroves.

Keywords: Community, mangrove forest, willingness to plant, willingness to protect, cookie from fruit of mangrove

INTRODUCTION

Mangroves forests provide a range of essential ecosystem functions, such as protection from abrasion, storm and tsunami, carbon sequestration, habitat and breeding ground for various marine biota, and provision of various goods in the form of wood and non-wood products. Communities utilize mangroves as source of firewood, charcoal, tannin, dyes, food and beverages, medicine, pole, and timber (Ramadhan and Savitri 2007). Various organisms are found in mangrove forests (Rusydi, Ihwan, and Suaedin 2015) including mangroves crabs, and other invertebrates, such as mollusk and crustaceans, i.e., shrimp, clams, and crabs. They are fishery commodities exploited by local people to generate income (Ramadhan and Savitri 2017).

The province of Nusa Tenggara Timur (NTT), Indonesia has mangrove forest area with an extent of 40,695.54 ha, including those located in the coastal zone of Timor Island. Mangrove forests are about 2.25% of total forest area in NTT Province and they play essential role in local community, especially as a source of food (Lio and Stanis 2018). Despite the small portion of mangroves in NTT, it consists of high biodiversity. For example, in Timor Island, NTT Province, there are 11 species of mangroves trees in, i.e., *Rhizophora apiculata, Rhizophora mucronata, Rhizophora stylosa, Burguiera gymnorrhiza, Osbornia octodonta, Avicennia officinalis, Avicennia marina, Scyphiphora hydrophyllacea, Lumnitzera racemosa, Sonneratia alba* and *Aegiceras corniculatum* (Rusydi et al. 2015), and there were seven species of mollusk i.e *Littorina scabra, Littorina undulata, Terebralia sulcata, Nerita planospira, Nassarius distortus, Morula margariticola,* and *Saccostrea cucullata* and one species of Crustacea group i.e *Semibalanus* sp (Imakulata and Tokan 2018).

Of the mangrove forests in NTT, around 8285.10 ha or 20.40% are heavily damaged, 19,552.44 ha or 48.14% are lightly damaged, and 12,776.57 ha or 31.46% are in good condition (BPHM 2011). The deforestation and degradation of mangrove forests are caused by human activities, such as logging, reclamation for infrastructure development along the coastline, mangrove forest conversion for intensive agriculture and fisheries, and waste disposal (Jayanthi et al. 2018; Poedjirahajoe and Matatula 2019).

Communities might play essential roles in protecting mangrove forests, however, their participation in sustaining mangroves is low in some locations (Roy 2014). There are some factors that prompted their participation in mangrove conservation. Amzu et al. (2007) stated there is component that related to community attitudes, namely stimulus which can be classified into 3, namely (i) natural stimulus, (ii) useful stimulus, and (iii) religious stimulus. This research

aimed to investigate the attitude of local communities in mangrove conservation which is reflected by their willingness to restore and protect the forest. In doing so, we focused on natural stimulus and useful stimulus (i.e. mangrove fruit utilization), since information about religious stimulus is limited in the community.

MATERIALS AND METHODS

Study area and period

This research was conducted on mangrove forest of Pariti Village, Sulamu Sub District, Kupang Regency, NTT Province (Figure 1). It is part of the 33,94 ha Kupang Bay's mangrove forest (Ramadhan and Savitri 2007) and has thickness of 50-200 meters (Hidayatullah and Ndolu 2015). The rationale for selecting this location is due to its potential source of fruit as alternative source of food (Koeslulat 2018). The research was conducted for three months, from April to June 2019.

Data collection procedure

Data were collected using interview method. Respondents were households selected purposely. The total respondents were 27 households, consisting of fish farmers, village leaders, gender representatives, small shop owners and pastry cookers. Information about the potential use of fruit was conveyed before the interview and they were invited to taste food products originated from mangrove fruits. After that, they were interviewed to answer questions related to current conditions of mangrove forests and its management. The interview was continued by asking their willingness to plant mangrove trees and the willingness to protect the mangrove forest in relation to mangrove fruit utilization.

Data analysis

Data were tabulated and processed using the frequency for each category. The results were descriptively analyzed and explained by existing theory to assist government to improve mangrove management and conservation. Some literature related to the studied site was also reviewed to add nuance to the analysis.

RESULTS AND DISCUSSION

Description of research location

Pariti village is one of the villages in the district of Sulamu, Timor Island, Indonesia with a total area of 1,305.5 ha. The area is mostly paddy fields (600 ha), settlements (300 ha), plantations (300 ha), and other public facilities such as graves, yards, parks, offices, and others. Pariti has 1,170 m coastline length and 100-480 m thickness. It was estimated 33,94 ha of mangrove area in the village (Ramadhan and Savitri 2007).

Pariti Village is one of the coastal areas where the majority of local people make a living as farmers and fishermen. Majority of the agricultural land is rain-fed rice fields, and in some lands people cultivate vegetables and other crops. Due to the large area of rice fields, production sharing system is commonly practiced. Access to the village is relatively good with paved road with distance of 17 km from the district capital and 60 km from the provincial capital. Good road access causes the marketing of agriculture, livestock, and marine products to go quite well.

In Pariti, mangrove thickness ranges between 100-200 m and there were 14 species (12 true mangrove and 2 associates mangrove) in which Rhizophoraceae family was found the most, i.e *Bruguiera cylindrica* (L). BI., *Ceriops tagal* (Perr), *Rhizophora mucronata* Lmk and *Rhizophora stylosa* Griff (Hidayatullah and Ndolu 2015). The density of mangrove forests in Pariti is classified as low to dense with 733-1.760 tree/ha (Hidayatullah et al. 2014).

The utilization of mangrove fruit in Pariti

The utilization of mangroves in Pariti is shown in Table 1. Table 1 shows that most of respondents utilized mangrove forests as source of shrimps, fishes, shells, and crabs (92.6%) and only a few respondents utilized mangrove forests as source of firewood (7.4%). This is in line with Ramadhan and Savitri (2017) that stated utilization value from captured fisheries in mangroves was Rp 19.204.934.508,-, higher than wood utilization (Rp. 229.605.000).

There was no utilization of fruit of mangrove (0%). Most of the respondents stated that they never know about the information of the utilization of mangrove fruit and questioned its safety. In 2017, Koeslulat (2018) has investigated sensory acceptance of *Sonneratia* sp cakes held in Pariti. The result suggested that the cookie needs to be improved especially in regards to taste. Because the respondents were limited in number, so the majority still did not yet know the feasibility of mangroves as a food source. In general, the community was excited by this new information although some suggestions arose during this survey related to its taste. Several questions arose regarding its possibility as a functional food (medicine), the fruit sustainability and its market.

Willingness of communities to plant trees

The willingness of communities to plant trees in mangrove is stated in Table 2. Table 2 shows that only one respondent was willing to plant trees in mangrove forests (3.7%). The fruit utilization was not enough to stimulate the community to plant trees since there was no clear information about the market, process, safety, and fruit sustainability. This finding is similar to Amzu et al. (2007) that conservation is failed because it is not in accordance with stimulus and attitude of conservation. The utilization of fruit of mangrove (useful stimulus) did not become stimulus for community since it was not clear about the information, especially about the market.

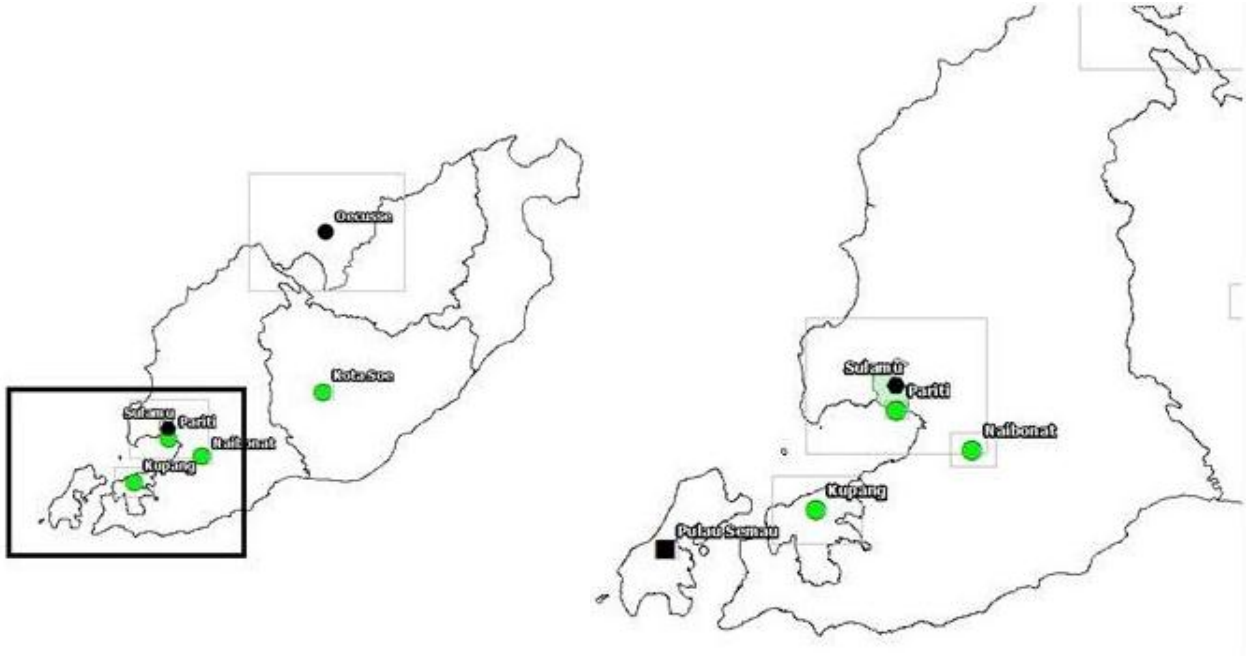

Figure 1. Map of study location in mangrove forest in Pariti Village, Timor Island, Nusa Tenggara Timur Province, Indonesia

It was presumed that the natural stimulus (decreased numbers of the plants) could be an effective stimulus more than the useful stimulus (economic value of the fruit of mangrove). However, along with the success of past planting projects supported by NGOs, there had been a change in attitude towards conservation since the degree of stimulus had weakened. Some of the reasons were: (i) the condition of the mangrove forest started to improve, (ii) there were village regulations (PERDES) that indicated the task of forest management was the duty of the government, (iii) there was no fund to support planting program. According to 7 levels of participation proposed by Hobley (1996), this condition was classified in the fourth level, namely Participation for Incentives. At this level, people participate through support in the form of resources, for example, labor, food support, income, or other material incentives. The weakness of this participation model is if the incentives run out then the program also stopped (Jariyah 2014).

Willingness of community to protect forest

The willingness of community to protect mangrove forests is shown in Table 3. The result indicated that most of the respondents were not willing to protect the forest (96.3%). It contradicts with Hidayatullah and Ndolu (2015) that the community's participation was good. It is likely caused by a change in attitude after the local regulation (PERDES) was published that due to the improvement of the forest. Besides, there was a perception that the government should play a role in protecting the forest instead of the community. The actions to protect the forest by the community were limited only to monitor the forest when they entered the forest.

Related to fruit utilization, the potential of the economy (useful stimulus) did not attract the community to protect the forest. In the perspective of the natural stimulus in the damaged area, it used enough to drive the community to plant the forest, but along with the success of past planting projects that were supported by NGOs, there had been a change in attitude towards conservation since the degree of stimulus had weakened.

Tabel 1. Utilization of mangrove forest by the respondents

Utilization of mangrove	Number of respondents	Percentage (%)
Wood	2	7.4
Source of shrimp, fish, shell and crab	25	92.6
Fruit as source of food	0	0.0
Total	27	100.0

Table 2. Willingness of the respondents to plant trees to improve the productivity of mangrove fruit

Willingness to plant trees	Number of respondents	Percentage (%)
Not willing	26	96.3
Willing	1	3.7
Total	27	100.0

Table 3. Willingness of the respondents to protect the forest

Willingness to protect forest	Number of respondents	Percentage (%)
Not willing	26	96.3
Willing	1	3.7
Total	27	100.0

According to Bloom's cognitive theory (Notoadmodjo 2011), there were 6 levels of cognitive knowledge i.e know, comprehension, application, analysis, synthesis, evaluation. The knowledge related to fruit utilization was at the lowest level. The information was only about the fruit potential utilization which was learned from other locations and was not adequate to stimulate the willingness to participate. The information has to be escalated by the information of the market and technical planting. Most of the community did not know about the technical planting of *Sonneratia* sp, while that of the *Rhizophora* sp was already known.

In conclusion, the information about fruit of mangrove utilization was not able to stimulate the community to participate in planting and protecting the mangrove forest. The information about the utilization of the fruit product, has to be completed by market and technical planting information.

ACKNOWLEDGEMENTS

This research was sponsored by Ministry of Environment and Forestry of Republic of Indonesia Government. We thank several colleagues in the Ministry of Environment and Forestry for their assistance in this research.

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