The Perspective of Small-Scale Fisherman Toward the Seagrass Conservation Contributes to the Sustainability of Friendly Environmental: a Case Study in Coastal Waters of East Lombok

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Keywords: Small-Scale fisherman, seagrass conservation, friendly environmental cultivation.

Abstract: Seagrass is the marine plant species that has essential ecological functions for the sustainability of fish resources and biodiversity. However, it has long been neglected, not fully conserved as well as other ecosystems (mangroves and coral reefs). This study aims to assess the small fisherman's perspective on seagrass sustainability through eco-friendly cultivation over the study sites. The data were collected through direct observation, questionnaires, interviews and discussions. All data was analyzed using descriptive statistical analyses. The results showed the small-scale fishermen over the study sites led to classifying seagrasses based on their morphological characteristics and seagrass functions. Most of respondent's assessment ended up finding it quite useful. The ecological knowledge of small-scale fishermen on seagrass conservation is important, especially for the sustainability of friendly environmental cultivation. Therefore, it should be included in the seagrass conservation policy at the local, regional and national level which empowers the small-scale fishermen for friendly environmental cultivation.

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1 INTRODUCTION

Seagrasses are flowering plants. They grow over the marine environment and support the sustainability of fishery (Ruseler *et al*., 2008: Fortes et al., 2011: Cullen-Unsworth et al., 2013). Nevertheless, the threat to seagrass, particularly in Indonesia coastal water, could have a negative impact on the sustainability of fish resources (Syukur et al., 2017). Seagrass ecosystems can be beneficial for monitoring the health of coral reefs (Syukur and Santoso, 2017). However, the seagrass had been long neglected in its protection at the national and regional levels in coastal area of Indonesia (Nadiarti et al., 2012; Syukur, 2016; Syukur et al., 2016). Therefore, in this case, the concept of environment-friendly farming may be considered as a strategy for the conservation of seagrass beds (Syukur et al., 2016). The aquasilviculture technology could serve as a model for initiating further conservation strategies in the Philippine mangrove forest and other critical wetlands (Flores, 2016). This paper focuses on the way small-scale fishermen valuing the seagrass conservation to support the sustainability of eco-friendly cultivation in the study area.

2 MATERIALS AND METHODS

This study was conducted on April to November 2015 and April to November 2016 in the coastal areas of East Lombok. The geographical position of the research area is 116°37'-116°45' east longitude and 8°17'- 8°18' latitude south (Figure 1).

There was a 100 cmall-scale fisherman selected for the purpose of this study and research paper.

1) They had a minimum of 30 years'experience as fishermen in their profession. 2) They fished around the seagrass beds. 3) They had a knowledge of seagrass and biota. 4) They were aware of the conservation (Syukur et al., 2017). Data were obtained through the survey, questionnaires, interviews, and focus group discussions. Data was analysed by descriptive statistical analysis method.

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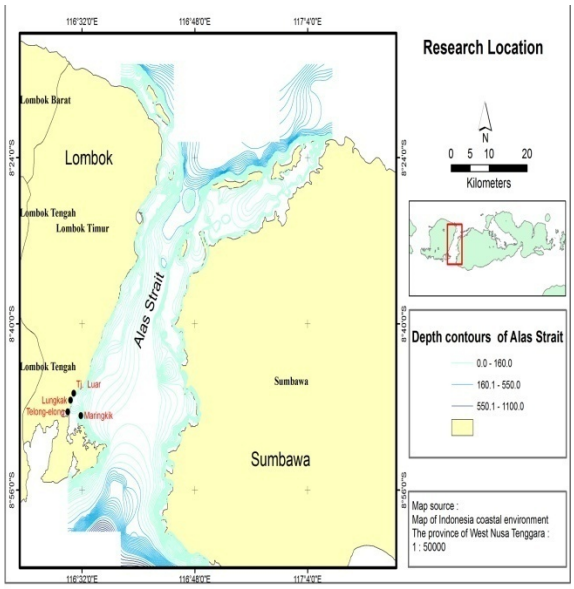

Figure 1: Research Location (Syukur et al., 2016).

3 RESULTS AND DISCUSSION

3.1 The Fishermen Knowledge on Seagrass in the Study Area

Ecological knowledge of the local communities can be observed through its natural resources such as seagrasses. (Ronnback and de la Torre-Castro 2004) and the small-scale fishermen's understanding of eco system in the study area (Syukur, 2013). These points can be better understood from the following examples 1) the fishermen's knowledge of seasional fruit-such as as *Enhalus acoroides*. 2) The way the fishermen spread seagrasses, Halophila. 3) They called them green seagrasses, Cymodoce. 4) They also identified seagrass grass, *Halodulle pinifolia* and *Syringodium isotifolium*. In this case, their perception is mainly influenced by their livelihoods (Daerden et al., 2005).

Table 1: The source of the threat seagrass at the study area.

	Score	Scale	Frequency	Functional Impact	Time of Recovery
	1	< 0,5 km^2	Never occurs	No impact	< 1 year
	2	0,5 km^2 – 1 km^2	Rare	Single species	1 -5 year
	3	1 km^2 – 5 km^2	Occasional	Single tropic level	5 - 10 year
	4	5 km^2 – 10 km^2	Annual or regular	Multiple tropic level	10 - 20 year
	5	> 10 km^2	Persistent	Entire community	> 20 year
Threats	Scale		Frequency	Functional Impact	Recovery time
development of fishery dock	3		1	5	5
boat anchoring	2		4	1	1
over fishing	1		4	4	2
Destructive fishing	2		4	4	3

Indonesia has been aware of the importance of seagrass conservation for marine sustainability and marine biodiversity. The results of this study is shown in (Table 1). The assessment of the level of knowledge of small-scale fishermen about the value of seagrass existence was presented in (Table 2). The accumulation of ecological knowledge of fishermen can be illustrated by their perspectives on seagrass conservation. The fishermen's level understanding of the ecological aspects and threats of seagrass sustainability at the study area are a basis for assessing the benefit of conservation value in the area.. In the in-depth discussions and interviews, the respondents stated that over-exploitation and destructive fishing were the main source of threat. It was worthed quoting that more than 88% of respondents stated seagrass conservation is urgently needed to prevent the the destruction and over-exploitative of the area.

Table 2. The distribution of respondents based on the assessment of seagrass benefits to fish and seagrass marine biota n= 100.

Parameter	Distribution respondents				
	No benefits	Less benefits	Enough benefits	Benefits	Very

	fits				bene fits
	1	2	3	4	5
Supporting Services					
Habitat of all fish	0	12	40	30	18
Habitat of small fish	0	3	45	31	13
Feeding grounds	0	0	42	44	14
The place of the fish sheltered from the sun and predators	0	0	65	20	15
Habitat of marine life other than fish	0	0	56	34	10
Habitat of marine life other than fish	0	0	68	20	12
Water fertility resources	0	0	36	43	11
Supporting vices outputs					
Food	0	0	72	19	9
Regulating and maintenance					
Mud traps	0	0	54	41	5
Increase the clarity of seawater	0	0	44	52	4
Coastal protection from abrasion	0	10	37	40	13
The regulates gas through CO_2 uptake and releases O_2	0	5	64	23	8

3.2 The Friendly Environmental Cultivation in the Study Area

Seagrass conservation was an instrument of increasing income of small-scale fishermen. In addition, environmentally friendly aquaculture can improve the livelihood of small-scale fishermen (Perez *et al*., 2012). The in-depth interviews with fishermen confirmed that the current cultivation was the source of their livelihood. Their perspectives for cultivation had to do with 1) sufficient time. (2) The cultivation security was ensured by their own group who belonged to it, and by the new employment sources for fishing and community families. 3) The cultivation had been seen as a means saving. Furthermore, two other things which observed that seemed to secured the sustainability, inputs (seeds and feed), and utilization of the marine environment in non-destructive ways, for example; bombs, potassium and damaging tools. In addition, the cultivation management system was also the deciding factor, such as; the management of seeds and feed as input production. The security management was carried out together with the adjacent floating net cage placement system. This had to be followed by marketing managed directly by the group.

To achieve the goal of environmental friendly farming, a cooperative apporoach was done. This economic development instrument was relevant with a group of small-scale fishermen. This approach suited the small-scale fishermen with a cooperation habit in groups as a single working unit for fishermen in catching fish (Wright *et al*., 2006; Basurto *et al*., 2013). This study proved that environmentally cultivation friendly 1) fish seeds of environmentally friendly aquaculture can be found from the surrounding environment. 2) The fish seeds always available for propagation. 3) The fish foods can be obtained from the environment. 4) It had a high economic value and marketable. 5) It became a new income source for families's of small-scale fishermen.

4 CONCLUSION

Seagrass conservation can empower the coastal communities, especially small-scale fishermen. The knowledge of small-scale fishermen about the seagrass ecology is significant to describe their perspective about the importance of conservation. The seagrass conservation has a significant contribution to the sustainability of eco-friendly cultivation on a small scale fisherman in the study area. Therefore, it should be written in the policy at local, regional and national level of seagrass conservation based on small-scale fishermen through a friendly environmental cultivation.

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