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## Seagrass conservation needs based on the assessment of local scale economic value on the diversity of its associated biota in the South Coast of East Lombok, Indonesia

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**Abstract.** The existence of seagrass has strategic value for the economic sustainability of small fishermen, especially in providing fish and related economic biota. This research aims to show the economic value provided by seagrass ecosystem services in providing biota associated, both as a primary or secondary source. Field surveys and analysis of effects on production (EOP) show that capture fisheries and other marine biota collectors, both crustaceans and mollusks associated with are directly utilized by local communities on the southern coast of the island of Lombok, Indonesia. The estimated economic value of fish and marine biota used in the Seagrass Ecosystem area is US\$ 40,669.00 and US\$ 21,105.00 per hectare per year or a total of US\$ 61,774 per hectare per year. This value demonstrates the potential importance of seagrass ecosystems so that seagrass conservation is needed for the sustainability of coastal communities and for the sustainability of marine biota in the future.

### 11 Introduction

Seagrass is a flowering plant (Angiospermae) that lives submerged in shallow sea waters and estuary consisting of grapes, leaves, stems spread commonly called rhizome, and roots that grow on the rhizome [1]. Then seagrass also has an important ecological function in the coastal waters area it occupies [2]. Fisheries are human activities related to the management and utilization of aquatic biological resources [3]. Fishermen often carry out fishing activities around the seagrass. Conversely, the role of seagrass in fishing zones often does not receive attention [4]. Fisheries are important in developing countries. In Indonesia, activities included in fisheries starting from preproduction, production, processing to marketing, implemented in a fishery business system. Thus, fisheries can be considered an agribusiness [5].

Seagrass has an ecological function as a primary producer on the structure of trophic levels that produce organic matter through the photosynthesis process [6]. Biota associated with seagrass fields can be analyzed through the function of seagrass fields as biota habitats and the diversity of food species of each biota in seagrass [7]. Seagrass as a habitat for biota health is determined by its density, species composition, surface area, physical parameters such as currents and waves, and where all these factors affect the life stages of fish and their interactions [8]. So it is known that more than 20% of commercial fish species use seagrass as habitat in their life cycle [9]. The condition of seagrass closure is certainly a very decisive factor in the presence of biota associated with it. Furthermore, other environmental factors such as fertility and timing of observation or data collection on related biota [10].



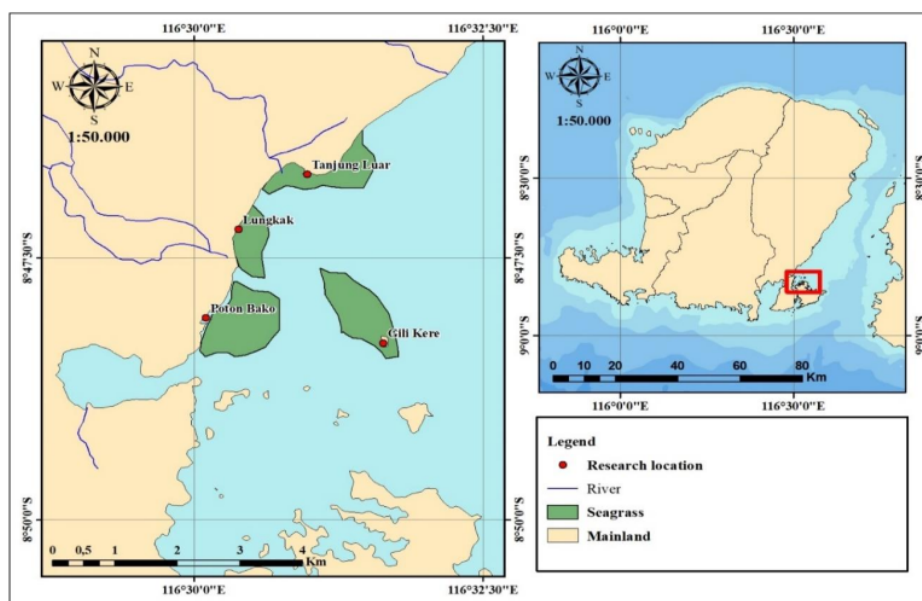
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The role of seagrass for biota in South Beach East Lombok is important. Seagrass fields provide provision services that play an important role in food security and human welfare, especially in coastal fishing villages. However, this use-value is not considered to support the production of fish and another biota (*echinoderms*, *Bivalvia*, *mollusk*). Therefore, Seagrass ecosystem services are underestimated and undervalued. This research is a preliminary study and aims to show the economic value of seagrass ecosystem services, indirectly providing marine products, both as a primary and secondary source.

## 2. Methods

This research was conducted with a case study at the south coast waters of East Lombok (Figure 1). Local communities in the study area have a habit of fishing and biota such as echinoderms and shellfish around seagrass [11]. Besides, the seagrass at the study site, where local communities or small-scale fishermen have used it as an environmentally friendly marine cultivation area [12]. Another potential is seagrass is scattered along the southern coastal waters of East Lombok [13]. Besides, the four research locations are traditional fishing catchments. Environmental conditions in the four research locations, 2 locations (Poton Bako, Lungkak) are close to the mangrove ecosystem, and 1 other location, namely Gili Kere is close to a coral reef ecosystem, and Gili Kere is a small island. The three sampling locations (Lungkak, Poton Bako, and Gili Kere) as new tourist sites, while Tanjung Luar is the location of the largest fish landing center on the island of Lombok. All research locations are fish landing sites, people from outside the village and local residents gather to buy fish caught by fishermen who have just landed, then it will be distributed to various markets with varying prices, according to the type of fish catch or other biota. This research was conducted from September 2019 – August 2020.



**Figure 1.** Map of research locations in South Coast Waters of East Lombok, West Nusa Tenggara, Indonesia.

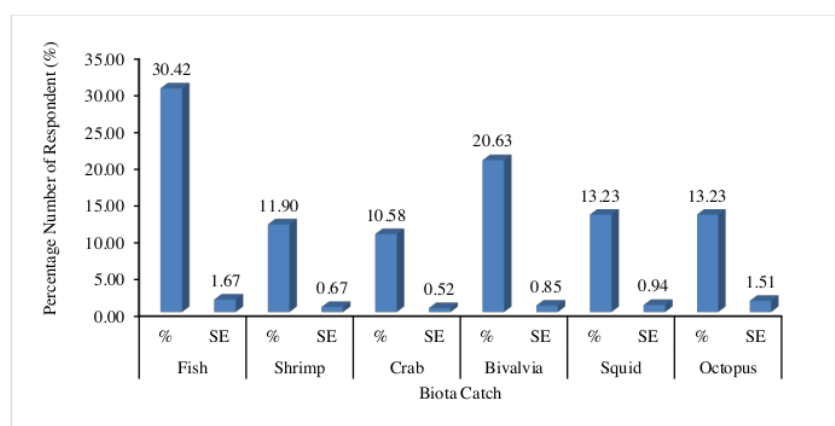
Primary data was collected using questionnaires, interviews, and focus group discussions with Fishermen and "Compactors/Collector" or communities that catch fish and collect their association biota such as marine invertebrates (*crustaceans*, *cephalopods*, and *bivalve*) in seagrass ecosystems as

respondents. Data analyzed using the EOP production effect method (The Assessment of Coastal and Marine Resource Economics) [14].

### 3. Results and discussion

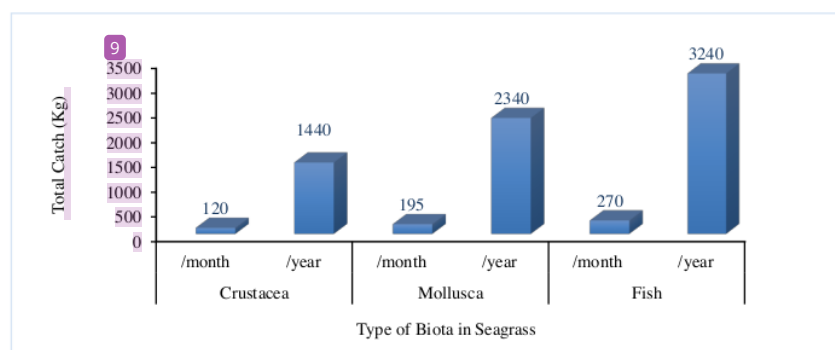
#### 3.1 Livelihoods of Local Community sourced from Seagrass at a Study site

Characteristic respondent is access to seagrass ecosystem and livelihood can describe the distribution of respondents related to seagrass products. In connection with this case, questionnaire results and in-depth interviews, as well as focus group discussion, found that seagrass products. In addition, at the study site 10.58% - 13.23% respondents mainly source of income from taking crabs, and shrimp from seagrass, Bivalvia 20.63%, and the highest respondents to the community that catches fish 30.42%. Responden has a direct reliance on seagrass ecosystem resources. The Percentage of the number of respondents with the main biota caught in seagrass beds at the study site (Figure 2). Fisheries and biota collectors can get 2.5-18 kg fish/ mollusc/crustacean or daily average 2-3 kg fish/ mollusca/ crustaceans per day.



**Figure 2.** The percentage of the number of respondents with the main catching biota in seagrass beds at the research location.

Fishermen generally catch fish and collect biota in seagrass ecosystems at low tide, with a total arrest day of 15 days/month (180 days in one year). Fish catches and biota collections are "madak" only for their own consumption, and are partially sold in the local market. Based on the local market price the selling value of fish ranges between 20.000 IDR-100.000IDR/kg or average 25.000-50.500 IDR/kg. This value is much smaller than the price of the existing biota, which ranges between 30.000-175.000 IDR or average 70.000-100.000 IDR/kg.



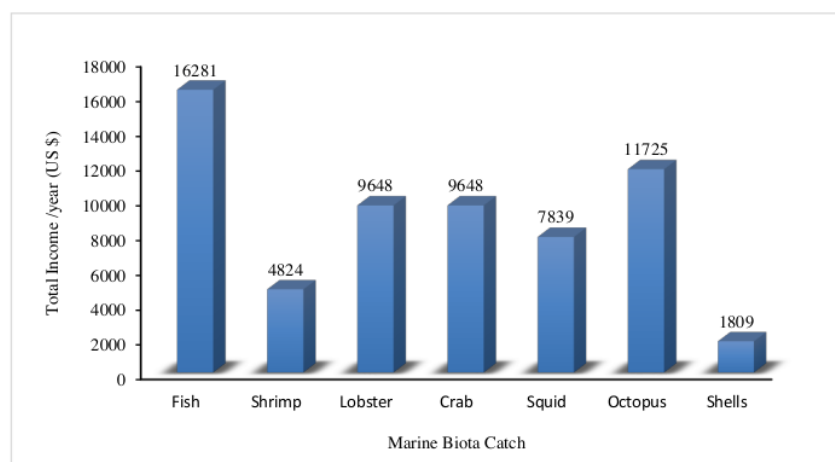
**Figure 3.** Average number of fish and biota catches at the study site.

The average catches on fish and on crustaceans (shrimp, lobster, crab) reaches 120 kg/month or 1440 kg/year, mollusc (cephalopods and bivalves) 195 kg/month or 2340 kg/year. Based on these values, total income of fisheries and biota collectors in Crustacea 6.000.000 IDR/month ( $\pm 50.000$  IDR/kg) or 72.000.000 IDR/year, Mollusca 5.850.000 IDR/month or 70.200.000 IDR/year ( $\pm 30.000$  IDR/kg), Fish 6.750.000 IDR/month or 81.000.000 IDR/year ( $\pm 25.000 - \pm 50.000$  IDR/kg). The average seagrass economy for recreational fishing is estimated to be around 351,179.56 USD per hectare per year in Bintan Island [15]. Seagrass ecosystem has supported fishermen's income from fishing catches, with a total income of 202,124 IDR/day or 12 kg/day in Malang Rapat Village and 193,151 IDR/day or 13.8 kg/day in Berakit Village [16].

### 3.2 Seagrass conservation is urgently needed by the local community

Based on the analysis (Figure 4), the utility of fisheries for fishing is 243.000.000 IDR/year (US\$ 16.281), crustacea like shrimp 72.000.000 IDR/year (US\$ 4.824), lobsters and crabs respectively 144.000.000 IDR/year (US\$ 9.648), while bivalvia 27.000.000 IDR/year (US\$ 1.809). Cephalopods like squid 117.000.000 IDR/year (US\$ 7.839) and octopus 175.000.000 IDR/year (US\$ 11.725). As such, the total utilization of seagrass with fishing rods, and nets using boats around the seagrass area on the south coast of East Lombok is 607.000.000 IDR/year (US\$ 40.669) and coastal activities "Pemadak" with Bubu and Gareng fishing equipment 315.000.000 IDR/year (US\$ 21.105). Thus, the total economic value of fish and marine biota obtained in the seagrass ecosystem area is 922.000.000 IDR (US\$ 61.774) per hectare per year (Figure 4). The total of economic value of fish and marine biota obtained in the seagrass ecosystem area is about 188.843.262,94 IDR (US\$ 13.488,80) and 500.425.602,56 IDR (US\$ 35.744,69) per hectare per year or Rp 689.268.865,50 IDR (US\$ 49.233,49) per hectare per year in Derawan Islands, Indonesia [14].





**Figure 4.** Value of fishermen's income with marine biota catch in seagrass ecosystem.

This value is quite significant, especially for people in villages located on the coast as in fishing villages on the south coast of East Lombok, real economic value also shows that seagrass ecosystem is an important ecosystem that can be a location for looking for marine biota as a food source for people on the south coast of East Lombok, especially during the difficult season to do fishing activities. However, seagrass fields are in an increasingly damaged condition characterized by decreased seagrass closure and seagrass density at the research site. This is due to several factors, such as coastal development, catching of biota with catch tools that cause damage to seagrass ecosystems, such as drill nets, chemical toxins (*Potassium Cyanide/kCn*), Gareng used to take *Bivalvia* and *Echinodermata* [17]. Another factor also causing damage to seagrass ecosystems is anthropogenic activity entering the coast, oil pollution, and other activities of the people that do not pay attention to the function of seagrass [18]. Damage to seagrass ecosystems will change the dynamics of coastal areas, both ecological health of the waters affecting the function of biota habitats associated with seagrass that ultimately affects the welfare of coastal communities and even human welfare. In addition, some other unwitting pressures also damage the structure/seagrass ecosystem is from the disposal of household waste that goes into the beach, boating and tourism activities [19, 14] With the threat of damage from such community activities, seagrass conservation becomes very important for the sustainability of livelihoods for coastal communities and especially the sustainability of seagrass association biota.

#### 4. Conclusion

Seagrass beds are important ecosystems that really need attention to be preserved so that their conditions remain stable, because seagrass beds have high economic value. However, the function of seagrass ecosystem services as an area that is very helpful in providing marine biota is often neglected, and its sustainability aspects are not fully understood by local people. Therefore, community-based conservation of the seagrass ecosystem needs to be an integrated policy by related parties and implemented jointly with the participation of local communities.

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