

ECONOMIC VALUATION OF MANGROVE RESOURCE IN BAROS COAST TIRTOHARGO VILLAGE SUB-DISTRICT OF KRETEK

Tyas Ismi Tria Ikhianty, Suadi, dan Djumanto
Fisheries Management, Faculty of Agriculture,
Universitas Gadjah Mada
Email: tyas.ismi@gmail.com

ABSTRAK

Mangrove memiliki nilai manfaat yang signifikan bagi ekologi dan social ekonomi, namun kuantifikasi nilai ekonomi tersebut masih jarang dilakukan. Tujuan penelitian ini adalah menghitung total nilai ekonomi ekosistem mangrove. Penelitian dilaksanakan di Pantai Baros Kabupaten Bantul pada bulan September sampai Oktober 2013. Responden sebanyak 41 petani, 10 nelayan, 9 peternak dan 34 wisatawan diwawancarai untuk mengetahui manfaat dari nilai ekonomi ekosistem mangrove. Hasil penelitian menunjukkan bahwa nilai total manfaat ekonomi di dalam kawasan mangrove adalah sebesar Rp 168.744.141,67/ha/tahun, yang terdiri atas nilai manfaat langsung sebesar Rp 19.756.491,67/ha/tahun, nilai manfaat tidak langsung sebesar Rp 132.017.160,00/ha/tahun, nilai pilihan sebesar Rp 170.490,00/ha/tahun dan nilai keberadaan sebesar Rp 16.800.000,00/ha/tahun. Nilai manfaat ekonomi tidak langsung memiliki nilai terbesar yang menunjukkan fungsi ekologi kawasan mangrove sangat besar dan mengindikasikan pentingnya melestarikan serta mengembangkan kawasan tersebut. Keberlanjutan ekosistem mangrove dan pengelolaan berbasis ekologi menjadi cara yang dapat dilakukan di masa mendatang.

Kata Kunci: *Baros, Bantul, Manfaat Ekonomi, Kawasan Mangrove.*

ABSTRACT

The community project to plan mangrove in downstream of Opak-Oya River has attracted the growing of various socio-economic activities. The objective of the research is to calculate the total economic values of mangrove ecosystem. The study was conducted in Baros Bantul Regency on September to October 2013. The numbers of 41 farmers, 10 fishers, 9 cattlemans and 34 tourists were interviewed to find out the economic values of mangrove ecosystem. The study indicated the total economic benefits of mangrove area was IDR168.744.141,67/ha/year, which consist of IDR19.756.491,67/ha/year for direct benefits, IDR132.017.160,00/ha/year for indirect benefits, IDR170.490,00/ha/year for optional benefits and IDR16.800.000,00/ha/year for existence benefits. The indirect economic benefit of mangrove area was higher. It shows that ecological functions of mangrove played a greater benefits and the action to conserve and expand the mangrove area are extremely needed. The sustainability of the mangrove and management based on ecology might remain as appropriate way to do in the future.

Keywords: *Bantul, Baros, economic benefits, Mangrove area.*

INTRODUCTION

Indonesia's mangroves cover 30.000 square kilometres, 21% of the global total mangrove area, and contain 45 of the world's 75 species of true mangrove (Spalding et al., 2010). A large of mangrove resource in Indonesia plays an important role in ecology, economic and social behaviour in communities. In the term of ecology, mangrove protects the land from erosion, and abrasion along coastal zone. The economic value of mangrove comes from biodiversity of flora and fauna which become products to provide food and industrial needs of human being. Conservation act created from awareness of mangrove's beneficiaries had become activities in community. This had been proved by Cahyawati (2012), as an act that created social gathering or movement in a group to reach their particular goal related to the mangrove.

Mangrove area located in Baros Beach is the one of mangrove ecosystem in Yogyakarta, which planted by community collaborating with non-government institution and university to protect the coastal environment. Grown along Opak-Oya river banks, that constructed mangrove had been developed mainly by community who lives next to the area. The awareness to build and develop mangrove came from many problems that have been faced by them for years. The problems that forced them to develop mangrove area along Opak-Oya river banks, such as the decreasing of farm production near by the river banks caused by wind that bring salt molecule which is harm the plants, the threat of tsunami and salt water intrusion.

None of mangrove existence in Opak river banks in 2003, now have became 5 hectare due to development invention by the communities and government. Ecological and economic benefits grow as a growing mangrove and become ecology investment for communities. The aim of this research is to calculate the total economic values of mangrove ecosystem. The result of this research will show how important the mangrove ecosystem which has given its functions to the communities in the term of economic

benefits. The awareness to develop and protect mangrove area can be created by serving this information. Besides, it is important for strengthened mangroves management by scientific evidence. Decision-makers easily grasp that "you can't manage what you don't measure" (Seidlet et al., 2011). So, it is important to measure the economic benefit before any roles of management be created.

This study focused in mangrove area in Baros, Tirtohargo village and geographically located at 08°00'28.695''S and 110°16'58.872''E. The map location of study area showed in Figure 1. The basic method of this research is study-case method, by looking through economic activities around mangrove area as a case. Observation along the area has been conducted to determine commercial uses of mangrove and assess their economic value. The measurement of economic value then carried out by purposive sampling of population of social groups influenced by the existence of mangrove area. The respondents comprise of four main groups that claimed as a group who get the beneficiaries of mangrove, they are fishers, cattleman, farmer who lived around the area and tourist who visit mangrove for both natural tourism or educational purposes. The total respondent of beneficiaries was 94 respondents, consist of 10 fishers, 9 cattlemen, and 41 landholder farmers closed to mangrove ecosystem, and 34 visitors (domestic tourist).

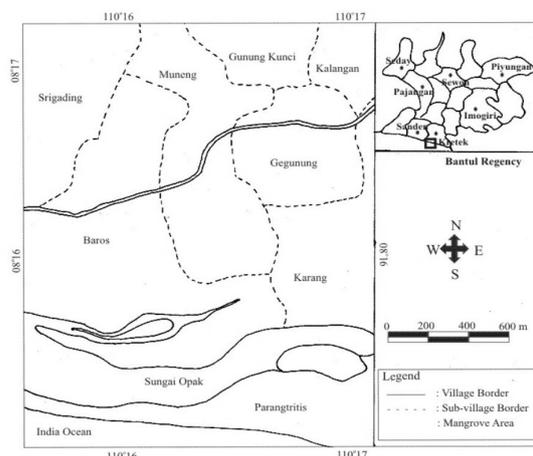


Figure 1. The map of mangrove area in Baros, Tirtohargo Village

To analyse the data, the economic benefits of mangrove area had been separated to four types of benefits following Barbier (1994). The main benefit of mangrove that had been identified shows in Figure 2.

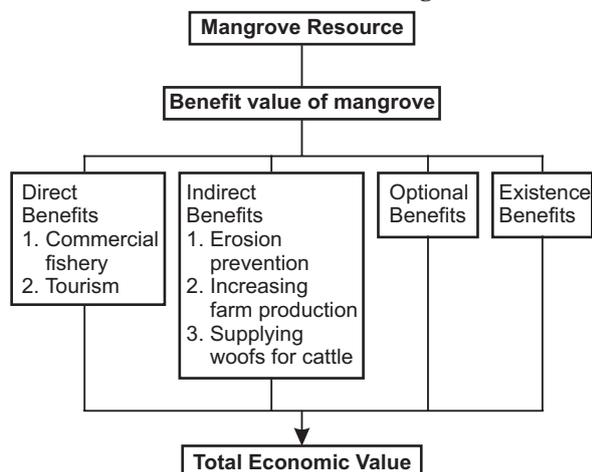


Figure 2. Economic value of mangrove

The method of mangrove economic valuation in this research following method that had been introduced by some previous works (Barbier, 1994; Barton, 1994; Ruitenbeek, 1992). In addition, following Dixon, and Pomeroy with modification by Harahap (2010), four beneficiaries of mangrove area comprise direct benefits, indirect benefits, optional benefits, and existence benefits calculated by the formula, as follows:

Direct Benefits

Commercial fishing

Economic value of commercial fishing came from profits earned by fishers. Fishers only catch the fish in their season, so the profit was the value counted within fishing effort.

$$\text{Commercial Fishing} = (T \times H) - B, \text{ with:}$$

T = catch (kg/year)
 H = market price (IDR/kg)
 B = operational cost (IDR/year)

Tourism

Economic benefit for tourism was calculated by non-market value with travel-cost method. The other cost related to tourism activities that has to be paid by tourist also

considered as economic benefits with opportunity cost approach.

$$\text{Tourism} = (T + B) \times F, \text{ with:}$$

T = travel cost (IDR/year)
 B = opportunity cost (IDR/year)
 F = travel frequency (year)

Indirect Benefits

Erosion Prevention

The damage cost from land protection against erosion was calculated to understanding the value of compensation measures. Building owners and plantation owners protected from coastal erosion were interviewed to measure the value of erosion prevention with damage cost approach. Those values were accumulated by the cost of building and land plantation or production located in 200 m from the outside zone of mangrove area, considering as the vulnerable zone with coastal erosion disaster.

Erosion prevention = $(B \times H) + (L \times K)$, with:

B = number of building (pcs)
 H = market price (IDR/pcs)
 L = plantation area (ha)
 K = farm product profit (IDR/year)

Green Belt Function on Farm Plantation

Mangrove area in Baros had become green belt zone that protected farm plantation. Before the existence of mangrove area, the plantation could not produce any kind of plants in dry season. The existence of mangrove had brought significant benefits for farm plantation nearby. Green belt function = $(P \times H) - B$, with:

P = farm products (kg/year)
 H = market price (IDR/kg)
 B = operational cost (IDR/year)

Supplying Woofs for Cattle

Mangrove area had created ecosystem that support the biodiversity and maintain food chain within the relation of prey and predator. Realizing the high biodiversity in mangrove, cattleman began to use it for supplying woofs for their cattle. The cattle were brought to mangrove area for feeding, so that

the cattleman do not have to paid for woofs as they have it from natural ecosystem. The cost has to be paid by cattleman for woofs considered as economic value in indirect benefits of mangrove area with replacement cost method.

The value of woof = $P \times F \times H$, with:
P = woofs for cattle (kg/year)
F = feeding frequency (year)
H = market price (IDR/kg)

Optional Benefits

The optional benefits were calculated by Contingent Valuation Method with benefit transfer approach following Ruintenbeek (1992). A value of \$US1,500 per squarekilometre per year is thus ascribed as a capturable biodiversity benefit if the mangrove were maintained intact. Similar values would apply to other mangrove areas in the country if they were ecologically important and if they were maintained in a relatively virgin state (Ruintenbeek, 1992).

Existence Benefits

Willingness to pay method was used to calculate the existence benefits of mangrove area. Concerning of the community who's connected to the mangrove area intensively, KP2B as a youth organization that had became developer of mangrove area in Baros since 2003 was the only one that appropriated to become surveys of this study. The costs of development project that had been paid by the developer revealed the existence benefits of mangrove area.

Total Economic Value

The total economic value of mangrove area is the summation of the value of direct benefit, indirect benefits, optional benefits and existence benefits.

DISCUSSION

Economic Value of Mangrove Area

Direct Benefits

Commercial Fishing

The frequency of fishing trip and fishing gears vary among fishers. The fishers used

net with mess size 1 to 4 inch. Fishing activity was conduct by a group of fishers, which composed 2 to 4 fishers. Fishing trip can be 2 to 5 hours a day, depending on the tide-rise. Fishers sell their catches to households (door to door) or to wholesaler who came to the vil- lage. Catches vary from 5 up to 9 kg per year, depending on the fishing effort. Fishing trip also vary between 2 to 3 per week, and fishers only catch the fish in their season. The catch- sconsist of different species, such as *Scylla* sp., *Mugil* sp., *Macrones* sp. And *Oreochromis* sp. The price depend on the type of spe- cies, it is IDR 40.000,00/kg for *Scylla* sp., IDR 25.000,00/kg for *Mugil* sp., IDR 15.000,00/kg for *Macrones* sp., and IDR 20.000,00 for *Oreo- chromis* sp. Total cost for fishing activities is IDR 20.467.542/year with total revenue IDR 100.716.000/year. Therefore, fishers gain IDR 80.248.458/year as their profit.

Tourism

Surveys showed that 89% of tourist vis- iting mangrove for educational purposes, whereas the rest of them visit it for natural tourism. Travel cost paid by tourist ranged from IDR 6.500,00/trip to IDR 30.000/trip. The expenses of visitors that paid for tourism activi- ties comprised several kind of accommodation. A few of them also paid for equipments rental that had been used for enjoy the view of man- grove, such as telescope and tent for camping. The total cost for tourism is IDR 18.534.000,00.

Total direct economic benefit of man- grove area is IDR 98.782.458,00/year or IDR 19.756.491,67/ha/year as showed at Table 1. The highest direct benefit of mangrove comes from commercial fishing rather than tourism. Lack of information for tourist is part of con- tributing factor of undeveloped area for tour- ism purpose. At the time of this research was conducting, KP2B organization on work for manage the area for tourism purpose. Based on surveys, over 92% of tourist agreed on the idea of develop mangrove for tourism pur- pose caused it natural view and function on explaining information about natural sample forscientific purposes.

Table 1. Direct economic benefits of mangrove area

No	Benefit	Benefit value (IDR/year)	Benefit value (IDR/ha/year)
1	Commercial fishing	80.248.458,00	16.049.691,67
2	Tourism	18.534.000,00	3.706.800,00
Total		98.782.458,00	19.756.491,67

Indirect Benefit Green Belt Function Increasing Farm Production

Total cost for farm production is IDR 99.360.500,00/year, and total revenue is IDR 553.990.000,00/year. So that the total profits gained by farmer in dry season from farm plantation is IDR 454.629.500,00/year. It is considering as economic benefits while the farm plantation cannot produce any plants due to the wind that bring salt molecule.

Supplying Woofs for Cattle

The total benefit for woofs is IDR 104.796.000,00 (based on market price).

Total indirect economic benefit of mangrove is IDR 660.085.800,00/year or IDR 132.017.160,00/ha/year. The highest benefit comes from mangrove's function as a green belt that protect farm plantation from salt molecule wind in dry season. It is calculated as 69% of all the total indirect economic benefit (Figure3).

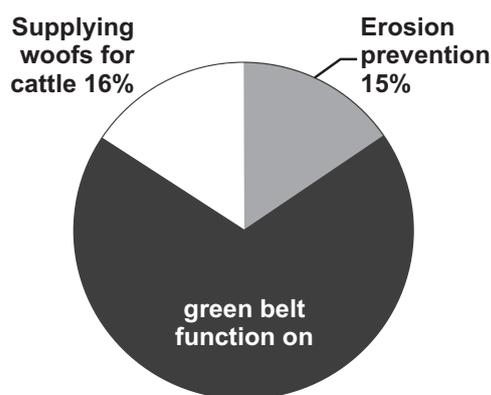


Figure 3. The economic value of indirect benefits of mangrove

Optional Benefits

Optional benefit for mangrove biodiversity is IDR 852.450,00. It is calculated from IDR 11.366,00 x US\$ 15 x 5 ha (conversions of Rupiah to US Dollar are based 2013 average

exchange rate of IDR 11.366,00 for 1 US\$). A value of US\$15 based on study that had been conducted by Ruitenbeek on Bintuni Island, Papua in 1992.

Existence Benefits

The cost that had been paid by developer (KB2B) for development project in mangrove area is considered as existence benefit of mangrove. Willingness to pay method used for this calculation by considering costs as an economic value that willing to be given by some group of people who aware more about the resource. The value of existence benefit is IDR 84.000.000,00. Many financial supports from government and NGO's helped KB2B for development program in mangrove area. Those programs include conservation movement such as planting the mangrove trees, protecting the area by creating awareness to local people, board prohibition setting around the area, and creating tourism event for awareness and educational purposes. The developer plans to expend the area up to 25 hectare.

Total Economic Value of Mangrove

Total economic value of mangrove area consist of economic value of direct benefits IDR 98.782.458,00/year, indirect benefits IDR 660.085.800,00/year, optional benefits IDR 852.450,00 and existence benefits IDR 84.000.000,00. The highest percentage of economic benefits is the indirect benefits of mangrove area with the value of 78,2% of total economic benefits (Table 4.1). Indirect benefits of mangrove's economic value showed a greater functions of mangrove for ecology and social-economic among communities who live nearby. Therefore, the communities and government should pay attention for sustainability of mangrove resource in Baros.

Table 2. Total economic value of mangrove area in Baros

No	Economic benefits	Total value (IDR/year)	Total value (IDR/ha/year)	Percentage (%)
1	Direct	98.782.458,00	19.756.491,67	11,7
2	Indirect	660.085.800,00	132.017.160,00	78,2
3	Optional	852.450,00	170.490,00	0,1
4	Existance	84.000.000,00	16.800.000,00	10,0
	Total	843.720.708,00	168.744.141,67	100

Comparison of the Economic Value with Other Studies

Economic benefit of mangrove in different area showed different value. It was Fitrawati (2001) whose calculated economic value of 144 hectareof mangrove in Buton Regency and came up with the value of IDR 1.419.298.332,00/ha/year, Sobariet all. (2005) with the value of IDR 176.901.768,95/ha/

year in 6,23 hectareof mangrove in Barru Regency, Baderan (2010) with the value of IDR 52.672.513.290,00/ha/year in 1.093,7 hectare of mangrove in Gorontalo Regency. Whereas the economic value of mangrove in Baros, Bantul Regency is IDR 168.744.141,67/ha/year in 2013. These differences of total economic value of mangrove came from different value of beneficiary type within.

Table3. Annual Values of Mangrove in Several Location

Type of beneficiaries	Total value (IDR/ha/year)			
	Buton	Bantul	Barru	Gorontalo
Direct	15.219.000,00	19.756.491,67	6.412.216,95	2.018.3079.000,00
Indirect	1.402.501.906,00	132.017.160,00	166.849.827,00	23.213.053.409,00
Optional	151.500,00	170.490,00	139.725,00	9.084.019.871,00
Existance	1.425.925,93	16.800.000,00	3.500.000,00	185.571.010,00

The results of mangrove economic valuation (Table 3) are extracted from baseline study that had been conducted by other studies in Buton (2001), Bantul (2013), Barru (2005), and Gorontalo (2010). This comparison among economic values of mangrove was to understand and to define the factors that shaped a different economic value of mangrove resources in different places and at different time.

Total economic value of mangrove showed positive relation with the size of mangrove area. The larger size the greater economic value it has. But it is become nega-

tive if we see deeply into each component of total economic value, for instance existence benefit. Mangrove located in Barru Regency has lower value than Bantul Regency whereas the size of mangrove in Barruis larger (1,23hectar) than mangrove in Bantul Regency. It means that there is some other reason that may affect the differences within economic value among areas. Further analysis can be discovering from which component that made the value was different. As show in Table 4, the economic value of mangrove was different because the component within the benefit itself was different.

Table 4. Comparison of Benefit of Mangrove Ecosystem in Several Location

Type of beneficiaries	Buton	Barru	Gorontalo	Bantul
Direct	Wood extraction, commercial fishery (fishing and aquaculture)	Wood extraction, natural seed source, commercial fishery (fishing and aquaculture)	Wood extraction (charcoal and building), commercial fishery (fishing and aquaculture), tourism	Commercial fishery (fishing) and tourism

Type of beneficiaries	Buton	Barru	Gorontalo	Bantul
Indirect	Erosion prevention, and supplying woofs for cattle	Erosion prevention and biological functions (<i>nursery ground, feeding ground, spawning ground</i>)	Intrusion prevention, erosion prevention and supplying woofs for cattle	Intrusion prevention, erosion prevention, as a green belt that increase farm production
Optional	Biodiversity	Biodiversity	Biodiversity	Biodiversity
Existence	Cognitive	Cognitive	Cognitive	Cognitive

Factors affect the economic value of mangrove: *Firstly*, Numbers and type of beneficiaries Both of number and type of beneficiaries can effect on the economic value of mangrove. It does not mean that lots of beneficiaries can make the value higher because there is effectiveness and efficiency that have to be considered. For instance, the number of beneficiaries on direct benefit of mangrove in Barru Regency is higher than Bantul Regency but the economic value of mangrove in Barru Regency is lower. The fishers in Bantul Regency do not need fuel for their boat cause their used traditional boat (called *getek*). That would be possible reason of profit differences between both of them. The awareness and knowledge of local people to used mangrove and get beneficiaries from it also could be a reason why the type and number of it are different.

Secondly, Economic market and condition in time The condition of economic when the time of research is conducted has an effect to the valuation of mangrove economic. Optional benefit following Ruintenbeek calculation that was used by four different studies, depend on the average exchange rate of rupiah to US dollar. So that the condition of macro and micro economic was also has to be considered. The economic market in different area effects in pricing on mangrove products, such as woods and fishes.

Thirdly, Condition of mangrove ecology. Economic valuation of mangrove does not calculated only by market value, but also non-market value with replacement cost and willingness to pay method. It makes the condition of mangrove ecology would be im-

portant to increase ecological and social-economic function for people, as a subject who pay for economic benefit in non-market value. This explanation can be proved by looking at the value of existence benefit of mangrove in Gorontalo Regency (Table 3). The highest value of existence benefits showed the highest beneficiaries of mangrove used by local people (Table 4).

CONCLUSION

The beneficiaries found in mangrove area in Baros comprised direct benefits from commercial fishing and tourism; indirect benefits from erosion prevention, green belt function protected farm plantation, supplying woofs for cattle; optional benefits from biodiversity; and existence benefits. The contributing factors that responsible of economic value distinction among several mangrove area consist of a condition of mangrove, economic market, and condition in time, a numbers and type of beneficiaries of mangrove area that depend on communities. The importance of the benefits from mangrove should be considered in the regulation and policies addressing mangrove management and conservation.

ACKNOWLEDGEMENTS

This study was funded by Laboratory of Socio-Economic, Department of Fishery Management, Universitas Gadjah Mada. We are grateful to Warsono, Handoko, and KP2B team with their valuable information that associated with this study. Realising 94 surveys in Baros and supporting us in every way to make this study be possible.

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