

THE ROAL OF COASTAL COMMUNITIES SUPPORT MANAGEMENT MANGROVE

Mulyadi and Pawana Nur Indah

Faculty of Agriculture University of Pembangunan Nasional "Veteran" East Java

ABSTRACT

The mangrove area has an important meaning in beach ecosystem, both from ecological and economical aspects. For this, the rehabilitation of mangrove forest is done as one effort that aims to maintain and return the mangrove forest function as one of life system supporters, especially in beach area. The most respondent ages of coast people of Gending, Pajarakan, danKraksaan districts, Probolinggo Regency are between 30 to 59 years old, i.e. as 86 people or 95.55% indicates that coast people are productive ages so they can be hoped very potential for having role in supporting mangrove ecosystem management of Probolinggo Regency coast. The average respondent educational rates are mostly Elementary School to Senior High School, i.e. as 76 people. Generally, human resources of coast people have relatively good education level. Thereby, it can be hoped to have positive potencies for the role of coast people themselves toward the mangrove ecosystem management support of Probolinggo Regency coast. The average most respondents have family burdens two and three people as six people or 6.67 percents. But, there are still three respondents who have not have family burdens. Generally, more and more members help in respondent's jobs. The mangrove ecosystem management strategy of Probolinggo Regency coast is by involving people role (people and people figures) and governmental supports through the models of mangrove forest management strategy, the model of embankment cultivation management by entering mangrove as input resources of production facilities, and ecotourism management by the purpose of improving people income.

INTRODUCTION

Mangrove forest is one of unique ecosystems, and very potential natural resources, supporting the life of various flora and fauna of aquatic terrestrial which directly has an important role for continuity of human life from economical, socio-cultural, and environmental aspects.

This uniqueness does not exist in other areas, because most plants and animals that live to associate each other there, especially the specific plants of estuary water which are able to adapt in quite broad salinity ranges.

Mangrove forest area is a forest that grows in estuary, tidal area or seaside. The unique character of mangrove forest is also caused by the combination of plant features that live on the land and in the sea. Mangrove has prominent rooting system, it is called breathing root, is a method of adaptation toward the land condition that is poor of oxygen or even anaerobic. The mangrove area has an



important meaning in beach ecosystem, both from ecological and economical aspects. For this, the rehabilitation of mangrove forest is done as one effort that aims to maintain and return the mangrove forest function as one of life system supporters, especially in beach area.

The efforts of utilizing mangrove resources need to be harmonized by the efforts of preservation and research, so that the functions of mangrove forest physically, ecologically and socio-economically stay eternal and continuing. Because the location that is situated in the ecosystem that is flanked by land ecosystem and sea ecosystem, so the mangrove forest management as an ecosystem should consider all potencies of natural, human, and artificial resources that are situated in land, sea and coast ecosystems.

Mangrove that consists of several types as Mangrove (*Rhisopora* spp.), Wood Fires (*Avicennia* spp.), Pedada (*Sonneratia* spp.) and Tanjung (*Bruguieraspp*) has benefits such as: 1) as natural protection that is strongest and most practical for resisting beach erosion, (2) preparing various forest result such as firewood, 3) having potency as eco-tourism, 4) is a habitat for several wild animals which are threatened extinct (sea/coast animals, mammals, birds), and a haven for migrant birds.

The role of coast people in supporting the success of beach ecosystem development is felt very big, remembering the beach ecosystem area is a livelihood area of most coast people, so the involvement and role of people in supporting and maintaining ecosystem harmony are hoped very much for supporting the continuity of their livelihood life.

The coast area is a field of people livelihood, in which various economical activities can be found, such as aquaculture, catching fish, sea results processing, and the development possibility of mangrove forest coast tourism. The management of coast ecosystem which involves space regulation based on the importances and purposes specifically, begun by mangrove forest development by the purpose of developing the habitat ecosystem for available various biotas. The developing biotas in mangrove forest area are basics of food link for other life organism, which estuary is certainly in food availability for humans. The condition like this should be understood by coast people, remembering that they live and seek food sources from coast area. So, the coast people in the coast area of Probolinggo Regency are very hoped about the role in coast ecosystem development.



The research about The Role of Coast People in Supporting Beach Ecosystem Management of Probolinggo Regency has the purposes such as:

1. Knowing as far as the role of coast people of Probolinggo Regency in beach ecosystem management.
2. Knowing whatever constraints which obstruct the role of coast people of Probolinggo Regency in beach ecosystem management.
3. Finding solution in order to improve the role of coast people in beach ecosystem management of Probolinggo Regency.
4. Determining the management model of effective beach ecosystem for each coast people group in supporting mangrove forest preservation.
5. Determining the management model of effective beach ecosystem for each coast people group in supporting people income improvement.

MATERIALS AND METHOD

The research activity time of coast people role in supporting ecosystem environmental management of East Java northern coast are conducted for 6 months (April 2010 to September 2010). Whereas the activity places are conducted in several districts of Probolinggo Regency which is a coast area and has a potency for beach ecosystem management.

a. Respondent Determination

1. This research is a review which scope is focused in cross-sectional in the role of coast people toward the ecosystem management of Probolinggo northern coast.
2. The population in this research is the coast people which consist of several groups based on their livelihoods (free fish catchers, fish and sea result farmers, and another groups) which are spread in 3 districts of Probolinggo northern coast area (Gending, Pajarakan, Kraksaan). In order not to ignore the data accuracies which can represent generally, so the sample id determined by using the method of Multistage Random sampling by still watching the characteristics of coast area, culture, and the livelihood of each society, so all members of coast people have the same chances for taken as respondents. The following respondent total is determined proportionally by using the method of simple random sampling. The mathematical formula from this method according to Emory (1994) is as follows:
3. The data analysis in this research is besides a "quantitative research" also a "qualitative research", because the conducted approach besides uses



quantitative method also uses qualitative method. The qualitative method is conducted for knowing the role of coast people in the efforts of beach ecosystem management. Besides that it is also used the analysis through quantitative method for gaining the stronger justification.

For answering the first purpose, it is done through quantitative approach in this research which is supported by using the analysis of "descriptive statistic", that is a statistic used for analyzing data by the way of describing or drawing the data which have been collected as they are. The descriptive analysis technique in this case is presenting data through table, graphic, average calculation. So, for measuring the attitudes of coast people is by using Likert scale with the score 1 - 5.

For answering the second purpose, that is using the analysis of "descriptive statistic", that is the used statistic for analyzing data by using the technique of Likert Scale, that is giving the score 1-5 in each criteria. Whereas, for answering the third purpose, that is using the analysis of double linear regression analysis which can be mathematically formulated as follows (Gurajati, 1988).

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \dots + \beta_n X_n$$

In which:

- Y = The attitudes of coast people in the role of managing ecosystem
- X1 = Household income
- X2 = The types of livelihood
- X3 = Education
- X4 = The total of family burdens

4. Determining the ecosystem management model for each type of coast people livelihood by the Swot analysis approach.

RESULTS AND DISCUSSION

a. *The Respondent Role of Coast People Toward Mangrove Ecosystem Management*

The coast people role of Probolinggo Regency in mangrove ecosystem management is measured by using 5 indicators, they are: first, what is done if knowing mangrove is helping; second, do you ever plant if there is broken mangrove plant; third, do you ever make mangrove seeding; fourth, do you care the seeds that have been planted; fifth, do you plant the successor if having cut the mangrove that has been old.



Form the interview result, it can be concluded that the care or role of coast people respondents of Probolinggo Regency in mangrove ecosystem management is quite high.

Table 1. The Role of Coast People Respondents of Probolinggo Regency Based on The First Indicator

Indicator	Answers	Frequencies	Percents
What do you do if knowing mangrove is helping	a. Left	0	0.00
	b. Trimmed	4	4.44
	c. Cut	11	12.22
	d. Cared	33	36.67
	e. Bred	42	36.67

Table 2. The Role of Coast People Respondents of Probolinggo Regency Based on The Second Indicator

Indicator	Answers	Frequencies	Percents
Do you ever plant if there is broken mangrove plant	a. Never	0	0.00
	b. Ever	8	8.89
	c. Sometimes	4	4.44
	d. Frequently with the group	34	37.78
	e. Always with the group	44	48.89

Table 3. The Role of Coast People Respondents of Probolinggo Regency Based on The Third Indicator

Indicator	Answers	Frequencies	Percents
Do you ever make mangrove seeding	a. Never	0	0.00
	b. Ever	3	3.33
	c. Sometimes	0	0.00
	d. Frequently with the group	15	16.67
	e. Always with the group	72	80.00

Table 4. The Role of Coast People Respondents of Probolinggo Regency Based on The Fourth Indicator

Indicator	Answers	Frequencies	Percents
Do you ever care the seeds that have been planted	a. Never	0	0.00
	b. Ever	8	4.44
	c. Sometimes	15	16.67
	d. Frequently with the group	10	11.11
	e. Always with the group	57	63.33



Table 5. The Role of Coast People Respondents of Probolinggo Regency Based on The Fifth Indicator

Indicator	Answers	Frequencies	Percents
Do you plant the successor if having cut the mangrove that has been old	a. Never	0	0.00
	b. Ever	0	0.00
	c. Sometimes	0	0.00
	d. Frequently with the group	3	3.33
	e. Always with the group	67	96.67

a. The Mangrove Ecosystem Management Model of Probolinggo Regency Coast

For determining the model alternatives of mangrove ecosystem management of Probolinggo Regency coast, it is used the analysis adopted from the analysis model of SWOT. The SWOT analysis is done beginning by doing the analysis of internal or external strategic factors of Strategic Factor Analysis Summary (IFAS), and the analysis of internal or external strategic factors of Strategic Analysis Summary (EFAS).

The analysis results of internal factors (IFAS) can be seen in table 5.9 and table 5.10. The Weights from The Strength factors are as follows. If seen from each weight of internal factor, really the weight is almost the same for each strength factor and weakness factor. Whereas the total weight from the strength factor and the total weight from the weakness factor are approximately 2 : 8.

Whereas the weights of The Weakness factors are as follows.

Table 6. The Strength Factors

Number.	The Strength Factors	Weights
1.	Mangrove is useful for sea, land and bird and human biotas	0.122
2.	Mangrove is useful for beach and land	0.133
3.	Mangrove is easy to plant	0.129
4.	Mangrove has many benefits	0.121
5.	Reducing beach abrasion	0.134
6.	Improving the types of sea biotas that live in mangrove forest	0.126
Total		0.765

Table 7. The Weakness Factors

Number	The Weakness Factors	Weights
1.	Difficult to be passed by boats	0.073
2.	Difficult for adding boats	0.076
3.	Reducing embankment width	0.085
Total		0.234



Whereas the external factor analysis (EFAS) can be seen in Table 11. The weights from the Opportunity factors can be seen in the following table 8.

Table 8. Opportunity Factors

Number	Opportunity Factors	Weights
1.	Many people have understood the benefits of mangrove	0.125
2.	Many types of mangrove can be planted	0.136
3.	The supporting beach condition	0.130
4.	The supporting law regulation	0.124
5.	The potencies for developing embankment	0.130
6.	The potencies for developing beach tourism	0.131
Total		0.776

The weights from the Threat factors can be seen in the following Table 9.

Table 9. The Threat Factors

Number	The Threat Factors	Weights
1.	The tide sea can kill the seeds that are just planted	0.068
2.	It has not been area regulation rules mangrove	0.073
3.	There is destruction caused by people catch birds/sea worms	0.084
Total		0.225

It is the same as the analysis results of internal factors, if seen from the weights of each external factor, really the weights are almost the same for each opportunity factor and threat factor. Whereas the total weights from Opportunity factors and the total weights from threat Factors are approximately 2 : 8.

The analysis results of internal factor score calculation (IFAS) can be seen in table 10. The scores from each internal factor and ratings from each factor are as follows.

Table 10. The Scores From Internal Factors (IFAS)

Number	Internal Factors Internal (IFAS)	Weights	Ratings	Scores
I The Strength Factors				
1.	Mangrove is useful for sea, land, and bird and human biotas	0.122	3	0.366
2.	Mangrove is useful for beach and land	0.133	3	0.399
3.	Mangrove is easy to plant	0.129	3	0.387
4.	Mangrove has many benefits	0.121	3	0.363
5.	Reducing beach abrasion	0.134	3	0.402
6.	Improving the types of sea biotas that live in mangrove forest	0.126	3	0.378
Sub Total		0.128		2.295
III The Weakness Factors				
1.	Difficult to be passed by boats	0.073	2	0.146
2.	Difficult to add boats	0.076	2	0.152
3.	Reducing embankment width	0.085	3	0.255
Sub Total		0.234		0.553
Totals		1.000		2.848

Whereas the analysis results of external factor score calculation (EFAS) can be seen in the following table 11.

Table 11. The Scores From External Factors (EFAS)

Number.	External Factors (EFAS)	Weights	Ratings	Scores
I The Strength Factors				
1.	Mangrove is useful for sea, land, and bird and human biotas	0.125	3	0.357
2.	Mangrove is useful for beach and land	0.136	3	0.408
3.	Mangrove is easy to plant	0.130	3	0.390
4.	Mangrove has many benefits	0.124	3	0.372
5.	Reducing beach abrasion	0.130	3	0.390
6.	Improving the types of sea biotas that live in mangrove forest	0.131	3	0.393
Sub Total		0.776		2.328
III The Weakness Factors				
		0.068		
1.	Difficult to be passed by boats	0.073	2	0.136
2.	Difficult to add boats	0.084	2	0.146
3.	Reducing embarkment width	0.225	3	0.252
Sub Total		1.000		0.534
Totals				2.862

Then, if plotted to axis cross, so the strategy alternative of mangrove ecosystem management based on the potencies of internal factors and external factors can be seen in the following picture.

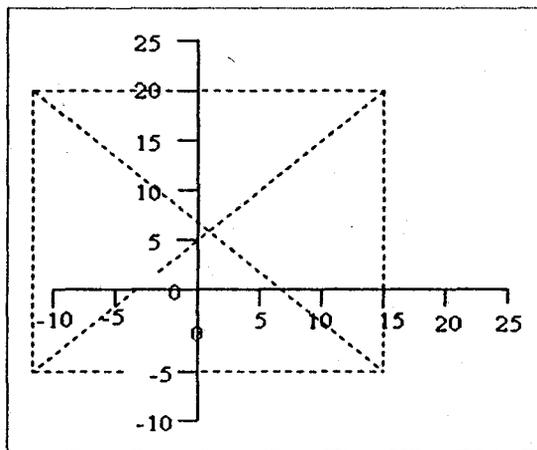


Figure 1. The score picture of internal and external factors

- From the results of picture section above, it can be known that the location of diagonal line intersection from internal factors and external factors is located in quadrant I, it means that the strategy alternative which can be suggested for doing is Aggressive Strategy. This strategy can be done by the way of maximizing strength factors and available chance factors.

b. The Factors That Influence Toward The People Role Rate

For answering about the role of coast people in supporting beach mangrove ecosystem management, so it needs to seek the relation between the influences of income rate, the types of jobs, and education toward how big the people role can be seen in table below this.

Table 12. The Double Linear Regression Analysis Results of Factors that Influence People Participation Rate Toward Mangrove Forest Preservation in Probolinggo Regency.

Free Changers	Regression Coefficients	Error Standards	Significances
1. Constant	7.944	1.706	0.000
2. Income	4.320E-06	0.000	0.000
3. Job	0.559	0.756	0.461
4. Education	0.356	0.282	0.210
5. The Total Family Burden	-0.285	0.427	0.507

Unfree Changer: People Participation in Mangrove Forest Preservation
 $R^2 = 0.668$
 $F_{hit} = 42.779$
 $\alpha = 0.05$

1. Determination Coefficient (R2)

Determination coefficient (R2) explains the total variation from free changer which can be explained by unfree changer. In this research, the unfree changer is people participation in supporting mangrove ecosystem management of Probolinggo Regency, whereas the free changers are income, job, education and the total family burden. The determinant coefficient of $R^2 = 0.668$ means that the total variations from people participation toward mangrove ecosystem management as 66.8 % determined by the variations from income, education, the total family burden, whereas 23.2 % is determined by another changer, besides the 4th independent variable above.

2. Over All Test (Test F)

Test F is used for knowing the influences simultaneously of free changers toward unfree changer. In this research, F calculation is 42.779 and significant in $\alpha = 0.05$. This case means that the changers of income, job and the total family burden simultaneously influence toward the role of coast people in supporting mangrove ecosystem management of Probolinggo Regency coast.

3. Partial Test (Test T)



Test t is used for explaining the influences of each free changers toward unfree changer. From the statistical analysis is gained the results as follows:

1. The income changer influences toward people role changer. The regression analysis result is gained that the influence of significant and positive income changer in the rate of $\alpha = 0.05$ means that higher the people income, so higher the people role toward the mangrove ecosystem management support of Probolinggo Regency.
2. The changer influences of job, education and the total family burden really do not have significant influences toward the role of coast people in supporting mangrove ecosystem management.
3. The the results above, so it can be explained that in the research area, the society figures (socio-culture) are very important in mangrove forest preservation. Anyway, the people in the research area are very strong in economical ones seen from embankment filed mastery by several quite broad society figures. So, this case supports the analysis results that the income influences positively toward the role of coast people in supporting mangrove ecosystem management.

CONCLUSION

Several cases that need to conclude from the research results about the people role in supporting mangrove ecosystem management are as follows:

1. The most respondent ages of coast people of Gending, Pajajaran, danKraksaan districts, Probolinggo Regency are between 30 to 59 years old, i.e. as 86 people or 95.55% indicates that coast people are productive ages so they can be hoped very potential for having role in supporting mangrove ecosystem management of Probolinggo Regency coast.
2. The average respondent educational rates are mostly Elementary School to Senior High School, i.e. as 76 people. Generally, human resources of coast people have relatively good education level. Thereby, it can be hoped to have positive potencies for the role of coast people themselves toward the mangrove ecosystem management support of Probolinggo Regency coast.
3. The average most respondents have family burdens two and three people as six people or 6.67 percents. But, there are still three respondents who have not have family burdens. Generally, more and more members help in respondent's jobs.



4. The mangrove ecosystem management strategy of Probolinggo Regency coast is by involving people role (people and people figures) and governmental supports through the models of mangrove forest management strategy, the model of embankment cultivation management by entering mangrove as input resources of production facilities, and ecotourism management by the purpose of improving people income.

REFERENCES

- Ablaza-Balayut, E, 1995. The Philippine fisheries Sector program . pp 156-177. In: Coastal and Marine Environmental Management : Proceedings of a Workshop. Bangkok, Thailand, 27 – 29, March, 1995. Asian Development Bank. Pp 331.
- Anwar, J., S.J. Damanik, N. Hisyam, and A Whitten, 1984. Ekology Ekosistem Sumatra. Gajah Mada Univ Press. Yogyakarta.
- Agardy, TS 1997. Marine Protected Area and Ocean Comservation. Academic Press. Inc., San Diego, California.
- Calumpong H. 1993. The role of academe in Community Based Coastal Resource Management: The Case of APO ISLAND . In : Proceedings Of The seminar Workshop on Community- Based Coastal Resources Management : Our Sea OurLife. Lenore P.C. (eds). Voluntary Services overseas, New Manila, Quezon City, Philipines.
- Crawford, B.R., I. Dutton, C. Rotinsulu, L. Hale. 1998. Community- Based Coastal Resources Management in Indonesia: Examples and Initial Lessons from North Sulawesi. Paper presented at Internasional Tropical Marine Ecosystem Management Symposium. Townsville, Australia , November 23 -26.
- Dahuri R, Rais J, dan Ginting SP, 2001. Pengelolaan Sumberdaya Pesisir dan Lautan Secara Terpadu. PT Pradya Paramita. Jakarta.
- Kasmidi, M., A. Ratu, E. Armada, J. Mintahari,. I. Maliasar, D. Yanis, F. Lumolos, dan N, Mangampe. 1999. Profil Sumberdaya Wilayah Pesisir Desa Blongko, Kecamatan Tenga, Kabupaten Minahasa Sulawesi Utara. In Press. Proyek Pesisir. University of Rhode Island, Coastal Resources Center, Naragansett, Rhode Island, USA.
- Kellerher, G and R. Kenchington. 1992. Guidelines for Establishing Marine Protected Area. IUCN Marine Conservation and Development Report, Gland, Switzerland.
- Melana D.M , Grece, D and Doudton, N, 2000. Management Mangrove Handbook. Coaltal Resource Management Project. Departement of Environment and Natural Resources. United State Agency for International Development.



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- Sathirathai, S and Barbier, EB, 2001. Valuing Mangrove Conservation in Southern Thailand. *Journal Contemporary Economic Policy*. Volume 19 No. 2 April 2001. Western Economic Association International.
- Sidik Frida, Latif H; Ferindra TD; Adi TR, Haris dan Candra (2002). Penanganan Abrasi, Erosi, dan Tsunami dengan Optimasi Vegetasi. Pusat Riset Teknologi Kelautan. Badan Riset Kelautan dan Perikanan. Departemen Kelautan dan Perikanan.
- Solikhin, Ahma. 2002. Otonomi Daerah dan Hak Ulayat Laut. *Majalah Cakrawala TNI - Angkatan laut*. Jakarta.
- Soemodiharjo, S and L. Soerianegara. 1989. The Status of Mangrove Forests in Indonesia. In *Ecological and Economic Considerations*. Biotrop Special Publication 37.
- Sudarmadji, 2001. Rehabilitasi Hutan Mangrove dengan Pendekatan Masyarakat. *Journal Ilmu Dasar*. Volume 2 No. 2. 2001. Universitas Jember.
- Sulistiyowati Hari, 2000. Diagram Profil Hutan Mangrove di Taman Nasional Buluran-Jawa Timur. *Journal Ilmu Dasar*. Volume 1 No. 1, 2000. Universitas Jember.
- Tomascik, Tomas, Mah AJ, Nontji A, and Moosa MK, 1997. *The Ecology of The Indonesian Seas. Part II*. Dalhousie University. Periplus Edition (HK) Ltd.
- Triatmodjo, B, 1999. *Teknik Pantai*. Beta Offset. Yogyakarta.
- Yuwono, Nur. 2001. *Dasar-dasar Pengelolaan Masterplan Pengelolaan dan Pengamanan Daerah Pantai*. Laboratorium Hidrolik dan Hidrologi. Pusat Universitas Ilmu Teknik. Universitas Gajah Mada, Jogjakarta.