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ECOLOGICAL ASPECT OF NON PRODUCTIVE FISHPONDS AT MAHAKAM DELTA AREA:REVITALIZATION WITH SILVOFISHERY SYSTEM

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ABSTRACT: *Mahakam Delta area utilization for various purposes, especially for intensive aquaculture has led to degradation of the land quality and mangrove vegetation both in ecological terms. The research was conducted in the Mahakam Delta to assess the ecological aspect revitalization of non productive fishponds at Mahakam Delta with silvofishery system which is a combination of fishery and forestry in one unit of land management. The research was conducted by surveys, interviews, laboratory analysis and tracking of secondary data relating to the revitalization activities of fishponds at Mahakam Delta with silvofishery system. The results of the study are: [1] Revitalization of non productive fishponds at Mahakam Delta with silvofishery system was conducted by government and local community, applied Traditional Ditch Fishponds with three types of bakau planting site, i.e.: permanent flooded, periodically flooded and not flooded site. [2] Five major parameters of water quality in the 2 to 8 years ages silvofishery fishponds, (Temperature: 25 to 28 ° C; Transparency: 40 to 60 cm; pH: 6.7 to 7.36; Salinity: 13 to 20 ppt; Dissolved Oxygen: 3.2 to 5.7 ppm) are relatively stable and meets the quality standard suitability for cultivation of shrimp, milkfish and crabs.*

KEYWORDS:Intensive aquaculture, Revitalization, Fishpond, Mahakam Delta, Silvofishery system.

INTRODUCTION

Mahakam Delta area utilization for various purposes, especially for intensive aquaculture has led to degradation or loss of quality and function of land and mangrove vegetation both ecologically and economically which leads to several problems, among others tread damage, decrease in the carrying capacity of the environment and decrease the productivity of mangrovestands and productivity of farms, which can affect the socio-economic conditions of society.

Syahrudin (2008) stated that the Mahakam Delta conservation area damage caused by uncontrolled land clearing fishponds and not environmentally friendly impact on coastal erosion and decline in farm production. Up to 2008 damage to the Mahakam Delta region reached 95,000 hectare or 87.96% of the total area of 152. 400 hectare.

Revitalization efforts that have been made in the Mahakam Delta region is the management of fishponds with Silvofishery system which is the combination of aquaculture in mangrove

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planting, which is done by the government, government partnerships with the community and by the community independently. Independently, community fishponds with Silvofishery system in the area has not managed or no longer productive. Extensive farms managed 5-30 hectares, with a variety of mangrovestand age.

In the Mahakam Delta region in the province of East Kalimantan-Indonesia, has conducted various studies, including studiesof Land Carrying Capacity for Shrimp Farming in the Mahakam Delta (Sutrisno and Ambarwulan, 2003), with the results of the study showed that while the central and northern parts in muara-Mahakam estuary is expected to support the cultivation of shrimp. Only the pH ofthe soil and water in some locations may become an obstacle to the success of this effort. The southern parth as a constraint on the suspended material in addition to relatively high pH of the soil and water. Observations image shows the trend expanding farms to Nyparegion (upstream Mahakam), which is physically less supportive of shrimp farming.

Zoning Plan Research and Rehabilitation Referral Mahakam Delta area, has been carried out by Suhardiman (2009), based on the interpretation of satellite imagery-based objects, the ratio between the area of fishponds and mangrove forests are still left with a variety of conditions is 60 : 40, and the rate is directly proportional to the level of criticality of land that reaches ± 60% of the total area. Based on these results, the pattern for the rehabilitation of areas already become a fishponds can be done using a model Silvofishery with systems adjusted to the wishes of the people

Economic Studies Business Model Mangrove Pond in the Mahakam Delta Regional Kutai regency has been done by Upat (2009), with the results that the type of pond viable by fish farmers are silvofioshery fishponds models, because it provides a great advantage to farmers financially, interest rate a year obtained also satisfies rates at by the bank. Study of Public Participation in the Management of Mangroves has been done by Wardani and Djuhriansyah (2006), provides the results of the level of community participation in the management of mangroves in Muara Jawa Ilir are in the low category. To complement previous research, this study is focused to determine whether the revitalization of non-productive fishponds in the Mahakam Delta Silvofishery ecological system can improve the site and capacity of the environment, the benefits of research: [1] as evaluation tool Mahakam Delta revitalization activities; [2] add to their knowledge of the management of mangrove areas; [3] into consideration the Mahakam Delta revitalization policy making.

MATERIALS AND METHODS

Research Location

Field research activities have been conducted at locations fishponds with Silvofishery system in the Mahakam Delta in Handil 8 village Muara Jawa District, Kutai Kartanegara. Water quality data analysis performed on Health Laboratoryof East Kalimantan Provincial.

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Scope of Research

The scope of this study is limited to studies related to the benefits of the ecological aspects of the revitalization of unproductive fishponds in the Mahakam Delta with Silvofishery System. The study focuses on issues related to the quality of the sites and environmental carrying capacity.

Data Collection Methods

Data biogeophysic: Observations biogeophysic done on aquaculture fishponds are managed by the Silvofishery system on several conditions and differentage of mangrove stands.

Monitoring of water quality: made in aquaculture Silvofishery fishponds which became the object of research. The observed parameters: temperature, brightness, pH, salinity, DO, BOD, suspended solids, ammonia, nitrite and nitrate. Some of the water quality parameters were observed directly in the field and analyzed at the Health Laboratory of East Kalimantan Provincial.

Waterquality parameters and equipment used for observation, refer to the equipment used by Prasita(2007) is presented in Table 1.

Table 1. Some Water Quality Parameters and Measure Tool Used

No	Parameters	Equipment	
1.	Temperature (ºC)	Thermometers	Direct measurements
2.	Brightness (m)	Secchidisk	Direct measurements
3.	pH	pH meter	Direct measurements
4.	Salinity (ppt)	Salinometer	Direct measurements
5.	Dissolved oxygen (ppm)	DO meter	Direct measurements
6.	BOD (ppm)	Sample bottle, BOD meter	Laboratory
7.	Dissolved Solids (mg /l)	Spectro photometer	Laboratory
8.	Ammonia (ppm)	Spectro photometer	Laboratory
9.	Nitrite (ppm)	Spectro photometer	Laboratory
10.	Nitrate (ppm)	Spectro photometer	Laboratory

Source: Prasita(2007)

Secondary Data: Secondary data collected through a survey of various research reports, literature, and the results of a survey of various institutions / agencies, such as documents, pictures / maps, textandtables, relevant and support research, analysis of research data.

Land Quality Analysis: based on the results of the laboratory analysis of water quality to provide a picture of the condition of the quality of landwhich includes water quality in Silvofishery fishponds with various mangrove plant age, and to analyze the suitability of land for Silvofishery system.

RESULTAND DISCUSSION

Forms and Implementation Activities:

Forms of unproductive fishponds revitalization activities in the Mahakam Delta with Silvofishery system has been implemented in the form of pond management system changes, that were initially managed intensively and has less or unproductive, modified with

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environmentally friendly farm management systems that integrate or combine aquaculture and forestry in one unit land management.
Implementation begins with the initiation of activities and the introduction of environmentally friendly farm management system by the government that the Forest Service Kutai Kertanegara, by making the Pilot Project farm management system implementation involves Silvofishery system. During the period 2002 to 2007 has been carried out mangrove planting area of 819 Hectare with Silvofishery system (Sidik, 2008). Insubsequent stages, most fish farmers in the Mahakam Delta gradually began to make changes to the system of environmentally friendly farm management with Silvofishery system.

Community Involvementin Activities:
The results of this study showed the public, especially the fish farmers either individually orin a group of farmers farms, has been actively involved and proactive in fishponds revitalization activities in the Mahakam Delta with Silvofishery system. This is demonstrated by the many farmers groups Silvofishery fishponds that have formed and the number of proposals for setting up a new Silvofishery pondraised by farmers groups to the Forest Service Kutai Kertanegara. Silvofishery fishponds farmer groups in the Mahakam Delta are presented in Table 2.

Table 2. Data Farmers Group in the Mahakam Delta Silvofishery Fishponds

No.	Farmers Group	Number of Member	Location	Activity
1.	Silvofishery Rintisan	29 Persons	Muara Jawa Ilir	Extension fisheries and nursery to planting mangroves.
2.	Pesona Mangrove	7 Persons	Muara Jawa Tengah	
3.	Windu Jaya	6 Persons	Bujit Island, Benakang, Anggana, Sepatin	
4.	Tanjung Lestari	9 Persons	Tanjung Sembilang	
5.	Theraphy Mangrove	9 Persons	Pulau Pemerung, Anggana	
6.	Maju Jaya	8 Persons	Muara Sembilang	

RESULTS ACHIEVED

The results that have been achieved from the revitalization activities in the Mahakam Delta region in particular Silvofishery system managed independently by the community are presented in Table 3.

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Table 3. Activities Revitalization Unproductive Fishponds with Silvofishery System in the Mahakam Delta Region

No	Fishponds Manager	Area (ha)	Location of Fishponds
1.	Farmers Group Silvofishery Rintisan Chairman: H.Shukri, S.Pi.; Members : 29 Persons	267,5	Muara Jawa Ilir (Handil 7, 8, 9)
2.	Farmers Group Pesona Mangrove Chairman: Nurdin; Members : 7 Persons	47,5	Muara Jawa Tengah (Handil 6, 7)
3.	Farmers Group Windu Jaya Chairman: M. Ishak; Members : 6 Persons	100	Bujit Island, Benakang, Anggana, Sepatin.
4.	Farmers Group Tanjung Lestari Chairman: Mulyadi; Members : 9 Persons	45	Tanjung Sembilang
5.	Farmers GroupTherapy Mangrove Chairman: H. Arsyad; Members : 9 Persons	35	Pulau Pemerung, Anggana
6.	Farmers Group Maju Jaya Chairman: Aldi; Members : 8 Persons	50	Muara Sembilang

Sustainability Activities:

Farm management activities with Silvofishery system on the location of research has been carried out for about ten years and is still well-managed and developed with the creation of new aquaculture with Silvofishery fishponds. This can be seen by age Silvofishery fishponds varied from age 2 (two) to 8 (eight) years old. Guarantee the sustainability of activities is also demonstrated by the seriousness of the farmer groups in procurement activities mangrove seedlings were carried out continuously to meet the needs of good seeds for planting and for replanting.

Ecological Aspect:

The results of the study of ecological aspects in particular water quality Silvofishery fishponds with different mangrove stand age, based on the class category suitability for 5 (five) main parameters are presented in Table 4.

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Table 4. Suitability Class Five Main Parameter Water Quality Silvofishery Pond with Different Age of mangroves stands

No.	Parameters	Age stands / Test Results / Measurement				Suitability Class
		2 years	5 years	6 years	8 years	
1.	Temperature (°C)	25-28	25-28	25-28	25-28	S1 (28 - 30)
2.	Brightness (cm)	40-60	40-60	40-60	40-60	S1 (30 - 40)
3.	pH	7	6.7	6.7	6.9	S2 (6 - 7.5)
4.	Salinity (ppt)	13-20	13-20	13-20	13-20	S1 (12 - 20)
5.	Dissolved Oxygen (ppm)	5.5	3.2	3.4	4.3	S1 (>5) and S2 (3-5)

Five major water quality parameters (temperature brightness pH salinity dissolved oxygen) Silvofishery fishponds, with different age of mangrove stand meet the criteria of suitability classes S1 and S2 for aquaculture.

The comparison of 5 (five) main parameters of water quality (temperature, brightness, pH, salinity and dissolved oxygen) in Silvofishery fishponds with the requirements for the cultivation of several types of fishery commodities, are presented in Table 5.

Table 5. Comparison 5 Main Parameters of Water Quality in Silvofishery Fishponds with Requirements for Cultivation of Several Types of Fishery Commodities

No.	Parameters	Results[1)]	Cultivation Requirements Specification						Remarks
			Shrimp [2)]		Milkfish[3)]		Crab[4)]		
I	Fishponds age of 2 years								Source:
1.	Temperature (°C)	25-28	29-30	E	21 - 32	E	25-30	E	Primary data
2.	Brightness (cm)	40-60	≥60	E	>5	E	-	-	Sutrisno and Ambarwulan (2003)
3.	pH	7	8.0-8.5	Ne	6.5 - 8.5	E	7-8	E	Prasita (2007)
4.	Salinity (ppt)	13-20	15-25	E	5 - 35	E	15-30	E	Susanto, G.N.(2006)
5.	Dissolved Oxygen (ppm)	5,5	≥3,0	E	>3	E	>3	E	
II	Fishponds age of 5 years								Cultivation requirements:
1.	Temperature (° C)	25-28	29-30	E	21-32	E	25-30	E	E :: Eligible
2.	Brightness (cm)	40-60	≥60	E	>5	E	-	-	Ne :: Not eligible

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3.	pH	6.7	8.0-8.5	Ne	6.5-8.5	E	7-8	E
4.	Salinity (ppt)	13-20	15-25	E	5 - 35	E	15-30	E
5.	Dissolved Oxygen (ppm)	3.2	≥3.0	E	>3	E	>3	E
III	Fishponds age of 6 years							
1.	Temperature (°C)	25-28	29-30	E	21-32	E	25-30	E
2.	Brightness (cm)	40-60	≥60	E	>5	E	-	-
3.	pH	6.7	8.0-8.5	Ne	6.5-8.5	E	7-8	E
4.	Salinity (ppt)	13-20	15-25	E	5 - 35	E	15-30	E
5.	Dissolved Oxygen (ppm)	3.4	≥3.0	E	>3	E	>3	E
IV	Fishponds age of 8 years							
1.	Temperature (°C)	25-28	29-30	E	21-32	E	25-30	E
2.	Brightness (cm)	40-60	≥60	E	>5	E	-	
3.	pH	6.9	8.0-8.5	Ne	6.5-8.5	E	7-8	E
4.	Salinity (ppt)	13-20	15-25	E	5 - 35	E	15-30	E
5.	Dissolved Oxygen (ppm)	4.3	≥3.0	E	>3	E	>3	E

The comparison showed that the 5 main parameters of water quality (temperature, brightness, pH, salinity and dissolved oxygen) in Silvofishery fishponds ages 2 to 8 years largely eligible for shrimp farming, milkfish and crab. Only the pH of water that do not eligible for shrimp farming.

Productivity improvements tread relation ship with fishponds and stands of mangroves

Descriptively, tread repair relations with farm productivity and increase mangrove stands, can be described:

Against Increased Productivity Pond: water quality conditions in the pond Silvofishery ponds can support increased productivity through the efforts of diversification and diversification of fishery commodities by selecting the most profitable businesses and selecting fishery

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commodities that have the highest economic value.Mangrove Stands Against Productivity Improvement: Improved tread on aquaculture with Silvofishery system is also very supportive for the intensive cultivation of mangroves, with the planting of the type and age of the uniform and regular spacing and silvicultural treatments can increase of productivity of mangrove stands.

Site Repair Relationship with Improved Environmental Carrying Capacity

Indescriptive relationships its improvement with increased carrying capacity of the environment: [1] Site repairing pond aquaculture with Silvofishery system can improve the utilization rate of land suitability of land for cultivation so more efficiently. Implementation in an increase in the carrying capacity of the environment is the land's use for aquaculture is more efficient to reduce the level of damage to the environment so as to increase the availability of land resources that can be utilized; [2] In addition to the increased availability of land that can be used, improved tread on aquaculture in fishponds Silvofishery system also works well for seed production forest commodity (mangrove) and fishery commodities (crab), so as to support the needs of seed for subsequent cultivation; [3] at the silvofishery fishponds various types of organisms that can be used as natural food for fish farming have also begun to exist, sometypes of shell fish and fish (trash fish) that live naturally in fishponds can also be used as feed silvofishery soft-shelled crabs are cultured with a system of cages in silvofishery fishponds. The presence of various types of biotain Silvofishery fishponds can increase the carrying capacity of the environment through the role of maintaining the stability of the aquatic environment so that it can bean ideal environment for the cultivation of a variety of fishery commodities.

The presence of various types of biotain Silvofishery fishponds which increase the carrying capacity of the environment through the role of maintaining the stability of the aquatic environment so that it canbean ideal environment for the cultivation of a variety of fishery commodities, economically can reduce the input of control and increase production, so as toreduce production costs and increase revenue society.

CONCLUSION

1. Revitalization of unproductive aquaculture fishponds in the area of the Mahakam Delta with Silvofishery system, has been implemented by the government and society using traditional ditch pond with three mangrove site conditions: permanent flooded, periodically flooded and not flooded,.
2. Five major water quality parameters (temperature brightness pH salinity dissolved oxygen) Silvofishery fishponds, with different age of mangrove stand meet the criteria of suitability classes S1 and S2 for aquaculture.
3. Water quality parameters in 5, 6, and 8 years ages of Silvofishery fishponds, with three different mangrove site planting conditions for the major water quality parameters: temperature (25-28°C) brightness (40-60 cm) pH (6.7 to 7.36) salinity (13-20 ppt) dissolved oxygen (3.2 to 5.5 ppm) in 5, 6, and 8 years ages of Silvofishery fishponds, relatively stable meet the quality standards suitability for cultivation of shrimp, milkfish and crabs.

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Suggestions

1. Based on the consideration of ecological aspects, revitalizing fishponds unproductive in the Mahakam Delta with Silvofishery system is suggested to use a traditional ditch pattern design with a pond where the mangroves sites planting flooded periodically.
2. For further aquaculture with Silvofishery system requires a relatively long cycle businesses, advised the government establishes the certainty of land status to support sustainability efforts.
3. To explore other benefits beyond commodity production forestry and fisheries, there should be a potential valuation of environmental services Silvofishery fishponds system.
4. For the development of Silvofishery fishponds, need input Silvofishery technological innovation, supported by research and development of other types of forestry and fishery commodities with high economic value.

REFERENCES

Abubakar, A. , A.M. Lahjie and Ichiro Hongo. 2012. Economic Analysis of Brackish Water Pond Cultivation Models in Kutai Kartanegara East Kalimantan. Regional Research Institute of Agricultural Production (RRIAP) Publication No. 26.

Allen, G.P. and J.L.C. Chambers. 1998. *Sedimentation in The Modern And Miocene Delta*. Indonesian Petroleum Association. Jakarta.

Allen, G.P.; D. Laurier and J. Thouvenin. 1976. "Sediment Distribution Pattern in Modern Mahakam Delta" . *Proceeding Indonesian Petroleoum Association,* 5th Annual Convention. Jakarta.

Anwar, C. And H. Gunawan. 2006.Role of Ecological and Economical Social Mangrove Forest in the Coastal Area Development Support. Main Paperson Exposure Research Results: Conservation and Rehabilitation of Forest Resources. Padang, 20 September 2006. (in Indonesian)

Bengen, D.G. 2009. The Integration Knitting Coastal Management as the Basis for Sustainable Environmental Development Cornerstone. Workshop Papers NGO Forum-TOTAL E&P, Samarinda 26 to 27 October 2009. 24p. (in Indonesian)

Gunarto. 2004. Conservation of Biological Resources Support Mangrove as Coastal Fisheries. Journal of Agricultural Research, 23(1), 2004.(in Indonesian)

Gunawan, W. And Noorhidayah. 2007. Functions and Benefits of Biological Resources in the Mangrove Ecosystem Perspective of Ecological and Economical (Bio Resource Function and Benefit of the Mangrove Ecosystem in Ecological and Economical Perspective). Info Forest Vol. IV. No.6. Year 2007: 595-604 p. (in Indonesian)

Harahab, N. 2010. Economic Assessment of Mangrove Forest Ecosystem and Its Application in Coastal Planning. Graha Science. Yogyakarta. 251p. (in Indonesian)

Karminarsih, E. 2007. Utilization of Mangrove Ecosystems to Minimize Impact of Disasters in Coastal Region (The Use of Ecosytem Mangrove in minimalize Disaster Impact in Beach Area). JMHT Vol. XIII (3) : 182-187, December 2007.

Kusmana, C.; Istomo; C. Wibowo; S.W. Budi, R.; I.Z. Siregar; T.Triyana; S. Sukardjo. 2008. Manual of Mangrove Silviculture in Indonesia. Published by: Directorate General of

ISSN 2053-5805(Print), ISSN 2053-5813(Online)

Land Rehabilitation and Social Forestry, Ministry of Forestry and Korea International Coorpiration Agency (KOICA) The Rehabilitation Mangrove Forest and Coastal Area Damaged by Tsunami in Aceh Project. Jakarta. 217 p.

Lahjie, A.M. 2003. Forest Utilization Approachto Agroforestry Systems. Mulawarman. Samarinda. 378p. (in Indonesian)

Mustafa, A., Tarunamulia and J.Sammut. 2008. Relationship between Environmental Conditions and Productivity Factors Pond to Refine Land Suitability Criteria: 2. Soil Quality. Aquaculture Research Journal Vol. 3No.1 Year 2008: 105-121p. (in Indonesian)

Prasita, V.D. 2007. Analysis and Optimization of Environmental Carrying Capacity Utilization for Coastal aquaculture in the District Coarses. Dissertation. Graduate School of Bogor Agricultural Intitute. Bogor.147p. (in Indonesian)

Sidik, A. S. 2008. The Changes of Mangrove Ecosystem in Mahakam Delta, Indonesia : A Complex Social-Environmental Pattern of Linkages in Resources Utilization. Paper Presented at The South China Sea Conference 2008. The South China Sea: Sustaining Ocean Productivities, Maritime Communities and the Climate. Kuantan, Malaysia, 25-29 November 2008.22 p.

Suhardiman, A. 2009. Zonation Plan and Rehabilitation Direction for Mahakam Delta area. Thesis. Master Program of Forestry Graduate Program Mulawarman University. Samarinda. 139 p. (in Indonesian)

Susanto, G.N. and S. Muwarni. 2006. Analysis In Ecological Farming Land Transfer on Potential Areas for Habitat Mangrove crab (Scylla sp.). 2006. National Seminar Papers Limnology. LIPI. Jakarta. GrahaWidya, 5th September 2006. (in Indonesian)

Sutrisno, D. And Wiwin Ambarwulan. 2003. Assessment of Land Carrying Capacity for Shrimp Farming in the Mahakam Delta. Marine Natural Resource Survey Center. Coordinating Agency for Surveys and Mapping Agency. Cibinong-Indonesia. 40p.(in Indonesian)

Suyatna, I. 2011. Demersal Fish Species Distribution Study Around Mangrove Mahakam Delta Region. Doctoral Dissertation. Doctoral Program of Forestry, Graduate Program Mulawarman University. Samarinda.177 p. (in Indonesian)

Syahrudin. 2008. Damage Apprehensive of Mahakam Delta. Research and Development of East Kalimantan Province. (in Indonesian)

Upat,A.M. 2009. Economic Studies Business Model Mangrove Pond in the Mahakam Delta Region Kutai Kartanegara Regency. Thesis. Master of Environmental Science Graduate Program. Mulawarman University. Samarinda. 113p. (in Indonesian)

Wardani, A. And Djuhriansyah. 2008. Study of Public Participation in the Management of Mangroves in Muara Jawa Ilir, Muara Jawa, Kutai Kartanegara Regency. Journal of Research and Socio-Economic Assessment of Forestry theoretical. Vol.1, No.2, December 2008: 95-108p. (in Indonesian)

Zwieten, van P.A.M.; A.S. Sidik; Noryadi; I. Suyatna, Abdunnur. 2006. Aquatic Food Production in The Coastal Zone: Data based perception on the trade-off between mariculture and fisheries production of the Mahakam Delta and Estuary, East Kalimantan, Indonesia. In CAB International 2006. Environment and Livelihoods in Tropical Coastal Zones (es. C.T. Hoanh, T.P. Tuong, J.W. Cowing and B. Hardy)

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