# THE EXISTENCE OF MANGROVE FOREST AND ITS EFFECT ON FISHERMEN'S INCOME IN NATIONAL PARK OF BERBAK SEMBILANG, SUB-DISTRICT OF BANYUASIN II, BANYUASIN REGION OF SOUTH SUMATRA

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**Abstract:** *This research examines the existence of mangrove forest and its effect on fishermen's income. This research tested partially and simultaneously with the statistical system analysis tool. Some of the factors that become variable in this research, i.e. the effect of modal on fishermen's income, modal has significant effect but negative. The effect of a number of fishing days on fishermen's income, the effect is significant. The effect of experience on fishermen's income, the effect is not significant. The effect of education on fishermen's income, the effect is not significant. The effect of the environmental quality on the fishermen's income, the effect is significant.*
**Keywords:** *mangrove, income.*

## I. Introduction

Indonesia has abundant natural resources and has a role in national and international economy. According to Fauzi (2010), a natural resource (natural resources) is an input factor in economic activity that also generates output because of the production process. One of the most fundamental of aspect economic of natural resource is how the extraction of natural resources can provide benefits or welfare of the community as a whole so as to increase economic growth. Therefore, it should be remembered that the achievement of rapid economic growth, if not careful it will deplete natural resources which in turn the item of natural resources needed in the production process which is also limited availability so this will hamper economic growth for further. However, the exploitation of natural resources to support national economic growth, in fact, often is conducted not cohesively and going concern.

Exploitation of natural resources is still often exploited beyond the limit of its regeneration and environmental pollution that exceeds its capacity (Sadeli, 2012). For that, three pillars of sustainable development goals to be achieved, namely economic growth, improving environmental quality and the improvement of inter-generational welfare.

One of the natural resources that are renewable in South Sumatera is forest. Based on the basic functions, according to Law No. 41, 1999, and made changes into Law No. 41 of 2004, the forest consists of: a. Conservation Forest, b. Protected Forest, c. Production forest. Conservation Forest consists of: a. Forest Area of Sanctuary, b. Forest Area of Nature Conservation, c. Hunting Park. Vast of forest in South Sumatra province based on the Provincial Spatial Planning (RTRWP) 1994 is 4.255.843 ha, while based on the appointment of the Minister of Forestry in line with Decision Letter No.76/Kpts-II/2001 dated March 15, 2001 is a vast of 4.416.837 ha, in the development of forest area today has undergone many changes.

According to Law No. 5 of 1990, about the Conservation of Biological Resources and Ecosystem, Nature Conservation Forest Area consists of: a. National Park, b. Forest Park, c. Nature recreational park. In South Sumatera, conservation area is 790.625 ha, consisting of wildlife sanctuary of 269.540 ha (34%), National Park of 472.155 ha (60%), Natural Park covering an area of 223 ha (0.03%) and Water Conservation Area of 48.707 ha (6%).

Based on the revised Law No. 5 of 1990 in 2012, the national Park is a land and/or water area that has a native ecosystem due to its privilege characteristics and nationally have aesthetic value and high scientific, commendable as national heritage, managed by the zoning system, with the main purpose to protect the authenticity and environmental service, and can provide a foundation for the development of religious, scientific, educational, recreational and visitors in accordance with the principles of environmental protection and culture.

The existence of mangrove forest ecosystem as a habitat for the larvae and juvenile of various species of animals in the shallow marine ecosystem, then directly have relevance with the quality and quantity of fish resources and other biota. From the research value of mangrove benefit in Teluk Bintuni of fishing, hunting and collection of product by a resident of US $ 10 million per year (Ruitenbeek, 1994). Benefit value of fish, shrimp, and crabs in the mangrove forest of Kubu Raya regency of West Kalimantan Rp. 50.094.355,857/year (Siregar, 2012). Thus, it can be argued that mangrove forest can be modal resources to provide economic service, namely providing employment and business opportunity. Therefore, the mangrove forest resources can be used as a source of income to support the system of life of communities around the coastal area.

Benefits and functions of mangrove forest ecosystems can be increased or decreased the function in a region according to the utilization rate. Differences in the perception of benefits value of mangrove forest as a result of the lack of "size" value of the benefits that can be understood by all parties. The value of important benefit need to be translated into measurable monetary value (Tutik 2002, Widada 2004, Bahruni 2008, Siregar 2012). Implicitly, the goods and services produced from resources and environment sourced from the mangrove forest assessed monetarily. In other words, the goods and services produced, e.g. fish, timber, water even, pollution and environmental damage can be calculated by rupiah value or economic

value because it is assumed that market is exist (market based), so that transactions of goods from natural resources can be done.

The approach used in doing assessment the benefits of mangrove forest ecosystem approach is using the approach concept of Economic Valuation of Natural Resources. Economic valuation to mangrove ecosystem is still rare done (LPP Mangrove, 2004), the value of economic benefits of mangrove forest is not easily recognizable. According to Siregar (2012) the value of economic benefits of mangrove forest at each location is different, depending on the socio-economic factor and local bio geophysical. Furthermore Widada (2004) suggests the information of economic value that is measured quantitatively is easier to explain the relationship between the interests of conservation of mangrove forest, national park, and regional development planning.

Various damage has been the case today caused the changing function of the mangrove forest. According Wiyono (2009), now the existence of mangrove forests increasingly are pressured by human needs, so that mangrove forest is often logged even to extinction. If this is constantly done it will result in erosion, loss of wildlife or marine life habitat that its habitat so needs support from the mangroves. Some factors contributing to the damage of mangrove forest according to Kusmana (2010) is pollution, conversion of mangrove forest is paying less attention to environmental factor and excessive logging. Bengen (2001) explains that the damage above due to the fact that some people in fulfilling the needs of their life by intervening in a mangrove ecosystem. Without considering sustainability and function on the surrounding environment.

As happened in the National Park of Berbak Sembilang namely mangrove forest reclamation activities into fish pond, shrimp pond, coconut plantation cause the damage mangrove ecosystem of 2.150 hectares. Mangrove forests in the National Park Berbak Sembilang reclaimed illegal fish ponds (TN Sembilang, 2005). Coastal mangrove ecosystems in West Kalimantan were damaged by reclamation into coconut groves and ponds. This damage results in West Kalimantan Regional Government to pay USD 1 trillion to make the building a breakwater along the 16 km. This means that per hectare mangrove ecological role as protector of the beach was 6.7 million US $, (Siregar, 2012). The mangrove ecosystem has a role in detritus-based food chain, habitat for fisheries and coastal protection from abrasion, strong winds and waves. Therefore mangrove ecology is not only valuable but also very high economic value.

The damaging of environment ecosystem sea and littoral as the damage of Mangrove forest, abrasion, environment pollution and trapping which use unsaved tentacle is caused the fish habit and other sea organism reduced Winarti (2014), as the result, the fisherman's income will be hereditary in a long way.

The welfare of fisherman depends on prisoner result. More prisoner result also shows the high income of fisherman that can use for their daily life. Hence, fulfill degree of daily need depends on by the income gotten. Yet, in their working, their income can be caused many factors. According to (Salim, 1999). The factors which influence the income of the fisherman is social factor and economic that consist of a mount of modals, a mount of ships, a mount of workers and the space of the fisherman and experience. Fisherman's income is based on big or little of the prisoners, there are many factors which can influence them, and they can be other social factors or economic factors.

In this research, the factors which influence the fisherman's income are the modals, a number of fisherman's days also the fisherman's experience. Modal factor in this research becomes one of the factors that influences the incomes caused by modal. In the production factor theory the output or product of the income depends on the modal. It means that fisherman's modal make them easy catch the fish in the sea. The more fishermen's modal, the more prisoner result production, so the fisherman's income will increase.

The next variable is a number of the fisherman's day as the timework that offers by the workers with the work day denomination each week, (Kinasari, 2010). They can influence the number of the fish, so it decides the fisherman's income grade.

According to Notoadmojo (2003), Knowledge and experience are as the result of know and usually happen after someone does the experiment for a specific object. Without knowledge, someone has no basic to decide the decision of facing the problem. From that, the job experiences can give benefit for the one who is working so they never feel hard in working. According to the Big Indonesian Dictionary in Rofi (2012), the job experience can be meant as the activity or proses that once happen while looking for earn to fulfill their daily life. It denotes as main modal of someone in a certain object (Sastrohadiwiryo, 2005).

Fishery source around the mangrove forest in the national park of Berbak Sembilang is very potential so it can raise the life standard and fisherman's welfare. But, the fact many fishermen do not raise their prisoner result yet, so the income is not raised up. Based on phenomenon and discussed theory in this research background is very important to analyze the condition of the mangrove forest in the Berbak sembilang national park, the direct advantage economic and the influence of the fisherman's income.

1.1 Problem of the Research

Based on the background of this research, the problems of this research are:

a. How is the direct advantage economic value in the National Park of Berbak sembilang ?
b. How is the influence modal, a number of fisherman's days and experience toward fisherman's income in the National Park of Berbak sembilang ?

1.2 The purpose of research

Based on the problem of research, so the purposes of this research are:

a. Analyze the direct advantage economic value of Mangrove forest in the National Park of Berbak Sembilang.
b. Analyze the influence modal, fishing day, experience toward the fisherman's income in the National Park of Berbak Sembilang.

1.3 The advantage of research

This theoretic research result is hoped become one of the contribute in progressing the concept of ecosystem management Mangrove forest to support the sustainability of the fisherman's income in the national park area of Berbak Sembilang. This research practically can be income for association of National Park Berbak Sembilang . The environment life service and forestry, and the government of Banyuasin regency, the province of south Sumatra and others about the direct advantage from Mangrove forest and the factors influenced the fisherman's income.

## II. Study Literature

2.1 Concept of Economic Advantage Value

Economic advantage value of conversation area by Bann C (1998) is classified on the source or the advantage process obtainable, they are:

a. Uses value, it is all advantage values from usage conversation area, like; firewood for fuel cooking in society. Forest result production non firewood is like rattan, cure plant, pansy, and water production for farming, household and excursion (cascade water).
b. Functional value, it is all advantage values from ecologic function of conversation area, like; controlling the flood, intrusion water sea and habitat.
c. Attributes Value, it is all value not from material usage but from aspect need of human psychology that relates on the culture.

2.2 Theory Economic Valuation of Mangrove Forest

Evaluation is activity which related to the concept building and methodology for presume goods and services value (David and Johnson, 1987). For further Davis and Johnson ( 1987) said that to do economic evaluation of the forest resource is needed to identify the condition of Bio-physic of the forest source and social culture to count each value indicator that is forest result, function service of forest ecosystem, also forest attribute related to indicator of the social culture.

2.3 Mangrove Forest

Mangrove forest is the plants of halo fit growth in a long beach which influenced by high water reach the area up to average high water growth in tropical area and sub- tropic area (1993), next Nybakken (1982) describes forest mangrove is general name used for describing the tropical communities which dominate by many species of the specific trees and bushes which can grow in the salt water.

Mangroves sources involve mangrove ecosystem that consist are: (1) one or more species of trees and bushes grow limited in the exclusive mangrove. (2) grow in non- exclusive mangrove, (3) biota which associates with mangrove (land biota and sea, seaweed, fungus, alga, bacterium and so on) whether their life in a settle, momentary, once, found, general or particular life in mangrove habitat, (4) the process maintain this ecosystem either in the area or out of it, and (5) landfall between forest boundary and the sea.

2.4 Production theory

According to Raharja (2006) in the production activities, producer moves many production factor become a goods and services. Based on its relation to production grade, production factor can be divided into permanent production and variable production. Permanent production factor is production factor which usage not depends on a number of productions. Then variable is production factor which the usage depends on the production levels.

2.5 The income theory

The someone's condition can be measured by the income concept which shows all amount of money gotten by the one or household in a particular time ( Samulson and Nordaus, 2002). According to Sukirno (2006) income is a large number of earn that is received by the population of working achievement in a certain period in a daily, weekly, monthly or annual.

2.6 The factors which influence the fisherman's income.

According to Sujarno (2008), besides cost, a number of workers, experience and mileage, there are three factors influence enhancement the fisherman's income, they are:

a. Technology, it is related to the things which used by the fisherman in trapping the fish is the boat. No machine or with machine, trawl and fishing rod. Things of trapping fish and foods that brought to the sea and things which leaved at their house. It is input for fisherman in trapping the fish, furthermore, a number of workers.
b. Social economic, there are many factor of social economic, like; age, education, experience, equipment, immixture in fisherman organization and season. Age influence fisherman's income because they are called by fisherman only if they are fifteen plus years old. Fisherman's education also to be the factor that can influence to the fisherman's income. The experience decides fisherman's skill in harbor. More ingenious of the fisherman, more the result of trapping fish. Factor of the ownership equipment that used by fisherman if fisherman has own equipment or not. If they have no equipment and they only receive earn from others, so they are called trade worker. The organization location and immixture of the fisherman's organization is hoped can give positive effect for their earn.
c. Fish trade system, it is commodity that is easy broken. So the process of its store should be saving. The fish quality brings the high cost in marketing. So it can be seen from efficiency of using fish trade system, if they are better and efficient so the price will increase.

## III. Research Method

The object of this research is Mangrove forest in the national park of Berbak Sembilang and all fishermen surround it. Next, it will be seen the direct advantage economic value of Mangrove forest and the factor which influence the fisherman's income includes the fisherman's modal, a number of days and experience. Data which used in this research is from 2 sources, they are: primary data and secondary data. In this object, Primary data obtainable from the result of two observations. The first observation is done to analyze the direct advantage economic value, data sources, like; fisherman, the officer of National park of Berbak Sembilang, the collector and the owner of *kilung* by the direct interview method. The second observation uses cross section data by the observation year 2016 using questioner, and the data source is fishermen. Secondary data is from legal institute of statistic center. Fishery life service and ocean service and forestry also life environment.

Principally, the research method of the forest source can be done through 2 approaches; they are based on the market price and readiness for paying WTP (Davis and Johnson).

### 3.1 Sampling Quotation Technique

This research object located on Banyuasin Regency, distric : Banyu Asin II. It comes from Statistic Center Agency (BPS), Banyuasin year 2014.this distric has 17 villages, 5 villages dominate as fisherman, they are Tanah Pilih Village, Sungsang II, Sungsang III, Sungsang IV. Then, there are three villages from five villages where close to Mangrove Forest, they are: Tanah Pilih, Sungsang village IV and Sungsang I.

Quotation sampling is based on population 2.650 families by considering three villages that become main sampling source in this research area. In this research, the researcher determines sampling size using solving pattern. Based on data of household numbers fishery sea year 2014 is 2.650 household from statistic center institute by using solving pattern with error grade is 10 percent which is assumption based on characteristic from population and number tool used by household fishery sea , so minimal sampling used in this research is totally 84 households. Based on accounting of this data got minimal sampling 84 fisherman, this research uses 90 fisherman, with detail 18 fishermen in Tanah Pilih Village, 46 fishermen in Sungsang IV Village and 26 fishermen in Sungsang I Village.

### 3.2 The Direct Utilization of the Fishery Result.

From identification result that fishery result which used by the society caused mangrove ecosystem involves fish source, shrimp, crab, clam, jellyfish. The fish trapping in Sembilang generally using traditional technology and it is done everyday. Based on component data of direct advantage forest result or fishery, so direct advantage value of mangrove ecosystem in Sembilang littoral can be counted. From this analyze, so the total of the direct advantage value pure mangrove ecosystem with the width 87.000 hectare is 234.251.950.000 with the forest advantage value each hectare is Rp. 2.262.551.

This research uses Bann Pattern to count Economic value of Mangrove forest in this research area, that is:

$$TEV = (DUV + IUV + OV) + (XV)$$

TEV = Total Economic Value
DUV = Direct Use Value
IUV = Indirect Use Value
OV = Option Value
XV = Existence Value

This research is limited on the direct use value, it forms addition from all of market price value which based on direct advantage Mangrove forest as like the direct advantage non wood, and it is water biota (fish, shrimp, clam, and jellyfish). Wood advantage value assumed out of accounting, because mangrove forest is on the conversation area. Advantage value of non wood is counted based on this accounting below:

Advantage value non wood = $\sum_{i=1}^{n} HNKi$

Note:
HKNi = forest result value non wood (advantage value of water Biota, fish, shrimp, clam, jellyfish)

3.3 Fish Production Income

Most of the society of Tanah Pilih village, Sungsang IV and Sungsang I are fisherman. So they always depend on the result of the sea to fulfill their daily life. Trapping prisoner which got is bought to the fish owner store in that place, there is also buyer directly buys the fish while the boat is still on the sea. Fishery result is classified based on the kind of fisherman; they are trapping fisherman and kilung fisherman. Trapping fisherman traps the fish used motorboat and motor ship that is usually called *pompong* ship. Kilung fisherman trapped the fish by building a chart on the sea.

The result of fisherman's trap is many kinds of fish like sembilang fish, senangin fish, Duri fish, flying fish, eel, gerot, Kerapu fish, pomfret, sea bass, red snapper, barred, pomfret. They are collected in the store directly sent to Mentok, then export through Malaysia and Singapore. Research result known even though it is on the littoral, in fact decrease and increase of dollar value influence the price and implicate to the fisherman's earn. Kilung fisherman produces Teri fish and fry jellyfish. Generally crop each kilung in three days is 100 kg, the price of each kilogram is 30.000 rupiahs. And there are 85 kilungs, Kilung generates Teri and fry jellyfish, and bought to the fish store in Palembang. Economic value from fishery is 174.000.000.000 rupiahs.

3.4 Shrimp Production Income

Fisherman's prisoner income of shrimp is classified as shrimp for local trade; it is for export and shrimp. Fisherman works usually ten months in a year. Its yield is bought to the fish store in that place. Or one directly buys the fish while they are on the sea. Trap tool used is called by sondong ship. Frequency of fisherman generally 10 trips in a month. The result for each trip is 750 kg for local trade 1250 kg for export and 700 kg for shrimp. Fish for export trade and shrimp directly brought to Mentok, Bangka, then exported to Malaysia and Singapore. The shrimp price in fisherman's level for local tradeis 30.000 rupiahs in each kg for export it is up to 50.000 rupiahs for each kg. Petak shrimp price is 30.000 rupiahs of kilogram and they will get the shrimp cost up to 33.700.000.000 rupiahs for a year.

3.5 Crab production income

Fisherman also catches the shrimp. It is classified for two kinds they are Bakau shrimp and sea shrimp which usually called by Rajungan. Bakau shrimp has longer time that is seven months in a year. The average production for each 3 days is 1.350 kg with the usual price 55.000 rupiahs for each kilogram. Rajungan has total production each 3 days is 750 kg. It usually has longer time up to 7 months, and general price of it is 42.000 rupiahs for each kilogram. The fisherman income for Bakau shrimp is 5.197.500 rupiahs and the fisherman's income for Rajungan shrimp is up to 2.231.250.000 rupiahs.

3.6 The clam income

The next fisherman's income is clam. They usually catch 30 clams. The average crop of a ship in each day is 20 sacks and usually the weight is up to 18 kg, the price for each kg is 6000, the longer season for each year is 6 months. The crop result of the clam for each year is 11.664.000.000 rupiahs. It is usually bought in Palembang.

3.7 Jellyfish production income

Fishermen also get many jellyfish when they are trapping the fish but they only get in the Tanah Pilih village. The number of ships for catching is 12 units. Usually they catch the jellyfish each day is up to 70 kg. The price of each kg is 24.000 rupiahs. The longer season for each year is 4 months, so the total crop result is 2.419.200.000 rupiahs every year. They are from the store and they are brought to the Mentok, Bangka, for export through Malaysia and Singapore.

In deciding contribution of an economic activity sector toward national building and it is generally called in money value then it is converted in presentation. Every economic activity sector must produce goods and services production in physical size. To declare all goods and service result then declare it in a value needs economic evaluation which declares all production of goods and services in the monetary value. The ecologist will do assessment about the impact on parameters of lock biodiversity in the future, while economist will consider its impact on sustainability life.

This accounting use actual trade price method, direct advantage economic value result of mangrove ecosystem TN Berbak Sembilang for water biota based on Bann formula (2002). Is up to 229.221.950.000 rupiahs. Based on analyzes result using regress analyze of double estimation known that use a free variable (modal, fishing day, experience influence to the fisherman's income in the national Park of Berbak Sembilang by seeing probability of F test then compared with the significant level 5 percent. If coefficient value of probability F test is smaller than 5 percent, it means simultaneously free variable influence to related variable. Based on F probability value on the table 1, got probability value < 0,05. So it is said that simultaneously free variable (modal (M), Person days (HOK) influence significant to the variable of fisherman's income (Ynt).

Table 1. Hypothesis Test and F Test

| Variable | t-Statistic | Prob. |
|---|---|---|
| LNMDT | -6.466029 | 0.0000 |
| LNHOKT | 2.954696 | 0.0041 |
| LNEXPRT | 1.360205 | 0.1774 |
| C | 13.96713 | 0.0000 |
| F-statistic | 11.72892 | |
| Prob (F-statistic) | 0.000000 | |

(Source: Analysis Data 2016)

By knowing each probability of free variable compared to significant level 5 percent. If probability coefficient value of free variable is smaller than 5 percent (0,05), so the alternative of hypothesis can be received on the other hand there is relation statistically between free variable and related variable, so significant variable influence the fisherman's income which showed on the table 1 is Modal, worker day then experience is not significant influence the fisherman's earn. On the table 1 shows that Modal variable, worker day, constantly have probability value <0,05. And experience variable has probability value >0,05. So that it said that modal variable, worker day, also constant partial significant influence the fisherman's income on the certain standard 95 percent (5%) while experience variable is not significant influence the fisherman's income.

## IV. Conclusions and Suggestions

5.1 Conclusions

a. The analyze result of accounting direct advantage value of mangrove forest shows that the fisherman gives the high value at the location and the existence mangrove forest area in this time and also in the future.
b. Mangrove ecosystems location influence the fishery natural source productivity where more large the Mangrove, more up fishery natural source of productivity, on the contrary it is also implicate the fisherman's income.
c. Fisherman Population that depends on working in this mangrove forest area at the national park of Berbak Sembilang is still under support power of mangrove ecosystem, so the increase of fisherman numbers quality and quantity can still be increased to raise the productivity of fishery source.
d. Preservation keeping and location of mangrove directly give impact to income sustainability and fisherman life.
e. Economically, production forest management wood utilization can give a high value and efficient if compared with the management in the conversation forest area. It shows that management and utilization of other areas are not being done optimally.
f. Commonly, modal variable, fishing day, experience, education and the significant location influence the fisherman's earn.
g. Partially, significant variables that influence the fisherman's earns are modal, fishing day, and location, while experience variable and education do not influence the fisherman's earn.

5.2 Suggestions

a. Mangrove forest has unique characteristic and must be adapted with the forest usage. Even though as same as mangrove forest but the evaluation method can not be same if it is on the shelter forest, conversation and production forest.
b. For further research can be done totally the evaluation of economic usage.
c. For further research suggested to add season variable, kind of boat and fishery sector credit which related to the fisherman's income.

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