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Economic Valuation of Mangrove Forest in Pabean Ilir, Indramayu, Indonesia

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ABSTRACT

This research aims to determine the total economic value of mangrove forests in Paben Ilir Village, and determine the factors - factors that affect the value of willingness to pay (WTP) the existence of mangrove forest in Pabean Ilir. The research was conducted in Pabean Ilir, Pasekan Sub-district, Indramayu district, West Java in March 2019 with the number of respondents 98 people. The method of data used by accidental sampling by collecting data through interviews and questionnaires with respondents. The results showed that the total economic value of mangrove forests in Pabean Ilir is IDR 32.1 billion per year, consisting of direct use value (market value) amounted to IDR 26.7 billion per year and the value of existence mangrove (non – market value) IDR 5.3 billion per year. The value of direct use is a more contribution than the value of existence mangrove. The direct use of mangroves in Pabean Ilir analyzed are seeds, fishing and catch shrimp, while the value of existence mangroves in Pabean Ilir analyzed based on the value of the public's willingness to pay to the existence of mangrove forest in Pabean Ilir using contingent valuation method. The factors that influence people's willingness to pay for the existence of mangrove forest was analyzed using multiple linear regression analysis with the results of factors - factors that affect the value of WTP is the type of job and income.

INTRODUCTION

The mangrove forests in Indonesia has an estimated area of about 4.25 million hectares and reached 25% of the entire mangrove mangrove in the world and 76% of the area of mangroves in Southeast Asia (Kordi 2012). According to the Statistics Agency of West Java Province (2016), Indramayu has an area of mangrove forests is estimated at 12,706.19 ha, but grouped into several categories, good condition (1,730.64 ha), medium (1,783.77 ha), broken (9,191.78 ha) and rehabilitation (133.00 ha). The mangrove forest in the Pabean Ilir, Pasekan sub - district, Indramayu district included into good category with mangrove forest area of 247.7 ha (Department of Fisheries and Marine Indramayu District 2017).

The existence of mangrove forest is very influential on the lives of coastal areas for mangrove forest has many benefits and functions both in terms of ecology, physical or biological. The mangrove forest is able to prevent abrasion, salt intrusion prevention, as well as the energy-producing nutrients, as a place of living biota, and to support the local economy. The benefits of mangrove forests may be affected directly or indirectly. Given the many benefits of the mangrove forests of mangrove forest utilization rate raises a number of negative effects (Kordi 2012).

Mangrove forests as a natural resource that has economic potential, utilization of mangrove forests needs to be done well - good so as to provide welfare benefits with regard to sustainability, so that benefits can obtained sustainable. The fundamental problem in the management of natural resources, according to Fauzi (2004) is an effort to manage the natural resources in order to produce benefits for the amount for people without compromising the sustainability of natural resources itself. One step to preserve the mangrove forests is to assess the economic value of mangrove forests in order to become a factor in taking decisions in the direction that the sustainable management of mangrove forests.

The economic value can be generally defined as a measure of the maximum amount a person wants to sacrifice goods and services to obtain other services. The concept can be called a willingness to pay (WTP) someone to goods and services produced by natural resources and the environment (Fauzi 2004). The concept of economic valuation in general, the economic value is defined as the total economic value is the sum of the value of use and non-use values.

The mangrove forest in Pabean Ilir is one of mangrove forests that is in the good category and until now there has not been an analysis of the valuation of the total economy forest area mangrove, so it is necessary to analyze the benefits and overall functionality on the economic value of mangrove forests that aims to control the way the utilization mangrove forest ecosystem so it can maintain the sustainability of ecological functions and provide guidance and insight to decision makers, especially in terms of planning development activities or the utilization of mangrove forest ecosystems based on economic approaches directly or indirectly.

METHODS

Research Place and Time

The research was conducted in Pabean Ilir, Pasekan Sub-district, Indramayu district, West Java in March 2019 with the number of respondents 98 people by interviewing directly using questionnaire to some fisherman and villagers.

Research Method

The method used in this research is a case study with the case unit is Pabean Ilir villagers. The case study method according to Nazir (1988) is an intensive and detailed study of an object and be carried out based on

questionnaires and direct observation of things that are not covered in the questionnaire. This study uses primary data and secondary data. Primary data is a source of research data obtained directly by the method of interview using a questionnaire that had recently been prepared in accordance with the purpose of empirically on direct respondents. Secondary data is the data obtained by researchers supporting indirectly from the source.

Respondent Determining Technique

The sampling method used in this research was accidental sampling. Accidental sampling is technique which in technique sample collection is not set in advance but directly collect data from the sampling unit meets, after a sufficient amount of the data collection is stopped (Nawawi 2001). Determination of the number of samples can be calculated from a certain population that has unknown number, using the formula Slovin with a sample size of 98 respondents, consisting of the fisherman and the villagers of Pabean Ilir.

Data Analysis

Analysis of the data in this study were divided into two descriptive analysis and quantitative analysis. Qualitative descriptive according to Winartha (2006) is to analyze, describe and summarize a variety of conditions, the situation of the various data collected in the form of interviews or observations of the issues, which occurs in the field. Descriptive qualitative analysis performed to explain the condition of mangrove forests Pabean Ilir village based on primary data and secondary data. Quantitative analysis is an economic assessment of mangrove forests in this study using two stages as did Ruitenbeek (1992), namely identify benefits and functions of mangrove forest ecosystems and to quantify all the benefits and functions of ecosystem in the value of money (IDR).

Use Value:

Direct use value is the value of the results of mangrove ecosystem utilization directly by human beings, such as a provider of fish, crabs, and shrimp resources, it can be also be used as firewood. To estimate the value of direct use of the mangrove use the market prices approach (Malik. et al. 2015). The direct use value is the direct usefulness of consumption of resources such as fishing, agriculture, wood, rattan, and so on. The direct use value in this research is mangrove seeds and fish resources.

According to Fauzi (2004) the total direct benefits can be calculated using the following equation:

$$\mathbf{DUV = DUV_1 + DUV_2 + DUV_3}$$

Explanation:
DUV = Total direct use value
DUV_1 = The direct use of mangrove seeds
DUV_2 = The direct use of catch a fish
DUV_3 = The direct use of catch a shrimps and crabs

An analysis of revenue is the difference between total revenue with total costs. An analysis of revenue can be calculated using the following equation:

$$\mathbf{\Pi = TR - TC}$$

Explanation:
Π = Profit
TR = Total Revenue
TC = Total Costs

Non Use Value

The non use value is the value given to the natural resources on its existence though not consumed directly. The non – use value consists of the value of mangrove existence. Existence value can be interpreted as a human value obtained simply by knowing the existence of an ecosystem or species. Existence value was estimated using the contingent valuation method (CVM). The existence value of an ecosystem can be approximated by using the contingent valuation method (CVM) through a survey of selected respondents (Rizal, et al., 2018).

Total Economic Value

Total economic value broadly grouped into two values, the use value and the non – use value. The total economic value is the sum of the use value and the non-use value, systematically can be formulated in the following equation:

$$\mathbf{TEV = UV + NUV}$$

Explanation:
TEV = Total economic value
UV = Use Value
NUV = Non – Use Value

Contingent Valuation Method (CVM)

Contingent Valuation Method (CVM) is a survey method to measure how much a vote or the community of goods, services and comfort. Usually to measure the value that is not sold on the market, for example the value of existence. Valuation method is one of the best methods to estimate the value of goods and services that are considered to have no value to and not have market prices (Yakin 1997). CVM also be thought of as an approach to measure willingness to pay, as obtained in the survey questionnaire can be the value of the overall population diagredasi (Fahrudin and Adrianto 2007). According to Fauzi (2006), the method of measurement with this technique, respondents rated the rupiah then given question agrees or not. In operation to approach the CVM conducted several phases of activities or processes.

Stages to CVM approach include:
a. Creating market hypothesis,
b. Getting the bid the value of WTP
c. Determine WTP WTP aggregated or total
d. Estimating the supply curve by regressing WTP is as follows:

$$\mathbf{WTP = \beta 0 + \beta 1P + \beta 2G + \beta 3U + \beta 4PD + \beta 5PE + \beta 6PK + \varepsilon i}$$

Explanation:
P = Profession
G = Sex
U = Age
PD = education
PE = Earnings
PK = Work experience
ε = error
i = respondents to - i (i = 1,2,3 ..., n)

Multiple linear regression analysis is a model equation that describes the relationship of a dependent variable with two or more independent variables. Multiple linear regression test is a tool to predict the effect of the value of two or more independent variables (X) on the dependent variable (Y) to prove the presence or absence of a functional relationship or causal relationship between two or more independent variables with the dependent variable (Riduwan 2016). Multiple linear regression analysis in this study is used to evaluate the use of contingent valuation method (CVM) multiple linear regression equation used to analyze the factors that affect the value of WTP of respondents is as follows:

$$WTP = \beta 0 + \beta 1P + \beta 2G + \beta 3U + \beta 4PD + \beta 5PE + \beta 6PK + \varepsilon i$$

Explanation:

WTP	= Value of respondents WTP (IDR / person)
β0	= intercept
β1 ... βn	= Coefficient of regression
P	= Profession (dummy variables)
G	= Gender (dummy variables)
U	= Age
PD	= education
PE	= Earnings
PK	= Work experience
ε	= error
i	= respondents to - i (i = 1,2,3 ... .n)

RESULT AND DISCUSSION

General Conditions Village Pabean Ilir

Indramayu Regency is one of regencies in West Java province, located on the north coast of Java Island. Indramayu district is geographically located at position 107°52 '- 108° 36' East Longitude and 6° 15 '- 6° 40' latitude with the west boundary Subang regency; north bordering the Java Sea; south by Majalengka, Sumedang, Cirebon; east by the sea of Java and Cirebon. Indramayu district has a total area of ± 204 011 ha which consists of the top 31 districts, which are divided into 317 villages and 8 wards. Indramayu district has a length of 114.1 km coastline consisting of 64.68 km of the beach on the sandy and muddy 44.91 km of the beach which is mostly a good place to grow for the development of mangrove forests.

Pasekan sub-district is one of the districts in Indramayu, is geographically located between 06 ° 16.437 'latitude and 108 ° 12.942' E. Pasekan sub-district consists of six villages, namely Pagirikan, Pasekan, Brondong, Pabean Ilir, Totoran, and Karanganyar. Pabean Ilir village is a village located in the district of Indramayu district Pasekan. Pabean Ilir village has a total area of 1820.310 hectares. Pabean Ilir village consists of two hamlets with five Rukun Warga (RW) and 20 Rukun Tetangga (RT) and included in one of the villages in the subdistrict Pasekan Indramayu district.

The population of the village of Pabean Ilir based on data from the last population census in 2018 there were 7218 inhabitants of the total households (families) of 2150 households with a population of men and women is 3,738 inhabitants was 3,480 inhabitants. Livelihoods at the Pabean Ilir village is dominated by farm workers, fishermen, farmers and fish farmers.

Characteristics of respondents in this study is based on education level (ranging from school not to s1), based age were divided into three categories: (1) <18 years; (2) 18 - 50 years; and (3)> 50 years, and based on revenues ranging from> IDR 1,000,000 -> IDR 5,000,000.

The mangrove forest in the village of Pabean Ilir has an area of 247.7 hectares. Mangrove species found in the village of Pabean Ilir namely *Avicennia marina*, *A. alba, Rhizophora mucronata, R. apiculata, Acanthus ilicifolius and Brugruiera cylindrica*. Mangrove species most commonly found in the village of Pabean Ilir is *Rhizophora mucronata.*

Pabean Ilir village conditions including coastal areas very conducive to good fishing effort fishery and aquaculture. The utilization of the fishery conducted using outboard motor boats and fishing gear gill nets, traps, sero, traps and other devices. Capture by fishing activities conducted around the mangrove to within 2 - 3 miles from the waterfront. This is because the fishing boat owned by the average - average 3-5 Gross Tonnes (GT). Type catches of fishermen in the village of Pabean Ilir is betotot fish or tigawaja (*Johnius belangerii*), mullet (*Mugil sp.*), Manyung fish (*Arius sp.*), Shrimp (*P. merguiensis* and *M. ensis*), crab. The catch is generally marketed through a mediator because in this country there are no auctions where fish.

Direct Use Value Mangrove Forest

Direct use value in this study consists of the direct benefits of mangrove seeds, the results of fishing, the results catch shrimp, crabs, and crabs. The value of direct benefits can be seen in Table 1.

Table 1. Economic Value of Direct Benefits

Direct Use	Use Value (IDR)	Total Cost (IDR)	Net Value (IDR)
Mangrove seedlings	20,000,000	10,400,000	9,600,000
Catching fish	12,882,240,000	4,161,326,400	8,720,913,600
Catch shrimp and crab	22,226,400,000	4,161,326,400	18,065,073,600
total	**35,128,640,000**	**8,333,052,800**	**26,795,587,200**

Types of mangrove seeds consist of *Rhizophora* sp and *Avicennia* sp. The business activities of mangrove seeds is done when there is demand from consumers and usually for a year can be done 2-3 times. The quantity of different consumer demand - but if the price difference - averaging period mangrove tree seedlings could sell some 10,000 seedlings with leaf size 3 (of 4 months), IDR 1,000 / seedling. Price propagules or seeds IDR 100. Based on the results of the income analysis shows that the benefits derived from the sale of mangrove seedlings can be specified by multiplying the quantity of mangrove seedlings that are sold multiplied by the price of the mangrove seedlings were then reduced by costs incurred, so that the value of total benefits amounting to IDR 10,000. 000 and reduced by expenses amounting to IDR 5,200,000, so the value of the net benefits from the mangrove nursery IDR 4,800,000 per period. The value of net benefits of mangrove seeds per year to IDR 9.6 million.

The direct use values of mangrove ecosystems in the Pabean Ilir village of fisheries sector into two catches and catches of shrimp and crabs. The value of direct value from the fishing IDR 8,720,913,600, - per year. Types of fish caught by fishermen in the village of Pabean Ilir are *Mugil* sp., *Arius* sp., and *Jhonius belangerii.* The direct use value of the catch of shrimps and crabs in the village of Pabean Vilage IDR 18,065,073,600 per year. The catch consisted of *P. merguiensis, M. ensis, Scylla serata*, and *portunus pelagicus*. Fishing gear used are gill nets and traps holdings.

Mangrove area enlargement useful as a *Mugil* sp.. The catch mullet including high enough for *Mugil* sp. including temporary resident fish, the fish associated with mangrove forests during seedling period before moving to offshore huddled along the beach adjacent to the mangrove forest. According Harahab (2009) mangrove community significantly contribute to the production of food. Mangrove forests have a large enough bearing capacity to the surrounding environment, especially as an advocate for a natural food source for organisms around the mangrove.

The direct use value of mangrove ecosystems in the Pabean Ilir Village IDR 26,795,587,200, per year. Mangroves provide nutrients for the surrounding biota thus contributing directly to the Productivity catches of fishermen.

Existence Value Mangrove Forest

Where the value of benefits for Pabean Ilir mangrove forest village obtained by using CVM (contingent valuation method) to determine the value of WTP (willingness to pay) or willingness to pay of the community will be the presence of mangrove forests. Analysis of the respondents' willingness to pay for the value of mangrove forests in the village of Pabean Ilir obtained through a scenario so that each respondent is willing to

pay. Scenario willingness to pay for the existence of mangrove forest in the village of Pabean Ilir on previous research conducted by asking questions about the state of conservation of mangrove forests at this time to the respondents. Respondents were shown a picture of two different conditions of mangrove forests that is the condition of mangrove forests is good and bad in order to understand the importance of preserving the mangrove forest. The number of respondents in this method is 98 respondents from 7218 as much as the soul of the total households (families) of 2,150 families in the village of Pabean Iilir. Respondents WTP value can be seen from Table 2.

Table 2. Values given WTP range of Respondents

No.	Parameter	Value (IDR)
1	WTP Max	100,000
2	WTP Min	5,000
3	WTP Average - Average	20,102
4	Median WTP	15,000
5	WTP mode	10,000

The greatest value of WTP (willingness to pay) of IDR 100,000 per ha, the smallest value of WTP is IDR 5,000 per ha, the value of the average - average of WTP is IDR 20,102 per ha, the value of the median (middle value) of the WTP is IDR 15,000 per ha, the mode (the most value) of WTP IDR 10,000 per ha. The next step is to multiply the value of WTP given by the villagers of Pabean Ilir IDR 10,000 multiplied by 2,150 multiplied by extensive mangrove KK Pabean Ilir Village area of 247.700 ha in order to obtain the value of the benefits the existence of mangrove forest in the village of Pabean Ilir IDR 5.32555 billion per year.

Willingness to pay for the value of mangrove forests in the village of Pabean Ilir IDR 10,000 per family per year, for IDR 10,000 is the highest WTP given by the Pabean Ilir Village community in accordance with the questionnaire at the time of the study. WTP IDR 10,000 per family per year with a system of fees paid directly to Pabean Ilir village hall for the management and maintenance of mangrove ecosystems in order to be maintained.

Total Economic Value of Mangrove Forest

The total economic value of mangroves Pabean Ilir village is the result of the sum of values - values which have been described previously, which consists of direct benefit value (market value) and the value of the benefits of the existence of (non-market). Here the value of the benefits with the details in table 3.

Table 3. Total Economic Value

No.	Types of Value	Value (IDR / Year)
1	Direct Use Value (Market value)	
	a. Mangrove seedlings	9.6 million
	b. Catching fish	8,720,913,600
	c. Catch shrimp and crabs	18,065,073,600
	Total Direct Use Value	26,795,587,200
2	Non Use Value (Non-Market)	5.32555 billion
	Total Economic Value	**32,121,137,200**

Based on the calculation results in Table 3 are obtained the total economic value of mangrove forest in the village of Pabean Ilir is IDR 32,121,137,200 per year consisting of direct benefit value (market value) IDR 26,795,587,200 per year and the value of the benefits of the presence of (non-market value) IDR 5.32555 billion per year. The market value is greater than the contribution of non market value.

Based on the results of Wahyu (2013) the total economic value of mangrove forests in the Mahakam Delta Region is IDR 503,071,298,869 consists of direct benefit value of IDR 480,451,836,369 and the value of mangrove forests IDR 13.305625 billion, while the results of Kalitouw (2015) the total economic value of mangrove forest ecosystems in the village Tjwoho, Wori District, North Minahasa Regency is IDR 2,316,961,823 per year.

Analysis of Factors Affecting Value WTP Existence Mangrove Forest Village Pabean Ilir

Willingness to pay is the dependent variable (Y), while the independent variables consisted of 6 variables, namely the profession (X_1), gender (X_2), age (X_3), education (X_4), income (X_5) and work experience (X_6). Profession and gender variables using dummy variables. Variable profession is categorized into two, namely non fisherman (0) and fishing (1), while the gender variable is categorized into two, namely women (0) and male - male (1). Variables - variables that affect the value of willingness to pay (WTP) the existence of mangrove forest in this study can be analyzed using multiple linear regression analysis. Models produced in multiple linear regression analysis WTP value of mangrove forests, as follows:

$$\mathbf{Y = -9{,}505.026 - 10502.190\ D_1 + 2191.580\ D_2 + 142.802\ X_3 + 571.862\ X_4 + 0.007\ X_5 + 3.623\ X_6}$$

Value for -9,505.026 constant coefficient indicates that if the profession (X_1), gender (X_2), age (X_3), education (X_4), income (X_5) and work experience (X_6) value is zero or does not exist then the value of willingness to pay the existence of mangrove forest in the village of -9,505.026 Pabean Ilir. So when the independent variables move up one unit, then the value of WTP existence of mangrove forests experienced a decline in the amount of 9505.026 units. The regression results WTP value of mangrove forests in the village where the Pabean Ilir can be seen in Table 4.

Table 4. Regression Results WTP value of mangrove forest existence Pabean Ilir

variables	coef	SE COEF	Sig,	VIF	t	Information
Constanta	-9505.026	6630.846	0.155	-	-	-
Profession	**-10,502,190**	**2128.429**	**0,000 (*)**	**1,459**	**-4.934**	**Real**
gender	2,191,580	2457.637	0,375	1,444	.892	Not real
Age	142.802	236 508	0.547	5.336	0.604	Not real
Education	571.862	408.51	0.165	2,817	1,400	Not real
Income	**0.007**	**0001**	**0,000 (*)**	**1,988**	**11.602**	**Real**
Work experience	3,623	209 478	0.986	6.427	0,017	Not real
R Square (R2)						**81.4%**
R Square adjust						**90.2%**
F count						**66.184**
Durbin Watson						**1,647**

Information: * Real Taraf 95%

Based on the results of Table 4, it can be seen that the coefficient of determination (R^2) in this study amounted to 81.4%, this means that the profession variable (X_1), gender (X_2), age (X_3), education (X_4), income (X_5) and work experience (X_6) can explain 81.4% of the value of willingness to pay (WTP) the existence of mangrove forests, while 18.6% is explained by variables - variables that are not mentioned in this study. Results from testing in this model that f F table on this model is 2,201, while the value of F calculated in this model is 66.184. This shows that in this model, the F count> F table, it means that the variable profession (X_1), gender (X_2), age (X_3), education (X_4), income (X_5) and work experience (X_6) simultaneously influence significantly to the WTP variable presence of mangrove forests in the village of Pabean Ilir (Y).

Based on t test results can be seen that the profession variable (X_1) has a t value of -4.934, the negative sign means that that happened offs between variables influence the profession against the dependent variable is WTP existence of mangrove forest in the village of Pabean Ilir. The value of the variable sig 0,000 professions. This shows that the value of t arithmetic (4.934) is greater than t table (1.662) and sig (0,000) is smaller than

0.05, it means that the profession variables have an influence on the value of WTP existence of mangrove forest in the village of Pabean Ilir.

Variable income (X_5) has a value of t count equal to 11.602, a positive sign that has a meaning, namely that there is unidirectional relationship between variables influence the profession against the dependent variable is WTP existence of mangrove forest in the village of Pabean Ilir. Sig variable income of 0.000. This shows that the value of the t (11.602) is greater than t table (1.662) and sig (0,000) is smaller than 0.05, it means that the income variables have an influence on the value of WTP existence of mangrove forest in the village of Pabean Ilir. These results are consistent with research conducted by Amanda (2009) who studied the lake Situgede Heritage in Bogor, West Java, which concluded that the revenues positive effect on WTP values, meaning that any increase in the number of respondents' income will increase the value of WTP.

Gender variable (X_2), age (X_3), education (X_4) and work experience (X_6) has a value of t <t table and sig> 0.05. This shows that the variables of gender, age, education and work experience partial does not have a significant impact on the value of WTP existence of mangrove forest in the village of Pabean Ilir.

CONCLUSIONS

The total economic value of mangrove forests in the village of Pabean Ilir is IDR 34,289,164,400 per ha per year consisting of direct use value of IDR 28,963,614,400 per year and the value of the existence of IDR 5.32555 billion per year.

Factors - factors that significantly affect the WTP are Profession (X_1) and Income (X_5). Profession affect the willingness to pay the mangrove forest where the lower professions where the higher the value of willingness to pay where the mangrove forests, while the higher the income it wishes to pay for the higher state of mangrove forests.

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