Price Determination of Sustainable Wood in Forest Conservation Efforts

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ABSTRACT

The condition of Indonesian production forests is currently experiencing potential crisis which caused by illegal logging practice, forest conversion, forest fires, forest encroachment and corporate political that have orientation on maximum profit that will ultimately threaten the existence of forests as a buffer of life. The aim of this research is to analyze the extent to which price determination of timber based on the economic value of the environment can form a sustainable forest. Analysis methodology used to achieve this purpose is calculated the plant production cost and economic value of the environment calculations. The result shows that by determined of Sustainable Timber Price per m³ of IDR 127,856,000 then the forest conservation efforts can be realized.

Keywords: plant production cost, environmental value, sustainable timber prices

INTRODUCTION

Background of the Research

Forest conditions are currently experiencing a potential crisis which causes uncertainty of resource goods availability in the form of timber, but it is also driven by the presence of Indonesian selective cutting with replanting system which has been instituted by the government, in its implementation by the holder of Business Permit for Timber Forest Product Utilization in the activities series of Indonesian selective cutting with replanting system still not implemented with perfect and complete.

Regulation of the Minister of Forestry Number: P.11/Menhut-II/2009 that decrease in the diameter class for dry land forest or mountain forest that for production forest with cycle period of 30 years which has been diameter class for timber exploited above 50 cm to 40 cm up and for a limited production forest that has been exploited of timber 60 cm up to 50 cm up and also based on the current price of timber is combination of exploitation costs added with fees and firm profits. With the result that, timber prices in the domestic market to be cheap, at this time (in 2012) the local market prices of meranti timber valued by IDR 1,500,000 per m³ and meranti timber prices in the international market ranges from IDR 3,000,000 per m³, while the reforestation activities of the government only collecting fees to the holder of Business Permit for Timber Forest Product Utilization in the form of Provision of Forest Resource and Reforestation Fund form in which the amount of fees determined by the government in the form of provision of forest resource that charged to the holders of Business Permit for Timber Forest Product Utilization only for IDR 60,000 per m³ (10%) from the benchmark prices of meranti timber (*Shoreasp*) determined by the Ministry of Commerce of the Republic of Indonesia by the letter of Number: 22/M-DAG-4/2012 April 24th, 2012 as well as the reforestation fund for only US $ 16 per m³ (IDR 160,000 per US $ 10,000).

The result of fee that received by the government comes from the holder of Business Permit for Timber Forest Product Utilization – Nature Forest, to make the forest as before still considered to have not been able to establish a sustainable forest. The inability of the return

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of natural forest will impact on the increase of critical of land area, which in turn damage the natural forest ecosystems will affect the life of the earth's surface. On the other side, the assessment towards nature forest stump (types of meranti) which already and will be exploited itself never calculated into the timber price determination, so that resulting timber prices that outstanding in the domestic market to be cheap because timber prices solely only based on the exploitation costs, forestry fees and firm profits when actually that stump have economic value to be reckoned.

Efforts to establish the forest stump of meranti (*Shoreasp*) derived from shoots/seedlings scraped until becomes a tree that has certain diameter until can be exploited or produce the timber that has an economic value of course require a lot of costs from the various activities, as well as the impact of forest exploitation activities toward the ecosystem that leads to the accumulation of sedimentation in the downstream area of Watershed, change the water color of the river, the change of air temperature and the other environmental damage. Impact mentioned above, will make the environment social costs is higher, while reforestation efforts is not optimal because of the costs used for reforestation activities at this time only based on the fees such as Provision of Forest Resource and Reforestation Fund of IDR 220,000 per m3 that used to build the original forest (sustainable forest) will not be realized. Based on the above consideration, it is necessary the research on price determination of sustainable timber that is the price of timber based on the environment. In connection with the above consideration, it is necessary the research towards price determination of sustainable timber in forest conservation efforts.

Problems Formulation

The problem of the research is summarized as the following: "To what extent the price determination of timber by calculating the environment economic value influence on level of forest sustainability".

Objectives of the research

The objectives of the research are:

1. To analyze the price of timber with attention to the environmental value (price of sustainable timber) that returns to its original shape of forest can be realized.
2. Analyzing the feasibility of sustainable timber prices.

Benefits of the Research

Could be material considerations in the price determination of sustainable timber of meranti types (*Shoreasp*) in Indonesia so as the sustainable forest management can be realized.

LITERATURE REVIEW

According to the Edwinsyah*et al*, (2012), that the price of Indonesia's natural forest round timber (including types of *Shoreasp*) per m^3 is IDR 2,176,899. In this case, the price can be used for determination / benchmark the amount of Provision of Forest Resource and Reforestation Fund. Value of timber from natural forests that determined by Edwinsyah above, have not entering yet the environmental value to the timber benchmark price. Determination of timber value is the basic policy that proposed to the government in terms of the determination of the value of Provision of Forest Resource and Reforestation Fund. According to Yuniati and Suastati (2008) that the Indonesian forest timber prices (including the types of *Shoreasp*) in the form of stumpage value of IDR 748,750. While, timber prices in the domestic market that does not have certificate of Sustainable Forest Management (SFM) is

equal to IDR 1,100,000 and the timber that has SFM is worth US $ 200-250. In this case, the price of timber is also still not entering the environmental economic value of timber prices.

THEORETICAL FRAMEWORK

Schematically, research framework of the research to achieve the forest conservation efforts, presented in Figure 1.
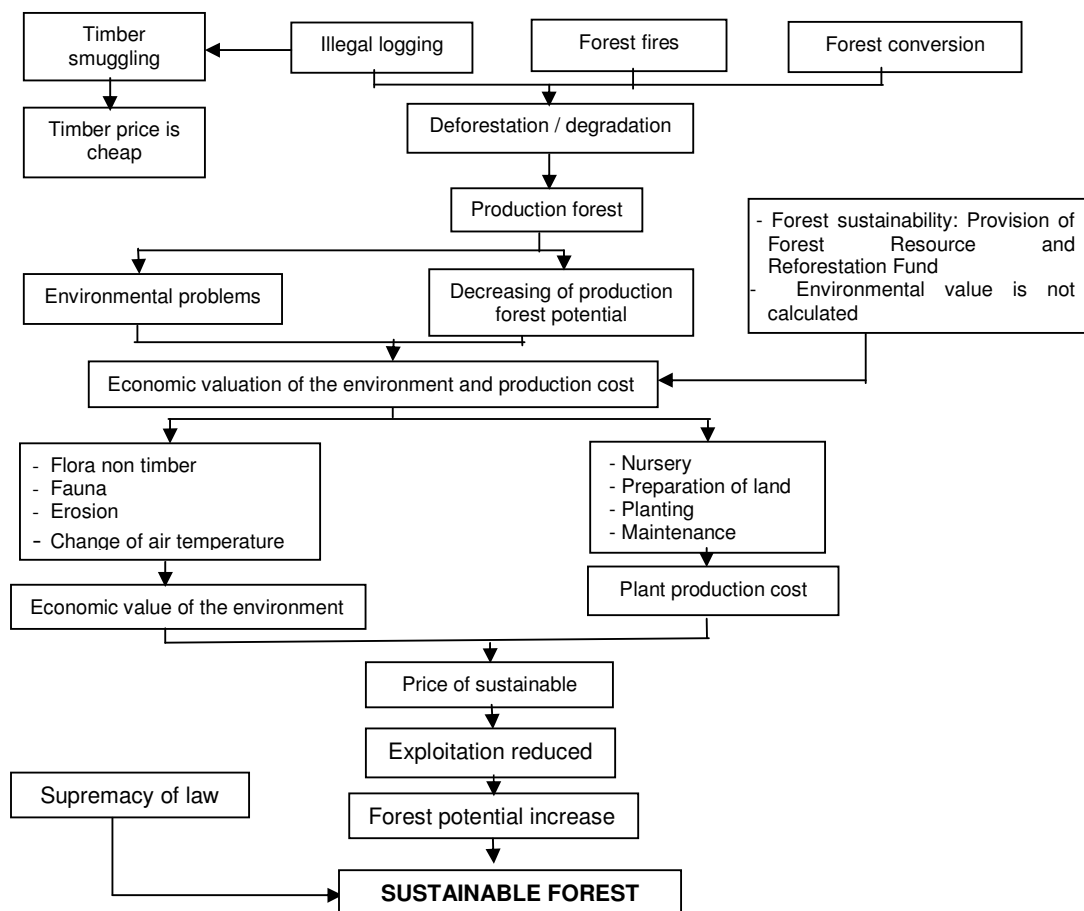

Figure 1. Research Framework to Achieve Sustainable Forest

Based on the picture above, that production forests are currently experiencing potential crisis due to deforestation/degradation. Deforestation/degradation is caused by forest fires, conversion from forest to palm oil plantations and residential, so that the forests function becomes reduce. Moreover, the existence of illegal logging activities leads to smuggling of timber, so that the price of natural forest timber in both the local and international markets becomes cheap. In addition, for forest conservation only based on the fee cost of Provision of Forest Resource, while the value of the environmental impacts of exploitation is never taken into account. So as, to solve the problem that caused environment problems and to overcome the reduction of forest potential are needed the economic valuation of the environment in the form of calculation of flora non-timber and timber that lost, the value of the lost fauna, the impact value of losses due to erosion and the changes of air temperature that occur as the result of exploitation. It is also necessary to have valuation of production cost that consists of nursery production, land preparation, planting and maintenance costs.

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The combination of the economic value of the environment and production cost produces the price determination of timber based on environment that called sustainable timber prices. With the determined of sustainable timber prices, the price of timber became expensive, so the demand for timber will decrease indirectly, reduce exploitation activities, by reducing the exploitation activities, the potential of forest (timber) will increase with enforced the strong supremacy of law, so as the production forests will be sustainable.

RESEARCH METHODS

The research is conducted in the area of PT. Karda Traders, the Decree holder of Business Permit for Timber Forest Product Utilization in natural forests with Ministry of Forestry Decree No.76/Kpts-II/2000 on December 20th, 2000. The area of 98,400 hectares located in the West Kotawaringin Regency, Seruyan Regency and Lamandau Regency, Central Kalimantan Province.

The research is conducted by direct observation in the field for 3 months, secondary data collection on relevant institutions (State Electricity Company; Department of Forestry; Department of Fisheries; Local Government Owned Water Utilities; corporate data; Traffic Director of River, Lake and Crossing Transportation) and also interviews with forest communities. The sampling method is conducted by purposive sampling of the areas of primary and secondary production forest.

ANALYSIS RESULTS AND DISCUSSIONS

Calculation of Sustainable Timber Prices

The calculation of sustainable timber prices is conducted by the following:

Economic Value of Environment (NEL): (IDR) = (Ns + Nt + Kae + Nu)

   a.   Fauna value (Ns)

   b.   Economic plant value (Nt)

   c.   Loss due to erosion (Kae): (IDR) = Nda + Ndp +Ndn

Where:

   i.   The changes of river water color towards the use of clean water (Nda)

   ii.   Siltation of river water towards the use of sailing (Ndp)

   iii.   Revenue of fisherman (Ndn)

   d.   Loss of air temperature changes (Nu)

Based on the results of research implemented, the economic value of environment data obtained as in Table 1.

Table 1. Economic Value of the Environment in Tropical Forest Areas

No	Description	Environment value/plant (IDR)	The percentage of Total NEL
1	Fauna value (NS)	17,230.00	3.21
2	Plant value (NT)	95,75.,41	17.5
3	Impact value of erosion (Kae)	5,183.93	0.97
4	Air temperature value (Lu)	418,207.00	77.97
	NEL	*536,377.34*	*100.00*

Source: Data processed, 2012

Based on Table 1 above that the value of the fauna lost as the result of the forests exploitation activities per plant of IDR 17,230 (3.21%), for 100 hectares obtained fauna value of IDR 689,200,000. Data of lost fauna which is in areal of Business Permit for Timber Forest Product Utilization, PT. Karda Traders that have economic value both for the sustainability or intermediate forest crop pollination and ecosystem in forest as well as food material, medicine. Furthermore, there is a lot of animals in the forest only to be hunted as ornamental animals for humans and loss of fauna due to the exploitation activities, because loss of food resources and the place to live (habitat) for these animals so that the fauna moved or died.

The economic value of the plant include rattan, bamboo, traditional medicinal crops such as Pasak Bumi (*Eurycoma longifolia* Jack), Seluang Belum (*Luvunga eleutheranda* Dalz), Akar Kuning (*Arcangelisia flava* L. Merr), Akar Longkan, Sarang Semut (*Myrmecodia pendans*), Bawang Tiwei (*Eleutherine palmifolia* L. Merr), Tapak Pilak,Galinggang (*Casseaalata*), Kelakai (*Stenochlaenapalustris*),SirihKetam (species of betel). Moreover, it is also as ornamental plant such as various kinds of orchids, ornamental leaves [Waves of Love(*Anthuriumplowmanii*), Forest Taro, TandukRusa (*Platyceriumbifurcatum*), Pisang-pisangan (*Heliconiacolinsiana*), Betel (*Piper betle*)and Pandanus] and also the economic feed plant of animal [Nyatoh (*Palaquiumxanthochymum*), Petiti, Forest Banana and Mango (*Magniferaindica*)] that lost due to forest exploitation, so that the plants many died due to falling trees that felled, in addition with the opening of the land caused by the exploitation many non-timber and timber plants that have economic value is died due to the lack of shade for the place to grow. So as, for planting due to the loss of economic non-timber per plant accounted of IDR 95,756.41 (17.85%). For 100 hectares acquired plant economic value that loss of IDR 3,830,256,400.

Whereas, the losses value due to erosion from the impact of forest clearing such as the changes of river water color towards the use of clean water, in relation to the use for household daily, the cost of processing turbid water into clean water is suitable for consumption. Result of erosion affecting siltation of river water associated with the use of shipping, so it is requires costs for dredging of sedimentation. Due to accumulation / soil erosion the impacts of the opening land result of forest exploitation activities and erosion loss values are also affect the income of fisherman that respect to the decline in production of fish catches. With the turbid water of the river, presence of siltation so fishes that had many into small. This is because the catch is getting away. The loss value per plant due to erosion impact is calculated of IDR 5,183.93 (0.97%). For 100 hectares of open land the loss value due to erosion is obtained of IDR 207,357,200.

The loss value due to changes in air temperature caused by forest clearing is obtained the magnitude of changes in air temperature between the primary forest and secondary forest of 7.6°C, to realize the shade such as secondary forest into forests (reaching temperature of 25°C) is required the fund per plant of IDR 418,000 (77.97%). For land area of 100 hectares is obtained the loss value due to changes in air temperature of IDR. 16.72 billion.

From the description above, it is obtained the total economic value of the environment as the result of the impact of 1 (one) tree is felled and which need to be calculated in the price determination of sustainable timber per plant is IDR 536,170.34 while for the 100 hectares is obtained the economic value of the environmental of IDR 21,446,813,600.

Pant Production Cost (BPT): (IDR/ha) = (B$_s$ + B$_l$ + B$_t$ +B$_p$)

Consists of:

    a.   Nursery Cost (Bs)

    b.   Land preparation activities cost (Bl)

  c. Planting activities cost (Bt)

  d. Maintenance activities cost (Bp)

The activities of plant production are one of a series in an effort to realize the reforestation in order to the function orest as the buffer for ecosystem can be realized. Based on the results of research conducted in Business Permit for Timber Forest Product Utilization, PT. Karda Traders, West Kotawaringin, obtained plant production costs data as in Table 2.

Table 2. Plant Production Cost (BPT)

No	Types of Activities	Cost (IDR)	The Percentage of BPT
1	Nursery Cost (BS)	1,861.41	18.10
2	Land preparation activities (BL)	443.50	4.32
3	Planting activities (BT)	5,023.67	48.86
4	Maintenance activities (BP)	2,953.29	28.72
	Total (BPT)	*10,281.86*	*100.00*

Source: Data processed, 2012

Based on Table 2 above that the costs incurred for nursery activities which include the cost of wages/labor for activity of making land preparation raised beds, filling polybags and separation of seedlings and costs of materials and tools for making raised beds of 126 and planting medium costs, the cost of purchasing seedlings, derived from the results of scraped shoots of Dipterocarpacea species which is *Shoreasp* (meranti) and also planning cost. In order to obtain the nursery cost per plant by IDR 1.861, 41 (18.10%), the total cost of seedlings for 100 hectares needed is IDR 74,456,400.

The cost for land preparation activities include planning costs for making of planting area boundary (making of plant block boundary), the cost for making the work shack, cost for making nameplate, the cost for making / clearance the planting path, the cost for installation of stake, and also the cost for making planting hole. While, the effective land area used for planting land preparation activities is 589.08 hectares with the planted seedlings amount of 235,632 seedlings, the land preparation activities per plant is needed the funds of IDR 443.50 (4.32%). For 100 hectares of planting hole cost needed the cost of IDR 17,740,000 with plant spacing (5 x 5) m.

Whereas, for planting activities include costs for enrichment activities (additional types), planting in vacant land outside the Silviculture System of Intensif Indonesian Selective Cutting with Replanting System, planting sides of the road, the cost of transporting seedlings, then obtained the planting activities cost per plant is IDR 5,023.67 (48.86%). Therefore, an area of 100 hectares is needed planting activities cost of IDR 200,946,800 for the same plant spacing (5 x 5) m. The planting activities are conducted on logged-over areas, skid trails and other vacant land.

For the maintenance activities toward plant including replanting, while this maintenance activities include the maintenance and replanting of the enrichment and rehabilitation, maintenance and replanting activities on land clearing, maintenance and replanting activities on both sides of the road, so for the implementation of the conducting maintenance and replanting plants are needed funds per plant of IDR 2,953.29 (28.72%). Therefore, an area of 100 hectares needed the maintenance activities cost of IDR 118,131,600.

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The total cost of pant production as a whole per plant since from nursery activities to field maintenance needs the costs of IDR 10,281.86 then the total cost of plant production for 100 hectares, it is necessary the plant production cost of IDR 411,274,400 with plant spacing in the field (5 x 5) m.

Sustainable Timber Prices (HKL): (IDR) = (BPT + NEL)

Sustainable timber prices obtained by adding the economic value of the environment with the cost of plant production. Therefore, obtained the sustainable timber prices at the time of the plants still in the nursery is IDR. 546,659.20.

By the assumption that an increase in the diameter of the tree for 1 (one) year period is equal to 1 cm, then to determine the sustainable timber prices based on the common diameter classes. As for determining the sustainable timber prices based on the each diameter class can be seen in Table 3 below.

Table 3. List of Price Classification based on Class Diameter of Sustainable Timber

No	*Tree Diameter Class (cm)*	*Timber Priceper (m³)*
1	40-49	11,597,000
2	50-59	21,761,000
3	60-69	42,107,000
4	70-79	87,095,000
5	80-89	187,856,000
6	90-99	417,017,000

Source: Data processed, 2012

Based on Table 3 above obtained the average of sustainable timber prices based on the diameter class per tree with diameter class (40-49) cm of IDR 39,416,470.04 with the average volume per tree is 3.40 m³, then the price per m³ is IDR 11,593,000. While, the diameter class (50-59) cm gained the average of sustainable timber prices per tree is IDR 102,236,171.97 and the average volume per tree is 4.70 m³ and the price per m³ is IDR 21,752,000.

For the diameter class (60-69) cm, the average of sustainable timber prices is IDR 265,174,300.20 with the average volume of 6.30 m³ per tree then its price per m³ is IDR 42,091,000. For the diameter class (70-79) cm the sustainable timber prices is IDR 687,793,841.75 with the average volume per tree 7.90 m³, then its price per m³ is IDR 87,063,000.

As for the diameter class (80-89) cm the sustainable timber prices per tree is IDR 1,783,960,091.15 with the average volume of 9.50 m³ per tree, then its price per m³ is IDR 187,785,000.

The average price for the sustainable timber for diameter class (90-99) cm per tree is IDR 4,627,133,035.55 with the average volume of 11.10 m³ per tree then its price per m³ is IDR 416,856,000.

To see whether the calculation of the sustainable timber prices as determined by Table 3 above is feasible to set or not, it is necessary to analyze the feasibility, therefore the sustainable forest can be realized.

Calculation of Feasibility Analysis of Sustainable Timber Prices

The Calculation of Feasibility Analysis of Sustainable Timber Prices is conducted by the following way:

   a.   Net present value (NPV)

$$NPV = \sum_{t=0}^{T} \frac{(B_t - C_t)}{(1 + r)^t}$$

   b.   Benefit cost ratio (B/C Ratio)

$$\frac{B}{C} = \frac{\sum_{t=0}^{T} \frac{B_t}{(1+r)^t}}{\sum_{t=0}^{T} \frac{B_t}{(1+r)^t}}$$

   c.   Internal rate of return (IRR)

$$IRR = i' \frac{PV\ fom\ i'}{(NPV\ from\ i' + NPV\ from\ i'')} x(i'' - i')$$

  With the criteria:

   i.   NPV > 0: HKL is feasible to set; NPV = 0: HKL can be specified but it is not profitable; NPV < 0: HKL is not feasible to set.

  ii.   B/C > 1: HKL is feasible to set, if the B/C < 1: the sustainable timber prices are stated not feasible to set.

 iii.   IRR lies between interest rates: HKL is feasible to be developed; if the IRR is beyond the interest rate: HKL is not feasible to be developed.

Table 4. The Result of Feasibility Analysis of Sustainable Timber Prices

Diameter Class (cm)	*NPV (10%)*	*NPV (16%)*	*BCR*	*IRR*
40 – 49	153,55	15,22	1,02	15,48
50 – 59	59,20	3,45	1,02	15,68
60 – 69	22,82	0,78	1,02	15,81
70 – 79	8,80	0,18	1,02	15,89
80 – 89	3,39	0,04	1,02	15,93
90 – 99	1,31	0,01	1,02	15,96

   Source: Data processed, 2012

Based on Table 4 above to sustainable timber prices by diameter class (40-49) cm obtained the NPV with 10% interest rate of 153.55 and 15.22 at 16% interest rate, the BCR of 1.02 and IRR of 15.48 then sustainable timber prices is feasible to set.

Meanwhile, sustainable timber prices based on the diameter class (50-59) cm obtained the NPV with 10% interest rate of 59.20 and 16% interest rate of 3.45 then BCR of 1.02 and IRR of 15.68 so the sustainable timber prices is feasible to set.

Sustainable timber prices by diameter class (60-69) cm gained the NPV with 10% interest rate of 22.82 and 16% interest rate of 0.78 then BCR at 1.02 and IRR of 15.81 so the sustainable timber prices is feasible to set.

Sustainable timber prices by diameter class (70-79) cm gained the NPV with 10% interest rate of 8.80 and 16% interest rate of 0.18 while BCR of 1.02 and IRR of 15.89 it is feasible to set the sustainable timber prices.

Sustainable timber prices by diameter class (80-89) cm obtained NPV with 10% interest rate of 3.39 and 16% interest rate of 0.04 and also BCR of 1.02 and IRR of 15.93 then sustainable timber prices is feasible to set.

Sustainable timber prices by diameter class (90-99) cm gained the NPV with 10% interest rate of 1.31 and 16% interest rate of 0.01, the BCR of 1.02 and IRR of 15.96 it is feasible to set the sustainable timber prices.

CONCLUSIONS

Corresponding to the results obtained sustainable timber prices (HKL) per m^3 of timber the types of meranti (*Shoreasp*) is IDR 127,856,000 with assumption the average volume of meranti trees (*Shoreasp*) for the diameter of 40 cm up is 7 m^3, the sustainable timber prices (HKL) per tree is IDR 894,992,000. Therefore, the value of one trees felled can finance the reforestation of the area of 4 hectares.

RECOMMENDATIONS

Referring to the results of the research is recommended that the determination of prices benchmark that determined by government towards sustainable timber prices or the price of Indonesian forest timber, derived from nature forest for types of meranti (*Shoreasp*) refers to the standard of sustainable timber prices. It is intended that return of the form of production forests have been exploited can be realized.

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