Economic value of non timber forest products - A Case study from South Tapanuli, North Sumatera, Indonesia

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Abstract. Non-timber forest products (NTFPs) are any product or service other than wood produced in the forest. NTFPs that are used by people around the forest are medicinal plants, resins, gums, essences and a series of bark and fibre, fruits and nuts. The study was conducted in Marancar Godang Village, Marancar District, South Tapanuli Regency, and North Sumatera. This study tries to find out, the dependence and significance of livelihoods from NTFPs for forest-dependent people. The study site has economic value for the utilization of non-timber forest products is 2,441,416,000,- IDR/year. The existence of forests is still a support for people's lives in the economic field.

1. Introduction
As an important source of livelihood for the community around the forest is non-timber forest products (NTFPs). In Indonesia, NTFPs are related to the socio-economic life and culture of people who depend on forests that inhabit ecological and geo-climate conditions [1]. An estimated 60 million Indonesians depend their lives on forests. NTFPs also serve as a safety net for vital livelihoods during difficult times. In addition, economy by generating employment and income in downstream processing and trade activities as a result of the multiple effects of NTFP Extraction

For communities around and within the region, forests are natural resources that can provide basic needs for the community such as food, boards, medicines and non-timber forest products (NTFPs) for the family. For the modern forest community has various functions, namely economic functions, protection and beauty [2]. Maintaining and improving these functions is an integral part of sustainable forest management [3].

This research is done to know the Economic Value of Non-Timber Forest Products used by Communities in Marancar Godang Village, Marancar District, South Tapanuli Regency. Information about status and trends in the socio-economic benefits of forests is very important in evaluating progress towards sustainable forest management.

2. Methods
This study was undertaken in Marancar Godang Village, Marancar District, South Tapanuli Regency. Research was conducted in January-February 2019. Geographically, it is located between 98° 46' 48" - 99° 17' 24" East Longitude and 10° 27' 00" - 10° 59' 24" North Latitude. This area has a slope of 16% to 60%. The combination of high rainfall, the predominance of slope> 50%, the topography is generally hills and mountains.
The number of families in Marancang Godang is 182 families. Determination of the number of respondents based on Slovin formula as follows.

\[ n = \frac{N}{1+N(e)^2} \]  

\( n \) = number of respondents  
\( N \) = number of population  
\( e \) = allowance level (10%)

Data was collected using rapid rural appraisal and structured interviews of 65 households. Field data collected in the study area is by interviewing households directly, in the form of a questionnaire about the identity of farmers, land ownership, land management methods, product selling prices (non timber forest products-NTFPs), worker and others. Data obtained from field observations both through interviews and questionnaires were then analysed quantitatively. Non-Timber Forest Products values for each type per year were computed using the formulae (2) to (5) as shown below:

2.1. The average number of NTFPs

The average number of NTFPs = \( \frac{\sum X_i}{n} \)  

\( X_i \) = Number of NTFPs taken by respondents  
\( N \) = the large number of NTFPs collection

2.2. Total collection NTFP every Year

\[ TP = RJ \times FP \times JP \]  

\( TP \) = Total collection NTFPs every year  
\( RJ \) = Average number of NTFPs  
\( FP \) = Frequency of retrieval NTFPs  
\( JP \) = Amount of retrieval NTFPs

2.3. Economic value of NTFPs every year

\[ NH = TP \times HH \]  

\( NH \) = Value of forest products per type  
\( TP \) = Total withdrawal (unit / year)  
\( HH \) = Price of forest products

2.4. The percentage of economic

\[ \%NE = \frac{Ne_i}{(\sum NE)} \times 100\% \]  

\( \% NE \) = Percentage of economic value  
\( Ne_i \) = Economic value of NTFPs every types  
\( (\sum NE) \) = Total economic value of all NTFPs
3. Result and discussion

3.1 Types of non-timber forest products NTFPs

NTFPs are related to the socio-economic life and culture of Indonesian people who depend on the forest. The system of community livelihoods around forests varies greatly between different ethnic groups and also among various regions, depending on socio-cultural, historical and ecological factors. They have occupied the forest area since time immemorial, living isolated from mainstream life. The characteristics of the people live in harmony and symbiotic relationship with nature [3] [4]. Types of non-timber forest products with economic value utilized by the community can be seen in Table 1.

| No | NTFPs                     | Benefit                                | Number of respondents | Percentage (%) |
|----|---------------------------|----------------------------------------|-----------------------|---------------|
| 1  | *Hevea braziliensis*      | Latex, rubber                          | 32                    | 49.23         |
| 2  | *Arenga pinnata* (betel nut) | Sugar palm, palm fibre, processed food | 27                    | 41.54         |
| 3  | *Cinnamomum sp*           | Cinnamon, food                         | 10                    | 15.38         |
| 4  | *Theobroma cacao L.*      | Food                                  | 14                    | 21.54         |
| 5  | *Areca catechu*           | Traditional ceremonies, herbal medicine | 15                    | 23.08         |
| 6  | *Archidendron pauciflorum*| Food, herbal medicine                  | 16                    | 24.62         |
| 7  | *Aleurites moluccana* (candlenut) | cooking ingredients, hair care, herbal medicine, hair care | 16                    | 24.62         |

Most of the households (49.23%) use rubber. The second type of forest products most used by respondents is sugar palm (41.54%) and subsequent forest products are *A. pauciflorum* and candlenut fruit which are 16 people (24.62%), *A.catechu* as many as 15 people (23.08%), cacao as many as 14 people (21.54%), and Cinnamon as many as 10 people (15.38%).

Forest products that are utilized by the community are very diverse, which aims to meet their own needs and some are sold to increase their household income [5]. Most NTFPs are part of a household subsistence strategy, a source of food for traditional forest communities. NTFPs can be a staple for those who live near forests. In the second level of important food, NTFPs are used to feed livestock [6] (Figure 1).
3.2 Economic value of Non-Timber Forest Products (NTFPs)

The economic value of NTFPs is derived from the multiplication of total annual harvests with the prices of forest products [7]. Based on the research that has been done to 65 respondents, it was found that the economic value of the utilization of non-timber forest products in Marancar Godang Village was 2,441,416,000 IDR / year. The economic value of each type of NTFP in one year can be seen in Table 2.

| No | NTFPs                  | Total taking (Kg/year) | Unit Price (IDR) | Economic Value (IDR) | Percentage (%) |
|----|------------------------|------------------------|------------------|----------------------|----------------|
| 1  | Hevea brasiliensis     | 66,240                 | 7,000            | 463,680,000          | 18.99%         |
| 2  | Arenga pinnata         | 28,896                 | 16,500           | 476,784,000          | 19.52%         |
| 3  | Cinnamomum sp          | 740                    | 38,000           | 28,120,000           | 1.15%          |
| 4  | Theobroma cacao L.     | 23,520                 | 20,000           | 470,400,000          | 19.26%         |
| 5  | Areca catechu          | 30,528                 | 14,000           | 427,392,000          | 17.52%         |
| 6  | Archidendron pauciflorum | 18,912            | 10,000           | 189,120,000          | 7.74%          |
| 7  | Aleurites moluccana (candlenut) | 12,864 | 30,000 | 385,920,000 | 15.82% |
|    | **Total**              |                        |                  | **2,441,416,000**    | **100%**       |

Indonesia's natural rubber production is exported around 85% in the form of semi-finished goods such as thick latex, Indonesian standard rubber (SIR), ribbed smoked sheet (RSS), etc. [2]. In this study, the economic value of rubber latex was the third largest, which was 463,680,000 IDR (18.99%).
The highest economic value of NTFP utilization is sugar palm plants (19.52%), while the smallest economic value is cinnamon (1.15%). *Arenga pinnata* economically have a high enough value because almost all parts can be utilized and the products vary. Palm sugar or commonly called red sugar is produced from *Arenga pinnata*. The usefulness of palm trees include leaves for roofing, fruit for *kaling*, raw materials for brown sugar, alcohol, biogas, household appliances. Fibre for broom sticks, fruit for *kaling*, sap for raw materials for brown sugar, alcohol, biogas, roots of medicines such as fibre for air such as household goods, souvenirs. In 1 (one) year of production, the number of effective months for the process of making palm sugar ranges from 9 months to 11 months. This is due to the fact that sugar palm trees do not produce throughout the year. Each palm tree can produce about three months. Respondents usually use more than 1 palm tree to increase production. Palm sugar provides the highest contribution compared to other types of NTFPs, where the economic value of palm sugar reaches 476,784,000 IDR (19.52%).

Indonesia exports cinnamon to the world with several advantages such as rich aroma and taste, specific colours, higher essential oil content, and the thickness and shape of quill pens. The use of cinnamon in general is for spices in food, drinks, perfumes, and for medical applications. Cinnamon skin products are the main product of cinnamon, this product is a piece of dried skin. cinnamon is produced by drying. Before being dried, the skin is scraped or cleaned from the outer skin, then split into 3-4 cm size, then the clean skin is dried under the hot sun for 2-3 days, the skin is declared dry if the weight has been lost by about 50%. The utilization of Cinnamon by respondents reaches 740 kg/year. With a selling price of 38,000 IDR/kg, the value obtained from the utilization of cinnamon is around 28,120,000.00 IDR.

Indonesia, as the third largest supplier of cocoa products in the world after Pantai Gading and Ghana, exports most of its cocoa production in the form of raw cocoa beans. This prompted the government to stimulate national value-added processing industries [8]. The economic value of cacao at the study location ranked second at 470,400,000 IDR (19.26%). The average production of dry cocoa beans is about 1,960.42 kg/ha/year, so farmers get revenue of 49,010,500 IDR/year [9].

*Areca catechu* (betel nut - actually seed endosperms) can be used for shewing when ripe. As stimulants masticatory by 5% of the world’s population, make more popular than chewing gum but not as popular tobacco [10]. The use of areca nut is usually for cultural or social rituals of various Asian and Pacific. The economic value of *A. catechu* at the study site around 427,392,000 IDR (17.25%).

*A. pauciflorum*, as one of the flowering tree species in the family of peas, fabaceae, known as Jengkol, Dogfruit, or Jering, which originates from Southeast Asia. Even though it smells strong. This seed is one of the popular foods in Indonesia, and is also consumed in Malaysia, Myanmar and in Southern Thailand [11]. The economic value of *A. pauciflorum* at the study site around 189,120,000 IDR (7.74%).

North Sumatra is one of the main cultivation areas of *A. moluccana* (candlenut) commodities in Indonesia. The economic value of *A. moluccana* the study site around 385,920,000 IDR (15.82%). According to [12] that candlenut seeds had the highest economic value amount 150,480,000 IDR/year with the percentage was 70.6%.

Forests provide a variety of economic and social benefits for humans, especially communities around the forest. This includes contributions to the economy as a whole, for example through, processing and trading of forest and energy products, opening employment and investment in the forestry sector.

### 4. Conclusion

The type of NTFP used by the people of Marancar Godang Village is *Hevea brasiliensis* (latex), *A. pinnata* (sugar palm), *Cinnamomum sp* (cinnamon), *T. cacao L* (cacao), *A. catechu* (betelnut), *A. pauciflorum* (Dog fruit) and *A. Moluccana* (candlenut). The total economic value for the utilization of non-timber forest products in the study site is 2,441,416,000 IDR/year. Non-timber forest products are one source of income and food for local communities. Thus the maximum benefits can be extracted from available resources, following the goals of sustainable development.
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