Potency of diversity and utilization of rattan in Paru village forest, Sijunjung regency, West Sumatra

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Abstract. The existence of forests for indigenous peoples in Paru Village (Nagari Paru) is very important as a source of livelihood. Paru Village Forest, which is under the management of Sijunjung Forest Management Unit, Sijunjung Regency has the potentials for economic value of both timber and non-timber forest products (NTFPs). In Paru Village Forest, various types of rattan were found which are the most common types of NTFPs found in this region. The purpose of this study was to determine the potency of rattan as one of a prime non-timber forest products and their utilization in Paru Village Forest, Sijunjung Regency, West Sumatra Province. Seventeen species of rattan were found based on observations on 98 sample plots with an area 0.1 hectares per plot. Sikai Rattan (Calamus spp.) was found in the highest number, namely 149 individuals, followed by Ant Rattan (Daemonorops verticilliaris (Griff.) Mart.) and Shrimp Rattan (Calamus spectabilis BL.) with 119 and 114 individuals respectively. Jernang rattan (Daemonorops draco BL.) occupies the highest priority as NTFPs producers in Paru Village Forest which has the greatest variety of benefits, which were used for medicine, handicrafts, dyes and resin producers.

1. Introduction
Paru Village Forest is one of the Social Forestry schemes in Indonesia under the management of Sijunjung Protected Forest Management Unit - Forestry Service of West Sumatra Province. The existence of forests for indigenous peoples in Paru Village (Nagari Paru) is very important as a source of livelihood and influences the social and economic behavior of the community. The indigenous people of Paru Village are aware of the importance of the existence of forests for them so that even though these protected forest areas are very close and directly adjacent to their settlements, the forests are still well preserved.

Paru Village Forest in Sijunjung Regency, West Sumatra has the potentials for economic value of both timber and non-timber forest products (NTFPs). In Paru Village Forest, various types of rattan were found which are the most common types of NTFPs found in this region. Rattan as a prime NTFP is one of the non-timber forest products which has a high market value [1]. Indonesia is claimed to be the largest rattan producing country in the world. It is estimated that 85 percent of raw material of rattan throughout the world are produced by Indonesia and the rest are produced by other countries such as the Philippines, Vietnam and other Asian countries [2]. Since the last 30 years, Indonesia is estimated to be
a supplier of 70-85% of the world's rattan raw materials. As one of the largest rattan producing country in the world, as many as 10 of 13 rattan genera in the world are found in Indonesia, which reaching around 350 species [3]. The best quality of rattan in the world is produced from Indonesia's forests, due to its excellent durability and flexibility. Rattan which has the number one quality in the world is Manau Rattan (*Calamus Manan* Miq.) which is produced from West Sumatra [4].

Currently government policy does not allow the export of raw rattan [5]. Information about the potential of diversity and utilization of rattan products will provide insight into processing rattan products into finished goods. Seeing the existing export opportunities, the cultivation, maintenance and processing of rattan needs attention from all parties. The purpose of this study was to determine the potency of rattan as a prime non-timber forest products and their utilization in Paru Village Forest, Sijunjung Regency, West Sumatra Province.

### 2. Materials and Methods

#### 2.1. Time and Location

The study was conducted in Paru Village Forest area in May 2017. Administratively, the Paru Village Forest area is located in Jorong Bukik Buar, Batu Ranjau, and Kampung Tarandam, Paru Village, Sijunjung District, Sijunjung Regency, West Sumatra Province. The Paru Village Forest area is bordered by Durian Gadang Village in the north, Aie Angek Village in the west, Paru Village in the east, and Solok Ambah Village in the south. Geographically, the Paru Village Forest area is located between 101°50'0" - 101°51'3" E longitude and 0°35'10" - 0°40'13" S latitude. Based on the distribution of watershed areas, the Paru Village Forest area is located in the Batang Binuang sub-watershed, Indragiri watershed [6]. The area of the Paru Village Forest is around 4,430 ha.

The Paru Village Forest is a protected forest that was initially in the form of *Rimbo Larangan* (Prohibited Forest) which has been determined through Village Regulation Number 1/2002 concerning Protected Forest or *Rimbo Larangan* [6,7]. The forest area has been recognized by the state based on the Decree of Minister of Forestry Number SK. 507/Menhut-II/2014 dated June 4, 2014 concerning the Establishment of a Working Area of Paru Village Forest covering an area of 4,500 ha. The village forest management permit has been followed up with the issuance of the Paru Village Forest Management Right based on the Decree of the Governor of West Sumatra Number 522.4-501-2015 in June 2015 with an area of around 4,500 ha [6]. In general, the topography in the Paru Village Forest area is hilly with 4 (four) mountains, 1 (one) mountain range, and 6 (six) hills.

Based on the image of the Shuttle Radar Topographic Mission-Digital Elevation Model (SRTM-DEM), information is obtained that the Paru Village Forest area has an elevation ranging from 152-874 meters above sea level (masl) as presented in Figure 3. Thus, forests in the region of Paru Village forest is classified into lowland forest (elevation <1000 masl). In general, the Paru Village Forest area is situated at an altitude of 200-700 masl (94% of the total area). Regions with an elevation of less than 200 masl and above 700 masl are only around 6%.

#### 2.2. Materials

Materials used in this study were blank tally sheets. Tools used were Global Positioning System (GPS) receiver, Suunto Clinometer, measuring tape 50 m, rope, and stationery.

#### 2.3. Methods

The establishment of observation/measuring plots in the field was determined randomly with a distance between the plots of at least 100 m. The shape of the observation plot used was a circle because it is easier to make, thus saving time for making plots. The area of the observation plot was 1,000 m² or 0.1 ha with a plot radius of 17.85 m and adjusted based on the slope of the land using the slope correction table made by FAO [8]. Measuring the radius of the plot was conducted using a 50 m measuring tape and rope. In each observation plot, the plot's center coordinates were recorded using GPS and location errors were made less than 5 m. Each plot was divided into four quadrants using a rope with axes.
pointing north-south and east-west. The total number of observation plots made in the Paru Village Forest area was 98 plots. Plot distribution map in the Paru Village Forest area is presented in Figure 1.

![Plot distribution map in the Paru Village Forest area](image)

Figure 1. Plot distribution map in the Paru Village Forest area

Observation of the diversity of rattan in each plot was conducted by recording the local names of the types of rattan, their benefits and uses, number of individuals, and their useful parts. Information about useful plant parts was obtained from community members involved in the field survey team. Identification of the type of rattan in each of these plots was carried out starting from the center of the plot outwards and moving from the northern quadrant clockwise. The plot’s elevation was obtained from reading the GPS receiver, while the slope was obtained using the Suunto clinometer.

2.4. Data Analysis

Descriptive Analysis. Data from observations of rattan types in each plot consisted of local names of rattan types, benefits, number of individuals, and useful parts. The data were analyzed descriptively to provide an overview of information about the type of rattan, the benefits provided, and the amount in the Paru Village Forest area.

3. Results and Discussion

3.1. The amount of rattan species based on its benefits in Paru Village Forest

Paru Village Forest area has a high diversity of rattan species. On the observation track, there can be identified 17 types of rattan (Table 1). Rattan is the most common type of NTFP found on the observation track. Among the 17 types of rattan, the most commonly found are sikai rattan, ants rattan, shrimp rattan, rocks rattan, jernang rattan (dragon’s blood), manau rattan and single rattan. The potential of these rattans can contribute significantly to the community, in the future, this potential should be managed better, so that its production increases and its sustainability is maintained.
These rattan species are NTFP producers that can be found in almost entirely Paru Village Forest areas, Sijunjung Regency, West Sumatra. The existing rattan species are different from those found in protected forest areas in Dampelas Sojol District, Donggala Regency, Central Sulawesi. Research results indicate that main kind variety of rattan in Dampelas Sojol Sub district, Donggala Regency, were dominated by worm rattan (Calamus melanoloma Mart), lambang (Calamus ornatus), tohiti (Calamus inops), stem (Calamus zollingeri Becc) and noko (Calamus koordersian Becc) [9].

Paru Village Forest Area is one of the protected forest areas which still has the relatively well-maintained conditions. Human intervention into the forest area is still limited by the existence of customary rules which its application is still respected. That’s why Paru Village Forest area still contain high biodiversity, both flora and fauna. The number of tree species that can be identified in the measured plot is 203 species with the dominant species are medang (Cinnamomum spp.) which is around 30% of the total trees measured. As a well-maintained protected forest, the Paru Village Forest area still has large diameter trees.

Paru Village community utilizes various rattan species from protected forest or ‘rimbo larangan’ (prohibited forest) from generation to generation. Table 1 shows the various use of rattan species in Paru Village Forest, among others, as medicine (jernang rattan and nails rattan), handicrafts (all rattan species), dye/coloring (jernang rattan) and sap / resin (jernang rattan). Some of the harvested rattan is used to fulfill subsistence needs of community and some of them are sold to increase household income. Paru Village Forest is a well managed protected forest supported by local wisdom and strong traditional regulations that have a high diversity of rattans.

The community around Paru Village Forest area is legally permitted to utilize NTFPs in the forest area. There are around 98 species of NTFP producers that have been successfully identified in the measurement plot, which can be utilized by the community as producers of food, medicine, handicrafts, dye/coloring, resin / building materials, and the others (e.g. as ornamental plants or traditional rituals). Jernang rattan is a species of NTFP producer that has a high selling value so that it is feasible to be developed by the community.

3.2. Utilization of Dragon’s Blood (Daemonorops draco Bl.) as priority NTFP
Jernang rattan has the highest amount of utilization used as medicine, handicrafts, dye/ coloring agents and resin / resin. Not only in Indonesia, but also in China, dragon's blood is one of important traditional medicine which was used as early as A.D. 400. In one of research, the results showed that resin contain of Cambodian Dragon's Blood has Similar chemical constituent and clinical curative effect as African Dragon's Blood. It is different from Indonesian Dragon's Blood in chemical constituent, but it has alike and on an equality with similar clinical effect as Indonesian Dragon's Blood [10].

As a medicinal plant, ethanol extract A fraction from Dragon's Blood contained pharmacologically effective compounds with antithrombotic effects, partially improving platelet function and anticoagulation activity [11] and as anti-inflammatory drugs [12].

Dragon’s blood is also used in South American, popular medicine for several purposes, including wound healing and as an inhibitor of cell proliferation [13]. This species is one of 11 selected taxa of rattan in the ASEAN countries with special emphasis on specialty use for food and condiments, ornamentals and dyes [15]. Sap of Dragon’s Blood is also used as wound medicine, toothache medicine, medicine after childbirth, and paint coloring. Cultivation efforts are generally carried out by applying intercropping patterns with rubber trees [15].
| No. | Plant’s Name                  | Scientific Name | Habitus | Utility | Utilized Plant’s Part | Individual Number | Utility Notes |
|-----|------------------------------|-----------------|---------|---------|-----------------------|--------------------|---------------|
| 1   | Rotan lain                   | Calamus spp.    | Palem   | 3       | stem                  | 44                 |               |
| 2   | Rotan air                    | Calamus sp.     | Palem   | 3       | stem                  | 12                 |               |
| 3   | Rotan batu                   | Calamus sp.     | Palem   | 3       | stem                  | 78                 |               |
| 4   | Rotan buaw                   | Calamus sp.     | Palem   | 3       | stem                  | 2                  |               |
| 5   | Rotan cincin                 | Daemonorops sp. | Palem   | 3       | stem                  | 36                 |               |
| 6   | Rotan jernung                | Daemonorops sp. | Palem   | 2,3,4,5| stem                  | 60                 |               |
| 7   | Rotan kubin                  | Daemonorops sp. | Palem   | 2       | stem                  | 8                  |               |
| 8   | Rotan lipe                   | Daemonorops sp. | Palem   | 2       | stem                  | 2                  |               |
| 9   | Rotan manau                  | Daemonorops sp. | Palem   | 3       | stem                  | 42                 |               |
| 10  | Rotan manau                  | Daemonorops sp. | Palem   | 3       | stem                  | 2                  |               |
| 11  | Rotan pande/palade           | Calamus sp.     | Palem   | 3       | stem                  | 18                 |               |
| 12  | Rotan paku                   | Calamus sp.     | Palem   | 2,3     | stem                  | 119                |               |
| 13  | Rotan semut                  | Calamus sp.     | Palem   | 3       | stem                  | 3                  |               |
| 14  | Rotan sikai                  | Calamus sp.     | Palem   | 3       | stem                  | 149                |               |
| 15  | Rotan tikolo                 | Calamus sp.     | Palem   | 3       | stem                  | 4                  |               |
| 16  | Rotan tunggal                | Calamus sp.     | Palem   | 3       | stem                  | 38                 |               |
| 17  | Rotan udang                  | Calamus sp.     | Palem   | 3       | stem/strand, leaf     | 114                |               |

Utility notes: 1. Food, 2. Medicine, 3. Handicraft, 4. Dye, 5. resin/sap, 6. Building material, 7. Custom ritual, and 8. Others.
Figure 2. Map of plot distribution of Dragon’s Blood in Paru Village Forest area

Jernang rattan is distributed evenly in Paru Village Forest area, which is around Bt. Rimbanan, Bt. Gadang, Bt. Sarik, Mountain Payung and Mountain Marapak. Based on information from the community involved in the survey activities, the price of jernang rattan per kilogram (kg) can reach Rp. 400,000. This price is much higher than other NTFPs. Almost all types of rattan are found in more than 16 measured plots. However, the average production of jernang rattan per stem is still relatively low, which is only around 3 kg. Efforts to increase fruit productivity per individu or increase the number of jernang rattan plants need to be done considering the high selling price of jernang rattan fruit.

Although the market price of jernang is higher than the price of other rattan species, based on the results of data collection and information from respondents, it is known that almost all NTFP commodities harvested from the forest are sold in raw material conditions and no processing activities have been carried out on them. Jernang rattan is sold at Rp. 40,000 per kg while Manau rattan and other rattan species are sold in the range of Rp. 5,000 - Rp. 15,000.

4. Conclusions
Paru Village Forest Area has a high diversity of rattan species. Rattan is the dominant type of NTFPs found on the observation pathway, which is identified by 17 species. Among the 17 species, jernang rattan is a type of prime NTFP producer that has the highest priority for its utilization by the community.

Paru Village community utilizes various rattan species from protected forests of Paru. The use of rattan species in Paru Village Forest includes medicine (jernang rattan/dragon’s blood and nails rattan), handicrafts (all rattan species), dye/coloring (jernang rattan/ dragon’s blood) and sap/resin (dragon’s blood). It is necessary to increase the capacity of the community in processing non-timber forest products from raw materials to finished goods.

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