The Utilization of Sugar Palm (*Arenga pinnata*) by The People Around Batang Gadis Nasional Park Area

I Azhar\(^1\)*, I Risnasari\(^1\), Muhdi\(^1\), M F Srena\(^1\), Riswan\(^2\)

\(^1\)Faculty of Forestry, University Sumatera Utara, Medan, Indonesia

\(^2\)Higher Education Service Agency, Region I Sumatera

*Email: irfari@yahoo.co.id

**Abstract.** Sugar palm (*Arenga pinnata*) is a non-timber forest species that has long been known as multi benefits plant. Almost all physical and production parts of this plant can be used and have economic value. Juice sap, palm fruit, leaves, palm fiber, and stems is harvested and collected for both commercial and household use yielding some products. This study has objective to identify the potential and utilization of sugar palm (*Arenga pinnata*) in Pastap Julu village around the Batang Gadis National Park area. The utilization of sugar palm (*Arenga pinnata*) is studied by applying a method of collecting data with questionnaires and interviews to the community. The results of this study indicate that the most popular parts of sugar palm (*Arenga pinnata*) harvested by community in Pastu Julu village is male flower section or locally called *nira*, a traditional sweet cold drink, and is also then processed into palm sugar. Another part collected are female flower section which converted into fruit sweets, leaves for bird cages, and palm stem which is utilized as a fiber brooms.

1. Introduction

Forests have important functions, roles and benefits for human life. One of benefits is by producing various types of forest products that can be utilized in various purposes. Forest products can be harvested as a timber forest products and non-timber forest products. So far, utilization of forest products is still focused on wood products. However, non-timber forest products also have enormous potential to be developed.

Non-Timber Forest Products (NTFP) are both vegetable and animal products along with its derivatives except wood. Kinds of NTFP consist of nine groups and 553 trees and animal species [1]. Some kinds of non-timber forest products are trees, such as rattan, bamboo, agarwood, and other such as sugar palm which is potential to be developed and utilized for further alternative livelihood.

Sugar palm are a kind of plant that has potential to be cultivated. It is also a versatile plant that has long been known to produce many benefits. Almost all physical and production parts can be utilized and have commercial value. The usefulness of sugar palm can be benefited directly by the community around the forest through traditional use. Sugar palm can be used as a producer of sap, a source of carbohydrates, a mixture of food and beverage ingredients (fruit sweets), building materials and as a conservation plant for critical land [2].

Batang Gadis National Park (TNBG) is one of the conservation areas in Mandailing Natal District with high biodiversity. The name of Batang Gadis National Park comes from the name of the main river stretch in Mandailing Natal district, namely Batang Gadis river. Batang Gadis National Park
consists of protected forest areas, limited production forests, and production forests. Batang Gadis National Park is classified as a type of tropical forest located at an altitude of 300 - 2145 meters above sea level with the highest point on the Sorik Marapi Peak. The villagers who live around and live in the National Park have farming activities and collect forest products around or inside the National Park [3].

Along with the increasing needs of community, the use of sugar palm began to be one of community’s focus in developing non-timber forest products. However, the development of sugar palm still has many obstacles and several problems such as, its traditional use, the post-harvest handling of sugar palm trees that are still not well controlled, the processing method used is still low capacity, poor quality of products, and market access. The utilization of sugar palm in the TNBG area will be optimum when the local community capacity knowledge can be developed in harvesting and processing sugar palm. This issue is also become a background of the study to find the existing method used by the community in utilization of sugar palm.

The objective of study is to identify the potential and utilization of sugar palm (Arenga pinnata) in Pastap Julu village around the Batang Gadis National Park area, Mandailing Natal district. This study is expected to provide information especially on the utilization of palm sugar (Arenga pinnata) by community in Pastap Julu Village which located in the Batang Gadis National Park (TNBG), Mandailing Natal District, North Sumatra. The results provide in this study could be important information for stakeholders to improve the economic and social well-being of the communities around the TNBG area while maintaining the sustainability of forest ecosystem.

2. Methods
This research was carried out in the forest around the Batang Gadis National Park in Pastap Julu Village, Tambangan sub district, Mandailing Natal district, North Sumatra Province. Data collection is made by means of interviews based on questions on the prepared questionnaire. Data obtained from interviews and questionnaires with respondents were analyzed descriptively and tabulated. Data collected consists of primary data and secondary data. Primary data was collected through interviews with respondents based on prepared questionnaires, and direct observation in the field to collect sugar palm plant samples that were utilized by the community.

Primary data is the result of observations and interviews with respondents in the field which includes kinds of non-timber forest products, especially kinds of sugar palm. Also to see the purpose of taking, the part used, the method of processing, the location of collection, the number and frequency of extraction from the forest by the people in Pastap Julu Village and the socio-cultural information of the community in the area. Primary data collected includes: (1) Information on the use of sugar palm, this information concerns on the utilization of part of sugar palm trees by the community live in Pastap Julu Village, Tambangan sub District, Mandailing Natal district, (2) Socio-culture information, Data collected includes respondents identities, include name, age, gender, livelihood source, social structure, and education.

Secondary data collected includes the general state of the area covers location, boundary, and area, climate, topography, and flora and fauna. The socio-economic situation which includes government, population, facilities and infrastructure, as well as location maps obtained from the district offices and related agencies.

2.1. Techniques and Data Collection Stages
Data retrieval is carried out directly in the field as follows:

a. Observe and analyze on sugar palm (Arenga pinnata) harvesting and collecting to obtain information in potential utilization.

b. Interviews and discussions using questionnaires to the stake holder which represent community

2.2. Determination of respondents
Determination of respondents is divided into two parts: general respondents and key respondents.

a. The general respondents in this study were the people who lived in the Pastap Julu Village, Tambangan sub District, Mandailing Natal District, who knew and directly used of sugar palm trees.

b. Key respondents were village heads, religious leaders and other community leaders. The number of sample respondents was 12 heads of families with a total of 120 families who were local residents in the village of Pastap Julu. This is in accordance with [4] statement which states that if the number of respondents is more than 100 heads of families, then 10% -15% of the total number of heads of households is taken.

3. Result and discussion

3.1. Utilization of Sugar Palm

Most of sugar palm trees parts can be used for various purposes. [2] states that sugar palm used as a producer of sap, renewable energy sources, carbohydrate sources, mixtures of food and beverages (fruits sweet), building materials (stems) and as conservation trees for soil protection of critical land. Local farmers collect sap of sugar palm by tapping the sugar palm flower. Results of interviews shows that activity of tapping palm sap is only carried out by men as listed in Table 1. The reason is tapping activity requires expertise and courage, such as the skill to climb palm trees using sigai or stairs made from bamboo and the courage to hang on high palm trees. As for another uses, such as making fruit sweets, palm fiber brooms and stick brooms, it is generally carried out by both men and women.

It is found that parts of sugar palm are collected are leaves, fibers, male flowers and female flowers, as well as stems while male flower is the most parts to be harvested and processed as sugar palm juice as traditional sweet drink. Table 1 above shows male flower is the most popular parts harvested by farmers in Pastap Julu Village. Female flower is taken from young sugar palm trees and used to produce fruit sweets. Sugar palm has quite high economic value since most of all parts of trees could be utilized and processed for commercial use as displayed on Figure 1. In additional to commercial use, farmers also using product from sugar palm for household purposes. Kinds of commercial product such as palm sugar, fruit sweets (kolang-kaling), and bird cages.

Table 1. Kinds of Sugar palm product utilized by the local community

| No. | Name                      | Male Flower | Female Flower | Leaf | Fibers | Stem |
|-----|---------------------------|-------------|---------------|------|--------|------|
| 1   | Ali Musa Manto Lubis      | √           | √             |      |        |      |
| 2   | Awaluddin Lubis           | √           |               | √    |        |      |
| 3   | Ardan Lubis               | √           | √             |      |        |      |
| 4   | Saminan Nasution          | √           | √             | √    |        |      |
| 5   | Eji Milwan Nasution       | √           |               |      |        |      |
| 6   | Indra Ernanda Nasution    | √           | √             |      |        |      |
| 7   | Pardamean                | √           | √             |      |        |      |
| 8   | Mat Darus Lubis           | √           | √             |      |        |      |
| 9   | Zulfikar Nasution         | √           | √             |      |        |      |
| 10  | Sapri Rangkuti            | √           | √             |      |        |      |
| 11  | Mahmuddin Pulungan        | √           |               |      |        |      |
| 12  | Sajar                     | √           | √             |      |        |      |
3.1.1. Use of male flowers

Sugar palm farmers in Pastap Julu village use palm trees to increase their income. Sugar palm trees grow naturally in the area. Palm sugar sap is a common product collected by farmers and then processed through traditional way into palm sugar juice for drinks. Some farmers cook the sap directly in the yard, and some others bring the sap to the house for further processing into sugar. Based on the interview results, a routine and step by step processing is required in making of palm sugar. To harvest sap, male flower which is ready to be tapped usually be perched on a bee due to the presence of nectar or honey in the flowers. In addition, other characteristics is found at the flower comes to shiny or local people call it as oily flowers, as can be seen in Figure 2.
Flower should be tapped are male flower bunches, according to [5], male flower bunches which are tapped with productive bunches are only 4-6 bunches with a period of 2-3 months. The leaves also affect the amount of productivity of sap. Green and fresh leaves are still involved in photosynthesis and affect the amount of sap produced. The number of productive leaves is highly correlated with the results of tapping sap obtained. Process of making palm sugar begins with harvesting the sap juice by tapping on the male flower's cob. Good sap juice will effect to palm sugar quality. Tapping process begins with cleaning the male flower bunches in order to obtain free impurities sap juice that will increase the acidity. The next step is beating and swinging bunches to drop flowers. The strength of the punch must be controlled so that the bunch does not get bruised. The beating was carried out twice a day and 1 time a week at the morning and evening for ± 1 month using a hammer-type tool or locally often called gual-gual. Next is cutting the flower bunches and holding them in bamboo containers which are also often called taguk, as shown in Figure 3.

![Figure 3. Gual-gual (Left), taguk (Right)](image)

Volume of sap juice obtained in one period is low at the beginning, and will increase until middle of tapping period, and decreasing at the end of period. One flower bunch can produce 3-5 liters of water per day in two leads depending on the level of fertility of sugar palm trees. The harvested sap must be cooked immediately due to acidic content. The sap is filtered first to separating impurities that comes during the tapping, then cook and stir in a pan for ± 4-5 hours or until the juice is clotted. The process of cooking into palm sugar can be seen in Figure 4. The froth that appears on the surface of the boiling juice is then discarded to obtain dark colored palm sugar. After the sap boils and thickens then lifted from the fireplace and cooled for ± 10 minutes. Then printed in rattan molds and packaged by wrapping the sugar with palm sugar leaves and deliver to collectors / buyers.

![Figure 4. Process of sap cooking into palm sugar (Left), cooling stage of formed palm sugar (Right)](image)
Several respondents stated that the use of the largest sugar palm trees in the Pastap Julu village is by processing sap juice into palm sugar for added value market. The average palm sugar produced by the community which is 20-25 kg / week and sold at a price of Rp. 17,000 per kg. Palm sugar trading is one of livelihood source in the village. Packaged palm sugar and ready for sale to the collectors can be seen in Figure 5.

![Figure 5. Palm Sugar](image)

3.1.2. Use of female flowers
Female flowers from palm sugar trees are flowers that will bloom and transformed to be fruit or often referred to as local terminology called kolang-kaling. Female flowers can be identified by the characteristic of greenish-white fruit and smaller than male flowers, as shown in Figure 6.

![Figure 6. Female flowers of sugar palm](image)

The fruits -kolang kaling- can be taken from the core of half-ripened palm fruit seeds. Each palm fruit contains three fruit seeds. According to [6], the half-ripened palm fruit is marked by the thin seed coat, soft and yellow, the core of seed is white, rather clear and flabby. Processing palm sugar seeds into sweets is carried out only in certain times according to market demand, especially in the fasting month of Ramadan and Ied celebration. Processing of fruit sweets begins with selecting a good palm fruit, which is a half-ripened palm fruit which is characterized by a fresh green fruit skin color, then releasing fruits off the bunch. Stage of making fruit sweets can be drawn as follows:

- Palm fruit burning in order to release the outer skin of seeds and mucus that may cause itching. Scorched seeds then cleaned with water to get clean seed core.
- Palm fruit boiling in the cauldron for 1-2 hours and followed by cooling process. To produce a good chips, clean and chewy sweets, core seeds are deposited in lime water for the next 2-3 days.
3.1.3. Use of Leaves
Another part of the palm sugar trees widely used by the community is leaves. Leaf bones from sugar palm trees are widely used for daily needs, such as for making broom sticks and use for household purpose. The villagers also use palm leaves to wrap palm sugar before delivered to collectors. However, leaves part also can be utilized for commercial purposes, such as palm sugar bones are often used in making bird cages combined with bamboo, as can be seen in Figure 8. The bird cage is sold at the market for Rp. 60,000, which can add another income of community in the village.

3.1.4. Use of Fibers and Stem
Palm sugar is a plant that can be used in almost all parts, including fibers. Palm sugar can produce palm fiber after more than 5 years of age or before the flower cobs grow. The number of fibers in sugar palm varies depending on the size of the tree and its age. Good production of palm fiber comes from sugar palm which is not too young and also not too old. Young trees have lower fiber quality and fewer, while the flowered sugar palm has low production of the fibers as well. The palm fiber is taken by directly picking up the fibers surrounding the stem, and for the fibers which are quite high, it is necessary to climb the tree using bamboo ladder. The taking of palm fiber is also useful for cleaning the sugar palm stem, making it easier to tap or harvest sap juice. The palm fiber is also used by the community in Pastap Julu village as for building material such as roofs and only use for domestic purposes only. Roofs made of palm fiber shown in Figure 9. Stem of sugar palm tree is also used for firewood and as an additional construction material in the village and usually not for commercial use.
3.1.5. Utilization for Conservation Purpose

Sugar palm is easy to grow with does not require special soil conditions. Sugar palm can grow on porosity soil that can pass water easy such as loose soil, volcanic soil on the mountain slopes, and sandy soil around the banks of the river is an ideal land for the growth of sugar palm. In contrary, sugar palm does not hold on to the soil with too high acid levels. According to [7] the best ambient temperature for sugar palm is an average of 25°C with an annual rainfall of 1,200 mm. Sugar palm (Arenga pinnata) can be used as a conservation plant for damaged land or critical land even in steep area. According to [8] sugar palm can prevent erosion to improve soil macro conditions and porosity.

4. Conclusion

Sugar palm trees have many benefits. The part of the most and popular used by the people in Pastap Julu village around the Batang Gadis National Park area is male flowers which are processed into palm sugar for commercial use. Another parts of sugar palm commonly utilized is female flowers, leaves, and sugar palm stems which are then processed into products in the form of fruit sweets, bird cages, palm fiber brooms that possible to increase income of the villagers.

5. Suggestion

Better quality improvement of sugar palm products (Arenga pinnata) that are carried out by the community need to be developed covered processing stage and packaging as well to create added value and may increase sales of palm products.

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