Utilization of sugar palm (*Arenga pinnata* Merr) by the communities around the PT Toba Pulp Lestari

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Abstract. Sugar Palm plants are multifunctional plants, with all parts of the plant that can be used for human survival. The palm tree is one of the balancing plants for the ecosystem and rural ecology. The purpose of this study was to determine the utilization of sugar palm (*Arenga pinnata*) plants and production process of sugar palm carried out by the community live around the area of PT. Toba Pulp Lestari. Observation and data collection were made with interview and questionnaires to the respondents. The results revealed that the most common use the utilization of sugar palm (*Arenga pinnata*) by the community around the PT Toba Pulp Lestari area was to produce palm wine, so-called *tuak*, through tapping techniques and traditional fermentation process. Another use that is seek by the community is to harvesting fruit and palm fibre which provide additional income for them. The utilization of palm sugar has the potential to provide economic added value to the community accompanied by proper cultivation and appropriate processing of yields due to high demand of sugar palm derivative products.

1. Introduction
Non-Timber Forest Products (NTFPs) is a type of plant that grows, both inside and outside the forest area. NTFPs have a very strategic value. NTFPs are one of the forest resources that have cooperative advantages and are in direct contact with communities around the forest. One of the roles of NTFPs has been felt by the community as a source of income, but the management system is still traditional so that the quality produced is still far from the expected standard and the price is still low [1].

Utilization of Non-Timber Forest Products can help the community get a more diverse source of livelihood without destroying the forest. Shorter NTFPs play a very large role in maintaining the existence of forests because farmers still have a source of income from forest land. In addition, it can also provide knowledge to local communities that forest utilization is not only from the wood, but also by means of utilization of fruits such as durian, mango, avocado, and other forest products such as rubber, sugar palm or rattan and so on [2].

One of the plants used as food is sugar palm (*Arenga pinnata*). Sugar palm plants are multifunctional plants, with all parts of the plant that can be used for human survival. The palm tree is one of the balancing plants for the ecosystem and rural ecology. The function of palm trees in an ecological manner is to protect natural resources, especially soil. The roots of the palm tree fibers are
very sturdy, deep, and scattered so that they have an important function to resist soil erosion. The use of palm plants is not only for the leaves, fruit and stems, but palm plants can also produce sap which has high economic value [3].

There are five products that the community can develop from sugar palm which has a selling value, namely, 1) tapped male flowers will produce sap for brown sugar (palm sugar); 2) young fruit, namely kolang-kaling; 3) fibers for rope, house roofs and water absorption filters in buildings; 4) palm stem (the outer part) is hardwood which is weather resistant which is used as additional income for the entrepreneur himself; 5) Sugar palm also produces flour from the pith of the stem before flowering plants [4].

Sugar palm has a high enough potential to be developed so that it allows the community living around the protected area of PT Toba Pulp Lestari to use it as a source of their daily livelihoods. However, it is quite a lot of farmers whose lives are less prosperous. Therefore, researchers want to find out how the community utilize the sugar palm and manage the product to generate income. This information will be useful to find the possibility of better management of sugar palm than businesses as usual. This study aims to determine the utilization of sugar palm (Arenga pinnata) by community who lived around the concession of PT. Toba Pulp Lestari and have access to harvest non-timber product in its protected forest.

2. Materials and methods

2.1. Study area
This research was carried out in May 2019. The research was conducted in the concession of PT. Toba Pulp Lestari in the Aek Nauli sector, North Sumatra Province.

2.2. Research tools and materials
In the research, the tools used were stationery and digital cameras. The materials used were questionnaires to collect primary and secondary data, previous research reports and various supporting literature.

2.3. Data collection and analysis
The primary data was collected through interview and discussion using questionnaire distributed to the respondent. The questionnaire mainly is directed to obtain kind of utilization and processing of sugar palm products. The secondary data covering the general condition of the research area, data obtained from reliable sources or related institutions and other supporting studies data collected from the questionnaire were analysed descriptively and tabulated.

3. Results and discussions

3.1. Utilization of sugar palm
Sugar palm is one type of palm with a variety of uses, because all parts of the tree can be utilized. Palm juice is the most important part of palm products. Another important product that can be provided are fruit, leaves, and stems. Sugar palm sap can be used for brown sugar, drinks and bio-ethanol, while leaves and stems are used for roofs, brooms, matting, and baskets [5]. The common of sugar palm utilization carried out by local communities in the study location is harvesting sap by tapping the male flowers of the palm tree. In addition, community also took palm fruit, palm fibre, leave and palm stems.

The utilization of palm sugar has the potential to provide economic added value to the community along with further good management in cultivation and processing with the support of appropriate technology, capital and wider access. The development of sugar palm cultivation as a source of income and welfare of rural communities has good prospects and an alternative greening commodity [6]. In the study area, community is stimulated to produce palm juice and its derivative, namely tuak, a
local alcoholic drink, due to high market demand. This beverage production activity has an effect on additional community income, and even more with fruit harvesting. In fact, there are still many more opportunities that can be improved for better and more diverse products. Since the sugar palm plants are in the protected forest, the community indirectly protects and maintains the forest. The community viewed sugar palm as an alternative commodity that provided both of economic and conservation value.

3.2. Palm juice sap (nira)
The most important products from the sugar palm is palm juice harvested from flower sap. Fresh palm sap, known as palm juice or nira, can be drunk in its natural syrup, sweet and transparent beverage [7]. Nira is produced from tapping the bunch of male flowers. However, female flower can also be tapped, but often the harvested palm juice is not good quality even less of quantity. Male flowers are elliptical shaped like a bright purple bullet when young, and blackish purple after adulthood. After the adult male flower is broken naturally there are many stamens filled with pollen. If a lot of pollen has fallen on the ground around the trunk of the palm tree, the soil surface will turn yellow. This can be a clue that it's time for male flowers to be tapped [8].

Palm juice can also be further be processed into palm sugar or brown sugar. Palm sugar which is one of the regional specialties consumed by Asians is used for making cakes, desserts, food coating, or mixed with drinks, brown sugar is gained by heating palm juice [9]. Community around PT Toba Pulp Lestari did not process/utilize palm sugar into brown sugar due to high local demand of local palm wine called tuak as traditional alcoholic drinks. In the process of tapping, in the first stage will get white liquid sap that tends to be very sweet and does not contain alcohol. This sweet sap or can be drunk directly as a juice or locally called nira. Nira is usually sell in Indonesia as a legend traditional drink served cold.

Stages of making palm wine (tuak) from palm juice sap:
1. Preparation of tapping
   The tapping process was preceded by swung the flower bunches slowly using a rope 50 to 100 times, and beating of flower stalk using a balbal, a kind of wooden hammer (see Figure 1). This is a common practice when harvesting sap to obtain a grime-free sap, and it is believed that bunches will produce a lot of sap with such treatment. Tapping process was begun with the cutting of male flowers using a machete, and first tapping using a knife. Since the sugar palm tree growth is towering, collectors usually use a single ladder made of bamboo. The cut and tapped flower stalk were given a cover that can be made of palm fibers, plastic sheet or cloth, and then left for 10-24 hours to be harvested on the next day.

2. Harvesting palm juice
   Normally the collectors harvested palm juice twice a day in the morning and afternoon as also suggested by [10]. When the tapping is carried out in the morning, the palm juice can be taken in the afternoon, and at the same time re-tapping was done. Then it can be harvested again in the next morning, and so on with the same cycle. The tapping of palm juice is shown in Figure 1.

![Figure 1. Balbal (a), tapping activity (b).](image-url)
3. Palm wine processing

Process was begun with the provision of containers or cask which were then filled with stem bark called *raru*, an endemic wood. *Raru* is a designation for the types of bark added to palm sugar palm juice which aims to improve the taste and alcohol content and preserve traditional *tuak* drinks. In various information, it is mentioned that there are several types of wood that are classified as *raru* wood, including *Dipterocarpaceae* and *Guttifera* family [11]. *Raru* bark can be seen in Figure 2. Actually, the fermentation process has begun since the tapping is done with an interval of 10-24 hours. The local palm wine producer stored *nira* in the containers that have been given *raru* for 2-3 days to produce good quality wine. This is in accordance with the statement [12], namely the processing of *nira* by sugar palm farmers is natural fermentation by storing *nira* in a container for 1-2 days.

![Figure 2. Raru bark.](image)

3.3. Palm fruit (kolang-kaling)
Sugar palm (*Arenga pinnata*) fruit also known in local terminology as *kolang-kaling*, *kabong* or *kolak* [13]. Sugar palm endosperm in the form of protein albumin is soft and white like glass when still young. The essence of these seeds is called *kolang-kaling* and is commonly used as food. *Kolang-kaling* is widely used as a mixture of various types of food and drinks, among others in making compote, round, ice jumbo, mixed ice, cake, canned drinks, sweets and others [2].

Palm sugar seeds commonly called *kolang-kaling* have been processed and used for various food and beverage materials that are widely circulating in the community. Sugar palm fruit has an oval shape, spiky and clear or white colour [14]. The texture of the fruit is chewy, oval shape and has a high-water content makes this palm fruit loved by the community. *Kolang-kaling* is widely used as an additive in fruit ice (mixed ice). In its processing, it is usually added to food additives in the form of dye agents to make it look more attractive [15].

Community in the study area taken fruit palm from the half-ripe female flowers, and according to [16] that half-ripe palm fruit seeds are mostly taken for making *kolang-kaling* purpose. According to [17], the half-ripe palm fruit is marked by the thin seed coat, soft and yellow, core of seeds is white, quite clear and flabby. The number of fruits found in one sugar palm tree reaches 6 bunches. However, usually the palm fruit was not harvested entirely because it will affect or reduce the taste of juice of sap. The community around the PT. Toba Pulp Lestari area only harvested the palm fruit when the high demand season for *kolang-kaling* on special event such as Eid holiday. Sugar palm fruit was only utilized once a year to produce *kolang-kaling*. Stages of making *kolang-kaling*

1. Selection of quality fruit

The first stage was fruit selection, which is half-ripe fruit with bright green colour. This selection is very important in determining the quality of production, the seeds must not be too old or too young, this is in accordance with the statement [18] which states that young palm sugar will produce a very soft and mushy flesh, conversely too old seeds will produce a hard flesh. The selection of palm fruit that will be used *kolang-kaling* is presented in Figure 3.
2. Fruit boiling
The next step was continued with the boiling process which takes up 24 hours in kettle. Boiling intended to remove the mucus from the fruit, which is known to be very itchy and corrosive. In addition, the boiling process will ease fruit peeling. The process of fruit boiling is presented in Figure 4.

3. Fruit peeling
Fruit peeling was carried out by using a knife to take the seeds. Seeds from peeled fruit was gouged out with the spoon handle. The process of fruit peeling is shown in Figure 5.
4. Seeds flattening

_Kolang-kaling_ seeds that have been removed from the fruit are then flattened using a kind of suppressor tool or pestle. Flattened seeds were soaked using whiting and clean water for 1-2 hours, and kolang-kaling were created. The process of flattening and washing of _kolang-kaling_ is presented in Figure 6.

![Figure 6. Pestle (a), fruit washing (b).](image)

3.4. Palm fibre (Ijuk)

Sugar palm tree have a straight trunk and grow to height of 20 m to 30 m. The trunk of the sugar palm tree is covered by black fibre known as _ijuk_ [19]. Sugar palm fibre is a part of the leaves that cover the stem. Good palm fibre comes from plants that have not flowered, that is when the sugar palm plants are 4-5 years old. Fibres are the raw material for making brooms, brushes, ropes and traditional roofs. Palm fibre is taken by cutting the base of the leaf sheaths, then the fibres in the form of woven plates are taken from using a machete [20].

Sugar palm fibre are usually used as roofs, house brooms, palm brushes, and many palm sugar preparations that can be utilized. Villagers around PT. Toba Pulp Lestari did not utilize palm fibre for domestic needs, but is directly sold to retailers in raw materials. The number of palm fibre sales by retailers is fairly low, because there is no specific demand for palm fibre in large quantities. Palm fibre prices are very low but possible to increase the income of sugar palm farmers.

Palm fibers grows in layers at the top of palm trees. In taking natural black fibres, people usually first cut the base of the lower leaves, then fibres removed from the stem with the tip of a knife. Respondents informed that the palm fibers layer grew in a 4 month period. Ideally, harvesting palm fibers is carried out once a year, which is when there are still three layers. According to [16], the extraction of palm fibers also functions to clean the sugar palm stems and ease the process of tapping the sap.

4. Conclusions

The most common and widely utilization of sugar palm by the community around the concession of PT Toba Pulp Lestari in Aek Nauli sector is tapping the palm trees to produce a local traditional palm wine called _tuak_ due to high demand. The fermentation process of palm wine is done traditionally by adding _raru_ bark for 2-3 days. Another use that is seek by the community is to harvesting fruit and palm fibre which provide additional income.

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