Identification of the potential and palm sap characteristics for palm sugar business development in Lombo Village, Sidrap Regency

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Abstract. Sugar palm is a commodity that has a high value of benefits and has become one of the home industries that are mostly cultivated by rural communities in Indonesia. Likewise, the community in Lombo Village, Pituriase sub-district, Sidrap district also cultivates palm sugar as a source of income in addition to their main job as a farmer. The purpose of this study were to identify the potential and characteristics of sugar palm and palm sap to serve as the basis for developing the palm sugar business in Lombo Village. This research was conducted using a sampling method to identify the potential of palm trees and interview methods to identify production data and characteristics of palm sap. The results showed that the number of sugar palm trees in Lombo Village was 2,038 trees consisting of 118 trees being tapped, 585 trees ready to be tapped, and 1,335 trees still waiting for about 3-4 years to be tapped. The average sap production is 995 liters/day and produces 139.2 kg/day of sugar, so it can be seen that the content of brix of palm sap in Lombo Village is 14%. The selling price of sugar produced by the community is Rp. 25,000- per kg so that the sales received by the craftsmen in Lombo Village is Rp. 3,480,000 - per day or Rp. 108,750,-/craftsman/day.

1. Introduction
Indonesia is known as a country rich in natural resources, including various types of plants and trees that have high economic value. One type of plant is the sugar palm (*Arenga pinnata L.*) which is a plant where all parts of the stem and leaves can be used [1]. The sap is known as a raw material making palm sugar, palm vinegar [2] and bioethanol. The leaves for roofing materials and other crafts, the fibers are used as raw materials manufacture of brooms and treatment materials on the soil before the construction of buildings to prevent termite attacks [3]. The potential for sugar palm in Indonesia is based on The data is 60,482 ha, with palm sugar production reaching 20,376 tons/year. Specifically for the South Sulawesi region, information was obtained that the potential for sugar palm is 7,293 ha with a sugar production of 3,174...
The potential of the area is very potential to be developed into the palm sugar industry. According to Shakir and Effendi (2010) [5], sap production in each region is quite abundant, including in Sulawesi South of 7,293 ha with sap production of 31,740 tons/year, Southeast Sulawesi 3,070 ha with sap production of 14,220 tons/year.

In accordance with the Minister of Health Regulation No. 30 of 2013 concerning the inclusion of information on Sugar, Salt, and Fat Content and Health Messages on Processed Foods and Food Ready to serve, the recommended sugar consumption/person/day is 50 grams; thus, sugar consumption per person/year is 18,250 kg/person/year. Based on BPS data in 2020, the number of Indonesia's population is 270.20 million people, so the sugar needs of the Indonesian people is 4,931,150 tons/year. Meanwhile, based on data from the Indonesian Sugar Association [6], national sugar production of 2.2 million to 2.5 million tons, so there is a deficit of 2.5 - 2.8 million tons.

To support national food independence, especially in the field of sugar commodities, one of the solutions to overcome these problems that the government has taken is by importing sugar. However, there are other alternatives that can carry out to overcome the sugar production deficit, among others, is to maximize complementary sugar sources. One of the abundant complementary sugar sources in Indonesia Indonesia is sugar palm. In addition, based on the results of research, palm sugar is healthier and healthier nutritious compared to cane sugar because it contains plant-based compounds such as polyphenols [7,8]. Palm sugar is also reported to have an anti higher oxidant than cane sugar, where the antioxidant activity is equivalent to 1.7 mg of vitamin C per 1 g of palm sugar [9]. Based on these, characteristics and efficacy of palm sugar are believed to be an alternative sweetener and sugar that is more nutritious than cane sugar [10], and palm sugar does not undergo a purification process or use synthetic chemicals to whiten the color.

Sidenreng Rappang Regency is one of the regencies in Sulawesi Province. The south is relatively narrower than other areas—however, Regency. Sidrap has a fairly high economic potential with an area of 189,808.69 km². Administratively, Sidenreng Rappang Regency consists of 11 sub-districts, 106 Village/Village. It consists of 68 Kelurahan and only 38 Villages (RUPM Kab. Sidrap, 2018).

As an illustration, Pitu Riase District is one of the sub-districts in the Indonesia Regency. Sidrap. One of the villages in this area, Lombo Village, is mostly populated has been working on palm sugar for a long time, both molded sugar and palm sugar. In this village, There are 43 craftsmen spread across four hamlets in the district. Sidrap There is a total of 8 palm sugar-producing villages that urgently need assistance within developing their palm sugar business.

To develop the palm sugar industry, it is necessary to know the potential of raw materials to ensure the sustainability of production. In addition to potency, the characteristics of sap as Raw materials also need to be analyzed and ensured of good quality so that the resulting product also has good quality too, where the quality of the sap is still good for processed into palm sugar if it is in the pH range of 6-7.5 [11].

Based on the description above, it is necessary to do research on the identification of the potential and characteristics of sap for the development of the palm sugar business in Lombo Village, Kec. Pitu Riase Kab. Sidrap.

2. Methodology

2.1. Study site
This research was conducted from April to June 2021 in the locus of activities in Lombo Village, Pitu Riase District, Sidrap Regency.

2.2. Methodology
This study uses an inventory method by making a research plot to identify the potential of palm
trees in Lombo Village. This village was chosen because it has potential sugar palm which has long been used by the community to support the economy. Meanwhile, interview and observation methods were used to obtain data and information about the characteristics of sap as raw material for palm sugar and sugar production community in Lombo Village. The data were analyzed descriptively including the potential of palm trees that are ready to tap and still need it time to be ready to be tapped as well as the characteristics of the juice, the amount of production and the economic value obtained by the community.

3. Results and Discussion

3.1. The Potential of Palm Oil in Lombo Village

In Lombo Village there are four (4) hamlets where in each hamlet there are sugar craftsmen with the number of craftsmen in Hamlet 1 Lombo as many as 3 people, Hamlet 2 Awotara as many as 7 people, Hamlet 3 Talorong as many as 30 people and Hamlet 4 Panreng as many as 3 craftsmen palm sugar maker. Based on the inventory carried out, data on the potential for palm sugar and sugar production were obtained, namely: the number of palm trees as many as 2,038 trees consisting of: a. the number of trees being tapped is 118 trees, b. trees that are ready to be tapped are 585 trees, and c. which are still waiting about 3-4 years to be tapped amounted to 1,335 trees. The average sap production is 9,95 liters/day and produces 139.2 kg/day of sugar kg/day.

The results of the full potential identification are presented in the following table:

| No Responder | Amount Tree | sap production per day from total the tree that harvested when this (L) | Average production nira/tree(L) | Nira (L) | Production sugar per day of number the tree that harvested (Kg) | Sugar (Kg) |
|--------------|-------------|---------------------------------------------------------------------|---------------------------------|---------|---------------------------------------------------------------|------------|
| 1            | 62          | 30                                                                  | 15                              | 339,450 | 6                                                             | 67,890     |
| 2            | 71          | 3                                                                   | 3                               | 77,745  | 1                                                             | 12,958     |
| 3            | 131         | 50                                                                  | 13                              | 597,688 | 7                                                             | 83,676     |
| 4            | 29          | 64                                                                  | 16                              | 169,360 | 6                                                             | 15,878     |
| 5            | 59          | 25                                                                  | 6                               | 134,594 | 6                                                             | 32,303     |
| 6            | 19          | 14                                                                  | 14                              | 97,090  | 3                                                             | 17,338     |
| 7            | 174         | 14                                                                  | 7                               | 444,570 | 3                                                             | 79,388     |
| 8            | 84          | 11                                                                  | 11                              | 337,260 | 1                                                             | 30,660     |
| 9            | 19          | 15                                                                  | 8                               | 52,013  | 2                                                             | 5,201      |
| 10           | 73          | 8                                                                   | 3                               | 71,053  | 1                                                             | 6,217      |
| 11           | 75          | 45                                                                  | 8                               | 205,313 | 8                                                             | 34,219     |
| 12           | 14          | 63                                                                  | 9                               | 45,990  | 7                                                             | 5,110      |
| 13           | 19          | 30                                                                  | 6                               | 41,610  | 5                                                             | 6,935      |
| 14           | 6           | 13                                                                  | 13                              | 28,470  | 3                                                             | 5,475      |
| 15           | 173         | 35                                                                  | 12                              | 736,692 | 6                                                             | 126,290    |
| 16           | 55          | 30                                                                  | 8                               | 150,563 | 5                                                             | 25,094     |
| 17           | 140         | 30                                                                  | 3                               | 170,333 | 5                                                             | 28,389     |
| 18           | 37          | 15                                                                  | 8                               | 101,288 | 3                                                             | 16,881     |
| 19           | 4           | 15                                                                  | 5                               | 7,300   | 3                                                             | 1,217      |
The characteristics of the distribution of palm trees in Lombo Village are that they generally grow in the hills and group, although there are also those that grow on the sidelines of the residents' plantations and relatively close to people's homes.

The documentation of the palm tree inventory in Lombo Village is as shown in the following figure:

![Inventory of palm trees in Lombo Village, Kec. Pitu Riase Kab. Sidrap.](image1)

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 20 | 104 | 55 | 11 | 417,560 | 6 | 45,552 |
| 21 | 50  | 100| 13 | 228,125 | 12 | 27,375 |
| 22 | 35  | 28 | 7  | 89,425  | 2  | 4,791  |
| 23 | 40  | 32 | 6  | 93,440  | 4  | 11,680 |
| 24 | 32  | 16 | 8  | 93,440  | 2  | 9,344  |
| 25 | 115 | 30 | 10 | 419,750 | 4  | 51,769 |
| 26 | 115 | 30 | 6  | 251,850 | 4  | 31,062 |
| 27 | 42  | 45 | 9  | 137,970 | 6  | 16,863 |
| 28 | 38  | 35 | 5  | 69,350  | 5  | 9,907  |
| 29 | 55  | 17 | 6  | 113,758 | 3  | 16,729 |
| 30 | 7   | 17 | 17 | 43,435  | 4  | 10,220 |
| 31 | 83  | 35 | 12 | 353,442 | 6  | 60,590 |
| 32 | 78  | 45 | 15 | 427,050 | 7  | 66,430 |
| Total | 2,038 | 995 | 290 | 6,546,975 | 139 | 963,428 |

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3.2. Characteristics of *Nira aren in Lombo Village*

*Nira* as a raw material for making palm sugar is a sweet liquid derived from palm sugar flower bunches that have not yet bloomed with a moisture content of 80-85% and sucrose about 15% [12]. Condition This causes the sap to easily ferment because of the activity of bacteria and yeast found in sap [13]. The bacteria found in the sap are wrong One is *Acetobacter* which is capable of oxidizing alcohol and sugar, in particular oxidizes ethanol to acetic acid [14].

Based on the results of the study, it was found that to prevent the occurrence of fermentation in sap During the wiretapping, there are several treatments carried out by farmers in preparation wiretapping, among others, cleaning the tapping container before it is used for tapping and using preservatives that are inserted into the tapping container in the form of jackfruit wood extract, forest mangosteen leaf and also some use a mixture of wood jackfruit and lime before being used for tapping. The preservatives can be seen in Figures 2 and 3 below:
The quality of the sap that is cooked into sugar will determine the quality of the sugar produced where the pH of the sap cooked by farmers in Lombo Village ranges from 6.48 to 6.78, this means that the quality of the sap is still good to be processed into palm sugar because it is still in the pH range of 6-7.5 [11].

In addition to pH, another indicator that characterizes sap is the brix level. Brix is the amount of dissolved solids in the sap, which consists of pol (sugar) and non-sugar. Sugar consists of on reducing sugars (fructose, glucose, maltose, and lactose) and sucrose [15].

The levels of brix sap in Lombo Village range from 10-14%, meaning that for the production of 1 kg of sugar it takes as much as 9.6 to 10 liters of sap.

3.3. Prospects of Palm Sugar Business Development in Lombo Village
To analyze the prospect of palm sugar business development in Lombo Village, Pitu. District Riase Kab. Sidrap, it can be estimated by estimating the average production of nira per day which will be processed into palm sugar.

Based on the research data obtained that the average production of sap is 995 liters per day and palm sugar production of 139.2 kg per day. As for the price of palm sugar, which produced by the community is Rp. 25,000,- per kg of income received by farmers in Lombo Village is Rp. 3,480,000,- per day or Rp. 108,750,-/farmer/day. Thus the total income that will be received by farmers or palm sugar craftsmen in Lombo Village is around Rp. 104,400,000,-/month. This value is certainly very promising and has the potential to be developed so that it becomes a sustainable and bring prosperity to the residents of Lombo Village, Pitu Riase District, Kab. Sidrap.

4. Conclusion
a. The number of sugar palm trees in Lombo Village were 2,038 trees, consisting of 118 trees
being tapped, 585 trees ready to be tapped and 1,335 trees still waiting for about 3-4 years to be tapped.

b. Palm sap characteristics in Lombo Village such as the pH of the sap cooked by farmers ranged from 6.48 to 6.78 and the level of brix sap ranged from 10-14%.

c. Palm sugar production is 139 kg/day or 4.170 kg/month and the selling price of sugar produced by the community is Rp. 25,000,- per kg so the sales received by all the farmers in Lombok Village is around Rp. 104.400,000,-/month.

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