The management model for sugar palm in educational forest of Universitas Hasanuddin

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Abstract. The Educational Forest of Hasanuddin University (Unhas-edfor) is an asset that must be utilized optimally in order to support the utilization and management of forest resources over a wider area. The palm sugar species has long been cultivated from generation to generation by people at and around the forest, and is a source of income that is quite meaningful for them. This research aims to assess the potential of non-timber product, especially palm sugar product and formulate the management for sugar palm species and its product in Unhas-Edfor. The research method used is a field survey method and data analysis is using a qualitative analysis approach. The results of the study indicated that the palm sugar production in 3 villages, that became the study location, namely Rompegading, Limampoccoe and Labuaja, was quite varied. The highest total net income was found in Moncongjai Hamlet (Rompegading Village) as much as IDR. 28,935,000,- with a total production of 1,640 packages and the lowest in the Jambua Hamlet (Limampoccoe Village) as much as IDR. 215,000,- with a total production of 50 packages. The total net income in each hamlet is different depending on the amount of processed sugar production which tends to vary and the number of farmers producing products from palm trees. The sustainability model for the development and management of sugar palm and its derivative products in the Unhas-edfor is carried out through community empowerment activities, the formation and strengthening of farmer group institutions together with the management of the Unhas-edfor, village and district governments, related agencies, and banks as owners capital in terms of cultivation, harvesting and post-harvest, to the processing and marketing of results so that sugar palm and its products provide optimal results.

1. Introduction
The Educational Forest of Universitas Hasanuddin (Unhas-edfor) has physical potential, biological potential, and strategic social potential to be managed as a center for education, research, training and forestry services in South Sulawesi and the Eastern Region of Indonesia. Community activities in and around the Unhas-edfor are paddy field, gardening, animal husbandry, and some are carrying out activities to utilize wood and non-timber forest products such as extracting firewood, tapping pine sap, tapping palm sugar, making palm sugar, extracting honey, harvesting plant seeds mahogany and pine, utilization of medicinal plants, mushrooms, etc. Therefore, Unhas-edfor will be managed with an ecosystem approach and socio-economic approach to the culture of the people in and around the forest.
Palm sugar plant is one of the non-timber forest products that is inside the Unhasedfor located in Cenrana District. Sugar palm plants are very potential plants in terms of overcoming food shortages and easily adaptable to various agro-climate, starting from the lowlands to 1,400 m above sea level. Sugar palm plants are very suitable in sloping conditions with agro-climatic conditions as diverse as mountainous areas where high rainfall with sandy clay-textured soil. In the growth of these plants requires a temperature range of 20-25 °C [1].

Sugar palm has long been managed from generation to generation by people around the Unhas-edfor and has become a source of income to meet economic needs besides farming. At present the main product of palm sugar plantations is tapping results from tapping of male flowers which are made into sugar or brown sugar [2]. Based on the description above, the research research on the potential and Management Model of Aren and Nira is one important part of a comprehensive study in the framework of developing various potential models of Unhas-edfor to support efforts to utilize educational forests as miniature models of sustainable forest management with optimal benefits both ecologically, socially, and economically. This study aims to examine the potential of non-timber forest products, especially sugar palm products and formulate management models of sugar palm and its products in the Unhas-edfor.

2. Research Methods
This research uses the Field Survey Method. The study was preceded by a limitation of the research problem, namely by focusing attention on the potential of sugar palm and its products, with consideration that optimizing the management of sugar palm and its products in the Unhas-edfor will be able to contribute to the optimization of the management and preservation of Unhas-edfor. Analysis of the data used uses a qualitative analysis approach that is supported by the presentation of quantitative information, especially for matters related to the potential of sugar palm and its products in the Unhas-edfor.

3. Results and Discussion
The species of palm (Arenga pinnata Merr.) grows spread in 3 (three) village which are research locations around the Unhas-edfor. The three villages namely Rompegading Village, Limampocoe Village and Labuaja Village. Understanding of the land characteristics where sugar palm grown is an important aspect in the sustainability of the management of palm plantations. The sugar palm plantations area managed by farmers in the three villages can be described as follows: the largest land area is in Moncongjai Hamlet (Rompegading Village), which is 39.55 ha or 55.67% of the total area of area palm plantations, while the smallest is in Jambua Hamlet, (Limampocoe Village), which is 2.10 ha or 2.96% of the total area of area palm plantations (71.05 Ha). By having sufficient land area, the management of palm sugar plantation can manage the continuity of palm juice production as raw material for making palm sugar. The area of palm sugar plantations owned by the farmers is presented in table 1.

The use of palm trees by the community around the location of the Unhas-edfor is still traditional or simple. That is due to the lack of farmers knowledge about palm sugar processing, and how to maintain and improve product quality, to increase selling price of product and their income. The process of processing raw material (palm juice) into palm sugar can be seen in figure 1.

| Village    | Hamlet   | Area (Ha) | Percentage (%) |
|------------|----------|-----------|----------------|
| Rompegading| Moncongjai| 39.55     | 55.67          |
| Labuaja    | Pattiro  | 14.80     | 20.83          |
|            | Kappang  | 12.00     | 16.89          |
|            | Nahung   | 2.60      | 3.66           |
| Limampocoe | Jambua   | 2.10      | 2.96           |
|            | Total    | 71.05     | 100.00         |

Source: [3].
The raw material (palm juice) for processing brown sugar (palm sugar) obtained through the tapping of sugar palm owned by farmers. That so, the availability of palm trees is an absolute requirement in the supply of palm sugar agro-industry raw materials. The juice demand of each farmer varies depending on the number of trees owned and the age of the palm tree. Palm sugar processing consists of two types of activities, namely tapping and cooking sap. In processing brown sugar requires the preparation of tapping sap specifically [4]. Palm trees will reach maturity level at the age of 6-12 years. The best tapping conditions at the age of 8-9 years when the flowers are already out the tapping process is done morning and evening [1].

![Figure 1. The process of processing brown sugar from palm sugar traditionally](image)

Opportunities for the use of palm trees, especially for the manufacture of palm sugar are still very wide open because the community demand for palm sugar products has never decreased [5]. Palm sugar derived from palm tree sap is preferred by consumers over other sugar products, palm sugar processing carried out by local people still uses simple equipment [6].

The form of palm sugar products produced by farmers in Labuaja Village, Pattiro Hamlet and Nahung Hamlet are semicircular (using coconut shell) where the lowest price is Rp.8,000 per kg and the highest price is Rp.15,000 per kg. The form of palm sugar products produced by farmers in Rompegading Village, Moncongjai Hamlet is rectangular (like a brick) with the lowest price of Rp.15,000 per seed and the highest price of Rp.40,000 per seed. The lowest average price occurs in June-August which is caused by the large production of palm sugar produced, while the highest average yield occurs in September-November due to the lack of people who manage sugar because it coincides with the rice planting season.

The marketing of palm sugar products around the Unhas-edfor is still very simple. Based on the marketing process of palm sugar products, there are two schemes found in the process of managing the product of palm sugar, namely marketing at the farm level directly to consumers and marketing at the farm level through collecting traders and channeled to consumers. The marketing of palm sugar by farmers from Rompegading Village, Moncongjai Hamlet markets their sugar production only around the village, namely to the Bengobengo and camba markets, while farmers from Labuaja village Pattiro Hamlet market their sugar production to Maros Regency and even to the Town of Bengobengo and Camba. Makassar. The proceeds from the sale of sugar palm are used to finance the needs of daily living. Obstacles encountered by sugar palm farmers are the lack of palm trees in the forest area, and the other obstacles is the disturbance of cattle and wild boar that widely found in HU-Unhas-edfor. These animals eat the leaves and step the stems of sapling of the palm trees. This further inhibits regeneration of sugar palm in Unhas-edfor area and surrounding area.

Based on interview results, the highest income from palm sugar products among 3 (three) villages around the Unhas-edfor, that is obtained sugar palm area in Moncongjai Hamlet (Rompegading Village). In this hamlet were found 17 owners of palm sugar plant with a total income of Rp.36,080,000,- and the corresponding total expenditure is Rp.7,145,000,- The lowest income is obtained by 2 respondents in the hamlet of Jambua, (Limampoccoe village), which is Rp.325,000,- and the corresponding total expenditure is Rp.110,000. Potential average income and total expenditure in palm sugar farming to produce to brown sugar are presented in Table 2.
Table 2. Potential of Average Income and Total Expenditure in Palm Sugar farming to Produce Brown Sugar

| Location | Village | Hamlet  | Average Processed results of palm sugar (packaging) | Average price per packaging | Average Palm Sugar Processed Revenue (IDR) | Total cost (IDR) |
|----------|---------|---------|-----------------------------------------------------|-----------------------------|-------------------------------------------|-----------------|
| Rompegading | Moncong Jai | 1,640 | 22,000 | 36,080,000 | 7,145,000 |
| Labuaja | Pattiro | 307 | 10,400 | 3,192,800 | 2,050,000 |
| Kappang | 265 | 10,000 | 2,650,000 | 610,000 |
| Nahung | 135 | 12,000 | 1,620,000 | 1,000,000 |
| Limampocce | Jambua | 50 | 6,500 | 325,000 | 110,000 |
| Total | | | | 43,867,800 | 10,915,000 |

The net income from refined palm sugar is the difference between gross income (revenue) and the total production expenditure in palm sugar processing [7]. Based on the number in Table 2, it is known that the highest net income was found by the farmers in Moncong Jai Hamlet (Rompegading Village), which is Rp.28,935,000, and the lowest net income was found by the farmers in Jambua Hamlet (Limampocce village), which is Rp.215,000. The total net income in each hamlet around the Unhas-edfor varies depending on the amount of processed sugar production which tends to be diverse, and also the number of farmers cultivating products from palm trees. To increase revenue from the palm sugar business, of course, palm sugar farmers have to optimize their production by increasing production costs such as adding palm sugar palm juice as the main raw material for making palm sugar[6]. Comparison of the total net income of farmers from processed palm sugar products among study site is presented in Figure 2.

3.1. The Sustainable Model Sugar Palm Forest Product Management

The sustainability model for the development and the production management of sugar palm and its derivative products in the Unhas-edfor, really need the community empowerment programs. These community empowerment programs have to be carried out by involving many parties. Accordingly, the formation and strengthening of farmer group institutions that are very important to consider. Institution is very influential in the success of craftsmen managing their businesses, for example in terms of the distribution of new rejuvenation seeds, distribution or marketing of palm sugar to the market or consumers, access to capital sources, and various facilitation programs for the development of standardization (Heryani, 2015), and therefore a number of parties are expected to be involved or involved themselves, ranging from matters relating to cultivation, harvesting and post-harvest, to the processing and marketing of products. The parties involved included: the Manager of the Unhas-edfor, the local Government (District head and Village head), the Regencial Government (Regent), the Office in charge of Forestry and the Environment, the Department of Industry and Trade, and Banking. The involvement of each party in the honey production process can be described in the form of a model like in Figure 3 and Table 3.
**Figure 2.** Histogram Net income of farmers from processed palm sugar product

**Figure 3.** The Palm Sugar Business Development Model in the HU-Edfor

**Table 3.** Agencies (Parties) related to the development of Palm Sugar Businesses and their Derivative Products, and their respective roles, respectively

| No. | (Related Agencies/Parties) | (Role) |
|-----|-----------------------------|--------|
| 1.  | Manager of Educational Forest of Hasanuddin University | Coordinating with parties related to community empowerment efforts, especially in developing the palm sugar business. Provide assistance to farmers in harvesting and processing palm sugar. Providing assistance to farmers in the cultivation of palm trees. |
2. **Manger of Forest Management Unit and Forest Service**
   Providing training and counseling for farmers about palm sugar cultivation
   Providing training and counseling for farmers on the improvement and stability of roomie production

3. **Regional Government (Regency)**
   Facilitating and / or encouraging assistance from third parties or donors concerned with efforts to empower the community in general, and the development of nira-based businesses in particular
   Can be a guarantor for capital assistance from banks, to support roomie-based businesses

4. **Local Government (District and Village)**
   Facilitating the formation of village unit cooperatives that can assist farmers in selling products made from palm juice and in keeping prices stable on the market

5. **Industry and Trade Service**
   Granting business licenses, and conducting training for farmers on processing and diversifying products made from palm juice
   Conduct training for farmers to improve the quality of products made from sap
   Providing aid for harvesting and processing palm sugar and its derivative products

6. **Banking**
   Monitor the feasibility of the business and provide capital assistance for roomie business

4. Conclusion
   Based on the results of research on the potential management of sugar palm and its products in the Unhas-edfor as a miniature model of sustainable forest management, the following conclusions are obtained:

1. Potential of sugar palm products in 3 (three) villages, namely Rompegading, Limampoccoe and Labuaja Villages based on the highest total net income found in Moncongjai Hamlet Rompegading Village, which is Rp. 28,935,000, - with a total production of 1,640 packages and the lowest in the Jambua Hamlet in the Village of Limampoccoe, which is Rp. 215,000, with a total production of 50 packages. The total net income in each hamlet is different depending on the amount of processed sugar production which tends to vary and the number of farmers producing products from palm trees.

2. The model of sustainable development and management of non-timber forest products, especially sugar palm and its products in the Unhas-edfor is carried out through community empowerment activities, the formation and strengthening of farmer group institutions together with the management of the Unhas-edfor, village and district governments, related agencies, and banks as capital owners in terms of cultivation, harvesting and post-harvest, to the processing and marketing of results so that sugar palm and its products provide optimal results.

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