Economic Returns And Production Constraints In Palm Sugar Processing In Kolaka District Of Southeast Sulawesi

Haji Saediman, Sitti Kurniansi, Wa Ode Yusria, Laode Geo, Rosmawaty

Abstract: The study aimed to find out economic returns and assess production constraints of traditional palm sugar processing. The study was conducted in a palm sugar producing village in Kolaka district of Southeast Sulawesi. All palm sugar farmer-processors existing in the village, namely, 20 persons, were selected as respondents. Data were collected using a questionnaire-based interview method and Focus Group Discussions. Data were analyzed using cost and returns analysis and R/C ratio. The average monthly net returns are Rp2,477,622, which is above the provincial minimum wage of Rp1,650,000. Palm sugar processing is profitable, as can be seen from the R/C ratio being more than 1. The main production constraints are the availability of fuelwood, traditional technology, competing crops or jobs, weather variability, intensive labor work, and naturally grown plants. Palm sugar processing operations give many benefits to the households and the rural community, especially in terms of income and employment generation. In order for palm sugar processing to continue performing these roles, attempts should be made to promote it and to address those constraints.

Keywords: constraints, palm sugar, processing, production, returns, Sulawesi.

1. INTRODUCTION

Sugar palm (Arenga pinnata (Wurmb) Merr.) is a natural forest species from the Palmae family that grows in most countries in Southeast Asia, including Indonesia. Sugar palm is a multipurpose tree species in which all of its parts can be utilized for various purposes [1]. Products from traditional utilization include palm sugar, thatch (ijuuk), alcoholic beverages (tuak), fruit (kolang kaling), leaves for roofing, matting, basket, and starch. Among these products, palm sugar is the most important one. Palm sugar has long been used as a sweetener that can become a substitute for sugar in the making of foods and beverages. People in Indonesia consume a lot of palm sugar and use it to make various kinds of dishes, such as desserts, drinks, and manufactured foods [1]. Palm sugar is produced from the palm sap. The production process involves four main steps, namely, tapping, cooking, stirring, and molding. Tapping the palm sap is usually carried out in the morning and afternoon. The collected juice is cooked in the large wok pan on the three-stone stove for a few hours. When the liquid is dark red and the liquid is sufficiently thickened, the solution is then poured into molds and left to cool and solidify to form palm sugar. The main product is the dark red palm sugar, which is used in many dishes like sweets, soft drinks, and canned products [2].

In many palm growing villages, many households earn a living from traditional palm sugar processing. It has provided employment and generated income for rural households. Martini [3] reported that palm sugar processing contributed more than 50% to weekly household income. However, this small-scale industry is characterized by a high labor requirement for juice collection and high consumption of fuelwood for cooking the juice. In addition, similar to small-scale enterprises in general, palm sugar processing is characterized by the use of traditional technology, simple management, the dominant use of family labor, limited capacity in capital accumulation, absence of bookkeeping, limited accessibility to financing from the formal financial institution, and absence of organization structure. Along with population growth, there has been a growing demand for palm sugar. Therefore, there is potential for further development of traditional palm sugar processing. Given the importance of the industry in the local economy, accurate and latest information on costs and returns is essential for policy formulation. Crop-wise information on costs and returns is useful for farmer-processors in the efficient allocation of scarce resources, which is also useful to organizations closely related to the agricultural and industrial sectors. This study is aimed at assessing the profitability and production constraints of small-scale palm sugar processing in a palm sugar producing village in Kolaka District of Southeast Sulawesi.

2 METHODOLOGY

The study was based on two surveys carried out in Tolowe Ponre Waru, Wolo Subdistrict, Kolaka District, Southeast Sulawesi. The village was selected as the study location because the village has long been well-known as a palm sugar producing area in Kolaka District. The size of the village is 3,954 ha with its population accounting for 1,829 persons. It is located 52 km from Kolaka (the district capital) and 226 km from Kendari (the provincial capital). Villagers who rely on agriculture as their main livelihood account for 76%. Annual rainfall ranges from 1,441 to 2,343 mm with an average of 1,885 mm. Temperature ranges from 28–32 °C. The first survey was done in May-June 2015. All 20 palm sugar processors in the village were taken as respondents. Data were collected through questionnaire-based interviews. Data were analyzed using cost and returns analysis and Revenue-Cost ratio [4],[5]. The second survey carried out in December 2018 aimed to assess the constraints of palm sugar processing. Two Focus Group Discussions (FGDs) were conducted with farmer-processors to collect data and information. Data and information were analyzed qualitatively.
Net returns  
\[ NR = TR - TC \]

where:
- \( NR \) = Net returns (Rp/month)
- \( TR \) = Total Revenue (Rp/month)
- \( TC \) = Total Cost (Rp/month)

b) Total Cost  
\[ TC = VC + FC \]

where:
- \( TC \) = Total Cost (Rp/month)
- \( VC \) = Variable Cost (Rp/month)
- \( FC \) = Fixed cost (Rp/4 month)

Net returns  
\[ NR = TR - TC \]

where:
- \( TR \) = Total Revenue (Rp/month)
- \( Y \) = Amount of production (kg/month)
- \( Py \) = Price (Rp/kg)

### 3 RESULTS AND DISCUSSION

#### 3.1 Socio-economic characteristics of respondents

The majority of respondents (85%) were in the age range of 15-55 years (with a mean of 43.0 years), while those in the age range of 56 years and above accounted for 15%. This implies that most farmer-processors were in their productive stage. The majority of respondents (60%) had a household size of four members or less. The majority of respondents (85%) had elementary school education, 10.0% had junior high school education, and 5% had senior high school education. A greater proportion of respondents (65%) had done palm sugar processing for more than five years, and those with less than five years of experience were 35%. Generally, it can be said that farmer-processors in the study area had sufficient experience in palm sugar processing. All of the respondents used simple and traditional tools to carry out palm sugar processing.

#### 3.2 Cost

Costs of processing consist of variable costs and fixed costs. In small-scale palm sugar processing, variable costs consist of costs for lime, fuelwood, coconut oil, and kerosene. No respondents used paid labors. All respondents use unpaid family labors, which were not included in the cost calculation. Awami and Wahyuningsih [6] reported that almost all small-scale palm sugar processing in Kendal of Central Java did not use paid labors. Likewise, palm juice as the primary raw material was obtained from their trees, so it was not included in the cost calculation.

<table>
<thead>
<tr>
<th>No</th>
<th>Cost items</th>
<th>Amount (Rp/month)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lime</td>
<td>1,600</td>
<td>1.1</td>
</tr>
<tr>
<td>2</td>
<td>Fuelwood</td>
<td>124,000</td>
<td>86.3</td>
</tr>
<tr>
<td>3</td>
<td>Coconut oil</td>
<td>9,000</td>
<td>6.3</td>
</tr>
<tr>
<td>4</td>
<td>Kerosene</td>
<td>9,000</td>
<td>6.3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>143,600</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 1 presents variable costs in palm sugar processing. The average variable cost was Rp143,600 per month. The lowest cost was for lime, which was only 1.1% of the total variable cost. The amount of lime used is only several grams per liter of sap to conserve it against fermentation. The item with the highest cost was fuelwood, which contributed to 86.3% of the total variable cost. The high need for fuelwood is because the cooking took place for about four hours continuously. This result regarding the high percentage of fuelwood cost agrees with findings in many studies. Martini et al. [3] mentioned that the cost of fuelwood is more than 50 percent of the total cost of sugar production. Fuelwood had become a significant cash cost in sugar production [7],[8]. The cost will be even higher if the opportunity cost of searching fuelwood is taken into account. Borin and Preston [9] reported that palm sugar producers might have to bear a loss when the opportunity cost of fuelwood finding was taken into account. Sugar production from Arenga pinnata requires 2-3 m² fuelwood for 100 to 120 kg of sugar [10],[11]. Fixed cost only consisted of the depreciation cost of building and tools. The building and tools calculated for depreciation include hut/shed, large pan, ax, machete, molds, jerry can, basin, filter, ladder, hammer, 3-stone stove, spatula, stirrer, and woven bamboo. The amount of depreciation is Rp559,916 per month.

The total cost for palm sugar processing is presented in Table 2. The total cost amounted to Rp703,528. Fixed cost contributed 79.6 percent to the total cost, which is higher than the contribution of variable cost. A lower contribution of the variable cost is because family labors and palm sap were not included in the cost calculation. In the study village, the use of paid labors in palm sugar processing was not common. Almost all processing operations are done by men, from tapping palm sap until its cooking process at home.

#### 3.3 Net returns

Table 3 presents net returns from traditional palm sugar processing. The total revenue is Rp3,181,150 per month, which is obtained from the average monthly production of 374.3 kg with the price of Rp8,500 per kg. The net return is Rp2,477,622 per month. This result is roughly the same as the finding of Awami and Wahyuningsih [6] that reported the net returns of Rp2,167,377 from small-scale palm sugar processing in Kendal of Central Java. The net returns in the study village were higher than the provincial monthly minimum wage of Rp1,650,000. The revenue-cost ratio is 4.52, which means that the traditional palm sugar processing is a profitable venture, as for every Rp1,000 used in the production process, there will be revenue of Rp4,520. Feasible operation of palm sugar processing in Kolaka District with Net Benefit-Cost Ratio being more than 1 is also reported by Rianse et al. [12].

#### 3.4 Constraints

Palm sugar processing provides a primary source of income for farmer-processors, which they can use to purchase food.
and non-food needs and to purchase productive resources. The main advantage of palm sugar processing is that the farmer-processors can have a daily income throughout the year. However, several constraints should be addressed in order for it to continue performing its role in income and employment generation.

3.4.1 Availability of fuelwood
Palm sugar processing requires a high quantity of fuelwood. This is because the cooking of palm juice to become sugar takes 4-6 hours to complete. According to respondents, lack of fuelwood is the principal constraint in processing palm sap into solid sugar. The local supplies of fuelwood in the village are particularly depleted as palm sugar processing has been intensified and has taken place for years. However, they try to collect first fuelwood from nearest forest, dead leaves or trees in their upland farm, or any dead leaves and trees in the village. They also have to purchase fuelwoods from suppliers who bring fuelwoods from outside the village. Fuelwood collection takes time and will reduce the net returns of palm sugar processing should the opportunity cost of fuelwood searching is taken into account. Given the large quantities of fuelwood required in palm sugar processing, the lack of fuelwood and its increasing price may become one of the limiting factors for the expansion of palm sugar processing in the area. There are examples in some areas where palm sugar processing is no longer done because of the lack of fuelwood [13]. Therefore, development of an improved stove that can save the amount of fuelwood used during the cooking process and the overall time needed for the cooking process is highly needed.

3.4.2 Traditional technology
Farmers still used traditional technologies for tapping, collecting, and processing palm sap into solid sugar. They invented and developed both knowledge and technology associated with Arenga pinnata [14]. Ta’lin [15] noted that the traditional way of tapping the palm sap is highly risky because tappers have to climb the tree for slicing and bringing down the previously collected sap. Climbing the tree is a hard job and there is the risk of falling off during climbing, tapping, and collecting the sap. Therefore, an improved technology for safely tapping palm sap is needed. Processing palm sap is done using simple tools, namely, a large, round iron pan, a three-stone stove, stir, and mold. The sap is cooked in a large, round iron pan over the wood-fired stove and is stirred until it starts to crystallize. These simple processes and tools will be a challenge when palm sugar is expanded or more commercialized. Further commercialization of palm sugar requires the industry to address several issues such as quality, sap freshness, level of invert sugar, food safety procedures, and assessment of its improved nutrition [16].

3.4.3 Competing jobs or crops
It was revealed from FGDs that the number of palm sugar processors is decreasing. One of the factors that drive the processors out of business is the financial returns from other competing jobs or crops. Recently a mining company operates in the area close to the village, so some villagers, including palm sugar tapper and farmer-processors, are attracted to work in the company. Palm sugar processing is considered as a labor-intensive and physically hard job, so villagers, especially the youngsters, prefer to work in other livelhoods with higher income and lower risk. Popular estate crops in Kolaka District are cocoa, clove [17], pepper, and patchouli. However, recent studies suggest that only clove and pepper that provide much higher net returns [18],[19], whereas cocoa and patchouli have roughly the same or lesser amount of net returns with that of palm sugar processing [20],[21],[22]. Nevertheless, price fluctuation of the products is high among these four crops, and any increase in price can motivate farmers to focus more on these crops again. Given the increasing competition with mining and these estate crops, improvement in palm sugar processing and marketing will reduce the likelihood of tappers and farmer-processors to abandon palm sugar production.

3.4.4 Weather
Palm sugar processing can be done all year round, but sap production and quality vary according to many factors, such as season and prevailing weather (Pethiyagoda as cited in [13]). During the rainy season and strong wind, there is a higher risk of falling when climbing and tapping. Rain can also dilute yields and spoil the sap [16]. Generally, palm sap is more abundant during the rainy season than in dry season, but the high supply often leads to decreased price. Besides, the rainy season causes difficulty in getting fuelwood.

3.4.5 Labor intensive work
Sugar palm tapping is a highly labor-intensive activity [13]. It is done regularly twice a day, in the morning and afternoon. Beating and preparation of inflorescence stalks may need 2.5 hours a day [10],[13][Dalibard, 1999]. Mogea et al. (1991) noted that a healthy tapper could tap 12-16 trees in a day. Tapping must be conducted every day to prevent the occurrence of the tissue healing that can make the sap flow diminish rapidly. The sap is then cooked in a wok pan on a wood-fired stove for about four hours. Given this labor-intensive activity, whenever easier and better-paid jobs were available, tapping was given up.

3.4.6 Naturally grown plants
Most sugar palm that farmers have tapped for sugar production grew naturally without much assistance and intervention from farmers or human. Until now rural communities are not able yet to grow and cultivate Arenga pinnata tree [14]. This condition presents the limitation to sap production and challenge for any plan to develop palm sugar processing on a larger scale or in more commercialized ways. In the long run, the supply of palm sap as raw materials may be constrained by the availability of palm trees. This is because the present trees are naturally grown, and the increased number of palm sugar processing households and the improved processing capacity might lead to their overexploitation. Therefore, there should be planting of new palm trees to ensure the sustainability of palm sugar processing. Planting of Arenga pinnata could also be directed toward reforestation or rehabilitation of marginal lands as the tree can grow on various soil types and altitudes [14].

4 CONCLUSION
Palm sugar processing is a profitable venture, as can be seen from the Revenue-Cost Ratio being more than 1. The average monthly net returns are Rp2,477,622, which is above the provincial minimum wage. The main production constraints are limited availability of fuelwood, the use of traditional
technology, competing jobs or crops, weather variability, highly intensive labor work, and naturally grown plants. Palm sugar processing provides many benefits to the households and the rural community in terms of income and employment generation. Efforts to maintain the existence of palm sugar processing or to develop it further need to take into account and address constraints mentioned earlier.

ACKNOWLEDGMENT
The authors are grateful to Pak Salahuddin for assisting in the conduct of FGDs in Tolowe Ponre Waru village during the second field survey.

REFERENCES