

VALUE ADDED ANALYSIS OF PALM SUGAR PROCESSING

(Case study: forest village community groups in Rongga and Gunung Halu Districts Bandung Barat Regency)

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ABSTRACT

Palm sugar processing was one of the household industries that have been run for several years by farmers in Rongga and Gunung Halu Districts. Generally, the business activities are very simple. Farmers are using simple business calculation to run the activity, for example, they usually do not calculate labor as a cost, so that they do not know if their activity profitable or not. This study aimed to analyze the income earned from palm sugar processing and analyze the added-value derived from palm sugar processing. Data were analyzed using income, added value, and descriptive analysis. The results show that the total cost (TC) is greater than the total revenue (TR): Rp 42,415 > Rp 37,108. This means that palm sugar processing in Rongga and Gunung Halu is not yet profitable. The added value of palm sugar processing is Rp 1,974, with the ratio of added value 0.42 (0.42 > 0). This positive added value ratio means that the process has increased the value of the palm juice raw materials. Palm sugar processing could be profitable and increase the socio-economic welfare of farmers if the business activity is managed effectively and efficiently.

Keywords: *Arenga pinnata*, business, palm sugar, processing, value added

1. INTRODUCTION

The sugar palm tree (*Arenga pinnata*) is considered to be one of domestic commodities which give high economic benefits. It is capable of producing a variety of non-timber products such as palm juice (*nira*) that could be processed into a traditional drink, vinegar, alcohol, and palm sugar. Palm sugar is a product that has the potential to generate substantial revenue, because sugar has known by people to be one of natural sweetener for food and beverage.

The demand for palm sugar is growing over time, as the food and beverage industry continues to grow. The demand comes from both local and global market (Smits, 2004). Palm sugar can be a substitution of imported refined sugar. Palm sugar also preferred by consumer because it has typical flavor, aroma, and color. The high market demand for palm sugar is not comparable with their production. Factors affecting palm sugar production are: 1) the limited number of productive sugar palm trees and plantation area; and 2) lack of community knowledge about the economic value and technologies in tapping and processing palm juice into palm sugar (Effendi (2003).

West Java Province is one of the largest distribution areas of sugar palm tree in Java Island (Plantation Protection Center of West Java Province, 2016). Based on statistical data from Department of Agriculture and Estate Crops of West Java Province (2015), the area of palm plantation in West Java is 14,204 Ha with production of 22,489 tons and its productivity reaches 2,781 Kg / Ha. West Bandung Regency, which is located in West Java Province, has several areas with sugar palm tree plantation that is located in Sindangkerta, Gununghalu, Rongga, Cipongkor and Cikalongwetan Districts (Department of Agriculture and Estate Crops of West Bandung Regency, 2015). According to Master Plan of Agricultural Development of West Bandung Regency in 2013 and "One Village One Product" program, sugar palm tree was recommended as a main commodity of West Bandung Regency. Sugar palm trees are growing unintentionally and spread over in people's garden. They grow in shrubby hills with a steep slope.

Most of people in West Bandung Regency are a farmer. They grow vegetables and corn. Palm sugar processing is not their main activities. The income earned by selling the sugar is an additional income. They tap juice from sugar palm tree, and then process it into palm sugar. Palm sugar are packed with coconut shell or bamboo, and then sold to sugar collector. The price was always determined by the collector. Most of farmers are lack of knowledge and attention to calculate the production cost. They do not take into account several cost such as labor tapping, labor processing, and the use of firewood. So that, they have no bargaining position to determine the price and do not have clear profit estimation. Whereas, based on the report "Development Planning of Sugar Palm Tree (*Arenga pinnata*) Processing Unit in West Bandung Regency" (Department of Agriculture and Estate Crops of West Bandung Regency, 2016), palm sugar processing has a high productivity and economic value. It can increase the farmer's income and also social and economic welfare of the communities. This study aimed to analyze the income and added value derived from palm sugar processing by examined the components of expenditure. Information gathered from this study could be useful to plan and develop sugar palm bio industry especially in West Bandung Regency.

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2. MATERIALS AND METHODS

2.1. Sampling Techniques

This study was conducted in forest village community groups in Rongga and Gunung Halu Districts of West Bandung Regency from May until July 2017. The research method used in this study is survey method with explanatory. Data were collected by questionnaire, depth interviews with purposive sampling method, field observations, and literature review. Key informants for this study were palm sugar producers, farmers, community leader or farmer group leader, sugar collector or purchaser, and related government agencies with total 50 respondents. Primary data which is collected in this study are the use of inputs, palm processing, prices, and output.

2.2. Analytical Procedures

The data that have been obtained were analyzed by using qualitative and quantitative analysis. Qualitative analysis aims to get a description of the business conditions, while quantitative analysis aims to get the value added of palm sugar business.

2.3. Data analysis

According to Hayami et al. (1987); Sudiyono (2004); Wardono (2015); and Aklimawati (2017), value added is a value of the final product minus the intermediate cost (the cost of raw materials and additional materials in the production process) or value addition of a commodity due to the functional input imposed on the commodity. The functional input consists of: 1) technical factors such as production capacity, quantity of raw materials used, and labor; and 2) market factors such as output price, labor cost, raw material prices, and value of other inputs). This definition can be formulated as follows (Hayami et al., 1987):

$$\text{Added value} = f \{K, B, T, U, H, h, L\}$$

Where:

K = production capacity

B = raw material

T = labor

U = wage of labor

H = output price

h = input price

L = value of other inputs except raw materials and labor

According to Hayami et al. (1987), additional value analysis procedure is described in Table 1. Value added is said to be positive if the value added ratio > 0 and it is said to be low if the value added ratio < 0.

Table 1: Added Value Analysis

	Variables	Formula
I.	Variables (Output, Input, Price)	
1	Output (palm sugar in Kg/day)	(1)
2	Input (palm juice in Liter/day)	(2)
3	Labor (hour/day)	(3)
4	Conversion factor	(4) = (1)/(2)
5	Labor coefficient	(5) = (3)/(2)
6	Price of product (IDR/Kg)	(6)
7	Wages (IDR/hour)	(7)
II.	Revenue and Profit	
8	Input (price of input in IDR)	(8)
9	Other inputs (firewood in IDR)	(9)
10	Output (IDR)	(10) = (4)x(6)
11	a. Added value (IDR)	(11a) = (10) – (9) – (8)
	b. Added value ratio	(11b) = (11a)/(10) x 100%
12	a. Revenue of workers (IDR)	(12a) = (5) x (7)
	b. Segment of workers (%)	(12b) = (12a)/(11a)x100%
13	a. Profit (IDR)	(13a) = (11a)-(12a)
	b. Rate of profit (%)	(13b) = (13a)/(10)x100%
III	Owner Compensation Factor of Production	
14	Margin (IDR)	(14) = (10)-(8)
	a. Direct labor income (%)	(14a) = (12a)/(14)x100%
	b. Donations of other inputs (%)	(14b) = (9)/(14)x100%
	c. Company profit (%)	(14c) = (13a)/(14)x100%

2.4. Variables Operationalization

Variables used in the analysis consists of: 1) actual profit; 2) tapping cost; 3) juice processing cost; 4) firewood cost; 5) the amount of production (output); and 6) output price. The observed variables need to be defined to avoid differences in perceptions of the key terms used in this study. Actual profit is the difference between total revenue and total cost. Total revenue is a multiplication between price and output. As for total cost is the sum of paid cost and calculated cost.

The tapping process is activities that consist of cleaning the bamboo tubes, tapping, installing the collecting tubes, and collecting daily juice. Tapping cost is wage for labor that did the tapping process. This process usually did by male worker. Juice processing includes of cooking juice, printing, and packaging of palm sugar. Juice processing cost is wage for labor that did the palm sugar production. This process usually did by female or male worker. Female and male labor wages are not differentiated. Furthermore, firewood cost is a fee incurred by farmer in obtaining firewood. It could be transportation cost, shipping cost, purchased cost, or wage for labor. Tapping cost, juice processing cost, and firewood cost are measured in Rupiah per day.

Output is the amount of gross production. The production measured is the form of printed palm sugar in kilograms. The quality of palm sugar produced is considered equal to the output variable. The output price is the price of palm sugar at the level of farmers. It is measured in Rupiah per kilogram.

3. RESULTS AND DISCUSSION

3.1. Description of Palm Sugar Processing in Rongga and Gununghalu Districts

Table 2 shows the general description of palm sugar processing in Rongga and Gununghalu Districts. Based on Table 2, it can be seen that the average age of farmers have exceeded the productive age. In fact, sugar palm farmers are old and less productive so that affect the performance of tapping and the number of trees tapped. Furthermore, when considering the level of education, it gives an illustration that they are generally less educated. Possible job opportunities only rely on their skills. This is indicated by the experience of cultivation as a sugar palm farmer, rice paddy, corn, and vegetables. Meanwhile, family members of the farmers quite a lot with the average ranges from 3-4 people.

Table 2: Description of Palm Sugar Processing in Rongga and Gununghalu Districts

	Description	Min	Max	Average
1	Age	32	63	47
2	Level of Education	Unfinished primary school (40 respondents)	Unfinished junior high school (1 respondent) Unfinished senior high school (3 respondents)	
3	Farming experience	Rice paddy, corn, vegetable, and palm sugar farming		
4	Family members	1	6	3-4
5	Land ownership (m ²)	400	10000	700
6	Numbers of tree tapped (tree/day)	1	9	5
7	Palm juice daily production (liter/day)	3	17	8,89
8	Palm sugar daily production (kg/day)	1,3	7,3	3,36
9	Palm sugar price (IDR)	10.000	12.000	11.136

In relation to the business activities, the average land used to produce palm sugar is relatively small. This condition allows some farmers to utilize palm trees in forest land with the average number of trees tapped to reach 5 trees per day. The number of tapped trees is relatively small compared to the number of palm trees plantation as much as 400 trees per hectare with a space of 5 m x 5 m. However, in this location, the number of trees tapped gives the quite high production of palm juice and palm sugar. Meanwhile, the farmers level price of palm sugar products is Rp 11,136, which is quite high (65%) compared to the local market price of Rp 15,000 with a margin of 35%.

As shown in Table 3, the fixed cost consists of components such as equipment for processing palm sugar (wok + spatula + furnace), and depreciation cost Rp. 1,500. While variable cost consists of wage and firewood cost, because farmers still use firewood as a requirement for palm sugar processing, the limited of farmers to look for firewood is a constraint for farmers. This causes fixed costs (62.33%) higher than fixed costs (37.67%).

Table 3: Average Cost of Palm Sugar Processing in Rongga and Gununghalu Districts

	Variable Cost	Price (IDR/day)	Ratio (%)
1.	Fixed cost (equipment)	15.962	37,67
2.	Variable cost (wage of labor and firewood)	26.452	62,33
	Total	42.415	100

Table 4 shows that the average total cost (Rp 42.415 per day) earned by farmers is greater than the average revenue (Rp 37.108 per day). This happens because the selling price of palm sugar is still low and the production of palm sugar is still low compared to the cost incurred. The solution that is needed is to increase the price of palm sugar based on quality and marketing improvement of palm sugar. This will motivate farmers to improve the quality and productivity of palm sugar.

Table 4: Average Income of Palm Sugar Processing in Rongga and Gununghalu Districts

	Variables	Value (Rp per day)
1.	Revenue	37.108
2.	Total Cost	42.415
	Net income	-5.307

3.2. Added Value of Palm Sugar Processing

Value-added analysis describes the production process based on the donation value of each production variable. Table 5 shows the calculation of value added of palm sugar processing with Hayami Method.

Table 5: Added Value of Palm Sugar Processing in Rongga and Gununghalu Districts

	Variables	Value
I.	Variables (Output, Input, Price)	
1	Output (palm sugar in Kg/day)	3,36
2	Input (palm juice in Liter/day)	9
3	Labor (hour/day)	2
4	Conversion factor	0,4
5	Labor coefficient	0,27
6	Price of product (IDR/Kg)	11.136
7	Wages (IDR/hour)	15.962
II	Revenue and Profit	
8	Input (price of input in IDR)	1.000
9	Other inputs (firewood in IDR)	1.499
10	Output (IDR)	4.472
11	a. Added value (IDR)	1.974
	b. Added value ratio	0,42
12	a. Revenue of workers (IDR)	10.104
	b. Segment of workers (%)	0,60
13	a. Profit (IDR)	-8.131
	b. Profit rate (%)	-19,91
III	Owner Compensation Factor of Production	
14	Margin (IDR)	3.472
	a. Direct labor income (%)	291,01
	b. Donations of other inputs (%)	43,17
	c. Company profit (%)	-234,19

Based on Table 4, the value of output, input, and output price variables are still small. This affects the productivity of farmers in processing palm sugar per day. According to farmers, good quality of palm juice is a yellowish juice that is produced during the dry season. The quality of palm sugar is determined based on the season. The quality of palm sugar in the dry season is better than in the rainy season. However, the amount of tap juice in the rainy season is more than in the dry season. In addition, since tapping jobs require special skills and are still less attractive

to other farmers there were only a few tappers. The small amount of labor causes the amount of sap produced to be slightly so that the coefficient of labor is low.

The output value is generated from the conversion factor multiplied by the output price. Meanwhile, the added value resulted from the reduction of the output value minus the price of the juice minus another input contribution (firewood cost). Then the labor income is generated from the labor coefficient multiplied by the labor wage with the labor share of 0.6. So the calculation of added value obtained from the production of palm sugar per day is Rp. 1,974 per kg.

Based on the calculation, the value added ratio of palm sugar is 0.42. This ratio is derived from the added value divided by the output value. However, the profit and income of sugar palm farmers are still negative. This is due to the low price of palm juice and palm sugar, and also labor costs. If the labor income is not calculated from the value of Rp 10,104 and is not considered a wage cost of producing palm sugar, then the profit will be positive. The palm sugar business conducted at the research location is done by sugar palm farmers who generally tapped and processed the palm juice, and also looked for firewood. This business is labor intensive because most of the production stages are done by only one male farmer. Sometimes, farmer's wife helps in the cooking process. The labor costs involved in this business are usually not calculated in the determination of the selling price of palm sugar. In the case of this research, the value added and profit value is negative, meaning that the selling price of palm sugar products is subsidized by the reciprocity of labor involved.

The palm sugar business margin is derived from the output value minus the raw material (palm juice), that is Rp 3,472. The contribution of labor income to get the margin is 291,01%. This suggests that the contribution of labor is very large to the margin of palm sugar products. The transformation of palm juice processing into palm sugar by labor is close to 3 times the production margin. Then the contribution of other input amounted to 43.17%, gives an indication of the relatively small contribution of firewood. While the profit contribution of farmers amounted to - 234.19%, means that loss in this business amounted more than 2 times.

Referring from research by Taridala et al. (2013) and Tambarta et al. (2013), the output value describes the ability of processing management of the product. Processing with higher technology will increase the conversion factor and the output value. The value of this output will affect the added value of a product. The added value can also be increase through the diversification of product. This clearly proves that processing will increase added value of the product. Value added is influenced by product value itself, raw material price, and contribution of other input. Product value is the market price of the product for each raw material used. Product value is obtained by multiplication of conversion factor and product price. A product

value of palm sugar was Rp 2,413.19 per kilogram and contribution of another input was Rp 716.68 per kilogram by considering depreciation cost of equipment. Value added received by producer in processing sugar palm sap to be palm sugar is Rp 696.51 per kilogram or 29% of product value. It means that 29% of palm sugar product value is value addition resulted from the process. Value added given by palm sugar is big because value added ratio is more than 20%. In palm juice processing, the producer get a profit of Rp 684.18 per kilogram palm sugar produced. Therefore, producer continuously runs this household industry. In addition, producer continued to make the sugar because it was business from generation to generation and when running the business did not require much care and time so they can do other tasks while making palm sugar such as farming or doing household work (Rianse *et al.*, 2016).

4. CONCLUSION

This study conclude as follows :

1. The added value obtained from the daily production of palm sugar is 42% (Rp. 1.974), with profit rate -19,91% (Rp -8.131) and revenue of worker 60% (Rp 10.104).
2. The average total cost (Rp 42.415 per day) earned by farmers is greater than the average revenue (Rp 37.108 per day). The average income earned by farmers from palm sugar processing business in research area is Rp -5.307 per day.
3. The selling price and the production of palm sugar is still low compared to the cost incurred.

5. POLICY IMPLICATIONS

The business requires new strategy to increase the added value and reduce the losses. Developing integrated estate crop plantation and processing unit with centralized production management, can increase the number of raw material and save another production input.

In this study, the income level of palm sugar business was small due to the saturation of production factors, ie tapping labor, processing labor, and firewood cost. In order to increase the income level, the production factor needs to be allocated to other business activities outside this business (Aliudin *et al.*, 2011). More importantly, the calculation of the opportunity cost gives an indication that the added value and negative profit are also caused by the amount of palm juice gained not supporting the output. So, the strategy to increase the income is to adjust the number of palm plant and manage the planting time so as palm trees could matured and were tapped in the same time.

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REFERENCES

- [1] Aklimawati, L. 2017. Dynamic of arabica coffee marketing organization in ngada district: progress upon implementing of geographical indication. *Pelita Perkebunan* 33 (1) 2017, 66—79, ISSN: 0215-0212.
- [2] Aliudin, Setiawan Sariyoga, dan Dian Anggraeni. 2011. Efisiensi dan Pendapatan Usaha Gula Aren Cetak (Kasus pada Pengrajin Gula Aren Cetak di Desa Cimenga, Kecamatan Cijaku, Kabupaten Lebak, Provinsi Banten). *Jurnal Agroekonomi*, Vol. 29 No.1, Mei 2011:73-85.
- [3] Apriadi, A. 2003. Business analysis and added-value of fish processing in shrimp or fish crackers industry in Indramayu.(Thesis) Institut Pertanian Bogor, Bogor. (Indonesian)
- [4] Burhanudin, 2005. Prospects of cooperative business development in the production of palm sugar. Jakarta.
- [5] Department of Agriculture and Estate Crops of West Bandung Regency. 2015. Potensi Aren di Jawa Barat. <http://disbun.jabarprov.go.id/btpt/id/post-detail/66/Potensi-Aren-andArengapinnataand-MERRand-di-Jawa-Barat>.
- [6] Effendi, D.S. 2003. Prospect of Sugar Plant Development (Arenga pinnata Merr) Supporting Bioethanol Needs in Indonesia. *Puslitbangbun. Perspektif* Vol. 9 No. 1 / Juni 2010. Hal 36 – 46.
- [7] Guetierrez, P.H. and Dalsted, N.L. Breakeven Method of Investment Analysis Fact. Farm and Ranch Series Economics. Colorado State University Extension, 9/92. Revised 7/08. Sheet No. 3. 753.
- [8] Gultom, 2007. Jutaan Dolar Harta Karun Tersimpan Di Dalam Pohon Arena tau Enau. <http://arensugar.multiply.com/journal/item/21>.
- [9] Hayami Y, Toshihiko M, dan Asjidin M. 1987. Agricultural Marketing and Processing In Upland Java: A Perspektif From A Sunda Vilage. The CGPRT Center. Bogor.
- [10] Kencana, F. 2012. Analysis of pattern and risk of palm sugar business in Rejang Lebang Region (Thesis) Faculty of Agriculture. Universitas Bengkulu. Bengkulu. (Indonesian)

- [11] Leatemia, D. 2008. Analysis of financial in palm sugar agroindustry. *Ichsan Gorontalo Journal (Indonesian)*, 3(1) : 1351-1359.
- [12] Master Plan of Agricultural Development of West Bandung Regency and “One Village One Product” program. 2013. Department of Agriculture and Estate Crops of West Bandung Regency.
- [13] Plantation Protection Center of West Java Province, 2016. <http://disbun.jabarprov.go.id/index.php/statistik/>. Rianse, S, I., Hartono, H., Suryantini, S and Jamhari. 2016. Analysis of palm sugar agroindustry value added in Kolaka Regency Indonesia. *International Journal of Business and Management Studies* 05(01):13–22.
- [14] Smits, J.P. (2004). International differences in economic welfare during the twentieth century, exploring economic growth. *Essays in Measurement and Analysis* (Aksant-Academic Publishers: Amsterdam, 2004), pp. 343-364.
- [15] Sudiyono, A. 2004. Agriculture marketing. Universitas Muhamadiyah Malang Press. Malang.
- [16] Tambarta, E., Tinaprilla, N and Adhi, K, A. 2013. Analysis added-value and development strategic of Gayo Coffe Products in Bener Meriah Aceh. *International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064*.
- [17] Taridala, A, A, A., Jusoff, K., Zani, M., Abdullah, G, W., Suriana and Merdekawati, I. 2013. Supply chain in sago agribusiness. *World Applied Sciences Journal* 26 (Natural Resources Research and Development in Sulawesi Indonesia): 07-12, ISSN 1818-4952.
- [18] Tarigan, R. 2004. *Economic Regional*. Bumi Aksara. Jakarta.
- [19] Wardono, B. 2015. Fish capture fish development model small scale to support economy area (Thesis) Post Graduated School. Institut Pertanian Bogor. Bogor (Indonesian).