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Added Value Analysis and Affecting Factors in Coconut Sugar Processing

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ABSTRACT

The general goal of processing coconut sugar obtained from coconut sap is to maximize its added value. Purbalingga Regency is a major producer of coconut sugar in Central Java. Molded coconut sugar is the most commonly produced variety of coconut sugar. The purpose of this study is to determine the added value of the coconut brown sugar processing industry, as well as the elements that influence it. The Hayami method of added value analysis was applied, as well as multiple linear regression analysis. The research employed up to 36 coconut brown sugar craftspeople and took place between February and March 2021. The results showed that processing coconut sap adds Rp. 689.81 per kilogram, with an added value ratio of 34.86 percent. The value added category falls into the medium group. Production capacity, raw materials, output price, raw material costs, and other input prices all have a substantial impact on the added value of converting coconut sap to sugar.

Keywords: coconut sap, added value, coconut sugar, Hayami

INTRODUCTION

The Purbalingga Agriculture Office reported that Purbalingga Regency has 5,459.27 ha of coconut plantations with a production of 41,969,688.06 kg and a productivity of 7,883,736 kg/ha. The number of coconut farmers is 20,419 (BPS 2019). Purbalingga Regency, together with Banyumas and Cilacap Regencies, is one of the most important coconut plantation locations in Central Java, producing the most coconut brown sugar. According to Fadilla (2021), long-term development investment is required for the coconut sugar industry to continue to grow in Purbalingga Regency, specifically by implementing strategies such as strengthening institutional organizations, human resources, product processes and development, service integration, and improving marketing networks and infrastructure.

Coconut brown sugar is made from processed coconut juice. Businesses that produce coconut brown sugar use sap (*badeg*) as a raw resource. The sap is extracted by tapping the coconut blooms (*mayang*). Taping is typically done in the morning and evening, once or twice every day. A coconut tree may produce an average of 1.75 L of sap (Pracaya 2016). Coconut brown sugar is, of course, in demand as an input by a variety of different businesses, including bakeries. According to Srikaeo and Thongta (2014), adding coconut and palm brown sugar to bread results in a lower GI (Glycemic Index) value than adding cane brown sugar.

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The majority of coconut brown sugar is produced by households/home industries, which include microbusinesses. Micro, Small, and Medium Enterprises (MSMEs) are productive business units operated by individuals or businesses from all sectors of the economy. Micro firms often employ five or less workers/employees, while the majority do not have any (Tambunan 2012). The coconut brown sugar processing process is carried out with the intention of creating/providing value to the product.

Sudiyono (2002) defines added value as the reduction in the cost of raw materials and other inputs, excluding labor, relative to the value of the products produced. According to Mardesci (2021), the coconut processing business unit in Indragiri Hilir Regency, Riau, produces many processed products and adds value. The goods generated have an added value of IDR 1,037.79 per kg for coconut sugar, IDR 760 per kg for coconut oil processing, and IDR 249.98 per kg for shell charcoal processing.

According to Lestari (2020), the coconut brown sugar agroindustry generated monthly income from an average cash expenditure of IDR 2,976,013.89, with a total monthly income of IDR 529,747.40. The added value of the coconut brown sugar processing business is 47.49%, which means that for every IDR 100.00 of product value, IDR 47.49 is added, and the processing of coconut sap into coconut brown sugar can provide added value, namely increasing the product value by 47.49%. Similarly, based on the characteristics of the coconut brown sugar processing business in the center area of Kaliwiro Regency, Wonosobo Regency, or other regional centers, the brown sugar processing industry can generate additional revenue for brown sugar craftspeople households. Mugiono (2013)

reported that the average acquisition in the coconut brown sugar manufacturing industry is IDR 456,097.96/month, and if the status is self-tapping, the income can reach IDR 754,599.93. Meanwhile, depending on their monthly production capacity of 360.3 L or more, coconut brown sugar craftspeople earn IDR 1,238,208/month. According to Juliasmi (2023), a production capacity of 106.3–360.3 L yields a monthly revenue of IDR 592,481, whereas a capacity of <106.3 L yields IDR 313,504/month (Juliasmi 2023).

According to Prasetiyo (2018), in the Blitar area's brown sugar agricultural product processing industry, 1 L of coconut sap adds 76.01% or IDR 705.90 to the value. On average, 1 L of processed sap yields 0.12 kg of brown sugar. According to Hubeis' (1997) added value categorization, 47.49% of the Lestari (2020) study outcomes fall into the high group. Taking into mind the demographic condition, the research area is on the shore, although the hub of the coconut sugar agroindustry in Purbalingga Regency is located distant from the coast. Based on this description, the goal of this study is to determine the added value of coconut brown sugar processing at Purbalingga Regency's coconut sugar processing center, as well as whether there are any similarities in characteristics to prior studies. Furthermore, six independent variables were used to determine which factors influence the added value of coconut sugar processing.

METHODS

This study's basic method is analytical descriptive. A total of 36 persons responded from coconut brown sugar craftspeople. The study took place between 2020 and 2021. The respondents represent 15% of the total population of coconut brown sugar craftspeople in the Karangmoncol area.

The Hayami method of added value analysis was used in this study to determine the amount of added value in the coconut sap processing industry. Value-added testing was classified into low, medium, and high categories based on a value-added ratio of < 15%, 15–40%, and > 40% (Hubeis 1997). The parameters that influence the added value in coconut brown sugar processing can be determined using multiple linear regression analysis with six independent variables, as well as data processing with SPSS (Widarjono 2009). The data collected throughout the study was averaged from 36 respondents and then analyzed using SPSS. The equation was then transformed into a linear equation by using the form of a natural logarithmic equation (Ln). The function is expressed as follows:

$$NT = b0X1\ b1.\ X2\ b2.\ X3\ b3.\ X4\ b4.\ .X5\ b5.\ X6\ b6.\ eu$$
$$Ln\ NT = b0 + b1\ ln\ X1 + b2\ lnX2 + \ldots + b6\ lnX6 + u$$

where
NT = Added value of coconut sugar business
b1- 6 = Estimated parameter regression coefficients
b0 = Constants or intercepts
X1 = Production capacity (kg/PP)
X2 = Quantity of raw materials (L/PP)
X3 = Product/output selling price (IDR/kg)
X4 = Purchase price of raw materials (IDR/L)
X5 = Purchase price of other inputs (IDR/kg)
X6 = Labor wages (IDR/working day
u = Errors

RESULTS AND DISCUSSION

Added Value of Coconut Brown Sugar Processing Business

Karangmoncol District is one of the coconut brown sugar processing locations in Purbalingga Regency. It shares administrative borders with Pemalang District in the north, Rembang District in the east, Pengadegan District in the south, and Karangjambu District in the west. Coconut brown sugar processors in Karangmoncol District have an average age of 45 years and have been in business for around 19 years. The level of education remains low, with the average formal education at the primary level. Male workers begin the coconut brown sugar processing activities by tapping. Men gather sap from coconut blooms. Men may usually climb coconut trees as high as 30 m. The sap production per coconut tree can range from 1.5 to 2 L daily. Sap tappers are commonly known as *penderes*. According to Faza (2021), coconut brown sugar makers in Karangmoncol District confront a number of challenges, including coconut sap that is in poor/less excellent condition and contains 'sekul'. Local inhabitants refer to 'sekul' as the foam found in coconut sap that can cause sugar to become solid or difficult to mold during the process of producing coconut brown sugar.

The method of tapping, collecting, and processing coconut sap influences the quality and components of sugar (Somawiharja 2018). Sugar as a finished product contains relatively low amounts of sucrose, fructose, and glucose. The practice of tapping, collecting, and processing coconut sap in Blitar Regency remains traditional, as does the technique used by craftspeople in Karangmoncol District. Sap is still processed into coconut sugar using traditional methods that take a long time and require a stable flame.

The added value of the coconut brown sugar processing firm using the Hayami method (Table 1). With 53.33 L of coconut sap raw material and a purchase price of approximately IDR 550.69/L, 10.59 kg of coconut brown sugar can be produced at a selling price of IDR 9,761.11/kg. The conversion factor is based on the yield from one liter of raw materials. With a conversion factor of 0.20, 1 L of coconut sap yields 0.20 kg of coconut brown sugar. This is due to shrinkage that occurs during the sap processing to produce coconut brown sugar. The amount of coconut

Table 1 Recapitulation of calculated added value of coconut brown sugar processing business using the Hayami method

Variable	Formula	
Output, Input, Price		
Total output produced (kg/PP)	A	10.59
Raw material input (L/PP)	B	53.33
Direct labor (man-day/PP)	C	1.82
Conversion factors	D = A/B	0.20
Labor coefficient (man-day/kg)	E = C/B	0.04
Product selling price (IDR/kg)	F	9.761.11
Direct labor wages (IDR/man-day)	G	16.117.96
Revenue and Added Value		
Purchase price of raw materials (IDR/Lr)	H	550.69
Purchase price of other inputs (IDR/kg)	I	711.32
Output value (IDR/kg)	J = D x F	1.951.83
a. Added value (IDR/kg)	K = J – H – I	689.81
b. Value added ratio (%)	L% = K/J x 100%	34.86
a. Labor income (IDR/kg)	M = E x G	559.53
b. Labor share (%)	N% = M/K x 100%	84.14
a. Profit (IDR/kg)	O = K – M	130.28
b. Profit rate (%)	P% = O/J x 100%	6.19
Remuneration for Production Factors		
Margin (IDR/kg)	Q = J – H	1.401.14
a. Labor wages (%)	R% = M/Q x 100%	40.22
b. Capital (other input contributions) (%)	S% = I/Q x 100%	51.48
c. Profit of the processor (%)	T% = O/Q x 100%	8.30

Remaks: PP = Production Period and L = Liter.

brown sugar produced throughout the processing process is lower than the amount of processed sap raw materials. When coconut sap is heated and processed, it clumps and compacts.

The labor outflow for the coconut brown sugar processing process is 1.82 man-day, assuming that 1 man-day equals 8 hours. The labor coefficient is 0.04 man-day, resulting in a direct labor wage of IDR 16,117.96/man-day. Meanwhile, the output value is calculated using market prices for coconut brown sugar per raw material used. The output value is IDR 1,951.83/kg coconut brown sugar, calculated by multiplying the product's average price by the conversion factor. The output value for coconut sap as raw material is IDR 550.69/L, with additional inputs including equipment depreciation of IDR 711.32.

The coconut brown sugar processing firm adds IDR 689.81 per kg, which means that IDR 689.81 can be added to each liter of sap processed into coconut brown sugar. Wage compensation has not been reduced, therefore the amount of added value remains a gross additional value for processors and workers. Labor compensation is IDR 559.54, and the ratio of labor compensation to added value is 84.15%. Labor wage compensation is the amount of money received by workers after processing one liter of coconut sap. Meanwhile, the profit from converting sap to coconut brown sugar is IDR 130.28/kg. The profit margin equals 6.19% of the production value. According to Hasanah *et al*. (2015), if the profit rate (in percentage) is high, the agro-industrial unit can stimulate economic growth. While labor compensation (in percentage) in this study is relatively high, at IDR 559.54, or an 84.15% ratio of labor compensation to added value, the coconut brown sugar processing agro-industry unit in Karangmoncol District also contributes to the local area's unemployment problem by providing job opportunities.

The additional value ratio (34.86%) indicates that the added value is moderate. In contrast to Novita (2021), the added value generated by coconut sap processing is IDR 1,835.8, with an added value ratio of 79.33%. It also differs with Sawitri (2021), who indicated that coconut sugar processing has an added value of IDR 4,672.76/kg and an added value ratio of 83.87%. The margin obtained from the amount of added value can be used to pay labor wages, make other input payments, and increase processing profits. The margin is defined as the difference between the production value and the raw material acquisition price. The total margin for coconut sap processing into coconut brown sugar is IDR 1,401.14/kg. The margin allocated for direct labor is IDR 563.54/kg, or 40.22%. The contribution margin for other inputs was 51.48%, or IDR 721.31/kg, while the profit margin was IDR 116.29/kg, or 8.30%. The higher fraction of labor remuneration (wage) compared to profit margin indicates that the coconut brown sugar processing industry remains labor-intensive, implying that it has not been supplied with mechanical production machines. According to Arianti (2019), the brown sugar industry in the Madiun area is also labor-intensive, employing simple technologies and requiring little capital.

Factors Affecting the Added Value of Coconut Brown Sugar Processing

Multiple linear regression analysis can be used to identify factors influencing the added value of processed coconut brown sugar. Added value refers to the entire added value of processing coconut sap into molded coconut brown sugar, while the coconut sugar processing process is still carried out traditionally. Data processing with the SPSS application yielded a complete regression analysis (Table 2).

The regression model test findings did not reveal multicollinearity, heteroscedasticity, normalcy, or autocorrelation. On the other hand, the regression equation model always includes variables that have no effect on the model, which are:

$$\ln NT = 4{,}397 + 2{,}603 \ln X1 - 2{,}690 \ln X2 + 2{,}270 \ln X3 - 0{,}805 \ln X4 - 0{,}875 \ln X5 - 0{,}052 \ln X6 + \mu$$

The R^2 determination coefficient of 0.986 was calculated using the findings of multiple regression analysis, which included variables that had no effect on the added value of coconut brown sugar processing. This means that 98.60% of the variation in the bound variable (added value) can be explained by the variation in the model's independent variables, which are production capacity (L/PP), quantity of raw materials (L), selling price of product (IDR/kg), purchase price of raw materials (IDR/L), purchase price of other inputs (IDR/kg), and labor wages (IDR/man-day). The six independent factors accounted for 98.60% of the variation in value-added variables. Variables that have a substantial impact on the added value of coconut brown sugar processing include production capacity, raw material quantity, products selling price, raw material purchase price, and input purchase price.

Meanwhile, the independent variables included in the study, both influential and influential, were not partially significant to the added value of coconut brown sugar processing, as follows.

- Production capacity (X1)

The *t*-calculated for X1 is 37.963 with a probability of 0.000. If the probability is less than α = 0.01, the hypothesis is rejected, indicating that the regression coefficient X1 has a significant impact on the bound variable (Y; added value) (Table 2). The regression coefficient of 2.603 states that for every one percent increase in production capacity, the added value of coconut brown sugar processing increases by 2.603%, implying that as production capacity increases, so does the added value. The average processed coconut sap each production period is 53.33 L, which yields approximately 10.59 kg of coconut sugar. The investigation was conducted during the wet season, when tapping circumstances influenced sap quality. According to Adisetya (2022), the sugar concentration of coconut sap increases when tapping is done on older coconut palms, during the dry season, and in the afternoon.

- Quantity of Raw Materials (x2)

The raw material variable indicates that the estimated *t*-calculated for X2 is –38.469, with a probability of 0.000. If the probability is less than α = 0.01, the hypothesis is rejected, indicating that the regression coefficient X2 has a significant impact on the bound variable (Y; added value). The regression

Table 2 Results of regression analysis of factors affecting the added value of coconut brown sugar processing

Variable	Regression coefficient	*t*-calculated	Prob. Sig.
Constant	4.397	2.003	0.055**
Production capacity (x1)	2.603	37.963	0.000 *
Quantity of raw materials (x2)	–2.690	–38.469	0.000 *
Product/output selling price (x3)	2.270	10.821	0.000 *
Purchase price of raw materials (x4)	–0.805	–14.037	0.000 *
Purchase price of other inputs (x5)	–0.875	–11.267	0.000 *
Labor wages (x6)	–0.052	–1.228	0.229^{ns}
Adjusted *R* Square	0.986		
R square	0.989		
F-calculated	426.471		
F-table	2.42	Sig. level	
t-table 1% *	2.756	0.000	
t-table 5% **	2.045		
Durbin Watson	1.574		
Confidence level: 99% (*)			
ns = insignificant			

coefficient of –2.690 indicates that for every 1% increase in raw materials, the added value of coconut brown sugar processing fell by 2.690%. Faizah (2020) and Faza (2021) also stated that one of the elements influencing coconut brown sugar production is the number of coconut trees tapped, which impacts the amount of coconut sap received. The average number of tapped coconut trees is 32.

- Output Selling Price (X3)

The output price variable reveals that the *t*-calculated for X3 is 10.821, with a probability of 0.000. If the probability is less than α = 0.01, the hypothesis is rejected, indicating that the regression coefficient X3 has a significant impact on the dependent variable (Y; added value). The regression coefficient of 2.270 implies that for every 1% increase in the selling price of output, the added value of coconut brown sugar processing increases by 2.270%, implying that as the selling price of output increases, so does the added value. The average selling price of molded coconut sugar is IDR 9,761.11/kg, however from 2011 to 2017, the price of coconut sugar ranged from IDR 6,500.00 to IDR 9,000.00 per kg (Intan 2018).

- Purchase price of raw materials (X4)

The raw material price variable indicates that the *t*-calculated for X4 is –14.037 with a probability of 0.000. H_o is rejected because the probability is less than α = 0.01, indicating that the regression coefficient X4 has a significant effect on the bound variable (Y; added value). The regression coefficient of –0.805 indicates that for every 1% increase in the price of raw materials, the added value of coconut brown sugar processing reduces by 0.805%, implying that as the purchase price of raw materials rises, the added value falls.

- Purchase price of other inputs (X5)

The other input price variables show that the *t*-calculated for X5 is 11.267 with a probability of 0.000. The probability is less than α = 0.01, so H_o is rejected, meaning that the regression coefficient X5 has a significant effect on the bound variable (Y; added value). The regression coefficient of –0.875 states that for every 1% increase in the purchase price of other inputs, the added value of coconut brown sugar processing decreases by 0.875%, meaning that if the purchase price of other inputs increases, the added value will decrease.

- Labor wages (X6)

For the labor wage variable, the t-calculated for X6 is –1.228 with a probability of 0.229. If the likelihood exceeds α = 0.1, H_o is accepted, indicating that the regression coefficient X6 has a negligible impact on the bound variable (Y; added value). The regression coefficient of –0.052 indicates that for every 1% increase in labor wages, the added value of coconut brown sugar processing reduces by 0.052%, implying that as labor wages rise, the added value declines. The molded coconut sugar processing business in the local region typically employs family members, specifically the husband (head of the family) and the wife, hence labor wages contain implicit expenses. Meanwhile, Sulistiowati (2017) reports that labor productivity in the coconut sugar business unit is low when compared to MSE productivity at the regency level.

The added value of coconut brown sugar processing in the Karangmoncol District area is influenced by five factors: production capacity, number of raw materials, selling price of products/output (cost of product), raw material purchase price, and input purchase price. Meanwhile, the variable of labor salaries has an illusory influence. According to Awami and Wahyuningsih (2015), the number of workers, the age of the craftspeple, the price of raw materials, the price of output (product), and production capacity all have an impact on the added value of the palm brown sugar processing process. In contrast to Yosifani (2021), factors such as labor wage and raw material prices have no effect on the added value of yellow tofu processing, however production capacity and output price factors do.

CONCLUSION

The added value from the coconut brown sugar processing industry is IDR 689.81/kg, at a ratio of 34.86%. Based on the value of this ratio, the conversion of coconut sap into coconut brown sugar falls into the medium category. The added value of coconut brown sugar processing is influenced by five factors: production capacity, raw material quantity, product selling price, raw material purchase price, and input purchase price. As a result, molded coconut sugar craftspeople must pay attention to these production aspects while maintaining or improving coconut sugar quality in order to deliver better added value.

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