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Determinants of Value Added in Copra Production in Central Buton District of Southeast Sulawesi

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***Abstract*: Coconut palm has significant position in the life of Indonesian people as it provides various products and by-products useful in their daily life. The main product is derived from coconut meat which can be produced into copra. The study aimed to assess value addition in copra production and to determine the factors that affect value addition in copra production. This research was carried out in Mawasangka Subdistrict, Central Buton District, Southeast Sulawesi Province. The population in this study was 51 copra producers. Respondents were determined using the census method through which the entire population was selected as respondents. Hayami method of production structure was used to calculate value addition, whereas multiple linear regression was employed to determine the factors affecting value addition. Study results showed that the average value added of copra production was IDR749.38/kg of raw materials. The regression results revealed that all independent variables, namely, the number of coconuts, labor wages, copra prices, coconut prices, and other inputs, jointly had a significant effect on the value added. Partially, the copra price, coconut price, and other input contribution had a significant effect on the value added, while other variables did not.**

***Keywords*: Coconut, copra, production, processing, value added.**

1. Introduction

The coconut palm (*Cocos nucifera* L.) is commonly referred to as the "tree of life" because people can benefit from various products and by-products made from the tree. Products include coconut meat, juice, oil, husk, shell, shell charcoal, leaves, pith, trunk, and inflorescence. Its main products are derived from the coconut, a fruit with a nut encased by a fibrous husk with a smooth outer surface [1]. Beneath the hard shell of the nut is the coconut meat, which can be processed into copra.

Copra is the processed, dried kernel of coconut extracted to produce coconut oil. Copra is used for a wide range of applications. It is consumed as food because it is a good source of proteins, vitamins, and minerals. Coconut oil can be used in cooking and in the production of shampoos, hair oils, soap, margarine, and other products. In addition, copra cake, the leftover material, can be used as livestock feed. On average, one nut can produce 180 g of copra and then 110 g of oil [2].

Coconut (*Cocos nucifera* L) has an essential meaning in the lives of Indonesian people. This critical position can be seen from the fact that coconut plantations cover an area of 3,712 million hectares, the largest in the world. With a total production of 12,915 billion coconuts (24.4% of global production), Indonesia ranks second in world coconut production [3]. In general, coconut plant plays roles as a source of income, vegetable oil, employment, and foreign exchange. In addition, it can play roles as a growth driver for economic centers and a trigger for the development of a coconut oil-based downstream industry and its by-products [4].

In Southeast Sulawesi, coconut is one of the leading commodities in the estate crops subsector [5] and is grown by smallholder farmers. The Southeast Sulawesi government continues to promote coconut production, especially to increase income of farmers, processors, and the communities. Processing of coconut into copra can create value added [6]. Value addition in agriculture allows farmers or processors to maximize the value of their products in the quantity and quality aspects, and at the same time, receive a larger share of the price from the retail price [7]. In this case, increasing value added through processing can help create jobs, increase income, increase food security, and alleviate poverty, which in turn supports sustainable development [8].

Coconut processing into copra is common in coconut growing villages. This is because copra production provides more income to the producers and is relatively easier to operate. Copra production increases value added, which is the additional value obtained from processing coconut into copra. The determining factors in the analysis of value added consist of technical and economic factors [9]. Technical factors include the amount of raw materials, production capacity, and labor devoted. Raw material prices, labor wages, output prices, and the value of other inputs are examples of economic factors. This value-added information can be used as a reference for producers and potential investors to make investment decisions and for the government to develop coconut commodities [10]. This research was conducted to calculate value added and the factors that influence the value added of copra production.

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2. Materials and Methods

The study was carried out in Mawasangka Subdistrict of Central Buton District in Southeast Sulawesi. The study location was determined purposively because Mawasangka District has the highest coconut cultivation and production area compared to other sub-districts in Central Buton District. In addition, coconut farmers in Mawasangka Subdistrict process coconuts into copra. Three coconut-growing and copra-producing villages were taken as research locations, namely Oengkolaki Village, Balobone Village, and Mapalenda Village. The research was carried out from June to September 2020, and the field survey was conducted in July 2020. To calculate the value added, we employed the production structure proposed by Hayami et al. [9] as used in [4], [8].

Multiple linear regression analysis was used to determine the factors that influence value added [7], [11], with the following equation

$$Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5$$

Where:
Y = Value added (Rp/Kg)
X1 = The amount of coconut (Kg)
X2 = Labor wage (Rp/Kg)
X3 = Copra price (Rp/Kg)
X4 = Price of coconut (Rp/Kg)
X5 = Other inputs contribution (Rp/Kg of raw materials)

3. Results and Discussion

A. Socioeconomic Characteristics of Respondents

The respondents' age ranged from 35 to 70 years, with an average of 53 years. Most respondents (92.2%) were in their productive ages (64 years old or less). The formal educational attainment of respondents was 6.4 years on average, or until they completed elementary school, The average family size was four persons. The average experience of being involved in copra production was 11.1 years. This result implied that most respondents already had sufficient experience in copra production. The length of involvement might have a positive effect on producers' ability to sustain their livelihoods amidst challenges in raw material procurement, processing, and marketing. All producers have their coconut trees but they sometimes buy coconut fruits from other growers to add to the quantity of raw materials they have for copra production.

B. Value Addition

Copra production consists of four steps, namely peeling, breaking the nut into two parts, drying, and removing meat from the shell. The peeling is done by removing the husk and leaving only the shell and coconut meat. The nut is then broken into two parts using a machete. Next, the split nuts are drained of water and placed in a simple traditional kiln for smoke drying. The smoke drying is done using coconut husks and shells as fuel. After being dried, the meat is gouged out of the shell. The gouging process uses hired labor and a reward system based on the number of pieces of gouging. The final task is to cut the meat into pieces to make it easier to put them in sacks.

Smoke drying produces copra with poor quality as it relies on direct contact of combustion gases with coconut meat [12]. Smoke drying produces the so-called *kopra hitam* (black copra), which has a high moisture content, dark color, and high free-fatty-acid content [13]. This inferior quality is reflected in the lower price paid to producers compared to the price of *kopra putih* (white copra). Nevertheless, producers might still receive higher returns from copra production than selling their coconut in other types of products. In other words, copra production provides value added to the producers.

Analysis of value addition is useful for calculating the value added of processed raw materials, namely the value added from processing coconut into copra. The value added is obtained by subtracting the total cost from the total revenue. All components of the analysis use unit of kilograms (kg) of raw materials. Table 1 presents the amount of value added obtained by copra producers.

Table 1
Production structure of copra production

No.	Output, Input, and Price	Value
1	Output (kg/production)	730
2	Raw material input (kg/production)	1,370
3	Labor (man-day/production)	11.45
4	Conversion factor = (1)/(2)	0.53
5	Labor coefficient = (3)/(2)	0.0084
6	Output price (Rp/kg)	5,263
7	Wage rate (Rp/man-day)	70,551
	Income and Profit (Rp/kilogram of raw material)	
8	Raw material input (Rp/kg)	2,014
9	Other current input (Rp/kg)	40.61
10	Product (Rp/kg)(4)x(6)	2,804
11	a. Value added (Rp/kg) = (10)-(9)-(8)	749.38
	b. Value added ratio (%)(11a)/(10)	26.73
12	a. Labor income (Rp/Kg)(5)x(7)	589.39
	b. Labor share (%)(12a)/(11a)	78.65
13	a. Profit (Rp/kg)(11a)-(12a)	159.99
	b. Profit rate (%)(13a)/(10)	5.71

Source: Field survey results

As presented in Table 1, the amount of copra output per one production process is 730 kilograms. The primary raw material used is 1,370 kilograms of coconuts. The average range of working days is 11.45 working days. The output-input conversion factor of 0.5 means that each kilogram of coconut can produce 0.5 kilograms of copra. The labor coefficient is 0.0084, and the average price of copra is Rp5,263 per kilogram. Labor wages are obtained from the average wages of peelers, climbers, and drying workers, then divided by the average number of man-day to obtain a value of Rp70,551/man-day.

The price of the primary raw material or coconut meat in this study averaged Rp2,014 per kilogram. The contribution of other inputs reached Rp40.61 per kilogram. The amount of value added is Rp749.38 per kilogram of coconut (raw material). The value added ratio of 26.73% is the percentage of the division of the value added and the output value. This means that value added of 21.08% can be obtained for each kilogram of raw materials processed. This value added ratio is lower than that obtained in the processing of star fruit [14], cassava [8], cocoa bean fermentation [15], *salak* [16], and sago [7].

Labor income is Rp589.39 per kilogram of raw materials,

while the direct labor share is 78.65%. The profit was Rp159.99 per kilogram of raw material with a profit rate of 5.71%. The low amount and level of profit is due to raw materials and family labor being included as costs. In fact, most raw materials are obtained from their farm, so there is no need to buy them. Likewise, the work of smoking (drying) is carried out by family members so there is no need to hire labor.

To determine the level of the value added obtained, the criteria used by Reyne as cited by Hubeis [17] was employed. Based on the Reyne criteria [17], the value added of 26.73% is in the range of 15-40% or in the medium category. This means that processing coconuts into copra is more profitable than selling raw coconuts. However, this value added ratio is lower than that obtained by Fitria [18] of 51.72%. The value added ratio obtained by Fitria [18] is higher because the price of copra in her research is higher, which is Rp10,000 per kilogram, compared to the price in the study area, which is only Rp5,500 per kilogram.

C. Determinants of Value Addition

Table 2 presents regression results of determinants of value addition in copra production. The F ratio is 3080,597 with a $p < 0,05$, which means that all independent variables together have a significant effect on the value added (Y). The coefficient of determination (R^2) 0.997 means that 99.7% of the value added diversity (Y) can be explained by the diversity of the independent variables (X_i), while the remaining 0.3% is caused by other factors not included in the model. This shows that the model can explain the effect of the independent variable (X_i) on the value added (Y). On the other hand, the correlation coefficient (R) of 0.999 means that there is a very close relationship between value added (Y) and all independent variables (X_i).

Table 2 shows the t-value, which reveals the influence of each independent variable on dependent variable, and regression coefficient as well. Factors that significantly influence value added are copra price, coconut price, and price of other inputs. By incorporating regression coefficients, the regression equation will be as follows:

$$Y = -6684.28 - 0.010X_1 - 0.013X_2 + 2.402X_3 - 2.580X_4 - 1.102X_5$$

Where:

Y = Value added (Rp/kg)

X_1 = Number of coconuts (kg)

X_2 = Labor wage (Rp/kg)

X_3 = Copra price (HOK)

X_4 = Coconut price (Rp/kg)

X_5 = Other inputs (Rp/kg)

The number of coconuts (X_1) has a regression coefficient (b_1) = -0.010 and t-statistic (t_1) = -1.072 with a significance greater than 0.05. This means that the number of coconuts (X_1) is negatively related and has no significant effect on value added. Thus, any addition or reduction of raw materials will not cause an increase or decrease in value added. This is due to the calculation of value added using a conversion factor whose value will remain unchanged without being affected by the amount of raw materials.

The labor wage (X_2) has a regression coefficient (b_2) = 0.013 which has a positive relationship and t-statistic (t_2) = -0.137 with a significance of 0.892 greater than 0.05. Thus, labor wages (X_2) are positively related and have no significant effect on value added. Thus, any reduction or increase in labor wages will not cause an increase or decrease in value added because value added is calculated using a conversion factor multiplied by the price of copra. Labor wages have no relation in the calculation of value added, and the amount of the wages does not affect the amount of value added obtained.

The copra price (X_3) has a regression coefficient (b_3) = 2.402 which has a positive relationship and t-statistic (t_3) = 73.928 with a significance of 0.000 less than 0.05. This means that the price of copra (X_3) has a significant effect and is positively related to the value added in copra processing. The regression coefficient of 2.402 indicates that every increase in the copra price by Rp1,000 will cause an increase in value added of Rp2,402. A decrease in copra price of Rp1,000 will cause a decrease in the value added of Rp2,402 with the assumption of cateris paribus.

The copra price has a significant effect on value added. This means that the greater the selling price of copra received by farmers, the value of selling copra received by farmers will also increase which causes the value added produced to be even greater. The results showed that the price of copra ranged from Rp5,000/kg - Rp5,500/kg with an average of Rp5,263/kg.

The coconut price (X_4) has a regression coefficient (b_4) = -2.580 and t-statistic (t_4) = -105.823 with a significance of 0.000 at 5 percent level. This means that the price of raw materials (X_4) significantly affect value added. The regression coefficient -2.580 means that each increase in the coconut price by Rp1,000 will decrease value added of Rp2,580, and the decrease in the coconut price by Rp1,000 will cause an increase in the value added of Rp2,580 assuming cateris paribus.

The coconut price has a significant and negative relationship

Table 2
Regression results of determinants of value addition in copra production

No.	Independent variables (X_i)	Coefficient (bi)	t-value	Sig.
1	Number of coconuts (X_1)	-0.010	-1.072	0.289
2	Labor wage (X_2)	-0.013	-0.137	0.892
3	Copra price (X_3)	2.402	75.928	0.000*
4	Coconut price (X_4)	-2.580	-105.928	0.000*
5	Other inputs (X_5)	-1.102	-4.136	0.000*
Adjusted R^2	0.997			
R	0.999			
F ratio	3080.597*			
$F_{Sig.}$	0.000*			

Notes: * means significant at 5% level

with value added because the coconut price is the purchase value of coconut per kilogram issued by farmers when selling copra products. Therefore, the higher the price of coconut paid by the farmers, the higher the cost of copra production, which in turn decreases value added. The results showed that the price of coconut ranged from Rp1,800/kg - Rp2,400/kg with an average of Rp2,006/kg.

The other input contribution (X_5) has a regression coefficient (b_5) = -1.102 which has a negative relationship and t statistic (t_5) = -4.136 with a significance of 0.000 at α = 0.05. This means that the contribution of other inputs (X_5) has a significant effect on value added from copra production. The regression coefficient value -1.102 indicates that any increase in the contribution of other inputs by Rp1,000 will lead to a decrease in the value added of Rp1,102. Likewise, a decrease of Rp1,000 in the contribution of other inputs will lead to an increase in value added of Rp1,102 assuming cateris paribus.

Other input contribution variable has a significant and negative relationship to the value added of copra production. The higher the contribution of other inputs spent by the farmers, the higher the cost of copra production, which in turn decreases the value added. The results showed that the average contribution of other inputs for copra production was Rp40.61/kg.

The results of the regression analysis showed that the relationship between value added and the price of copra is positive. In contrast, the relationship between the price of raw materials and the contribution of other inputs each with value added is negative. This result agrees with the findings of Thoriq [19] that raw material prices and output prices affect the amount of value added. The research results by Gandhi, Kumar, and Marsh [20] also show that the main obstacle in developing agro-industry is the lack of supply and the low quality of raw materials. The quality of raw materials is often low, and the time of availability of raw materials is usually relatively short and less consistent.

Copra production generates value added that can benefit producers and rural community in terms of income and employment generation [21], [22]. Based on the research results, efforts to further improve value added need to consider determinants of value addition mentioned earlier. For instance, the copra price can be increased by improving the copra quality and strengthening farmers' institutions [23]. At present, respondents produced black copra through sun-drying or smoking methods. Instead of this direct heating method, producers may use indirect heating to produce white copra at a higher price than black copra [24]. Strengthening farmers' institution will improve bargaining position of producers in copra marketing against intermediaries.

4. Conclusion

The average value added in copra production is Rp749.38/kg of raw material, with a value added ratio of 26.73%. The value added ratio of copra production is included in the category of medium level. Together, the variables of the quantity of coconut, the price of copra, the coconut price, labor, and the contribution of other inputs significantly affect the amount of value added. Individually, the copra price, the coconut price, and other input contributions have a significant effect on value added, while the amount of raw materials and labor wages do not have significant effect at 5%. The copra production business needs to be developed by increasing the volume of raw materials and improving the copra quality, because it is proven able to provide a moderate value added ratio. The government must protect the copra price to assist the community in developing a sustainable copra business.

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