Original Article

ANALYSIS OF PALM OIL FARMING AND PALM SUGAR ADDED VALUE AS AS HERBAL MEDICINE (CASE: KARO REGENCY, NORTH SUMATRA PROVINCE)

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Abstract

North Sumatra is one of the provinces that has the potential as one of the palm-producing regions in Indonesia. The farming management system in Juhar District, Karo Regency includes seed selection which is carried out generatively, namely through seed selection, land preparation, planting, fertilization, pest and disease control, and harvesting. This study aims to analyze sugar palm farming and analyze the added value of palm sugar in Karo Regency, North Sumatra. The analytical methods used are income analysis, feasibility analysis, and the Hayami method. The results obtained indicate that sugar palm farming is profitable and feasible to cultivate. The income of sugar palm farming is Rp. 6,963,069/ha/year. The results of the R/C analysis were 2,303 > 1, so sugar palm farming was feasible to continue. The contribution of the added value ratio of palm sugar processing to palm sugar obtained is 10% with the added value obtained of Rp 2.659/kg palm sugar.

Keywords: Farming, Palm, Palm Sugar, Value Added

Introduction

Oil palm plantations are spread in all parts of Indonesia. In Indonesia, the total area of sugar palm plantations is not known with certainty. However it is known that the main production centers of sugar palm are in 14 provinces included, namely: Papua, Maluku, North Maluku, North Sumatera, West Sumatera, West Java, Central Java, Banten, North Sulawesi, South Sulawesi, Southeast Sulawesi, Bengkulu, South Kalimantan and Nangroe Aceh Darussalam. The total area of oil palm plantation centers in 14 provinces is approximately 70,000 hectares. The highest sugar palm population is West Java Province with an area of 13,135 hectares and the lowest population is in Maluku Province, namely 1,000 hectares (Central Java Forestry Service, 2010).

Aren (*Arenga pinnata* (Wurmb) *Merr.*) is kind of a plant from the Palmae tribe that reaches 25 meters in height, has a sturdy stem, and is covered by black palm fibers known as fibers. Aren (*Arenga pinnata* (Wurmb) *Merr.*) is a plantation crop that has the potential to produce starch and sugar. Sugar palm plants can adapt to various agro-climatic conditions, ranging from lowlands to 1,400 meters above sea level (Effendi, 2009). Sugar palm plantations are mostly carried out by farmers and have not been cultivated on a large scale. Currently, the management of oil palm plantations has not applied good cultivation techniques, therefore the productivity is low. The main product of palm plants is palm wine which is tapped from male flowers and is used as palm sugar, as well as soft drinks, vinegar, and alcohol (Rindengan and Manaroinsing, 2009). Palm trees (*Arenga pinnata* (Wurmb) *Merr.*) are very suitable to be planted in tropical climates such as Indonesia. Sugar palm plants are

usually found in hilly areas, valleys and mountains. This plant can grow anywhere because it does not require intensive care (Shafira, 2015). Palm trees usually produce industrial materials either that have been well known for a long time. Almost all parts of products of this plant can be utilized and have economic value. But unfortunately, this plant has received less attention to be developed or cultivated seriously by various parties. The demand for products produced by this plant, both for export and domestic needs, continues to increase (Sunanto, 1993 and Harahap et al., 2018). Sugar palm plants can absorb and store rainwater through the midrib, roots, and stems in large quantities. These palm plants also play an important role in watersheds. If more and more sugar palm plants are planted in the village, it also can hold water that can flow downstream of the watershed (Rauf, 2015).

In Indonesia, sugar palms can grow well and be able to produce in areas with fertile soil at an altitude of 500-800 meters above sea level. In areas that have a height of fewer than 500 meters and more than 800 meters, sugar palm plants can still grow but the fruit production is not satisfactory (Ministry of Agriculture, 2013). In addition, the amount of rainfall is evenly distributed throughout the year, which is at least 1,200 millimeters per year. If calculated by the formula of Schmidt and Fergusson, the most suitable climate for this plant is a temperate climate to a slightly wet climate (Iswanto, 2009).

Sugar palm has a production function that produces various commodities of high economic value and has the potential to be exported if seriously cultivated because all parts of the plant can be processed into various food and non-food products (Lempang, 2012). The nira can be processed into sugar, palm wine, and bio-ethanol, moreover, the young fruit can be used for making palm fruits, the stem can produce flour if the sap is not tapped and as a raw material for making furniture, leaves for roofing and also its stick can be used for making brooms, palm fiber also can be processed into handicraft products, and roots can be used as herbal medicine because they contain secondary compounds such as saponins, flavonoids, and polyphenols (Ministry of Agriculture, 2011).

The main obstacle in developing sugar palm plantations is the lack of attention from parties involved in agricultural activities, including the government itself. Given the many benefits (multipurpose) that can be obtained from sugar palm plants, it is necessary to think about and take policy steps to make efforts to develop sugar palm plants. If this effort is not carried out, it can be ascertained that in the future the existence of sugar palm plants in Indonesia will be increasingly rare and even potentially extinct (Sunanto, 1993).

North Sumatra is one of the sugar-producing provinces in Indonesia. In addition, North Sumatra is also one of the areas that have great potential in producing sugar palms. This can be proven by the area of sugar palm plantations in North Sumatra. The increase in the area of sugar palm plantations occurred from 2017 to 2019. In 2017, the area of sugar palm plantations in North Sumatra was 6,473 ha. The increase in the area of sugar palm plantations in North Sumatra occurred in 2018 which was 8,25%, so the area of sugar palm plantations was 7,007 ha. 2019 became the year that had the largest sugar palm plantation area from the previous year, which was 7,020 ha. In 2019, North Sumatera had 19 sugar-producing regencies, including Mandailing Natal Regency covering an area of 1,032 ha, South Tapanuli Regency covering an area of 984 ha, Simalungun Regency covering an area of 885 ha, and Karo Regency covering an area of 720 ha. The latest data on the area of sugar palm plantations throughout Indonesia is still unknown, as well as data on the area of oil palm plantations planted in agroforestry areas (North Sumatera Plantation Statistics, 2020).

One of the potential sugar-producing districts in North Sumatera Province is Karo Regency. The regency with the largest land area in North Sumatera is Karo Regency with a land area of 714 ha (Central Bureau of Statistics North Sumatera, 2017). Juhar sub-district is a sub-district that has the largest sugar palm plantation area in Karo Regency, with details of the immature land area of 23,4 ha, productive land of 359 ha, and 30 ha of unproductive land. The amount of sugar palm production produced by Juhar Regency in 2019 was 548,7 tons with an average production of 1,548.41/kg/ha/year. In addition, in Juhar Regency 225 family heads work as farmers (North Sumatera Plantation Statistics, 2020). Sugar palm farming in North Sumatra is still classified as conventional, so there is a need for farming analysis to determine farmers' production so that efforts can be made to increase production and added value to sugar palm plants.

Research methods

Analysis of the data used is descriptive analysis, namely by explaining the pattern of palm cultivation to marketing products in the form of palm sugar through interviews and data collection directly to the field. Data were obtained from sugar palm farmers in Juhar District, Karo Regency. Data processing and data analysis methods use income analysis to find out all the income earned on sugar palm farming by calculating the difference between the total revenue and the total cost (Soekartawi, 2006).

To analyze farmers' income, the following formula is used:

I = TR – TC

Information:

I = Income (Rp)

TR = Total Revenue(Rp)

TC = Total Cost (Rp)

R/C Ratio is a method used to analyze the feasibility of sugar palm farming in the research area. R/C ratio is an abbreviation of return cost ratio or known as a comparison or a comparison between income and costs used. Mathematically, it can be written as follows:

$$A = \frac{R}{C}$$

$$R = P_y \times Y$$

$$\mathrm{C} = \mathrm{FC} + \mathrm{VC}$$

$$A = \left\{\frac{(P_y \times Y)}{(FC + VC)}\right\}$$

Information:

R = Revenue (Rp)

C = Cost (Rp)

Py = Output Price (Rp)

Y = Total Output

FC = Fixed Cost (Rp)

VC = Variable Cost (Rp)

With the following conditions:

Jika R/C > 1, therefore farming is feasible

Jika R/C = 1, therefore farming is equal

Jika R/C < 1, therefore farming is not feasible (Soemadi, 1997).

To analyze the added value obtained from palm sugar processing in the research area, the Hayami method was used (Arvanti *et al*., 2017).

Table 1. Calculation of Value Added Analysis with the Hayami Method

No.	Variables (Output, Input, and Price)	Notation
1.	Output (Kg)	(1)
2.	Input (Liter)	(2)
3.	Tenaga Kerja (Working day/year)	(3)
4.	Conversion Factor	(4) = (1)/(2)
5.	Labor Coefficient	(5) = (3)/(2)
6.	Output Price (Rp/Kg)	(6)
7.	Labor Wage (Rp/Working day)	(7)
	Revenue and Profit	
8.	Raw Chart Price (Rp/Liter)	(8)
9.	Contribution of Other Inputs	(9)
10.	Output Value	(10) = (4) x (6)
11.	a. Added Value (Rp/Kg)	(11a) = (10) – (9) – (8)
	b. Value Added Ratio (%)	(11b) = (11a)/(10) x 100%
12.	a. Labor Revenue (Rp/Liter)	(12a) = (5) x (7)
	b. Labor share (%)	(12b) = (12a)/(11a) x 100%
13.	a. Profit(Rp)	(13a) = (11a) – (12a)
	b. Profit Rate (%)	(13b) = (13a)/(11a) x 100%
	Remuneration for Factors of Production	
14	Margin (Rp/Kg)	(14) = (10) – (8)
	a. Labor Income (%)	(14a) = (12a)/(14) x 100%
	b. Contribution of Other Inputs (%)	(14b) = (9)/(14) x 100%
	c. Farmer Profit (%)	(14c) = (13a) x 100%

Results and discussion

Aren Farming and Marketing Management Systems in Karo Regency, North Sumatra Province

The sugar palm plantation management system in the research area includes seed selection, land preparation, planting, fertilization, pest and disease control, harvesting, and then sugar palm processing. To perform seed selection, plant propagation is done generatively, namely through seeds. Seeds selected for breeding should be of good quality and fully ripe. Seedlings for nurseries were coming from oil palm seedlings that come out of the civet's stomach (natural plant distribution), old seeds picked directly from trees, old oil palm seeds from felled trees, and old palm seeds from fallen fruit. In the process of land preparation, before planting, the land that is used

must be cleared of weeds. Sugar palm plants can grow on clay, muddy and sandy soils, at an altitude between 9 – 2.000 meters above sea level with rainfall of more than 1,200 mm a year (Van, 2005).

Sugar palm planting can be done in monoculture or intercropping. In a monoculture system, the land is first cleared of existing vegetation (land clearing) and land preparation is done by plowing or plowing and making planting holes at the same time. Then, for fertilizing plants aged 1 – 3 years, urea, NPK, drum, and KCl fertilizers can be sprinkled around the palm tree trunks. Fertilization is done after the soil around the plant is loose (Syakir, *et al*, 2009).

Pests that commonly attack sugar palm plants are rhinoceros beetle (*Oryctes rhinoceros*), sago beetle (*Rhinochophorus ferruginous*), and grasshopper (*Sexana spp*). Other pests that suck sap and flowers are bees, bats, and badgers. The way to control it, can be done mechanically, namely by cutting down and burning sugar palm trees that are attacked by the disease. The chemical method is to apply certain pesticides such as heptachlor 10 grams, Diazonin 10 grams, and BHC (Sebayang, 2016). While the types of diseases that often attack sugar palm plants in nurseries are spots and yellow on the leaves caused by *Pestalotia Sp*., *Helmiathosporus Sp.* Control of this disease can be done with fungicides such as Dithane N-45 and Delsene NX 200 (Siregar, 2016).

Income Analysis and Feasibility Analysis of Palm Oil Farming

To calculate production costs, firstly fixed costs and variable costs are determined. Fixed costs are costs whose total amount remains constant, not affected by changes in the volume of farming activities or activities to a certain level. Based on the results of the study, the fixed costs that are taken into account are the cost of land rent, taxes, and depreciation, so the following describes the fixed costs of sugar palm farming in the research area.

Table 2. Average Fixed Cost of Palm Oil Farming in Karo District, North Sumatra Province

No.	**Description**	**Per Farmer (Rp)**	**Per Chain (IDR)**
1.	Land Rental Cost	250.000	111.940
2.	Depreciation Cost	484.144	216.781
Total		**734.144**	**328.721**

Based on Table 2, it can be seen that the average land rental cost is Rp. 250,000 per farmer and Rp. 111,940 per chain, while the depreciation cost of equipment is Rp. 484,144 per farmer and Rp. 328,721 per chain with details of the number of 30 farmers and the total land area used is 67 links. Based on these calculations, the average fixed costs used in sugar palm farming in the research area were Rp. 734,144 per farmer and Rp. 328,721 per chain.

Table 3. Average VariableCost of Palm Oil in Karo District, North Sumatra Province

No.	**Description**	**Per Farmer (Rp)**	**Per Chain (Rp)**
1.	Labor Cost	11.280.000	5.046.269
2.	Fertilizer Cost	176.067	78.836
Total		**11.456.067**	**5.125.105**

Based on Table 3, it can be seen that the largest average variable costs used are labor costs of IDR 11,280,000 per farmer and IDR 5,046,269 per chain. While the smallest variable cost is the cost of fertilization, which is Rp. 176,067 per farmer and Rp. 78,836 per chain with details of the sample size of 30 farmers and the area of sugar palm used in 67 chains. Based on the above calculation, the average variable cost used in sugar palm farming in the research area is Rp. 11,456,067 per farmer and Rp. 5,125,105 per chain.

Table 4. Average Total Cost of Aren Farming in Karo District, North Sumatra Province

No.	**Description**	**Per Farmer (Rp)**	**Per Chain (Rp)**
1.	Fixed Cost	734.144	216.781
2.	Variable Cost	11.456.067	5.125.105
Total		**12.190.211**	12.190.211

Based on Table 4, it can be seen that the average total cost of sugar palm farming in the research area is Rp. 12,190,211 per farmer, which consists of fixed costs of Rp. 734,144 and variable costs of Rp. 11,456,067. While the average total cost of farming per chain is Rp 5,341,886, which consists of Rp 216,781 for fixed costs and Rp 5,341,886 for variable costs. Based on Suratiyah (2015), income is the result of the multiplication between production and selling price and the amount of income earned by farmers in every rupiah spent in farming production activities is influenced by the number of products produced or the costs incurred. Based on the results of the research obtained in the field, the acceptance results are obtained as can be seen in Table 5.

Table 5.Sugar Palm Farming Income in Karo Regency, North Sumatra Province

Description	**Unit**	**Per Farmer**	**Per Chain**
Total Production	Liter	7.585	3.396
Selling Price	Rp	3.633	1.627
Revenue	Rp	27.481.067	12.304.955

Based on Table 5, it can be seen that the average amount of sugar palm production is 7,585 liters per farmer and 3,396 liters per chain. In addition, it can be seen that the average selling price obtained in farming in the research area is Rp. 3,633 per farmer and Rp. 1,627 per chain. The income in the research area is IDR 27,481,067 per farmer and IDR 12,304,955 per chain in one growing season. Farm income is the difference between income and total costs. It can be calculated with the farm income formula, namely:

Income :

I = TR – TC

I = Rp 27.481.067 – Rp 12.190.211

I = Rp 15.290.856.

Income per Chain:

I = TR – TC

I = Rp 12.304.955 – Rp 5.341.886

I = Rp 6.963.069.

Keterangan:

I = Income (Rp)

TR = Total Revenue (Rp)

TC = Total Cost (Rp)

Based on the above calculation, the average income of sugar palm farming in the research area per farmer is Rp. 15,290,856 per farmer and Rp. 6,963,069 per chain. R/C ratio is an abbreviation of return cost ratio or known as a comparison or comparison between income and costs. Mathematically it can be written as follows:

R/C = TR/TC

R/C = Rp 12.304.955 / Rp 5.341.886

R/C = 2.303

With the following conditions:

If R/C > 1, therefore the farming is feasible to carry out or continue

If R/C = 1, therefore the farming reaches the break-even point

If R/C < 1, therefore the farming is not feasible to carry out or continue

The results of the feasibility analysis of farming obtained the R/C value of sugar palm farming in Karo Regency. North Sumatra with a value of more than 1 which is 2,303 where one rupiah issued by sugar palm farmers can generate income of Rp 2,303 so that sugar palm farming in Karo Regency, North Sumatra provides benefits and is feasible to continue.

Analysis of Added Value of Palm Sugar

The definition of added value is the addition of value contained in a product after undergoing further processing which results in a higher value than before undergoing processing (Nurlina et al., 2019). The purpose of the added value analysis is to see how much-added value is contained in one kilogram of agriculture products that are processed into processed products. The profit obtained by the craftsmen from the added value is the profit from one kilogram of processed raw materials after deducting the total costs incurred by the entrepreneur in one production process (Soejono, 2011).

Table 6. Calculation of Hayami Value Added for Palm Sugar in Karo Regency, North Sumatra Province

No	**Variables (Output, Input, Price)**	**Unit**	**Notation**	**Total**
1	Output	Kg	(1)	88,50
2	Input	Liter	(2)	114,00
3	Labors	Working Day	(3)	0,25
4	Conversion Factor		(4) = (1)/(2)	0,78
5	Labor Coefficient		(5) = (3)/(2)	0,002

6	Output Price	Rp/Kg	(6)	33.800
7	Labor Wage	Rp/HOK	(7)	23.000
	Income and Profit			
8	Raw Material Price	Rp/Liter	(8)	2.300
9	Contribution of Other Inputs	Rp	(9)	21.280
10	Output Value	Rp/Kg	(10) = (4) × (6)	26.239
11	a. Added Value	Rp/Kg	(11a) = (10) - (9) - (8)	2.659
	b. Value Added Ratio	%	(11b) = (11a)/(10) × 100%	10
12	a. Labor Revenue	Rp/Liter	(12a) = (5) × (7)	50
	b. Labor Share	%	(12b) = (12a)/(11a)× 100%	1,90
13	a. Profit	Rp	(13a) = (11a) - (12a)	2.609
	b. Profit Rate	%	(13b) = (13a)/(11a) × 100%	98,1
	Remuneration for Factors of Production			
14	Margin	Rp/Kg	(14) = (10) - (8)	23.939
	a. Labor Income	%	(14a) = (12a)/(14) × 100%	0,21
	b. Contribution of Other Input	%	(14b) = (9)/(14) × 100%	88,9
	c. Farmer's Profit	%	(14c) = (13a)/(14) × 100%	10,9

Based on Table 6, the conversion factor from palm fruit to palm sugar is 0,78. This shows that 1 liter of palm raw materials produces 0,78 kg of palm sugar. The labor coefficient obtained based on the carried-out calculations is 0.002. Therefore, to process 1 liter of palm raw materials into ready-to-use palm sugar requires a working day of 0.002. Other input contributions are the costs used to produce palm sugar in addition to the costs used to purchase raw materials and labor costs. The contribution of other inputs is obtained from the sum of joint costs (besides the cost of raw materials and labor costs), then divided by the number of standards used in production activities. Based on the calculations that have been made, the contribution of other inputs is Rp 21.280 per kilogram of raw materials. The output value is Rp 26.239 per kilogram. The output value is obtained by multiplying the conversion factor by the product price. This output value indicates that the value of each product has been produced through processing one liter of palm oil raw materials. The added value is Rp 2.659 per kilogram of palm oil and resulted in a value-added ratio contribution of 10 percent. The added value is obtained by calculating the difference between the value of the project with raw and the contribution of other inputs.

Conclusions and Recommendations

Conclusions

Based on the results of research and discussion, the following conclusions can be drawn as follows:

1. The obtained income from sugar palm farming is Rp 27.481.067,- per chain and Rp 12.304.955,- per farmer. The sugar palm business income is obtained by calculating the difference between the total income earned and the total costs incurred for production activities.

2. From an economical point of view, sugar palm farming in Karo Regency is profitable. It can be seen from the R/C value of 2,303. The value obtained is more than 1, which means that one rupiah spent by sugar palm farmers can generate an income of Rp 2,303,- so sugar palm farming in Karo Regency, North Sumatra provides benefits and it is feasible to continue.

3. The results of value-added analysis using the Hayami method were obtained at Rp 2,659 per kilogram of sugar palm and contributed 105 of the value-added ratio. The added value is obtained by calculating the difference between the value of the products, raw materials, and contribution of other inputs. The value added is a gross added value because it still contains labor income and labor revenue sharing.

Recommendations

Based on the results of research and discussion, the following suggestions can be proposed as follows:

1. For palm farmers, it is expected to be able to increase the production of sugar palm becomes more to increase the income of sugar palm farmers for the sustainability of sugar palm farming.

2. For palm sugar entrepreneurs, it is expected to be able to improve the quality of palm sugar and expand market share to increase the business scale of the palm sugar industry.

3. For the government, it is expected to give more attention by assisting in the form of subsidies and socialization to both palm farms and palm sugar entrepreneurs so that their products can compete in the market.

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