International Journal of Contemporary Sciences (IJCS)
Vol. 3, No. 7, 2025: 67-82

Analysis of Income of Palm Sugar Farmers (Arenga Pinnata) in Giri Madia Lingsar Community Forest, West Lombok District

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A R T I C L E I N F O

Keywords: Income, Palm Farmers, Palm Sugar, Community Forest

Received : 5 June
Revised : 20 June
Accepted: 25 July

A B S T R A C T

Palm sugar (Arenga pinnata) has strong economic potential due to its adaptability to various soil types and its ability to produce multiple products. In the community forest area of HKm Giri Madia, Lingsar Subdistrict, West Lombok, the potential for cultivation is high. This study shows that palm farmers earn an average annual net income of IDR 30,544,321 from palm sugar production, making it a key livelihood source. Processing adds value: IDR 3,280 for traditional sugar, IDR 69,000 for crystal sugar (gula semut), and IDR 18,000 for briquette sugar. With a Revenue-Cost Ratio of 2.6, the business is profitable and worth expanding. Enhancing palm sugar development could improve the economic resilience of farmers and the broader local community

DOI: https://doi.org/10.55927/ijcs.v2i9.120
E-ISSN: 2985-6108
https://journalijcs.my.id/index.php/ijcs/index

INTRODUCTION

The new paradigm of forestry recognizes forests as a multifunctional resource, encompassing economic, ecological and social aspects. Non-Timber Forest Products (NTFPs), as defined in the Regulation of the Minister of Environment and Forestry Number 23 of 2021, play an important role in forest ecosystems and provide economic benefits to the communities around the forest. One of the NTFPs that is easy to find and has high economic value is the palm plant (Arenga pinnata Merr.) (Suhesti & Hadinoto, 2015).

Palm sugar has significant economic potential because of its ability to grow in various types of soil and produce a variety of products such as woven materials, kolang-kaling, palm flour, palm oil, and sap that can be processed into palm sugar and nata pinnata. In Indonesia, palm trees are widespread, including in West Nusa Tenggara (NTB), with the largest area on the island of Lombok. In fact, it was recorded that palm production in NTB reached 366 tons in 2015 (BPS, 2015).

Although the palm sugar industry is often considered a side job, in some areas such as Giri Madia Village, Lingsar District, West Lombok, palm is the mainstay of the livelihood of people living around forest areas. The Giri Madia Community Forest (HKm), which has abundant NTFP potential, including palm oil, showed a significant increase in palm production from 2021 data (Indrasari et al., 2017). The results of an interview conducted with the Chairman of the Forest Farmers Group, Muhammad Munzir, explained that the amount of palm NTFP production obtained from KTH production house data in 2021 was 54,451 tons. The potential income from the palm sugar agroindustry has also been proven to contribute to the community's economy (Patianingsih & Nizar, 2018).

Seeing the high potential for palm utilization in HKm Giri Madia, this study aims to find out more about the income of the palm sugar farming community in the HKm Giri Madia area, Lingsar District, West Lombok Regency.

LITERATURE REVIEW

Social Forestry

Regulation of the Minister of Environment and Forestry Number P.83/MENLHK/SETJEN/KUM.1/10/2016 on Social Forestry defines social forestry as a forest management system carried out within state forest areas or privately owned forests, implemented by local communities as the main actors. This initiative aims to improve community welfare, environmental balance, and socio-cultural dynamics. Social forestry includes Village Forests, Community Forests, People's Plantation Forests, Private Forests, Customary Forests, and Forestry Partnerships.

Social forestry is a concept aimed at increasing community participation, with the expectation that it will enhance the role of local communities in the management of natural resources in Indonesia (Rahman et al., 2021). Initially, social forestry conflicted with the traditional forestry concept in Indonesia, which was viewed purely from a technical perspective—excluding participatory involvement of communities in land and forest management.

Utilization of Non-Timber Forest Products

Optimal utilization of Non-Timber Forest Products (NTFPs) can be achieved through greater diversity of NTFP types, allowing for a wider range of marketable products. Diversifying agroforestry products in a given area increases the variety of goods that can be sold, which in turn is expected to support the economic well-being of rural communities (Wulandari, 2015).

Sugar Palm (Aren)

Sugar palm (Arenga pinnata Merr.) is a type of palm with considerable economic value and is widely distributed throughout Indonesia. Almost all parts of the sugar palm—from the leaves to the roots—can be utilized (Lempang, 2014). A wide variety of products derived from sugar palm are marketed daily, and demand for these products continues to rise both domestically and for export. Key sugar palm products used as sources of food and energy include palm sugar, crystal sugar (gula semut), fresh sap, kolang-kaling (sugar palm fruit), and alcoholic beverages. In addition, sugar palm is also commonly used as raw material for handicrafts and construction (Manambangtua et al., 2018).

Income Analysis

In economics, income is defined as monetary or other material gains derived from the use of assets or human labor. It encompasses earnings from a company's activities, referred to by various names—sales, service fees, interest, dividends, royalties, and rent. This definition portrays income broadly: it includes both earnings from the company's normal operations and those from non-operating activities. In contrast, revenue refers specifically to income generated from the sale of products, merchandise, services, and earnings from each transaction. Essentially, revenue represents the top-line sales figure, while income denotes the broader net outcomes that follow after deducting expenses.

METHODOLOGY

The research method used in this study is the mixed methods approach. According to Creswell (2014), mixed methods research is a research strategy that combines or integrates both qualitative and quantitative approaches in a single study to provide a comprehensive analysis. This research was conducted in HKm Giri Madia, located in Giri Madia Village, Lingsar District, West Lombok Regency.

The study utilizes two types of data: Quantitative data, which includes measurable data such as the economic value of water utilization, and Qualitative data, which includes non-numeric information such as respondents' identities, educational background, number of dependents, and contextual explanations that support interpretation and conclusions.

Five data collection techniques were employed: literature review (preliminary), observation, interviews, questionnaires, and documentation. Primary data was collected directly by the researcher, both qualitative and quantitative, using interviews, observation, and documentation. This includes information such as respondents' occupations, income, family size, and other relevant details. Secondary data was gathered from related institutions, such as village authorities, youth organizations, and local community groups, in the form of documents related to the participation of these institutions in the

development or management of water environmental services (e.g., village profiles, official records, and other documents). The total number of farmer respondents in this study was 68 individuals.

Data Analysis

The collected data is then processed and analyzed which includes: receipts, costs, revenue, and R/C ratio analysis.

1. Cost

The combination of fixed costs and variable costs is called total cost which is generally formulated (Irmayani, 2021) as follows:

$$TC = FC + VC \quad (3.3)$$

Information:

TC = Total cost

FC = Fixed Cost

VC = Variable Cost

Agricultural revenue can be accepted by farmers, revenue must be deducted from the costs incurred in farming. Farm revenue is the multiplication between the production obtained and the selling price of the product using the formula (Irmayani, 2021) as follows:

$$TR = Q.P \quad (3.4)$$

TR = Total Revenue

Q = Production

P = Price

2. Income

Based on research (Irmayani, 2021) income is all income obtained from other parties as a sign of reciprocity for services rendered, where the income is used to meet the needs of families or individuals. So that it can be concluded that income is all income obtained from other parties for economic activities in a certain period by using the following formula:

$$\pi = TR - TC \quad (3.5)$$

Π = Income

TR = Total Revenue

TC = Total cost

3. Feasibility Analysis

To determine the feasibility of farming, an analysis of the R/C ratio (Return Cost Ratio) is used, which is the ratio (ratio) between income and costs. Mathematically, it can be written as follows:

$$a = R/C \quad (3.6)$$

$$R = Py.Y \quad (3.7)$$

$$C = FC + VC \quad (3.8)$$

$$a = (Py - Y) / (FC + VC) \quad (3.9)$$

Information:

a = Value of te revenue-to-cost ratio

R = Revenue

C = Cost

Py = Output Price

Y = Output

FC = Fixed cost

VC = Variable cost

If:

a > 1 The farming business is considered feasible

a = 1 The farming business is considered break-even (neither profit nor loss)

a < 1 The farming business is considered economically unfeasible

5). Added Value Analysis

The amount of added value obtained from the palm sales business, it can be calculated using the hayami method presented in Table 1.

The basis for the calculation of value-added analysis is per kg of output, standard prices used for inputs/raw materials and production at the processor/producer level. Added value describes the rewards for labor, capital, and management.

RESULTS AND DISCUSSION

HKm Giri Madia is one of the HKm in West Nusa Tenggara. HKm Giri Madia is located in Giri Madia Village, Lingsar District, West Lombok Regency.

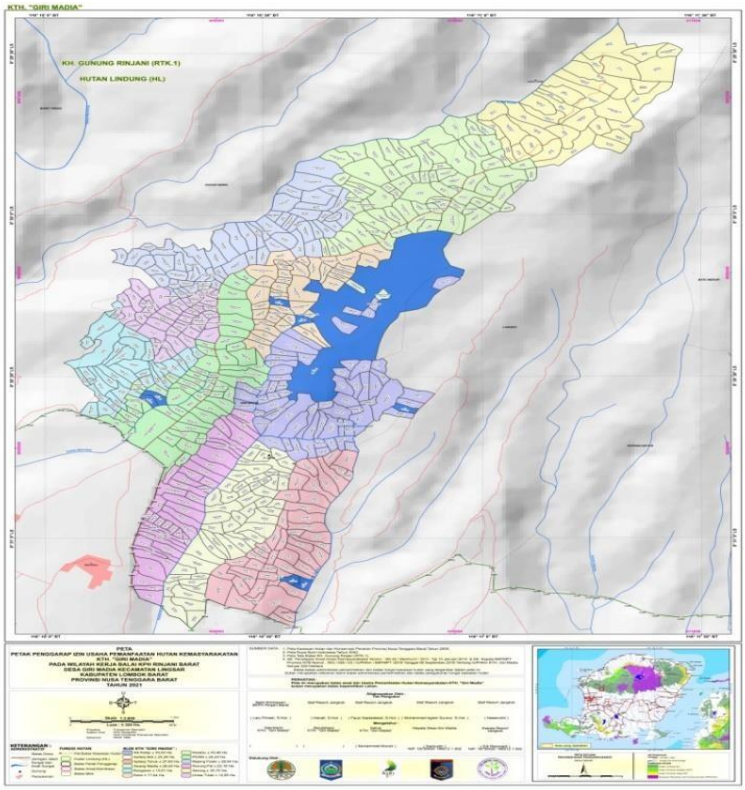

Figure 1. Map of HKm Giri Madia Area

HKm Giri Madia covers an area of 329 hectares, characterized predominantly by moderate to steep slopes. This area is designated as protected forest, as stipulated by the Decree of the Forestry Service in 2014, with the reference number 1170/41/DISHUT/2014. Within this HKm area, there is an active forest farmer group that manages the land and has been granted a Community Forest Utilization Permit (IUPHKm). The group consists of 394 members, organized into 12 sub-groups.

Analysis of Income

Harvesting or tapping of palm sap is carried out every day and in the morning and evening.

Table 1. Number of Nira Aren harvesters of all respondents

Range of sap harvest (liters)	Number of Respondents	Average morning (liters)	Average afternoon (liters)
0 (not ready to harvest)	12	0	0
2 – 10	31	6,2	4,5
>11 – 20	22	14,9	18,3
>21-30	10	29	0
>31-40	5	35	0
Sum	80	85,1	22,9
Average	16	17,02	4,56

Based on the results of table 1, the respondents who are ready to harvest are 68 people with an average harvest in the morning of around 17.02 per liter and in the afternoon of around 4.56 liters.

Table 2. Number of Palm Sap Harvest Per Day, Week, Month, and Year

No	Information	Average sap harvest (lt/resp)
1	Per Day	21,58
	Per Week	151,06
3	Monthly	604,24
4	Per Year	7.250,88

Based on the results presented in Table 2, the average daily sap harvest is approximately 21.58 liters. This amounts to 151.06 liters per week and an average of 604.24 liters per month, resulting in an annual total of approximately 7,250.88 liters of sap harvested per farmer. However, the sap yield observed in this study is higher than that reported in similar research conducted by Dimas et al. (2022), where the average annual sap production of palm trees in HKm Binawana was recorded at 1,669.606 liters per year.

Production Cost

1. Fixed Costs

Fixed costs are costs whose total amount remains within the range of a specific activity change. The fixed cost in this study is the cost of depreciation of the tool. The cost of tool depreciation can be seen in the table below.

Table 3. Average Fixed Cost of Palm Sugar Per Respondent (*Fixed Cost*)

No	Cost Composition	Price/Unit (Rs)	Number of Units	Total (Rs.)	Economical Age (Rp/year)	Tool Depreciation Per Year (Rp/year)
1	Wajan	354.754	1	354.754	5	70.950,8
2	Parang	26.153	1	26.153	4	6.538,1
3	Ladder	18.695	8	151.670	5	30.334,0
4	Man	22.850	4	96.478	5	19.295,6
5	Such	20.017	4	80.068	5	16.013,6
Sum		442.469	18	709.122	24	143.132,1

Source: Primary Data, 2025

Based on table 3. It can be seen that the total amount of fixed costs incurred in carrying out production by palm sugar producers in HKm Giri Madia per respondent is 143,132/year obtained from the cost of shrinkage of equipment.

2. Fixed Costs (Variable Costs)

Variable cost refers to a cost that varies in direct proportion to changes in the volume or level of business activity, such as the quantity of goods or services produced or sold by a company.

Table 4. Non-Fixed Costs

No	Cost Composition	Number of processed (per year)	Price/unit (Rp/year)	Amount (Rp/year)
1	Firewood	12	300.000,00	3.600.000
2	Nira	7.520,88	2.000	14.501.760
3	Workforce	0	-	-
Sum		-	302.000,00	18.101.760,00

Source: Primary Data, 2025

Palm farmers harvest sap daily, with yields ranging from 15 to 30 liters per day, depending on the number of palm trees owned. It is known that 5 liters of sap are required to produce 1 bungkul (a unit equivalent to one coconut shell) of palm sugar per production cycle. The price of sap per liter is Rp 2,000, resulting in an estimated annual raw material cost of Rp 14,501,760 for sap—the main input in palm sugar production. According to the research findings, the firewood cost

used in the palm sugar production process is approximately Rp 300,000 per month, totaling Rp 3,600,000 per year. Thus, the total variable (non-fixed) costs incurred by each palm sugar producer in HKm Giri Madia amount to Rp 18,101,760 per year per respondent.

Total Cost

Table 5. Total Cost of Palm Sugar Production

Yes	Description	Total Cost (Rp/Year/Rec.)
1	Fixed Fees	143.132,00
2	Non-Fixed Costs	18.101.760,00
	Sum	IDR 18,244,892.00

Based on Table 5, the total annual production costs incurred by farmers in HKm Giri Madia for producing palm sugar amounted to Rp 18,244,892, which was derived from a combination of fixed costs and variable costs

Palm Sugar Production Income

The income produced by palm farmers is obtained from the calculation of the average gross income, receipts and net which can be reviewed in table 5.

Table 6. Average Net Income of Palm Sugar Production Per respondent

Average Production Value (Receipt) (Rp/year/resp.)	Average Production Value (Expenses) (Rp/year/resp.)	Average Total Revenue (Rp/year/resp.)	Average Total Revenue (Net income) (Rp/year/resp.)
32.835.857	18.244.892	14.590.695	1.215.891,25

Source: Primary Data, 2025

The average annual production value or gross income earned by palm farmers is approximately Rp 32,835,857, with the selling price of sap per block set at Rp 22,000. The average production cost incurred by farmers is Rp 18,244,892. Therefore, the net annual income of palm farmers is calculated by subtracting total expenditures from gross income, resulting in approximately Rp 14,590,695. When broken down on a monthly basis, this equates to an average net income of around Rp 1,215,891.25 per month. The income level of palm farmers in HKm Giri Madia is still lower compared to that reported in the study by Pratama et al. (2020), which focused on palm farmers in HKm Binawana Village, Kebun Tebu District, West Lampung Regency. In that study, farmers earned a significantly higher monthly net income of Rp 4,672,588.

Input and Output of Palm Products

Input is the amount of raw materials used in production in one production period to produce derivative products from palm trees. Inputs can be raw materials or semi-finished materials. Output is the amount of production produced during a single production period.

Table 7. Table of Palm Products Input and Output

Uraian	Palm sugar		Ant Sugar		Sugar Briquettes	
	Raw Material Consumption (liters)	The product is produced (kg)	Raw material usage (Kg)	Products produced (Kg)	Raw material usage (Kg)	Products produced n(Kg)
Per Day	55	9	25	25	5	5
Monthly	1.155	189	200	200	20	20

Source: Primary Data, 2025

In this study, the outputs produced include palm sugar, ant sugar (gula semut), and briquette sugar, with kilograms (kg) as the unit of measurement. Based on Table 8, the average daily production of palm sugar is 9 kg, processed from 55 liters of sap. On a monthly basis, farmers in HKm Giri Madia are capable of independently producing an average of 155 kg of palm sugar using 1,189 liters of sap. The average output of ant sugar produced by farmer groups is 25 kg per production cycle, using 25 kg of palm sugar as raw material. In one month, they can produce 200 kg of ant sugar by processing 200 kg of palm sugar, indicating a 1:1 production ratio. Similarly, forest farmer groups produce an average of 5 kg of sugar briquettes per production cycle, using 5 kg of palm sugar. Over the course of a month, they can produce 20 kg of sugar briquettes from 20 kg of palm sugar, also reflecting a 1:1 ratio. This data shows that both ant sugar and briquette sugar are produced from palm sugar in a 1:1 conversion ratio, meaning that each kilogram of palm sugar yields one kilogram of processed product.

Input Price, Output, Output Value, Value-Added and Value-Added Ratio

The cost or price paid by a producer to acquire raw materials used in the production process is referred to as the input price. This price is often influenced by the location or source from which the raw materials are obtained. The output price refers to the price set by the producer for the finished goods, and it is determined by both production costs and market conditions. The output value is the result of multiplying the output price by the conversion factor, reflecting the value of the product derived from a unit of raw material. The added value represents the increase in economic value resulting from the transformation of raw materials through the production process.

The value-added ratio is calculated by comparing the added value to the output value. According to Darmawan & Rahim (2018), a value-added ratio

greater than 50% (0.5) is considered significant, indicating high efficiency and profitability in the production process. Conversely, a ratio below 50% is considered low, suggesting limited economic gain from processing. Table 9 below presents the detailed figures for input price, output price, output value, added value, and the value-added ratio.

Table 8. Input Price, Output, Output Value, Added Value, and Palm Product Added Value Ratio

No	Description	Value (Rp/Kg)		
		Palm sugar	Ant Sugar	Sugar Briquettes
1	Input price	2.000	15.000	15.000
2	Output Price	22.000	85.000	56.000
3	Output Value	5.280	85.000	56.000
4	Added Value	3.280	69.000	18.000
5	Added Value Ratio	0,62	0.81	0.32

1. Palm sugar

To calculate added value, it is necessary to compare the price of the raw input (sap water) with the output value generated after processing, in order to determine the value added through product diversification. The price of sap water is Rp 2,000 per liter, while the average selling price of palm sugar (output) is Rp 22,000 per kilogram. The output value per liter of sap is calculated to be Rp 5,280, obtained by multiplying the conversion factor (0.24) by the output price. The added value from producing palm sugar is Rp 3,280, which is the result of subtracting the input cost (sap price) from the output value. Based on this calculation, the value-added ratio for palm sugar production is 0.62 or 62%, indicating that palm sugar production generates a relatively high level of added value, as it exceeds the 50% benchmark.

2. Palm Sugar Powder

In this study, *gula semut* (palm sugar powder) is a processed product produced by the farmer group at the KTH Giri Madia production house. To produce *gula semut*, the farmer group purchases raw materials from palm sugar producers or farmers. Based on Table 4.9, the average input cost incurred by the farmer group for production is Rp 15,000 per kilogram of palm sugar, which is then processed into *gula semut* with a 1:1 conversion ratio. The selling price or output value of *gula semut* is Rp 85,000 per kilogram. Since the production ratio is 1:1, the output value of *gula semut* equals the product's selling price, i.e., Rp 85,000. The value added generated from *gula semut* production by KTH Giri Madia is Rp 69,000, with a value-added ratio of 0.81 or 81%, indicating that the *gula semut* production process generates significant added value.

3. Briquette Sugar

Briquette sugar is one of the products produced by the farmer group in HKm Giri Madia. Similar to *gula semut* (palm sugar powder), the production of briquette sugar also involves purchasing raw materials from palm sugar producers or farmers within the HKm area. The average cost spent on raw materials is Rp 15,000 per kilogram of palm sugar. The selling price or output value of briquette sugar sold by the farmer group is around Rp 56,000 per kilogram (equivalent to 4 jars). The output value of the briquette sugar product is Rp 56,000, and the value added generated from the production process is Rp 18,000, with a value-added ratio of 0.3 or 30%, indicating that the production of briquette sugar yields relatively low added value.

Value-added calculation framework

This value-added calculation framework is compiled based on the Hayami model value-added calculation method. Calculation with this method, the author only took the calculation formula and conducted an independent analysis based on the data that had been obtained from the interview results.

Palm Sugar Value-Added Calculation Framework

This value-added calculation is based on the Hayami method, where the author adopted the calculation formula and conducted an independent analysis using data obtained through interviews.

Based on the data presented in Table 10, it is shown that palm sugar production per batch is 6 kg, which is processed from 25 liters of sap, resulting in a conversion factor of 0.24. This indicates that every 1 liter of sap yields approximately 0.24 kg of palm sugar. The labor involved consists of one worker, namely the farmer themselves, resulting in a labor coefficient of 0.03 workdays (HOK) per kilogram of palm sugar.

The value added from processing sap into palm sugar is Rp 3,280 per liter. This figure is derived from subtracting the cost of other inputs from the output value. The resulting value-added ratio is 0.62 or 62%, meaning that the processing activity contributes an added value of 62%. This is considered relatively high, as it exceeds the 50% threshold.

No labor compensation is included in the production of palm sugar in HKm Giri Madia, as the forest farmers or palm sugar producers carry out the entire process independently, without employing paid labor. The profit earned from palm sugar production is Rp 1,500, representing a 100% profit margin of the product value.

Table 10. Palm Sugar Value-Added Calculation Framework

Variabel	Value	
Outputs, Inputs, and Prices		
Output (Kg)	A	6
Raw Material (L)	B	25
Labor (JKO/month)	C	0
Conversion Factors	D=A/B	0.24
Labor Coefficient	E=C/B	0.00
Output Price(Rp./Kg)	F	22000
Average Labor Wage (Rp./HOK)	G	0
Income and Profit (Rp./Kg)		
Raw Material Price (Rp./Kg)	H	2000
Other Input Contribution(Rp/Kg)	I	0
Output Value	J=QxF	5280
a. Added value	K=J-I-H	3280
b. Value-added ratio	L%=(K/J)x100%	0,62
a. Labor compensation	M=ExG	0
b. Labor section	N%=(M/K)x100%	0
a.Advantages	0=K-M	3280
b. Profit level	P%=O/Kx100%	1
Return for Production Factor		
Margin	Q=J-H	3280
a.Advantages	R=O/Q x 100%	1.00
b. Workforce	S=M/Q x 100%	0.00
c.Other inputs	T=I/Q x 100%	0.00

Source: primary data, 2025

The results of this analysis also illustrate how the value-added margin from raw materials is distributed among various components, including labor compensation, other input contributions, and producer profit. In the case of palm sugar production, the margin obtained is Rp 3,280, which is allocated as follows: 0% for labor income, 0% for other inputs, and 100% as profit for the producer or business owner. This indicates that the entire value-added in palm sugar production is retained as pure profit, with no distribution to labor or additional input costs beyond the raw material.

R/C Ratio Analysis

The feasibility of palm farming was assessed using the Revenue-Cost (R/C) Ratio analysis, which resulted in a value of approximately 2.60, indicating a financially viable and profitable farming activity. The R/C Ratio is a useful tool for determining the feasibility of agricultural enterprises. A value greater than 1 suggests that the business generates more revenue than cost, making it economically worthwhile. The following is the calculation used to determine the feasibility of palm farming:

R = Py.Y
R = 22.000
R = 132.000

C = FC+VC
C = 397,58 + 50.282
C = 50.679,58

a = R/C

$$a = \frac{Rp.\ 132.000}{Rp.\ 50.679{,}58}$$

a = 2,60

Based on the results of the feasibility analysis, the selling price of cocoa sugar is Rp 22,000, which is multiplied by the total output of 6 units, resulting in a total revenue of Rp 132,000. The total cost is calculated by summing the fixed and variable (non-fixed) costs, with an average total cost of Rp 50,282. To determine feasibility, the Revenue-Cost Ratio (R/C Ratio) is calculated by dividing total revenue by total cost. The resulting R/C Ratio is approximately 2.60, which is greater than 1. Since a > 1 (2.6 > 1), this indicates that palm farming is financially feasible and can be considered a viable business venture.

CONCLUSIONS AND RECOMMENDATIONS

Palm sugar farmers in HKm Giri Madia earn an average net annual income of Rp 14,590,695 from palm sugar production, indicating that this activity remains a potential and significant source of income for local farmers.

The processing of palm-derived products contributes substantially to farmers' economic well-being. The value-added from processing is notably high: palm sugar yields Rp 3,280, ant sugar (gula semut) Rp 69,000, and sugar briquettes Rp 18,000.

Palm-based products hold strong potential for further development, as reflected in the Revenue-Cost Ratio (R/C Ratio) analysis, which yields a value of 2.6. This indicates that the palm product business is financially viable and feasible for continued investment and expansion. The government should provide greater support to forest farmers, particularly through business mentoring and access to capital. urther research is needed on the development and marketing efficiency of palm sugar, crystal sugar (gula semut), and sugar briquettes in the HKm Giri Madia area.

ACKNOWLEDGMENT

The author would like to express sincere gratitude to Prof. Dr. Ir. Markum, M.Sc. and Mr. Budhy Setiawan, S.Hut., M.Si. for their valuable guidance and insightful input throughout the research process. The author also extends appreciation to fellow classmates for their technical assistance in data collection and analysis. Special thanks are also due to the author’s family for their unwavering moral support and encouragement.

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