



Analysis of Financial Feasibility and Added Value of Mangrove Plants Processed Product: A Case Study in Kampung Nipah, North Sumatra Province, Indonesia

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Abstract. The mangrove ecosystem provides many benefits for the environment and ecosystem services. Mangrove economically can be utilized to become any miscellaneous food and drink. One of the potential mangrove areas is Kampung Nipah, Sei Nagalawan Village, Perbaungan District, Serdang Bedagai Regency, North Sumatra. This study aims to identify the technical aspect of product processing and to analyze the financial feasibility and the added value distribution of mangrove processed products. Data collection used the census method and the open interview method with the leader and members of Kelompok Tani MuaraTanjung and data analyzed using the quantitative descriptive method. The result shows that the processing product is still manual and done cooperatively. The products obtained are Jeruju chips, Pedada syrup, and Dodol Api-Api. The business of mangrove processed products produces profit and worth by financial with a Revenue Cost Ratio (R/C) value of 1.6, 1.2, and 1.2, respectively. The Payback Period is 2, 5, and 4, respectively. Break Even Point (BEP) is 15, 13, and 14, respectively. And the BEP Analysis in Rupiah is Rp 5.045, Rp 10.098, and Rp 8.001. All the results show a profit. The added value for each product is Rp 52.871/kg, Rp 20.725/kg, and Rp 31.318/kg.

Keyword: Financial Analysis, Kampung Nipah, Mangrove Plants, Mangrove Processed, Products Value Added

Received 21 September 2022 | Revised 25 August 2022 | Accepted 26 August 2022

1 Introduction

A third of the world's mangrove area is in Indonesia, with 44 major species [1]-[3]. It makes Indonesia the most prominent and prosperous mangrove forest country on a global scale [4]. Mangrove is a type of plant that grows on the coast and has a unique and distinctive form of the forest ecosystem found in tidal areas and is tolerant of seawater salinity. Almost all the coasts in

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Indonesia are covered with mangroves. Mangroves have a vital function in coastal ecosystems. The existence of mangroves can withstand aberrations [5]-[7].

Mangrove ecosystems provide many environmental benefits and ecosystem services, such as being a valuable habitat for biodiversity conservation, adaptability to sea level rise, natural barriers that block storms and tsunamis, and potential as carbon sinks [8]-[13]. Economically, mangroves can be used directly for daily needs such as firewood, building materials, household needs, paper, medicine, bark, and charcoal. Even fruit can be processed into various foods and beverages [14].

One of the potential mangrove area is Kampung Nipah, Sei Nagalawan Village, Perbaungan District, Serdang Bedagai Regency, North Sumatra [15]. Kampung Nipah has enormous potential for its natural resources and is the object of mangrove ecotourism. The economic value of mangrove ecotourism in Kampung Nipah with the travel cost method was Rp 19.658.622.505/year [16]. Kampung Nipah has tremendous potential in tourism development and its processed products.

Some of the mangrove plants in Sei Nagalawan Village have been used by the surrounding community for processed food and beverage products. The processing is carried out by Kelompok Tani Muara that located in Sei Nagalawan Village. Mangrove processing product is one of the leading businesses in this ecotourism object, both as an educational tour package and as food for a souvenir. Therefore, a study is needed to assess the mangrove processed products in Kampung Nipah.

This study aims to identify the technical aspect of the product processing, to analyze the financial feasibility and the added value distribution of mangrove processed products as a support for ecotourism activities at the Kampung Nipah, Sei Nagalawan Village, Perbaungan District, Serdang Bedagai Regency, Sumatera Province. North, Indonesia.

2 Research Method

2.1 Data Collection

A. Unit of Analysis

The bottom analysis and added value are carried out on unit analysis in the form of the Kelompok Tani Muara Tanjung as the management agency for the Kampung Nipah Mangrove Tourism Object.

B. Data Source

This study uses the census method. The data collected includes primary and secondary data related to the procurement of raw materials, processing processes, work management, and the

sale of mangrove processed products. The study respondents are the leader and all Kelompok Tani Muara Tanjung members. The total numbers of respondent are 27.

2.2 Analysis of Financial Feasibility

A. Analysis of Business Income

This analysis aims to determine the amount of profit obtained from the business. According to [17] formulated as follows:

$$I = TR - TC \quad (1)$$

Information: I = Income

TR = Total Revenue

TC = Total Cost

To determine the total revenue and total cost, formula used:

$$TR = P \times Q \quad (2)$$

$$TC = TFC + TVC \quad (3)$$

Information: P = Price per unit

Q = Quantity product

TFC = Total fix cost

TVC = Total variable cost

According [17], Profitability criteria used are:

- if total revenue > total cost, then the business is profitable.
- if total revenue = total cost, then the business is neither profit nor loss.
- if total revenue < total cost, then the business is loss.

B. Analysis of Revenue Cost Ratio (R/C)

This analysis aims to examine the extent to which the profitability results are obtained from a business's capital. This analysis measures how far each rupiah can provide a value of revenue as a benefit. According to [18], the formula for calculating the R/C value is as follows:

$$R/C = \frac{\text{Total Revenue}}{\text{Total Cost}} \quad (4)$$

Profitability criteria used are:

$R/C > 1$, then it is profitable; $R/C = 1$, then it breaks even; $R/C < 1$, the it is loss.

C. Analysis of Payback Period

The Payback Period is the time it takes for the funds embedded in an investment to be fully recovered. According to [19] it can be done with the following formula:

$$PP = \frac{\text{Total cost}}{\text{Total Revenue}} \times 1 \text{ time production} \quad (5)$$

D. Analysis of Break Even Point (BEP)

BEP is needed to determine the volume of sales or production of a company and is a point where the company does not make a profit and does not suffer a loss. According to [20], it can be done with the following formula:

$$BEP \text{ (Product Volume)} = \frac{TFC}{P/\text{unit} - VC \text{ unit}} \quad (6)$$

Alternatively, the calculation of BEP based on rupiah units is carried out with the following formula:

$$BEP = \frac{\text{Total Cost}}{\text{Total Product}} \quad (7)$$

2.3 Analysis of Added Value

A. The Added Value

Analysis of a product's added value is needed to determine whether the product provides added value to the surrounding community even though it does not provide benefits in its production. If the amount of output per production is A, and the amount of raw material needed for one production in kg is B. Then the conversion factor is:

$$D = \frac{A}{B} \quad (8)$$

Calculation of the output value is as follows:

$$J = D \times F \quad (9)$$

Information: J = Output value

D = Conversion factor

F = Output price

The formula for calculating added value is formulated as follows:

$$K = J - I - H \quad (10)$$

Information: K = Added value

J = Output value

I = Others input

H = Raw material prices

2.4 The Added Value Distribution

The distribution of added value is obtained through added value analysis and the distribution of added value through the profit margin received by each actor (marketing agency) [21]. The profit margin (retribution) obtained by the production factor actors can be formulated as follows:

$$\text{Margin} = \text{Output value (J)} - \text{Raw material prices}$$

Furthermore, for the calculation of the profit level (V) obtained can be formulated as follows:

$$T = \frac{U}{K} \times 100\% \quad (11)$$

where K is the added value and U is the profit formulated:

$$U = K - S \quad (12)$$

where, V is the profit rate, K is value added and S is labor income. Labor income is obtained by the formula:

$$S = Q \times R \quad (13)$$

Where, Q is the labor coefficient obtained from the number of workers (O) in the conversion section (P). R is labor. Furthermore, the labor share can be formulated.

$$K = \frac{S}{T} \times 100\% \quad (14)$$

3 Result and Discussion

Based on [22], the species found in Sei Nagalawan Village are *Avicennia marina*, *Rhizophora mucronata*, *Avicennia alba*, *Rhizophora apiculata*, *Avicennia officinalis*, *Brugiera cylindrica*, *Xylocarpus moluccensis*, and *Sonneratia caseolaris*. Abundant species will be processed into mangrove processed products made into food and beverages.

3.1 Mangrove Processed Production

A. Production of Jeruju Chips

Jeruju (*Achantus ilicifolius*) is one of the mangrove plants that grows in muddy areas or along riverbanks in Sei Nagalawan Village and is used by the community as chips to increase income. The community also uses Jeruju leaves as medicine. By the statement [23] that the plant *A. ilicifolius* can be used as an ornamental plant because of its flower beauty. Several studies have shown that bioactive compounds from this plant can fight disease. The chemical compounds in *A. ilicifolius* function as neuralgia, analgesic, anti-inflammatory, antioxidant, antifertility, hepatoprotective, anti-tumor, anti-leukemia, anti-cancer, anti-microbial, anti-viral, and anti-fungal as well as natural insecticides.

The raw material for jeruju chips used by Kelompok Tani Muara Tanjung is jeruju leaves that grow around the banks of the Nagalawan River. Cultivation of jeruju leaves is done by picking the shoots of the jeruju plant and choosing healthy leaves. The shoot system is considered very good for the growth and development of jeruju leaves because the shoots picked in a few months will appear as new shoots that can be used continuously as raw material for jeruju chips. The abundant raw material availability for jeruju chips products can be an alternative developed business. The production can also be carried out continuously every month throughout the year.

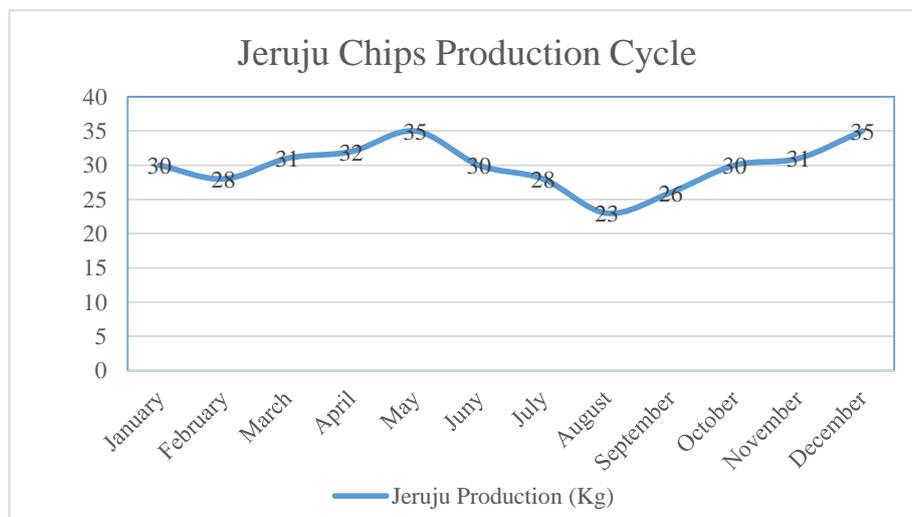


Figure 1 Jeruju Chips Production Cycle

The number of jeruju chips per production is 5-8 kg. Due to the limited marketing range, the production of jeruju chips is only around 30 kg per month (Figure 1). The highest production is usually in the season before school holidays when they do many field learning activities in the form of food processing practices from mangrove plants (educational tour packages). The amount of products produced for one month is \pm 30 kg. The time required for each production is 4-5 hours. To produce 5 kg of jeruju chips, it needs 1 kg of jeruju leaves. Jeruju chip products

have three flavors: original, balado, and corn flavor. Consumers can choose flavors according to their tastes. Jeruju chips are sold for Rp 8.000 per pack.

B. Production of Pedada Syrup

Pedada (*Sonneratia caseolaris*) fruit is used by the community as a syrup, but the population of pedada trees is not too much in Sei Nagalawan Village. Pedada only produces twice a year, with the abundant around June. The fruit taste is sour, but with good processing techniques, it will produce products with a suitable taste and high economic value. *S. caseolaris* fruit has several advantages compared to other types of mangrove plants. Namely, the fruit's nature is improper, so it can even be eaten directly [24]. The sour taste, distinctive aroma, and soft texture of the fruit make *S. caseolaris* suitable for processing into several food products such as jenang, dodol, jam, and syrup.

Kelompok Tani Muara Tanjung requires 5 kg of raw pedada fruit to produce 7 liters of syrup per production. The time required is 2-3 hours. Pedada syrup products are sold for Rp. 12.000,-/bottle. So far, the production of pedada syrup is made by order because the pedada syrup produced by Kelompok Tani Muara Tanjung does not use preservatives, so the syrup produced cannot last long. Due to seasonal factors, the production of pedada syrup fluctuates every month and can only produce as many as 100 bottles per fruit season (Figure 2).

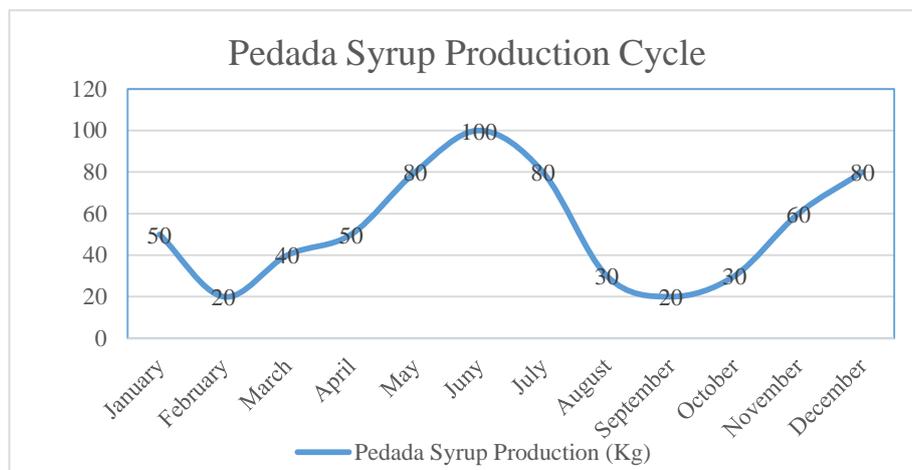


Figure 2 Pedada Syrup Production Cycle

C. Production of Dodol Api-Api

Api-api (*Avicennia marina*) is one of the dominant mangrove vegetation in Nagalawan Village. Api-api domination causes its fruit use as food to be an effective business carried out by the community. Api-api bears fruit in one cycle in a year. Api-api will begin to bear fruit in April, and the peak of the fruit will occur in June-August. The fruit season is one obstacle to continuously producing dodol api-api throughout the year. During the peak fruit season (June-August), dodol api-api reaches 35 kg per month, but in other months (April, May, September,

and October), production decreases. When it does not bear fruit, it is not easy to produce dodol api-api (Figure 3).

The processing of api-api fruit into food has been done a lot. In addition, api-api fruit also contains high vitamin C. Api-api fruit can be made into chips like peas and tastes savory and crunchy like emping melinjo [25]. The api-api seed contains protein and carbohydrates to be used as an alternative material for food. Protein can be used in the body as a source of nutrition for cells to grow and develop. Carbohydrates can be used as a source of energy for the body. A. marina that has been processed can be consumed as a medicine to increase stamina and vitamin C. Some are even processed as food ingredients, namely chips, dodol, and flour.

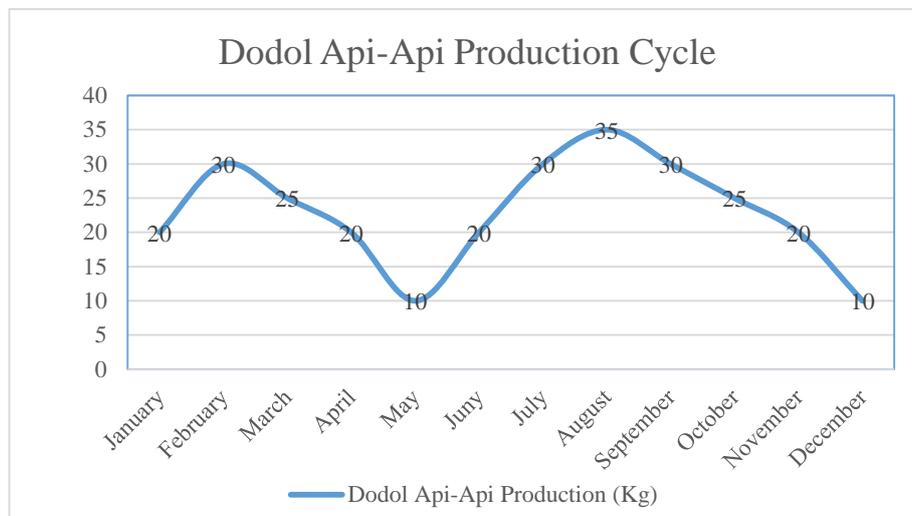


Figure 3 Dodol Api-Api Production Cycle

The raw materials needed for single production of dodol api-api are 3 kg of api-api fruit, so that it will produce 5 kg of dodol api-api. The time needed is 5-6 hours. The process is quite long because it requires mixing the dodol dough evenly so that the dodol texture is soft and not sticky. Dodol api-api is sold for Rp 10.000/pack. The marketing of dodol api-api is only carried out at the location of Kampoeng Nipah Mangrove Tourism, Sei Nagalawan Village. Besides being more effective, this is done so that it becomes a characteristic of the tourism object.

3.2 Analysis of Financial Feasibility

A. Production and Income Cost

Several costs incurred to carry out production activities for mangrove processed products in Kelompok Tani Muara Tanjung are called production costs. Production costs are divided into two, namely fixed cost and variable cost. Fixed cost does not depend on the amount of production of jeruju chips, dodol api-api, and pedada syrup, such as equipment, land rent, taxes, and equipment maintenance. In comparison, the variable cost depends on the amount of production of jeruju chips, dodol api-api, and syrup pedada, such as the costs for starch,

glutinous rice flour, coriander, refined shrimp, salt, brown sugar, white sugar, garlic, oil, gas, and labor required.

Table 1 Cost and Revenue of Jeruju Chips Production

Description	Amount	Percentage (%)
Fixed cost (Rp)	54,134	10.70
Variable cost (Rp)	450,400	89.30
Total cost (Rp)	504,534	100.00
Volume (pack)	100	
Price (Rp/ pack)	8,000	
Revenue (Rp)	800,000	
Income (Rp)	295,466	

Based on the cost details in table 1, the variable cost used is quite significant because the total cost incurred for other raw materials is quite significant. The total revenue is greater than the total cost. Based on this, the jeruju chips processing business is feasible and fulfills the criteria for generating profits.

Table 2 Cost and Revenue of Pedada Syrup Production

Description	Amount	Percentage (%)
Fixed cost (Rp)	32,900	6.50
Variable cost (Rp)	472,000	93.50
Total cost (Rp)	504,900	100.00
Volume (pack)	50	
Price (Rp/ pack)	12,000	
Revenue (Rp)	600,000	
Income (Rp)	95,100	

Based on Table 2, the proportion of variable cost is also greater, because of the cost for supporting raw materials and other factors such as the required labor are larger. The total revenue shows that the pedada syrup production business is feasible and meets the profit criteria.

Table 3 Cost and Revenue of Dodol Api-Api Production

Description	Amount	Percentage (%)
Fixed cost (Rp)	47,634	18.05
Variable cost (Rp)	216,400	81.95
Total cost (Rp)	264,034	100.00
Volume (pack)	33	
Price (Rp/ pack)	10,000	
Revenue (Rp)	330,000	
Income (Rp)	65,966	

The processing dodol api-api requires variable costs such as glutinous rice flour, brown sugar, white sugar, coconut milk, gas, and plastic packaging. Therefore, the required variable cost is

relatively high. Based on Table 3, the dodol api-api processing business is still feasible and meets the profitable criteria.

B. *The R/C Ratio Analysis*

The R/C ratio analysis is obtained from the total revenue and costs required for production. This analysis aims to determine how far the profits are obtained from the total costs incurred for its production.

Table 4 R/C Analysis

Description	Jeruju Chips	Pedada Syrup	Dodol Api-Api
Revenue (Rp)	800.000	600.000	330.000
Total Cost (Rp)	504.534	504.900	264.034
R/C	1,6	1,2	1,2

The results of the R/C of jeruju chips were 1.6. The ratio obtained is greater than 1, which indicates that the jeruju chips processing business is profitable and has the potential to be developed. The R/C result of the pedada syrup obtained is 1.2. The ratio obtained is greater than 1, which indicates that the pedada syrup processing business is profitable and has the potential to be developed. The results of the R/C dodol api-api were 1.2. The ratio obtained is greater than 1, which indicates that the dodol api-api processing business is profitable and has the potential to be developed.

C. *Payback Period Analysis*

Payback Period analysis aims to determine the time required for the funds invested by investors to return in full. The payback period is obtained by comparing the total cost of production with the profit received multiplied by a single production.

Table 5 Analysis of Payback Period

Product	Payback Period (frequency of production)
Jeruju Chips	2
Pedada Syrup	5
Dodol Api-api	4

The payback period for pedada syrup and dodol api-api is quite long because the costs required to produce these products are significant, and the production volume produced in one production is small compared to jeruju chips. The limitations of raw materials also affect because the raw materials for api-api and pedada fruit are done seasonally. This follows the statement [26] that the projected sales volume is the most critical variable affecting the company's financial needs. Sales forecasts usually tend to be overstated in projected financial needs. Therefore, a crafted sale forecast forms carefully is the basis for projecting financial needs. For this purpose, it is necessary to establish a ratio between the sales level and the

expenditure types required. It is also necessary to take into account seasonal sales and sales fluctuations.

D. Break Even Point (BEP) Analysis

Break Even Point analysis or point analysis needs to be done to analyze the feasibility of farming. This analysis aims to determine where the business does not experience a loss or profit.

Table 6 Break Even Point (BEP) Analysis

Description	Jeruju Chips	Pedada Syrup	Dodol Api-Api
Fixed cost (Rp)	54.134	32.900	47.634
Variable cost (Rp)	450.400	472.000	216.400
Total cost (Rp)	504.534	504.900	264.034
Volume (pack)	100	50	33
Price (Rp/ pack)	8.000	12.000	10.000
Revenue (Rp)	800.000	600.000	330.000
Income (Rp)	295.466	95.100	659.66
BEP of Production Volume(pack)	15	13	14
BEP of Price (Rp/ pack)	5.045	10.098	8.001

Based on Table 6, the total break-even point of jeruju chips, pedada syrup, and dodol api-api are below the production volume. Based on the analysis results, it can be said that the jeruju chips processing business is profitable.

E. The Added Value Analysis

Value added analysis aims to determine a business in providing more value or imbalance to business actors, such as the statement [27], the use of analyzing the added value to determine the amount of added value that will occur due to specific actions given to the agriculture commodity, unequal distribution received by owners and workers.

Based on these data, in the processing of jeruju chips, if the output price is Rp 8,000 and the conversion factor is 10 then the output value is Rp 80,000. This value will then be reduced by the number of costs incurred for other supporting materials such as starch, coriander, salt, sugar, garlic, refined shrimp, and plastic packaging so that the added value for jeruju chips is Rp 52,871 for a single production that requires 1 kg of jeruju leaves so that the added value for jeruju chips is Rp 52,871/kg.

As for the pedada syrup product, if the selling price is Rp 12,000 and a conversion factor of 10, the output value obtained is Rp 120,000. This value is deducted from the total costs incurred for other supporting materials such as white sugar, gas, packaging bottles, and labels. After getting the added value for pedada syrup is Rp 103,627 for a single production that requires 3 kg of pedada fruit, so the added value of the pedada syrup product is Rp 20,725/kg.

While the added value of dodol api-api if the selling price is Rp 10,000, and a conversion factor of 11 then the output value obtained is Rp 110,000. This value is deducted from the total costs incurred for other supporting materials such as white sugar, brown sugar, coconut milk, gas, plastic packaging, and labels. After getting the added value for dodol api-api is Rp 93,955 for a single production that requires 5 kg of api-api fruit, so the added value of the dodol api-api product is Rp 31,318/kg.

Based on the results of the added value analysis, it can be seen that each product produces considerable added value for business actors. This also shows that these mangrove processed products have great potential to be developed. However, the obstacle is the seasonal production of pedada syrup and dodol api-api, so the production is limited.

F. *The Added Value Distribution*

Based on the calculation, the added value for jeruju chips is Rp 52,871/kg, pedada syrup is Rp 20,275/kg, and dodol api-api is Rp 31,318/kg. The product selling price influences the calculation of the added value distribution, the purchase price of raw materials for each actor, production costs, and marketing for each actor.

Table 7 Analysis of Added Value Distribution

Product	Sale Value (Rp/Kg)	Added Value (Rp/kg)	Labor Share Rp (%)	Profit Level (%)
Jeruju Chips	80,000	52,871	Rp 7,190 (13.6 %)	86.40
Pedada Syrup	120,000	20,725	Rp 4,787 (23.1 %)	76.90
Dodol Api-api	110,000	31,318	Rp 7,986 (25.5 %)	74.50

According to the results of research from [28] regarding the financial analysis of the utilization and processing of jeruju leaves (*Acanthus ilicifolius*) into various processed products carried out at the exact study location, the results obtained for the distribution of added value in processing jeruju chips of Rp 12,500 or as much as 25% while for jeruju tea around Rp 15,000 or 18% of the production value. The profit level for the processor is 74% of the production value of jeruju chips and 81% of the production value of jeruju tea, which means that for every 100 units of production value to be produced, a profit of 74 and 81 units will be obtained, respectively.

Based on these results, it can be seen that the comparison of, the profit level for jeruju chips has increased from 74% to 86%. This shows that the mangrove processing business is experiencing development. One of the factors supporting this development is that the processed products are marketed directly at tourist sites in Kampung Nipah, so it has become a characteristic of tourism sites.

Sustainable economic use by strengthening the aspect of service benefits is a model that is worthy of being developed as a pilot. Preserving and restoring mangroves is a very productive investment, not only for the present generation but also for future generations [29].

4 Conclusions

The processing product is still manual and done cooperatively, but Kelompok Tani Muara Tanjung controls all equipment and processing well. The products produced are chips from jeruju leaves, dodol from api-api fruit, and syrup from pedada fruit. The business of processing jeruju crackers, pedada syrup and dodol api-api produces profits and is financially feasible with the R/C value of 1.6, 1.2, and 1.2, respectively. The Payback Period is 2, 5, and 4, respectively. Break Even Point (BEP) is 15, 13, and 14, respectively. And the BEP Analysis in Rupiah is Rp 5,045, Rp 10,098, and Rp 8,001. All the results show a profit. The added value for each product is Rp 52,871/kg, Rp 20,725/kg, and Rp 31,318/kg.

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