

Break Even Point Analysis of Goderukem Production from Pine *Mercusii Jungh et de Vriese*

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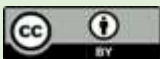
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Abstract: The type and composition of sap varies for each type of pine. Break Even Point is where the total revenue point is equal to the total cost or the point that shows the total contribution margin is equal to the total fixed cost. This study aims to analyze the Break Even Point to find the point where production costs are equal to revenue. The product to be calculated is a processed product gondorukem (Resina colophonium) from pine resin which can be used as raw material for batik, leather, soap, paint, insulators, paper and varnish industries. This research is a descriptive study using quantitative methods, where the author will collect data in the form of numbers needed in connection with the problem to be examined, so that the results of his research can be more trusted and reliable truth. In addition, this research also uses literature studies to obtain the necessary theories, data and images. Based on the calculation of the Break Even Point value in units is 7,065 units of gondorukem products Rp.50,000, - / unit with Fixed Cost (FC) Rp.24,497,000, - annually and sales must reach Rp. Rp.349,957,143, - so it can be concluded that this product is feasible to produce.

Keywords: Gondorukem; Break Even Point; Fixed Cost;

1. INTRODUCTION

Non-timber forest products have been managed and developed and received attention from the government, one of which is pine sap (gondorukem). Pine sap has commercial value and potential that can be processed to produce various products that can increase added value and have strategic market potential. (Herawaty et al., 2020; Hidayat et al., 2023). Pine sap is one of the Non-Timber Forest Products with commercial value and potential to increase its added value. Pine sap is the result of tapping *Pinus merkusii Jungh* pine trees. Pine sap has been tapped since the 15th century in America and is used to patch cracked boats or countries that have pine stands to produce sap biomass that provides economic and social benefits. (Kada' et al., 2023).

West Sumatra is one of the producers of pine resin with about 10% of the total production to meet the needs of the industry in the country and 90% for export needs. Some export countries include India, China, and Japan (Suryanaji & Na'iem, 2023). Solok Regency is one of the raw pine resin producing areas in West Sumatra. Currently, the sap produced has never been processed or determined the quality of pine sap raw materials. Therefore, determining the quality of pine resin produced from pine resin plantations owned by the Solok Regency community is important to do. Determination of quality can be the basis for

determining the price of sap which has an impact on improving the economy of the surrounding community. To determine the quality of pine resin can be seen from several parameters such as color, moisture content and dirt content (Herawaty et al., 2022).

The type and composition of sap varies for each type of pine. The pines in West Sumatra are *merkusii* (Mercusii Jungh et de Vriese). Pine sap tapped from pine trees when processed will produce 15-25% turpentine and 70-80% gondorukem (Riwayati, 2005). Gondorukem (resina colophonium) is processed from tapped sap on the trunk of tusam (*Pinus*). Gondorukem is the result of cleaning the residue of the steam distillation process of tamarind sap (Suwaji et al., 2017). Gondorukem is used as a raw material for the batik, leather, laundry soap, paint, insulators, paper and varnish industries. Turpentine is used for the paint and varnish industry, shoe polish ingredients, organic material solvents, synthetic camphor manufacturing materials and other uses (Kasmudjo, 2010).

In the pine post-harvest process, it is necessary to determine the quality of pine resin, before processing to obtain processed pine resin materials such as gondorukem. The processing of these products aims to increase added value and income not only the production approach but also the price level received by producers so as to encourage the development of rural industries (Aprilia et al., 2017). Gondorukem products can be produced sustainably, it is necessary to do economic analysis, one of which is Break Even Point Analysis.

A company in producing or producing products needs to plan how much profit it wants to get, including this gondorukem industry. According (Nadhiroh et al., 2022), The size of the profit to be obtained is a measure of the success of management in managing the business. Break Even Point Analysis is an analysis that can be done to find a point on the cost-income curve that shows costs equal to revenue, besides that this analysis is a cost-benefit analysis calculated based on the analysis of fixed costs, variable costs and income. This analysis is indispensable for people who will make alternative selection decisions that are quite sensitive to variables that are difficult to estimate in value (Aprilia et al., 2021). Break Even Point is where the total revenue point is equal to the total cost or the point that shows the total contribution margin is equal to the total fixed cost.

2. METHOD

The stages and processes carried out in the research a. Type of Research This research is using: quantitative data. Data collection is carried out in the form of numbers needed in connection with the problem to be studied, so that the results of the research can be more reliable and reliable. b. Literature search Literature searches are carried out to get an overview of the classification of costs and ways of analyzing the research to be carried out. c. Gondorukem production process. d. Data Collection Collecting data on the components of costs required in the production of gondorukem. Data Collection Collecting data on the cost components required in the production of gondorukem. The data analysis technique

used in this research is descriptive analysis using the Break Even Point. (Nadhiroh et al., 2022) (Aprilia et al., 2021) The formula used is as follows.

1. Break Even Point Calculation on Unit Basis

$$\text{BEP (Q)} = \frac{FC}{P-VC}$$

2. Break Even Point Calculation Based on Product Summation in Rupiah

$$\text{BEP (Q)} = FC \div (P - VC)$$

Description:

FC = Fixed cost

P = Selling price per unit

VC = Variable cost per unit

3. RESULT AND DISCUSSION

Fixed Cost Analysis

Fixed costs are costs that are fixed or unchanged and are not influenced by the volume of production or sales but can be influenced by the amount of investment invested, the amount of investment costs can be seen in Table 1. The amount of fixed costs of gondorukem production by distillation method can be seen in table 1.

Table 1. Inverstation data of gondorukem production

No	Equipment	Quantitas	Price (Rp)	Total	Economic life	value
1	Hot Plate	2	500.000	1.000.000	5	100.000
2	Scales	1	300.000	300.000	5	30.000
3	Stainliss	2	100.000	200.000	3	20.000
4	Thermometer	2	30.000	60.000	2	6.000
5	Strainer	2	20.000	40.000	2	4.000
6	Spatula	2	20.000	40.000	2	4.000
Total				1.640.000		164.000

The calculation of fixed costs of gondorukem production from pine resin in this study uses several assumptions, including: (1) The final value is obtained 10% (2) the electric power used is 900 VA Rp 150,000/month (3) indirect labor employed is only 1 person with a monthly salary of Rp 2,000,000 (4) water abodemen Rp 25,000/month The following is the amount of depreciation costs of making gondorukem from pine resin can be seen in table 2.

Table 2. Fixed Cost Analysis of Gondorukem Production from Pine

No	Fixed Cost / year	Economic life (year)	Fixed Cost /year (Rp.)
1	Depreciation cost		
	Depreciation cost 2 Unit Hotplate	5	200.000
	Depreciation cost 1 Unit Timbangan	5	60.000
	Depreciation cost 2 Unit Stainless	3	67.000
	Depreciation cost 2 Unit Thermometer	2	30.000
	Depreciation cost stainer	2	20.000
	Depreciation cost 2 Unit Spatula	2	20.000
2	Biaya Tetap Lainnya		
	Abodemen electricity		1.800.000
	Abodemen water		300.000
	Employee		24.000.000
	Fixed cost/ year		24.497.000
	Fixed cost/Unit		7.360

The amount in table 2 of fixed costs incurred for the manufacture of gondorukem per year is 24,497,000.

Variable cost

Variable costs are costs that are affected by the amount of production. One production produces 15 packs (500 gram packaging). Production activities are carried out 5 times a week, 20 times a month and 240 times in 1 year. The production capacity in 1 year is 3,600 packs (500 gram packaging). The assumptions used in calculating variable costs are the need for materials for making gondorukem from pine resin for one production is 10kg of pine resin, the need for turpentine in one production is 1 liter, the need for oil in one production is 5 liters. The amount of variable costs of gondorukem from pine resin can be seen in table 3.

Table 3. Variable Cost Analysis of Gondorukem Production from Pine

No	Equipment	quantity	PRICE	Total	Total price /moon	Total price/Tahun
1	Pine Gap	10 Kg	10.000	100.000	2.000.000	24.000.000
2	Turpentine	1 Liter	60.000	300.000	6.000.000	72.000.000
3	Oksalat Acid	40 Gr	1.200	48.000	960.000	11.520.000
4	Oli	5 Liter	35.000	175.000	3.500.000	42.000.000
5	Packing	15 Pcs	5.000	75.000	1.500.000	18.000.000
	Variable cost					167.520.000
	Variabel cost/Unit					46.533

Break Even Point (BEP)

Break Event Point (BEP) is a condition / state where the amount of income is equal to the amount of capital spent. This condition is a situation where we do not make a profit and also do not experience a loss or balance.

$$\begin{aligned}\text{Fixed cost production/ year} &= \text{Fixed cost} + \text{Variable cost} \\ &= \text{Rp. } 24.497.000 + 167.520.000 \\ &= \text{Rp. } 192.017.00\end{aligned}$$

$$\begin{aligned}\text{Production cost/packing} &= \text{Fixed cost} + \text{Variable cost} \\ &= 7.360 \text{ /Unit} + 46.533 \\ &= 53.893\end{aligned}$$

BEP is calculated assuming a selling price of 50,000 per package and a production quantity of 3,600 packs per year.

1. Calculate *Break Event Point per Unit*

$$\begin{aligned}\text{BEP (Q)} &= \frac{TFC}{P-VC} \\ &= \frac{\text{Rp } 24.497.000/\text{year}}{50.000/\text{unit}-46.533/\text{unit}} \\ &= \frac{\text{Rp } 24.497.000 \text{ /year}}{3.467/\text{unit}} \\ &= 7.065 \text{ Unit}\end{aligned}$$

2. Calculate *Break Event Point* based on sale per rupiah

$$\begin{aligned}\text{BEP} &= \frac{TFC}{1 - \frac{VC}{S}} \\ &= \frac{24.497.000\text{Rp /year}}{1 - \frac{46.533 \times 3.600}{50.000 \times 3.600}} \\ &= \frac{24.497.000/\text{year}}{1 - \frac{167.518.800}{180.000.000}} \\ &= \frac{\text{Rp } 24.497.000/\text{year}}{1 - 0,93} \\ &= \frac{\text{Rp } 24.497.000/\text{year}}{0,07} \\ &= \text{Rp } 349.957.143\end{aligned}$$

Based on the BEP calculation above, the company makes a profit if the company has produced 7,065 units and obtained revenue of Rp349,957,143,-.

4. Conclusions

The company must sell 7,065 units of products each year and the sales must reach Rp. Rp.349,957,143, - so that the company does not experience losses and can continue to operate.

Additional Section (Patents) if Any

This section is not mandatory but may be added if there are patents resulting from the work reported in this manuscript.

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