



Economic Feasibility of Kemojo Cake Products Using Stevia Extract (*Stevia rebaudiana* B.)

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ABSTRACT

This study aims to determine the feasibility of kemojo cake products using stevia as a sweetener produced on an industrial scale. The research method used a descriptive method with mathematical analysis. The research begins with making assumptions and analysing parameters, components and cost structure, investment funding requirements and working capital. These parameters calculate production, revenue, and cash flow projections. Determination of the economic feasibility of kemojo cake products with Net Present Value (NPV), Incremental Rate of Return (IRR), Net B/C and Pay Back Period (PBP). The assumption of a year's production of kemojo cakes is 31,680 boxes for at IDR 35,000.00/box. The proportion of capital comes from 60% own capital and 40% credit. The average operational costs per year are IDR 675,083,359.00, variable costs IDR 549,813,919.00 and fixed costs IDR 125,269,440.00. The average income per year is IDR 1,108,800,000.00 while expenses are IDR 770,378,416.00. The profit earned was IDR 287,658,346. Profit on sales of 20.40% with 15% tax per year. This business BEP occurs in sales of an average value of Rp 338,421,584 or 25.94% of production capacity per year. The results showed that the NPV was Rp 279,583,647, the IRR was 79%, and the Net B/C was 2.22 times. Based on existing criteria or assumptions, this business is feasible to carry out with PBP for two years, or the capital invested in this business can be returned before the project ends (3 years).

1. INTRODUCTION

1.1. Research Background

Kemojo cake has a traditional cake from Riau region cooked in the form of frangipani flowers, so it is called kemojo cake or kojo cake. Kemojo cake has a sweet, legit taste and has a distinctive aroma. The texture has denser and slightly wetter than kemojo cake in general. This cake is made from wheat flour, eggs, margarine, coconut milk, pandan leaves and vanilla and the manufacturing process can be done by baking or steaming [1]. Kemojo cake is famous for its sweet taste and distinctive green color. The sweetener generally used in making kemojo cakes is granulated sugar [2].

Granulated sugar has a high glycemic index so it is not recommended for people with diabetes mellitus. Granulated sugar has a higher glycemic index than stevia sugar. The glycemic index of granulated sugar is 68 [3], while stevia sugar has a glycemic index of 0. A safe glycemic index for people with diabetes mellitus is a low glycemic index below 55. Stevia is very safe for diabetics and good for health, so potential to be used as a natural sweetener to replace sugar [4]. In addition, kemojo cakes are consumed by various groups such as children, adolescents, adults and the elderly [5]. In children, high sugar consumption can cause dental caries and high sugar intake is not good for adults or the elderly because it can increase blood sugar. Stevia has a very small chance of causing dental plaque compared to sucrose. Stevia sweetener can also be used as an antibacterial to prevent dental caries in children. Meanwhile, stevia can increase insulin secretion in the rat pancreas [6].

The prospect of developing kemojo cake with stevia sweetener is very good for development because of diversifying



traditional food products into healthier, lower in calories, have antioxidant activity, and increase selling prices. The existence of kemojo cakes is increasing along with the number of business actors who modify the shape, size, and taste of kemojo cake [7]

Making kemojo cake using stevia sweetener is expected to be an alternative and help the kemojo product industry. However, for its application, it is necessary to carry out an economic feasibility test in the kemojo cake industry. One of the competitiveness of a product can be seen from the maximum profit. If the profit of a product increases, it means that its competitiveness also increases and vice versa.

1.2. Research Objective

This study aims to determine feasibility of rising cake business of kemojo cake using stevia (*Stevia rebaudiana* B.) as a sweetener.

2. MATERIALS AND METHODS

The research method used descriptive method with mathematical analysis. Making kemojo cake with stevia as a sugar substitute sweetener is a continuation of research from previous research, namely the characteristics of kemojo cake products using stevia (*Stevia rebaudiana* B.). The research was conducted from May to August 2022. The tools used in this research were stationery, calculators and Microsoft Excel 2010 software.

The research begins with making assumptions and analyzing parameters, components and cost structures, investment funding requirements and working capital. These parameters are used to calculate production, revenue, cash flow projections. The economic feasibility of kemojo sponge cake products with value Net Present Value (NPV), Incremental Rate of Return (IRR), Net B/C dan Pay Back Period (PBP). The data was processed in tabulations, then analyzed mathematically by referring to aspects of the calculation of financial feasibility analysis. Variable cost data and fixed costs are used to determine the total production cost or total cost, by calculation:

$$TC = VC + FC$$

Description :

TC = Total Cost

VC = Variable Cost

FC = Fixed Cost

Determination of assumptions is made to assist data processing, setting the Cost of Production (COP), and making cash flow. The assumptions set include the number of employee working days, product selling prices, expected increase in production capacity, raw material prices, and project life.. Cost calculations carried out include investment costs, variable costs, fixed costs, and other costs. Investment costs are the capital or costs used to start or develop a business [8].

Variable costs are costs that are routinely incurred every time a production business is carried out where the amount depends on the number of products to be produced [9]. Fixed costs are another type of cost routinely incurred by the company while the company is carrying out production activities. However, the amount of fixed costs does not depend on production capacity. Calculation of installed or actual capacity

COP, is done by setting the selling price among producers and calculating revenue through the following [10]:

$$\begin{aligned} \text{Cost of Production} &= TC / \text{Actual Capacity} \\ \text{Revenue} &= \text{Selling price} \times \text{total production} \end{aligned}$$

Calculating cash flow, to see the development of financial flows that can be obtained. BEP is a point in the amount of production or sales that must be made so that the costs incurred can be covered again or the value where the profit received is zero.

$$\text{BEP Unit} = FC = \frac{FC}{p - VC} \text{ atau } \text{BEP IDR } FC = \frac{FC}{p - VC/P}$$

Net Present Value analysis is carried out to determine the investment value by considering changes in currency values. NPV is the difference between the present value of profits and costs [11].

$$NPV = \sum_{t=0}^n \frac{(B_t - C_t)}{(1+i)^t}$$

Description

B_t = t-year gross receipts

N = Economic Age

C_t = Gross cost of year t

I = Interest rate

The criteria used [12]:

NPV > 0, business worth running

NPV = 0, the business returns the same amount of money invested

NPV < 0, the business is not worth running

The IRR of the investment rate is the discount rate which shows the present value (NPV) equal to the total project investment. A business plan is said to be feasible when the IRR value is greater than the Marginal Average Revenue Return (MARR). MARR determination can be calculated as in the following equation:

$$\text{MARR} = (1 + i) (1 + f) - 1 \quad (6)$$

Description :

i = investment interest rates

f = highest inflation

The estimated payback period for an industry's investment can be shown by calculating the Payback Period. Payback period is the minimum time to return the initial investment in the form of cash flow based on the total receipts minus all costs [13].

$$\text{PBP} = \frac{\text{initial investment}}{\text{acceptance period}} \times 1 \text{ year}$$

The calculation of the B/C ratio is a comparison between total receipts and total costs, which shows the value of receipts obtained from each rupiah spent. The project is feasible if the ratio B/C ≥ 1 [14].

$$\text{B/C ratio} = \sum_{t=1}^n (B_t - C_t) / (1 + \text{IRR})^t$$

Description

B_t = t-year gross receipts

N = economic age

C_t = The gross cost of year-t

3. RESULT AND DISCUSSION

3.1. Assumptions for Financial Analysis

The feasibility analysis uses assumptions regarding process technology parameters and costs, as seen in Table 1. These

assumptions were obtained based on a study of the process of making stevia kemojo cakes carried out in this study and compared with kemojo cakes on the market.

Table 1. Assumptions and Parameters for Financial Analysis

No	Assumptions	Qty	Value/Amount
1	Project period	Year	3
2	The month of the work year	Month	11
3	Working days in a month	Day	20
4	Output, Production and Prices		
	a. The average production of kemojo cake per year	Box	31680
	b. Kemojo cake production average per month	Box	2880
	c. Kemojo cake production average/day	Box	144
	d. The average selling price of kemojo cake/box	IDR	35,000
	f. Long wait for earnings	Month	1
	e. The yield of kemojo cake per kg of stevia	Box	320
	f. The need for stevia / kemojo cake box	Kg stevia	0.001
5	Average employee requirement per month	People	3
6	Use of inputs and prices		
	a. The average need for stevia raw materials per year	Kg	32
	b. The average need for stevia raw materials per year	IDR/kg	426,000
7	Interest rate	%	14
8	Capital Proportion:		
	a. Credit	%	40
	b. Owner's equity	%	60
9	Term of Investment Credit	Year	3
	Term of working capital credit	Year	1

The kemojo stevia cake industry is assumed to be carried out by groups with a monthly production of 2880/boxes of kemojo measuring 22 cm x 22 cm x 9 cm which will be carried out by 3 workers. Assuming an average of 20 working days per month. This assumption was taken because the process of making kemojo cake is carried out continuously with Saturdays and Sundays off. Determination of the age of the project for 2 years is based on the economic life of the equipment used for a maximum of 3 years.

The stevia raw material needed to make 1 box of kemojo cakes is 1 g or 0.001 kg. Stevia is obtained from the extraction process for 426,000/kg stevia. Kemojo cake production per day is based on the capacity of the machine and tools used. Kemojo sponge cake production by baking using a 3-deck oven with a capacity of 12 pans. Production is carried out 4 times a day so that 144 boxes of kemojo cakes can be produced. The need for stevia per year is obtained from knowing the production of kemojo cakes in a year multiplied by the need for stevia per box. Stevia's raw material requirement is 32 kg/year.

3.2. Component and Cost Structure

The cost components in the feasibility analysis of the stevia kemojo cake processing business are divided into two, namely investment costs and operational costs. Investment cost is a cost component required to meet the initial funding requirements for production activities which include production equipment. Operational costs as costs that must be incurred in the production process.

a) Investment Cost

The investment cost required in the early stages of the production process of stevia kemojo cake is used to provide production equipment and other equipment as well as buildings

amounting to IDR 288,699,000. consists of supporting equipment. land and production buildings in producing kemojo stevia cakes. The investment cost for making kemojo cakes is assumed to be in the production of medium-capacity household industries. Economic value is used in 3 years of production. The calculation of the depreciation value is based on the total investment costs and the economic life of the production equipment used. Complete investment costs can be seen in Table 2.

Based on the data above, it can be seen that the main production equipment needed includes ovens, blenders, and mixers as well as kemojo sponge prints. The need for an oven with a quantity of 3 units, 2 units of the blender, and 2 units of the mixer. Determination of oven needs is calculated based on the time and capacity needed in one batch. The time to make kemojo sponge is 45 minutes using an oven, a blender for 10 minutes, and a mixer for 15 minutes. Preparation and production process for each batch for 2 hours with 4 production times/day.

The land and production buildings used are calculated based on the area of space needed for the production process, workspace, access to raw material cars, sanitation, and parking. The size of the production area is seen from the dimensions of the production machine and the mobility of workers in the production process. The land area based on production requirements is 70 m² and the building area is m².

The total cost of production equipment and packaging at IDR 73,699,000, while land and buildings at IDR 155,000,000. The annual depreciation cost of production and packaging costs as well as land and buildings at IDR 35,066,333.

Table 2. Machine Requirements. Production Equipment. Land and Buildings for Kemojo Production

No.	Component Cost	Qty	Physical Amount	Price per unit (IDR)	Amount Cost (IDR)	Age Economi (Year)	Depreciation Value (IDR/year)
1.	Production and Packaging Equipment						
	a. Oven	Unit	3	14,393,000	43,179,000	3	14,393,000
	b. Bowl	Unit	10	100,000	1,000,000	3	333,333
	c. Scale	Unit	2	550,000	1,100,000	3	366,667
	d. Blender	Unit	2	8,360,000	16,720,000	3	5,573,333
	e. Mixer	Unit	2	3,650,000	7,300,000	3	2,433,333
	f. Knife	Unit	10	50,000	500,000	3	166,667
	j. Sponge print	Unit	50	75,000	3,750,000	3	1,250,000
	k. Stirrer	Unit	10	15,000	150,000	3	50,000
2.	Production Land and Buildings						
	Production Building	m ²	70	1.500.000	105.000.000	10	10,500,000
	Land	m ²	100	500.000	50.000.000	10	5,000,000
	Total				228,699,000		35,066,333

b) Operational Cost

Operational costs in the business of making kemojo stevia cakes include variable costs and fixed costs. The average total operational cost per month is IDR 56,256,947 or in one year IDR 675,083,359 assuming that since the first month this business can operate fully with 100% capacity. Operational costs per year consist of variable costs IDR 45,817,827 and fixed costs IDR 10,439,120. Complete details of the need for fixed costs and variable costs can be seen in Table 3.

Table 3. Composition of Operating Costs

Cost component	IDR/month	IDR/year
Fixed cost	10,439,120	125,269,440
Variable Cost	45,817,827	549,813,919
Total Operational Costs	56,256,947	675,083,359

Based on the data above, fixed costs per year are IDR 125,269,440, while variable costs are IDR 549,813,919/year. The total operational cost for the production of stevia kemojo cake is IDR 675,083,359/year.

3.3. The Need for Component Funds and Working Capital

The total initial project cost requirement for investment is IDR 228,699,000 and IDR 91,479,600 (40%) comes from bank loans. with a loan term of 3 years and an interest rate of 14% per year. Working capital requirements are calculated based on production needs where the monthly operating costs are IDR 549,813,919. The determination of the time period is based on the calculation of the processing time for the stevia kemojo cake until the product has been sold. 40% or IDR 219,925,568 of the planned working capital needs from credit. with a loan taking period of one year and 14% interest. Details of project needs and sources of financing can be seen in Table 4.

Table 4. Components and Structure of Project Cost Requirements

No	Project Cost Components	Percentage	Total Cost (IDR)
1	Investment Cost		228,699,000
	Credit	40%	91,479,600
	Owner's equity	60%	137,219,400
2	Working Capital Costs		549,813,919
	Credit	40%	219,925,568
	Owner's equity	60%	329,888,352
3	Total Project Cost		778,512,919
	Credit	40%	311,405,168
	Owner's equity	60%	467,107,752

The project cost component with the distribution of working capital was credited by 40% and 60% own capital. The total project cost obtained from investment costs and working

capital (variable costs) of IDR 778,512,168. Credit costs that must be issued for the initial investment are IDR 311,405,168 and own capital at IDR 467,107,752. The entrepreneur's

obligation to make principal installments and interest installments is carried out every month during the credit period. Bank loan with interest per year 14% per year.

3. 4. Production and Income

Based on existing capacity. Production from the kemojo cake processing business averages 2880 boxes per month. This business was projected to be able to produce throughout the year (11 months) with a total production of 31,680 boxes per year. with an average selling price of kemojo stevia sponge per month of 35,000.00 per box. So for one year production is projected to earn an income of 1,108,800,000 per year.

3. 5. Projection of Operating Profit and Loss and Break Even Point (BEP)

The projection of operating profit loss shows that the business of processing kemojo stevia cakes has generated profits at an average annual rate of 287,658,346 with an average profit on sales value per month of 25.94%. The projected profit and loss data can be seen briefly in the Table 5.

Table 5. Projection of Revenue and Profit and Loss of Business

No	Description	Average per Year
1	Revenue (IDR)	1,108,800,000
2	Expenditures (IDR)	778,512,919
3	Profit/loss before tax (IDR)	338,421,584
4	Tax (15%)	50,763,238
5	Profit after tax (IDR)	287,658,346
6	Profit on sales (%)	25.94%
7	BEP : IDR	338,421,584
8	%	30.52

Table 6. Feasibility of Kemojo Stevia Cake Processing Business

No	Criteria	Value	Eligibility Justification
1	NPV (14%)	IDR 279.583.647	>0
2	IRR	79%	>14%
3	Net B/C ratio	2.22	>1
4	Pay Back Period	2 years	< 3 years

4. CONCLUSION

Based on the research that has been done, the following conclusions are obtained: (1) The addition of stevia as a sweetener using the existing assumptions, a Net Present Value (NPV) of IDR 279,583,647 with an Incremental Rate of Return (IRR) of 79% and a Net B/C of 2.22 time; (2) Based on existing criteria or assumptions, this business is feasible to carry out with a Pay Back Period (PBP) of 2 years or the capital invested in this business can be returned before the project ends (3 years).

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Based on Table 5, it could be seen that the revenue obtained from the sale of kemojo cakes/boxes per year. While expenses were based on investment costs, fixed costs, and variable costs. The profit after tax at IDR 287,658,346, with the tax paid to the company being 15%. So the profit on sales was 25.94%.

Compare expenses for fixed costs to variable costs and total revenue. Then the BEP of this business occurs in sales worth an average of IDR 338,421,584 or 30.52% of annual production capacity.

3.6. Projection of Cash Flow and Project Feasibility

Cash flow in data analysis on the stevia bolu kemojo project is divided into two flows, namely cash inflow and cash outflow. Inflows were obtained from the sale of kemojo cakes for one year. Outflows include investment costs, variable costs, and fixed costs, including principal repayments, interest installments and income taxes.

Evaluation of the profitability of the stevia kemojo cake business plan is carried out by assessing the business feasibility criteria, namely NPV (Net Present Value) and Net B/C Ratio (Net Benefit-Cost Ratio). The business of processing kemojo stevia cakes using the existing assumptions obtains an NPV value of IDR 279,583,647 with an IRR (Incremental Rate of Return) of 79% and Net B/C of 2.22 times. This data can be seen in Table 8. Based on the existing criteria or assumptions, this business is feasible to carry out with a Pay Back Period (PBP) of 2 years or the capital invested in this business can be returned before the project's life ends (3 years).

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