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Financial Feasibility Analysis Of Corn Cookies Product Development With The Addition Of Spinach And Tilapia Flour

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Abstract— Cookies are a type of snack that is known and popular with the public because they are durable, easy to make, and are liked by children as snacks. The raw material commonly used in cookies is wheat flour. In this study, wheat flour was substituted with local food ingredients, namely corn flour, to reduce dependence on wheat flour as an imported commodity. In addition, to increase the nutritional content of cookies, other food additives such as spinach and tilapia flour are added. Cookie products with the addition of corn flour as a substitute for corn flour and the addition of spinach and tilapia fish flour are the results of research product development that are expected to be utilized by consumers, so a container or business is needed. An analysis is needed to find out whether the production of corn cookies with the addition of spinach and tilapia fish meal is feasible to develop, especially from a financial perspective. From the financial analysis calculations, the net present value results are positive in the amount of Rs. 79,517,784, the internal rate of return is 36.23, the payback period is 10 months and 9 days, and the B/C ratio is 1.41. From the consideration of the investment criteria above, it is clear that the corn cookie production business is feasible to run.

Keywords— Cookies; financial analysis; corn

I. INTRODUCTION

In implementing efforts to prevent stunting, the Ministry of Health of the Republic of Indonesia (2021) stated that the pandemic disrupted the nutrition service process. One of the four alternative solutions designed to overcome these obstacles is to increase the use of local food in the form of Supplementary Feeding which can be made from nutrient-dense Mixed Food Ingredients (BMC) using local food ingredients [1]. One form produced by factories is cookies.

Cookies are a type of snack that is known and popular with the public because they last a long time, are easy to make, and are liked by children as a snack. The raw material commonly used in cookies is wheat flour. The need for wheat flour increases along with the variety of processed products based on wheat flour [2]. According to data from the Central Statistics Agency (2022), the amount of wheat imported throughout the year reached 8.43 million tons [3]. Therefore, in this research, wheat flour was substituted with local food ingredients, namely corn flour, to reduce dependence on wheat flour as an imported commodity.

Corn is a strategic commodity in agricultural and economic development in Indonesia. Corn can be used as a raw material for local food which is processed into various food products. The use of corn for food in Indonesia has reached 50 percent of total needs [4]. Corn contains 9.8% protein, 7.3% fat and 69.1% carbohydrates [5]. The use of corn flour has been previously studied

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in making biscuits and cookies [6,7] and cookies with corn flour substitution [8]. Apart from that, to increase the nutritional content of the cookies, they are equipped with other food additives in the form of spinach and tilapia fish flour.

Spinach (*Amaranthus sp*) is a vegetable that is rich in nutrients, low in calories, but very high in vitamins, minerals and other phytonutrients. Spinach also contains flavonoids which function as antioxidants so they can ward off free radicals [9]. The nutritional content contained in 100 g of spinach leaves is 2.3 g protein, 3.2 g carbohydrates, 3 g iron and 81 g calcium. Spinach is also rich in various vitamins and minerals, namely vitamin A, vitamin C, niacin, thiamin, phosphorus, riboflavin, sodium, potassium and magnesium [10]. Galla et al., [11] research results that used amaranth flour in making biscuits showed a good increase in protein, minerals and fiber in biscuits when compared to controls.

The source of animal protein added to these cookies is tilapia (*Oreochromis niloticus*), which also has a protein content of 43.76%; fat of 7.01%; ash content of 6.80% and water 4.28% per 100 g of fish weight [12]. The use of tilapia fish in making cookies has been previously studied by Syadeto et al., [13] who used tilapia fish meal to produce cookies with high levels of calcium, phosphorus and protein.

Cookie products with the addition of corn flour as a substitute for corn flour and the addition of spinach and tilapia fish flour are the result of research product development which is expected to be utilized by consumers, so a platform/business is needed. Setting up a business for a product requires a financial feasibility analysis such as determining and calculating production costs, equipment costs, profit and loss analysis, how much capital and profits and the period for returning capital. According to Wulandari [14], financial feasibility analysis aims to find out whether a business is worth running or not. For this reason, it is necessary to carry out an analysis to find out whether the production of corn cookies with the addition of spinach and tilapia fish meal is worth developing, especially from a financial aspect.

II. MATERIALS AND METHODS

2.1. Place and time of research

Place and time of research. This research was conducted at UKM Syaifa Cake which runs a bakery and pastry production business. The time for conducting the research is November 2022 – January 2023. The ethical committee has approved this research with ethical approval number 1.02/KEPK-UNP/IV/2023.

2.2. Research methods

The method used in this research is a case study. Collect information regarding investment costs, production costs, variable costs, fixed costs, labor costs and other data related to this study. Information was obtained through interviews with business owners and those in charge of production as well as through reviewing financial records in UKM.

2.3. Data processing methods

The data is tabulated and then analyzed mathematically by referring to aspects of financial feasibility analysis calculations, namely Break Even Point (BEP), Net Present Value (NPV), Payback Period, Incremental Rate of Return (IRR), and B/C Ratio (Wulandari, 2012). Variable cost and fixed cost data are used to determine total production costs by calculating:

TC = VC + FC

TC = Total Cost

VC = Variabel Cost

FC = Fixed Cost

Net Present Value (NPV)

Net present value can be interpreted as the present value of the income stream generated by investment [15]. NPV is the result of subtracting income from discounted costs. The NPV calculation can be formulated as follows:

$$\text{NPV} = \sum_{i=1}^{n} NB_i(1+i)^{-n}$$

Or

$$\text{NPV} = \sum_{i=1}^{n} \frac{NB}{(1+i)^n}$$

Or

$$\text{NPV} = \sum_{i=1}^{n} B_i - C_i = \sum_{i=1}^{n} NB_i$$

NB = Net benefit = Benefit – Cost

C = Investment costs + operational costs

i = Discount factor

n = year (time)

Criteria:

NPV > 0 (zero) = The corn cookies business/project is feasible

NPV < 0 (zero) = The corn cookies business/project is not feasible

NPV = 0 (zero) = The corn cookies business/project is in BEP condition

Internal Rate of Return (IRR)

Internal Rate of Return is the maximum interest rate that can return the costs invested. The criterion that shows that a business is worth running is if the IRR value is greater than the interest rate in effect at the time the corn cookies are being started. The IRR calculation according to [15] can be formulated as follows:

$$\text{IRR} = i_1 + \frac{NPV_1}{(NPV_1 - NPV_2)}(i_2 - i_1)$$

Information :

IRR = Internal Rate of Return

i1 = interest rate that produces a positive NPV

i2 = interest rate that produces a negative NPV

NPV1= positive NPV

NPV2= negative NPV

Net Benefit Cost Ratio (Net B/C Ratio)

The corn cookie business is said to be profitable if the Net B/C value is > 1. The NET B/C calculation according to [15] can be formulated as follows:

$$\text{Net}\frac{\text{B}}{\text{C}} = \frac{\sum_{t=1}^{n} \frac{B_t - C_t}{(1+i)^t}}{\sum_{t=1}^{n} \frac{B_t - C_t}{(1+i)^t}}$$

Information :

Net B/C = Net Benefit Cost Ratio

Bt = Benefit or benefits in the t-th year

Ct = Cost in year t

i = interest rate used

t = year 1 to year 10

Payback Periods (PP)

Payback period (PP) is the time period required to return the money invested from the cash flow generated from the production of corn cookies. A business is said to be feasible if the payback period value is smaller or equal to the life of the business investment [16] (Kusuma, 2012). The formula for determining the Payback Period according to [17].

$$\text{PP} = T_{p-1} + \frac{\text{Cash accumulation comes in before PP}}{\text{Net cash flow on PP}} \; x \; 1 \text{ year}$$

Information :

PP = Payback Periods

Tp-1 = The year before there was a PP

Break even Point (BEP)

$$BEP = Tp - 1 + \frac{\sum_{i-1}^{n} TCi - \sum_{i-1} Bicp - 1}{Bp}$$

Where :

BEP = Break Even Point

Tp-1 = Year before the BEP occurred

TCi = Total discounted cost

Bicp – 1 = Number of benefits that are late discounted before BEP

Bp = Number of benefits in BEP

III. RESULTS AND DISCUSSION

Analysis of the financial feasibility of developing corn cookies with the addition of spinach and tilapia fish meal consists of investment capital estimates, production cost estimates, break-even value calculations, income estimates, cash flow preparation, determining investment criteria (Net Present Value, Internal Rate of Return, Pay Back Period, B/C ratio). Determination of assumptions is carried out to assist data processing, determining basic prices, and creating cash flow. The assumptions set include the number of employee working days, product selling price, expected increase in production capacity, increase in raw material prices, and project life [18].

3.1. Investment Costs

The investment required to realize the product development project for corn cookies with the addition of spinach and tilapia fish meal is IDR 18,670,000 consisting of investment in production equipment and supporting equipment required as in Table 1.

Table 1. Requirements for production machines and equipment

Production equipment

No	Machine requirements	Qty	unit	Investment Costs (Rp)	Machine age (months)	Salvage value	Depreciation (Rp/month)	Maintenance fee (Rp)
1	Gas oven Getra RFL-12SSGC	1	unit	7.900.000	120	500000	61.667	32.917

2	Planetary Mixer 5 Liter SZM-5	1	unit	3.700.000	120	200000	29.167	15.417
3	Gas fuel 12 kg	1	unit	430.000	120	300000	1.083	1.792
4	Blender Philips Series 5000	1	unit	870.000	36	0	24.167	12.083
5	Continuous Band Sealer HEAVYPACK FR-800PH	1	unit	2.400.000	120	150000	18.750	10.000
6	Digital scales Harnic HL-4350	1	unit	170.000	60	0	2.833	1.417
7	Food Dehydrator Getra ST 01	1	unit	3.200.000	120	200000	25.000	13.333
Total Investment Cost				18.670.000			162.667	88.958

Ancillary equipment

No	Machine requirements	Qty	unit	Investment Costs (Rp)	Machine age (months)	Depreciation (Rp/month)	Maintenance fee (Rp)
1	Measuring spoon	1	Pcs	100.000	36	2.778	694
2	Mixing bowl	2	Pcs	300.000	36	8.333	2.083
3	Baking dish	10	Pcs	1.500.000	36	41.667	10.417
4	Rack	1	Pcs	450.000	36	12.500	3.125
5	Container boxes	2	Pcs	400.000	36	11.111	2.778
6	Adjustable Rolling Pin	2	Pcs	150.000	36	4.167	1.042
7	Spatula	4	Pcs	100.000	36	2.778	694
8	Stainless sieve	2	Pcs	60.000	36	1.667	417
9	Napkin	10	Pcs	60.000	36	1.667	417
10	Stainless mold	4	Pcs	220.000	36	6.111	1.528
Total Investment Cost				3.120.000		86.667	21.667

3.2. Operating costs

Operational costs are costs whose amount is determined by the number of products produced. Operational costs consist of fixed costs, variable costs and semi-variable costs. The fixed cost components of corn cookie production consist of building rent, machine equipment depreciation costs, maintenance costs, routine cleaning and security costs. Variable costs consist of: raw material costs, supporting materials, labor costs, and overhead costs, while semi-variable costs consist of marketing costs and administrative costs.

Table 2. Costs of raw materials and labor

No	Type	Qty	unit	Cost/day (Rp)	Cost/month (Rp)
1	Margarine	300	gram	16.335	392.040
2	Butter	300	gram	45.540	1.092.960

3	Fine granulated sugar	400	gram	10.488	251.712
4	Egg yolk	200	gram	11.200	268.800
5	Vanilla	10	gram	3.465	83.160
6	Milk vanilla aroma	10	gram	6.000	144.000
7	Milk powder	100	gram	11.852	284.444
8	Low protein flour	100	gram	1.550	37.200
9	Cornstarch	680	gram	33.993	815.837
10	Tilapia fish meal	200	gram	7.000	168.000
11	Spinach flour	20	gram	3.226	77.419
12	Choco chips	150	gram	11.100	266.400
Total		2470	gram	161.749	3.881.973

Support costs

No	Type of material	Quantity	Unit	Price	Cost (Rp)
1	LPG fuel	2	pcs	85.000	170.000
2	Tissue	4	pack	10.000	40.000
3	Plastic packaging and labels	3000	pcs	800	2.400.000
4	Equipment sanitation materials	1	1L	25.000	25.000
Total					**2.635.000**

Details of labor requirements

No	Job details	Quantity	Salary/person (Rp)	Total (Rp)
1	Leader	1	1200000	1.200.000
2	Technician	2	800000	1.600.000
Total				**2.800.000**

The overall operational costs incurred in running a business can be seen in Table 3.

Table 3. Operational costs

No	Cost type	Amount (Rp)
1	**Fixed Cost**	
	Cleaning and security fees	50.000
	Maintenance cost	108.625
	Cost of depreciation	249.333

	Building rental cost		500.000
2	**Variable cost**		
	Raw material		3.881.973
	Miscellaneous materials		2.635.000
	Labor costs		2.800.000
	Factory overhead costs		250.000
3	**Semi variable cost**		
	Marketing		150.000
	Administration and general fee		50.000
Total		**Rp**	**10.674.931**

3.3. Need for Investment Funds and Working Capital

The funds needed to carry out corn cookie production activities apart from investing in production equipment and machinery are initial working capital in the form of operational costs for 1 month, namely Rp. 10.674.931. The total investment costs and working capital required are IDR 32.464.931. The source of funds is assumed to be obtained from the Melati Faculty of Tourism, Hospitality Cooperative with a profit sharing of 10-20%/year of the total capital borrowed. and the loan repayment period is 3 years.

3.4. Production and Income

Based on previously determined assumptions and technical parameters, the monthly production capacity of corn cookies/3000 packages, with a selling price/package of Rp. 5000. The selling price is calculated from the cost of production of Rp. 3,558.31 plus a profit of 40% of the cost of production. From the results of calculating sales of corn cookie products, the annual income is IDR. 15,000,000.

Table 4. Selling prices for cookie products

No.	Details	Total (Rp)
1	Cost of goods sold	3.558,31
2	Margin (40%)	1.423,32
	Total	4.981,63
	Selling Price	5000

The Discount Factor or also known as Marginal Avarage Revenue Return (MARR) used is 12%-14%, referring to previous research which set a MARR value of 12%-14%. Kusuma et al., [19] using December 2022 inflation of 5 .51%, then the MARR value obtained is 18%.

3.5. Production and sales projections for cookies

Projected sales of corn cookies Rp. 15,000,000/month with a selling price of Rp. 5000/pack.

Table 5. Production and sales projections for corn cookies

Description	Production output/year (packaging)	Price (Rp)	Value/month (Rp)
Cookies	36000	5000	15.000.000
Total gross income/year			180.000.000

3.6. Projected Profit and Loss and Breakeven Point/Break Event Point

The profit/loss calculation for the corn cookies business investment plan produces a net profit of Rp. 3,668,162/month. From the calculation of the break-even value/BEP, the results are obtained: the corn cookies development project will be BEP if it produces and sells 36,000 packages of corn cookies or Rp. 15,000,000.

Table 6. Projected profit and loss for corn cookies business

No.	Details	Average (Rp)
1	Income	15.000.000
2	Operational costs (fixed costs, variable costs, semi-variable)	10.674.931
3	Gross profit	4.325.069
4	Profit before tax	4.325.069
	Cost of depreciation	249.333
5	Taxable profits	4.075.736
	Tax (10%)	407.573,57
6	Net profit	3.668.162,16
7	Profit margin (%)	24,45%

3.7. Financial Feasibility Analysis

To determine the feasibility of an investment plan, the NPV, IRR, PP and B/C ratio are calculated. This method aims to compare the initial investment costs with the net cash flow received during the production period. The recapitulation results of the feasibility analysis are presented in Table 7.

Table 7. Investment criteria for the corn cookies development project

Year-	Cash Flow (Rp)
0	-32.464.931
1	38.957.917
2	46.749.501
3	56.099.401
NPV	79.517.784
IRR (%)	36,23%
MARR (%)	14%
Rasio B/C	1,41
PP	10 months 9 days
Decision	Project accepted

From the calculation results, it is obtained that the NPV has a positive value > 0, namely IDR 79,517,784. This value shows that investments made over the next 4 years will receive a net benefit currently valued at IDR 79,517,784. The IRR is 36.23%, which means this business can return capital up to a loan interest rate of 36.23% per year. The B/C ratio is 1.41, which is a comparison between the total current value of positive receipts (positive net benefit) and the total current value of negative receipts (negative net benefit), meaning that every expenditure is IDR 1.00 will get a benefit of IDR 1.41. The payback period for a corn-based noodle production business is smaller than the life of the project, namely 10 months and 9 days. From the investment criteria above, the corn cookies business investment plan is feasible.

IV. CONCLUSION

From the financial analysis, the Net Present Value results show a positive value of IDR 79,517,784. Internal Rate of Return of 36.23% indicates that the rate of return is greater than the determined bank interest rate. The payback period is 10 months 9 days if the planned assumptions are met, and the B/C ratio is 1.41, more than 1, so from a financial perspective, the corn cookies business plan is feasible. From consideration of The investment criteria above, it show that the business activity of producing corn cookies with the addition of spinach and tilapia fish flour is feasible to carry out as long as the project runs in accordance with the assumptions and technical parameters specified.

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