

Analysis of Added Value and Economic Feasibility in Mangosteen Derivative Products and Alternative Products in Leuwiliang Agropolitan Area

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Abstract: Mangosteen (*Garcinia mangostana* L) is a superior commodity in the Leuwiliang agropolitan area, Bogor. However, currently mangosteen is only sold for export and local markets. This study aims (1) to analyze economic feasibility and changes in economic sensitivity and (2) analyze the value added of existing mangosteen derivative products and alternative derivative products that can be applied in the agropolitan area. The method used is the method of evaluating investment feasibility along with its sensitivity analysis and Hayami's method for analyzing the added value of each product. The results of the analysis of the added value of mangosteen derivative products and alternative products have higher added value than other products and better economic viability. Mangosteen Dodol Product, Mangosteen Peel Extract, and Tea Nano Mangosteen Peel Mangosteen Powder Drink and Mangosteen Syrup products are feasible to be carried out under normal conditions and sensitivity 1 and 2. Nano mangosteen tea and mangosteen syrup are mangosteen derivative products that have considerable added value than other products with added value of Rp. 106.791.000 and Rp. 227.916.000 per kilogram. The economic feasibility results indicate that nano mangosteen tea and mangosteen peel extract have feasibility criteria with a PBP value of less than 1 year; NPV amount Rp. 66.829.633 and Rp. 68.369.956 ; B/ C ratio of 1,61 and 2,13.

1 INTRODUCTION

Mangosteen fruit contains an antioxidant complex that is good for health, especially antioxidants in the xanthone, anthocyanin, epicatechin and phenol groups. Mangosteen is very beneficial for body health because it is known to contain xanthones as an antioxidant, antiproliferative, anti-inflammatory and antimicrobial. Its antioxidant properties exceed vitamin E and vitamin C. Xanthones are not found in other fruits except in the mangosteen fruit, therefore mangosteen in the world is given the nickname

"Queen of Fruit" or the queen of fruit (Iswari and Sudaryono, 2007).

Bogor Regency especially in Leuwiliang sub-district, Karacak is the largest mangosteen producing area in Jabodetabek. Seasonal harvesting of mangosteen fruit causes ineffectiveness in post-harvest management. Then an increase in the development of mangosteen fruit derivatives is needed along with an analysis of the value added of each product.

Agropolitan area development is one of the efforts in increasing human resource capacity, network development, rural agro-industry

development so as to create complementary and sustainable physical, social and economic linkages. In the Karacak agropolitan area, there are already several mangosteen processed products, namely dodol mangosteen, mangosteen peel extract. Both products are carried out on the scale of regional women's MSME businesses. While the other processed mangosteen peel products that have been produced on an industrial scale are extracts of garcia mangosteen peel and products that are still in the development stage of the research are the mangosteen skin nano tea.

In a previous study, the results of mangosteen-based agropolitan sustainability analysis in the agropolitan area of Karacak, which was viewed from the economic, social, environmental, technological and infrastructure aspects and policies, were less sustainable on economic and social, environmental and technological and infrastructure aspects and did not influence policy aspects. (Oryzanti, 2019). In this study, each of the products will be analyzed for financial feasibility including PBP, NPV, B/C Ratio, IRR and also value added analysis on processed mangosteen products and what alternative products will be developed in leuiwiliang, mangosteen-based agropolitan area.

2 METHODS

2.1 The Types and Data Source

The types and sources of data collected in this study consist of primary data and secondary data. The primary data used in this study was obtained from observations and directly on the object in the field. Data collection is also carried out by conducting interviews and discussions with experts both individually and in the form of Focus Group Discussion, experts interviewed included experts in rural development, agropolitan areas, mangosteen cultivation, mangosteen processing industries, development planners, academics and other related sources.

2.2 Data Analysis Method

The analytical method used is using a method for evaluating investment feasibility. Financial eligibility criteria include Net Present Value (NPV), Internal Rate of Return (IRR), B/ C Ratio, Break Even Point (BEP), Pay Back Period (PBP). Financial analysis is carried out to evaluate the feasibility of a project based on existing investment criteria.

Whether the current and ongoing project is feasible or not if it continues. This analysis was also conducted to calculate the estimated funds needed, both for the provision of fixed assets and the need for initial working capital funds (Oryzanti, 2019). The products that will be measured are investment mangosteen dodol, mangosteen peel extract cleansing soap, garcia capsulated mangosteen peel extract and mangosteen skin nano tea. The data obtained is obtained from the results of literature studies and direct observations with interviews with SMEs in the agropolitan area. Karacak and industrial scale mangosteen processing industries. The following is a formula for calculating the investment financial feasibility analysis.

2.3 Net Present Value (NPV)

Net Present Value (NPV) is a method used to determine the difference in present value with the present value of net cash receipts. This is formula for calculating the Net Present Value.

$$\text{NPV} = (\text{total PV inflow}) - (\text{total PV outflow}) \quad (1)$$

$$\text{NPV} = \sum_{t=1}^n \frac{(B_t - C_t)}{(1+i)^t} \quad (2)$$

Description:

B_t = Gross social benefits year t

C_t = Gross social costs related to project year t

i = Applicable bank interest rates

T = Investment period (t = 0, 1, 2, ..., n)

NPV > 0, then the project is profitable and can be implemented;

NPV = 0, then the project is not profitable but also does not lose so it depends on the subjective judgment of the decision maker;

NPV < 0, then this project is detrimental because the profit is smaller than the cost, so it is better not to do it.

2.4 Internal Rate of Return

The internal rate of return is the interest rate which will make the present value of the proceeds to be expected to be received (PV of future proceeds) equal to the sum of the present value of capital expenditure (Riyanto, 2001). Mathematical formulations according to Gray et al. 1993, are:

$$\sum_{t=1}^n \frac{B_t}{(1+i)^t} = \sum_{t=1}^n \frac{C_t}{(1+i)^t} \quad (3)$$

$$\text{or } \sum_{t=1}^n \frac{(B_t - C_t)}{(1+i)^t} = 0 \quad (4)$$

Then according to Gittinger (1986), IRR can be mathematically written as follows:

$$IRR = i_1 + (i_2 - i_1) \frac{NPV_1}{(NPV_1 - NPV_2)} \quad (5)$$

Description:

i_1 = Discount rate (DR) level when NPV is positive

i_2 = Discount rate (DR) when NPV is negative

NPV_1 = Positive NPV value

NPV_2 = Negative NPV value

2.5 Net Benefit Cost Ratio (Net B/C)

Net B / C value is a comparison number between the number of positive present values and the negative number of present values. Net B / C ratio is greater than one is a requirement so that the project can be said to be financially feasible so that it can be continued, on the contrary if the value is smaller than one is a sign that the project is not feasible to implement (Oryzanti, 2019). In general, Net B / C is formulated as follows (Oryzanti, 2019) :

$$\text{Net B/C} = \frac{\sum_{t=1}^n \frac{(B_t)}{(1+i)^t}}{\sum_{t=1}^n \frac{(C_t)}{(1+i)^t}} \quad (6)$$

2.6 Pay Back Period (PBP)

PBP shows how long the capital invested in the investment will return, the return of this capital is seen from the cash in flow (cash in flow). An investment is accepted / feasible if the payback period is lower than the time required. If an alternative cash flow is obtained from the proposed business again, the alternative business proposal that provides the shortest period is best (Harahap, 2002).

$$PBP = \frac{\text{value of initial investment}}{\text{net cash}} \times 1 \text{ year} \quad (7)$$

2.7 Break Event Point (BEP)

This analysis is used to determine the production volume or minimum sales volume so that the costs incurred are equal to the profits obtained. The equation used is (Oryzanti, 2019) :

$$BEP = \frac{FC}{1 - \frac{TC}{TR}} \quad (8)$$

Description:

FC = Fixed costs (Rupiah or other currencies)

TC = Total costs (Rupiah or other currencies)

TR = Total receipts (Rupiah or other currencies)

Uncertainty in future conditions results in the need for a sensitivity analysis, there is an estimated risk of cash flows in the future. According to Husein (2007), sensitivity analysis is done by changing the value of a parameter at a time to further see how it affects the acceptability of an alternative investment. Parameters that usually change and changes can affect decisions are investment costs, cash flow, residual value, interest rate, tax rate, economic conditions and so on. In this study a sensitivity analysis of changes in interest rates, raw material costs and a decrease in product prices was carried out. By taking 2 (two) scenarios, namely (1) fixed product prices, but raw material prices and interest rates rise and (2) product prices drop, raw material prices rise and interest rates rise. Next, the calculation of the economic value added of each product using the Hayami method.

3 RESULT AND DISCUSSION

Financial feasibility analysis in this study includes the analysis of the feasibility of investment criteria, sensitivity analysis and value added analysis of each mangosteen derivative product in the agropolitan area. The results of the financial feasibility analysis of investments in the agropolitan area can be seen in Table 2 with information:

- 1) = Mangosteen Dodol Product
- 2) = Mangosteen Peel Extract Floor Soap
- 3) = Mangosteen Peel Extract
- 4) = Tea Nano Mangosteen Peel
- 5) = Mangosteen Powder Ready to Drink
- 6) = Mangosteen Syrup

1. Normal Condition

Under normal conditions of each product with a corporate loan interest rate of 9.95%, it refers to PT Bank Negara Indonesia (Persero) Tbk (BNI). Assumed normal conditions include fixed raw material prices, fixed selling prices and fixed production prices.

To measure the sensitivity of the project, a sensitivity analysis of the increase in bank interest rates for each product was carried out at 18% under sensitivity conditions. The results of the sensitivity analysis one can be seen in Table 3. The assumption of the project life used is 10 (ten) years. Sensitivity

Table 1: Financial Investment in Normal Condition.

No	Investment Criteria	(1)	(2)	(3)	(4)	(5)	(6)
1	PBP (year)	1,03	2,12	0,46	0,75	1,83	2,35
2	NPV(in thousand rupiah)	4.914.291	2.968.910	68.369.956	66.829.633	24,970,427	18,348,703
3	B/C Ratio	1,18	1,11	2,13	1,61	1,50	1,34
4	IRR (%)	111	47,9	223,4	147,9	151,4	149,1
5	BEP(in thousand rupiah)	42.967.849	44.310.168	60.914.477	128.024.404.	69,485,104	75,129,281
6	BEP(product)	1.432.262	2.954.011	870.207	1.828.920	992.644	1,073,275
7	Net provit (in thousand rupiah)	8.595.277	5.772.787	114.569.200	114.385.720	45,093,820	33,513,520

Table 2: Financial Investment in Sensitivitas Condition 1.

No	Investment Criteria	(1)	(2)	(3)	(4)	(5)	(6)
1	PBP (year)	1,15	16,74	0,48	1,167	2,37	4.15
2	NPV(in thousand rupiah)	2.867.421	-963.575	46.222.422	48.344.048	20.313.317	14.565.675
3	B/C Ratio	1,14	0,96	1,97	1,44	1,31	1.24
4	IRR (%)	94,1	-15,9	214,2	124,4	75,7	50,1
5	BEP(in thousand rupiah)	44.965.824	55.758.063	63.166.164	135.038.842	92.188.530	88.873.459
6	BEP (product)	1.498.861	4.289.082	902.374	1.929.126	1.316.979	1.269.621
7	Net provit (in thousand rupiah)	7.587.277	-619.522	109.769.200	84.135.880	36.891.720	28.196.920

Table 3: Financial Investment in Sensitivitas Condition 2.

No	Investment Criteria	(1)	(2)	(3)	(4)	(5)	(6)
1	PBP (year)	-134,9	1,025	2,33	2.95	1.51	-134,9
2	NPV(in thousand rupiah)	-1.013.423	17.690.067	28.518.601	18.933.110	31.096.616	-1.013.423
3	B/C Ratio	0,95	1,39	1,29	1,31	1,52	0,95
4	IRR (%)	-116,6	102,1	79,8	59,25	91,18	-116,6
5	BEP(in thousand rupiah)	58.763.377	77.685.494	132.142.628	86.791.704	78.941.860	58.763.377
6	BEP (product)	2.350.535	1.553.710	1.887.752	1.239.881	1.127.741	2.350.535
7	Net provit (in thousand rupiah)	-1.052.722	49.889.200	51.526.168	35.511.160	55.239.640	-1.052.722

Table 4: Feasibility Status Mangosteen Derivative Product.

Product	(Normal Condition)	(Sensitivitas 1 Condition)	(Sensitivitas 2 Condition)
Mangosteen Dodol Product	Feasible	Feasible	Feasible
Mangosteen Peel Extract	Feasible	Feasible	Feasible
Tea Nano Mangosteen Peel	Feasible	Feasible	Feasible
Mangosteen Peel Extract Floor Soap	Feasible	Not Feasible	Not Feasible
Mangosteen Powder Drink	Feasible	Feasible	Feasible
Mangosteen Syrup	Feasible	Feasible	Feasible

Table 5: The result of value added analysis mangosteen derivative product.

No.	Variabel	M. Dodol	M.Peel Extract	MPE Extract floor soap	Tea Nano	Powder Drink	M.Syrup
I. Input, Output and Price							
1.	Output produced (kg/ production process)	6	25	15	98	100	437.5
2.	Raw material used (kg/production process)	7	833	25	500	300	200
3.	Labor (HOK/ production process)	2	10	2	5	10	5
4.	Conversion Factor (kg output/kg raw material)	0,86	0,03	0,60	0,20	0,33	2,19
5.	Labor coefficient (HOK/kg raw material)	0,29	0,01	0,08	0,01	0,03	0,03
6.	Output Price (Rp x000/kg)	120	2.916	60	1.250	500	150
7.	Average wages of labor (Rp x000/production process)	100	100	100	100	100	200
II. Added Value and Benefits							
8.	Price of raw materials (Rp x000 /kg)	13	13	14,255	13	13	13
9.	Other input contributions (Rp x000/kg output)	36.179	13	8.580	125,208	120	87,208
10.	Output Value (Rp x000/kg)	102.857	87,535	36	245	166,67	328,125.
11.	Added Value (Rp x000/kg)	53,677	60,601	13,164	106,791	33,67	227,916
	Value added ratio (%)	52,19	69,23	36,57	43,59	20.20	69.46
12.	Labor income (Rp x000/kg)	28,571	1,248	8	1	3,33	5
	Labor portion (%)	53,23	1,98	60,77	0,94	9.90	2.19
13.	Benefits (Rp x000/kg)	25,106	59,401	5,164	105,791	30,33	222,916
	Profit section (%)	24,41	67,86	14,35	43,18	18.20	67.94
III. Reply to Production Factor Services							
14.	Marjin (Rp x000./kg)	89,857	74,535	21,745	232	153,67	315,125
a.	Labor income (%)	31,80	1,61	36,79	0,43	2.17	1.59
b.	Other input contributions (%)	40,26	18,69	39,46	53,97	78.09	27.67
c.	Profit (%)	27,94	79,70	23,75	45,60	19.74	70.74

analysis of condition 2 for an increase in bank interest rates on each product by 20%. The project life assumption used is 10 (ten) years. the results of the sensitivity analysis one can be seen in Table 4.

In the mangosteen peel extract floor cleaning products, the price of the product is Rp. 15,000 / bottle at the level of agro-industry and the project life is 10 years, then a total receipt value of Rp. 44.310.168.200,- will be obtained. Based on the Table 2, the results of the calculation of financial investment feasibility criteria, this agro-industry can be declared feasible to be implemented. With a return on capital of 2.12 years, the NPV value is Rp. 2,968,910,412,- and the B / C ratio is 1.11. However, at the level of product prices falling to Rp. 13,000 / bottle, then during the life of the project a total revenue value of Rp. 41,550,013,440,- will be obtained. Based on the table of results of the calculation of financial investment eligibility criteria sensitivity 1 scenario, this agroindustry is declared not feasible to be implemented. With a capital return rate of 16.74 years which means exceeding the

project age limit, the NPV value is minus Rp. 963,575,379,- and the B / C Ratio value is 0.96 or less than 1. If the Net BCR is less than one or BCR is less from zero, then the business is detrimental then not feasible, and vice versa (Kadariah et.al., 2001). Therefore, it is not followed by sensitivity calculation 2.

If analyzed from the results of the investment feasibility calculations above, it can be concluded that the Mangosteen Dodol Product, Mangosteen Peel Extract, Tea Nano Mangosteen Peel, Mangosteen Powder Drink and Mangosteen Syrup products are feasible to be carried out under normal conditions and under sensitivity 1 and 2. However, the Extract Floor Soap product is said feasible only under normal conditions. On sensitivity conditions 1 product Mangosteen Peel Extract Floor Soap is declared not feasible because no return on capital (PBP) is not appropriate and the NPV value gets a minus value which means the business is detrimental.

Whereas the results of the value added analysis using the Hayami method on each product can be seen in the Table 5. From the data in the table above, it provides information that the product of dodol manggis is required to contribute another input of 40.26% or Rp. 36,179.17/kg of output from the margin of Rp. 89,857.14/ kg. While the added value of Rp. 53,677.98/ kg, obtained from the output value of Rp. 102,857.14 / kg which was reduced by the price of raw materials of Rp. 13,000 / kg and the contribution of other inputs was Rp. 36,179.17/ kg of output. For mangosteen peel extract cleansing products, another input contribution of 39.46% or IDR 8,580.73/ L of output is needed from the margin of IDR 21,745 / L Added value of Rp. 13,164.27 / L. In contrast to mangosteen skin extract products, a significant contribution of other inputs is needed around 18.69% or Rp. 13,933.33 / kg of output from a margin of Rp. 74,535.01/ kg. While the added value of Rp. 60,601.68/ kg. Whereas the mangosteen skin nano tea product needed another input contribution of 53.97% or Rp 125,208.33/kg output from a margin of Rp. 232,000/ kg Added value of Rp. 106,791.67/L. In the mangosteen powder drink product, to make the mangosteen juice powder is required another significant input contribution which is around 78% or Rp 120,000 / kg. While the added value of Rp 33,666/Kg. Whereas to make mangosteen syrup needed another input contribution of 27% or Rp 87,208 / L and an added value of Rp 227,916/ L. Based on the results of the analysis of value added for some mangosteen derivative products, it shows that mangosteen syrup products have a greater chance. the value added of the product is Rp. 227,916/L of mangosteen raw material.

4 CONCLUSIONS

The agropolitan area of Karacak, Bogor Regency has the potential to become a mangosteen-based agropolitan area. The results of the analysis of the added value of nano mangosteen tea have higher added value than other products and better economic feasibility. Nano mangosteen tea and mangosteen syrup are mangosteen derivative products that have considerable added value than other products with added value of Rp. 106.791.000 and Rp. 227.916.000 per kilogram. While the economic feasibility results indicate that nano mangosteen tea and mangosteen peel extract have feasibility criteria with a PBP value of less than 1 year; NPV amount Rp. 66.829.633 and Rp. 68.369.956 ; B/ C ratio of 1,61 and 2,13.

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