Feasibility Study of Cassava Plantation and Tapioca Flour Industry in Bengkalis Regency

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Abstract. This research aims to conduct a economic feasibility study on cassava plantation and tapioca flour industry in Bengkalis Regency. The study was conducted to evaluate the economic, technical, environmental, and social potential of developing these agricultural sectors in the region. In this study, we applied a comprehensive methodology, including field surveys, secondary data analysis, interviews with farmers, and literature review. Key aspects assessed include production cost estimation, revenue projection, market analysis, risk analysis, and environmental impact of cassava plantation and tapioca flour production. The study results show that the potential of cassava plantations in Bengkalis Regency is promising, with a positive NPV value, a payback period of 1 year and 6 months, a profit index of 6.72, an IRR of 37.76%, and a GIM value of 2.09. Economic projections indicate favorable investment opportunities in the tapioca starch industry, with consistent market demand and export potential.

Keywords: cassava plantation, economic feasibility study, tapioca flour industry

1 Introduction

Riau Province has been known as one of the largest petroleum producer areas in Indonesia, through oil and gas products Riau grew quite rapidly, especially after the implementation of the Regional Autonomy Law. In addition to oil and gas potential, Riau also has other potential that is quite large and international, including the Palm Oil and Paper Industry. For the paper industry in Riau Province, there are two international-scale paper mills that produce various types of paper for domestic and export purposes. The two giant paper mills are PT Indah Kiat, which was established in 1976 and is located in Perawang City, Siak Regency, and PT Riau Andalan Pulp and Paper (RAPP), which is located in Kerinci, Pelalawan Regency, which was established in 1995. In 2017 PT RAPP produced 3,500 tons of paper per day (850,000 tons per year) and became the second largest paper producer in the world after International Paper, a paper producer from the United State of America (USA) [1].

An interesting fact revealed in a regional economic forum is that the existence of two giant paper mills in Riau to produce world-class paper requires a large amount of tapioca flour. Tapioca is a mandatory raw material that must be available in the paper industry, so that the paper produced is white and has a smooth surface. PT Indah Kiat explained that the need for tapioca at the factory in Perawang reaches 3,000 tons per month. Currently, most of these needs are imported

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from Thailand, only a few are fulfilled from domestic producers. Even Permadi Eko (2020) explained that throughout 2019 Riau imported 40,000 tons of tapioca for the paper industry with a total budget of Rp. 250 billion [8].

The high demand for tapioca for the paper industry is a business opportunity for national entrepreneurs, especially in Riau Province. In 2016, a tapioca factory with a capacity of 150 tons per day was established, located in Kandis District, Siak Regency. Quoting Hasan Basri's statement in an online news, he explained that the kandis tapioca factory is capable of processing cassava into tapioca up to 1500 tons per day. To achieve this production requires at least 3500 Ha of cassava plantation land per year [12].

Looking at the description above with the level of need and the nominal round of money, it is clear that cassava is one of the potential commodities to be developed in Riau Province, especially in meeting the needs of the tapioca industry. It's just that what is happening now is that several factories that were built actually lack the supply of cassava raw materials from farmers. In terms of making cassava as one of the leading commodities that has a broad multiplayer effect on society and at the same time is able to meet the needs of the industry and a source of Regional Original Income (PAD) [13]. So it is necessary to prepare a study that discusses the best efforts in meeting the needs of cassava as raw material for the existing tapioca industry. So that the plan to fulfill industrial tapioca through domestic supply can be realized.

2 Research Methods

The research method used in data analysis in this study is a mixed method between qualitative methods and quantitative methods, qualitatively analyzing data based on the process of interviews and in-depth discussions (indepth interviews) conducted to data sources (key informants) who are competent to provide the information needed in the preparation of this business feasibility study of cassava plantations and tapioca flour industry.

2.1 Data Collection

Data collection methods are ways that can be used to collect research data. The data in this study were obtained by means of observation, interviews and literature studies. Observation is data collection by directly observing the objects under study so as to obtain a real picture. Interviews are conducted by conducting questions and answers directly with stackeholders who have information. Literature study is data collection through related book or journal sources related to aspects of business and financial feasibility.

2.2 Data Analysis

The data analysis used in this research is qualitative and quantitative analysis methods. Qualitative methods are used to obtain an overview of business feasibility aspects such as technical aspects, management aspects, legal aspects, economic and social aspects, environmental aspects, and market aspects. Quantitative analysis in this study was used to calculate the financial feasibility of the tapioca yam processing plant. The quantitative methods to calculate the financial feasibility are BEP, ROI, R/C ratio, PP, NPV and IRR.

3. Result and Discussion

Table 1. Estimated Cash Flow of Cassava Plantation

Year	Revenue	Total Expenditure						NCF/ Net Profit	
		Office Cost	Employee Cost	Land Rental Cost	Land Operational	Operational vehicle	Depreciation		
	N	a	b	c	d	e	f	= ∑ Expenditure	= N - ∑ Expenditure
I	84,000,000,000.00	2,034,000,000.00	335,400,000.00	8,000,000,000.00	22,400,000,000.00	5,147,083,333.33	2,338,386,666.67	40,254,870,000.00	43,745,130,000.00
II	88,200,000,000.00	2,135,700,000.00	352,170,000.00	8,400,000,000.00	23,520,000,000.00	5,404,437,500.00	2,338,386,666.67	42,150,694,166.67	46,049,305,833.33
III	92,610,000,000.00	2,242,485,000.00	369,778,500.00	8,820,000,000.00	24,696,000,000.00	5,674,659,375.00	2,338,386,666.67	44,141,309,541.67	48,468,690,458.33
IV	97,240,500,000.00	2,354,609,250.00	388,267,425.00	9,261,000,000.00	25,930,800,000.00	5,958,392,343.75	2,338,386,666.67	46,231,455,685.42	51,009,044,314.58
V	102,102,525,000.00	2,472,339,712.50	407,680,796.25	9,724,050,000.00	27,227,340,000.00	6,256,311,960.94	2,338,386,666.67	48,426,109,136.35	53,676,415,863.65
VI	107,207,651,250.00	2,595,956,698.13	428,064,836.06	10,210,252,500.00	28,588,707,000.00	6,569,127,558.98	2,338,386,666.67	50,730,495,259.84	56,477,155,990.16
VII	112,568,033,812.50	2,725,754,533.03	449,468,077.87	10,720,765,125.00	30,018,142,350.00	6,897,583,936.93	2,338,386,666.67	53,150,100,689.50	59,417,933,123.00
VIII	118,196,435,503.13	2,862,042,259.68	471,941,481.76	11,256,803,381.25	31,519,049,467.50	7,242,463,133.78	2,338,386,666.67	55,690,686,390.64	62,505,749,112.49
IX	124,106,257,278.28	3,005,144,372.67	495,538,555.85	11,819,643,550.31	33,095,001,940.88	7,604,586,290.47	2,338,386,666.67	58,358,301,376.84	65,747,955,901.44
X	130,311,570,142.20	3,155,401,591.30	520,315,483.64	12,410,625,727.83	34,749,752,037.92	7,984,815,604.99	2,338,386,666.67	61,159,297,112.35	69,152,273,029.85

Notes:

1. Revenue (net profit) predicted to increase by 5% per year, forecast number of visitors
2. Employee salaries to increase by 5% per year
3. ADM costs increase by 5% per year
4. Asset depreciation costs 10% of total asset value
5. General expenses increased by 3% per year

Table 2. Estimated Net Cash Flow (NCF) of Cassava Plantation

Year	Net Profit (IDR)	Depreciation (IDR)	NCF (IDR)
1	43,745,130,000	2,338,386,667	46,083,516,667
2	46,049,305,833	2,338,386,667	48,387,692,500
3	48,468,690,458	2,338,386,667	50,807,077,125
4	51,009,044,315	2,338,386,667	53,347,430,981
5	53,676,415,864	2,338,386,667	56,014,802,530
6	56,477,155,990	2,338,386,667	58,815,542,657
7	59,417,933,123	2,338,386,667	61,756,319,790
8	62,505,749,112	2,338,386,667	64,844,135,779
9	65,747,955,901	2,338,386,667	68,086,342,568
10	69,152,273,030	2,338,386,667	71,490,659,697

3.1 Analysis Net Present Value

Formula:

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

Where:
NPV = net present value

(C)t = year t cash inflow
(Co)t = year t cash outflow
n = age of the investment result business unit
i = rate of return
t = time

Indication:
NPV = positive, the proposed project can be accepted, the higher the NPV number the better
NPV = negative, the proposed project is rejected
NPV = 0 means neutral

Table 3. Perh Calculation of NPV of Cassava Plantation

Year	Cash Flow (IDR)	DF (8%)	Present Value (PV in IDR)
1	43,745,130,000	0.943	41,268,990,566
2	46,049,305,833	0.890	40,983,718,257
3	48,468,690,458	0.840	40,695,247,132
4	51,009,044,315	0.792	40,403,940,769
5	53,676,415,864	0.747	40,110,140,444
6	56,477,155,990	0.705	39,814,166,409
7	59,417,933,123	0.665	39,516,319,100
8	62,505,749,112	0.627	39,216,880,273
9	65,747,955,901	0.592	38,916,114,078
10	69,152,273,030	0.558	38,614,268,072
	Total PV of Cash Flow		399,539,785,101
	Total Investment		59,453,416,667
	Net Present Value		340,086,368,435

From table 5.4 Calculation of NPV of Cassava Plantation above, it can be seen that the Net Present Value (NPV) value is positive (+), namely Rp340,086,368,435, thus this Cassava Plantation is feasible to establish.

3.2 Profitability Index (PI)

Profitability Index is the present value of cash flow compared to the investment value [2]. If the Profitability Index value is above 1, then the investment is worth accepting.

Formula: $$PI = \frac{PV\ Cash\ Flow}{Investments}$$

$$Profitability\ Index = \frac{\text{Rp}399{,}539{,}785{,}101}{\text{Rp}59{,}453{,}416{,}667} = 6{,}720$$

The Profitability Index (PI) value is above 1, namely 6.720, so the Cassava Plantation investment is feasible.

3.3 Analysis Internal *Rate of Return* (IRR)

Internal Rate of Return (IRR) is the interest rate that will make the sum of the present values of the proceeds expected to be received equal to the sum of the present values of capital expenditures [3]. Basically, to calculate the IRR, a discount factor must be found so as to produce a negative NPV close to zero if the first NPV is positive. To find the discount factor by ittrative procedures.

Formula IRR :

$$IRR = PI - CI + \left[\frac{P2 - P1}{C2 - C1}\right] x\ 1\%$$

Description:
P1 = 1st interest rate
P2 = 2nd interest rate
C1 = 1st NPV
C2 = 2nd NPV

Table 4. Calculation of IRR for Cassava Plantation

Year	Cash Flow (IDR)	DF (6%)	Present Value (PV) (IDR)	DF (30%)	Present Value (PV) (IDR)
1	43,745,130,000	0.943	41,268,990,566	0.769	31,745,377,358
2	46,049,305,833	0.890	40,983,718,257	0.592	24,250,720,862
3	48,468,690,458	0.840	40,695,247,132	0.455	18,523,098,376
4	51,009,044,315	0.792	40,403,940,769	0.350	14,146,542,757
5	53,676,415,864	0.747	40,110,140,444	0.269	10,802,826,998
6	56,477,155,990	0.705	39,814,166,409	0.207	8,248,548,142
7	59,417,933,123	0.665	39,516,319,100	0.159	6,297,570,204
8	62,505,749,112	0.627	39,216,880,273	0.123	4,807,576,724
9	65,747,955,901	0.592	38,916,114,078	0.094	3,669,773,811
10	69,152,273,030	0.558	38,614,268,072	0.073	2,801,007,581
	Number of PV Cash Flow		399,539,785,101		125,293,042,813
	Total Investment		59,453,416,667		59,453,416,667
	Net Present Value		340,086,368,435		65,839,626,147

$$IRR = 6\% - 340{,}086{,}368{,}435 + \left[\frac{30\% - 6\%}{65{,}839{,}626{,}147 - 340{,}086{,}368{,}435}\right] x\ 1\%$$

$$IRR = 6\% - 340{,}086{,}368{,}435 + \left[\frac{24\%\ (340{,}086{,}368{,}435)}{-\text{Rp}274.246.742.288}\right] x\ 1\%$$

$$IRR = 6\% + 29{,}76\%$$

$$IRR = 37{,}76\%$$

This means that the invested capital of Rp59,453,416,667 when compared to the cost of capital or the required interest of 6 percent obtained a higher IRR of 37.76 percent, so the investment for the establishment of Cassava Plantation is feasible.

3.4 Payback Period Analysis

Table 5. Payback Period Calculation

Year	Net Cashflow (IDR)	Payback Period (IDR)
1	43,745,130,000	(15,708,286,667)
2	46,807,289,100	31,099,002,433
3	50,083,799,337	81,182,801,770
4	53,589,665,291	134,772,467,061
5	57,340,941,861	192,113,408,922
6	61,354,807,791	253,468,216,713
7	65,649,644,337	319,117,861,050
8	70,245,119,440	389,362,980,490
9	75,162,277,801	464,525,258,291
10	80,423,637,247	544,948,895,538
Total	**604,402,312,204**	

Based on the calculation of the payback period, it can be seen in the table above, that the investment value will return in 1 year and 6 months. The shorter the investment return time, the faster the business turnover will be.

3.5 Gold Index (GI) Method

According to Islamic principles, investments should not determine profits in advance, but should be made through profit-sharing in both profit and loss situations. This principle ensures fairness for both those who own the capital and those who run the business [7]. This is because profit

sharing is done based on the final results of a business. If the profit sharing is done in advance, there will be a high possibility that one party will experience a loss, or in Islam is trapped in the issue of usury.

Table 6. Calculation of Gold Value Method (GVM) of Cassava Plantation

Year	Cash Flow (IDR)	Profit sharing ratio	Revenue (IDR)	Gold Price* (per grams)	Revenue (gold grams)
1	43745,130,000	0.40	17,498,052,000	1,049,000	16,681
2	46,049,305,833	0.40	18,419,722,333	1,206,350	15,269
3	48,468,690,458	0.40	19,387,476,183	1,387,303	13,975
4	51,009,044,315	0.40	20,403,617,726	1,595,398	12,789
5	53,676,415,864	0.40	21,470,566,345	1,834,708	11,702
6	56,477,155,990	0.40	22,590,862,396	2,109,914	10,707
7	59,417,933,123	0.40	23,767,173,249	2,426,401	9,795
8	62,505,749,112	0.40	25,002,299,645	2,790,361	8,960
9	65,747,955,901	0.40	26,299,182,361	3,208,915	8,196
10	69,152,273,030	0.40	27,660,909,212	3,690,252	7,496
	Total Gold Revenue (grams)				**115,570**
	Investment at the beginning (grams)		59,453,416,667	1,049,000	**56,676**

** Assumed price of 1 gram gold in 2022 is IDR 1,049,000 and increases by 15% every year.*

The Gold Index or GI is the ratio between the Present Value of gold and the gold Present Value of cash flow expenses. This method provides results that are consistent with the Gold Value Method. The formula for this GI method can be written as follows:

$$GI = \frac{\text{Total Gold Revenue (grams)}}{\text{The first investment (gram)}}$$

Assuming the price of 1 gram of gold in 2022 is Rp1,026,000, the gold index can be calculated as follows:

$$GI = \frac{115{,}570}{56{,}676}$$

$$GI = 2{,}039$$

Based on these calculations, it can be seen that the GI value is more than 1 (one), namely 2.039, so the Cassava Plantation is feasible to establish.

From the results of the calculation of the feasibility study from the economic aspect by taking into account the financial results can be shown as follows:

Table 7. Results of Economic Feasibility Analysis

Assessment	Eligibility Criteria	Calculation Result	Decision Result
Net Present Value	Positive Value	+340,086,368,435	Eligible
Payback Period	Faster	1 year 6 month	Eligible
Profitability Index	Result ≥ 1	6,720	Eligible
Internal Rate of Return	Result ≥ bank interest 6%	37,76%	Eligible
Gold Index Method	Result ≥ 1	2,039	Eligible

4. Conclusion

The feasibility study of the Cassava Plantation and Tapioca Flour Industry in Bengkalis Regency presents a comprehensive analysis of the potential establishment of a cassava plantation and tapioca flour production facility in the region. Through a thorough examination of various factors, the study concludes with the following key findings:

1. Resource Availability: Bengkalis Regency possesses favorable agro-climatic conditions for cassava cultivation, including suitable soil types, rainfall patterns, and temperature ranges. This suggests that establishing a cassava plantation is viable in the region.
2. Market Demand and Trends: The demand for tapioca flour, a versatile ingredient used in various industries such as food, pharmaceuticals, and textiles, is projected to remain steady. The study identifies potential markets and consumption trends, indicating a positive outlook for the tapioca flour industry.
3. Technical and Operational Feasibility: The study examines the technical aspects of cassava cultivation, including planting, harvesting, and processing into tapioca flour. The availability of skilled labour and necessary equipment suggests that the operational requirements can be met effectively.
4. Financial Viability: A comprehensive financial analysis, including cost projections, revenue estimates, and potential return on investment, indicates that the cassava plantation and tapioca flour industry venture holds the potential for profitability over the medium to long term.
5. Socioeconomic Impact: The establishment of the cassava plantation and tapioca flour industry has the potential to contribute significantly to the local economy by creating employment opportunities, boosting rural development, and enhancing the income of local farmers.
6. Environmental Sustainability: The feasibility study acknowledges the importance of sustainable agricultural practices and recommends incorporating eco-friendly methods to minimize environmental impacts associated with cassava cultivation and processing.

In conclusion, the Feasibility Study of Cassava Plantation and Tapioca Flour Industry in Bengkalis Regency demonstrates a positive outlook for the establishment of a cassava plantation and tapioca flour production facility. The study's comprehensive analysis of resources, market trends, technical feasibility, financial viability, risk assessment, socioeconomic impact, and

environmental sustainability supports the viability of the proposed venture. By adhering to the recommended strategies and best practices, the project has the potential to contribute positively to the local economy and meet the demand for tapioca flour in various industries.

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