

Feasibility Study on the Development of Coconut Product Agroindustry in Berau Regency: A Financial Approach

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ARTICLE INFO

Keywords: Agroindustry, Coconut Product, Diversification Economy, Feasibility Study, Financial Approach.

Received : 20, July

Revised : 02, August

Accepted: 20, September

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ABSTRACT

The policy direction of the local government of Berau Regency in building agro-industry derivative products from coconut commodities is one of the alternative developments in the plantation sector. The potential for the development of coconut products is relatively strong when viewed both from the aspect of the area of planting and the aspect of annual production. This study aims to measure the potential financial benefits that can be generated from the development of coconut agro-industry products in Berau Regency. Utilizing data for 2021–2024 and financial feasibility measurement techniques such as Net Present Value (NPV), Internal Rate of Return (IRR), Benefit Cost Ratio (BCR), and Payback Period (PP), this study proves that the development of coconut derivative products is feasible to be developed within a period of six years, with an NPV value of IDR 10.79 billion, IRR of 54 percent, BCR of 1.22, and a payback period of 2.65 years. These four indicators are consistently above the required eligibility threshold, showing that the diversification of plantation commodities through the integrated processing of coconut derivative products is a financially viable economic alternative for Berau Regency, while supporting the regional economic transformation agenda that has tended to depend on the extractive sector, such as oil palm plantations and coal mining.

INTRODUCTION

Coconuts have economic value in almost all parts of their crops, ranging from pulp, water, shells, to coir. The Ministry of Agriculture of the Republic of Indonesia reported that national coconut production reached around 2.82 million tons of copra equivalent in 2024 and is projected to rise to 2.86 million tons in 2025, making Indonesia one of the largest coconut producers in the world, surpassing the Philippines and India. However, national coconut productivity is still relatively low, which is around 1.1 tons of copra per hectare, far below the plant's genetic potential of up to 3 tons. The government responded to this gap through the Coconut Downstream Roadmap 2025–2045 launched by the Ministry of National Development Planning (BAPPENAS) in September 2024, as a follow-up to the National Long-Term Development Plan 2025–2045, with a target of increasing the export value of coconuts and their derivative products by up to ten times in twenty years. The gap between low upstream productivity and the high potential for downstream added value is the main argument for the urgency of downstream national coconuts, so that this great potential does not only stop as a low-value upstream commodity.

The direction of the national policy is increasingly relevant to the plan to develop the agroindustry of coconut products in Berau Regency. The local government of Berau Regency has designated coconut commodities as one of the strategic superior commodities through East Kalimantan Provincial Regulation Number 11 of 2024 concerning the Regional Long-Term Development Plan (RPJPD) for 2025–2045. In the planning document, coconut commodities are focused on developing their products in the long term, along with other commodities, such as rubber, pepper, cocoa, and palm oil. This national and regional policy framework needs to be seen as an important foundation in formulating regional transformation through the development of value-added products from superior commodities. This is expected to encourage regional economic diversification of Berau Regency, which has been dominated by extractive sectors, such as oil palm plantations and coal mining.

Various studies related to the financial feasibility of coconut-based businesses and agroindustries have been carried out in various coconut production center areas in Indonesia, including the analysis of the financial feasibility of the nata de coco agroindustry in Pangandaran Regency, the feasibility of the desiccated coconut industry in Tasikmalaya Regency, the feasibility of the coconut fiber agroindustry in Ciamis Regency, to the feasibility study of the establishment of a deep coconut cooking oil industry center in Banggai Regency. Most of this research uses standard financial feasibility criteria such as Net Present Value (NPV), Internal Rate of Return (IRR), and Benefit-Cost

Ratio to determine the economic feasibility of coconut agroindustry businesses, with a similar approach also used in research on coconut sugar businesses in East Lampung Regency and MSME-scale coconut milk businesses in Padang Pariaman Regency.

However, the financial feasibility study of the development of coconut commodity derivative products through the agro-industrial scheme in Berau Regency has never been carried out before. Most of the feasibility studies on the development of coconut products also tend to be concentrated in Java, Sumatra, and Sulawesi, while the Kalimantan region, including Berau Regency, has not yet become a similar study locus. This condition confirms the urgency and foundation of this study to fill this gap, especially in the midst of the momentum of the national coconut downstream policy 2025–2045.

This study offers novelty by presenting a financial feasibility study of the development of an integrated coconut agroindustry, specifically for the Berau Regency area, which processes various parts of coconut (meat, shell, water, and coir) into value-added products at once. This study also positions coconut as an alternative to regional economic diversification in line with Berau's green economic transformation agenda, in the midst of the dominance of the palm oil and mining sectors which have been the main focus of the regional economy. Thus, the results of this research are expected to make an empirical and strategic contribution to local governments, business actors, and coconut farmers in formulating policies for the development of coconut agro-industry based on financial evidence in Berau Regency.

THEORETICAL FRAMEWORK

This research is fundamentally based on the capital budgeting theory, which provides an investment decision-making framework based on the time value of money through the indicators of Net Present Value (NPV), Internal Rate of Return (IRR), Benefit Cost Ratio (BCR), and Payback Period (PP). These four indicators are consistently used in contemporary agro-industry feasibility studies to assess the financial feasibility of a discounted or non-discounted cash flow-based project (Sinaga et al., 2023). The relevance of this theory is further strengthened by recent studies on the plantation commodity-based agribusiness sector in developing countries, which show that the combination of NPV, BCR, IRR, and payback period indicators is able to provide a comprehensive picture of investment viability, both in terms of absolute return, relative rate of return, and velocity of return on capital, as well as the basis for policy recommendations for investors and regional policymakers (Ayompe et al., 2021).

Referring to this research framework which examines the integrated processing of coconut into four derivative products at once (VCO, charcoal briquettes, nata de coco, and cocofiber) from the same raw material, the theoretical framework also relies on the theory of circular economy and the valorization of agroindustrial waste (circular bioeconomy). This theory emphasizes that residues and by-products from one production process can be converted into value-added raw materials for other production processes, thereby minimizing waste while maximizing the economic value of one unit of raw materials (Vieira et al., 2024; Wagh et al., 2024). This approach is increasingly relevant for coconut commodities in particular, considering that almost all parts of coconut fruit have the potential to be processed into commercial products, and the latest literature confirms that the integration of coconut waste valorization into the circular economy framework is the key to sustainability as well as the economic competitiveness of the coconut industry (Chojnacka et al., 2022; Haque et al., 2023).

In the agro-industrial value chain upgrading approach, it is explained that the added value of an agricultural commodity can be significantly increased through a shift in position from a raw material provider to a processor of high-value finished products. The latest study on the supply chain and innovation trends of the coconut agroindustry globally confirms that strengthening processing capacity at the upstream production level is the main determinant of the competitiveness of a region's coconut industry in the global market, as well as being a strategic basis for downstream policies based on smallholder plantation commodities (Ramírez et al., 2023). These three theoretical frameworks, investment feasibility, circular economy, and value chain improvement, complement each other in explaining the object of this research, namely the development of an integrated coconut agroindustry that is financially feasible (capital budgeting), operationally maximizing the use of raw materials (circular bioeconomy), as well as strategically placing raw material producing areas in a more favorable value chain position (value chain upgrading).

A number of previous studies provide an empirical basis for the above theoretical framework. Ayompe et al. (2021) evaluated the financial feasibility of oil palm processing investment by smallholders in Cameroon using PBP, IRR, BCR, and NPV indicators, and found that processing plantation products at the local level resulted in higher financial returns than the sale of raw materials, in direct line with the downstream logic tested in this study. Ramírez et al. (2023) conducting a technological foresight analysis of the global coconut agro-industry supply chain and identifying processing innovation trends as a key factor in the competitiveness of the world coconut industry. Vieira et al. (2024)

comprehensively reviewing the potential of coconut waste valorization into the circular economy framework, including the use of coir, shells, and other coconut residues into value-added products. Wagh et al. (2024) Discuss the biorefinery process and agro-industrial waste valorization in the framework of a circular economy that is relevant to the integrated coconut processing scheme. Haque et al. (2023) Examining the relevance of agricultural waste recovery to the agricultural sector in line with circular economy principles, provides a conceptual basis for the zero-waste approach adopted in the production scheme of this study. Meanwhile, Sinaga et al. (2023) compare capital budgeting methods (NPV, IRR, Payback Period) and affirm the consistency of the three as standard instruments for assessing the feasibility of project investments, which is the main methodological reference for the calculation of financial feasibility in this study.

METHODS

Data

This study uses two types of data, namely primary data and secondary data, which complement each other to answer the purpose of the financial feasibility study of the integrated coconut agroindustry in Berau Regency. Primary data was obtained through interviews with business actors engaged in the processing of coconuts and their derivative products, in order to explore information about the prices of raw materials and final products, the pattern of the coconut supply chain from farmers to processors, as well as the technical aspects of processing that make it possible to be developed on an agro-industrial scale. This interview approach was chosen because the information is local-specific and dynamic, so it is not adequately available in official data publications, but it is crucial to ensure that the assumptions in the financial feasibility analysis reflect real conditions on the ground.

The secondary data is used to obtain aggregate data that are macro and historical, such as data on coconut production in Berau Regency, which is obtained from relevant government agencies such as the Berau Regency Plantation Office and the Central Statistics Agency. This secondary data serves as the basis for projecting raw material capacity and validating the interview results, so that the combination of these two types of data results in a financial feasibility analysis that is not only based on theoretical assumptions, but also confirmed by actual conditions in the field and available official statistical data. The type of this research is a quantitative research to evaluate the feasibility of developing coconut product agroindustry with a financial approach in Berau Regency. The analysis tools used include Net Present Value (NPV), Internal Rate of Return (IRR), Payback of Period (PP) and Benefit Cost Ratio (BCR) which are further explained in the next section.

Data Analysis

The financial feasibility analysis tools used in this study include Net Present Value (NPV), Internal Rate of Return (IRR), Payback of Period (PP) and Benefit Cost Ratio (BCR). NPV is an investment feasibility analysis tool used to calculate the difference between the present value of all *cash inflow* and the current value of *cash outflow* a project during its economic life, taking into account the time value of money through a certain discount rate (Jones & Smith, 1982). For this reason, it is necessary to determine the economic life and interest rate, including tax rate, of a project before proceeding with the feasibility measurement using NPV. The following is the NPV measurement formula.

$$NPV = \sum_{t=1}^n \frac{CF_t}{(1+i)^t} - I_0$$

Where:

- CF_t = net cash flow in year t
- i = the required discount rate or return rate
- t = time period
- n = life of the investment project
- I_0 = Initial investment

Decision-making criteria:

- If the NPV is > 0 then the project is feasible
- If NPV = 0 then the project gives a return equal to the capital expended
- If the NPV < 0 then the project is rejected

On the other side, IRR is an investment feasibility analysis technique used to measure the project's internal rate of return, which is the discount rate that makes the Net Present Value (NPV) equal to zero. IRR describes the project's ability to generate a level of profit from the capital invested, without depending on the external interest rate (Wang, 2025). In investment decision-making practice, IRR is often used as an indicator of investment efficiency because it is expressed in easy percentage units compared to the minimum rate of return required by investors. IRR is formulated on the following equation.

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

Where: and $i_1 i_2$ is the discount rate that yields; and . The IRR decision criterion is that the project is declared eligible if the IRR is greater than the applicable interest rate. If the IRR is less than the required rate of return, then the project is considered unfeasible. $NPV_1 NPV_2$

Furthermore, Payback Period (PP) is an investment feasibility analysis technique that measures the period of time required to return the initial investment costs through the accumulation of project cash inflows (Sokolov, 2024). This technique emphasizes liquidity and short-term risk aspects rather than long-term value creation, so it does not reflect the overall profitability of the project as NPV or IRR. Therefore, PP is generally used as an initial screening tool (*screening tool*) in the investment decision-making process, not as a stand-alone feasibility indicator.

$$PP = \frac{I_0}{CF}$$

The decision-making criteria using PP refer to the duration of the return on investment period. The shorter the return period, the less liquidity risk the investor faces, as the capital can be immediately redirected to other investments. In the context of projects with high levels of uncertainty, PP is often used as an initial indicator to filter out projects that have a risk of return for too long.

Finally, BCR is an investment feasibility analysis tool used to calculate the comparison between the present value of the entire *cash inflow* (benefit) with the present value of the whole *cash outflow* (cost) of a project over its economic life, taking into account the time value of money (*time value of money*) through a certain discount rate (Rose & Pellegrini, 2026; Rosegrant et al., 2023). In contrast to NPV, which presents the difference in the form of absolute values, BCR presents the results in the form of ratios, so that it shows the amount of benefits generated for each unit of cost incurred. For this reason, it is necessary to determine the economic life and interest rate, including tax rate, of a project before proceeding with the feasibility measurement using BCR. The following is the BCR measurement formula.

$$BCR = \frac{\sum_{t=1}^n \frac{CI_t}{(1+i)^t}}{\sum_{t=1}^n \frac{CO_t}{(1+i)^t}}$$

Where:

- CI_t = cash inflows in the year t
- CO_t = cash outflows in year t, including initial investment in year 0
- t = time period
- n = life of the investment project
- i = the required discount rate or rate of return on investment

Decision-making criteria:

- If the BCR is > 1 then the project is feasible
- If BCR = 1 then the project provides a significant benefit with the costs incurred
- If BCR < 1 then the project is rejected

RESULTS

This section describes the relationship between these indicators in more depth, while placing them in the context of the characteristics of coconut commodities and the conditions of the Berau Regency area, in order to provide a more complete understanding of the meaning of the feasibility of integrated coconut agroindustry investment studied in this study. The total initial investment required for the establishment of this integrated coconut derivative product processing business unit is IDR 10.44 billion. The value consists of five main components, namely land of IDR 550 million, buildings of IDR 7.40 billion, planning and licensing of IDR 795 million, production tools and machinery of IDR 1.31 billion, and operational vehicles of IDR 389 million. Building components constitute the largest portion of the investment structure, which is around 70.9 percent of the total investment, followed by tools and machinery of 12.5 percent. Planning and licensing costs are assumed to be 10 percent of the value of land and buildings, referring to the assumptions used in the initial investment calculations of this study.

Table 1. Components of Initial Investment in the Development of Coconut Product Agroindustry

Investment Components	Value (Rp)
Land	550.000.000
Buildings	7.400.000.000
Planning and Licensing	795.000.000
Tools/Machines	1.309.229.200
Vehicles	389.000.000
TOTAL	10.443.229.200

Source: data processed by the author, 2026

The allocated land area of 2,200 m², priced at IDR 250 thousand per m², is divided into five designated zones: a VCO processing area and a charcoal briquette processing area, each covering 500 m² and valued at IDR 125 million; and a nata de coco processing area, a cocofiber processing area, and a supporting facilities area, each covering 400 m² and valued at IDR 100 million. Within the same land area, building requirements are allocated to three principal functions: a processing building covering 1,800 m² at a construction cost of IDR 3.5 million

per m² (IDR 6.30 billion), an office building covering 250 m² at the same construction cost (IDR 875 million), and a waste treatment unit covering 150 m² at a construction cost of IDR 1.5 million per m² (IDR 225 million).

Table 2. Components of Land Acquisition for Buildings

Buildings	Area (m ²)	Cost per m ² /(Rp)	Total Cost (Rp)
Processing Buildings	1,800	3,500,000	6,300,000,000
Office	250	3,500,000	875,000,000
Waste Treatment	150	1,500,000	225,000,000
TOTAL	2,200		7,400,000,000

Source: data processed by the author, 2026

Investment in production equipment and machinery is allocated across four coconut derivative product processing lines, with values varying according to the complexity of each process. The VCO processing line requires the largest investment among the four lines, at approximately IDR 416 million, encompassing eight processing stages from coir stripping to filling and labelling, with the vacuum evaporator machine, valued at IDR 203 million, as the dominant component. The charcoal briquette processing line requires an investment of IDR 495 million, dominated by a carbonization furnace unit valued at IDR 157 million. The nata de coco and cocofiber processing lines require investments of IDR 206 million and IDR 192 million, respectively. Beyond the four production lines, operational vehicle investment is allocated to one new box truck unit valued at IDR 324 million and one used box truck unit valued at IDR 65 million, bringing the total vehicle investment to IDR 389 million.

Table 3. Operational Equipment, Machinery and Vehicle Requirements

No.	Components	Investment Value (Rp)
1	VCO Processing Tools/Machines	415,996,000
2	Charcoal Briquette Processing Tools/Machines	495,465,600
3	Nata de Coco Processing Tools/Machines	206,141,600
4	Cocofiber Processing Tools/Machines	191,626,000
5	Operational Vehicles	389,000,000
TOTAL		1,698,229,200

Source: data processed by the author, 2026

The structure of monthly operating costs shows that the production component dominates overall expenditure, amounting to approximately IDR 704.7 million, or around 84.1 percent of the total monthly operating costs of approximately IDR 838 million. This dominance stems primarily from the procurement of coconut raw materials, which accounts for approximately 82.0 percent of total monthly operating costs, far exceeding the combined contribution of all daily production support materials, which account for only around 2.1 percent. This structure indicates that the coconut derivative product processing business is material-intensive in nature, as reflected in the contribution of labor costs, which amounts to only 8.8 percent. This finding has implications for operational risk management, as business continuity is more vulnerable to fluctuations in the price and availability of coconut supply than to changes in labor costs. A comparison with the initial investment value of approximately IDR 10.44 billion further reveals that total annual operating costs, at approximately IDR 10.06 billion, represent an almost equivalent magnitude, underscoring the need for careful working capital planning from the first year of operation onward.

Table 4. Operational Cost Components

No.	Operational Cost Components	Total (Rp)
1	Production	704,696,312
2	Phone/Internet	490,000
3	Tool Maintenance	2,511,005
4	Employee Salary	73,500,000
5	Marketing	56,812,063
Total Monthly Operations		838,009,380
Total Annual Operating Costs		10,056,112,560

Source: data processed by the author, 2026

The calculation of the need for coconut raw materials is based on data on deep coconut production in Berau Regency in 2024 of 2,570 tons per year (Berau Regency Plantation Office), assuming that the factory operates 12 months per year and 22 working days per month, and utilizes 60 percent of the total regional production capacity to maintain supply sustainability. Based on this assumption, the maximum raw material capacity is recorded at 9,740 kilograms per day, with

a target of 5,844 kilograms per day of raw materials, or the equivalent of 3,903 coconuts per day (assuming 1 grain is equivalent to 1.5 kilograms). This figure is consistent with the demand for coconuts in the calculation of operational costs of 85,870 pieces per month, with a difference of less than 0.01 percent due to rounding, thus showing that the projected production capacity and raw material needs have been prepared coherently and the availability of raw materials in Berau Regency is theoretically sufficient to support the planned production scale.

Table 5. Simulation of Raw Material Use

Scheme	Unit/Description
2,570 tons: 12 = 214 tons	Monthly
214.16 tons: 22 = 9.75 tons	Daily
9.74 tons x 1,000 = 9,740 Kg	Maximum Raw Material Capacity
9.740 Kg x 60% = 5.844 kg	Target Raw Material of Coconut u/ Processing (kg)
5.855 kg : 1.5 kg = 3.903 grains	Convert to coconut granules (daily)

Source: data processed by the author, 2026

Regarding the production scheme, each processed coconut grain is used in an integrated manner to produce four derivative products at once, namely virgin coconut oil (VCO) from coconut meat, charcoal briquettes from coconut shells, nata de coco from coconut water, and cocofiber from coconut fiber, with the same raw material needs of 3,903 coconuts per day for the four production lines. Based on this basis, the daily production capacity produced includes 390.3 liters of VCO, 780.6 kilograms of charcoal briquettes, 557.6 kilograms of nata de coco, and 487.8 kilograms of cocofiber, which are respectively equivalent to the monthly production targets of 8,587 liters, 17,173.2 kilograms, 12,267.2 kilograms, and 10,733.3 kilograms. On an annual basis, the projected production of the four products reaches around 103,048 liters of VCO, 206,078.4 kilograms of charcoal briquettes, 147,206.4 kilograms of nata de coco, and 128,799 kilograms of cocofiber, respectively. This integrated production scheme shows efforts to use coconut raw materials as a whole (*zero-waste approach*), where each coconut component is processed into a value-added product without leaving any waste unused.

Table 6. Production Scenario

Potential Raw Materials	Final Products	Raw material usage	Daily Capacity	Monthly Production Target	Annual Production Target
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Coconut Meat	Virgin Coconut Oil (VCO)	3,903 pieces	390.3 liters	8,587 liters	103,048 liters
Coconut Shell	Charcoal Briquettes	3,903 pieces	780.6 kg	17,173.2 kg	206,078.4 kg
Coconut Water	Nata de Coco	3,903 pieces	557.6 kg	12,267.2 kg	147,206.4 kg
Coconut Coir	Cocofiber	3,903 pieces	487.8 kg	10,733.3 kg	128,799 kg

Source: data processed by the author, 2026

The production quantity scenario of coconut derivative products is prepared for a six-year operational period, starting from 2026 to 2031. In the first year of operation (2026), the plant has not yet produced production because this stage is fully allocated for initial preparation, while from the second year (2027) to the sixth year (2031), the four production lines are assumed to have operated at the maximum capacity consistently, namely around 103 thousand liters of VCO, 206 thousand kilograms of charcoal briquettes, 147 thousand kilograms of nata de coco, and 129 thousand kilograms of cocofiber per year. This scenario is conservative in terms of the time of achieving the target, as it does not include a phased increase in production (ramp-up), so revenue projections in the early years of operation tend to represent full production conditions from the beginning of operation.

The final product selling price scenario in the same period is also assumed to be fully valid since the second year of operation, with price details of IDR 80 thousand per liter for VCO, IDR 25 thousand per kilogram for charcoal briquettes, IDR 15 thousand per kilogram for nata de coco, and IDR 20 thousand per kilogram for cocofiber, which is set constant until the fifth year. The price of VCO, which is much higher than the other three derivative products, reflects its position as the highest value-added product in this integrated coconut processing chain, in line with the characteristics of VCO as a processed product with a more complex production process and a more specific market segmentation than charcoal briquettes, nata de coco, and cocofiber.

Based on the combination of these quantity and price scenarios, the projection of annual cash inflows of factories from 2027 to 2031 is consistently recorded at IDR 18.18 billion per year, with the largest contribution coming from VCO of IDR 8.24 billion (45.3 percent), followed by charcoal briquettes of IDR 5.15 billion (28.3 percent), cocofiber of IDR 2.58 billion (14.2 percent), and nata de coco of IDR 2.21 billion (12.2 percent). This structure shows that VCO is the

flagship product that contributes the most significant revenue even though the production volume of charcoal briquettes is twice as large as VCO, thus confirming that the selling value per unit of product is the main determining factor in revenue contribution, not solely the volume of production produced.

Table 7. Production Quantity Scenario in Six Years of Operation

Production Scheme	1st year	2nd year	3rd year	4th year	5th year	6th year
VCO	0	103.048	103.048	103.048	103.048	103.048
Charcoal Briquettes	0	206.078	206.078	206.078	206.078	206.078
Nata de Coco	0	147.206	147.206	147.206	147.206	147.206
Cocofiber	0	128.799	128.799	128.799	128.799	128.799

Source: data processed by the author, 2026

Table 8. Product Price Scenario in Six Years of Operation

Product Pricing	1st year	2nd year	3rd year	4th year	5th year	6th year
VCO	0	80.000	80.000	80.000	80.000	80.000
Charcoal Briquettes	0	25.000	25.000	25.000	25.000	25.000
Nata de Coco	0	15.000	15.000	15.000	15.000	15.000
Cocofiber	0	20.000	20.000	20.000	20.000	20.000

Source: data processed by the author, 2026

Table 9. Cash Inflow Scenario in Six Years of Operation

Cash Inflow Scenario	1st year	2nd year	3rd year	4th year	5th year	6th year
VCO	0	8.243.840.000	8.243.840.000	8.243.840.000	8.243.840.000	8.243.840.000
Charcoal Briquettes	0	5.151.950.000	5.151.950.000	5.151.950.000	5.151.950.000	5.151.950.000
Nata de Coco	0	2.208.090.000	2.208.090.000	2.208.090.000	2.208.090.000	2.208.090.000
Cocofiber	0	2.575.980.000	2.575.980.000	2.575.980.000	2.575.980.000	2.575.980.000
Total Cash Inflow	0	18.179.860.000	18.179.860.000	18.179.860.000	18.179.860.000	18.179.860.000

Source: data processed by the author, 2026

The results of the financial evaluation of the agroindustry investment plan for coconut derivative products indicate strong feasibility, based on four complementary investment appraisal criteria: Net Present Value (NPV), Internal

Rate of Return (IRR), Payback Period (PP), and Benefit-Cost Ratio (BCR). This project requires an initial investment of approximately IDR 10.44 billion in period 0, with a projected stable net cash inflow of approximately IDR 6.34 billion per year over six years of operation, after accounting for a tax burden of 22 percent. At a discount rate of 15 percent, which reflects the minimum cost of capital, or the minimum rate of return required by investors, the project generates a positive NPV of approximately IDR 10.80 billion. According to standard investment analysis principles (Brigham & Houston, 2018), a positive NPV indicates that a project is able to generate economic value in excess of investors' minimum expectations, thereby rendering it fundamentally feasible to run.

Table 10. Financial Development Analysis

Period	1st year	Year 2	3rd year	4th year	5th year	6th year
Cash Inflow	0	18.179.860.000	18.179.860.000	18.179.860.000	18.179.860.000	18.179.860.000
Cash Outflow	(10.443.229.200)	(10.056.112.654)	(10.056.112.654)	(10.056.112.654)	(10.056.112.654)	(10.056.112.654)
Profit Before Tax	(10.443.229.200)	8.123.747.346	8.123.747.346	8.123.747.346	8.123.747.346	8.123.747.346
Tax	0	(1.787.224.416)	(1.787.224.416)	(1.787.224.416)	(1.787.224.416)	(1.787.224.416)
Net Cash Flow	(10.443.229.200)	6.336.522.930	6.336.522.930	6.336.522.930	6.336.522.930	6.336.522.930
Cumulative Cash Flow	(10.443.229.200)	(4.106.706.270)	2.229.816.660	8.566.339.590	14.902.862.520	21.239.385.449
Taxes (%)			22%			
Interest Rate (%)			15%			

Source: data processed by the author, 2026

The IRR indicator of 54% strengthens this conclusion, as the value far exceeds the 15% discount rate used as the *hurdle rate*. The wide gap between the IRR and the interest rate indicates that there is a significant *margin of safety*, so that the project remains potentially viable despite fluctuations in the cost of capital or uncertainty in the coconut raw material market in the future. This is also supported by a relatively short *payback period*, which is 2.65 years from the total six-year projection period, which indicates a low level of liquidity risk for

investors as the initial capital can be returned before half of the project's operational life ends. However, it should be noted that the *payback period* method has conceptual limitations because it does not take into account the *time value of money* in full or cash flow after break-even is reached, so its use should be complementary to NPV and IRR, not as a single criterion.

Meanwhile, the *Benefit-Cost Ratio* (BCR) analysis provides additional perspective on the efficiency of resource use in the project. Based on the calculation of the *present value* of all benefits (*cash inflow*) and costs (*cash outflow* and taxes) for six projected years at a discount rate of 15%, a BCR value of 1.22% was obtained. This value shows that every rupiah of cost incurred is able to produce a benefit of Rp1.22, or there is a surplus of benefits of 22% of the total cost in the present value. The BCR value of more than one confirms that the benefits of the project economically exceed the sacrifice of resources spent, thus strengthening the consistency of the NPV and IRR results that have been obtained previously. Thus, the four indicators, positive NPV, IRR that far exceeds the *hurdle rate*, relatively short *payback period*, and BCR above one, simultaneously provide a strong basis to conclude that the development plan for the agro-industry of coconut derivative products is feasible from a financial point of view, although it is still recommended to analyze the sensitivity to the variables of raw material prices, production volumes, and interest rate fluctuations to mitigate the risk of uncertainty in the future.

Table 11. Financial Feasibility Analysis

Analysis	Value	Criteria	Status
NPV	10.797.778.443	NPV > 0	Feasible
IRR	54%	IRR > Interest Rate	Feasible
Payback of Period	2.65 years	PP < 5 Years	Feasible
BCR	1.22	BCR > 1	Feasible

Source: data processed by the author, 2026

DISCUSSION

The consistency of the four indicators, NPV, IRR, Payback Period, and Benefit Cost Ratio, within the feasible zone strengthens the argument that coconut commodities in Berau Regency hold economic potential that has not yet been optimally exploited. The positive NPV of IDR 10.80 billion and the IRR of 54 percent, which far exceed the hurdle rate of 15 percent, indicate that the gap in the utilization of this commodity is not a matter of economic feasibility, but rather a lack of structured downstreaming initiatives. These findings are consistent with Santiago et al. (2025), who evaluated a VCO processing facility in Aklan, Philippines, and reported a positive NPV, an IRR of 33 percent, and a Benefit Cost Ratio of 1.46, thereby confirming that investment in coconut

derivative agroindustry is generally competitive relative to benchmark interest rates across the Southeast Asian region. These results provide empirical justification for the regional economic diversification agenda set out in the Berau Regency RPJPD 2025 to 2045, as well as evidence of a transformation away from dependence on the extractive sector.

The Benefit Cost Ratio of 1.22 obtained in this study is slightly below the finding reported by Santiago et al. (2025), a reasonable difference given that the model employed here integrates four production lines simultaneously, namely VCO, charcoal briquettes, nata de coco, and cocofiber, such that the fixed investment burden, particularly the building component, which absorbs 70.9 percent of total investment, also reduces the margin between benefits and costs. This approach of utilizing all coconut components without waste is consistent with the direction of global coconut agroindustry development identified by Ramírez et al. (2023), who identify the holistic utilization of coconut as an essential element of coconut agribusiness competitiveness amid growing global consumer demand. However, the raw material intensive operating cost structure, in which the procurement of coconuts absorbs approximately 82 percent of monthly operating costs, underscores the dependence of the business on supply and price stability at the farmer level. Similar vulnerabilities were revealed by Wahyudi et al. (2025) in the coconut supply chain of Indragiri Hilir, Riau, which identified raw material supply and marketing as the principal weaknesses affecting the sustainability of Indonesia's coconut agroindustry, a risk that is also anticipated to be relevant in Berau.

The substantial difference between the 54 percent IRR and the 15 percent interest rate provides investors with a considerable margin of safety against rising capital costs or fluctuations in raw material prices, reinforced by a relatively short payback period of 2.65 years within the projected six year horizon, reflecting low liquidity risk. However, the payback period should not be interpreted as a stand-alone measure of profitability. Yard (2000) emphasizes that this method has two fundamental weaknesses, namely its disregard for the precise time value of money and its exclusion of cash flows occurring after the break-even point, and therefore recommends that it be used to complement, rather than replace, NPV and IRR. The BCR value of 1.22 complements the other three indicators by showing that every single rupiah of cost generates IDR 1.22 in benefits, such that the four indicators collectively reinforce one another and provide a robust basis for concluding that the project is feasible.

Although all four indicators consistently support the feasibility of the project, several methodological limitations warrant acknowledgment. The assumption of constant production and prices from the second through the fifth year does not adequately accommodate real market dynamics, including the volatility of raw material prices that Wahyudi et al. (2025) demonstrated to be a structural problem in Indonesia's coconut producing center. The use of a single discount rate of 15 percent, without sensitivity analysis under pessimistic scenarios, also risks overstating the project's actual margin of safety. Better

practice is demonstrated by Santiago et al. (2025), who complemented their NPV, IRR, and Benefit Cost Ratio findings for the VCO facility in Aklan with sensitivity analysis of changes in sales, costs, and discount rates, thereby yielding results that are more credible and applicable. Further research incorporating multi scenario sensitivity analysis of prices, production volumes, and interest rates would strengthen the validity of this conclusion and provide policymakers in Berau with a firmer foundation for formulating coconut downstreaming strategies that are adaptive to market uncertainty.

CONCLUSIONS AND RECOMMENDATIONS

This study demonstrates that the development of an integrated coconut agroindustry in Berau Regency, which processes coconut meat, shell, water, and fiber into four derivative products simultaneously, namely VCO, charcoal briquettes, nata de coco, and cocofiber, is financially feasible. With an initial investment of IDR 10.44 billion and annual operating costs of IDR 10.06 billion, this project generates a positive NPV of IDR 10.80 billion, an IRR of 54 percent exceeding the discount rate of 15 percent, a BCR of 1.22, and a payback period of 2.65 years within a six year project life. The operational cost structure, dominated by the procurement of coconut raw materials, which accounts for more than 80 percent of total monthly operating costs, indicates that this business model is material intensive, such that business sustainability is far more dependent on the price stability and supply of raw materials than on labor factors.

Although all four financial feasibility indicators consistently exceed the required threshold, the relatively thin BCR value of 1.22 indicates a comparatively narrow feasibility margin, rendering the project vulnerable to even minor shocks to the assumed selling prices, production volumes, or raw material costs. The study also confirms that the availability of coconut raw materials in Berau Regency, at a utilization rate of only 60 percent of the region's production capacity, is theoretically sufficient to meet the requirements of the planned production scale without compromising raw material availability for consumption needs or other sectors. However, this study is limited by its use of a constant production and price scenario from the second year of operation onward, without accounting for a ramp up scenario or a sensitivity analysis of the coconut price fluctuations empirically observed to be volatile in the national market. The interpretation of these feasibility results should therefore be understood as a single point estimate rather than as a projection that accommodates market uncertainty.

Based on these findings, three actionable measures are proposed for the Berau Regency Government. First, the Berau Plantation Office should facilitate the establishment of farmer institutions, such as cooperatives or farmer groups, in Talisayan and Biduk Biduk District, supported by a medium term supply contract, or offtake agreement, to ensure certainty in the volume and price of raw materials, given the cost structure's strong dependence on coconut supply. Second, in view of the project's relatively narrow feasibility margin, initial investment financing should be directed through a regionally owned enterprise or a clustered microcredit capital participation scheme, rather than relying on

pure private investment, which tends to be reluctant to enter at such a thin margin. Third, the Investment and One Stop Integrated Services Office may consider offering regional tax relief incentives during the first year of operation to strengthen project liquidity during the pre-revenue phase, and future feasibility studies should incorporate sensitivity analysis of coconut price volatility to complement the base case scenario adopted in this study.

ACKNOWLEDGMENT

We would like to express our gratitude to the Berau Regency Government, particularly the Plantation Office and the Investment and One Stop Integrated Services Office (DPMPTSP) of Berau Regency, for providing the data required for this study.

REFERENCES

- Ardyn Sari Sinaga, Maya Macia Sari, Anggi Andini Hutasuhut, Safina Tu Zahara, Ayu Amanda, Anisa Fitri, & Muhammad Arief Caesario. (2023). Comparison of capital budgeting methods: NPV, IRR, PAYBACK PERIOD. *World Journal of Advanced Research and Reviews*, 19(2), 1078–1081. <https://doi.org/10.30574/wjarr.2023.19.2.1483>
- Ayompe, L. M., Nkongho, R. N., Masso, C., & Egoh, B. N. (2021). Does investment in palm oil trade alleviate smallholders from poverty in Africa? Investigating profitability from a biodiversity hotspot, Cameroon. *PLOS ONE*, 16(9), e0256498. <https://doi.org/10.1371/journal.pone.0256498>
- Brigham, E. F., & Houston, J. F. (2018). *Fundamentals of Financial Management*. Cengage Learning. <https://books.google.co.id/books?id=kpRUEAAAQBAJ>
- Chojnacka, K., Moustakas, K., & Mikulewicz, M. (2022). Valorisation of agri-food waste to fertilisers is a challenge in implementing the circular economy concept in practice. *Environmental Pollution*, 312, 119906. <https://doi.org/10.1016/j.envpol.2022.119906>
- Grass Ramírez, J. F., Muñoz, R. C., & Zartha Sossa, J. W. (2023). Innovations and trends in the coconut agroindustry supply chain: A technological surveillance and foresight analysis. *Frontiers in Sustainable Food Systems*, 7, 1048450. <https://doi.org/10.3389/fsufs.2023.1048450>
- Haque, F., Fan, C., & Lee, Y.-Y. (2023). From waste to value: Addressing the relevance of waste recovery to agricultural sector in line with circular economy. *Journal of Cleaner Production*, 415, 137873. <https://doi.org/10.1016/j.jclepro.2023.137873>
- Jones, T. W., & Smith, J. D. (1982). An Historical Perspective of Net Present Value and Equivalent Annual Cost. *The Accounting Historians Journal*, 9(1), 103–110. <https://www.jstor.org/stable/40697714>

Coconut Commodity Outlook (2025). Ministry of Agriculture of the Republic of Indonesia.

https://satudata.pertanian.go.id/assets/docs/publikasi/OUTLOOK_KELAPA_2025_sign.pdf

Coconut Downstream Roadmap 2025–2045 (2024). MINISTRY OF NATIONAL DEVELOPMENT PLANNING/NATIONAL DEVELOPMENT PLANNING AGENCY (BAPPENAS).

https://perpustakaan.bappenas.go.id/e-library/file_upload/koleksi/dokumenbappenas/konten/Upload%20Terbaru/Peta%20Jalan%20Hilirisasi%20Kelapa%202025-2045%20ISBN%20Protected_Rev.pdf

Regional Regulation of East Kalimantan Province Number 11 of 2024 concerning the Regional Long-Term Development Plan (RPJPD) for 2025-2045. Regional Development Planning, Research and Innovation Agency (BAPPERIDA) of Berau Regency.

<https://baplitbang.beraukab.go.id/Download>

Rose, J. M., & Pellegrini, A. (2026). Comparing public investments across sectors with CBA-based impact information and participatory budget choices. *Transportation Research Part A: Policy and Practice*, 211, 105044. <https://doi.org/10.1016/j.tra.2026.105044>

Rosegrant, M. W., Wong, B., Sulser, T. B., Dubosse, N., & Lybbert, T. J. (2023). *Benefit-cost analysis of increased funding for agricultural research and development in the global south*. <https://doi.org/10.1017/bca.2023.27>

Santiago, I. J., Barroga, R., Buenavista, M. J., & Tuates, A. (2025). Economic Viability Analysis of Centrifuge-type Virgin Coconut Oil (VCO) Processing Facility in Aklan, Philippines. *CLSU International Journal of Science and Technology*, 9, 1–10. <https://doi.org/10.22137/IJST.2025.000006>

Sokolov, M. V. (2024). NPV, IRR, PI, PP, and DPP: A unified view. *Journal of Mathematical Economics*, 114, 102992. <https://doi.org/10.1016/j.jmateco.2024.102992>

Vieira, F., Santana, H. E. P., Jesus, M., Santos, J., Pires, P., Vaz-Velho, M., Silva, D. P., & Ruzene, D. S. (2024). Coconut Waste: Discovering Sustainable Approaches to Advance a Circular Economy. *Sustainability*, 16(7), 3066. <https://doi.org/10.3390/su16073066>

Wagh, M. S., S. S., Nath, P. C., Chakraborty, A., Amrit, R., Mishra, B., Mishra, A. K., & Mohanta, Y. K. (2024). Valorisation of agro-industrial wastes: Circular bioeconomy and biorefinery process – A sustainable symphony. *Process Safety and Environmental Protection*, 183, 708–725. <https://doi.org/10.1016/j.psep.2024.01.055>

- Wahyudi, A., Ardana, I. K., Aunillah, A., Rianto, B., Anggoro, U. K., Hasibuan, A. M., Mardiharini, M., Indrawanto, C., Wardono, B., Sujianto, Ermati, Sudjarmoko, B., Listyati, D., & Ferry, Y. (2025). Building sustainable and resilient coconut supply chains in remote areas: A study from Riau Province – Indonesia. *Sustainable Futures*, 9, 100709. <https://doi.org/10.1016/j.sftr.2025.100709>
- Wang, S. (2025). *Net Present Value (NPV) Vs. Internal Rate of Return (IRR): Evaluating Investment Rules in Financial Markets*. 59.
- Yard, S. (2000). Developments of the payback method. *International Journal of Production Economics*, 67(2), 155–167. [https://doi.org/10.1016/S0925-5273\(00\)00003-7](https://doi.org/10.1016/S0925-5273(00)00003-7)