Quantitative Economics and Management Studies (QEMS) *ISSN: 2722-6247 (online)*
Vol. 5 No. 1 (2024)
https://doi.org/10.35877/454RI.qems2178

Feasibility Analysis of Hydroponic Melon Business at PT. Agro Bergas Sejahtera, Bergas Subdistrict, Semarang Regency

Muhammad Ulyn Nuha*, Agus Setiadi, & Titik Ekowati

Department of Agribusiness, Faculty of Animal Husbandry and Agriculture, Diponegoro University, Semarang, Indonesia

Abstract

This research aims to analyze the feasibility of hydroponic melon business at PT. Agro Bergas Sejahtera. Data collection of the case study method was carried out in detail using various existing data collection procedures. Sampling was obtained from all twelve employees who recognize and have various information needed for the research to be carried out. The sampling technique employed interviews of all samples as respondents. Primary data included data obtained through direct interviews from sources in the field, such as resources, production, investment costs, and operating costs. Secondary data were data obtained indirectly from sources related to research, namely Central Bureau of Statistics *(BPS)* data and documents from PT. Agro Bergas Sejahtera. The data obtained was then analyzed using qualitative and quantitative analysis. Qualitative analysis is used to analyze non-financial aspects, including production aspects. Quantitative analysis was used to analyze the financial feasibility of PT. Bergas Agro Sejahtera using investment criteria, such as Payback Period, NPV, IRR, and Profitability Index. The research results indicate that hydroponic melon farming at PT. Agro Bergas Sejahtera is feasible according to the production aspect. The calculation results show that the payback period analysis is during two years four days. NPV is Rp. 637.561.973, IRR is 37%, and PI is 1,73. The financial analysis results show that all financial aspects are feasible.

Keywords: hydroponics, investment, financial feasibility, melon, production

Received: 5 November 2023 Revised: 27 December 2023 Accepted: 11 January 2024

1. Introduction

Holticultural farming, especially fruit cultivation in Indonesia, has long been viewed as a side business planted in small backyard areas with simple post-harvest practices. The agricultural subsector that is widely favored is the horticulture subsector, particularly fruit. Fruit is a type of horticultural plant whose products are annual and are known as a source of vitamins and minerals as well as a good commodity to be developed in the region (Septiadi Dudi & Nursan Muhammad, 2021). Market demand for fruit from both local and export markets requires a certain quality, same size, and a continuous supply of fruit.

Plants that can be grown using a hydroponic system are horticultural plants, including vegetable plants, fruit plants, ornamental plants, landscaping, and medicinal plants (Hidayat et al., 2020). This type of plant is consumed routinely by people almost every day. The hydroponic technology system can be stated to be the cultivation of plants using water as a growing medium with an emphasis on meeting the nutritional needs of plants. Nutrient application uses the units of parts per million (ppm), which are given to plants starting from transplanting from seedlings to the final week before harvest. Plant nutrients dissolved in water become a nutrient solution and are reused by recirculation (closed system) using electrical energy.

Melons (*Cucumis melo*) in Indonesia are a horticultural product that is often consumed by people in Indonesia. The production of high quality and high quantity melons consistently is achieved through hydroponic cultivation within a greenhouse system. Melons can be cultivated using a hydroponic system for optimal fruit growth. Hydroponic plant cultivation is carried out in a greenhouse to ensure optimal plant growth and is completely protected from the influence of external elements, such as rain, pests, diseases, and climate (Tando, 2019). The hydroponic cultivation is a plant

* Corresponding author.
E-mail address: nuhaulyn26@gmail.com

cultivation system without using planting media. Hydroponic technology is a system of cultivating plants without using soil but using water containing nutrient solutions (Roidah, 2014). The main aim of cultivating melons hydroponically is to provide safe quality melons for consumers' health. The benefit of cultivating melons using a hydroponic system is that melon production produces quality output with a sweet and fresh taste throughout the year.

Melon cultivation in Semarang Regency is relatively rare. According to data compiled by the Central Statistics Agency, melon production in Semarang Regency in 2019 was 1.485 tons. This figure is considered low because the average melon production in Central Java was 6.900 tons in 2019. Considering the significant opportunities for melon farming in Semarang Regency, PT. Agro Bergas Sejahtera seizes the opportunity to establish hydroponic-based melon farming. This hydroponic melon cultivation has few competitors, thereby reducing trade competition.

Along with the times, melon farming has become popular, causing competition between melon farming companies. Such intense competition requires every company to be creative, develop, and improve product quality through innovation that meets consumer needs in order to continue to gain trust and be able to compete in the market.

PT. Agro Bergas Sejahtera is one of the farming businesses that produces the main commodity of melons using a hydroponic planting system and premium melons. Cultivating melons using hydroponic techniques and having premium melon varieties is an opportunity and has promising prospects and must be researched to see whether hydroponic melon cultivation at PT. Agro Bergas Sejahtera is financially and non-financially viable. By analyzing the financial aspects, the feasibility of the business will be known in relation to the capital spent and the profits generated when the business is run. Non-financial aspects consist of legal aspects and environmental aspects. By analyzing these aspects, it will be recognized which legal provisions are met, the impacts caused and the handling carried out, the benefits of the business bring to the community, which are then compared with the criteria created to determine the feasibility of the business.

2. Methods

This research used a case study method, which was carried out in April 2023 - May 2023 at the PT. Agro Bergas Sejahtera farming company located in Bergaskidul Village, Bergas Sub-district, Semarang Regency. This location was chosen deliberately based on the consideration that this company is one of the melon producers with premium quality results in the Semarang Regency area. Samples were taken from all twelve employees at PT. Agro Bergas Sejahtera who knows and has various information needed for the research to be carried out. Sampling technique was conducted using interviews.

The data sources obtained from this research are primary data and secondary data. Primary data included data obtained through direct interviews from sources in the field, such as resources, production, investment costs, and operating costs. Secondary data includes data obtained indirectly from sources related to research, namely Central Bureau of Statistics (BPS) data and documents from PT. Agro Bergas Sejahtera. Data collection in this research was carried out using field research, namely by interviewing to analyze the suitability of resources and their production, documentation, and observation. Meanwhile, library research was carried out by studying literature related to the research. The data analysis used in this research is qualitative and quantitative analysis.

3. Result and Discussions

Investments made by PT. Agro Bergas Sejahtera included a greenhouse construction, irrigation channels constructions, purchasing equipment, and unexpected costs. The Table 1 show the data and details of investments made by PT. Agro Bergas Sejahtera.

Table 1. Initial Capital Costs (Investment)

No	Investment	Total
		--Rp--
1	Greenhouse	643.895.000
2	Irrigation Channels	181.226.000
3	Equipment	11.420.000
4	Unexpected Costs	40.000.000
Total Investment		**876.541.000**

3.1. Greenhouse Construction

A green house is a building with a translucent roof that functions to manipulate environmental conditions so that the plants inside can develop optimally (Tando, 2019). Construction of the greenhouse was started in January 2019 and was completed in August 2019. The Table 2 show the details of the greenhouse construction.

The greenhouse construction was started in January 2019 and was completed in August 2019. Its construction includes purchasing UV plastic used as a roof at a price of Rp. 84.975.000, a screen net amounting to Rp. 50.760.000, light steel battens used as a greenhouse frame at a price of Rp. 70.200.000, light steel C channel as a frame amounting to Rp. 188.700.000, steel bolts amounting to Rp. 15.360.000, purchase of 33 concrete brick amounting to Rp. 26.400.000, purchase of sand amounting to Rp. 21.600.000, payment for labor amounting to eleven people amounting to Rp. 185.900.000. Thus, the total greenhouse construction is Rp. 643.895.000.

Table 2. Details of Greenhouse Construction Costs

No	Items	Price
		--Rp--
1	UV Plastic	84.975.000
2	ScreenNet	50.760.000
3	Light Steel Battens	70.200.000
4	Light Steel C Channel	188.700.000
5	Steel bolt	15.360.000
6	Concrete brick	26.400.000
7	Sand	21.600.000
8	Labor	185.900.000
	Total cost	**643.895.000**

3.2. Irrigation Channels Construction

The irrigation channel was built by PT. Agro Bergas Sejahtera to support irrigation by watering melons in each greenhouse. Components in the construction of irrigation channels include the purchase of 1.764 units of drip packages (hoses, pipettes, digital timers) at a cost of Rp. 68.856.000, the purchase of a control machine used to mix the nutrients needed by melon plants at a cost of Rp. 80.000.000, the purchase of water reservoirs of six units at a cost of Rp. 37.370.000. The total construction of irrigation channels is Rp. 181.226.000.

3.3. Farming Equipment

Farming equipment is something that is used to support the maintenance of melon cultivation at PT. Agro Bergas Sejahtera. Details of purchasing farming equipment can be seen in Table 3.

Table 3. Details of Farming Equipment Purchases

No	Items	Total	Price
		--Unit--	--Rp--
1	Pesticide Spray Machine	2	3.500.000
2	Plastic Chair	9	135.000
3	Wheelbarrows	3	1.050.000
4	Plant Scissors	8	200.000
5	Generator	1	4.400.000
6	200L Drums	2	440.000
7	Trash Can	2	200.000
8	Hose 100 Meters	1	275.000
9	Rope	8	140,000
10	Fruit basket	18	1.080.000
	Total Cost		**11.420.000**

The purchase of farming equipment includes two units spray machines used for spraying leaf fertilizer and pesticides at a cost of Rp. 3.500.000, nine units of short plastic chairs used for plant maintenance in the greenhouse at a cost of

Rp. 135.000, three units wheelbarrows used for transporting harvest into the warehouse at a cost of Rp. 1.050.000, plant scissors used for prunning and harvesting eight units at a cost of Rp. 200.000, one unit generator machine used for backup electricity when there is a power outage at a cost of Rp. 4.400.000, two units of trash can at a cost of Rp. 200.000, a 100-meter water hose at a cost of Rp. 275.000, one set of ropes for eight greenhouses at a cost of Rp. 140.000, eighteen fruit baskets at a cost of Rp. 1.080.000. Total equipment purchases amounted to Rp. 11.420.000.

3.4. Unexpected Costs

Unexpected costs are used for unexpected expenses at the initial stage of the PT. Agro Bergas Sejahtera, such as purchasing soap for washing containers, machine maintenance, greenhouse maintenance, social costs, and so on. Unexpected costs prepared by PT. Agro Bergas Sejahtera amounting to Rp. 40.000.000.

Depreciation is the allocation of the investment costs of a farming business each year during the life of the farming business. PT. Agro Bergas Sejatera apply depreciation charges to investments made to cover operational losses at the time of the initial investment. Depreciation charges charged annually form a cost available to cover operational losses during the start of the farming business (Fabiola et al., 2018). Depreciation is compensation for equipment losses for the reduction in value caused by the time and method use of all fixed capital in farming (Mapu et al., 2019). Depreciation fees imposed by PT. Agro Bergas Sejahtera is the depreciation of infrastructure including greenhouses, irrigation channels, and equipment. The Table 4 show the depreciation of PT. Agro Bergas Sejahtera infrastructure.

Table 4. Depreciation of Infrastructure Facilities at PT. Agro Bergas Sejahtera

No	Description	Lifespan	Price	Depreciation Per Year
		--Year--	--Rp--	--Rp--
1	UV Plastic	7	84.975.000	12.140.000
2	Screen Net	5	50.760.000	10.152.000
3	Light Steel Battens	25	70.200.000	2.808.000
3	Light Steel C Channel	25	188.700.000	7.548.000
4	Steel bolt	25	15.360.000	614.400
5	Irrigation Channels	7	181.226.000	25.889.400
6	Equipment	7	11.420.000	1.631.400
	Amount of Depreciation per Year			**60.783.200**

3.5. Production cost

Production costs are all aspects of expenditure used to produce products in one production cycle. Production costs are divided into two based on the relationship between changes in production volume, namely fixed costs and variable costs. Fixed costs are costs that do not change in total when business activity increases or decreases, consisting of depreciation costs (buildings, machines, vehicles), fixed salaries and wages, rental costs, insurance costs, taxes and other costs that are not affected by sales (Yuni et al., 2021). Variable costs are calculated over one production period, for example the costs of seeds, pesticides, and fertilizers (Saadudin et al., 2017). Production costs incurred by PT. Agro Bergas Sejahtera includes:

3.5.1. Fixed cost

Fixed costs are costs that do not change and are not influenced by production volume. Fixed costs incurred by PT. Agro Bergas Sejahtera includes depreciation of infrastructure. Fixed costs are costs that do not change in total when business activity increases or decreases, consisting of depreciation costs (buildings, machines, vehicles), fixed salaries and wages, rental costs, insurance costs, taxes and other costs that are not affected by sales (Yuni et al., 2021). Fixed costs incurred by PT. Agro Bergas Sejahtera, which includes annual depreciation of Rp 60.783.200. Details of fixed costs at PT. Agro Bergas Sejahtera is presented in Table 5.

Based on Table 5, the total costs that must be paid for land rent are Rp 10.000.000 per year, the greenhouse deprecation covers the entire building each year is Rp 33.262.400. Depreciation of irrigation channels include control machines, drip hoses, pipettes, digital timers, water reservoirs amounting to Rp 25.889.400. Depreciation of equipment including tools farming business, namely spray machines, plastic chairs, wheelbarrows, plant shears, generators, water drums, trash cans, water hoses, vines, and baskets amounting to Rp 1.631.400.

Table 5. Fixed Costs of PT. Agro Bergas Sejahtera

No	Description	Amount --Rp--
1	Land rent	10.000.000
2	Greenhouse Deprecation	33.262.400
3	Irrigation Channels Depreciation	25.889.400
4	Equipment Depreciation	1.631.400
	Amount	**60.783.200**

3.5.2. Variable Costs

Variable costs are costs whose quantity changes and are directly related to the hydroponic melon production carried out by PT. Agro Bergas Sejahtera. Variable costs are calculated over one production period, for example the costs of seeds, pesticides, and fertilizers (Saadudin et al., 2017). Therefore, variable costs always change every year. The components contained in variable costs consist of the costs of melon seeds, polybags, planting media, nutrients, pesticides, electricity and water, labor, and unexpected costs. Details of variable costs can be seen in Table 6.

Table 6. Variable Costs at PT. Agro Bergas Sejahtera

No.	Type	2019 --Rp--	2020 --Rp--	2021 --Rp--	2022 --Rp--
1	Melon Seeds	108.000.000	162.000.000	144.000.000	144.000.000
2	Polybag	3.760.000	4.402.000	3.910.000	3.910.000
3	Growing media	61.364.000	92.672.000	82.375.000	81.522.000
4	Nutrition	93.858.000	140.786.000	125.143.000	125.143.000
5	Pesticide	21.600.000	32.400.000	28.800.000	19.200.000
	Total cost / production	**288.582.000**	**432.260.000**	**384.228.000**	**373.775.000**
6	Electricity and Water	21.520.000	26.343.000	24.333.000	26.238.000
7	Labor	296.820.000	393.200.000	245.600.000	259.200.000
8	Unexpected Costs	15.671.000	19.440.000	9.056.000	10.760.000
	Total Variable Costs	**622.593.000**	**871.243.000**	**663.217.000**	**669.973.000**

One of the variable costs for PT. Agro Bergas Sejahtera is the purchase pesticides used to control pests. Effective pest control will support good production quality. This is in line with the opinion of Durroh & Yusuf Dawud (2022) who stated that it is necessary to understand pest and disease control strategies because many farmers do not understand the provisions on how to use pesticides as a strategy to control pests and diseases in order to get good quality production so that they can increase melon farmers' income. Pest control can stabilize the harvest period so that you get good harvests. The harvest period carried out by PT. Agro Bergas Sejahtera can influence existing variable costs because they are influenced by the number of planting periods, which will affect variable costs.

The number of harvest periods can be seen in Table 7.

Table 7. Harvest Period of PT. Agro Bergas Sejahtera

No	Year	Harvest Period
1	2019	18
2	2020	27
3	2021	24
4	2022	16

Based on Table 6 and Table 7, the total variable costs of hydroponic melon cultivation in 2019 are Rp 622.593.000 with eighteen harvests carried out from eight greenhouses. In 2020, the total cost is Rp 871.243.000 with twenty-seven harvests carried out from eight greenhouses. In 2021, the company will evaluate production management, so that

production is further optimized with a harvest period of twenty-four harvests. The total variable costs incurred in 2021 are Rp 663.217.000. In 2022, the total cost is Rp 669.973.000 with twenty-four harvests. Variable costs in 2020 increased due to the addition of thirteen workers. This can be a consideration for PT. Agro Bergas Sejahtera to deploy human resources to maximize variable costs incurred.

The process of cultivating melon fruit in PT. Agro Bergas Sejahtera is seeding, transferring seeds, and harvesting. The production process to produce good quality melons is carried out through cultivation stages, namely greenhouse preparation, seeding and planting, maintenance, harvest and post-harvest, and marketing. The cultivation site used at PT. Agro Bergas Sejahtera is a greenhouse. Production itself has the meaning of being the result of a process or economic activity by utilizing several inputs, thus production activities are combining inputs and producing output (Ratna, 2017).

PT. Agro Bergas Sejahtera's production location is easily accessible and the workers are employed from the local community for production efficiency. Melon production volume in PT. Agro Bergas Sejahtera meets the feasible elements because it is able to meet the market and has regular buyers. Machines and equipment used by PT. Agro Bergas Sejahtera is a technology that follows developments so that it meets production feasibility. The raw materials used, namely melon seeds, were obtained from trusted sources and PT. Agro Bergas Sejahtera has a safety stock of 300 seeds per production period. The workers employed are local residents who have been trained. Selection of local community workers aims to empower the surrounding community. Division of work tasks carried out by PT. Agro Bergas Sejahtera is efficient that is separating production parts, such as machines and equipment in one room, and sowing seeds in one room. Spatial planning is carried out to expedite the production process. This has fulfilled the production feasibility aspect according to Wahyuni et al. (2022) who argue that there are several elements from the production/operations aspect that must be analyzed.

Melon farming revenues obtained by PT. Agro Bergas Sejahtera is calculated from the number of melon production sold in one year multiplied by the prevailing selling price. Revenue is the total income received by producers in the form of money obtained from the sale of goods produced (Kabai, 2015). PT. Agro Bergas Sejahtera received revenue of Rp 952.569.000 in 2019, Rp 1.311.511.500 in 2020, Rp 1.083.672.000 in 2021, and Rp 1.128.242.500 in 2022. This revenue is influenced by the size of the planting area of 1 hectare. The melon commodity planted is premium hydroponic melon. This is in line with the opinion of Tri et al. (2011), which states that farming income is influenced by several factors, such as the size of the farm, type, and price of commodities cultivated farming . Acceptance of PT. Agro Bergas Sejahtera can be seen in Table 8.

Table 8. Acceptance of PT. Agro Bergas Sejahtera in 2019-2021

No	Year	Production Volume	Price	Total
		--Kg--	--Rp--	--Rp--
1	2019	35.946	26.500	952.569.000
2	2020	49.491	26.500	1.311.511.500
3	2021	40.136	27.000	1.083.672.000
4	2022	41.027	27.500	1.128.242.500

Based on Table 8, it can be seen that the selling price of melons has increased in 2021 by Rp 500 for each kg. PT. Agro Bergas Sejahtera increase the amount of production in 2020 and 2021 in order to increase profits. Production in 2020 was 27 planting periods, while in 2021, there were 24 planting periods. The increase in the selling price of melons causes an increase in revenue obtained by PT. Agro Bergas Sejahtera every year.

3.6. Income

Hydroponic melon farming income obtained by PT. Agro Bergas Sejahtera is from the difference between income and production costs. Revenue is obtained after receipts are reduced by the total costs incurred during production process activities (Sartika et al., 2016). Revenues that are considered large will affect the income earned by PT. Agro Bergas Sejahtera. It can be seen in Table 9.

Based on Table 9, the income of PT Agro Bergas Sejahtera in 2019 eighteen production periods amounting to Rp. 319.976.000. In 2020, with more planting periods of twenty-seven planting periods, PT. Agro Bergas Sejahtera received income of Rp 430.268.500. In 2021, there will be a decrease in income due to fewer planting periods, that is twenty-four times with income of Rp. 410.445.000. In 2022, farming income will be twenty-four times the planting period with income of Rp. 458.269.500.

Table 9. Income of PT. Agro Bergas Sejahtera in 2019-2021

Year	Production Volume	Selling price	Reception	Total Production Costs	Income
	--kg--	--Rp--	--Rp--	--Rp--	--Rp--
2019	35.946	26.500	952.569.000	632.593.000	319.976.000
2020	49.491	26.500	1.311.511.500	881.243.000	430.268.500
2021	40.136	27.000	1.083.672.000	673.217.000	410.445.000
2022	41.027	27.500	1.128.242.500	679.973.000	458.269.500

3.7. Financial Feasibility Analysis

Financial feasibility analysis is used to measure the feasibility level of PT. Agro Bergas Sejahtera's hydroponic melon farming business. The method used to measure financial feasibility is the investment assessment method, which includes PP, NPV, PI, and IRR analysis

3.7.1. Payback Period (PP)

Payback Period is a business feasibility calculation that is used to find out the minimum time needed for a company to return its initial investment. The results of the Payback Period (PP) analysis show that PT. Agro Bergas Sejahtera can return the investment made within 2 years and 4 days. This means that during that period, the total cash inflow from farming projects Hydroponic melons are enough to cover the total cash outflow or invested capital. The PP value is calculated quickly because of the time expected by PT. Agro Bergas Sejahtera to return the capital is three years so that PP is faster than the target determined for the Melon hydroponic farming project can be considered a profitable investment option. This means that within three years or less, the initial investment will be recouped through cash inflows from the project. This is in line with research by Zakaria & Marlia (2019), which states that if the PP value is shorter than the economic life of the investment project, this indicates that farming is feasible.

3.7.2. Net Present Value (NPV)

Net Present Value is a calculation of the feasibility of a business that is used to determine whether changes in the prevailing currency value will affect the value of the investment made. NPV calculations require a discount factor (df). The results of the NPV calculation show that the farming project Hydroponic melons have an NPV value of Rp 637.561.973. Based on positive NPV calculation results, this means farming melon hydroponics at PT. Agro Bergas Sejahtera is feasible to implement. This shows that this project has the potential to generate quite large profits and contribute positively to the company's growth. This is in line with research by Zakaria & Marlia (2019), which states that a positive accumulated NPV value indicates that farming is feasible. The expected profits from this project are quite large and can make a positive contribution to the company's growth, so the project is considered worthy of implementation.

3.7.3. Profitability Index (PI)

Profitability Index is the activity ratio of the total present value of net receipts to the present value of investment expenditure over the life of the investment. The PI value can be stated to be feasible if it is greater than 1. The research results show that the calculation of the Profitability Index (PI) for farming melon hydroponics at PT. Agro Bergas Sejahtera is 1,73. Based on the criteria used, if the PI value is greater than 1, then the business is considered feasible or profitable. This project is expected to provide significant financial benefits and has the potential to provide greater results than the initial investment that has been incurred. This is in line with research by Ipandi et al. (2019), which states that if the PI value is more than one or positive, then the business project is feasible.

3.7.4. Internal Rate of Return (IRR)

Internal Rate of Return is the level of net profit on investment, where positive net benefits are reinvested in the following year and earning the same rate of return and bearing interest over the remaining life of the project. The IRR calculation uses a df value that is higher than the df that has been used in the NPV calculation. Searching for df on IRR in this study utilized trial and error. After carrying out calculations using the IRR formula, it obtained an IRR value that is higher than the interest rate.

Based on the calculation results, the applicable bank interest rate is 8.89%, while the IRR obtained is 37% . Thus, IRR results that are higher than bank interest rates indicate that investment in farming melon hydroponics at PT. Agro Bergas Sejahtera has the potential to provide a more profitable rate of return if the funds are deposited in a bank at the prevailing interest rates. This means that, in terms of potential returns, the hydroponic melon farming project is worth

implementing because it can provide higher profits compared to the alternative of saving at the bank with a fixed interest rate. This is in line with research by Zakaria & Marlia (2019), which states that the IRR is greater than commercial bank interest, indicating that farming is feasible. IRR indicates the expected rate of return on an investment or project taking into account the cash flows generated over the life of the project and the return from reinvesting those positive cash flows at the same rate.

4. Conclusions

PT. Agro Bergas Sejahtera has a strategic production location, production volume that meets market needs, sophisticated production machines and equipment, readily available supporting raw materials, trained workforce, and good production practices. The hydroponic melon farming income at PT. Agro Bergas Sejahtera continues to increase over time with results amounting to Rp 319.976.000 in 2019, Rp 430.268.500 in 2020, Rp 410.445.000 in 2021, and in Rp 458.269.500 in 2022. The results of financial analysis calculations using PP, NPV, PI, and IRR calculations indicate that the payback period (PP) of the initial investment made by PT. Agro Bergas Sejahtera has returned for a period of two years four days, the NPV calculation produces a result of Rp 637.561.973. The value obtained exceeds 1 then the business is declared feasible, the Provitability Index (PI) at PT. Agro Bergas Sejahtera was declared feasible, because it obtained a result of 1,73. This project is expected to provide significant financial benefits and has the potential to provide greater results than the initial investment that has been issued and an IRR of 37%. This value is greater than the bank interest rate of 8,89%, thus the IRR value of PT. Agro Bergas Sejahtera was declared eligible.

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