Available online at: http://publikasi.mercubuana.ac.id/index.php/ijiem

IJIEM (Indonesian Journal of Industrial Engineering & Management)

ISSN (Print) : 2614-7327 ISSN (Online) : 2745-9063

Business Feasibility Analysis of Bioethanol Distillation Equipment Using Waste Empty Palm Oil Bunches and Palm Fronds

Siti Mariyam*, Muhammad Isnaini Hadiyul Umam, Muhammad Nur, Suherman, Muhammad Ihsan Hamdy

Department of Industrial Engineering, Universitas Islam Negeri Sultan Syarif Kasim Riau, JL. HR. Soebrantas Km. 15, Pekanbaru 28293 Indonesia

ARTICLE INFORMATION

Article history:

Received: 14 December 2024
Revised: 9 June 2025
Accepted: 10 September 2025

Category: Research paper

Keywords:
Feasibility analysis
NPV
PI
IRR
PP

DOI: 10.22441/ijiem.v6i3.31347

A B S T R A C T

Indonesia as one of the largest palm oil-producing countries in the world, produces a considerable amount of waste as a result of the palm oil production process. It can utilize the waste of empty palm bunches and palm fronds to be used as bioethanol as renewable energy. Purification of bioethanol using distillation equipment. The purpose of this study is to determine the feasibility of bioethanol distillation equipment using waste empty palm bunches and palm fronds in terms of market aspects, technical aspects, and financial aspects. The results of the research based on market aspects with the calculation of the selling price of production, forecasting, and benchmarking are declared feasible to run. Based on the technical aspects of determining the location and production process, it can be declared feasible to run because it is profitable. Based on the financial aspects by calculating NPV of IDR 850,702,895> 0, it is declared feasible because it is positive, PI of 3.67> 1 is declared feasible, IRR of 35%> 11% so that IRR is declared feasible, and PP obtained 2 years 2 months is declared feasible because it can return the investment before 5 years from the time that has been set.

*Corresponding Author
Siti Mariyam
E-mail: sitimaryampku2001@gmail.com

1. INTRODUCTION

Indonesia, as one of the largest palm oil-producing countries in the world, produces a considerable amount of waste as a result of the palm oil production process. One of the main wastes produced is empty palm bunches (EFB) and palm fronds. This waste is often underutilized and left to accumulate. The waste contains enormous potential as a source of raw material for making bioethanol, one of the environmentally friendly renewable energy. Bioethanol is an alcohol-based alternative fuel that is gaining popularity as a solution to reduce greenhouse gas emissions. The process of making bioethanol is generally through fermentation of sugars obtained from carbohydrate-containing raw materials, such as biomass waste. Empty palm bunches and palm fronds containing cellulose and lignocellulose can be processed to produce sugar through hydrolysis, which can then be fermented to produce ethanol. One of the technologies that can be used to convert palm oil waste into bioethanol is the distillation process, which serves to separate ethanol from the fermentation mixture using heating and evaporation. The

distillation process utilizes the boiling point difference between ethanol and other components in the mixture such as water. Thus the distillation device, empty palm bunches (EFB), palm fronds, and bioethanol are connected in a production cycle that utilizes organic waste to produce renewable energy (Praevia & Widayat, 2022). Research that has been conducted in Pekanbaru City regarding distillation equipment, obtained sales data of distillation equipment products in Pekanbaru City can be seen in Table 1.

Table 1. Sales data of distillation equipment

Period 2023	Total Sales (units)
January	6
February	4
March	7
April	9
May	11
June	12
July	15
August	19
September	22
October	24
November	28
December	29

(Source: PT. XYZ)

Based on Table 1 the number of sales of distillation equipment has a pattern of sales data that tends to increase as the waste of empty palm bunches and palm fronds increases. This condition is an opportunity for business development of distillation equipment. The development of distillation equipment is designed to easily utilize the waste of empty palm bunches and palm fronds. The distillation device is carried out by research conducted by Fikratullah in 2024 regarding the design of a distillation device. After passing the design stage of this distillation device, it is necessary to analyze the feasibility of the product to be developed. The development of a distillation device that will be marketed needs to be carried out with a business feasibility study with several aspects to avoid the risk of loss. A business feasibility study is research that aims to decide whether a business idea is feasible to implement or not. The aspects used in this study include market aspects carried out by forecasting distillation equipment and benchmarking with other competitors. Technical aspects are carried out to determine the location and production process using a gantt chart. And financial aspects are carried out by calculating using Net Present Value, Profitability Index, Internal Rate of Return, and Payback Period.

Business feasibility study of bioethanol distillation equipment products using waste empty palm bunches and palm fronds aims to determine the feasibility of bioethanol distillation equipment using waste empty palm bunches and palm fronds in terms of market aspects, technical aspects, and financial aspects.

2. LITERATURE REVIEW

According to (Simanjuntak et al., 2021) Oil palm plantations are a waste of empty palm bunches and palm fronds. So it has great potential to be used as environmentally friendly renewable energy, namely bioethanol. Because there is a fairly high cellulose content of 30%-33% which can be used as bioethanol raw material. According to (Mulyati et al., 2023). Bioethanol is one of the alternative fuels obtained from the fermentation of sugar-containing materials such as waste empty palm bunches and palm fronds. Fermentation is carried out by microorganisms usually yeast or bacteria to produce ethanol. Separation of ethanol with other components is done by distillation. According to (Latara et al., 2021). Distillation equipment is the basis for separating it with a large enough boiling point difference.

Distillation equipment consists of 4 main components, namely thermostat, distillation column, condenser, and distillate container. According to (Qomariyah, 2021) A business feasibility study is an analysis carried out to assess whether a business has the potential to be successful, whether the idea is worth realizing or not worth continuing.. According to (Husain & Lukum, 2022) a business feasibility study has several objectives including minimizing the risk of loss, facilitating planning, facilitating work implementation, facilitating supervision, and facilitating control. According to (Widianingsih et al., 2023) Aspect in a business feasibility study business include market aspects, technical aspects, and financial aspects.

The market aspect is useful for knowing how much market potential can be achieved, how

wide a range the company can reach, and which strategies can be planned to get customers in the market (Dewi & Iriani, 2023). To generate profit or profit can determine the price. The selling price is obtained from the calculation of the cost of production using the Full Costing method. The cost of goods manufactured using the Full Costing method has the following equation(Safitry & Muntiah, 2022):

Raw material cost	xxx	(1)
Labor cost	xxx	
Fixed overhead cost	xxx	
Variable overhead cost	xxx +	
Cost of goods manufactured	xxx	
Expected profit	xxx +	
Selling price	xxx	

According to (Satria, 2021) Forecasting is an activity of making estimates for future testing using past data. According to (Yulianti & Rahmawati, 2022) The method that can be used in determining future forecasts is the Trend Least Square method. Trend Least Square is a forecasting method used to see trends in time series data. There are two group divisions in the Trend Least Square method, namely:

1. Even data, then score the t value: ....,-5, -3, -1, 1, 3, 5,...
2. Odd data, then the score of the t value: ....,-3, -2, -1, 0, 1, 2, 3,...

The linear equation in forecasting using the Trend Least Square method is as follows:

$$a = \frac{\sum Y}{n} \quad (2)$$
$$b = \frac{\sum XY}{\sum X^2}$$
$$Y = a + bX$$

Description:
Y' = Trend Value (Forecasting)
a = Constant Number
b = Trend Line Slope Coefficient
X = Time Coefficient
Y = Original Value Obtained

According to (Nugroho & Jaqin, 2021) Benchmarking is known in the business world as something that can be measured and used, as a standard that can be compared with other things. So, benchmarking is a benchmark used to assess or compare something.

According to (Agustina et al., 2022) The technical or operational and technological aspects studied are location determination, machinery and equipment used for the production process, provision of raw materials, and how the production process is carried out. For location determination using market segmentation. According to (Wahyuni et al., 2022) Market segmentation also called marketing segmentation is the activity of sorting consumers into several groups according to different needs, desires, purchasing objectives, and consumer characteristics. According to (Prabowo et al., 2022) The production process is an activity carried out to create or change a product by optimizing the use of existing production resources to add value to the product. The production process uses a gantt chart.

According to (Melani et al., 2024) The financial aspect is a feasibility analysis to assist in knowing the overall acquisition of costs incurred by a business or business. Financial costs include investment cost requirements, estimates, income, balance sheet projections, income statements, investment appraisal criteria, and financial ratios used to assess company capabilities. Measuring tools to determine business feasibility based on financial aspects can be done through a financial approach including funds to be obtained, investment cost requirements, estimated income, and investment costs over several periods.

According to (Apriliani et al., 2024) Net Present Value (NPV) is the difference between cash inflows' present value and cash outflows' present value in a certain period. The investment will be accepted if a positive net present value (NPV) is obtained. The equation for calculating Net Present Value (NPV) is as follows:

$$NPV = PV\ Cash\ Flow - PV\ Invest \quad (3)$$

he eligibility criteria according to (Purnatiyo, 2021) are: (1) If the Net Present Value (NPV) is positive then the investment project is feasible,

(2) If the Net Present Value (NPV) is negative then the investment project is not feasible 2.

According to (Iskandar, 2023) The profitability index (PI) method is a ratio used to measure the feasibility of an investment by comparing the present value of net income to the present calue of all investment expenditures over the life of the investment. The formula for calculating the probability index value is as follows:

$$PI = \frac{\sum PV\ Cash\ Flow}{\sum PV\ Investasi}\ x\ 100\% \qquad (4)$$

The eligibility criteria according to (Iskandar, 2023) are:
1. If, Profitability Index (PI) > 1 the business is considered feasible.
2. If, Profitability Index (PI) < 1 the business is considered unfeasible.

According to (Alfian Pradana et al., 2020) Internal Rate of Return (IRR) is used to see the percentage (%) in returning the investment. if the IRR is greater than the discount factor, the investment is concluded to be profitable.

The formula for calculating the Internal Rate of Return value is as follows:

$$IRR = i_1 + \left[\frac{NPV1}{NPV1-NPV2}\right](i_2 - i_1) \qquad (5)$$

According to (Purnatiyo, 2021) Payback period (PP) is an assessment technique for the return on investment in a project or business based on the calculation of the annual cash inflow generated by the investment project. The Payback Period calculation formula is as follows:

$$PP = n + \frac{\text{a-b}}{\text{c-b}}\ x\ 1\ Year \qquad (6)$$

Description:
n = Years of payback requirement
a = Initial investment amount
b = Total investment cash flow in year n
c = Cumulative amount of cash flow in year n+1

The eligibility criteria according to(Purnatiyo, 2021) are: (1) If the Payback Period (PP) is smaller than the target return on investment, the investment project is feasible, (2) If the Payback Period (PP) is greater than the target return on investment, the project is not feasible

3. RESEARCH METHOD

This study analyzes the business feasibility of bioethanol distillation equipment using waste empty palm bunches and palm fronds to be developed to utilize waste empty palm bunches and palm fronds. Researchers used a bioethanol distillation device resulting from the design by Fikratullah. The data collection technique that researchers use is obtained from interviews and observations of PT. XYZ to obtain sales data for distillation equipment for 1 year back, namely data from January 2023 to December 2023. The research method uses market aspects, technical aspects, and financial aspects. The purpose of this research is to determine the feasibility of bioethanol distillation equipment using waste empty palm bunches and palm fronds in terms of market aspects, technical aspects, and financial aspects. The research steps can be seen in Figure 1.

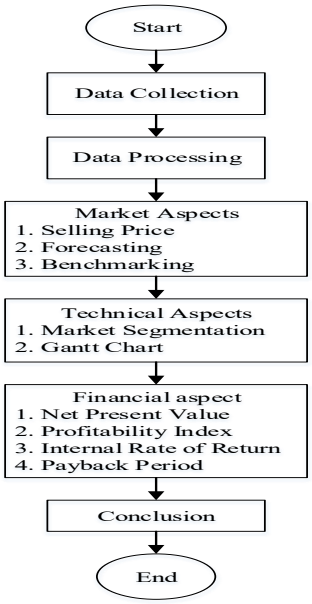

Figure 1. Study framework

Based on Figure 1, the research stage begins with collecting data, namely sales data of distillation equipment and initial investment costs. The next stage is to process the data that has been collected consisting of market aspects, technical aspects, and financial aspects.

The next stage Market aspects are carried out to determine the selling price of the product, forecasting, and benchmarking. The selling

price is obtained from the calculation of the cost of production using the Full Costing method. Forecasting is done to get the sales demand for distillation equipment in the future using the Trend Least Square method. Benchmarking contains a comparison of products that will be marketed with 3 other competitors. Furthermore, the technical aspect contains location determination using market segmentation, and the production process is carried out using the gantt chart method. Furthermore, the financial aspects first perform calculations to obtain net cash flow consisting of cash in, cash out, and depreciation costs. Then calculate the Net Present Value (NPV) with the equation:

$$NPV = PV\ Net\ Cash - PV\ Investment$$

Next, calculate the Profitability Index (PI) using the equation:

$$PI = \frac{\sum PV\ Net\ Cash}{\sum PV\ Investment}\ x\ 100\%$$

Then calculate the Internal Rate of Return (IRR) using the equation:

$$IRR = i_1 + \left[\frac{NPV1}{NPV1-NPV2}\right](i_2 - i_1)$$

Next, calculate the Payback Period using the equation:

$$PP = n + \frac{\text{a-b}}{\text{c-b}}\ x\ 1\ Years$$

The last step taken is to conclude the results of the research that has been done.

4. RESULT AND DISCUSSION

A. Market Aspect

The market aspect involves determining the selling price of the product, forecasting, and benchmarking.

Selling Price Determination

Determining the selling price is done by calculating the cost of production using the Full Costing method. This can be seen in Table 2.

Table 2. Cost of production and selling price

Description	Total
Raw material cost:	
Dt-40	IDR 30,000
Wire hose	IDR 50,000
Iron plate	IDR 114,000
Reactor	IDR 168,000
Distillator tube	IDR. 36,000
Connecting pipe	IDR. 24,000
Thermometer	IDR 100,000
Labor cost:	
Cutting	IDR 33,750
Drilling	IDR 33,750
Welding	IDR 101,250
Assembly	IDR 67,500
Packaging	IDR. 16,875
Variable overhead cost:	
Drilling machine	IDR. 1,011
Welding machine	IDR. 18,781
Hand grinding machine	IDR 2,600
Lights	IDR. 780
Fixed overhead cost	
Advertising costs	IDR. 450,000
Transportation	IDR. 800,000
Total cost of production	IDR 2,048,298
Desired profit	50%
Profit	IDR 1,024,149
Selling price per unit	IDR 3,072,447

(Source: data processing)

Based on Table 2 Calculation using Full Costing the total cost of production is IDR 2,048,298-, with the selling price per unit being IDR 3,072,447-,.

Forecasting

Forecasting is done by plots of previous sales data to identify existing patterns.

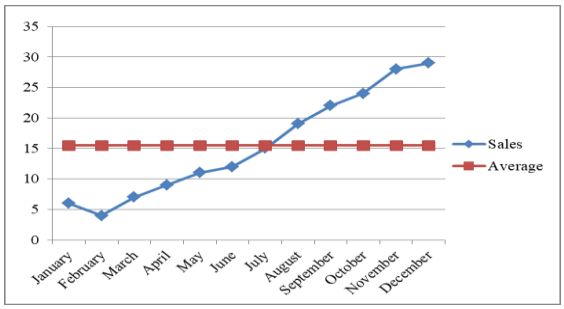

Figure 2. Plot of distillation equipment sales data (Source: data processing)

Based on Figure 1, the data plot of distillation equipment sales has increased so forecasting uses Trend Least Square analysis.

Table 3. Least square trend calculation for 2023

Month	X	Y	XY	X^2
January	-6	6	-36	36
February	-5	4	-20	25
March	-4	7	-28	16
April	-3	9	-27	9
May	-2	11	-22	4
June	-1	12	-12	1

July	1	15	15	1
August	2	19	38	4
September	3	22	66	9
October	4	24	96	16
November	5	28	140	25
December	6	29	174	36
Total		**186**	**384**	**182**

(Source: data processing)

Based on Table 3, forecasting using the Trend Least Square method is calculated manually. The results of forecasting future demand for the number of sales from January to December 2024 using the Trend Least Square method are as follows:

Table 4. Forecasting sales in 2024

Month	X	Y
January	7	30
February	8	32
March	9	34
April	10	37
May	11	39
June	12	41
July	13	43
August	14	45
September	15	47
October	16	49
November	17	51
December	18	53

(Source: data processing)

Based on Table 4 sales data in 2024 every month has increased so that the business is feasible to develop.

Benchmarking

Benchmarking contains a comparison of products to be sold with 3 other competitors. The comparison contains the advantages and disadvantages of the product when used, the uniqueness of the product, product materials, and product prices. After comparing the products sold with competitors of distillation equipment, it is known that the product is feasible to sell and compete to be marketed. This distillation device product has superior product quality at a lower price and uses more durable materials.

B. Technical Aspects

The technical aspect contains the stage of determining the location of the business and the production process for making distillation equipment.

Location determination

Location determination is obtained by using market segmentation. Market segmentation contains 3 main segments, namely geography in the form of places, demographics in the form of age, and psychographics in the form of job salaries. In the market segmentation for distillation equipment products, the geography used is the Tapung area due to its strategic location in marketing the product. Demographics are divided into 3, namely children, adolescents, and adults with the selected segment of adults aged 21-50 years because adults use distillation equipment for purification to produce biofuels. Psychographic segments that have been carried out distillation tools are more likely to be marketed to the upper class with a salary range of IDR 5,000,000- IDR 10,000,000 because this group is concerned with affordable prices.

Production process

The production process is carried out to find out how much time it takes to produce 1 distillation device. The production process is carried out using the gantt chart method.

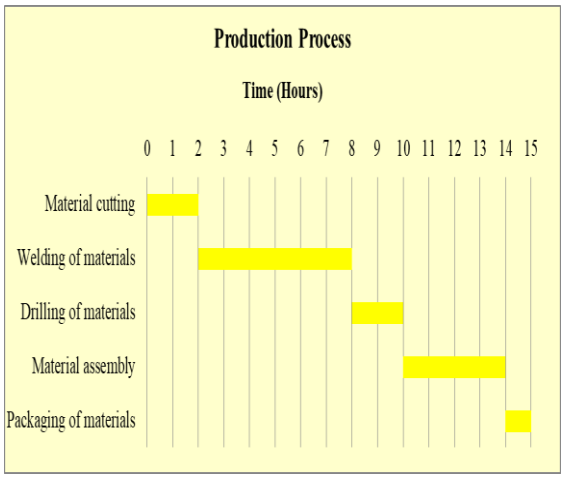

Figure 3. Gantt chart of the production process
(Source: data processing)

Based on Figure 3 Gantt chart, it is known that the time needed to produce 1 distillation device is 15 hours. With the labor of cutting materials for 2 hours, welding for 6 hours, drilling for 2 hours, assembly for 4 hours, finally packaging for 1 hours. So that it can produce 12 distillation devices per month.

C. Financial Aspects

The financial aspects in the feasibility study of

the distillation equipment business first carried out a cash flow calculation to determine the amount of net cash obtained from year 1 to years 5. The following is an estimate of the total cost of the project and the expected net cash results in the feasibility of a distillation equipment business:

Table 5. Cash flow year 1 to years 5

Description	Years (IDR)					
	0	1	2	3	4	5
Investasi	318.476.300					
Cash in		307.244.700	494.663.967	682.083.234	869.502.501	1.056.921.768
Cash-out		252.319.343	300.848.853	349.378.364	359.074.539	407.770.716
depreciation		38.156.208	38.156.208	38.156.208	38.156.208	38.156.208
Net cash flow		54.925.357	193.815.114	332.704.870	510.427.962	649.151.052

(Source: data processing)

Based on Table 5, cash inflows are obtained from 20% of the previous forecasting results. While cash-out is obtained from the cost of raw materials, employee salaries, electricity, advertising costs, bank installments, depreciation costs, transportation, and store rental costs. For depreciation obtained from equipment or machinery used in the production process, the economic life used is 5 years. The net cash generated is in year 1 of IDR 54,925,357, in year 2 of IDR 193,815,114, in year 3 of IDR 332,704,870, in year 4 of IDR 510,427,962, and in year 5 of IDR 649,151,052. After obtaining net cash in years 1 to 5, then look for the calculation of Net Present Value (NPV), Profitability Index (PI), Internal Rate of Return (IRR), and Payback Period (PP).

Table 6. Calculation of net present value (NPV), profitability index (PI), and payback period (PP)

Years	Net cash (IDR)	Present value discount factor (11%)	Present value net cash (IDR)	Kumulatif net cash (IDR)
0	318.476.300			318.476.300
1	54.925.357	0.9	49.432.821	263.550.943
2	193.815.114	0,81	156.990.242	69.735.829
3	332.704.870	0,73	242.874.555	-262.969.041
4	510.427.962	0,65	331.778.176	-773.397.003
5	649.151.052	0,59	382.999.121	-1.422.548.055
Total present value of net cash			1.169.179.195	
Net present value (NPV)			850.702.895	
Profitability index (PI)			3,67	
Payback period (PP)				2,21

(Source: data processing)

Based on Table 6, the results of the calculation of the Net Present Value (NPV) of IDR. 850,702,895> 0 are declared feasible because it is positive which has been calculated with a discount factor at present value. The Profitability Index (PI) has a requirement to be declared feasible if the results of the PI calculation> 1, so the Profitability Index (PI) obtained from the calculation of the Present value of net cash divided by the Present value of the investment is 3.67> 1 declared feasible. The payback Period (PP) is used to calculate the time required to return the initial investment from the cash flow generated, the PP calculation is obtained from the cumulative net cash in year 0 of IDR 318,476,300 minus the net cash in year 1 of IDR 54,925,357 so that the cumulative net cash for year 1 is IDR 263,550,943. This is because the net cash varies every year. The Payback Period results are between year 2 and year 3, so the Payback Period (PP) is declared feasible because the investment payback time of 2 years and 2 months is not more than the specified time of 5 years.

Table.7 Calculation internal rate of return (IRR)

Years	Net cash (IDR)	Present value discount factor (11%)	Present value net cash $_1$ (Rp)	Present value discount factor (15%)	Present value net cash $_2$ (Rp)
0	318.476.300				
1	54.925.357	0.9	49.432.821	0,87	47.785.061
2	193.815.114	0,81	156.990.242	0,76	147.299.486
3	332.704.870	0,73	242.874.555	0,66	219.585.214
4	510.427.962	0,65	331.778.176	0,57	290.943.939
5	649.151.052	0,59	382.999.121	0,50	324.575.526
Net Present Value (NPV)			850.702.895		711.712.926
Internal Rate of Return (IRR)					35%

(Source: data processing)

Based on table 7, the calculation of the Internal Rate of Return (IRR) with the first Present Value Discount Factor is 11% and the second is 15%. Before calculating the IRR, first calculate the NPV with the first Present Value Discount Factor of 11% and the second of 15%. NPV1 was obtained at IDR 850,702,895 and NPV2 at IDR 711,712,926. After knowing the NPV1 and NPV2 values, the IRR calculation is carried out. The IRR value is 35%> 11% so that the IRR is declared feasible.

Organizational Structure

The following is the organizational structure of the company (Figure 4).

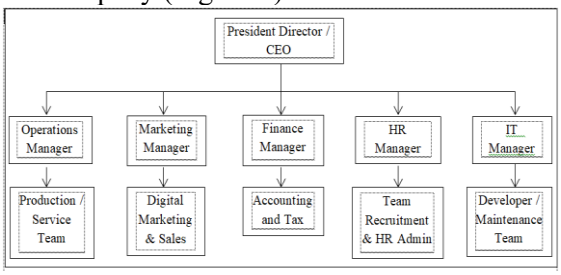

Figure 4. Organizational structure

5. CONCLUSION

From the results of the research objectives it can be concluded that the business of bioethanol distillation equipment using empty palm bunches and palm fronds is reviewed based on 3 aspects, namely: Based on market aspects, the selling price of the product is obtained from the calculation of the cost of production using the Full Costing method so that the selling price per unit of distillation equipment is IDR 3,072,447. forecasting calculations carried out using the Trend Least Square method obtained sales data of distillation equipment has increased. Benchmarking is done by comparing the product to be marketed with 3 other competitors, bioethanol distillation devices that will be marketed have superior quality and lower prices compared to 3 other competitors. So it can be concluded that the market aspect is declared feasible to run. Based on the technical aspects of determining the location obtained using market segmentation, namely in the Tapung area with the adult category of the age range 21-50 years in the upper class. The production process using a gantt chart month produces 12 units of distillation equipment and gets a profit of IDR 36,869,364 per month so that it can be an opportunity to develop a distillation equipment business and based on technical aspects it is declared feasible. Based on the financial aspects of the NPV obtained from IDR. 850,702,895 > 0 is declared feasible because it is positive, the PI obtained of 3.67> 1 is declared feasible because it is profitable, the IRR obtained is 35%> 11% so it can be financially profitable, and the PP obtained 2 years 2 months is declared feasible because it can return the investment before 5 years from the specified time. Based on the calculation of NPV, PI, IRR, and PP that has been obtained, the bioethanol distillation tool business using empty palm bunches and palm fronds can be declared feasible to run.

Research on the feasibility of bioethanol distillation equipment using waste empty palm bunches and palm fronds in the future has enormous potential, seen from the utilization of waste. This research can help identify profitable business opportunities and develop more effective and efficient technology in bioethanol production.

REFERENCE

Agustina, L., Hanny, H., Tjun, L. T., Debbianita, D., Joni, J., & Batistuta, F. F. F. (2022). Analisis Studi Kelayakan Usaha Air Minum Berbasis Chlorine

Dioxide Pada Unit Usaha BUMDes Kertajaya. *Aksiologiya: Jurnal Pengabdian Kepada Masyarakat*, *6*(1), 18. https://doi.org/10.30651/aks.v6i1.4601

Alfian Pradana, J., Komari, A., & Dewi Indrasari, L. (2020). Studi Kelayakan Bisnis Tell Kopi Dengan Analisis Finansial. *Industri Inovatif : Jurnal Teknik Industri*, *10*(2), 92–97. https://doi.org/10.36040/industri.v10i2.2855

Apriliani, Aji Tuhagana, & Dwi Epty Handayani. (2024). Analisis Kelayakan Investasi Properti Proyek Pembangunan Perumahan Grand Panghegar Residence Purwakarta. *Al-Kharaj: Jurnal Ekonomi, Keuangan & Bisnis Syariah*, *6*(4), 5448–5460. https://doi.org/10.47467/alkharaj.v6i4.1938

Dewi, G. A. D. A., & Iriani, I. (2023). Evaluation of Business Feasibility of Construction and Building Services Business at CV. Nirwatama. *IJIEM - Indonesian Journal of Industrial Engineering and Management*, *4*(3), 506. https://doi.org/10.22441/ijiem.v4i3.21579

Husain, S. P., & Lukum, A. (2022). Studi Kelayakan Bisnis Untuk Wirausaha di Desa Pentadio Barat Kecamatan Telaga Biru. *Mopolayio : Jurnal Pengabdian Ekonomi*, *1*(2), 123–128. https://doi.org/10.37479/mopolayio.v1i2.25

Iskandar, R. (2023). Analisis Studi Kelayakan Kedai DjamoeLenial Ditinjau dari Aspek Finansial. *Jurnal Akademi Pariwisata Medan, 11(1), 17-25.* https://doi.org/10.36983/japm.v11i1.421

Latara, A., Mustofa, M., & Botutihe, S. (2021). Destilasi Bioetanol dari Nira Aren dengan Variasi Waktu Pengadukan pada Proses Fermentasi. *Jurnal Teknologi Pertanian Gorontalo (JTPG)*, *6*(2), 30–35. https://doi.org/10.30869/jtpg.v6i2.809

Melani, S., Elisah, E., Maharani, S., Devy, J. K., & Widodasih, R. W. K. (2024). Business Feasibility Study Analysis of the Frustashit Store Business in Terms of Non-Financial Aspects and Financial Aspects. *Dynamic Management Journal*, *8*(1), 121. https://doi.org/10.31000/dmj.v8i1.10509

Mulyati, T. A., Pujiono, F. E., & Farida, U. (2023). Pemberdayaan Kelompok Tani Nanas Queens Kediri Melalui Pembuatan Bioetanol "Pina Queens" dari Limbah Kulit Nanas. *Indonesia Berdaya*, *4*(4), 1541–1548. https://doi.org/10.47679/ib.2023600

Nugroho, B. H., & Jaqin, C. (2021). Implementation of Benchmarking Method for Higher Education Institution: A Literature Review. *IJIEM - Indonesian Journal of Industrial Engineering and Management*, *2*(2), 81. https://doi.org/10.22441/ijiem.v2i2.10797

Prabowo, T., Purwanto, A., & Suharyoko. (2022). Peranan Schedulling Dalam Perencanaan Dan Pengawasan Produksi Pada Perusahaan Percetakan Kertas Garuda Offset Di Kecamatan Jebres Kota Surakarta. *Jurnal Ganeshwara*, *2*(1), 0–9. https://doi.org/10.36728/jg.v2i1.1770

Praevia, M. F., & Widayat, W. (2022). Analisis Pemanfaatan Limbah Tandan Kosong Kelapa Sawit Sebagai Cofiring pada PLTU Batubara. *Jurnal Energi Baru Dan Terbarukan*, *3*(1), 28–37. https://doi.org/10.14710/jebt.2022.13367

Purnatiyo. (2021). Analisis Kelayakan Investasi Alat DNA Real Time Thermal Cycler (RT-PCR) Untuk Pengujian Gelatin. *European Pharmaceutical Review*, *VIII*(1), 6–14. https://doi.org/10.29309/tpmj/2012.19.06.2455

Qomariyah, S. N. (2021). Studi Kelayakan Bisnis Usaha Batk Dengan Metode Financial (Studi Kasus Batik New Collet Desa Jatipelem Kecamatan Diwek Kabupaten Jombang). *Jurnal Studi Manajemen Dan Bisnis, 8(1), 11-16.* https://doi.org/10.21107/jsmb.v8i1.10819

Safitry, S. E., & Muntiah, N. S. (2022). Perhitungan Harga Pokok Produksi dengan Metode Full Costing dan Activity Based Costing. *ISOQUANT : Jurnal Ekonomi, Manajemen Dan Akuntansi*, *6*(2), 227–237. https://doi.org/10.24269/iso.v6i2.1319

Satria, W. (2021). Jaringan Syaraf Tiruan Backpropagation Untuk Peramalan Penjualan Produk (Studi Kasus Di Metro Electronic Dan Furniture). *Djtechno:*

Jurnal Teknologi Informasi, *1*(1), 14–19. https://doi.org/10.46576/djtechno.v1i1.966

Simanjuntak, A. L. S., Rangkuti, I. U. P., & Ginting, M. H. (2021). Potensi Limbah Padat Kelapa Sawit: Pelepah Kelapa Sawit Dan Tandan Kosong Kelapa Sawit Sebagai Bahan Baku Bioetanol. *Jurnal Agro Fabrica*, *3*(2), 52–63. https://doi.org/10.47199/jaf.v3i2.224

Wahyuni, W., Fatih, M. L., Syahrani Hsb, R. M., Sakina, S., & Suhairi, S. (2022). Analisis Studi Kelayakan Bisnis Dalam Aspek Produksi. *VISA: Journal of Vision and Ideas*, *2*(2), 126–134. https://doi.org/10.47467/visa.v2i2.960

Widianingsih, R., widodasih, R. W. K., & BR, K. s. (2023). Analisis Studi Kelayakan Bisnis pada Pangkalan Gas Lpg "Rana" di Desa Cibatu Kecamatan Cikarang Selatan Kabupaten Bekasi (Ditinjau dari Aspek Teknis, Aspek Pasar dan Pemasaran, dan Aspek Keuangan). *Jurnal Ilmiah Global Education, 4(2, 1131-1139.* https://doi.org/10.55681/jige.v4i2.888

Yulianti, I., & Rahmawati, A. (2022). Pengembangan Sistem Forecasting Penjualan Pada Aplikasi Point of Sales Menggunakan Metode Trend Least Square. *Jurnal Larik: Ladang Artikel Ilmu Komputer*, *2*(1), 24–31. https://doi.org/10.31294/larik.v2i1.1153