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Regional Case Study

Value-Added Analysis of Used Cooking Oil Recycling as a Base Material for Floor Cleaning Soap: A Case Study of Putra Abadi MSMEs in Pagalaram City, South Sumatra

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Abstract

Used cooking oil disposed directly to the ground by Putra Abadi MSMEs can threaten the surrounding environment. It is necessary to manage used cooking oil by reprocessing it into another form that can be useful, namely by processing it into floor cleaning soap to overcome these problems. The purpose of this study was to determine the suitability of the content of floor cleaning soap made from used cooking oil from the production process of Putra Abadi MSMEs with SNI Floor Cleaning Soap and to determine the added value of floor cleaning soap made from used cooking oil from the production process of Putra Abadi MSMEs in terms of economy and ecology. The method used is the experimental making of floor cleaning soap with analysis of floor cleaning soap content test data referring to SNI 1842: 2019. Analysis of ecological added value is explained descriptively by considering abiotic, biotic, and cultural components; Economic feasibility analysis is carried out by calculating B/C and PBP. The results of this study indicate that variation 4 is the variation with the best composition that meets the SNI 1842: 2019 non-disinfectant category and is economically viable. Manufacturing these products provides ecological benefits, including reducing environmental pollution, restoring aquatic and soil biota habitats, and encouraging sustainable behaviour patterns.

Keywords: Added value; recycling; used cooking oil; floor cleaning soap

1. Introduction

Indonesia is one of the countries that consume cooking oil due to the proliferation of culinary businesses and food industries, as well as household food needs whose central processing is fried. Cooking oil results from refining animal or plant fat that has been refined into liquid form (Erna & Wiwit, 2017). Cooking oil used too often contains residues and oxidized substances during frying, damaging food quality and affecting health (Megawati & Muhartono, 2019). The physical characteristics of used cooking oil are the colour that turns brown to black, an unpleasant or rancid aroma, and sediment in the oil (Putri & Rahmawati, 2022).

Currently, the optimization of used cooking oil management is still minimal. It lacks storage facilities, so used cooking oil is still disposed of carelessly in the environment, especially in waterways or soil (Harsiti et al., 2019). The phenomenon of careless disposal of used cooking oil can cause environmental damage. Used cooking oil discharged into the water can pollute waterways, and blockage of waterways changes the nature of water to become unfit and contributes to shifts in the dynamics of aquatic ecosystems. In addition, the soil also feels the impact because it will be challenging to decompose soil microorganisms. After all, the accumulation of used cooking oil can disrupt the physical properties and structure of the soil to threaten soil fertility and the survival of various soil organisms (Haqq, 2019).

Used cooking oil contains potentially carcinogenic elements, including high levels of acid number, epoxides and peroxides, which can threaten ecosystems and the environment (Erviana et al., 2018).

At Putra Abadi MSMEs, the used cooking oil produced every month can reach up to 150 litres with 5 litres per day and the used cooking oil is just thrown on the ground, so to overcome these problems, efforts are needed to manage used cooking oil at Putra Abadi MSMEs by *recycling* or reprocessing it into other forms that can be useful, such as making floor cleaning soap from used cooking oil. According to (Mardiana et al., 2020), these management activities can reduce the amount of used cooking oil waste in the environment and add ecological and economic value. The purpose of this research is to determine the suitability of the content of used cooking oil-based floor cleaning soap from the Putra Abadi MSMEs production process activities with SNI Floor Cleaning Soap and to determine the added value of used cooking oil-based floor cleaning soap from the Putra Abadi MSMEs production process activities in terms of economic and ecological aspects.

2. Methods

This research was conducted at Putra Abadi MSMEs, which is located on Jalan Lintas Pagar Alam-Lahat, Atung Bungsu, South Dempo District, Pagar Alam City, South Sumatra, with coordinates 4°02'58"S 103°23'10"E. Laboratory testing of floor cleaning soap made from used cooking oil was carried out at the Sebelas Maret University Laboratory. This research is an experiment-based research with laboratory test research limitations. The dependent variable in this study is the test results of mop soap found in SNI 1842: 2019. The independent variable in this study is the amount of KOH used, where KOH has a vital role in creating the best saponification process for soap made from used cooking oil. This study used a completely randomized design with repetitions based on the Federer formula (1963); repetition was carried out four times (quadruple) with six samples, so 24 experiments were obtained. The use of arpus, essential oil, used cooking oil, and water refers to previous research conducted by (Prionggo, 2013), while the variation of KOH is a novelty in the study of making floor cleaning soap from used cooking oil. The following is a variation of the treatment of soap-making research from used cooking oil:

Table 1. Variations of research treatments

Materials	Unit	V1	V2	V3	V4	V5	V6
KOH	gram	5	10	15	20	25	30
Arpus	gram	15	15	15	15	15	15
Essential Oil	ml	4	4	4	4	4	4
Used Cooking Oil	ml	100	100	100	100	100	100
Water	ml	450	450	450	450	450	450

Informations = V1 : Variation 1 with the addition of 5 grams of KOH, V2 : Variation 2 with the addition of 10 grams of KOH , V3 : Variation 3 with the addition of 15 grams of KOH, V4 : Variation 4 with the addition of 20 grams of KOH, V5 : Variation 5 with the addition of 25 grams of KOH, V6 : Variation 6 with the addition 30 grams of KOH

Making floor cleaning soap from used cooking oil begins with adsorbing the used cooking oil using mashed bagasse and leaving it to stand for seven days. This process aims to eliminate the unpleasant odour of used cooking oil and absorb the remaining residual impurities in used cooking oil; after that, filter the used cooking oil from bagasse. Dissolve KOH in distilled water and put it into the used cooking oil. Stir until the solution becomes slightly solid. In the next step, add the heated distilled water. This process is called saponification, which converts the fat in the used cooking oil into soap. After saponification is complete, mix the arpus added to the distilled water. Stir until completely homogeneous. Add essential oil as a fragrance and let the soap liquid sit for about 24 hours.

2.1. Laboratory Analysis Methods and Economic Feasibility

Floor cleaning soap testing is carried out by referring to SNI 1842: 2019 concerning floor cleaning soap. The category of floor cleaning soap in SNI 1842: 2019 is divided into two categories, namely, disinfectant and non-disinfectant floor cleaning soap. The economic feasibility analysis follows the NPV, IRR, Net B/C and PBP equations presented in equations (1)-(4).

Table 2. Floor cleaner quality requirements

No	Test Parameters	Unit	Requirements	
			Non-disinfectant Floor Cleaner	Disinfectant Floor Cleaner
1	pH (0,1% solution)	-	5-11	
2	Phenol Coefficient	-	-	Minimal 1
3	Specific Gravity	-	0,9-1,2	
4	Total Active Ingredients	Mass fraction, %	Minimal 2	
5	Microbial Contamination			
5.1	Total Plate Number	Colonies/mL	Maximal 1×10^3	

$$NPV = \sum_t^n = \mathbf{1} \frac{Bt - Ct}{(1+i)^t} \quad (1)$$

Informations :
NPV = net present value (Rp)
Bt = Cash inflow in year t (Rp)
Ct = Cash outflow in year t (Rp)
t = time in years
i = interest rate (% year)
n = economic life of the appliance (year)

$$IRR = i_1 + \frac{NPV_1}{NPV_1 - NPV_2}(i_2 - i_1) \quad (2)$$

Informations :
NPV = net present value (Rp)
i = interest rate (% year)

$$\frac{B}{C}\ Ratio = \frac{\sum_t^n = 1 \frac{Bt}{(1+i)^t}}{\sum_t^n = 1 \frac{Ct}{(1+i)^t}} \quad (3)$$

Keterangan:
Bt = Cash inflow in year t (Rp)
Ct = Cash outflow in year t (Rp)
t = times in year
i = interest rate (%/year)
n = economic life of the appliance (year)

$$PBP = \frac{I}{A} \tag{4}$$

Informations :
PBP = amount of payback time
I = investment cost
A = benefits per year

3. Result and Discussion

3.1. SNI Conformity of Used Cooking Oil-based Floor Cleaning Soap

Table 3. Testing Results of Floor Cleaning Soap Made from Used Cooking Oil in accordance with SNI 1842:2019

Parameters	Unit	SNI	Results			
			V3	V4	V5	V6
pH (0,1% solution)	-	5-11	7,51	8,82	10,29	11,67
Phenol Coefficient	-	- Minimal 1	0,81	0,84	0,85	0,86
Specific Gravity	-	0,9-1,2	0,842	0,937	1,021	1,304
Total Active Ingredients	Mass fraction, %	Minimal 2	18,98	20,82	21,76	23,93
Total Plate Number	Colonies/mL	Maximal 1×10^3	6,8	2,5	2,3	1,8

Source: (Author, 2024)

Informations = V3 : Variation 3 with the addition of 15 grams of KOH, V4 : Variation 4 with the addition of 20 grams of KOH, V5 : Variation 5 with the addition of 25 grams of KOH, V6 : Variation 6 with the addition of 30 grams of KOH

The manufacture of cooking oil-based floor cleaning soap in this study initially had six variations, but testing was only done on four variations. Because two variations fail, namely variation 1 and variation 2, the failure occurs because the soap and oil still cannot be fused due to the inability of the saponification process so that the surface level is still high. Saponification is the most critical process in soap making because the saponification process, which is a basic hydrolysis process of fats contained in the oil, will form soap compounds as a result of the reaction between hydroxide ions from KOH with carboxyl groups from fatty acids so that surface tension will decrease. Oil can merge with water (Susanti & Guterres, 2018). Variation 1 was only given 5 grams of KOH, while variation 2 was only 10 grams of KOH; from the research conducted, both failed to form soap, so further testing of the two variations was not carried out.

3.1.1. pH

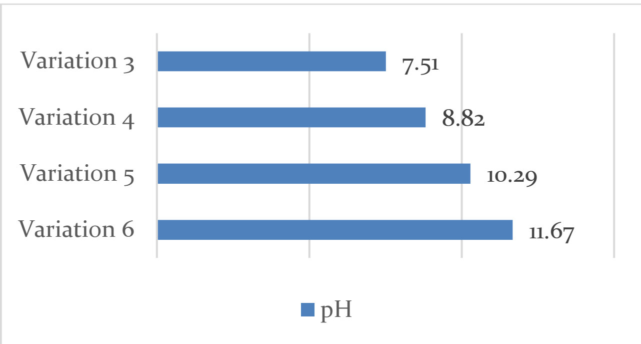

Figure 1. pH value graph

The pH test on the soap solution is intended to determine the feasibility and safety of floor-cleaning soap (Silsia et al., 2017). Based on SNI 1842: 2019 concerning floor cleaning soap, the pH quality standard for floor cleaning soap is on a scale of 5-11. Based on the results of the floor cleaning soap tests that have been carried out, the pH values of V3, V4, V5 and V6 are 7.51, 8.82, 10.29 and 11.67, respectively. Variations that have values by SNI are only V3, V4 and V5. V3 to V6 showed pH values that gradually increased. Different pH values may be influenced by differences in the composition of KOH as the main ingredient of the saponification process. The saponification process will convert fat into soap. This process requires KOH, a chemical with a strong base content. KOH will produce OH- (Hydroxide) ions, which can increase the pH of the solution (Setiawati & Auliyah, 2020), so the higher the concentration of OH- ions, the higher the pH of the soap solution (Yein, 2021).

3.1.2. Phenol Coefficient

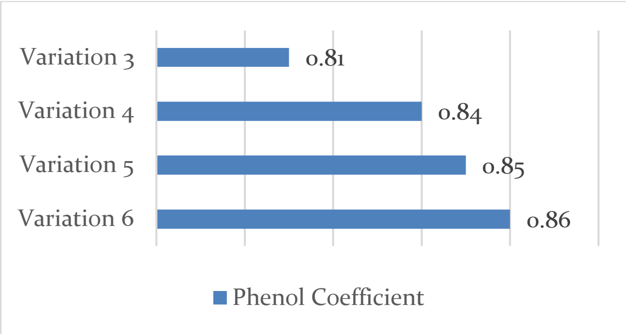

Figure 2. Phenol coefficient value graph

Determining the phenol coefficient aims to evaluate anti-microbial power and assess its effectiveness through the time and concentration used to kill microorganisms (Rahma, 2015). Graph 2 shows that of the four variations tested, no variation has better antibacterial power than phenol because all variations are <1. According to (Hariss, 2022), the phenol coefficient <1 shows an antibacterial effect that is not comparable to phenol; if the phenol coefficient value found is> 1, then the floor cleaning soap is more effective than phenol.

V3 has the lowest coefficient value of 0.81, while V6 is the variation with the highest coefficient value of 0.86. The phenol coefficient test is carried out to determine the germicidal activity or the ability of the compound to kill microorganisms within a certain period; according to (Wulandari et al., 2018), the more KOH that is added, the more fatty acids will react, so that the antibacterial strength will also be more robust. V6 is the variation with the highest KOH value, so the more KOH may be added, the greater the phenol coefficient value will also be, which means the higher the antibacterial content contained in the floor cleaning soap. This statement is also supported by research conducted by (Bakhri et al., 2022), where the concentration of KOH added will be directly proportional to the area of the inhibition zone of bacterial growth; this means that KOH includes substances that can be active as antibacterial. Disinfectant floor cleaning soap is a floor cleaning soap with a minimum phenol coefficient test value of 1; if the phenol coefficient value is not 1, the floor cleaning soap still meets the standards but is classified as non-disinfecting. From the statement and the results of the phenol coefficient test, it can be concluded that V3, V4, V5 and V6 have met the quality standards of SNI 1842: 2019 regarding floor cleaning soaps that are not classified as disinfectant (Bakhri et al., 2022).

3.1.3. Specific Gravity

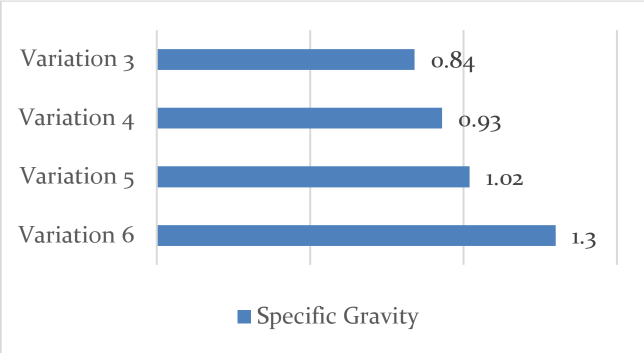

FIgure 3. Specific gravity value graph

Specific gravity is a substance's density value against water's density under general conditions. Based on SNI 1842: 2019 regarding floor cleaning soap, the quality standard set for the specific gravity parameter is 0.9-1.2. The test results show that V3, V4, V5 and V6 have met the SNI 1842:2019 quality standards with particular gravity values of 0.84, 0.93, 1.02 and 1.3, respectively. Variations that have values by SNI are only V4 and V5. The specific gravity value in the four variations has a value that continues to increase, according to (Sutanto et al., 2022). Because the specific gravity value is influenced by the composition of KOH ingredients in soap making, the amount of KOH concentration in the same amount of water has a directly proportional relationship with the specific gravity value, where the more KOH composition used, the higher the specific gravity value of the floor cleaning soap. The more KOH is used, the more soap compounds are produced from oil, increasing the resulting soap's density and specific gravity (Nurmalasari et al., 2023). High and low viscosity can influence the high and low specific gravity value of a solution (Riyanto et al., 2023). Suppose the concentration of KOH given is more. In that case, it can cause more oil phases to be bound by KOH, resulting in the solution having a higher viscosity than those with less KOH concentration.

3.1.4. Total Active Ingredients

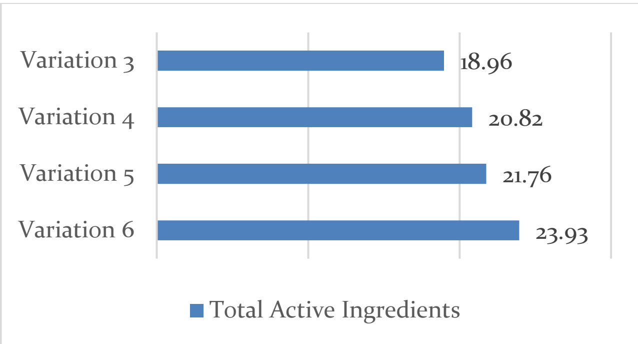

Figure 4. Total Active Ingredients value graph (%)

Determination of the total active ingredients in floor cleaning soap aims to find out what percentage of active ingredients is contained in floor cleaning soap (Kamilah et al., 2022). Based on the test results, the total active ingredients in floor cleaning soap V3, V4, V5 and V6 are 18.96%, 20.82%, 21.76% and 23.93%, respectively, so in this study, the results obtained meet SNI. The active ingredients in making soap from used cooking oil are divided into 2, derived from KOH and Arpus. KOH can hydrolyze fat in used cooking oil and produce glycerol (Saehu et al., 2022). The active ingredients in KOH allow saponification due to the reaction between fatty acids in used cooking oil and alkalis or bases contained in KOH (Putri, 2023). According to (Wulandari et al., 2018), the more KOH added, the more fatty acids will react, so the antibacterial strength will also be more robust. Research conducted by (Bakhri et al.,

2022) also states that the more mass of KOH added will be directly proportional to the area of the inhibition zone of bacterial growth. Arpus is also an active ingredient in floor cleaning soap because arpus contains anti-bacteria that can be used as a disinfectant (Prionggo, 2013). The active ingredients contained in arpus can be utilized as antibacterial; this statement is supported by the results of research (Nandari et al., 2022), which tested that arpus can kill E. coli bacteria with high enough effectiveness.

3.1.4. Total Plate Number

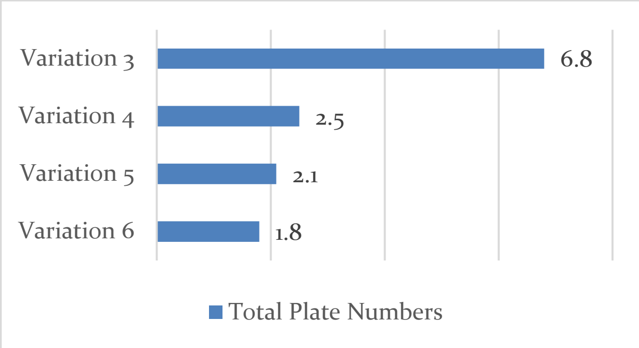

Figure 5. Total Plate Number value graph

The total plate number is a test used to determine whether the soap contains bacterial contamination; the more bacteria, the greater the contamination or bacterial contamination contained in the soap (Febrianti et al., 2013). Total plate number testing generally gives different results due to environmental factors such as temperature, air and humidity that spur the growth of bacteria on Petri dish media (Widyasanti et al., 2019). The total plate number value tends to decrease from V3 to V6, respectively, 6.8 colonies/mL, 2.5 colonies/mL, 2.1 colonies/mL and 1.8 colonies/mL.

V3 has the highest total plate number value with 6.8 colonies/mL, while V6 has the lowest total plate number value with 1.8 colonies/mL. Variations with low total plate numbers mean better anti-microbial chemicals or active ingredients (Widyasanti et al., 2019). Based on the graph, it is known that the variation with greater KOH obtained a lower total plate number value. The more concentration of KOH added, the lower the total plate number obtained. This statement is supported by (Bakhrie et al., 2021), where the tests showed a higher bacterial inhibition zone as the KOH concentration increased. This statement is also supported by (Wulandari et al., 2018), which states that the higher the free fatty acid, the lower the binding power of the soap and vice versa.

Apart from KOH, arpus can also act as a disinfectant because, based on research conducted by (Hadi et al., 2022), testing arpus is proven to increase the inhibition zone of E-coli bacteria. The total plate number test results on cooking oil-based floor cleaning soap show little bacterial growth and are still below the quality standards allowed in SNI 1842: 2019, which is 1 x103 or equivalent to 1000 bacteria. Thus, cooking oil-based floor cleaning soap is proven hygienic from bacteria and has fulfilled SNI 1842:2019.

3.2. Economic Feasibility Analysis

The best variations from the test results are 4 and 5, following SNI 1842: 2019 standards. Economic analysis was carried out on variation 4 because it meets the standards and uses less KOH to reduce raw material costs. According to (Mamondol, 2024), economic analysis will assess the potential financial benefits and business sustainability. According to (Damayanti & Supriyantin, 2021), turning used cooking oil into floor cleaning soap can create an environmentally friendly creative economy and prevent environmental pollution. The calculation uses the prices of materials and tools from online shopping platforms such as Shopee and OLX in 2024 with the speculation of providing goods and tools for the business needs of making soap from used cooking oil at varying prices.

3.2.1. NET Present Value (NPV)

According to (Rumiyanto et al., 2015), Net present value (NPV) is the difference between the current incoming cash value stream and that incorporated in the investment project; therefore, in its calculation, NPV requires fixed costs, variable costs and also interest rates, which are the reference for calculation. NPV calculations can assist entrepreneurs in estimating the present value of future cash flows so that investment risks can also be analyzed (Maulana et al., 2014). The following is a table of NPV calculations in the production of cooking oil-based floor-cleaning soap :

Table 4. NPV Calculation Results of Floor Cleaning Soap Production Made from Used Cooking Oil at Putra Abadi MSMEs

Year (t)	Outflow	Inflow	Discount Factor (i)	Present Value		(NPV)
	Investment & Operating Expenses	Of Main & Side Products	1 (1+i)t i=0,1/th	PV Outflow Cost Time in years	PV Inflow Income Time in years	Flow Benefits Netto Time in years
0	13.355.347	0	1,00000000	13.355.347	0	(13.355.347)
1	96.382.962	115.632.000	0,90909091	87.620.875	105.120.000	17.499.125
2	96.382.962	115.632.000	0,82644628	79.655.341	95.563.636	15.908.296
3	96.382.962	115.632.000	0,75131480	72.413.946	86.876.033	14.462.087
4	96.382.962	115.632.000	0,68301346	65.830.860	78.978.212	13.147.352
5	96.382.962	115.632.000	0,62092132	59.846.236	71.798.374	11.952.138
6	96.382.962	115.632.000	0,56447393	54.405.669	65.271.249	10.865.580
7	96.382.962	115.632.000	0,51315812	49.459.700	59.337.500	9.877.800
8	96.382.962	115.632.000	0,46650738	44.963.363	53.943.181	8.979.818
9	96.382.962	115.632.000	0,42409762	40.875.785	49.039.256	8.163.471
10	96.382.962	115.632.000	0,38554329	37.159.804	44.581.142	7.421.337
Total	977.184.969	1.156.320.000		605.586.926	710.508.584	104.921.657

Based on the table, the resulting NPV value is Rp 104,921,657.00. This value is obtained by reducing the present value of the cash outflow of Rp 710,508,584.00 minus *the* present value of *the* cash inflow of Rp 605,586,926.00. The NPV result of Rp 104,921,657.00, which is> 1 according to (Abuk & Rumbino, 2020), indicates that the business is feasible.

3.2.2. Internal Rate off Return (IRR)

According to (Nufaili & Utomo, 2024), IRR is a rate of interest that will equalize the sum of the present value of the expected revenue received. The calculation of the IRR value will be carried out by experimenting with the numbers that will later become the interest rate range (Xie, 2021). This research hypothesis uses a minimum interest rate of 25% and a maximum of 26%. The IRR results must be within the hypothesized value range for the investment to be feasible. The following is a table of NPV calculation data in the production of cooking oil-based floor-cleaning soap :

Table 5. Results of Data Component of IRR Calculation of Floor Cleaning Soap Production Made from Used Cooking Oil at Putra Abadi MSMEs

Year (t)	Flow Benefits	Present Value Net Benefit Flow for IRR Calculation	
	Netto	Df =	Df =

	in Time in years	**0,25 per year**	**NPV_1 (Total must be positive)**	**0,26 per year**	**NPV_2 (Total must be negative)**
0	(13.355.347)	1,00000000	(13.355.347)	(1,00000000)	13.355.347
1	19.249.038	0,80000000	15.399.230	(0,79365079)	(15.277.014)
2	19.249.038	0,64000000	12.319.384	(0,62988158)	(12.124.614)
3	19.249.038	0,51200000	9.855.507	(0,49990602)	(9.622.710)
4	19.249.038	0,40960000	7.884.406	(0,39675081)	(7.637.071)
5	19.249.038	0,32768000	6.307.525	(0,31488159)	(6.061.168)
6	19.249.038	0,26214400	5.046.020	(0,24990603)	(4.810.451)
7	19.249.038	0,20971520	4.036.816	(0,19833812)	(3.817.818)
8	19.249.038	0,16777216	3.229.453	(0,15741120)	(3.030.014)
9	19.249.038	0,13421773	2.583.562	(0,12492953)	(2.404.773)
10	19.249.038	0,10737418	2.066.850	(0,09915042)	(1.908.550)
Total	**179.135.031**		**55.373.405**		**-53.338.836**

The table shows the data that will be used to calculate the IRR. Some components needed include profits from years 0 to 10 and differentiation values of 25 and 26%. The differentiation value is used to generate positive and negative NPV values; later, the IRR calculation will be obtained from the NPV summation, which is then divided by the positive and negative NPV values and then multiplied by the difference from the minimum and maximum differentiation used (Irsayad & Yanti, 2016). The following is the IRR calculation used in this study:

$$IRR = i^1 + \frac{NPV^1}{NPV^1 - NPV^2}(i^2 - i^1)$$

$$IRR = 0{,}25 + \frac{55.373.405{,}40}{55.373.405{,}40 - (-53.338.836{,}28)}(0{,}26 - 0{,}25)$$

$$IRR = 0{,}25 + \frac{55.373.405{,}40}{108.712.249{,}69}(0{,}01)$$

$$IRR = 0{,}25 + 0{,}0050935758976$$

$$IRR = 0{,}2550935758976$$

$$IRR = 25{,}50935758976\%$$

Based on these calculations, the IRR value obtained is 25.50935758976% / year. The IRR> MARR value indicates the investment is feasible (Khotimah & Setiono., 2014). According to (Utami et al., 2020), MARR (Minimum Active Rate of Return MARR*)* is the minimum value of the rate of return that investors will receive.

3.2.3. Net Benefit Cost-Ratio (Net B/C)

The net benefit-cost ratio (Net B/C) is an economic feasibility analysis that describes how many benefits are obtained from the costs (Supriatna et al., 2023). This Net B/C calculation uses a comparison of positive and negative Present Value (Anwar et al., 2018). Gross B / C calculations generally accompany net B / C calculations because both have a link where Net B / C looks for net benefits. At the same time, Gross B / C will describe the effect of additional costs on the benefits to be received (Gandhi et al., 2022).

The results of the calculation of the Gros B/C and Net B/C values of the cooking oil-based floor cleaning-soap production business are as follows:

$$Gross\ B/C = \frac{PV.Total\ Penerimaan}{PV.Total\ Biaya}$$
$$= \frac{710.508.584}{605.586.926}$$

$$Gross\ B/C = 1{,}173256147$$

$$Net\ B/C = \frac{PV.Benefit\ (+)}{PV.Benefit\ (-)}$$
$$Net\ B/C = \frac{104.921.657}{13.355.347}$$
$$Net\ B/C = 7{,}856153603$$

The Gross B / C value is obtained by dividing the present value of total revenue by the *present* value of the total costs incurred. Based on the calculation of Gross B / C, it can be seen that the resulting value is 1.173256147, which means that the production business of cooking oil-based floor cleaning soap is feasible to run; this is following (Arifin et al., 2018) if the Gross B / C value> 1 then it is declared feasible. The Net B / C value is obtained by dividing the positive and negative present values. Based on the calculation of Net B / C, it can be seen that the resulting value is 7.856153603, which means that the production business of cooking oil-based floor cleaning soap is feasible to run; this is by (Ariani et al., 2022) if the Net B / C value> 1 then it is declared feasible.

3.2.4. Payback Period (PBP)

Pay Back Period (PBP) is an analysis used to determine the length of time needed for the funds used in business development to return ultimately (Dwiputra, 2016); according to (Gorshkov et al., 2018), it will be better if the calculation of the payback period returns funds faster. Calculating the PBP value requires a cumulative cash flow value, which is obtained from calculating cash inflows and outflows (Irsayad & Yanti, 2016). The following is a table of PBP calculations from the production of cooking oil-based floor-cleaning soap :

Table 6. PBP Calculation Results of Floor Cleaning Soap Production Based on Used Cooking Oil at Putra Abadi MSMEs

Year Period	Cash Inflow			Cash Outflow	Cumulative Cash Flow
	Investment	Net Profit	Depreciation	Loan Principal Repayment	
0	13.355.347				
1		18.447.717	1.278.629	3.472.390	16.253.955
2		18.607.981	1.278.629	3.312.126	16.574.484
3		18.768.245	1.278.629	3.151.862	16.895.012
4		18.928.509	1.278.629	2.991.598	17.215.540
5		19.088.774	1.278.629	2.831.334	17.536.069
6		19.152.793	1.278.629		20.431.422
7		19.152.793	1.278.629		20.431.422
8		19.152.793	1.278.629		20.431.422

9		19.152.793	1.278.629	20.431.422
10		19.152.793	1.278.629	20.431.422
Total	13.355.347			
PBP	0,821667502	Year		
	9,86001002	Month		
	296	Day		

The table shows the PBP value obtained after dividing the investment value by the cumulative cash flow in the first year obtained by the result of RP. 13.355.347,00. The calculation is based on cash inflows in year 0, assuming sales have been made in the first year so that producers get income; the income will be reduced by depreciation costs as well as the principal of loans that have been obtained from banks with the interest of 6% so that the cumulative cash flow in the first year becomes Rp. 16,253,955.00. The calculation of cumulative cash flow for years 2 to 5 will always be deducted from the principal cost of bank loans whose value is adjusted to the previous table 4.10 related to the calculation of investment fund borrowing. Years 6 to 10 show that the cumulative cash flow value tends to be the same because there is no additional cost to pay the principal loan payment because it has been completed, assuming the selling price and production amount are always the same every year, and all goods are sold out. The PBP value per year is 0.821667502, the monthly PBP is 9.86001002, and the PBP per day is 296. According to (Aridho et al., 2021), the payback period is declared feasible if it has a result of <5 years; thus, it can be seen that the production business of cooking oil-based floor cleaning soap from Putra Abadi MSMEs can be declared feasible to run.

3.3. Ecological Added Value

3.3.1. Abiotic

Severe environmental damage will reduce environmental functions to dysfunction so that the environment loses its carrying capacity. Carelessly disposing of used cooking oil in the aquatic environment, according to (Ginting et al., 2020), will damage the aquatic ecosystem so that COD and BOD levels increase due to the covering of the water surface by a layer of oil so that sunlight cannot penetrate the water surface. Used cooking oil disposed of on the ground will be absorbed and can pollute the soil, damaging the soil structure and the mineral and clean water content (Damayanti & Supriyantin, 2021). The innovation of making used cooking oil as a floor cleaning soap can reduce the amount of used cooking oil that has been disposed of by Putra Abadi MSMEs to the environment so that the soil and water will become clean and environmental damage can be reduced due to natural degradation by nature.

3.3.2. Biotic

Used cooking oil previously discharged into the aquatic environment will disrupt the survival of aquatic biota such as fish, benthos, plankton and many more; the instability of aquatic biota life will affect the sustainability of aquatic ecosystems (Ginting et al., 2020). Used cooking oil that is disposed of directly into the soil and seeps into it will disrupt the soil structure and soil abiotic components (Mardiana et al., 2020); its plants are highly dependent on soil abiotic conditions such as pH, moisture content, oxygen content, nutrients as well as microbial abundance, damage to the soil structure and a decrease in the value of soil abiotic components will interfere with plant survival, according to (Haqq, 2019) polluted soil will make it infertile and difficult to plant trees.

Using used cooking oil from the entire series of Putra Abadi MSMEs work processes in floor cleaning soap will significantly prevent the waste of used cooking oil into the environment. Used cooking oil waste that is processed and does not pollute the environment will maintain environmental sustainability and health and can also be a source of income (Hasibuan et al., 2022). Ecological sustainability and maintained health will positively affect the continuity of living things such as animals, plants, and humans. Fertile soil not polluted by used cooking oil will provide a suitable environment for the growth and development of land animals, including micro or macro animals, that function as decomposition agents that keep the soil fertile (Lestari & Susanti, 2019). Fertile soil, due to the decomposition of soil animals, provides abundant nutrients for plants to grow and benefit other living things, such as animals and humans. Humans will feel the blessings of fertile soil through plants that can become food or increase the economy from the results of gardens and fields.

3.3.2. Culture

Managing used cooking oil waste into a product such as floor cleaning soap can create a creative economy in an environmentally friendly community (Damayanti & Supriyantin, 2021). Utilizing used cooking oil waste, which is waste according to (Aini et al., 2020), is a form of resource optimization; waste utilization can reduce environmental impacts. Innovating waste initially valueless into economically valuable goods can increase public awareness of care for the environment by innovating zero-waste industry-based products (Erviana et al., 2018). Used cooking oil processed into floor cleaning soap can change the behaviour pattern of Putra Abadi MSMEs, which initially threw used cooking oil into the environment to use it for economic value. Used cooking oil waste that is no longer disposed of in the environment will increase environmental sustainability, health and community income.

4. Conclusions

Floor cleaning soap from used cooking oil following SNI 1842: 2019 is variations 4 and 5. Both variations are by the SNI Floor Cleaning Soap non-disinfectant category. Variations 3 and 6 do not follow SNI because the specific gravity of variation 3 is still below the quality standard. In variation 6 the pH value and specific gravity exceed the existing quality standards. In contrast, variations 1 and 2 do not comply with SNI because they fail in the saponification process, so further laboratory testing cannot be done. From an economic point of view, the sale of used cooking oil-based floor cleaning soap products for up to 10 years is categorized as feasible with a net profit of Rp. 18,447,717.00 - Rp. 19,249,038.00 per year. NPV and Net B/C values are declared feasible because > 1, IRR is declared feasible because > MARR and PBP are declared feasible because the business capital returns < 5 years, precisely in 296 days. In terms of ecology, it can provide benefits in reducing environmental pollution, restoring aquatic and soil biota habitats, and encouraging sustainable behaviour patterns in society.

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