

THE USE OF USED COOKING OIL AS A RAW MATERIAL FOR AROMATHERAPY CANDLES TO SUPPORT THE CREATIVE ECONOMY OF HOUSEHOLDS IN KEMIRI VILLAGE

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Abstract

Used cooking oil is a household waste that has the potential to pollute the environment if disposed of carelessly. In Kemiri Village, the high production activities of chip-making and frying-based small and medium enterprises (SMEs) generate large amounts of used cooking oil waste. This community service activity aims to provide education and training to PKK mothers in Tegarong Hamlet on utilizing used cooking oil as a raw material for making aromatherapy candles. The activity was held on January 31, 2026, at the Tegarong Hamlet Community Hall, involving 28 participants. The methods used included theoretical material delivery through PowerPoint presentations and leaflets, followed by demonstration and hands-on practice of aromatherapy candle making. In addition to production training, participants also received business feasibility training through the calculation of Cost of Goods Sold (COGS) and Break Even Point (BEP). The results showed that aromatherapy candles made from used cooking oil have a COGS of IDR 6,016.70 per unit, a selling price of IDR 8,000.00, yielding a profit of IDR 1,983.30 per unit, with BEP achieved at approximately 3 units sold. This activity has proven effective in increasing public awareness of the hazards of used cooking oil disposal while simultaneously creating environmentally friendly home-based creative economic opportunities.

Keywords: aromatherapy candles, creative economy, household waste, Kemiri Village, used cooking oil

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INTRODUCTION

Household waste is one source of environmental pollution generated from people's daily activities. According to Ayu (2025), household waste can be classified into organic waste, inorganic waste, and hazardous and toxic waste (B3). According to Government Regulation of the Republic of Indonesia Number 101 of 2014 concerning the Management of B3 Waste, it is defined as waste from a business or activity that contains hazardous materials or toxic substances due to its nature, concentration, and quantity, which can pollute or damage the environment directly or indirectly, thereby endangering human health and the survival of living things on earth. Among the various types of household waste, used cooking oil is one of the most common types of liquid waste produced from daily cooking activities. Used cooking oil is leftover frying oil that has been used repeatedly, causing a decline in quality due to oxidation and thermal degradation (Adytamacita et al., 2026). Repeated use causes changes in the physical and chemical properties of the oil, such as an increase in free fatty acid content, the formation of peroxide compounds, carcinogenic compounds, and the emergence of a pungent rancid odor (Adytamacita et al., 2026; Mardiah et al., 2019). If disposed of directly into the environment without treatment, used cooking oil has the potential to pollute soil and water bodies and disrupt the balance of the ecosystem.

In general, used cooking oil is disposed of directly into the environment, particularly into waterways, soil, or landfills without prior treatment, which has the potential to cause environmental pollution. Environmental pollution is the introduction of foreign substances into the environment that cause changes and imbalances in the ecosystem. Used cooking oil waste can be a cause of pollution because it contains free fatty acids, peroxides, and residues from thermal degradation that are difficult to break down naturally, thereby polluting the soil and water bodies and disrupting the quality of the environment (Gusti & Surtikanti, 2024; Silaban, 2023). In addition, disposing of used cooking oil into kitchen drains can cause drainage blockages due to accumulation with other waste, damage wastewater treatment systems, and increase treatment costs. Used cooking oil is also ecotoxic when it seeps into the soil, contaminating the soil and negatively impacting plant growth (Sanli et al., 2011).

In Kemiri Village, most residents earn their living from home-based businesses, particularly the production of chips and various MSME products based on fried foods. These activities result in a relatively high demand for cooking oil in daily production activities. The continuous use of cooking oil in the frying process produces a significant amount of used cooking oil waste. Therefore, efforts are needed to properly manage and utilize used cooking oil so that this waste does not have a negative impact and can be processed into products that have utility and economic value for the community.

The use of used cooking oil as a raw material for useful products is one of the strategies for sustainable waste management. One potential use is processing used cooking oil into aromatherapy candles. Aromatherapy candles made from waste cooking oil have proven to be durable and not only serve as an alternative source of lighting, but also have added value as health and relaxation products through the use of essential oils (Adhani & Fatmawati, 2019; Hayati et al., 2024). Processing used cooking oil into aromatherapy candles can reduce waste volume, minimize potential environmental pollution, and increase the economic value of previously unused waste.

Several previous researchers have conducted programs on processing used cooking oil into aromatherapy candles, such as Pemanfaatan Minyak Jelantah dalam Pembuatan Lilin Aromaterapi di Desa Pener, Kecamatan Taman, Kabupaten Pemalang, Jawa Tengah (Kenarni, 2022). In addition, Program Pemberdayaan Ibu-Ibu PKK Desa Metesih Kabupaten Madiun Jawa Timur melalui sosialisasi Pemanfaatan Minyak Jelantah untuk Pembuatan Lilin Aromaterapi (Hendarto et al., 2025). Then there is also a program on Pelatihan Pemanfaatan Limbah Minyak Jelantah Sebagai Bahan Dasar Lilin Aromaterapi Di Desa Negara Batin Kecamatan Sungkai Utara, Kabupaten Lampung Utara (Andani et al., 2021). community, especially mothers in Kemiri Village, Subdistrict Temanggung Regency.

The development of aromatherapy candles based on used cooking oil also has great potential in supporting the creative economy of households, especially in Kemiri Village. Through the UNNES GIAT 15 activity, it is hoped that this can become a home-based business opportunity that is easy to implement, low-cost, and environmentally friendly, thereby increasing community income, especially for housewives. Therefore, this article aims to examine the utilization of used cooking oil as raw material for aromatherapy candles and analyze its contribution to supporting the development of the creative economy of households in Kemiri Village.

METHOD

This community service activity was carried out in the form of training on processing used cooking oil into aromatherapy candles, consisting of several stages including preparation, socialization, and implementation of the training. This activity is part of the UNNES GIAT 15 program, which aims to provide knowledge and skills to the community in utilizing waste cooking oil into economically valuable products while reducing the impact of environmental pollution.

Location and Time of Implementation

This community service activity was carried out in Kemiri Village, specifically in Tegarong Hamlet, which is a rural area. The location was chosen based on the availability of responsive partners and the potential for utilizing

waste cooking oil at the household level. The activity was held on Saturday, January 31, 2026, for one day at the RW Hall in Tegarong Hamlet. The venue was provided by the partner as a form of active participation in this activity.

Partners and Activity Participants

The partners in this community service activity were the women of the PKK in Tegarong Hamlet, Kemiri Village, with a total of 28 participants. The PKK was chosen as a partner based on the active role of housewives in the kitchen and several MSME actors who produce used cooking oil. Participants did not have specific criteria and were open to all PKK members who were interested in participating in the training. The diversity of the participants' backgrounds was expected to broaden the impact of knowledge and skill transfer to the wider community.

Activity Approach Method

The approach method in this activity uses a combination of theoretical knowledge and direct practice, which is divided into two stages as follows:

1). Knowledge and Information Delivery

This stage is conducted through presentations using PPT media and the distribution of *leaflets* containing information on tools, materials, and methods of production. The material is delivered interactively by opening a space for discussion and questions and answers to ensure participants' understanding of the basic concepts of used cooking oil processing.

2). Application of Knowledge through Training

After the theoretical material is delivered, it is followed by a demonstration and practice of making aromatherapy candles. The demonstration is carried out by the implementation team with the help of one volunteer from the participants to make it easier for participants to understand each step of the manufacturing process.

The participation of partners in the implementation of this community service activity included the following aspects:

1). Participation in Activity Planning

Partners play a role in determining the timing of activities in accordance with the schedule and availability of participants. Coordination is carried out with the Head of the Neighborhood Association and the Head of Tegarong Hamlet to ensure that activities can be carried out properly and receive support from relevant parties. In addition, partners also play a role in disseminating information about activities through announcements at regular women's gatherings, so that information can reach all PKK members in Tegarong Hamlet.

2). Participation in Activity Implementation

Partners provide a venue for the activity in the form of the Tegarong Hamlet RW Hall, which is adequate to accommodate 28 participants and training equipment. Partners are also asked to bring used cooking oil from their homes, if they have any, as a form of contribution to the provision of raw materials. During the implementation, one participant acts as a volunteer who assists the implementation team in the process of demonstrating how to make aromatherapy

candles.

Activity Implementation Method

Based on the problems faced by partners related to the suboptimal management of used cooking oil waste, which has the potential to pollute the environment, the solution offered is training in processing used cooking oil into aromatherapy candles. This community service activity was carried out in several stages as follows:

A. Preparation Stage:

1). Coordination with Village Officials

The implementation team conducts initial coordination with the Head of the Tegarom Hamlet Neighborhood Association and the Head of the Tegarom Hamlet to convey the activity plan, objectives, and implementation mechanisms. This coordination is important to obtain support and legitimacy from the village authorities and to ensure that the timing and location of the implementation are in line with the conditions of the local community.

2). Activity Socialization

Socialization was carried out through announcements at the regular yasinan agenda of the PKK women in Tegarom Hamlet. This method of socialization was chosen because it utilized existing regular meeting forums, so that information could be conveyed directly and effectively to prospective participants. During the socialization, information was conveyed regarding the time, place, and objectives of the activity, as well as an invitation to participants to bring used cooking oil if they had any.

3). Preparation of Materials and Tools

The UNNES GIAT 15 Desa Kemiri implementation team prepared all the materials and tools needed for the training. The materials prepared included used cooking oil (as the main reserve), stearin, essential oils (lavender and jasmine), crayons for coloring, and activated charcoal for the used cooking oil purification process. The tools prepared included a stove, pots or used cans, molds in the form of small glass cups, candle wicks, sticks as wick supports, and stirrers. The process of purifying used cooking oil using activated charcoal was carried out before the training to ensure the quality of the raw materials to be used.

B. Training Implementation Stage

1). Provision of Information and Materials

Information was provided to participants through a presentation using PPT media, supported by the distribution of leaflets as reading material and references for participants. The material presented included the definition of used cooking oil, environmental pollution, types of environmental pollution, causes of pollution, hazardous waste pollution, the impact of used cooking oil pollution, how to make aromatherapy candles, and the benefits of aromatherapy candles.

2). Demonstration and Practice of Making Aromatherapy Candles

After the theoretical material was presented, the activity continued with a demonstration on how to make aromatherapy candles, guided by the implementation team with the help of one volunteer from among the participants.

The demonstration was carried out step by step so that participants could observe and understand each step clearly. The product produced in this training was aromatherapy candles with lavender and jasmine scents, which were chosen because of their calming aromas and popularity among the general public.

3). Materials Used:

Refined coconut oil using activated charcoal, stearin (stearic acid) as a candle hardener, lavender and jasmine essential oils as fragrances, crayons as colorants, candle wicks, small glass jars as molds

4). Formula/Composition:

The ratio of ingredients used is 1:1, which is 400 ml of used cooking oil mixed with 400 grams of stearin. This ratio has been adjusted to produce a candle with a solid texture that is easy to light and long-lasting.

5). Steps for Making:

- a) Filter the used cooking oil using a fine sieve or clean cloth to separate any remaining impurities and solid particles. This filtering process is important to produce candles with a smooth texture and no unpleasant odor.
- b) The candle wick is inserted into a small glass jar that has been prepared. To keep the wick upright in the center of the mold, it is tied to a stick or toothpick placed across the top of the jar. The correct position of the wick will ensure even burning of the candle.
- c) The filtered used cooking oil is poured into a pan or used can, then heated on the stove over medium heat. Once the oil begins to warm, add stearin in a 1:1 ratio (400 ml of used cooking oil : 400 grams of stearin). Stir the mixture slowly until the stearin dissolves completely and is evenly mixed with the used cooking oil. Once the mixture is homogeneous, turn off the stove and allow the mixture to cool slightly.
- d) Once the mixture has cooled slightly (but is still in a liquid state), add the crushed crayons to the pot. Crayons serve as a safe and easily obtainable natural dye. Stir the mixture again until the color is evenly distributed.
- e) Essential oil (lavender or jasmine) is added to the candle mixture according to taste, generally 10- 15 drops for every 400 ml of mixture. Essential oil is added at a temperature that is not too hot to keep the aroma strong. The mixture is stirred until the essential oil is evenly mixed.
- f) The prepared wax mixture is slowly poured into a glass jar equipped with a wick. The pouring is done carefully to prevent the wick from shifting from its central position. The wax is left at room temperature until it hardens completely, which usually takes about 1-2 hours.
- g) Once the wax has hardened, the wick support stick is removed and the wick is cut to a length of about 1 cm above the surface of the wax. The

aromatherapy candle is now ready for use or packaging as a product.

During the demonstration process, participants are given the opportunity to ask questions and observe each stage carefully. There are no groups in this activity, so all participants can follow the demonstration directly.

RESULTS AND DISCUSSION

Based on initial observations in Tegaron Hamlet, there is no management of used cooking oil waste, and some residents still dispose of used cooking oil directly into the environment, especially into drainage channels. This condition has the potential to cause environmental pollution, reduce water quality, and disrupt the balance of the ecosystem (Gusti & Surtikanti, 2024). Community knowledge about the impact of used cooking oil disposal is still low. Additionally, the community is unaware of the potential to utilize used cooking oil into useful products, which is a major factor in the suboptimal management of household waste.

To address these issues, the GIAT 15 community service team conducted a socialization program and training on making aromatherapy candles from used cooking oil. This activity was designed as a form of education and skill enhancement for the community in managing household waste in a more environmentally friendly manner. The material provided included the environmental impact of used cooking oil disposal, the heating process, the mixing of additional ingredients such as stearic acid and essential oils, and the product molding process. In addition, participants were also given an understanding of the potential of as a creative household product that has both practical value and economic potential.

In addition to conducting outreach and demonstrations on making aromatherapy candles from used cooking oil, the GIAT 15 Team from Semarang State University also provided training on Break Even Point (BEP) and Cost of Goods Sold (COGS) calculations as a basis for business planning. This training aims to ensure that PKK mothers are not only able to produce aromatherapy candles but also understand the economic aspects and feasibility of the business, thereby potentially developing it into a sustainable home-based business opportunity. The following presents a detailed breakdown of production costs that can serve as a reference for initial capital, along with calculations of COGS, BEP, and estimated profits from the aromatherapy candle-making business using waste cooking oil.

Table 1. Operational Costs

Raw Materials	Unit	Unit Price	Requirements per Unit		Price/Unit
			Unit	Units Produced	
Used Cooking Oil	1000 grams	Rp10,000	25 grams	40	Rp250

Stearic acid	1000 grams	Rp35,000	25 grams	40	Rp875.00
Essential Oil	10 mL	Rp10,000.00	0.5 ml	20	Rp500
Crayons	125 grams	Rp9,000	10 grams	13	Rp720,00
Glass	6 pieces	Rp17,000	1 piece	6	Rp2,833.33
Sticks	100 pieces	Rp4,000	1/3 pcs	300	Rp13.33
Rope	2000 cm	Rp3,000	5 cm	400	Rp7.50
Total					Rp5,199.17

Source: Author's analysis, 2026

Based on Table 1, it can be seen that the total production cost for making one unit of aromatherapy candle made from used cooking oil is Rp 5,199.17. This calculation is obtained from the accumulation of the requirements for each raw material and production equipment, which includes used cooking oil, stearic acid, essential oil, crayons as coloring, glass containers, and supporting components such as sticks and wick strings. This information on production costs per unit can be used as a basis for determining the Cost of Goods Sold (COGS), setting selling prices, and calculating business profits (Purwanto & Watini, 2020). By understanding the detailed cost structure, home-based business operators are expected to be able to plan production more efficiently and set realistic sales strategies so that the aromatherapy candle business from waste cooking oil can be run sustainably.

Table 2. Depreciation Costs

Equipme nt	Unit	Price	Time	Economic	Depreciation
			Year	Day	
Stove	1	Rp178,000.00	5	1825	Rp97.53
Regulator	1	Rp72,000	5	1825	Rp39.45
Pots	1	Rp50,000	5	1825	Rp27.40
Sutil	1	Rp20,000	5	1825	Rp10.96
Total					Rp175.34

Source: Author's analysis, 2026

Based on Table 2, the depreciation cost of production equipment in the aromatherapy candle manufacturing business is calculated by considering the acquisition price of the equipment and the estimated economic life of five years.

The equipment components taken into account include the stove, regulator, pot, and spatula as the main equipment in the production process. The calculation results show that the total depreciation cost per day is IDR 175.34, with the largest contribution coming from the use of stoves as the main heating equipment. It is important to include this depreciation cost calculation in the fixed cost component so that the estimated Cost of Goods Manufactured is more accurate and reflects the real costs of the business (Fitri et al., 2025). By taking into account equipment depreciation, business operators can plan equipment investment needs more rationally and determine more appropriate product selling prices so that business sustainability can be maintained (Fauziah et al., 2025).

Table 3 Fixed Costs Per Unit with a Production Target of 10 Units per Day

Description	Daily Cost	Cost per Unit
Depreciation Cost	Rp175.34	Rp17.53
LPG Gas	Rp3,000	Rp300
Labor	Rp5,000	Rp500
Total	Rp8,175.34	Rp817.53

Source: Author's analysis, 2026

Based on Table 3, the fixed costs of producing aromatherapy candles are calculated based on a target production of 10 units per day. The fixed cost components taken into account include equipment depreciation, LPG gas usage, and daily labor costs. The calculation results show that the total daily fixed costs are Rp 8,175.34, or equivalent to Rp 817.53 per unit of product. This fixed cost per unit value then becomes an important component in calculating the Cost of Goods Manufactured (COGM), as it reflects the operational costs that must still be incurred even if the production volume changes. By knowing the detailed fixed costs, business actors can plan optimal production capacity, control operational expenses, and determine product selling prices more rationally so that the business aromatherapy candle production from waste cooking oil can be run efficiently and sustainably (Ansori et al., 2025; Faradela et al., 2022; Tambuhan et al., 2025).

Table 4 Cost of Goods Sold Calculation

Row Material Costs + Filex Costs	
COSG :	Rp 6.016,70
Selling Price:	Rp 8.000,00
Profit :	Rp 1.983,30

Source: Author's analysis, 2026

$$\text{BEP Unit} = \frac{\text{Fixed costs}}{\text{Selling price per unit} - \text{Variable Costs}}$$

$$\text{Rupiah BEP} = \frac{\text{Fixed costs}}{1 - \left(\frac{\text{Variable costs}}{\text{Selling price per unit}} \right)}$$

Figure 1.1 Formula for Unit BEP and Rupiah BEP

Source: (Garrison et al., 2017)

Table 5 Results of BEP unit and BEP rupiah calculations

BEP Units	2,918895567
BEP in Rupiah	Rp 23.351,16

Source: Author's analysis, 2026

Based on Table 4, it is obtained that the Cost of Goods Sold (COGS) for aromatherapy candles made from used cooking oil is Rp 6,016.70 per unit, which is the sum of raw material costs and fixed production costs. Assuming a selling price of Rp 8,000.00 per unit, the estimated profit is Rp 1,983.30 for each product sold. The Break-Even Point (BEP) analysis shows that the break-even point is around 3 units sold, equivalent to Rp 23,351.16. These calculations show that the business of making aromatherapy candles from used cooking oil waste has economic feasibility potential because the minimum number of sales required to reach the break-even point is relatively low. Thus, if production and marketing are carried out consistently, this activity has the potential to provide additional income for the community while also serving as an alternative use for household waste that is both economically valuable and environmentally friendly.



Figure 1. Socialization and Training on Making Aromatherapy Candles from Waste Cooking Oil

Figure 2. Aromatherapy Candle Products

Figure 3. Socialization Calculation of HPP and BEP for aromatherapy candle production

(Source: Author's documentation, 2026)

The results of the demonstration on making candles from used cooking oil waste had a positive impact on the PKK mothers because, in addition to learning about the environmental damage caused by the indiscriminate disposal of used cooking oil, these mothers also learned how to utilize used cooking oil waste to produce marketable products. Furthermore, this activity also had many benefits, particularly in the social, economic, and environmental fields. From a social perspective, this activity can help strengthen the role of women as drivers of the village's creative economy, while from an economic perspective, this activity helps open up new business opportunities that have the potential to increase family income. These scented candles have a higher selling price than conventional candles because conventional candles only prioritize their function as lighting, while scented candles have many other benefits, such as deodorizing rooms, creating a comfortable and relaxing atmosphere, and promoting better sleep (Mansur et al., 2024; Mulyani et al., 2024). The therapeutic aroma content of the added essential oils has been proven to have relaxing and sedative benefits, as well as helping to overcome insomnia, anxiety, and stress (M et al., 2025).

Overall, the training activity on processing used cooking oil into aromatherapy candles can be considered successful in achieving its objectives, namely providing education on the environmental impact of used cooking oil, transferring aromatherapy candle-making skills, and opening up economic opportunities for the community. Although there are limitations in terms of follow-up assistance, the basic knowledge and skills that have been provided are expected to become capital for participants to continue developing themselves and improving their families' welfare.

CONCLUSION

The community service activities carried out in Tegarom Hamlet, Kemiri Village through the UNNES GIAT 15 program successfully achieved the set objectives. The training on processing used cooking oil into aromatherapy candles proved to be effective in improving the knowledge and skills of PKK mothers in managing household waste in a productive and environmentally friendly manner. Participants not only acquired technical skills in making aromatherapy candles but also gained an understanding of the economic potential of the product through training in calculating the cost of goods sold (COGS) and break-even point (BEP).

Based on the results of the business feasibility analysis, the production of aromatherapy candles from used cooking oil shows real economic potential with a relatively low break-even point, namely around three units per production cycle. This indicates that the business is feasible to be developed as a sustainable home

business opportunity, especially for housewives in Kemiri Village. From an environmental perspective, this activity contributes to reducing the volume of used cooking oil waste that has been carelessly disposed of, thereby supporting efforts to preserve the quality of the environment at the village level.

However, this activity still has limitations, particularly in terms of the lack of follow-up assistance and a structured marketing network. Therefore, follow-up in the form of sustainable business assistance, development of attractive product packaging, and expansion of the marketing network is needed so that aromatherapy candles from Kemiri Village can compete in a wider market. With support from various parties, it is hoped that this activity can become a pioneer of creative economy based on local wisdom that provides long-term positive impacts on the welfare of the people of Kemiri Village.

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