# Waste to Light: Innovation of Aromatherapy Candles from Used Cooking Oil

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***Abstract***

*This community service project titled "Waste to Light: Innovation of Aromatherapy Candles from Used Cooking Oil" focused on empowering members of the PKK women's group in Gedong Village to address improper disposal of household waste oil, which is a primary cause of local environmental pollution and health risk. The participants underwent a one-day training based on the Participatory Learning and Community Empowerment (PLCE) model, combining environmental education, materials provision, and hands-on practical skills. Aromatherapy candles were chosen for their dual health benefits and market potential, offering a creative and eco-friendly solution distinct from other waste oil preparations. Field analysis revealed that up to 70% of local pollution was attributed to improper disposal, underscoring the relevance of this initiative. As a result of the training, participants showed a significant increase in understanding about the environmental hazards of used cooking oil and demonstrated new technical skills in producing quality aromatherapy candles using safe household methods. Group reflection and discussion indicated strong attitudinal change, with participants motivated to continue candle production independently and aware that household waste could become valuable resources. All participants produced candles exhibiting uniform color, stable burning, and appealing aroma. The project successfully fostered environmental literacy, creativity, and micro-entrepreneurial interest, highlighting community-based empowerment and behavioral change. Future programs should expand collaborations and target sustainability through youth and local industry involvement.*

## Introduction

Used cooking oil is one of the most common types of household waste that poses serious environmental and health challenges. In Indonesia, improper disposal practices such as pouring used oil into drains or mixing it with household waste are still prevalent. These actions can cause soil and water contamination, clog drainage systems, and contribute to unpleasant odors (Ramadhani et al., 2023). Continuous reuse of the same oil for frying also produces toxic compounds, including trans fats and free radicals, which have been linked to cardiovascular and digestive disorders (Ridlwan et al., 2023). Many communities still lack awareness and facilities for managing used cooking oil effectively (Brotosusilo et al., 2022). A recent study in Yogyakarta City revealed that most households still dispose of used cooking oil directly into drainage systems due to a lack of collection facilities and awareness. This situation contributes to local water pollution and hinders

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circular economy goals (Budijati et al., 2025). Community initiatives are needed to convert household waste into value-added products that can both protect the environment and generate income. The target of this activity is training in households, with community use tailored to the partners involved. In this regard, the introduction of aromatherapy candles serves as a practical solution. Aromatherapy candles are chosen because they offer health benefits and economic potential, while their production from used cooking oil can help reduce environmental pollution and provide a new source of income for participating household members and communities. Provide a new source of income for participating household members and communities.

The Family Welfare Movement (PKK) in Gedong Village represents a strategic community partner to address this issue. Most members are housewives who play active roles in maintaining family health and environmental hygiene. However, their understanding of waste processing especially regarding used cooking oil remains limited, leading to environmental pollution and wasted economic potential (Erlina, 2025). Empowering women in this context is essential, as they are the main actors in household waste generation and management, with significant influence in shaping environmentally responsible behavior.

Practical training and education on how to recycle used cooking oil into valuable products are needed to support both household sustainability and income generation (Malik et al., 2018). Field situation analysis reveals that approximately 70% of environmental pollution incidents related to household waste in the studied region are caused by waste oil being dumped directly into the environment. Recognizing this critical need, a community service program titled "Waste to Light: Innovation of Aromatherapy Candles from Used Cooking Oil" was designed to address these challenges. By applying the Participatory Learning and Community Empowerment (PLCE) approach, the program combined environmental education with practical training to increase participants' environmental literacy and entrepreneurial motivation. This participatory model has been proven effective in changing behavior and increasing self-efficacy in community-based waste management (Asteria & Haryanto, 2021).

Community-based empowerment programs have been demonstrated to effectively enhance local knowledge and attitudes toward waste management. Brotosusilo et al (2022) emphasized that continuous environmental education can significantly improve community participation in waste reduction. Research by Ramadhani et al (2023) and Ridlwan et al (2023) showed that innovations using waste cooking oil can produce useful products such as candles and soaps, thereby reducing household waste. Malik et al (2018) also highlighted that integrating environmental education into small-scale entrepreneurship creates sustainable behavioral change, especially among women.

Building on these findings, this project contributes to community development by integrating environmental education with practical entrepreneurship training for sustainable living. The "Waste to Light" program demonstrates that simple household innovations can serve as catalysts for local economic resilience and environmental awareness.

**Methods**

This community service activity implemented the Participatory Learning and Community Empowerment (PLCE) approach, a participatory learning method that emphasizes collaboration, active involvement, and hands-on practice to encourage behavioral change. The activity was conducted in Gedong Village, Banyubiru District, Semarang Regency, Central Java, on August 12, 2025, involving 14 members of the Family Welfare Movement (PKK) women's group as the main participants. The implementation consisted of four main stages, namely:

1. Coordination and Preparation

The organizing team collaborated with village officials and PKK representatives to

determine the schedule, prepare materials and tools, and distribute educational brochures about used cooking oil management.

2. Educational Session
   Participants received short lectures on the environmental impact of used cooking oil, its potential for reuse, and examples of eco-friendly product innovation. The session aimed to build environmental awareness and motivation toward sustainable household waste management.
3. Hands-on Training
   Participants were trained to make aromatherapy candles from used cooking oil using two methods: stearic acid and palm wax formulations. The training provided hands-on experience with essential equipment and materials readily available in households.
   Main steps included:
   a. Filtering used cooking oil that had been soaked with charcoal to remove impurities.
   b. Mixing the filtered oil with stearic acid (ratio 3:1) or palm wax (ratio 1:1) to achieve the desired candle consistency.
   c. Melting the mixture using the double boiler method (utilizing a pot, water, and basic kitchen utensils) until homogeneous.
   d. Adding essential oils (approximately 10-15 drops per candle) and food-grade coloring as desired to enhance the aromatherapy properties.
   e. Pouring the mixture into candle molds and allowing it to cool at room temperature until fully solidified (approximately 2-4 hours). Each participant successfully produced one to two aromatherapy candles with consistent quality during the session.

Figure 1. Candle making training process

4. Evaluation and Reflection
   The final stage involved group discussion, direct observation, and open feedback to assess participants' understanding, skill development, and enthusiasm for continuing candle production independently. Evaluation was conducted informally participants shared new insights, such as awareness that used cooking oil can be transformed into candles and recognition of oil waste's environmental impacts. The process emphasized reflective dialogue, allowing participants to express changes in knowledge and attitudes toward waste management. Documentation supporting these outcomes was carried out through photographs and field notes.

The entire activity lasted approximately three hours, consisting of educational explanations, hands-on practice, and reflective discussion. Data were analyzed descriptively based on participant feedback, behavioral observations, and product outcomes to evaluate improvements in environmental literacy and practical skills. This participatory approach effectively empowered women to transform household waste into eco-friendly products while fostering micro-entrepreneurial potential and promoting community-based green innovation (Malik et al., 2018).

**Results and Discussion**

The "Waste to Light" community service program produced significant improvements in environmental awareness and skills among members of the PKK women's group in Gedong Village. Before the activity, participants had limited understanding of the dangers of disposing of used cooking oil directly into the environment. After attending the educational session, all fourteen participants could explain the environmental impacts of improper waste oil disposal and the benefits of converting it into value-added products. This finding demonstrates that community-based education effectively enhances environmental literacy and awareness (Asteria & Haryanto, 2021).


Figure 2. Group photo of participants and candle results

The practical training stage enabled participants to acquire technical skills in making aromatherapy candles. They were able to clean, filter, and mix used cooking oil with palm wax and stearic acid, producing candles with stable texture, consistent fragrance, and good burning quality. The process encouraged creativity and self-confidence among participants, proving that technology transfer can be successfully implemented at the household level (Ramadhani et al., 2023). Similar empowerment-based training also showed positive outcomes in women's participation and skill development for sustainable entrepreneurship (Kresnapratiwi et al., 2025).

The activity also generated broader social and economic impacts. Several participants expressed their interest in continuing candle production at home, indicating the program's potential to stimulate micro-enterprises. Previous studies by Malik et al (2018) and Brotosusilo et al (2022) emphasized that empowerment through waste utilization fosters women's independence and builds environmentally conscious communities. In addition, Sulistyawati (2024) reported that household waste management education not only improves hygiene practices but also strengthens collective responsibility for public health. Beyond the enhancement of environmental literacy and candle-making skills, the program also promoted behavioral change toward sustainable living. Before attending the training, most participants disposed of used oil directly into household waste or drainage systems. After the program, they showed increased awareness of waste segregation and safe oil disposal practices. This behavioral transformation reflects a key outcome of the empowerment process. As highlighted by Winih et al (2024), community-based waste recycling initiatives not only transfer technical knowledge but also cultivate environmental responsibility and economic awareness among women in rural industries.

Furthermore, this program demonstrated that small-scale household innovations can become catalysts for sustainable micro-enterprises. The women's initiative to commercialize their aromatherapy candles after the training shows the integration between environmental awareness and entrepreneurship. Such synergy between ecological responsibility and creative economy has been highlighted in previous studies as a driver of local resilience and green tourism-based economic revival (Solihin et al., 2024). Thus, the activity not only addressed the issue of household waste but also laid the foundation for environmentally conscious economic practices within rural communities.

Overall, the participatory approach proved effective in empowering women to manage used cooking oil sustainably. These results align with previous findings that combining environmental education and entrepreneurship training enhances motivation, innovation, and community resilience (Pahl-Wostl et al., 2020). The *"Waste to Light"* program demonstrates that local communities can develop sustainable solutions when guided by participatory learning and supported by evidence-based environmental education.

**Conclusion and Suggestion**

The community service program empowered the PKK women's group, leading to significant behavioral change and increased environmental awareness as well as practical skills. Through this empowerment process, participants shifted their daily habits and attitudes towards household waste, demonstrating their motivation to apply green innovations and sustainable practices in their community. The program successfully achieved its objectives. Through the Participatory Learning and Community Empowerment (PLCE) approach, participants gained a better understanding of the environmental hazards of used cooking oil and learned how to process it into valuable, eco-friendly products. The results showed that the chosen method was accurate and appropriate for the community's needs, as it effectively combined education, practice, and empowerment in one integrated activity.

The program had a positive impact not only on environmental awareness but also on the development of women's creativity and entrepreneurial potential. Participants expressed strong motivation to continue candle production at home, reflecting the sustainability of behavioral change and skill mastery. The benefits of this initiative extended beyond environmental improvement by creating small-scale economic opportunities and encouraging community-based green entrepreneurship.

Future community service programs are encouraged to expand the training model by involving youth and local business actors to strengthen marketing and sustainability aspects. Further research can also explore the chemical quality and safety standards of recycled oil-based candle products to ensure higher commercial value and environmental compliance. This program proved that collaboration between educational institutions and local communities can generate a strong social impact. The partnership between Universitas Ngudi Waluyo and UIN Walisongo through the 2025 KKN program effectively integrated scientific knowledge with community wisdom. The training model can be replicated in other regions by adapting to local resources and community characteristics. Further programs could explore partnerships with local industries or SMEs to ensure the long-term commercialization of recycled products.

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