

## Zero Waste Campaign Through Training in Candle Making from Used Cooking Oil

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**Abstract:**

Waste has become a pressing global issue that requires serious attention, including in Indonesia. Household waste management remains a major challenge, and one type of waste that is often overlooked is used cooking oil. Frequently perceived as worthless waste, used cooking oil is usually discarded without further consideration. However, improper disposal of used cooking oil can cause significant negative impacts on the environment. In response to this issue, an initiative was carried out to not only reduce waste but also provide creative and sustainable solutions. The program aimed to raise public awareness about individual responsibility in managing waste while equipping participants with practical skills to process it. The approach adopted was Participatory Action Research (PAR), which emphasizes community empowerment to address practical needs, solve local problems, develop knowledge, embrace diversity, and facilitate social change. The training generated strong enthusiasm from community members, including children who actively participated in practicing how to process used cooking oil waste under guidance. Through this activity, participants gained valuable new skills in processing used cooking oil, skills that enable them to reuse the oil in more environmentally friendly ways or even develop it into a potential business opportunity.

## INTRODUCTION

Cooking oil is an essential ingredient that cannot be separated from daily life, particularly in Indonesia. Fried foods remain widely popular and can be easily found in restaurants as well as in households. Indonesian cuisine itself is characterized by its diversity in types and cooking methods, one of which is frying. Affordable and widely available snacks such as *gorengan* are among the most favored by the public (Amaliyah & Gunawan, 2017). Beyond their taste and

enjoyment, however, cooking oil has health aspects that must be considered especially when it has been used repeatedly, resulting in what is known as used cooking oil or *waste cooking oil* (*minyak jelantah*).

Waste cooking oil refers to oil that has been used multiple times for frying. It may originate from various sources such as palm oil, corn oil, coconut oil, olive oil, and others, all serving the same purpose of frying food. According to nutrition and food safety expert Prof. Ir. Ahmad Sulaeman, MS, PhD, from IPB University, cooking oil should only be used for up to three frying cycles. Using oil more than three times poses health risks due to the chemical degradation that affects the nutritional content of fried foods. Consuming reused cooking oil has been linked to an increased risk of cancer, vascular constriction, hypertension, stroke, and coronary heart disease (Bachtiar et al., 2022).

Public knowledge regarding the dangers of reused cooking oil remains uneven, leading to low awareness among communities. Without adequate awareness, people tend to manage waste cooking oil solely for personal benefit. A study showed that 57.92% of 30 respondents possessed a moderate level of knowledge about waste cooking oil (Ardhany & Lamsiyah, 2018). Meanwhile, another study revealed that most respondents (52.1%) lacked awareness of the health hazards, and the majority (62.8%) continued to use waste cooking oil for cooking (Nurohman, 2021). Knowledge about the dangers of waste cooking oil directly influences people's attitudes toward its management. Awareness and wise use of cooking oil support Sustainable Development Goal (SDGs) 3: Good Health and Well-being.

In addition to its health risks, improper disposal of waste cooking oil poses environmental threats. It can clog drainage systems and pollute both water and soil. When poured into water channels, used oil can block pipes and contaminate water sources; when discarded onto the ground, it can damage soil structure and disrupt ecosystems. Continuous household production of waste cooking oil can be harmful without proper disposal awareness. Therefore, in addition to understanding the health risks, the community also needs to learn safe disposal methods for used oil. This aligns with SDGs 6 (Clean Water and Sanitation) and

SDGs 12 (Responsible Consumption and Production). Proper waste cooking oil management not only minimizes environmental pollution but also creates opportunities for the development of useful by-products.

The use of cooking oil for frying is common among households, including among mothers in Sentul Barat Hamlet, Tiru Lor Village, Gurah District, Kediri Regency. Women, particularly mothers, play an important role in managing waste cooking oil responsibly for the health of their families and the environment. Equal access for women in productive activities accelerates the achievement of Sustainable Development Goals (SDGs) (Basiroen et al., 2024), particularly SDGs 5 (Gender Equality) and SDGs 8 (Decent Work and Economic Growth). Therefore, initiatives are needed that not only focus on waste reduction but also offer creative and sustainable solutions. The *Zero Waste Campaign* presents a holistic approach to minimizing waste through the 5R principles: Reduce, Reuse, Recycle, Rot, and Refuse. One of the efforts supporting this campaign is training in candle-making from waste cooking oil. This innovation serves as a practical solution for managing household waste while also opening new economic opportunities, especially for women.

This program was designed to raise public awareness about the dangers of household waste, particularly waste cooking oil. In addition, the community service activity also aims to equip participants with practical skills, enabling them to independently process this waste into useful products. The program is expected to create a dual impact serving as a tangible solution for environmentally friendly waste cooking oil management and as a driver for the development of a circular economy at the community level.

## RESEARCH METHODS

The community engagement method used in this activity is *Participatory Action Research* (PAR), which aims to promote learning through problem-solving. The PAR approach emphasizes the value of experiential knowledge in addressing problems that arise from unjust and disadvantageous social systems, as well as in designing and implementing alternatives (Cornish et al., 2023). The

condition of the target community particularly women who demonstrate strong interest and commitment to environmental and family economic empowerment issues is highly relevant to the PAR approach.

The PAR approach contains empowerment elements that consistently strive to integrate three dimensions simultaneously. These dimensions include fulfilling needs and solving practical problems; developing scientific knowledge and community religiosity; and promoting social and religious transformation (Afandi, Agus et al., 2022). The empowerment process in this program enhances community knowledge about health and the environment while providing practical alternatives for solving household waste problems.

The core principles of PAR are participation (involvement), concrete action (action), and critical reflection (reflection). This demonstrates that the empowerment process is carried out *with* the community, not merely *for* the community. All stakeholders—including lecturers, students, village officials, and members of the Family Welfare Empowerment group (PKK)—are part of a social learning cycle oriented toward problem-solving. The implementation of community service using the PAR approach in this activity involves five stages:

a. To Know (Understanding the Real Situation)

The first stage involved identifying the real conditions of the community and environment in Sentul Barat Hamlet. The student team conducted an approach through structured coordination with the local village apparatus. They also engaged socially by participating in various community activities, particularly within RW 01, covering RT 01 to RT 04 of Sentul Barat Hamlet. This stage aimed to build trust and obtain a comprehensive understanding of the residents' social, economic, and cultural conditions. The observations revealed that no household waste management system had been established in RW 01, and public awareness regarding the dangers of waste cooking oil as a form of household waste remained low.

b. To Understand (Understanding Community Issues)

The second stage was carried out through a focused group discussion involving women representatives from each RT in RW 01 (RT 01–04). This

discussion provided a platform for the participants to share their knowledge and practices related to household waste management. The discussion highlighted that waste management within the community had not yet considered its environmental impact. The participants agreed on the need for education on proper management of waste cooking oil, as well as alternative ways to utilize it as a potential source of economic value.

c. To Plan (Designing Problem-Solving Strategies)

The planning stage was conducted participatively with community members through several strategic steps. First, the team and participants determined the type of activity to address the identified issues. Second, they selected the activity location at the house of a local resident, Mrs. Har, which was considered representative and easily accessible. Third, each RT appointed two representatives, resulting in a total of eight participants. A detailed activity schedule was then developed, including the opening session, welcoming remarks, material presentation, candle-making practice, and reflection session. Preparations were made for the required tools and materials, including waste cooking oil, candle decorations, charcoal, and hardeners.

d. To Act (Implementing the Action Program)

The training was conducted on August 3, 2025, involving eight women participants and several children who also showed enthusiasm during the activity. The program consisted of two main sessions: the first was an educational session covering the dangers of waste cooking oil, followed by a hands-on practice session. The practical session began with an explanation of the steps for processing used cooking oil into candles. Participants, assisted by students, processed the oil into candles, while each participant decorated their own candle independently. Every participant successfully produced one decorative candle and two aromatherapy candles. The high level of enthusiasm was evident from both the participants' engagement and the active involvement of children during the activity.

e. To Change (Building Awareness and Ensuring Sustainability)

The final stage involved reflection among participants, students, and lecturers. The dialogue aimed to capture participants' perspectives on the activity and its outcomes. Many expressed surprise that waste cooking oil, which they had previously discarded, could be transformed into a useful product and even create new business opportunities. Although time constraints limited the marketing aspect, participants committed to disseminating this skill within their respective neighborhood units (RTs) to ensure sustainability. The reflection process also fostered participants' self-confidence, particularly among the women, reinforcing their sense of agency in protecting the environment and contributing to their families' economic well-being.

The Participatory Action Research (PAR) method implemented in this program has demonstrated several positive impacts and advantages. First, this approach served as a platform for women to actively engage in every stage of the process from problem identification to program reflection so that they were not merely beneficiaries but also agents of change. Second, the program provided *experiential learning* opportunities, offering not only theoretical understanding but also hands-on experience that allowed participants to acquire practical skills. Third, the training program successfully utilized household waste materials that were simple and easily accessible, enabling participants to independently replicate the candle-making process at home.

Through the PAR approach, the training program on processing waste cooking oil into candles in Sentul Barat Hamlet produced significant positive outcomes. The program fostered environmental awareness, improved participants' technical skills and creativity, and enhanced the microeconomic consciousness of housewives. Therefore, PAR can be regarded as a strategic approach that bridges the academic sphere with real community needs, while simultaneously promoting environmental awareness and supporting local economic development.

However, the program also faced several limitations during implementation. One of the main challenges was the relatively short duration of the activity, which limited the participants' ability to explore marketing strategies and commercial utilization of the products in depth. Additionally, continuous mentoring,

monitoring, and evaluation are required to ensure that the skills acquired can further develop into sustainable and productive economic ventures.

## RESULTS AND DISCUSSION

The aromatherapy decorative candle-making workshop using waste cooking oil was held on Sunday, August 3, 2025, at 09.00 a.m. in one of the residents' houses that provided adequate space. The activity was initiated based on the mutual benefits it could offer to multiple stakeholders. The main objectives were to educate and raise environmental awareness in order to create a cleaner environment while equipping housewives in Sentul Barat Hamlet, Tiru Lor Village, Gurah District, Kediri Regency with practical skills and economic self-reliance. Beyond environmental benefits, the transformation of waste cooking oil into candles also provided personal advantages for each participant, both as an eco-friendly household product and as a potential small business idea.

The workshop began with a short opening session led by one of the students, followed by welcoming remarks from the student representative. In the opening speech, the objectives of the activity were explained to provide insight to the community, especially women, on how to process used cooking oil into decorative aromatherapy candles that are not only aesthetically pleasing but also beneficial in reducing anxiety and stress (Abdullah et al., 2024). After the opening, the session continued with an introduction to the tools and materials. The students introduced various tools such as pans, spatulas, knives, stoves, glass molds, spoons, and bowls. The materials used included activated charcoal, candle wicks, decorative shells, water, waste cooking oil, stearic acid, crayon shavings as colorants, and fragrance oils. Each material was introduced along with an explanation of its function so that participants could fully understand its purpose.

The next stage involved a demonstration by the students. Prior to the workshop day, the students had clarified the dark-colored used oil using activated charcoal to restore its transparency (Muhammad et al., 2020). During the demonstration, the clarified oil was filtered, poured into a pan, and heated



together with stearic acid until dissolved. Crayon shavings and fragrance oil were then added to produce colored aromatherapy candles.

Once the candle mixture was ready, the women were invited to try the process themselves. They enthusiastically engaged in each step handling the tools, preparing the wicks, and pouring the melted wax into containers. Some participants chose to fill glass molds to the top, while others creatively placed shells and water at the bottom before pouring the wax, resulting in candles with a more attractive, *aesthetic* appearance.

The activity atmosphere was lively and joyful. Participants asked numerous questions about ingredient proportions, how to prevent cracking, and ways to make the fragrance last longer. The students patiently answered and provided additional tips for candle-making variations based on personal creativity. During the waiting time for the candles to harden, a dialogue session was held among the women, students, and lecturers to reflect on the process and discuss the sustainability of waste oil processing. Once completed, all finished candles were displayed on a table for collective viewing. The participants expressed happiness and pride in their creations, noting their appealing appearance and pleasant scent. Several women even commented that the product had market potential as a handmade craft.

Following the completion of this program, the expected outcome was the development of collective awareness among the women of Sentul Barat Hamlet regarding the importance of household waste management. Waste cooking oil, once considered useless, is now viewed as a valuable resource with both economic and environmental benefits. Furthermore, participants are expected to master the techniques of candle production independently and to develop this skill into a marketable product.

This change is not expected to stop at the individual level but to create a domino effect within the broader community. The training, which emphasized direct practice (*experiential learning*), proved effective in empowering participants and fostering entrepreneurial motivation (Qaiyim Asy'ari et al., 2022). The trained women are expected to become pioneers who disseminate their



skills to others in their respective neighborhood units (RTs), thus increasing the number of waste-oil-based candle producers. Ultimately, this program aims to create a cleaner, healthier, and more productive Sentul Barat Hamlet, aligned with the *zero-waste* principle and fostering sustainable community economic independence.

The achievement of this program also supports several *Sustainable Development Goals (SDGs)*, specifically Goals 3, 5, 6, 8, and 12 Good Health and Well-being; Gender Equality; Clean Water and Sanitation; Decent Work and Economic Growth; and Responsible Consumption and Production (*Literasi – SDGs Indonesia*, n.d.). Gender equality in this context is reflected in the active role of women in supporting sustainable development, starting with small yet crucial household-level initiatives such as waste management. Regarding responsible consumption and production, households and small business actors are encouraged to take responsibility for managing their used cooking oil to prevent environmental pollution.

The goal of *Clean Water and Sanitation* (SDG 6) is achieved through preventing environmental contamination, ensuring water quality and safety for daily use. Improper disposal of waste cooking oil can reduce soil fertility and threaten soil-dwelling organisms that play key roles in maintaining ecosystems (Darmansyah et al., 2024). Moreover, *Good Health and Well-being* (SDG 3) can also be achieved through the availability of clean water and wise cooking oil practices specifically by limiting oil reuse to a maximum of three times. Unfortunately, this educational message is often neglected by communities seeking to economize, even though the long-term health risks may be severe and only become apparent over time.

Finally, supporting decent work and economic growth can be achieved by utilizing the skills of managing used cooking oil waste as an entrepreneurial asset. This household waste-based business can serve as a simple yet promising enterprise due to the accessibility of its raw materials. The candle products themselves hold diverse market potential. Decorative candles, which have become a trend in aesthetic home interiors, are among the main target markets particularly

for millennial and Gen Z consumers who are increasingly interested in visually appealing spatial designs. In addition, aromatherapy candles are widely recognized as an alternative therapy to reduce anxiety, relieve stress, and improve the sleep quality of pregnant women (Abdullah et al., 2024).

Overall, this activity has produced a substantial impact and, based on the discussion, aligns with the objectives of the Sustainable Development Goals (SDGs). It contributes to promoting a healthy environment that ensures the availability of clean water and supports healthy living, while simultaneously empowering women as both consumers of cooking oil and active participants in economic growth. This program demonstrates that higher education institutions and local communities can collaborate synergistically to generate tangible benefits when designed through a participatory approach. Further development can be directed toward entrepreneurship and economic aspects such as business development, marketing, branding, and product innovation to strengthen the program's impact and ensure the sustainability of community empowerment in Dusun Sentul Barat.

## CONCLUSIONS AND RECOMMENDATIONS

The activity conducted in Dusun Sentul Barat, Desa Tiru Lor, Kecamatan Gurah, has successfully increased the awareness and participation of local women in managing used cooking oil waste into useful products, namely decorative aromatherapy candles. Through the *zero waste* campaign, the amount of unmanaged waste can be reduced, and community awareness of sustainable environmental management has improved. The outcomes of this activity indicate that, through creativity and innovation, waste can be transformed into something valuable and beneficial for the community. This activity is expected to serve as an example for other communities and contribute to environmental preservation efforts. Furthermore, the skills acquired by the participants can be further optimized by deepening the entrepreneurial aspect to develop and market candle products more broadly and strategically.

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