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Community Empowerment in Reducing Waste Cooking Oil into Eco-Friendly Soap Products

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Abstract.

The community service program, located in Sukosewu Hamlet, Sukosewu Village, Gandusari District, Blitar Regency, aims to address the issue of used cooking oil waste, reduce environmental pollution caused by used cooking oil, and diversify processed products from the PKK group. The implementation method of this service activity includes outreach/socialization and assistance to the PKK group, conducted over a two-month period. The socialization method was carried out in Sukosewu Hamlet in May-June 2024 to convey the purpose and objectives of this service program by providing theoretical information on the procedures and mechanisms for processing used cooking oil into eco-friendly soap. The assistance activity involved direct guidance, resulting in the creation of a new product, eco-friendly soap, which can increase the community's economic value (income). Additionally, PKK participants gained a deeper understanding and awareness of the dangers of used cooking oil to human health and the environment as a result of this outreach and training. Ultimately, participants also learned how to properly dispose of used cooking oil waste and utilize it to prevent environmental pollution.

Keywords: *Household Waste, Used Cooking Oil, Assistance, Soap*

I. INTRODUCTION

In recent years, the issue of waste management has gained increasing attention due to its significant impact on the environment and public health. Among various types of waste, used cooking oil represents a growing concern, particularly in urban areas where improper disposal can lead to severe ecological consequences, such as water

pollution and damage to local ecosystems. This research aims to explore innovative and sustainable solutions for managing waste cooking oil through community empowerment and the production of eco-friendly soap products.

Used cooking oil, when disposed of improperly, can clog drainage systems, contribute to waterway contamination, and create hazardous conditions for aquatic life. As populations grow and urbanization expands, the volume of waste cooking oil continues to increase, necessitating effective waste management strategies. Traditional disposal methods, such as pouring oil down drains or throwing it away, exacerbate these environmental issues. Communities often lack awareness of the environmental impact of waste cooking oil and the potential benefits of recycling it. By empowering individuals with knowledge and skills related to waste reduction, communities can play a pivotal role in mitigating environmental harm. Additionally, transforming waste cooking oil into eco-friendly soap products not only addresses waste management but also presents economic opportunities for local residents, promoting entrepreneurship and self-sufficiency.

The concept of upcycling waste materials into usable products aligns with broader sustainability goals, encouraging a circular economy where waste is minimized, and resources are reused. The production of eco-friendly soap from waste cooking oil offers a practical application of these principles, providing a low-cost, environmentally friendly alternative to commercially produced soaps. Community empowerment is essential for the successful implementation of any environmental initiative. By actively involving community members in the process of recycling and soap making, this research seeks to foster a sense of ownership and responsibility towards local environmental issues. Educational workshops, skill development, and hands-on training will serve as the foundation for building knowledge and capacity within the community.

This research is significant as it not only addresses the pressing issue of waste cooking oil disposal but also contributes to the broader conversation about sustainable practices and community resilience. By exploring the intersection of environmental management, community engagement, and economic opportunity, the research aims to develop a replicable model that can be adapted to other communities facing similar challenges.

Based on the Minister of Home Affairs Regulation Article 1 Year 2013 about Family Empowerment and Welfare, it is stated that the *Pemberdayaan dan Kesejahteraan Keluarga* (PKK) Movement is a national movement in community development that grows from the grassroots, managed by, from, and for the community. The PKK is aimed at achieving families that are morally upright, virtuous, healthy, prosperous, progressive, independent, and committed to equality, gender justice, as well as legal and environmental awareness (Anonim, 2013).

Sukosewu Village is one of the villages located in Gandusari District, Blitar Regency, with 34 active PKK members. The PKK is an organization that plays a crucial role in supporting the local government in fulfilling its functions to develop and prosper the region in various fields, especially in environmental conservation. Sukosewu Village faces challenges in managing household waste. This community service activity will focus on processing used cooking oil or waste oil into eco-friendly soap.

Used cooking oil comes from the repeated use of cooking oils, which can include types such as corn oil, vegetable oil, ghee, and others (Kataren, 2005). The initial sign of cooking oil degradation is the formation of acrolein in the oil. Acrolein causes a scratchy sensation in the throat when consuming food fried in repeatedly used cooking oil, according to research findings (Rukmini, 2007) The prolonged consumption of used cooking oil can cause damage to body organs, such as liver cells, the heart, blood vessels, and kidneys.

The purpose of the community service program titled "Community Empowerment in Reducing Waste Cooking Oil into Eco-Friendly Soap Products" is to provide assistance to the community, specifically the Family Welfare Empowerment group, by utilizing or managing used cooking oil to produce a new product, namely eco-friendly soap. This soap-making process involves repurposing waste cooking oil. The PKK group in Sukosewu Village will be guided in processing this eco-friendly soap. Currently, the PKK group’s activities have only managed to process organic and inorganic waste into handicraft items. However, they have not yet undertaken the processing of used cooking oil. The goal of this community service program is to provide a solution to the problem of waste cooking oil, reduce environmental pollution caused by its use, and diversify the processed products from the PKK group.

The existing problems in Sukosewu Village, from both social and economic perspectives, include unemployment and low-income residents. Waste management is also a significant issue, with used cooking oil waste being carelessly disposed of on the ground and in household drainage channels.

II. METHOD

The method used in the implementation of the Student Creativity Program is training and outreach/socialization to the Family Welfare Empowerment (PKK) group in Sukosewu Village.

Among the activities:

1. Socialization to the PKK Group

   This socialization activity was conducted with a frequency of one meeting, providing theoretical information on the procedures and mechanisms for processing used cooking oil into eco-friendly soap. The target attendance was 50 participants.

2. Assistance in Making Eco-Friendly Soap

   This assistance activity involved four meetings. The stages in this assistance include:

   a. Preparation of Tools and Materials Needed for Making Eco-Friendly Soap

   1) Tools

      a) Measuring cup (heat-resistant plastic or glass)
      b) Digital scale
      c) Hand blender
      d) Silicone molds
      e) Stainless steel or heat-resistant plastic containers
      f) Mask
      g) Gloves

   2) Materials

      a) Used cooking oil, 500 grams
      b) Fruit extract
      c) Water
      d) NaOH, 64 grams

e) Charcoal

b. Providing Training on Procedures and Methods for Making Eco-Friendly Soap

1) Clarification and Soap Making Process:

a) Oil Clarification Method

Provide an understanding of the oil clarification method to the PKK group in Sukosewu Village, with the following steps:

(1) Prepare used cooking oil.

(2) Filter it to remove residual impurities.

(3) Mix charcoal into the used cooking oil and let it sit overnight for sedimentation.

(4) Filter the oil with a cloth-lined strainer. Repeat the filtering process three times until the oil is clean and its color is lighter.

(5) The oil is ready for use.

b) Soap Making Method

Provide an understanding of the method for making eco-friendly soap using the clarified used cooking oil.

(1) Prepare the tools and materials.

(2) Weigh the soap ingredients; 64 grams of NaOH with 500 grams of used cooking oil.

(3) Add NaOH to the filtered used cooking oil solution. Mix using a hand blender until the mixture becomes thicker.

(4) Pour the thickened soap mixture into prepared silicone molds.

(5) Let it sit for a week until the soap texture hardens completely.

(6) The soap is ready for use.

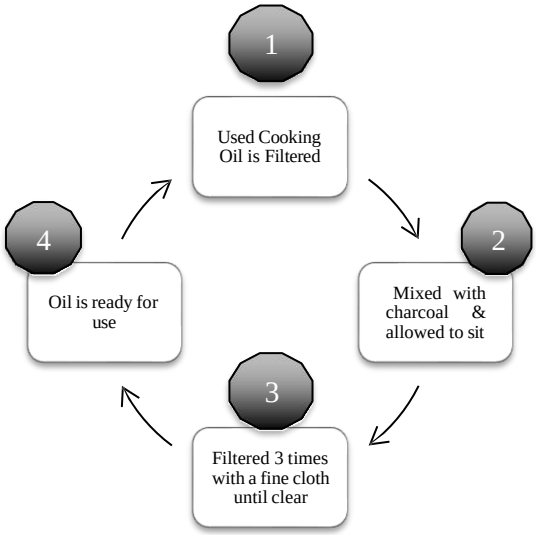

Diagram 1: Stages of Used Cooking Oil Clarification

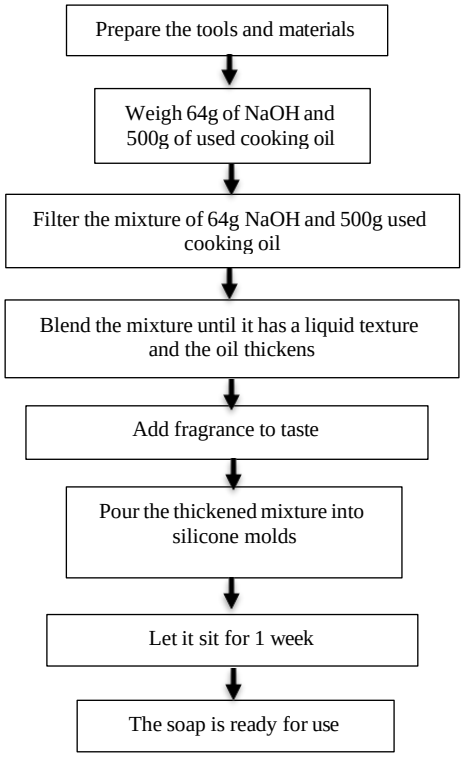

Diagram 2: Stages of Soap Making

In the soap-making process, caution is required, so the following should be noted:

1. Do not use tools (spoons, containers) made of aluminum.
2. Use safety equipment during the soap-making process.

The community service program is located in Sukosewu Hamlet, Sukosewu Village, Gandusari District, Blitar Regency, with socialization and training activities starting in May-June 2024. Sukosewu Village is divided into two hamlets: Sukosewu Hamlet, which consists of 8 RW and 34 RT, and Sukoreno Hamlet, which consists of 6 RW and 29 RT. The boundaries of Sukosewu Village are as follows:

North : Gadungan Village
South : Kotes, Jajar, Tambakan Villages
West : Sumberagung Village
East : Gandusari, Gadungan Villages

Figure 1: Map of Sukosewu Village

III. DISCUSSION

The discussion section of this research highlights the significance of community empowerment in addressing environmental challenges, specifically through the recycling of waste cooking oil into eco-friendly soap products. This initiative not only addresses waste management but also fosters sustainable practices and economic resilience within communities.

Key Points of Discussion:

1. Environmental Impact: Waste cooking oil is a significant pollutant when improperly disposed of, contributing to water contamination and harming local ecosystems. By converting this waste into soap, communities can significantly reduce their environmental footprint and promote cleaner surroundings.
2. Community Engagement and Education: Effective community engagement is crucial for the success of this initiative. Workshops and training sessions create a platform for knowledge sharing, enabling participants to understand both the environmental and health implications of waste cooking oil. The educational component encourages behavioral change and enhances community members' sense of responsibility towards their environment.
3. Economic Benefits: The production of eco-friendly soap from waste cooking oil presents economic opportunities for community members. It not only provides a low-cost alternative to commercial soaps but also creates potential for small-scale entrepreneurship. This can lead to income generation and increased financial independence for participants.
4. Skill Development and Empowerment: Learning how to recycle waste cooking oil empowers individuals with new skills that can be utilized for personal and community benefit. This practical knowledge can inspire further innovation, as community members may explore other sustainable practices and products, enhancing local resilience
5. Social Cohesion and Network Building: The initiative fosters social cohesion by bringing community members together around a common goal. Building a network of individuals invested in sustainability encourages collaboration,

idea exchange, and collective problem-solving. This sense of community can enhance support systems and lead to sustained engagement in environmental initiatives

6. Challenges and Considerations: Despite the positive impacts, the research acknowledges potential challenges, such as access to resources, initial resistance to change, and the need for ongoing support and motivation. Addressing these challenges through continuous engagement, providing necessary materials, and ensuring that participants feel supported is vital for the long-term success of the program.
7. Future Directions: The findings of this research can inform future initiatives aimed at sustainability and waste management. Expanding the program to include other recyclable materials or integrating with local businesses can amplify its impact. Collaborations with governmental and non-governmental organizations can also enhance resources and support for scaling these efforts.

There needs to be a new breakthrough to overcome the problem of used cooking oil waste so that it can become an economical and environmentally beneficial product. This also supports the Sustainable Development Goals 2030 in point 12 regarding responsible consumption and production. The solution to the Used Cooking Oil Soap making program by recycling used cooking oil waste which is used as solid soap with the integration of natural fragrances and eco-friendly packaging is expected to gradually help Indonesia in realizing the 2030 SDGs.

As is known, the remaining production using cooking oil has not been processed optimally which can cause various impacts on the environment. Waste cooking oil from household processing, if disposed of into the environment will have a major impact, such as decreasing the concentration of dissolved oxygen in the water, making sunlight less than optimal so that organisms in the water lack light, at low temperatures waste cooking oil will freeze so that it clogs the pipes, and disrupts the drainage channels (Travis et al, 2008).

Used cooking oil can be recycled and utilized into products with economic value. In order to achieve the goal of responsible consumption and production in 2030, the RAN document sets 11 targets measured through 19 indicators. These targets consist of achieving the implementation of a 10-year framework for responsible consumption and production, management of chemicals and B3 waste, and achieving sustainable business practices. Efforts made to achieve these targets are outlined in policies, programs and activities that will be carried out by the government and non-government. The processing of used cooking oil waste into solid soap with the integration of natural fragrances and environmentally friendly packaging will be a new solution that also supports the realization of responsible consumption and production in Indonesia. Used cooking oil can be processed into soap in either solid or liquid form (Wijana et al., 2009; Priani, 2010).

The use of soap is produced from the hydrolysis process of oil or fat into free fatty acids and glycerol which is continued with the saponification process using a base (KOH or NaOH). Free fatty acids that bind to this base are called soap (Ketaren, 2005). In making this soap, ingredients are needed such as: 100 ml of pure used cooking oil, 30 grams of NaOH with 105 ml of water in a beaker, sufficient charcoal, fragrance, and natural food coloring. Then the tools used are: wooden stirrer, spatula, measuring cup, scales, heat-resistant container, mold, cloth, used newspaper, mask, and gloves.

1. Implementation of Socialization

This socialization method was carried out in Sukosewu Hamlet, Sukosewu Village, Gandusari District, Blitar Regency, with socialization and training activities starting in May-June 2024. The sessions were held at the Sukosewu Village Office to convey the aims and objectives of the Student Creativity Program in community service or to the PKK group by providing theoretical information on the procedures and mechanisms for processing used cooking oil into eco-friendly soap. The socialization materials were presented by the PKM team from the University of Islam Balitar Blitar and accompanying lecturers, with around 50 participants present.

The implementation of socialization for this research focuses on engaging local communities to empower them in reducing waste cooking oil through innovative practices that convert it into eco-friendly soap products. This initiative aims to educate community members about the environmental impact of waste cooking oil and the benefits of recycling it into sustainable products.

- Objectives:
  - ✓ **Raise Awareness:** Conduct workshops and informational sessions to inform the community about the negative effects of improper waste disposal and the potential for recycling waste cooking oil.
  - ✓ **Skill Development:** Provide hands-on training in the process of transforming waste cooking oil into eco-friendly soap, equipping participants with practical skills and knowledge.
  - ✓ **Promote Sustainability:** Encourage the adoption of sustainable practices by showcasing the economic and environmental benefits of creating eco-friendly products from waste materials
  - ✓ **Foster Community Engagement:** Build a network of community members who are committed to reducing waste and promoting sustainability, fostering a sense of collective responsibility
- Activities:
  - ✓ **Workshops:** Organize regular workshops to teach the process of soap making from waste cooking oil, covering topics such as safety, ingredients, and production techniques
  - ✓ **Demonstrations:** Conduct live demonstrations in community centers or local markets to showcase the soap-making process and its benefits
  - ✓ **Distribution of Educational Materials:** Provide brochures, flyers, and online resources that outline the steps for recycling cooking oil and the advantages of eco-friendly products

- ✓ **Feedback Sessions:** Facilitate discussions to gather community input on the initiative, allowing participants to share experiences and suggestions for improvement

The successful implementation of this socialization strategy will empower community members to actively participate in waste reduction efforts. It will enhance local knowledge of environmental issues, encourage the development of eco-friendly products, and foster a culture of sustainability within the community. Ultimately, this initiative aims to create a replicable model for other communities seeking to address waste management and promote eco-friendly practices

2. Assistance in Making Eco-Friendly Soap

The assistance program for making eco-friendly soap as part of the research entitled Community Empowerment in Reducing Waste Cooking Oil into Eco-Friendly Soap Products is designed to provide community members with the knowledge, skills, and resources needed to effectively recycle waste cooking oil into sustainable soap products. This initiative aims to empower individuals while promoting environmental sustainability and economic self-sufficiency.

This assistance activity was conducted with a total of four meetings, providing direct guidance on processing used cooking oil and fruit waste into eco-friendly soap. The aim was to help the community understand the processes involved in making used cooking oil into soap. Training included procedures and methods for making eco-friendly soap, such as oil and charcoal clarification processes, and discussions with PKK members to emphasize the importance of environmental protection and managing available resources as an economic asset, particularly for PKK women. The activity also sought to gauge community interest in waste management by involving several community members in sustainable waste processing to promote environmental conservation.

During the implementation of this program, the community, especially the PKK group in Sukosewu Village, showed great enthusiasm, particularly in learning about the tools and materials needed to make eco-friendly soap.

However, there were concerns about the safety of the soap made from used oil. Therefore, laboratory testing was conducted at the Health Laboratory of the University of Islam Balitar to check the pH buffer of the eco-friendly soap, with three samples tested: Sample 1 with a pH of 10.2, Sample 2 with a pH of 10.1, and Sample 3 with a pH of 10.2. According to pH guidelines, a relatively safe soap pH is between 9-11 (Doni S., 2018). This eco-friendly soap is intended for handwashing.

The program resulted in a new product derived from used cooking oil and fruit waste, increasing community awareness of environmental protection and potentially enhancing the economic value (income) for the community, especially for the PKK women.

Figure 2: Documentation of Socialization and Assistance with the PKK Group

The advantage of this eco-friendly soap is that it can be used as hand soap and helps reduce waste pollution in Sukosewu Village.

The opportunity generated from this community service activity includes providing a sustainable business opportunity for the community, particularly for the PKK group in Sukosewu Village. It can also serve as an example in addressing environmental pollution, specifically in managing used cooking oil waste.

Through this assistance program, participants will gain not only the skills needed to make eco-friendly soap but also a deeper understanding of the importance of waste reduction and environmental stewardship. By transforming waste cooking oil into valuable products, community members will be empowered to take action in addressing local environmental issues while also exploring potential economic benefits. This initiative aims to foster a culture of

sustainability and innovation, contributing to the overall resilience and well-being of the community.

IV. CONCLUSION

a. The level of achievement of this community service activity has been implemented very well.
b. The issues in Sukosewu Village include social and economic problems such as unemployment and low-income residents. Waste management is a significant issue, with used cooking oil being discarded directly onto the ground and into household drainage channels. Market waste management is also not yet optimized.
c. To address waste and economic issues, the community service Program employs methods of socialization and assistance to the Family Welfare Empowerment (PKK) group in Sukosewu Village by processing used cooking oil into eco-friendly soap.
d. The benefits of this activity include mitigating waste pollution in Sukosewu Village, especially since waste management is currently lacking. This activity has a positive impact on the community by improving the environmental conditions and increasing economic value for the community, particularly for the PKK group, thereby enhancing their income. It can also serve as an example for other communities in addressing environmental pollution, especially in managing used cooking oil waste.

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