

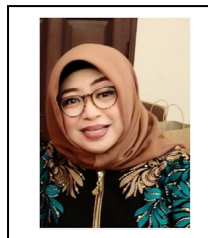
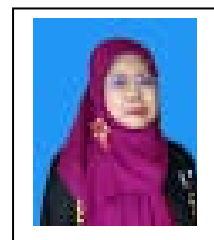
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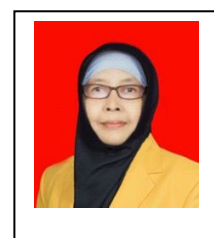
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## EMPOWERMENT OF BUKIT PARIAMAN VILLAGE COMMUNITY IN MANAGING HOUSEHOLD ORGANIC WASTE INTO ECO ENZYME-BASED PRODUCTS TO IMPROVE ENVIRONMENTAL SANITATION

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### Abstract

**Background.** Organic waste, particularly from household remains, can be easily decomposed naturally without human intervention. When processed correctly and adequately, organic waste from households offers many benefits, such as being converted into animal or livestock feed, organic

fertilizer, compost, biogas, and eco enzyme. The nature of the eco enzyme is that it is an antimicrobial that inhibits pathogens, making it useful as a cleaning agent.

**Aims.** Training the participants in the skills and knowledge of recognizing the types of household waste, such as raw materials, which can be processed into fermentation products (eco enzyme).

**Methods.** Community Service Activities involving approximately 15 RT (Neighborhood Associations) in Bukit Pariaman Village, Tenggara Seberang District (especially to local housewives), provided training on making Eco Enzyme and the application of Eco Enzyme in daily life needs.

**Result.** In practice, eco enzyme is used as a multi-purpose cleaning fluid, including detergent, air purifier, floor cleaner, toilet cleaner, kitchen cleaner, odor remover, dishwashing liquid, fruit and vegetable cleaner, hair and skin care, pesticides, and insecticides. Eco enzyme is considered environmentally friendly because it is processed entirely from organic materials.

**Conclusion.** The community service activities were successfully conducted, and enthusiasm was received from training participants who actively asked questions, engaged in discussions, and practiced making eco enzymes. After a three-month fermentation period, they successfully produced eco-enzyme products.

**Keywords:** Eco Enzyme, Bukit Pariaman Village, Cleaning Agent

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## INTRODUCTION

Waste fermentation products, also known as eco enzymes, are environmentally friendly products made from organic materials. Eco enzymes are easily decomposed and harmless to the environment and humans. This community service program aims to provide knowledge and practical skills in producing eco enzymes from household organic waste, enabling participants to use them as organic cleaning agents and for other purposes.

The residents of Bukit Pariaman Village have limited understanding of waste management, environmental health, cleanliness, and sanitation. Therefore, a community service program was carried out to offer direct training and awareness programs for the residents of Bukit Pariaman Village about the utilization of household waste and direct application in dealing with cleanliness problems in households and the surrounding environment. It is hoped that through this practice and training, participants will gain and improve their knowledge, insight, and attitudes in utilizing household waste into valuable products, and will also help improve the level of cleanliness, health, and welfare of the villagers.

Some of the key challenges faced by the community include: lack of knowledge about the types of household waste that can be processed into fermentation products (in the form of eco enzymes); limited knowledge about the fermentation process and processing of household organic waste into eco enzyme products; lack of knowledge on how to apply eco enzyme products in household and environmental hygiene and health activities; and lack of

knowledge in developing eco enzyme-based products that can improve the welfare of residents.

To address these issues, this community service provides training to the community, especially to housewives, with the aim of: training the skills and knowledge of the participants in recognizing the types of household waste, as raw materials, which can be processed into fermentation products (eco enzyme); providing knowledge to the participants about the fermentation process and processing of household organic waste into eco enzyme products and how to use eco enzyme products for household and environmental hygiene; providing motivation and encouragement to the participants in developing eco enzyme-based product that could become a source of income and improve community welfare.

The training provided benefits to the community, such as: participants gained the ability to recognize the types of household waste, as raw materials, which can be processed into fermentation products (eco enzymes); understood the fermentation process and processing of household organic waste into eco enzyme products and how to apply eco enzyme products for household and environmental hygiene; the community is motivated and encouraged to develop eco enzyme-based products that can improve the welfare of the community.

## **METHOD**

The community service programs were carried out directly (offline) and consisted of a series of activities: training and practice in the fermentation processes (making eco enzymes) and the application of enzyme products. The program took place at the multipurpose hall of the Bukit Pariaman Village Office, Tenggarong Seberang, Kutai Kartanegara, East Kalimantan. The implementation date was Monday, September 30, 2024.

### **a. Audience**

The general public, particularly housewives in Bukit Pariaman Village, Tenggarong Seberang District, Kutai Kartanegara Regency, East Kalimantan, was the target audience for this community service program.

### **b. Type of Activity**

This activity was conducted through lectures, training, and practice (Aribowo, 2018), which were held directly (offline). It focused on the manufacture of an eco-enzyme fermentation process from organic waste (such as fruit peels and vegetable scraps), and the practice of using the resulting eco-enzyme product.

### c. Activity Stages

The Community Service Program, conducted in collaboration with the local community, consisted of five main stages: 1) Lecture/presentation, as theoretical knowledge, 2) Eco enzyme production, 3) Development of utilization-based eco enzyme formulations, 4) Application of eco enzyme-based products, and 5) Monitoring and evaluation.

The following are details of each step performed in the production of Eco Enzyme. The steps in the production of EE (Eco Enzyme, 2023) are as follows:

1. Use an airtight container. Fill only 60% of the container capacity.
2. The ratio used to make EE is 1 part brown sugar, three parts organic material leftover vegetables/fruits), and 10 parts water (1:3:10).
3. Use five or more types of organic materials. The organic materials used are banana, gedebok, pineapple peel, papaya peel, melon peel, cabbage, orange peel, etc.
4. Cut the organic materials into small pieces.
5. Fill the container with clean water up to 60% of its volume.
6. Add sugar according to the required dosage, which is 10% of the weight of water.
7. Add fruit/vegetable waste pieces into the container, which is 30% of the weight of water.
8. Mix all ingredients thoroughly.
9. Seal the container tightly.
10. Label the EE container with production and expected harvest dates.
11. For the first week, open the lid daily to release the gas.
12. Stir the organic matter mixture on the seventh day.
13. Stir the mixture again on the 30th day (do not stir unless a mother enzyme is present).
14. Harvesting the eco enzyme after 3 months of fermentation.
15. The container must be labeled to facilitate monitoring the Eco-Enzyme fermentation period.

## RESULTS AND DISCUSSION

The community service programs were carried out directly (offline). Around 20 people from the Bukit Pariaman Village community took part in the training and practice of making the fermentation process (making eco enzymes) and applying eco enzyme products. The event occurred at the multipurpose building, Bukit Pariaman Village Office, Tenggara Seberang, Kutai Kartanegara, East Kalimantan.

The target participants in this community service activity were housewives and vegetable farmers in Bukit Pariaman Village, Tenggara Seberang, Kutai Kartanegara (Figure 1). The event included presentations and practice making Eco Enzyme. Discussions with the participants were highly interactive and engaging. Most importantly, the practical activities provided an understanding of how to use Eco Enzyme not only as a sanitation solution for household needs but also in agriculture and health-related contexts, both for personal use and for the benefit of the surrounding environment.

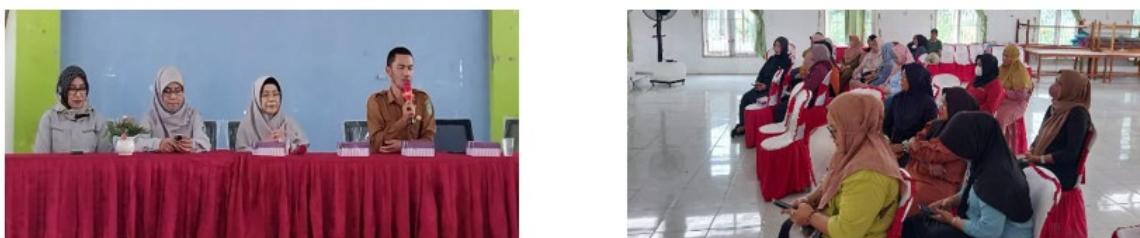


Figure 1. Welcome and Opening Speech of PKM Activities by the Secretary of Bukit Pariaman Village, followed by a Presentation and Discussion with Participants



Figure 2. Eco Enzyme fermentation is ready to harvest, and the Eco Enzyme yield in Large and Small Packaging

The stages of making eco enzymes begin with sorting the organic waste as the main ingredient. The ingredients are mixed according to a standard ratio: 1 part of brown sugar, three parts of organic matter, and 10 parts of water. Eco enzyme can be harvested as early as 3 months after fermentation (Gumilar et al., 2023). The community service activities carried out by the team included making eco-enzyme from raw materials (pineapple peel waste, orange peel, banana peel, papaya peel, melon peel), and applying EE solution for hygiene and wellness.

The fermentation container for making EE should be stored away from garbage cans and not exposed to direct sunlight. The fruit peel fermentation process takes approximately three months, and the container needs to be opened three times: once after the first week, again after the first month, and finally during the harvest period. After three months, the eco enzyme is ready to be harvested (Figure 2).

After the fermentation period, the training participants' Eco Enzyme (EE) showed very satisfying results, with no organisms or black mold. All groups successfully produced EE with a fresh fruit aroma, which indicates successful EE production (fermentation).

The harvesting process is relatively simple: Prepare a sieve and container to separate the fruit pulp from the liquid. The resulting EE liquid can be used for making hand sanitizers, soap mixtures, external health applications, and more. Meanwhile, the leftover fruit pulp can be repurposed as fertilizer, eco-enzyme pillows, or natural fragrances.

Eco enzyme products are environmentally friendly, easy to make, and easy to use (Tallei et al., 2023). They offer various benefits, such as serving as liquid organic fertilizer (Marjenah dan Kiswanto, 2022), hygiene and sanitation products, soap, hand sanitizer and others (Gumilar et al., 2023). When using eco enzyme solution, paying attention to the correct dosage is important. Since the EE solution is acidic, the pH level must be adjusted, primarily if the EE solution is used for plants. Likewise, if the EE solution is used in the health sector, it is necessary to pay attention to the dosage in its use. It is important to note that the eco enzyme solutions should not be consumed or ingested. The recommended dosages for the various uses of the multipurpose eco enzyme solutions are listed in Table 1.

Table 1. Dosage of Eco Enzyme as Multipurpose Organic Liquid (not for drinking)

| No. | Usage                               | Dosage                                           | Usefulness                                                                                |
|-----|-------------------------------------|--------------------------------------------------|-------------------------------------------------------------------------------------------|
| 1   | Cleaning The Stove And Kitchen Area | EE: Soap: Water = 1:1:5 or 10                    | Helps clean grease and oil                                                                |
| 2   | Washing Dishes                      | EE: Soap: Water = 1:1:5 or 10                    | Removes oil and odors                                                                     |
| 3   | Washing Clothes                     | EE: Soap: Water = 1:1:500-1,000                  | Removes stains and rinses easily, by soaking for a few minutes                            |
| 4   | Mopping The Floor                   | EE + Water = 1-2 Bottle caps + 1 bucket of water | Kills germs and reduces oil and insects                                                   |
| 5   | Removing Unpleasant Odors           | Pure EE                                          | Eliminates unpleasant odors, including from small animal carcasses, etc.                  |
| 6   | Cleaning Bathroom/Toilet            | Pure EE                                          | Eliminates odors, unclogs drains, supports septic tank bacteria                           |
| 7   | Cleaning Brass Metal                | Pure EE                                          |                                                                                           |
| 8   | Washing Pesticides Off Vegetables   | EE: Water = 1 bottle cap : 1 basin of water.     | Removes pesticides, herbicides, and insecticides residues                                 |
| 9   | Mouthwash & Teeth Brushing          | EE: Water = 10 ml : 1/2 glass                    | Freshens breath, helps prevent gum bleeding and canker sores                              |
| 10  | Washing Hair                        | EE: Soap/Shampoo : Water = 1:1:5 or 10           | Prevents hair loss, dandruff and itching                                                  |
| 11  | Washing Hands Or Bathing            | EE: soap : water = 1:1:5-10                      | Supports skin health, anti-allergy and anti-itch                                          |
| 12  | Air Purifier                        | EE: Water = 1 ml : 1,000 ml                      | Cleans air from germs, freshens the air                                                   |
| 13  | Body Detox                          | EE: Warm water (30-40°) = 10-20 ml : 1 bucket    | Reduces odors and treats cracked heel                                                     |
| 14  | SCRATCHES, BOILS, Etc               | Pure EE                                          | Can be used as a compress                                                                 |
| 15  | Organic Fertilizer, Pesticide       | EE: Water = 1:1,000                              | Fertilize plants, repels pests                                                            |
| 16  | Cleaning Pets                       | EE: Water = 1: 10 or 15                          | Eliminates odor, reduces parasite, improves skin conditions                               |
| 17  | Anti Radiation                      | Pure EE                                          | Put it in a closed bottle and place it near electronic items to reduce radiation exposure |
| 18  | Sanitizer                           | EE : Water = 1: 4                                | Clean hands and kills germs                                                               |

Source: Eco-Enzyme (2023)

For example, the EE solution was used to make hand sanitizer. Hand sanitizer made from eco enzymes provides the same benefits as other hand sanitizers; the difference is in the ingredients and how they are made. Hand sanitizer dosage from Eco Enzyme was a mix of 100 ml of Eco Enzyme with 400 ml of clean water (aquadest) using a 1:4 ratio. The solution is then ready for hand sanitizer (Fig. 3). For dishwashing soap, use the ratio EE:Soap: Water = 1:1:5 or 5 ml of EE, 5 ml of soap, and 25 ml of water.



Figure 3. Eco Enzyme-Based Hand Sanitizer and Dishwashing Soap

Implementing this community service activity, the program hopes to raise awareness, provide accurate information, and equip the community, especially in the Bukit Pariaman Village area, with useful skills for managing organic waste properly. Through this program, the environment is expected to become cleaner. The Eco Enzyme produced can be utilized in various ways, contributing to environmental sustainability.

## CONCLUSION

The Community Service Activities carried out by the Community Service Team of the Faculty of Forestry, Mulawarman University, were successfully implemented and received enthusiastic participation. The training participants actively asked questions, engaged in discussions, and practiced until they successfully produced eco enzymes.

## IMPLICATION

This training can benefit the community, enabling them to recognize and utilize various types of household waste as raw materials for fermentation products (in the form of eco enzymes). Participants gained knowledge of the fermentation process and the processing of household organic waste into eco-enzyme products and their application in households, environmental

cleaning, and health activities. Moreover, the training motivated and encouraged participants to develop eco-enzyme-based products as a potential source of income, thereby supporting the welfare and sustainability of village communities.

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