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Eco-enzyme Making Assistance for Family Welfare Guidance Women

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Abstract: The lack of understanding and skills of Family Welfare Guidance women in Bawen Village in making eco-enzymes in processing organic waste impacts the suboptimal processing of household-based waste. This community service program aims to provide counseling, education, and practice in making eco-enzymes. The methods used in this activity are socialization and counseling, practical training in making, harvesting, and application. The activity lasted for five months, starting from January to May 2023. The results of this activity are twofold: participants' increased understanding of eco-enzymes, participants' ability to make eco-enzymes, participants' ability to harvest eco-enzymes, and participants' ability to use eco-enzymes for various kitchen and plant fertilization purposes. All participants were able to make, harvest, and use eco-enzymes. The increase in participants' understanding is evident.
Keywords: eco-enzyme; household waste; waste treatment

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INTRODUCTION

Every human activity always leaves waste and causes problems when handling it. Waste is generally considered useless because it is disruptive, a source of disease, and other negative terms associated with waste. Due to minimal understanding of waste, waste management is more pragmatic. Waste is simply disposed of or scattered, and collectors take care of it. Such behavior triggers indifference and a lack of concern for the waste produced. People often feel comfortable putting all kinds of waste into plastic bags and then disposing of it, especially with plastic. Therefore, waste management processes are important for a clean and comfortable environment. Waste management is a systematic, comprehensive, and sustainable activity that includes waste reduction and handling. Waste reduction, as referred to in Article 19 Letter A, includes waste reduction, recycling, and/or reuse of waste (Hayati, 2022; Setiari & Sudirga, 2022).

Waste management in Indonesia has not followed the established regulations. Waste is considered a material to be discarded, with nothing else to be utilized. However, several parts or even all parts of waste can still be reused. Both organic and dry waste still need to be treated specially to avoid environmental damage (Lestari et al., 2022). Eco-enzyme is one of the products resulting from the reuse of organic waste. Eco-enzyme is a complex liquid containing enzymes (proteins), organic acids, and mineral salts produced through anaerobic fermentation of fruit and/or vegetable waste with the addition of sugar and water (Parwata et al., 2021; Widodo et al., 2022; Wulandari et al., 2019). Eco-enzyme solution has benefits related to daily life, such as cleaning and organic fertilizers (Megah et al., 2018), controlling various plant pests, and neutralizing water pollutants (Suprayogi et al., 2022; Zainal et al., 2023).

The eco-enzyme-making process uses anaerobic principles similar to organic fertilizer production, but the results are liquid and easy to use. Making eco-enzymes does not require a large building, so anyone, including those without land, can do it. In addition to not requiring a large area of land, eco-enzyme making does not require large compost bins (Septiani et al., 2021). Eco-enzyme has been researched for more than 30 years by its founder, Dr. Rosukon Poompanvong, an organic farmer from Thailand, and continued by a Naturopath from Penang, Malaysia named Dr. Joean Oon. Eco-enzyme transforms useless materials into something useful, thus addressing waste problems.

Waste is a major problem in every region, including Semarang Regency, especially in Bawen Village. The population of Bawen Village is spread across 14 neighborhoods (RWs) and consists of 14,515 people, including 7,236 males and 7,279 females. The area covers 5.82 km2, located at 7.2475 latitude and 110.4348 longitude. In Bawen District, the largest final waste disposal site is located at Blondo Environment's border with Bawen Village in Polisiri Village. The landfill is the central waste disposal site for the entire Semarang Regency. Based on interviews and direct surveys at the central landfill of the regency, it was found that within the first three years of operation, the waste accumulation reached 5000m3. This amount continues to increase due to the community's lack of education about waste management.

Additionally, there is no organic waste management in each environment, both individually and communally. Waste is collected by waste collectors to be deposited at the landfill. Given the importance of eco-enzyme function, its many benefits, and its ability to address waste problems, the community service program team conducted Socialization and Eco-enzyme Making in Bawen Village. This step is one means of educating the community to manage waste properly.

METHOD

The activities conducted are specifically part of continuing education divided into two stages. The first stage is socialization, an awareness-raising activity for partners about the importance of managing household waste, eco-enzymes, and the practice of making them. In this activity, each neighborhood representative practices making eco-enzymes, which will be harvested in the following stage. The activity took place on January 29, 2023. Before the activity began, participants were given a questionnaire about their understanding of eco-enzymes and related matters. At the end of the training activity, a questionnaire was given again to assess the participants' increased understanding after

participating. The questionnaire was prepared by the team and consisted of a total of 17 closed and open-ended questions. The second stage is the harvesting of the eco-enzymes that have been made. Each neighborhood group harvests its eco-enzymes. In addition, partners were also given guidance on the utilization and use of eco-enzymes. The activity was carried out on May 30, 2023. The overall flow of activities is shown in Figure 1.

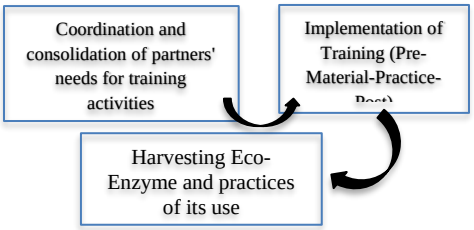

Figure 1 The flow of activity implementation

RESULTS AND DISCUSSION

The community service program activity in Bawen Village began with socialization. After the Village Chief of Bawen opened the activity, the activity participants were given a questionnaire. The questionnaire contained questions about eco-enzymes. The results of participants' responses to the questionnaire distributed before the socialization and training activities are shown in Table 1.

Table 1 Participant responses before the activity

Question about	%	Description
Information about Eco-Enzyme	82.35	Never
Seeing the Eco-Enzyme	94.12	Never
Materials for making Eco-Enzyme	76.47	Don't Know
Tools for making Eco-Enzyme	94.12	Don't Know
Ever made Eco-Enzyme	100	Never
Benefits of Eco-Enzyme for households	82.35	Don't Know
Benefits of Eco-Enzyme for self-care	88.24	Don't Know
Benefits of Eco-Enzyme for wound healing	94.12	Don't Know
Benefits of Eco-Enzyme for agriculture	88.24	Don't Know
Benefits of Eco-Enzyme for environmental management	100	Don't Know

Table 1 shows that the percentage of participants who have never known about eco-enzymes, seen eco-enzymes, and made eco-enzymes is more than 75%. Therefore, participants' knowledge about the tools, materials, and uses is also unknown.

Next, the team presented material on Introduction to eco-enzymes, the definition of eco-enzymes, the importance of eco-enzymes, and the tools and materials needed to make them. The socialization went smoothly and was very interesting. Participants were enthusiastic about asking questions and responding to other participants' opinions about organic waste management before knowing eco-enzymes. Participants asked more about the function of eco-enzymes; they only knew that eco-enzymes are processed waste products but did not understand what eco-enzymes can be used for. This is because eco-enzymes contain various enzymes, organic acids, and minerals as fermentation products. These substances are very effective for various purposes, such as household furniture cleaners, body cleaners, water clarifiers, odor removers from wastewater, food preservatives, insecticides, pesticides, and organic fertilizers (Bulai et al., 2021; Zhang et al., 2022). Figure 2 and 3 show the activities of stage 1, where in Figure 2, participants attend the socialization, and in Figure 3,

participants practice making eco-enzymes to be harvested in the following three months.

Figure 2 Participants in the eco-enzyme counseling and socialization

From the socialization, the activity continued to the participants' demonstration and practice session of making eco-enzymes. Making eco-enzymes starts with preparing the ingredients and tools commonly found in the kitchen. The procedure for making eco-enzymes begins with preparing two main things, namely tools and ingredients. The tools used include a knife, cutting board, ladle, bucket, tape, plastic, and storage containers. Meanwhile, the ingredients needed are fruit/vegetable peels, palm sugar/sugar cane drops, and water.

Figure 3 Participants practicing making eco-enzymes

After attending the socialization and practice session, the participants were given a questionnaire to assess their understanding during the activity. The participants' responses after the activity are shown in Table 2.

Table 2 Participants' responses after the activity

Question about	%	Description
Information about Eco-Enzyme	92.86	Received a lot
Seeing the Eco-Enzyme	92.86	Very understanding
Materials for making Eco-Enzyme	100	Know
Tools for making Eco-Enzyme	92.86	Know
Benefits of Eco-Enzyme for households	92.86	Know
Benefits of Eco-Enzyme for self-care	100	Know
Benefits of Eco-Enzyme for wound healing	92.86	Know
Benefits of Eco-Enzyme for agriculture	100	Know
Benefits of Eco-Enzyme for environmental management	92.86	Know
Interest in making Eco-Enzyme	92.86	Very interested

Participants gained an understanding of eco-enzymes, including seeing them firsthand and practicing making them so participants could understand things related to their benefits and uses. Additionally, participants were interested in making eco-enzymes after learning about it and practicing.

The overall process of making eco-enzymes is shown in Figure 4.

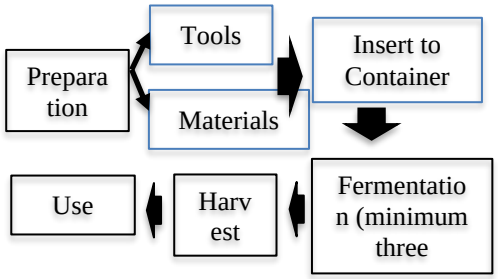

Figure 4 Flow of eco-enzyme production

The explanation of each stage of eco-enzyme production is as follows:

1. Preparation of ingredients and tools

The tools used are knives, cutting boards, closed plastic containers for eco-enzyme fermentation, tape, scales, and writing tools. The plastic fermentation container must meet certain requirements, namely being made of plastic (glass is easy to break) and having a wide mouth (if narrow, it is prone to exploding). Using a non-glass container for making eco-enzymes is recommended so that when a gas expands, the container does not break (Budiyanto et al., 2022; Harahap et al., 2021; Jelita, 2022). The materials used are palm sugar, vegetable scraps, fruit peels, and water. Organic materials have certain requirements.

To produce high-quality eco-enzymes, the fruit peels used are pineapple, papaya, orange, mango, banana, watermelon, melon, etc. Vegetable scraps that can be used are water spinach, long beans, young corn, etc. Parwata et al. (2021) stated that fruit peels and vegetable scraps for eco-enzyme materials should not be oily, too hard, or rotten. If the waste is oily and rotten, it can affect the process and the results. The types of water used are biomist water, clean river water, well water, rainwater, refill water, and settled tap water.

2. Making Eco-enzyme

The process starts with (1) collecting organic materials such as fruit peels and vegetable scraps from the kitchen or elsewhere; (2) sorting the obtained organic materials between those that are still fresh and those that have started to rot or mold, then choose the fresh organic materials, then wash the organic materials to remove attached dirt; (3) cutting the washed organic materials into small pieces, then soak the cut organic materials in an eco-enzyme solution of 1:300 for 10-15 minutes; (4) preparing and cleaning a fermentation container, don't forget to measure the volume of the container and then fill it with water up to 60% of the container's volume; (5) weighing palm sugar or molasses equal to 10% of the water volume, then add the palm sugar or molasses to the fermentation container filled with water, then stir until completely dissolved; (6) weighing the soaked organic materials in the EE solution equal to 30% of the weight of water, then add the organic materials to the fermentation container, stir until all the organic materials are submerged in the sugar or molasses solution; (7) closing the fermentation container tightly and airtight, label the container with information about the date of production, harvest date, and type of organic material used; and (8) storing the fermentation container in a good and shady place until harvest time. The recommended ratio for making eco-enzyme is 1:3:10 for molasses, organic waste, and water (*Eco Enzyme* Nusantara, 2020; Dewi et al., 2021; Prasetio et al., 2021; Septiani et al., 2021).

3. Harvesting

The fermentation of making eco-enzymes should last at least three months. During this process, in the first month, the container must be opened daily to release gas. This condition is necessary if the container used has a small opening, as the gas produced from the fermentation process is explosive. However, if the container used has a wide mouth, close it tightly and do not need to open it for three months. The gas produced in making eco-enzymes is known as ozone (Larasati et al., 2020; Pakki et al., 2021; Qothrunada et al., 2023; Safitri et al., 2021). Eco-enzymes are ready for harvest by filtering or draining them using a clear hose. Figure 5 shows the eco-enzyme harvesting process by filtering.

Figure 5 Harvesting of eco-enzyme

High-quality harvested eco-enzyme solution is brown and has a distinctive fresh acidic fermentation aroma. The color and aroma of eco-enzymes depend on the type of sugar and organic materials used. A fresh, non-rotten aroma characterizes good eco-enzymes; if their acidity level is measured, it should have a pH of less than 4.

Residues from the eco-enzyme fermentation process, such as the dregs, can still be used as a starter for making the next batch of eco-enzymes. Additionally, these residues can also be used as plant fertilizer and even to aid in the decomposition process in septic tanks as compost by layering it in the soil (Dewi et al., 2021; Kartika & Bakti, 2022; Maharmi et al., 2022; Widhiarso et al., 2023). During the eco-enzyme production process, there is a reduction in volume. According to Gumanti, et al. (2023), the decrease in volume during the fermentation process is due to gas production. The liquid eco-enzyme produced can be stored in tightly closed plastic or glass bottles before being used for various purposes. Eco-enzymes do not have an expiration date, but diluted eco-enzymes only last for three days.

After participating in the enzyme-making training, participants are expected to be able to apply the knowledge acquired simultaneously, starting from the family level to the community. Some benefits obtained from using eco-enzymes are increasing awareness of environmental cleanliness (Asiah et al., 2024; Juniartin et al., 2022; Koniherawati & Martini, 2022), increasing income (Novianti et al., 2023; Ramli & Peniyanti Jap, 2021), saving expenses (Nurafina et al., 2021; Yosuky et al., 2022), where these benefits lead to self-sufficiency in households.

CONCLUSION

Making eco-enzymes is one effort to process waste into useful materials. The activity is carried out through socialization and practice. Socialization includes providing materials on the Introduction of eco-enzymes, the benefits of eco-enzymes, and explanations of how to make eco-enzymes. Participants in small groups practice making eco-enzymes, and the results are stored and then harvested after reaching three months of age. It should be arranged sustainably and massively to build public awareness of handling organic waste in eco-enzymes.

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