

SOCIALIZATION OF THE UTILIZATION OF ORGANIC FRUIT AND VEGETABLE KITCHEN WASTE FOR PRODUCTION OF ECOENZYMES

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Abstract. Household waste management, especially organic waste from the kitchen, is one of the serious problems faced by rural communities in Indonesia. Waste in the form of fruit peels and vegetable scraps from daily cooking activities is often not managed properly so it has the potential to pollute the environment and cause health problems. The purpose of waste management activities through the production of ecoenzyme is to assist the community of Tenggiring Village, Sambeng Sub-district, Lamongan Regency, in processing kitchen waste, such as vegetables and fruits, into valuable products. This activity is crucial considering the increasing global warming and the growing volume of household waste, thus processing organic waste into eco-enzyme can be an environmentally friendly solution. The fermentation product of eco-enzyme has many benefits, such as a natural floor and toilet cleaner, unclogging drains, fertilizing plants, repelling insects, and its residue can be utilized as organic fertilizer. The method used was participatory through socialization, counselling, and direct demonstration with the involvement of Universitas Muhammadiyah Lamongan students. The results show that the residents were able to understand and practice eco-enzyme production using simple ingredients such as brown sugar, vegetable and fruit residues, water, and recycled containers with a fermentation process of three months. The community showed high enthusiasm since the product proved useful for household, environmental, and agricultural needs, while also reducing the volume of organic waste. This activity had a positive impact in increasing environmental awareness among the community and demonstrated that organic waste management can be implemented in an affordable, easy, and sustainable way.

Keywords: *ecoenzymes, household waste, organic waste*

Abstrak. Pengelolaan sampah rumah tangga, khususnya limbah organik dari dapur, merupakan salah satu permasalahan serius yang dihadapi masyarakat pedesaan di Indonesia. Limbah berupa kulit buah dan sisa sayuran dari aktivitas memasak sehari-hari sering kali tidak dikelola dengan baik sehingga berpotensi mencemari lingkungan dan menimbulkan masalah kesehatan. Tujuan kegiatan pengelolaan sampah melalui pembuatan eco-enzyme adalah untuk membantu masyarakat Desa Tenggiring, Kecamatan Sambeng, Kabupaten Lamongan dalam mengolah limbah dapur berupa sayur dan buah sehingga memiliki nilai guna. Kegiatan ini penting mengingat pemanasan global semakin meningkat dan volume sampah rumah tangga terus bertambah, sehingga pengolahan limbah organik dengan ecoenzyme dapat menjadi solusi ramah lingkungan. Ekoenzyme hasil fermentasi memiliki banyak manfaat seperti pembersih lantai dan kloset alami, pelancar saluran air tersumbat, penyubur tanaman, pengusir serangga, serta ampasnya dapat dimanfaatkan sebagai pupuk organik. Metode yang digunakan adalah partisipatif melalui sosialisasi, penyuluhan, dan demonstrasi langsung kepada warga dengan melibatkan mahasiswa KKN Universitas Muhammadiyah Lamongan. Hasil kegiatan menunjukkan warga mampu memahami dan mempraktikkan pembuatan eco-enzyme menggunakan bahan sederhana berupa gula merah, sisa sayur dan buah, air, dan wadah bekas dengan proses fermentasi selama tiga bulan. Antusiasme masyarakat cukup tinggi karena produk yang dihasilkan terbukti bermanfaat bagi kebutuhan rumah tangga, lingkungan, serta pertanian, sekaligus membantu mengurangi volume sampah organik. Kegiatan ini memberikan dampak positif dalam meningkatkan kesadaran lingkungan masyarakat dan menunjukkan bahwa pengelolaan limbah organik dapat dilakukan dengan biaya murah, mudah, dan berkelanjutan.

Kata Kunci: *ecoenzym, limbah organik, limbah rumah tangga*

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INTRODUCTION

Household waste management, especially organic waste from the kitchen, is one of the serious problems faced by rural communities in Indonesia. Waste in the form of fruit peels and



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vegetable scraps from daily cooking activities is often not properly managed, potentially polluting the environment and causing health issues. Based on data Kementerian Lingkungan Hidup (2024) around 50-60% of total household waste is organic waste, most of which comes from the kitchen. Tenggiring Village, Lamongan Regency, which has high agricultural and household activity, faces similar conditions. Most of its residents still have bad habits, such as improperly disposing of organic waste without further utilisation (Yoada et al., 2014). The absence of temporary disposal sites (TPS) and recycling facilities is an obstacle that prevents the economic value of this waste from being explored (Kisworo et al., 2025).

The problem is further complicated by the community's lack of knowledge in managing organic waste sustainably (Manea et al., 2024). The lack of information and skills regarding alternative technologies, such as ecoenzymes, is a challenge that hinders the utilization of organic waste as a useful product (Abidin et al., 2022). This condition exacerbates environmental problems in rural areas and prevents the economic opportunities from household waste from being maximized (Yurike et al., 2024). Given these constraints, the community needs solutions that are simple, affordable, and easy to implement in everyday life. One effort that can be made is through the dissemination of information on ecoenzyme production. This activity is expected to increase public awareness, knowledge, and skills in processing organic kitchen waste into useful and environmentally friendly products (Utomo et al., 2025).

The objective of this socialization program is to encourage the community to adopt ecoenzyme technology as part of household waste management (Sari et al., 2026). Through a participatory approach and direct demonstrations, the activity is expected to foster environmental awareness, encourage the optimal use of local resources, and contribute to improving family economic welfare (Fatimah et al., 2024). Ecoenzymes are liquids produced from the fermentation of organic fruit and vegetable waste mixed with brown sugar and water. This product has various benefits, ranging from natural cleaning agents, liquid organic fertilizers, to wastewater treatment (Benny et al., 2023; Achmad, 2024). The manufacturing process is simple and can be done at the household level at low cost, making it very suitable for implementation in rural areas.

Previous research has also shown that ecoenzyme contains enzymes, vitamins, minerals, and organic acids that are beneficial for households and agriculture. In addition, its application has been proven to reduce the volume of organic waste by up to 90%, thus playing an important role in alleviating the burden of waste management in communities and supporting the realization of a clean and sustainable environment (Febrianti et al., 2024; Maryanti et al., 2023).

METHOD

This community service was carried out by students participating in the Community Service Program (KKN) at Muhammadiyah University Lamongan, Group 12 Academic Year 2025/2026, in collaboration with the community of Tenggiring Village, Sambeng District, Lamongan Regency. The method used in this activity was the participatory method, which is a mentoring method aimed at empowering the community to solve and find solutions to their problems. In everyday terms, participation is the involvement or engagement of a person (individual or community member) in a particular activity (Djauhari et al., 2021).

The involvement or engagement referred to here is not passive but actively directed by the person concerned. Therefore, participation is more accurately defined as the involvement of a person in a social group to take part in community activities, outside of their own work or profession. Thus, the participatory method is a method that encourages the participation of every individual in a group process regardless of age, gender, social class, and educational background of each individual, which grows from their awareness and responsibility. The parties involved in this activity were the community of Tenggiring Village, Sambeng Subdistrict, Lamongan Regency. The activity was carried out at the Tenggiring Village hall and was attended by 18 residents. The activities carried out included socialization about eco-enzymes, which was directly delivered by

KKN students, providing guidance, preparing tools and materials, and conducting demonstrations.

Preparation Stage

The preparation stage of the activity began with identifying problems and needs through field observations and discussions with village officials. The results showed that household organic waste, such as fruit and vegetable peels, was still being disposed of without processing, potentially polluting the environment and not being utilized economically (Wadhwa et al., 2016). To deepen understanding, focus group discussions were held with the community to explore their needs and expectations for simple and easy-to-implement solutions at the household level. Based on these results, ecoenzymes were chosen as the solution because the manufacturing process is easy, inexpensive, and suitable for rural conditions (Gumilar et al., 2023).

The implementation strategy was designed through socialization, education, and hands-on practice so that the community would not only understand the concept but also be able to practice it. The socialization materials were prepared in a simple and interactive manner, covering the definition, benefits, manufacturing process, and examples of ecoenzyme products, with the support of media such as slides, leaflets, and short videos (Alibasyah et al., 2025). In addition, the team prepared practical tools and materials in the form of airtight plastic containers, knives, cutting boards, scales, gloves, kitchen waste, brown sugar, and clean water, the amount of which was adjusted to the number of participants. As a demonstration tool, a sample of ecoenzyme that had been fermented for three months with a ratio of 3:1:10 (fruit/vegetable waste, brown sugar, and water) was also prepared to provide a concrete picture of the final result of the fermentation process.

Implementation Stage

The implementation phase began with the dissemination and presentation of material on the importance of managing household organic waste. Students delivered the material through presentations and interactive workshops explaining the benefits of ecoenzymes for households, agriculture, environmental health, and their potential economic value (Wibowo et al., 2025). The material was presented in simple and communicative language so that it could be easily understood by all levels of society. After that, the activity continued with a demonstration of ecoenzyme production using a 3:1:10 ratio (300 grams of fruit or vegetable waste, 100 grams of brown sugar, and 1 liter of water). Participants were shown firsthand the process of cutting the ingredients, mixing them with brown sugar and water, and storing them in airtight plastic containers. In the final stage, students presented examples of ecoenzymes that had been fermented for three months as teaching aids. Participants were able to observe changes in the color of the liquid, smell the distinctive fresh sour aroma, and compare the initial condition of the ingredients with the fermentation results (Tournier et al., 2007), thereby gaining a more concrete understanding of the process and benefits of ecoenzymes as environmentally friendly products.

RESULT AND DISCUSSION

During the preparation stage, the KKN team from Muhammadiyah University Lamongan first identified problems in Tenggiring Village. Observations showed that the community still disposed of kitchen waste in the form of fruit peels and vegetable scraps without further processing. This condition causes environmental pollution, potential unpleasant odors, and the loss of opportunities to utilize organic waste as useful products (Nisa et al., 2023). In addition, most of the community did not have the knowledge and skills to process kitchen waste into useful products.

Based on this identification, the community's needs were formulated in the form of education, training, and assistance in organic waste processing (Supinganto et al., 2022). To address this need, the team designed a strategy consisting of socialization activities and hands-on practice in making eco-enzymes using simple materials that are easily found in households. With this strategy, the community can immediately understand and practice how to process kitchen waste into eco-enzymes (Romauli Pantaria et al., 2025).

Socialization and Presentation of Ecoenzyme Material

The second stage involved socialization to the community. In this session, KKN students explained what ecoenzymes are, their benefits, and opportunities for their use in everyday life. The material was presented in simple language so that it could be easily understood by all levels of society, including housewives and farmers. This socialization also emphasized the importance of organic waste management as an effort to maintain environmental cleanliness while improving family welfare (Saragih et al., 2023).

In addition, at this stage, examples of finished ecoenzyme products were also shown. This aimed to provide the community with a concrete picture of the result of kitchen waste fermentation (Nafilah et al., 2024). In this way, the community can directly see the benefits of ecoenzymes, both as natural cleaners, liquid organic fertilizers, and deodorants (Salvi et al., 2024; Tallei et al., 2023). This socialization stage succeeded in building initial awareness among the community to be more concerned about managing household waste.



Figure 2. Socialization and presentation of ecoenzyme material

Ecoenzyme Production Demonstration

After the socialization, the activity continued with a hands-on demonstration of ecoenzyme production. Students showed the steps starting from sorting kitchen waste, cutting ingredients, dissolving brown sugar, mixing all ingredients in a container, and storing the mixture. During the demonstration, participants not only watched but were also allowed to try it themselves so that they could more easily understand how to make it. This demonstration was key because the community could see and practice the process firsthand. With the guidance of the students, participants felt more confident to make ecoenzymes independently after the KKN activity ended (Sarminingsih et al., 2023). In addition, with the example of mature ecoenzymes, participants could compare the initial and final results of fermentation, making them more confident in the success of this process. The ecoenzyme production process is carried out using a ratio of 3:1:10 (300 grams of organic kitchen waste, 100 grams of brown sugar, and 1 liter of water). The kitchen waste is chopped into small pieces, mixed with the brown sugar solution, and then placed in an airtight plastic bottle. The container is stored in a shaded place for three months. In the early weeks, fermentation gas will be released, so the bottle cap needs to be opened occasionally to avoid excessive pressure (Benny et al., 2023).

Ready-to-use ecoenzymes must first be filtered to extract the liquid. Dissolve 30 ml of ecoenzyme in 2 liters of water. This solution can be sprayed around plants, and the fermentation residue can be used as plant fertilizer. After 90 days of fermentation, the ecoenzyme liquid is filtered to separate it from the residue. The liquid can be used for various purposes such as liquid fertilizer, household cleaner, or deodorizer. Meanwhile, the residue can be used as solid fertilizer to enrich the soil (Romauli Pantaria et al., 2025). Thus, no waste is wasted. This production process is simple, inexpensive, and can be done in households without the need for special equipment.



Figure 3. *Demonstration of ecoenzyme production*

Socialization and demonstration activities on ecoenzyme production in Tenggiring Village have proven to be effective in addressing the issue of suboptimal kitchen waste management. Through the transfer of simple fermentation-based skills, the community has gained access to a low-cost, practical solution that is suitable for rural conditions (Nisa et al., 2023). The materials used are also readily available, including fruit and vegetable waste, brown sugar, and water. This method fulfils the community's need for a real solution to reduce kitchen waste, while also providing useful products for households (Galhena et al., 2013). This is in line with previous studies, which state that ecoenzymes contain active compounds such as enzymes, vitamins, and organic acids that are useful for agriculture and environmental hygiene (Draghi et al., 2022; Tallei et al., 2023).

The ecoenzyme production process is also measurable and easy to practice. Using a 3:1:10 ratio (kitchen waste: brown sugar: water) yields stable and high-quality fermentation results on a household scale (Benny et al., 2023). The community is also taught important steps such as opening the container lid to release gas (degassing), storing the bottle in a shaded place, and filtering the fermentation results after three months. With these simple guidelines, the risk of failure can be minimized even without laboratory equipment. This approach also strengthens the participatory empowerment model, as the community not only receives theoretical knowledge but also practices the process directly with the KKN team.

The results of this activity have both direct and indirect impacts. Directly, the community can use liquid ecoenzymes as liquid organic fertilizer, natural cleaners, and deodorizers, while the solid residue can be used as compost fertilizer (Romauli Pantaria et al., 2025; Salvi et al., 2024). Indirectly, this activity fosters new habits in the community in processing kitchen waste, thereby reducing the volume of waste and improving the quality of the environment (Syamfaini, 2025). This reinforces the evidence that ecoenzymes are not only an environmentally friendly solution but also a means to raise public awareness in managing waste sustainably.

CONCLUSION

The socialization activity on the use of organic fruit and vegetable kitchen waste for the production of ecoenzymes in Tenggiring Village, Lamongan Regency, has successfully increased the community's knowledge and skills in processing household organic waste. Residents not only understand the concept of environmentally friendly waste management, but are also able to practice making ecoenzymes using simple ingredients through a three-month fermentation process. The community's enthusiasm was high because ecoenzymes have proven to be useful as natural cleaners, plant fertilizers, pest repellents, and help reduce the volume of organic waste. This program provides a cheap, easy-to-implement, and sustainable solution, and encourages the growth of collective awareness of the importance of waste management at the household level.

As a follow-up, ongoing assistance from students and village officials is needed so that the community can continue to produce ecoenzymes independently and consistently. In addition, the formation of ecoenzyme management groups at the neighborhood or PKK level can be a strategic step to optimize the utilization of kitchen waste while expanding product distribution. Training in product diversification, such as cleaning fluids, liquid organic fertilizers, and natural pest control, is also important to increase economic added value. Collaboration with the village government and the environmental agency needs to be strengthened to support the sustainability of the program through policies and assistance with facilities and infrastructure. Regular monitoring and evaluation must also be carried out to assess the effectiveness of ecoenzyme implementation and its impact on reducing the volume of organic waste in Tenggiring Village.

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