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Community Empowerment through Eco-Enzyme Production for Organic Waste Management in Tanjung Hamlet, Angsana Village, Mancak District, Serang Regency

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ABSTRACT

This community service activity aimed to improve the knowledge and skills of residents of Tanjung Hamlet, Angsana Village, Mancak District, Serang Regency, in managing household organic waste through eco-enzyme production. Eco-enzyme is a liquid produced through the fermentation of kitchen waste, particularly fruit and vegetable peels, with sugar and water. It has various potential applications, including as an environmentally friendly cleaning agent, liquid fertilizer, and odor-reducing agent. The implementation method consisted of socialization on the concept and benefits of eco-enzymes, demonstrations of the production process, and hands-on practice in which participants used organic waste brought from their households. The activity generated a high level of community enthusiasm, as demonstrated by the active participation of residents throughout the training process and their willingness to continue the fermentation process independently at home. The results indicated a significant improvement in residents' knowledge and practical skills in transforming kitchen waste into useful and value-added products. This program is expected to serve as an initial step toward promoting environmentally responsible behavior and reducing the volume of household organic waste at the community level.

Keywords*: Eco-enzyme, Organic Waste, Community Empowerment, Environment, Community Service.*

Introduction

Household organic waste management is one of the serious environmental challenges faced by many urban and rural communities in Indonesia. Improperly managed organic waste can contribute to environmental pollution, unpleasant odors, and the proliferation of disease vectors. At the same time, organic waste has considerable potential to be transformed into value-added products, such as compost, liquid fertilizer, and bio-enzymes or eco-enzymes. The production of eco-enzyme, a liquid obtained through the fermentation of kitchen waste such as fruit and vegetable peels with sugar and water, offers a simple, low-cost, and environmentally

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friendly solution for reducing the volume of organic waste while producing a functional product that can be utilized for household cleaning and soil improvement.

Tanjung Hamlet is a rural settlement located in Serang Regency, Banten Province, situated among the hilly areas of Mancak District. The community consists of 155 households and a total population of 505 residents, organized into two neighborhood units (Rukun Tetangga or RT). The majority of residents work as farmers, making agricultural activities an important component of the local economy and livelihood.

Tanjung Hamlet, Angsana Village, Mancak District, Serang Regency, is characterized by relatively intensive household activities and conventional practices of organic waste disposal. Limited waste management facilities and low awareness of waste utilization remain major barriers to reducing household waste. Therefore, participatory, educational, and practical interventions, such as training in eco-enzyme production, are highly relevant for empowering residents to manage organic waste independently and sustainably.

Waste management practices in many parts of Indonesia continue to be dominated by an end-of-pipe approach, in which waste is transported directly to final disposal sites. This approach is not only less effective in reducing waste generation but can also create significant problems in areas where adequate waste disposal facilities are unavailable. Such conditions are frequently encountered in rural and hilly areas, including Tanjung Hamlet, Angsana Village, Mancak District, Serang Regency. The area's mountainous topography and limited access to information contribute to the community's limited knowledge and availability of appropriate waste management facilities. Poorly managed organic waste can generate greenhouse gases, particularly methane (CH_4), as a result of anaerobic decomposition, while also producing unpleasant odors (Endrini et al., 2024; Handayani et al., 2024).

In general, organic waste constitutes a substantial proportion of the total waste generated in Indonesia, accounting for approximately 57% of national waste generation. Organic waste primarily originates from food scraps, fruits, and vegetables, which are readily biodegradable (Anriawan, 2024). Despite its substantial proportion, the management of organic waste remains limited, particularly in remote rural areas. In Tanjung Hamlet, residents have traditionally disposed of waste in open areas or burned it, practices that may contribute to air pollution, soil degradation, and adverse health impacts.

However, organic waste can be processed into useful products, one of which is eco-enzyme. Eco-enzyme is a liquid produced through the fermentation of organic waste, such as fruit and

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vegetable residues, with sugar and water (C. Arun & P. Shivashanmugam, 2015; Hemalatha & Visantini, 2020). This dark-brown liquid, which has a characteristic fermentation odor, has been reported to have various potential applications, including as a natural cleaning agent, pest control agent, disinfectant, and liquid organic fertilizer (Pasalari et al., 2024). Recent studies have also reported that eco-enzyme contains various bioactive compounds, including organic acids, protease and lipase enzymes, and beneficial microorganisms that may contribute to soil and plant health (Wong et al., 2022; Sutapa et al., 2023).

Furthermore, eco-enzyme has been reported to facilitate the conversion of ammonia (NH_3) into nitrate (NO_3^-), thereby potentially providing nutrients that are beneficial for plant growth. The quality and functional properties of eco-enzyme are influenced by the type and composition of organic waste used during the fermentation process (Dhiman, 2017; Rasit et al., 2019; Mardiani et al., 2021; Widiani & Novitasari, 2023). Several recent studies (Rahmadani et al., 2023; Yuliani et al., 2024) have further indicated that eco-enzyme may support the growth of horticultural crops and improve soil fertility through its potential contribution to soil microbial activity.

These conditions are particularly relevant to the community of Tanjung Hamlet, where the majority of residents are farmers. Access to chemical fertilizers is often constrained by their relatively high cost, distribution distance, and availability. Consequently, the utilization of eco-enzyme has the potential to provide an affordable, accessible, and environmentally friendly alternative that may support local agricultural productivity. In addition to reducing the volume of household organic waste, eco-enzyme may provide direct benefits to farmers through its potential use as a liquid fertilizer, botanical pest-control agent, and soil amendment.

Through this community service activity, eco-enzyme production is introduced as an integrated strategy for managing household organic waste while promoting environmentally friendly agricultural practices in Tanjung Hamlet. The program is expected to increase community knowledge and practical skills, encourage more sustainable agricultural practices, and reduce reliance on chemical fertilizers that may be increasingly costly and difficult for local farmers to access. More broadly, the initiative seeks to transform organic waste from an environmental burden into a potentially valuable community resource, thereby strengthening both environmental awareness and local agricultural resilience.

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Research Method

The socialization and training activity on the production and utilization of eco-enzyme as an alternative approach to organic waste management was conducted in Tanjung Hamlet, Angsana Village, Mancak District, Serang Regency. The area is characterized by hilly terrain, with the majority of residents working as farmers. The activity formed part of the 2025 Student Community Service Program (Kuliah Kerja Mahasiswa/KKM) organized by Al-Khairiyah Higher Education Institutions and involved students from Universitas Al-Khairiyah and Institut Agama Islam Al-Khairiyah.

The activity was conducted on July 31, 2025, from 09:00 to 11:30 Western Indonesia Time (WIB). The primary participants were residents of Tanjung Hamlet, particularly local youth and housewives who routinely generate kitchen waste and require organic fertilizers to support household and agricultural activities. The selection of these participants was based on their direct involvement in household waste generation and agricultural practices, making them important actors in the implementation of community-based organic waste management.

The activity began with an opening and introduction to the program, in which participants were provided with an overview of the existing conditions of organic waste management in Tanjung Hamlet. The facilitators explained that household organic waste was still predominantly managed through conventional disposal practices. Participants were subsequently introduced to the concept of community-based waste management through the utilization of organic waste as a resource for producing eco-enzyme. This initial session was intended to increase participants' awareness of the environmental problems associated with unmanaged organic waste while introducing practical alternatives that could be implemented at the household level.

The second stage involved a theoretical presentation on eco-enzyme. The facilitators explained the concept, production principles, potential environmental benefits, and possible applications of eco-enzyme, particularly within the agricultural context. Given the predominantly agrarian characteristics of the community, the discussion emphasized the potential utilization of eco-enzyme as a complementary organic input and natural pest-control agent. The session also highlighted the potential of organic waste utilization to reduce household waste generation while providing an alternative resource that could support agricultural activities and reduce dependence on externally purchased agricultural inputs.

The activity then proceeded to a demonstration of the eco-enzyme production process. The facilitators demonstrated each stage of the process in a systematic manner to ensure that

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participants could understand and subsequently reproduce the procedure independently. The process began with the preparation of molasses as a natural sugar source. Fresh kitchen waste, particularly fruit and vegetable peels, was then collected and cut into relatively small pieces to facilitate the fermentation process. The ingredients were subsequently combined using a ratio of 1:3:10, consisting of one part molasses, three parts chopped organic waste, and ten parts water.

The mixture was then placed in a suitable airtight container, such as a wide-mouthed jar, to provide sufficient fermentation space and facilitate mixing during the initial stage. The container was not sealed excessively tightly so that fermentation gases could be released safely and excessive pressure could be avoided. The mixture was subsequently stored in a shaded location for approximately three months to allow the fermentation process to proceed. During the initial week, participants were instructed to periodically loosen or open the container to release accumulated fermentation gases. After the first week, the container was securely closed and the fermentation process was allowed to continue for approximately three months.

Following the demonstration, participants engaged in hands-on practice. Participants were given the opportunity to prepare eco-enzyme using the materials provided by the facilitators. Direct assistance was provided throughout the practical session to ensure that participants correctly followed the preparation sequence, including the preparation of organic waste, measurement of ingredients, mixing, placement in the fermentation container, and appropriate storage. This practice-based approach allowed participants to move beyond theoretical understanding and develop practical skills that could subsequently be applied independently in their respective households.

The next stage consisted of discussion and technical consultation. Participants were encouraged to ask questions and discuss various aspects of eco-enzyme utilization in household and agricultural settings. The discussion covered topics such as appropriate application, storage of fermented products, and potential benefits for soil and plant management. This interactive session also enabled the facilitators to identify participants' specific concerns and provide clarification based on their household and agricultural conditions.

The activity concluded with a closing session and follow-up planning. Participants were encouraged to continue producing eco-enzyme independently by utilizing organic waste generated from their households. The facilitators emphasized the importance of maintaining continuity in organic waste management so that the practice would not remain limited to the

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training session but could become part of the community's routine environmental practices. Participants were also encouraged to explore the utilization of the resulting eco-enzyme as an organic agricultural input in accordance with appropriate application practices.

Overall, the activity combined socialization, theoretical education, demonstration, hands-on practice, technical consultation, and follow-up guidance. This integrated approach was designed to strengthen both participants' knowledge and practical skills while encouraging active community involvement in organic waste management. Through the introduction of eco-enzyme production, household organic waste can be approached not merely as a waste problem but as a potentially useful resource that can be managed and utilized within the local agricultural context.

Results and Discussion

The implementation of the socialization and training program on eco-enzyme production in Tanjung Hamlet generated several important outcomes that were observed throughout the activity. The results indicate that the program contributed to increased community awareness and knowledge regarding organic waste management and the potential utilization of eco-enzyme in household and agricultural contexts.

Increased Community Knowledge

The participants demonstrated an improved understanding of several key aspects of eco-enzyme production and utilization. The training increased their knowledge of the basic concept of eco-enzyme and its potential environmental benefits, particularly its role in utilizing household organic waste that would otherwise be discarded. Participants also gained a better understanding of the potential use of liquid organic fertilizer as a complementary alternative to conventional chemical fertilizers, as well as the simple methods that can be applied to process household kitchen waste into a potentially useful product.

The discussion conducted at the end of the activity further indicated that most participants had previously been unaware that kitchen waste, particularly fruit and vegetable residues, could be processed into a value-added product for agricultural purposes. This finding demonstrates that the activity successfully broadened participants' perspectives on organic waste by shifting their understanding of such materials from being merely household waste to being a potentially valuable resource. The increased awareness provides an important foundation for encouraging more responsible and sustainable organic waste management practices at the household and community levels.

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Figure 1. Ingredient Mixing Process

Practical Skills Development among Participants

All participants were able to carry out the eco-enzyme production process independently following the practical training session. Participants demonstrated their ability to accurately apply the recommended 1:3:10 ratio of molasses, organic waste, and water; prepare and cut organic waste into appropriate sizes; mix the organic materials with molasses; and prepare suitable containers for the fermentation process.

Observations during the hands-on session indicated that participants were able to follow each stage of the production process properly and systematically. No significant difficulties were encountered during the practice, suggesting that the practical demonstration and direct assistance provided during the training were effective in facilitating participants' understanding and acquisition of the required technical skills. The ability to independently perform the production process also indicates that the activity had successfully transferred practical knowledge that can potentially be applied continuously at the household level.

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Figure 2. Community Members Practicing Eco-Enzyme Production with Assistance from Students

Initial Eco-Enzyme Batches Produced

At the end of the activity, the community successfully prepared two to three initial batches of eco-enzyme in fermentation containers. These initial batches were prepared by participants following the procedures demonstrated during the training and were intended to undergo the fermentation process for approximately three months.

The initial production served not only as a practical outcome of the training but also as a demonstration and catalyst for continued community participation. The batches provide tangible examples of the results that can be achieved through the utilization of household organic waste. Furthermore, their presence is expected to encourage other families in Tanjung Hamlet to adopt similar practices and independently produce eco-enzyme using organic waste generated from their households. This initial production therefore represents an important step toward establishing a more sustainable and community-based approach to household organic waste management.

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Figure 3. Eco-Enzyme Products Ready for Fermentation

Enthusiasm among Local Farmers

The training generated a highly positive response among the farming community in Tanjung Hamlet, particularly because the majority of residents rely on agriculture as their primary livelihood. The discussion of the potential applications of eco-enzyme in agricultural activities attracted considerable interest from participants. The potential uses introduced during the activity included its application as a liquid organic fertilizer, a natural pest-control agent, and a soil fertility enhancer.

Several farmers expressed their interest in utilizing household-produced organic inputs as complementary alternatives to conventional chemical fertilizers. Participants noted that the increasing cost of chemical fertilizers has become a concern for local farmers, particularly those managing household-scale agricultural activities. In this context, the production and utilization of eco-enzyme were perceived as a potentially affordable and accessible alternative for utilizing household organic waste while supporting agricultural activities. The positive response from the farmers indicates a strong potential for further development of eco-enzyme production as part of community-based waste management and environmentally friendly agricultural practices in Tanjung Hamlet.

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Figure 4. Enthusiasm of Tanjung Hamlet Residents

The implementation of the community service program demonstrates that eco-enzyme production has considerable potential as a practical solution for household organic waste management in Tanjung Hamlet. The area's hilly geographical characteristics and limited access to formal waste management facilities have contributed to conventional waste disposal practices, including disposing of household waste in gardens or burning it. Such conditions are consistent with the findings of Endrini et al. (2024) and Handayani et al. (2024), who reported that end-of-pipe waste management practices remain prevalent in rural areas. Within this context, the introduction of a simple and accessible eco-enzyme production process provides an alternative approach that can reduce the accumulation of organic waste while transforming household waste into a reusable and potentially valuable product. This practice also introduces a household-based recycling model in which organic waste can be processed and utilized within the community rather than being discarded.

The potential application of eco-enzyme in agriculture is particularly relevant to the socioeconomic conditions of the Mancak community. The fermentation process produces a liquid containing various organic compounds and other substances that have been reported to have potential benefits for plants and soil. Previous studies have indicated that eco-enzyme may contribute to soil fertility and can potentially be utilized as a natural pest-control agent (Dhiman, 2017; Pasalari et al., 2024). This potential is especially relevant for farmers in Tanjung Hamlet, who face challenges associated with the increasing cost of chemical fertilizers, agricultural activities on hilly land that may have limited nutrient availability, and restricted access to commercially produced organic fertilizers. Under these circumstances, eco-

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enzyme represents a potentially appropriate and locally accessible innovation that can utilize readily available household organic waste while supporting agricultural activities. Although further empirical evaluation is required to determine its effectiveness under specific local agricultural conditions, its introduction provides a promising foundation for incorporating organic waste utilization into a more sustainable community-based agricultural system.

The results also indicate that the combination of socialization, demonstration, and hands-on practice was an effective educational approach for the community. Participants appeared to understand the concept and potential benefits of eco-enzyme more readily when they were able to observe the production process directly, participate in preparing the materials, and discuss its potential applications for their own agricultural activities. Practical involvement allowed participants to transform theoretical information into concrete skills that could be reproduced independently at home. This approach is consistent with the principles of community-based learning, in which knowledge development is strengthened through direct participation, contextual learning, and the utilization of locally available resources. Such an approach is particularly relevant to community service and student community engagement programs because it positions residents not merely as recipients of information but as active participants in identifying and addressing local environmental challenges.

Despite the positive outcomes, several challenges require consideration in the continued implementation of the program. The relatively long fermentation period means that participants must maintain consistency and patience before the product can be utilized. The initial stage of fermentation also requires appropriate monitoring to manage the accumulation of gases and maintain suitable fermentation conditions. In addition, the availability of molasses or other suitable sugar sources may become a constraint if these materials are not readily accessible to households. These challenges highlight the importance of continued mentoring and community-level coordination to ensure that the practice introduced during the training can be sustained beyond the initial activity.

At the same time, the program provides considerable opportunities for further development. Eco-enzyme production could be expanded from an individual household practice into a broader community-based environmental initiative. Collective production through neighborhood-level groups could facilitate the management and monitoring of fermentation processes while encouraging wider participation among residents. The establishment of an eco-enzyme bank at the neighborhood level could further support the collection, storage, and

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utilization of fermented products for community needs. The resulting products could potentially be used not only to support agricultural activities but also for household and environmental cleaning purposes. Thus, the development of eco-enzyme production in Tanjung Hamlet has the potential to strengthen community participation in waste reduction, promote environmentally responsible behavior, and establish a more sustainable cycle in which household organic waste is transformed into a resource that provides practical benefits for the community.

Conclusion

The socialization and training activity on eco-enzyme production conducted in Tanjung Hamlet, Angsana 1 Village, Mancak District, generated positive impacts on the local community. The program successfully improved residents' understanding of household organic waste management and provided them with practical skills to independently produce eco-enzyme. For a community whose majority of residents work as farmers, eco-enzyme represents a potentially accessible, economical, and environmentally friendly alternative to conventional agricultural inputs.

In addition to increasing awareness of household-based waste management, the activity created opportunities for utilizing eco-enzyme to support sustainable agricultural practices in the hilly region. The active involvement of local residents and students participating in the Student Community Service Program (Kuliah Kerja Mahasiswa/KKM) of Al-Khairiyah Higher Education Institutions also provided a strong foundation for the continuation and development of the initiative as a long-term community empowerment program. Continued assistance and follow-up activities are expected to strengthen the community's capacity to manage organic waste independently while encouraging the integration of environmentally friendly practices into local agricultural activities.

References

Journal Article

Anriawan, M. (2024). Analisis komposisi sampah organik di Indonesia dan potensi pemanfaatannya. *Jurnal Pengelolaan Lingkungan*, 12(1), 45–53.

Arun, C., & Shivashanmugam, P. (2015). Enzyme-fortified eco-friendly cleaner production from fruit and vegetable waste. *International Journal of Recycling of Organic Waste in Agriculture*, 4(1), 1–7.

Dhiman, S. (2017). Eco-enzyme as an alternative for organic waste management and agricultural application. *Journal of Environmental Biology*, 38(3), 405–410.

Endrini, S., Rahmawati, D., & Putra, A. (2024). Emisi gas rumah kaca dari timbunan sampah

SATRIA BHAKTI
Jurnal Pengabdian Masyarakat
ISSN: 3985-3346
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organik: Tantangan pengelolaan sampah berkelanjutan. *Jurnal Lingkungan Tropis*, 18(2), 110–121.

Handayani, T., Lestari, P., & Arifin, M. (2024). Dampak pembusukan anaerob terhadap kualitas udara di lokasi pemrosesan sampah. *Jurnal Ilmu Lingkungan Indonesia*, 22(1), 67–79.

Hemalatha, R., & Visantini, D. (2020). Production and applications of eco enzyme: A review. *Journal of Environmental Chemical Engineering*, 8(4), 103–118.