



Community Empowerment Through the Processing of Organic Waste into Eco-Enzyme and Compost to Support Environmental Sustainability

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Abstrak

Permasalahan sampah organik masih menjadi tantangan lingkungan yang serius akibat rendahnya kesadaran masyarakat dalam pengelolaan sampah serta minimnya pemanfaatan limbah organik menjadi produk yang bernilai guna. Sebagian besar masyarakat masih membuang sampah organik secara langsung tanpa pengolahan sehingga berpotensi menimbulkan pencemaran lingkungan dan pemborosan sumber daya. Kegiatan pengabdian kepada masyarakat ini bertujuan untuk memberdayakan masyarakat melalui pengolahan sampah organik menjadi eco-enzyme dan pupuk kompos guna mendukung keberlanjutan lingkungan. Kegiatan ini menggunakan pendekatan pemberdayaan masyarakat secara partisipatif yang melibatkan 30 orang peserta yang terdiri atas anggota masyarakat yang aktif dalam pengelolaan lingkungan. Pengumpulan data dilakukan melalui observasi, wawancara, angket, pre-test, post-test, dan dokumentasi. Instrumen yang digunakan meliputi lembar observasi, pedoman wawancara, kuesioner pengetahuan, serta lembar evaluasi peserta. Data dianalisis menggunakan teknik deskriptif kuantitatif dan kualitatif dengan membandingkan tingkat pengetahuan dan keterampilan peserta sebelum dan sesudah pelaksanaan program serta menginterpretasikan tanggapan peserta selama kegiatan berlangsung. Hasil kegiatan menunjukkan bahwa tingkat pengetahuan peserta tentang pengelolaan sampah organik meningkat dari 46,7% menjadi 86,7% setelah mengikuti program. Selain itu, keterampilan peserta dalam memproduksi eco-enzyme dan pupuk kompos mengalami peningkatan, dengan 83,3% peserta mampu melakukan proses produksi secara mandiri. Sebanyak 80,0% peserta juga menunjukkan komitmen untuk menerapkan praktik pengelolaan sampah berkelanjutan di lingkungan rumah tangga. Dapat disimpulkan bahwa pemberdayaan masyarakat melalui pengolahan sampah organik menjadi eco-enzyme dan pupuk kompos efektif dalam meningkatkan kesadaran lingkungan, pengetahuan, dan keterampilan masyarakat. Implikasi kegiatan ini menunjukkan bahwa model pengelolaan sampah organik berbasis pemberdayaan masyarakat dapat menjadi alternatif strategis dalam mendukung keberlanjutan lingkungan sekaligus memperkuat kemandirian dan potensi ekonomi Masyarakat

Abstract

Organic waste accumulation remains a significant environmental challenge due to inadequate waste management practices and limited public awareness regarding waste utilization. Many communities continue to dispose of organic waste without processing it into value-added products, resulting in environmental pollution and inefficient resource use. This community service study aimed to empower community members through the processing of organic waste into eco-enzyme and compost to support environmental sustainability. The study employed a participatory community empowerment approach involving 30 community members who actively participated in educational activities, practical training, mentoring, and evaluation sessions. Data were collected through observations, interviews, questionnaires, pre-tests, post-tests, and documentation. The research instruments included observation sheets, interview

guidelines, knowledge assessment questionnaires, and participant feedback forms. Data were analyzed using descriptive quantitative and qualitative techniques by comparing participants' knowledge and skills before and after program implementation and interpreting participant responses throughout the activities. The results indicated that participants' knowledge of organic waste management increased from 46.7% before the intervention to 86.7% after the program. Practical skills in producing eco-enzyme and compost improved significantly, with 83.3% of participants successfully completing the production process independently. Furthermore, 80.0% of participants demonstrated a commitment to implementing sustainable waste management practices in their households. The study concludes that community empowerment through eco-enzyme and compost production is an effective strategy for enhancing environmental awareness, strengthening waste management skills, and promoting sustainable resource utilization. The findings imply that integrated community-based organic waste management programs can serve as a practical model for fostering environmental sustainability and supporting local economic empowerment.



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INTRODUCTION

Organic waste management has become an essential component of sustainable environmental development due to its significant role in reducing waste accumulation and promoting resource recovery. Organic waste, including food residues, fruit peels, vegetable scraps, and garden waste, can be transformed into valuable products such as eco-enzyme and compost. Eco-enzyme is a multifunctional liquid produced through the fermentation of organic waste with sugar and water, offering benefits as a natural cleaner, liquid fertilizer, and biological agent for environmental management (Agustin & Widyaningrum, 2026). Compost, on the other hand, is a nutrient-rich organic fertilizer resulting from the decomposition of biodegradable materials that improves soil fertility and productivity. The integration of eco-enzyme and compost production not only minimizes environmental pollution but also strengthens community participation in sustainable waste management practices (Bashir et al., 2026; Saqib & Sadeh, 2025).

Previous studies have demonstrated that the conversion of organic waste into eco-enzyme contributes significantly to waste reduction and environmental improvement. (Salvi et al., 2024) reported that household organic waste fermentation into eco-enzyme reduced organic waste accumulation by more than 50% while producing environmentally friendly by-products. Similarly, (Mulasari et al., 2024) found that community-based organic waste treatment programs reduced landfill-bound waste by approximately 40–60%. Furthermore, research conducted by (Barman et al., 2022) revealed that eco-enzyme production from kitchen waste generated a substantial reduction in household waste disposal while promoting environmentally responsible behavior among community members. These findings indicate that eco-enzyme production can serve as an effective strategy for mitigating waste management challenges and supporting environmental sustainability (Varshini & Gayathri, 2023).

The implementation of community empowerment programs in organic waste management has also shown positive outcomes in improving environmental awareness and practical skills. (Nurhikmah & Hamidah, 2022) reported that eco-enzyme training activities increased participants' knowledge levels from 45% before the intervention to 85% after the program. Likewise, Wulandari et al. (2023) found that community mentoring programs

improved participants' waste processing skills by 72%, enabling them to independently produce environmentally beneficial products. In another study, (Luo et al., 2022) observed that approximately 80% of participants were able to continue eco-enzyme production independently following technical training and continuous assistance. These results suggest that educational and participatory approaches are critical factors in enhancing community capacity for sustainable waste management.

Beyond environmental benefits, organic waste processing has considerable economic potential for local communities. (Lunag & Elauria, 2024) demonstrated that households involved in community-based compost production experienced an average income increase of 25% within six months of program implementation. Similarly, (Bidzakin et al., 2023) reported that the commercialization of eco-enzyme and organic fertilizer products generated additional monthly income ranging from IDR 500,000 to IDR 1,500,000 for community members. Moreover, (Ansar et al., 2025) found that farmers utilizing compost produced from organic waste reduced their expenditure on chemical fertilizers by approximately 35%. These findings highlight the dual environmental and economic benefits of transforming organic waste into marketable and useful products.

Research has further emphasized the contribution of eco-enzyme and compost to sustainable agricultural and environmental practices. (Arma & Rembon, 2025) reported that the application of eco-enzyme as an organic fertilizer increased plant growth performance by nearly 20% compared to conventional treatments. (Al-Astani Tengku Din et al., 2025) also noted that eco-enzyme contains beneficial microorganisms that accelerate organic matter decomposition and enhance soil quality. Additionally, (Živanov et al., 2023) found that continuous application of compost increased soil organic matter content by approximately 15% after one planting season. These findings demonstrate that organic waste-derived products not only reduce environmental burdens but also contribute to the long-term improvement of ecosystem health and agricultural productivity.

Several community service initiatives have successfully promoted public participation in organic waste management through eco-enzyme and compost production. (Indrarosa et al., 2025) reported that eco-enzyme training programs increased community participation in household waste management activities by 78%. Likewise, (Shamu et al., 2025) found that community-based composting initiatives reduced organic waste generation by 35% within four months of implementation. (Kulshrestha et al., 2024) further revealed that 85% of participants expressed a commitment to continuing sustainable organic waste management practices following educational and mentoring activities. These outcomes demonstrate the effectiveness of community engagement programs in fostering environmental responsibility and sustainable waste management behavior.

The growing body of literature consistently highlights the environmental, social, and economic benefits of converting organic waste into eco-enzyme and compost. However, most existing studies and community service programs focus on either eco-enzyme production or composting activities separately, with limited attention given to integrated empowerment models that combine both approaches within a sustainable framework. Moreover, many programs emphasize short-term training without providing continuous mentoring and monitoring mechanisms to ensure long-term adoption by community members. This limitation often reduces the sustainability and effectiveness of community-based waste management initiatives over time.

Based on the findings presented above, there remains a need for a comprehensive community empowerment model that integrates education, practical training, hands-on implementation, and continuous assistance in the processing of organic waste into eco-enzyme and compost. The novelty of this community service program lies in its integrated approach that simultaneously promotes environmental awareness, waste reduction, resource utilization, and community economic empowerment through sustainable organic waste management practices. Therefore, this study aims to enhance community knowledge, skills, and participation in processing organic waste into eco-enzyme and compost while supporting environmental sustainability and fostering a cleaner, healthier, and more sustainable community.

IMPLEMENTATION METHOD

This community service program employed a participatory empowerment approach aimed at enhancing community knowledge and skills in processing organic waste into eco-enzyme and compost to support environmental sustainability. The activity was conducted through a series of educational, training, practical, and mentoring stages involving community members as active participants throughout the program. The empowerment approach emphasizes community participation in identifying problems, implementing solutions, and maintaining sustainable environmental practices (He et al., 2024). The target participants consisted of local community members, household representatives, and youth groups who were directly involved in household waste management activities. The implementation was carried out over a predetermined period through collaborative engagement between the service team and community stakeholders (Prastya et al., 2025).

The program began with a preliminary assessment to identify the community's level of knowledge, attitudes, and practices regarding organic waste management. Data were collected through observations, informal interviews, and discussions with community leaders and participants to determine existing challenges and opportunities. Based on the assessment results, educational materials and practical training modules were developed, focusing on the principles of waste segregation, eco-enzyme production, composting techniques, environmental conservation, and the economic potential of recycled organic waste. Educational sessions were delivered through interactive lectures, group discussions, and demonstrations to facilitate participants' understanding and engagement during the learning process (Dontas et al., 2024).

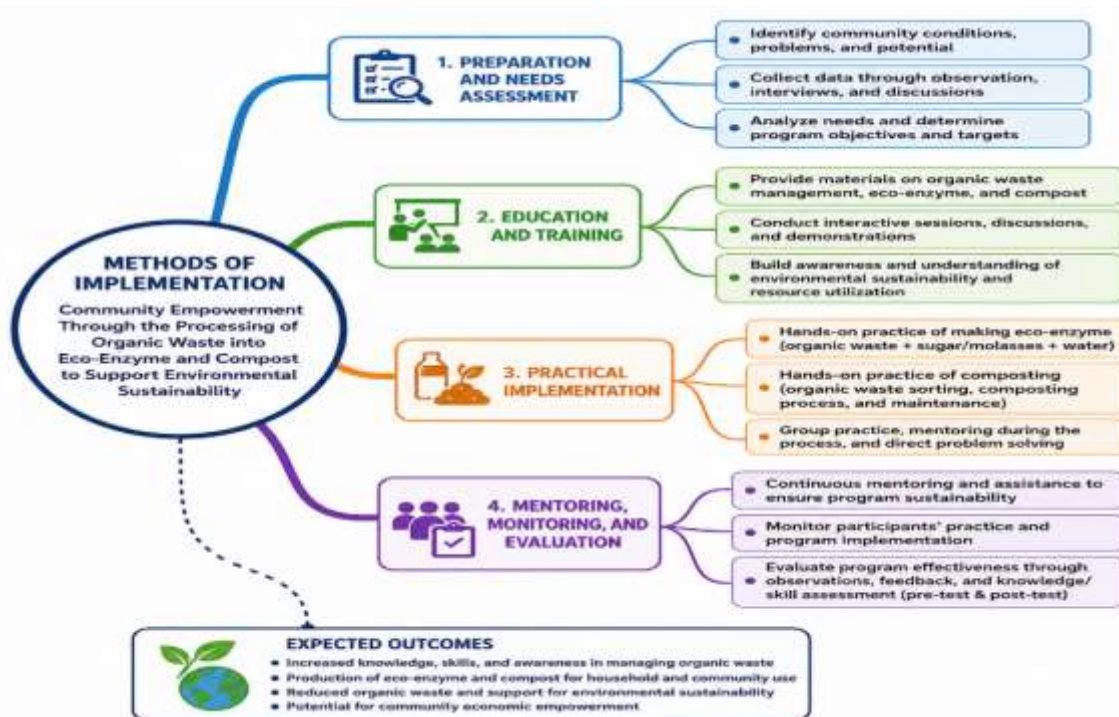


Figure 1. Implementation Method

Following the educational sessions, participants were involved in hands-on training activities to produce eco-enzyme and compost using locally available organic waste materials. During the eco-enzyme production process, participants learned to prepare organic waste, brown sugar or molasses, and water according to the recommended fermentation ratio. Simultaneously, composting training introduced participants to organic waste sorting, compost pile preparation, decomposition monitoring, and compost harvesting techniques. Practical activities were conducted in small groups under the supervision of the service team to ensure proper implementation and maximize participant involvement. This experiential learning strategy was adopted to strengthen participants' technical competencies and encourage the adoption of environmentally responsible behaviors (Prastya et al., 2025).

The final stage consisted of mentoring, monitoring, and evaluation activities designed to assess program effectiveness and sustainability. Continuous assistance was provided to participants during the implementation phase to address technical difficulties and encourage consistent application of the acquired knowledge and skills. Program evaluation was conducted through observations, participant feedback, and comparisons of participants' knowledge and practical abilities before and after the intervention. The evaluation results were analyzed descriptively to determine improvements in community awareness, participation, and capacity in managing organic waste through eco-enzyme and compost production. The outcomes of this community service program are expected to contribute to sustainable environmental management while fostering community empowerment and self-reliance in waste utilization practices.

RESULTS AND DISCUSSION

The community service program was successfully implemented with active participation from community members throughout all stages of the activities. Participants demonstrated

strong enthusiasm during educational sessions, practical training, and mentoring activities related to organic waste management (Indrarosa et al., 2025). Initial observations revealed that most participants had limited knowledge regarding the utilization of household organic waste and primarily disposed of organic residues together with other domestic waste. This condition highlighted the necessity of introducing practical and sustainable waste management strategies that could be easily adopted at the household level (Lunag & Elauria, 2024).

The educational activities significantly improved participants' understanding of environmental issues associated with improper waste disposal. During discussion sessions, participants gained knowledge regarding waste segregation, environmental pollution, and the benefits of converting organic waste into valuable products. The interactive learning approach encouraged participants to share their experiences and discuss local environmental challenges. This finding supports the argument of (Barman et al., 2022) that participatory learning approaches enhance community engagement and facilitate knowledge transfer more effectively than conventional one-way communication methods.

One of the major outcomes of the program was the successful implementation of eco-enzyme production training. Participants learned how to prepare organic waste materials, measure the required proportions of molasses, water, and organic matter, and conduct the fermentation process according to recommended procedures (Ansar et al., 2025). At the end of the practical session, participants demonstrated the ability to independently prepare eco-enzyme mixtures for household application. The hands-on learning approach enabled participants to directly experience the production process, thereby increasing their confidence and technical competence in managing organic waste (Arma & Rembon, 2025).

The composting training activities also produced positive outcomes. Participants successfully practiced waste sorting, compost pile preparation, moisture regulation, and decomposition monitoring techniques. Through direct involvement in compost production, participants developed a better understanding of biological decomposition processes and nutrient recycling. The resulting compost was considered suitable for application in household gardens and community green spaces. These findings are consistent with previous studies indicating that practical composting activities contribute to improved environmental awareness and sustainable agricultural practices (Shamu et al., 2025).

An important result of the program was the increased awareness of environmental sustainability among participants. During mentoring sessions, participants expressed greater concern regarding the environmental impacts of unmanaged organic waste and demonstrated a willingness to adopt environmentally friendly practices (Živanov et al., 2023). Several participants reported beginning waste segregation activities at home and encouraging family members to participate in waste reduction efforts. This behavioral change suggests that community empowerment programs can effectively influence environmental attitudes and promote long-term sustainable practices (Varshini & Gayathri, 2023).

The economic potential of eco-enzyme and compost production emerged as another significant finding. Participants recognized that organic waste, previously considered useless, could be transformed into products with practical and economic value. Eco-enzyme can be utilized as a natural cleaning agent, liquid fertilizer, and pest control solution, while compost can reduce dependence on commercial fertilizers. The discussion sessions revealed participants' interest in developing small-scale community enterprises based on organic waste processing. Such findings support previous studies highlighting the economic benefits of community-based waste management initiatives (Mulasari et al., 2024).

Continuous mentoring played a crucial role in ensuring the effectiveness of the program. Participants frequently consulted the service team regarding fermentation procedures, compost maturity indicators, and product utilization techniques. The mentoring process helped address technical challenges and reinforced participants' motivation to continue implementing the acquired skills. According to (Luo et al., 2022) experiential learning theory, continuous guidance and reflection are essential for transforming practical experiences into sustainable knowledge and behavior change. Therefore, the mentoring component significantly contributed to the long-term success of the program.

From an environmental perspective, the program contributed to reducing the volume of organic waste generated by participating households. By converting kitchen waste and biodegradable materials into eco-enzyme and compost, participants reduced the amount of waste disposed of through conventional methods. This outcome supports the principles of the circular economy, where waste materials are reintroduced into productive cycles rather than becoming environmental pollutants. The integration of waste reduction and resource recovery practices represents a practical strategy for supporting environmental sustainability at the community level (Salvi et al., 2024).

Overall, the results demonstrate that community empowerment through organic waste processing provides environmental, educational, and economic benefits simultaneously. The combination of educational activities, practical training, and continuous mentoring successfully improved participants' knowledge, skills, and environmental awareness. Furthermore, the integration of eco-enzyme and compost production offers an innovative approach to sustainable waste management by transforming household organic waste into valuable resources. These findings indicate that similar community-based programs can be replicated in other communities to strengthen environmental sustainability, promote responsible waste management practices, and support local economic development (Agustin & Widyaningrum, 2026; Bidzakin et al., 2023).

CONCLUSION

The community empowerment program through the processing of organic waste into eco-enzyme and compost demonstrated that participatory educational approaches combined with practical training and continuous mentoring can effectively enhance community capacity in sustainable waste management. The integration of knowledge transfer, hands-on experience, and community engagement encouraged participants to recognize organic waste as a valuable resource rather than an environmental burden. As a result, the program fostered greater environmental awareness, strengthened practical waste management skills, and promoted more responsible environmental behavior within the community.

Furthermore, the implementation of eco-enzyme and compost production illustrates that community-based organic waste utilization can serve as a sustainable strategy for simultaneously addressing environmental, social, and economic challenges. The transformation of household organic waste into useful products supports the principles of environmental sustainability while creating opportunities for local empowerment and resource efficiency. Therefore, an integrated empowerment model that combines education, practice, and long-term assistance can be considered an effective approach for developing environmentally responsible communities and promoting sustainable waste management practices in broader societal contexts.

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