Indonesia Berdaya, 7(2) 2026: 483-488
https://doi.org/10.47679/ib.20261441

P-ISSN 2502-4825
E-ISSN 2502-9495

Empowering Community for Liquid Compost Production from Household Waste at the "Restu Ibu" Waste Bank in Yogyakarta, Indonesia

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Published online: 2 Februari 2026

ABSTRACT

Community-based waste banks play a crucial role in promoting sustainable waste management and local economic empowerment. The "Restu Ibu" waste bank in Sambilegi, Sleman Regency, faces challenges related to limited product innovation, human resource capacity, and economic aspects, particularly product pricing and commercialization. This community engagement program aimed to enhance the technical skills and pricing determination capabilities of female waste bank members through applied chemical innovation and economic capacity building. The program employed offline counseling and hands-on training focused on producing liquid compost fertilizer from household organic waste using simple batch reactors made from locally available materials. Program effectiveness was evaluated through post-test assessments, participant interaction, interviews, and reviews of financial records. The results showed a 100% increase in participants' knowledge of liquid compost production and reactor concepts, with comprehension levels improving from low (scores 1–2) to high (scores 3–4) among 88% of participants. Active engagement during training further indicated effective knowledge transfer. Overall, the program strengthened individual and institutional capacity, supported sustainable organic waste valorization, and enhanced the potential of the waste bank to contribute to local economic development and tourism-oriented community initiatives.

Keywords: Community-Based Waste Bank; Liquid Compost Fertilizer; Capacity Building; Organic Waste Valorization; Sustainable Waste Management

INTRODUCTION

The "Restu Ibu" waste bank is one of the community-based waste management facilities located in Sambilegi. Established in 2017, the waste bank is managed by a team of ten administrators and currently serves 102 registered households. The facility has been equipped with assets comprising two sewing machines, two weighing scales, and two handcarts, which were granted by the Sleman Regency Environmental and Forestry Agency, Special Region of Yogyakarta (Kapanewon Depok, 2024). Despite its operational capacity, the waste bank faces several challenges, including limited innovation in waste-derived products, suboptimal human resource management, and constraints in product marketing..

The waste collected by this waste bank consists primarily of household waste, including inorganic materials (such as plastics and related materials) and organic waste (including food residues and coconut pulp). Coconut pulp has considerable potential as an alternative raw material for wheat flour substitution. Flour derived from coconut pulp is considered safer for consumption by individuals with diabetes and obesity due to its gluten-free properties (Budiarti et al., 2023). The "Restu Ibu" waste bank has received support from the Sleman Environmental Agency (DLH Sleman) in the form of a waste shredding machine and has previously participated in eco-enzyme training provided by external institutions. However, the members continue to experience difficulties in applying the

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acquired knowledge to product development, determining appropriate pricing strategies, and implementing effective marketing approaches.

Sambilegi Hamlet, located in Maguwoharjo Village, Depok Sub-district, Sleman Regency, is situated in close proximity to Adi Sucipto International Airport, Transmart, and several hotels, making it highly accessible to visitors from outside Yogyakarta. Maguwoharjo Village is one of the villages in Depok Sub-district, covering a total area of 15.01 km² (Badan Pusat Statistik, 2024). As Sambilegi Hamlet is planned to be developed into a tourism village, the "Restu Ibu" waste bank plays a strategic role in supporting this initiative by producing and marketing innovative value-added products derived from waste materials. Previous community engagement programs conducted by the project team included training on coconut pulp flour production, natural food colorant preparation, muffin production using coconut pulp flour, and digital marketing (Budiarti et al., 2022; Evitasari et al., 2021; Rahmadewi et al., 2023). The products developed through these training activities have been marketed during local exhibitions and events in Sambilegi.To ensure the sustainability of the program, further training focusing on product innovation and commercialization strategies will be implemented.

Based on the previously described situational analysis, the partner's challenges can be classified into three main categories: technological innovation, human resources, and economic aspects, particularly marketing and product pricing. Following a joint discussion between the partner and the project team, two priority areas were identified for focused intervention. The first priority lies in the technological domain, specifically the development of applied chemical product innovations aimed at diversifying and enhancing the value of waste bank products. The second priority concerns the economic domain, with an emphasis on determining appropriate product pricing through accurate calculation of the cost of goods sold (COGS). The objective of this community engagement program is to provide structured training for female members of the "Restu Ibu" waste bank to enhance their technical skills and pricing determination capabilities, thereby improving community welfare and increasing the income of the waste bank.

LITERATURE OR CONCEPTUAL REVIEW

Liquid compost fertilizer is a solution produced from the decomposition of organic materials derived from plant residues, animal manure, and human food waste, containing multiple essential nutrient elements (Yudha et al., 2025). Compared to solid compost, liquid compost fertilizer offers several advantages, including faster infiltration into the soil, more efficient nutrient uptake by plants, and greater practicality in application. The equipment used in the production of liquid compost fertilizer includes plastic buckets, knives, stirring rods, blenders, gloves, and bottles. The materials required consist of organic waste (such as food scraps, spoiled vegetables, and rotten fruits), well water, palm sugar, and rice washing water (Danga et al., 2024; Darmayani et al., 2023; Pitjamit et al., 2025; Ramadhani et al., 2025)

MATERIALS AND METHODS

The implementation method employed in this program comprised counseling sessions and hands-on training or demonstrations, conducted through offline (face-to-face) activities. The counseling method was applied to provide participants with additional theoretical knowledge related to the program objectives. Following the counseling sessions, practical training or direct demonstrations were conducted to enhance participants' technical skills. Evaluation was carried out after the completion of the training activities to assess the extent to which participants' understanding and skills had improved. The evaluation aimed to measure the achievement of learning outcomes and the effectiveness of the program implementation.

In general, the procedure for producing liquid compost fertilizer is as follows. First, large-sized organic waste is chopped into smaller pieces to increase the surface area for decomposition. The processed organic waste is then weighed to obtain 4 kg of material. Subsequently, 300 mL of prepared papaya-based local microorganisms (MOL) is added into a bottle, followed by the addition of 1 L of well water, and the mixture is stirred until homogeneous. The household organic waste is then placed into a composter and mixed thoroughly with the papaya-based MOL solution, after which the composter is tightly sealed. Daily stirring is carried out to release excess heat and to accelerate the decomposition and degradation of organic matter. Finally, the composter is resealed and the mixture is allowed to ferment for 15 days until the compost reaches maturity (Amelia et al., 2019).

This training program comprised counseling sessions and hands-on practice on the production of compost fertilizer derived from food waste, with a total duration of 400 minutes. The training was delivered by Dr. Siti Salamah, M.Si., whose expertise lies in chemical engineering, particularly in environmental engineering and waste treatment. The activity was scheduled to be conducted on 8 March 2025 during the even semester of the 2024/2025 academic year. Technical assistance, including activity implementation and documentation, was provided by three undergraduate students. Evaluation was conducted at the end of the training through post-test assessments and direct interactions with participants. Post-activity evaluation was further carried out through interviews and direct observation of partner progress, particularly by reviewing the partner's financial reports to assess program impacts on economic performance.

RESULTS AND DISCUSSION

The implementation method employed in this program comprised counseling sessions and hands-on training or demonstrations, conducted through offline (face-to-face) activities. The counseling method was applied to provide participants with additional theoretical knowledge related to the program objectives. Following the counseling sessions, practical training or direct demonstrations were conducted to enhance participants' technical skills. Evaluation was carried out after the completion of the training activities to assess the extent to which participants' understanding and skills had improved. The evaluation aimed to measure the achievement of learning outcomes and the effectiveness of the program implementation.

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DISCUSSION

The significant improvement observed in participants' knowledge and comprehension reflects the effectiveness of the applied pedagogical approach, which combined participatory counseling with experiential, hands-on learning. The 100% increase in understanding of liquid compost production and reactor concepts indicates that the training successfully addressed fundamental knowledge gaps among participants, particularly in introducing unfamiliar technical terminology such as batch reactors. This finding is consistent with adult learning theory, which emphasizes the importance of contextualized and practice-oriented instruction to facilitate knowledge acquisition among community learners.

The substantial shift in comprehension levels from predominantly low scores (1–2) prior to the training to higher scores (3–4) after the intervention demonstrates not only short-term knowledge transfer but also the development of participants' cognitive confidence in applying the learned concepts. Active engagement during question-and-answer sessions further suggests that the training environment encouraged critical inquiry and peer interaction, both of which are essential components of effective capacity building.

From a capacity-building perspective, the training contributed to strengthening participants' technical competencies in organic waste valorization, thereby enhancing their readiness to independently implement liquid compost production within the waste bank operations. The use of locally available materials and simple reactor designs reinforced the sustainability of the intervention by reducing technological barriers and promoting replicability. Consequently, the program not only improved individual skills but also supported institutional capacity at the community level, enabling the waste bank to expand its role in sustainable waste management and value-added product development (Hashimy et al., 2023).

CONCLUSIONS

This study demonstrates that participatory training combining counseling and hands-on practice is an effective approach for strengthening the technical and economic capacities of community-based waste banks. The liquid compost fertilizer training successfully addressed critical knowledge gaps and significantly improved participants' understanding of organic waste processing and simple reactor systems. The substantial increase in comprehension levels and active participant engagement highlight the effectiveness of experiential learning in community capacity-building initiatives. From a broader perspective, the program contributed to enhancing the institutional capacity of the "Restu Ibu" waste bank by equipping its members with practical skills in organic waste valorization using accessible and replicable technologies. These outcomes support the sustainability of waste bank operations and their potential contribution to local economic development, particularly in the context of Sambilegi's planned transformation into a tourism village. Future programs should expand product innovation and strengthen marketing and pricing strategies to further increase the economic impact and long-term sustainability of community-based waste management initiatives..

Acknowledgments

The authors gratefully acknowledge the financial support provided by Universitas Ahmad Dahlan through the Community Engagement (PkM) Program under Contract Number U.12/SPK-PkM-MONOTAHUN-22/LPPM-UAD/XI/2024. The authors also express sincere gratitude to the "Restu Ibu" waste bank as the program partner, particularly to the waste bank advisor Mrs. Rosdiana, S.T., M.Eng., and the head of the "Restu Ibu" waste bank, Mrs. Elis, for their valuable support and collaboration. Appreciation is further extended to the students Annisa Syifa Andara and Bunga for their essential technical assistance during the implementation of the program.

Conflict of Interests

Tim penulis menyatakan bahwa tidak ada potensi konflik kepentingan terkait kepengarangan dan publikasi untuk artikel ini.

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