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Community Training in Vermicompost and Vermiwash Production from Organic Waste in Pedakbaru, Bantul, Special Region of Yogyakarta

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Abstract

Increasing household food waste in the Special Region of Yogyakarta results from changing consumption patterns and excessive portion sizes. Effective household organic waste management is therefore essential to minimize its environmental impact. This community service activity, carried out by the Faculty of Biotechnology, Duta Wacana Christian University, addressed the problem of household organic waste in Pedakbaru RW07, Karangbendo, Banguntapan, Bantul. Through education that links waste challenges with actionable solutions based on organic waste processing, participants learned to convert kitchen scraps into valuable resources. The training successfully enabled 25 participants to produce vermicompost and vermiwash from household organic waste using repurposed containers, demonstrating a practical and scalable approach to waste reduction. This outcome reflects the value of collaboration between university stakeholders and residents in adopting sustainable, locally adapted waste management practices.

Keywords: *household organic waste, vermicompost, vermiwash, waste management*

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Introduction

Consumption patterns in the Special Region of Yogyakarta have intensified, contributing to higher volumes of household food waste (Pambudi, 2025). According to the National Waste Management Information System (SIPSN), 75,29% of waste in Bantul Regency originates from households, with food waste accounting for 58,47% of the total composition (Ministry of Environment and Forestry of the Republic of Indonesia, 2024). Data from the Yogyakarta City Sanitation Office (2016-2024), published by BPS DIY publication (2024), indicate that only 60,34% of daily waste was managed in 2023, with 181.37 m^3/ton transported against a total daily generation of 300.56 m^3/ton. This imbalance leads to persistent waste accumulation. Excessive food consumption beyond actual needs further exacerbates the problem (FAO, 2015). Household level organic waste management offers a practical solution to mitigate these impacts. Composting converts food waste into nutrient rich fertilizer, reducing reliance on chemical inputs and enhancing soil fertility (Widowati et al., 2022).

Organic materials such as cow manure and sago pulp are readily available and suitable for composting (Sacita & Ichsania, 2021). Combined with kitchen waste, they improve soil structure over time (Yang et al., 2020). Earthworm-based systems, in particular, yield higher nutrient content than conventional methods.

Vermicompost is the decomposed material produced as earthworms digest organic waste in their gut (Khairani et al., 2022). A liquid by-product, vermiwash, is also generated through moisture movement during the process (Awadhpersad et al., 2021). When properly managed, these outputs support efficient and environmentally sound agricultural practices. In response to Yogyakarta's waste challenges, residents of Pedakbaru RW07 were engaged in a community-based solution to process unmanaged organic waste.

The Faculty of Biotechnology, Duta Wacana Christian University provided training on household organic waste processing using vermicompost and vermiwash methods. The activity aimed to equip residents with skills to preserve the environment and generate economic value from compost and worms. The approach was grounded in prior laboratory testing of fertilizer quality, and training emphasized the use of cow manure, sago pulp, and household waste to enhance community capacity in sustainable waste management.

Methods

This community service program was conducted in Pedakbaru RW07, Karangbendo, Banguntapan, Bantul, on June 1, 2025. The program aimed to involve and train the local community through planned activities. The focus of the activity is entered on training activities on processing household organic waste in collaboration with the surrounding community to increase awareness of the importance of sorting and processing household organic waste. This activity, in addition to utilizing household organic waste, also repurposes used gallon bottles cut in half as containers for the composting process. This training uses materials such as cow manure, sago pulp, and household organic waste collected by residents. These materials are then arranged in sequence, and *Eisenia fetida* worms are added to mix the organic materials to produce compost.

This activity was held in the meeting room of Pedakbaru residents RW07, Karangbendo, Banguntapan, Bantul. Before the training, it began with a seminar attended by RW07 residents and the academic community of the S1 Biotechnology study program at Duta Wacana Christian University. This seminar was conducted to provide knowledge about what organic materials can be used in the vermicompost method. This activity was attended by biotechnology lecturers who focus on sustainable waste treatment and environmental conservation, namely Dra. Haryati B Sutanto, M.Sc., and Drs. Kisworo, M.Sc, as well as architecture lecturers who focus on urban design and residential architecture, namely Dr.-Ing. Ir. Paulus Bawole, MIP. The design of the training activities can be seen in Figure 1.

This program, which was held on Sunday, June 1, 2025, trained the community in processing household organic waste that is not disposed of in landfills. Cooperation between communities played an important role in the implementation of this activity.

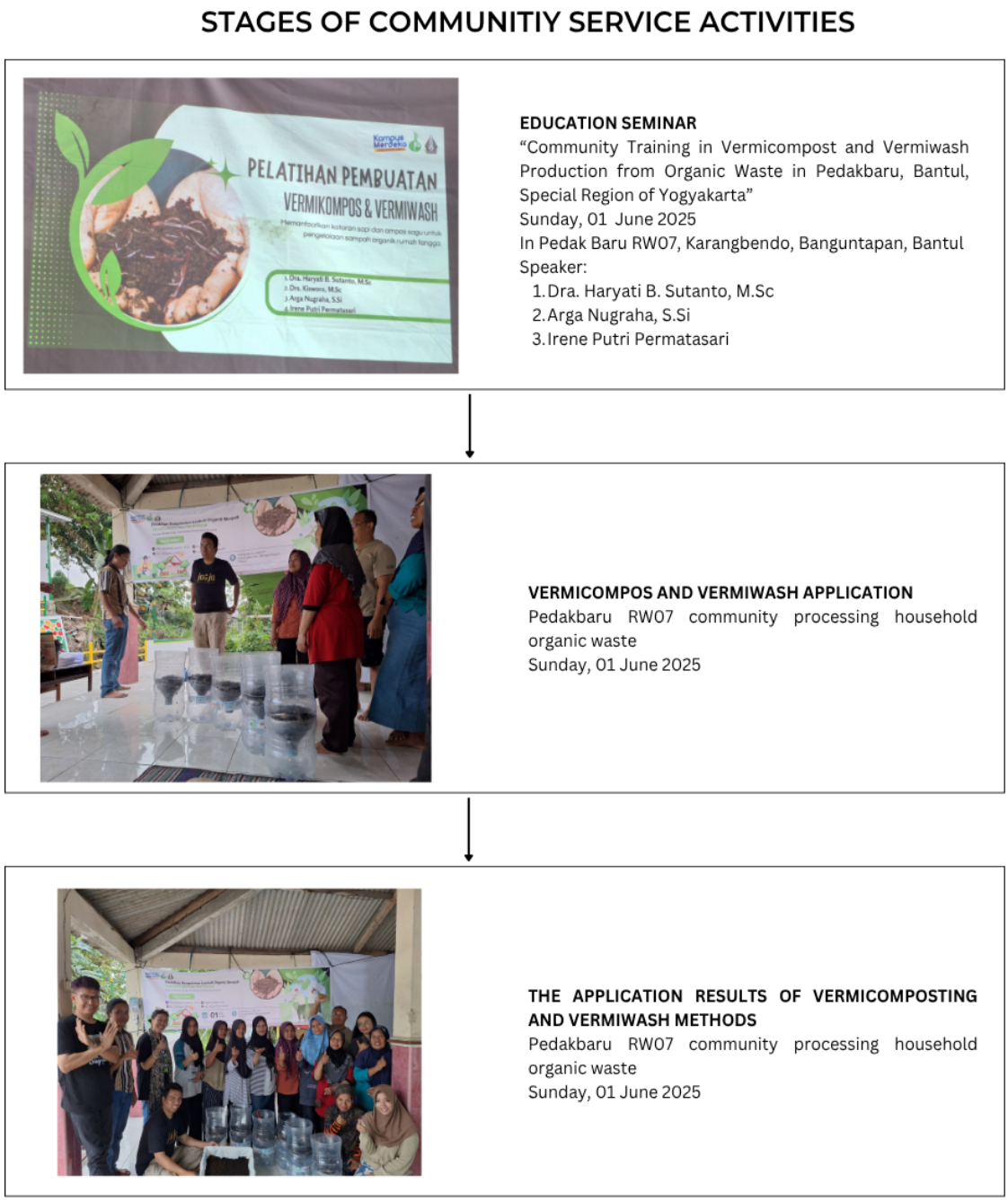

Fig. 1. Stages of community service at Pedakbaru RW07

Results and Discussions

Results

Twenty-five residents of Pedakbaru RW07 actively participate in the training. As part of preparation, they collectively gathered approximately one large sack (1-2 kg) of dried leaves to serve as carbon-rich "brown" material for balancing kitchen waste.

Composting was maintained for 1-2 months, with regular monitoring by participants. Figure 2 shows the final products, mature vermicompost (dark, crumbly, earthy smelling) and clear, amber coloured vermiwash, both suitable for home gardening.

Fig. 2. Final vermicompost (left) and vermiwash (right) produced from household organic waste after 8 weeks of composting

Figure 3 displays *Eisenia fetida* earthworms harvested from the units, confirming natural population growth and system sustainability. Participants demonstrated high engagement, they asked detailed questions, volunteering for hands-on practice, and expressed strong intent to replicate the method at home. This activity involvement reflects increased awareness and practical readiness to adopt sustainable waste practices.

Fig. 3. *E. fetida* earthworms harvested from vermicomposting units, demonstrating self-sustaining worm population growth

Discussions

Commonly used organic waste treatment solutions are anaerobic composting and decomposition (Thao et al., 2022). To overcome the problem of household organic waste in Pedakbaru RW07, Karangbendo, Banguntapan, Bantul, the composting method using earthworms called vermicompost was applied. The result of vermicompost is in the form of solid organic fertilizer with by-products in the form of liquid organic fertilizer called vermiwash. This method produces organic fertilizer content that can promote plant growth (Mishra et al., 2022). This is because the vermicompost method produces better content compared to the conventional methods. Vermicompost and vermiwash have better content because the decomposition of organic matter is processed with the help of earthworms. Vermicompost has long-term effectiveness influenced by factors such as pH, organic carbon content, and nutrients. These factors affect micronutrient availability in plants (Oyege & Balaji Bhaskar, 2023). Vermiwash plays an important role in plant growth and development by contributing to root initiation, root improvement, plant development, and increasing the growth rate and production yield of plants (Deepthi et al., 2021).

The vermicompost method applied to the community in Pedakbaru RW07, Karangbendo, Banguntapan, Bantul, illustrates collaboration and innovation that can be applied on a household scale. The content of vermicompost is produced from organic matter that earthworms process with the help of microorganisms. The nutrient-rich composition of waste makes it ideal for the processing of vermicompost. Kitchen waste is referred to as "green materials", consisting of food scraps, such as vegetables and fruits peels, while “brown materials” refers to dry, carbon-rich organic waste such as dried leaves, shredded paper, or sawdust (Sulaiman et al., 2022). According to Srivastava (2020), the mixture of dry organic matter from municipal waste with cow manure can produce effective compost. Household organic waste provides a need for earthworms and microorganisms, so the decomposition of organic matter will produce compost.

The main result of the enthusiasm of the residents of Pedakbaru RW07 is the increase in public awareness about environmental issues that have an impact on the lives of the surrounding community. This activity involved 25 participants, including the academic community. In addition, this activity fosters a sense of shared responsibility between residents in Pedakbaru

RW07. By involving residents in every stage of processing household organic waste, thereby creating a sense of responsibility for the environment.

The community training in Pedakbaru RW07 successfully demonstrated that household-scale vermicomposting is a feasible and practical solution for managing organic waste in an urban village. As observed during the 1 – 2-month implementation period, 25 residents actively participated in hands-on session and independently maintained their composting units using repurposed plastic containers. The process yielded mature vermicompost characterized by a dark, crumbly texture and earthy odor and clear, amber coloured vermiwash, both of which are suitable for home gardening (Figure 2). Additionally, earthworm populations increased naturally during the process, confirming the self-sustaining nature of the system (Figure 3).

This outcome aligns with findings from Mishra et al. (2022), who reported that vermicompost produced through earthworm activity contains higher levels of organic carbon, nitrogen, and micronutrients compared to conventional compost. In our case, the method relied on locally available materials: “green” components (kitchen scraps such as fruit and vegetable peels) and “brown” components (dry organic matter like dried leaves and shredded paper). Prior to training, participants collectively gathered approximately one large sack (1-2kg) of dried leaves, which served as the primary carbon source to balance moisture and nutrient content—ensuring optimal decomposition conditions without external inputs.

These outcomes demonstrate that community-based vermicomposting is not only technically feasible but also socially sustainable. The residents’ continued engagement after the training highlights a shift from awareness to consistent practice, showing long-term potential for local waste reduction. Unlike large-scale waste treatment systems that require infrastructure and municipal support, this model leverages household participation and low-cost materials—making it highly adaptable to similar communities in the Special Region of Yogyakarta. The collaboration between academic and residents fostered a sense of shared responsibility, as seen in collective material preparation and peer-to-peer knowledge sharing.

Conclusion

This community service initiative successfully demonstrated that household-scale vermicomposting is a practical and sustainable approach to managing organic waste in

Pedakbaru RW07, Bantul. Over a 1 – 2-month period, 25 residents learned to convert kitchen scraps into nutrient-rich vermicompost and vermiwash using a repurposed container. The process supported natural earthworm reproduction, confirming the system's self-sustaining potential. Participants' active engagement through questioning, hands on practice, and expressed intent to continue indicates strong community readiness for adoption. While scalability to other areas is promising, it requires attention to material access, initial training quality, and follow-up support. This initiative underscores the value of university community collaboration in developing locally relevant, low-cost environmental solutions.

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Special thanks are due to the community leaders of RW07, particularly the RT heads and the neighbourhood facilitators, whose logistical coordination and warm hospitality created a conducive environment for knowledge exchange. Their proactive involvement from venue preparation to participant mobilization was instrumental in ensuring high attendance and active participation.

We also acknowledge the invaluable contribution of the undergraduate students from the Biotechnology Study Program (Class of 2023), who assisted in material preparation, demonstration setup, documentation, and post-training follow up. Their enthusiasm and hands-on support exemplify the spirit of service learning that bridges academic theory with real world application.

Finally, we thank the residents of Pedakbaru RW07 not only as participants but as co-creators of these sustainable solutions. Their curiosity, willingness to experiment, and feedback during the training have provided us with rich qualitative insights that will inform future literature of

similar programs. Their journey from waste generators to resource managers embodies the transformative power of community-based environmental education.

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