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EDUCATION AND INNOVATION PROGRAM FOR WASTE MANAGEMENT INTO ORGANIC COMPOST FERTILIZER

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Abstract

This community service activity was prompted by the still low levels of public awareness and skills in managing organic waste, particularly in Mluweh Village, East Ungaran District, which has the potential to cause environmental problems. Therefore, this activity aims to increase the knowledge, skills, and awareness of the community in independently and sustainably processing organic waste into compost. The implementation methods included several stages: preparation through surveys and coordination with village authorities, dissemination to provide the community with initial understanding, compost-making training through demonstrations and hands-on practice, as well as monitoring and evaluation to assess the program's success and sustainability. This activity involved a team of KKNT lecturers and students collaborating with village officials, PKK, youth organizations, and farmer groups. The implementation results showed an increase in community understanding and skills in processing organic waste into compost. In addition, the community has started to independently make compost and use it for agricultural and home garden needs. This activity also succeeded in raising public awareness of the importance of environmentally friendly waste management. Thus, this service program has made a positive contribution by reducing organic waste while supporting the creation of a clean, healthy, and sustainable environment

***Keywords**: Community Service, Waste Management, Compost Fertilizer*

Abstrak

Kegiatan pengabdian kepada masyarakat ini dilatarbelakangi oleh masih rendahnya kesadaran dan keterampilan masyarakat dalam mengelola sampah organik, khususnya di Desa Mluweh, Kecamatan Ungaran Timur, yang berpotensi menimbulkan permasalahan lingkungan. Oleh karena itu, kegiatan ini bertujuan untuk meningkatkan pengetahuan, keterampilan, serta kesadaran masyarakat dalam mengolah sampah organik menjadi pupuk kompos secara mandiri dan berkelanjutan. Metode pelaksanaan kegiatan meliputi beberapa tahapan, yaitu persiapan melalui survei dan koordinasi dengan pihak desa, sosialisasi untuk memberikan pemahaman awal kepada masyarakat, pelatihan pembuatan kompos melalui demonstrasi dan praktik langsung, serta monitoring dan evaluasi untuk menilai keberhasilan dan keberlanjutan program. Kegiatan ini melibatkan tim dosen dan mahasiswa KKNT yang bekerja sama dengan perangkat desa, PKK, karang taruna, dan kelompok tani. Hasil pelaksanaan menunjukkan adanya peningkatan pemahaman dan keterampilan masyarakat dalam mengolah sampah organik menjadi kompos. Selain itu, masyarakat mulai menerapkan pembuatan kompos secara mandiri dan memanfaatkannya untuk kebutuhan pertanian dan tanaman pekarangan. Kegiatan ini juga berhasil meningkatkan kesadaran masyarakat terhadap pentingnya pengelolaan sampah yang ramah lingkungan. Dengan demikian, program pengabdian ini memberikan kontribusi positif dalam mengurangi limbah organik sekaligus mendukung terciptanya lingkungan yang bersih, sehat, dan berkelanjutan.

Kata kunci: Pengabdian Kepada Masyarakat, Pengolahan Sampah, Pupuk Kompos.

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INTRODUCTION

The issue of waste continues to be a crucial problem faced by various regions in Indonesia, both in urban and rural areas. The increase in population, changes in consumption patterns, and low environmental awareness are the main factors contributing to the annual rise in waste volume (Arief Yulianto et al., 2025; Samin & Sunarto, 2024). Based on data from the National Waste Management Information System (SIPSN), waste production in Indonesia reaches tens of millions of tons per year, with a significant portion not being optimally managed. This condition shows that waste management is not only the responsibility of the government but also requires the active role of the community as the main actors in maintaining the environment ((Anita Sriwaty Pardede et al., 2026; Imam Sudarmaji et al., 2025). Without community involvement, various waste management programs that are designed will not run effectively and sustainably (Anindyntha et al., 2021; Dewi et al., 2023; Fauziah et al., 2024; Muhammad Julian & Ayu Pratiwinindya, 2025).

In addition, the problem of waste is often caused by the low awareness of the community in sorting and managing household waste. Many people still mix organic and inorganic waste, then dispose of it directly into landfills without any prior processing (Arief Yulianto et al., 2025; Pratiwi, 2022). This is also found in various rural areas in Indonesia, where the waste management system is still conventional and not based on community participation. The impact of these conditions not only causes environmental pollution but also has the potential to lead to health issues such as environmentally-based diseases, including diarrhea, respiratory infections, and skin diseases. Therefore, an approach that is not only technical but also educational and participatory is needed to raise public awareness.

One of the approaches deemed effective in addressing this issue is thru community empowerment based on education and innovation in waste management. Community empowerment is a process aimed at enhancing the capacity, awareness, and independence of the community in managing the potential they possess, including in environmental management (Melia Anisa Putri et al., 2025; Ni Putu Saras Arya Pratami & Ni Made Utami Dwipayanti, 2025; Rahmadda, 2022; Tumimomor & Lasso, 2024) In the context of waste management, empowerment can be carried out thru outreach activities, training, and

continuous mentoring. Research shows that educational activities can significantly increase public knowledge regarding the importance of waste management and the application of the 5R principles (Reduce, Reuse, Recycle, Replace, and Rot (Juniartini, 2020; Sallo et al., 2025). With the increase in knowledge, it is hoped that there will be a change in community behavior toward a more environmentally friendly lifestyle (Ika Parma Dewi et al., 2025; Nur Ismirawati et al., 2023; Pariono et al., 2025; Syaiful Bachri et al., 2026).

In addition to education, innovation in waste management also plays an important role in supporting the success of community empowerment programs. These innovations can take the form of establishing waste banks, utilizing digital technology, or processing waste into economically valuable products such as compost and recycled crafts (Asteria & Herdiansyah, 2022a; Saqib & Sadef, 2025). The waste bank program, for example, has proven capable of increasing community participation in waste sorting while also providing economic benefits to residents (Chattaraj et al., 2025; Hettiarachchi et al., 2018). Moreover, current technological developments allow for the existence of digital-based waste banks that can enhance management efficiency and transparency in waste transaction recording (Alves et al., 2023; De Boni et al., 2022; Manea et al., 2024). Thus, waste management is no longer seen as a burden, but rather as an economic opportunity that can enhance community welfare (Ferronato & Torretta, 2019).

Furthermore, community-based waste management also plays an important role in supporting sustainable development. Thru active community involvement, waste volume reduction can be carried out right from the source, namely households (Kyeyune & Ntayi, 2025; Pambudi et al., 2025). This is in line with the concept of sustainable development, which emphasizes the balance between environmental, social, and economic aspects (Kumari & Harikrishnan, 2021; Reddy et al., 2023). Studies show that community empowerment in organic waste management not only improves environmental quality but can also enhance financial literacy and economic independence in rural communities. Thus, the empowerment-based waste management program has a significant multidimensional impact (Aloysius Hari Kristianto et al., 2026; Santos et al., 2025; Somadayo et al., 2024).

Mluweh Village, located in the Ungaran Timur District, Semarang Regency, is one of the areas facing challenges in waste management. As an area with rapid residential

development, Desa Mluweh is experiencing an increase in household waste volume that is not matched by an adequate management system. The lack of waste processing facilities and the low public awareness in sorting waste have become the main issues that need to be addressed immediately. If this condition is left unaddressed, it will impact the decline in environmental quality and the health of the local community. Therefore, a program is needed that can integrate educational and innovative aspects in waste management to empower the Mluweh Village community.

The educational program is expected to enhance the community's understanding of the importance of proper waste management, while innovative waste management can provide practical solutions that are easy for the community to implement (Asteria & Herdiansyah, 2022b; He et al., 2024; Prata et al., 2025; Weißert et al., 2025). A participatory approach is also the key to the success of this program, where the community is not only an object but also an active subject in every stage of the activities. Thus, the implemented program can be more aligned with the needs and local conditions of the community (Al Zahra & Shohibuddin, 2025; Anyanwu et al., 2025; Chareonvong et al., 2025; Dilip Mishra, 2024; Rozikin et al., 2024).

In addition, the involvement of various parties such as village governments, community groups, and educational institutions is also essential in supporting the sustainability of the program. The synergy between various parties will strengthen the implementation of the program and ensure the sustainability of activities in the long term. Experience from various community service programs shows that the success of waste management is greatly influenced by collaboration among stakeholders and the presence of sustainable mentoring. Therefore, the community empowerment program in Mluweh Village needs to be designed comprehensively by involving all existing elements.

Based on the above description, community service related to community empowerment thru education and innovation in waste management programs is needed as one of the strategic solutions in creating a clean and healthy environment. Therefore, this research or activity aims to study and implement a community empowerment program thru education and innovation in waste management in Mluweh Village, Ungaran Timur District, Semarang Regency. It is hoped that thru this program, the community can enhance

their awareness and skills in waste management, thereby creating a cleaner, healthier, and more sustainable environment.

METHOD

Community service activities in the form of education and innovation programs for waste management are carried out in Mluweh Village, Ungaran Timur District, Semarang Regency. The target audience of this activity is the PKK mothers, youth organizations, and farmers who are directly involved in household waste management. The implementation of the activities was carried out using methods of counseling, socialization, and participatory direct training, where the community was actively involved in every stage of the activities.



Figure 1. Flowchart of Community Service Activities

The steps taken in the activities include: (1) Preparation; (2) socialization and coordination with the village government and community groups; (3) implementation of compost fertilizer making training; and (4) monitoring and evaluation. With this method, it is hoped that the community will be able to increase awareness, knowledge, and skills in waste management, thereby creating a clean and healthy environment sustainably. The steps of the activities are as follows.

a. Preparation

The method of preparing community service on waste processing into compost is carried out thru several planned steps to ensure the activities run effectively and appropriately. The initial stage begins with a field survey to identify environmental conditions, the potential for organic waste, and the needs of the local community. Next, the service team coordinated with village officials and community groups to determine the appropriate time, location, and form of activities. Based on the results of the identification, training materials were prepared covering the basic concepts of composting, techniques for processing organic waste, and the benefits of compost for the environment and agriculture. The preparation method also involves providing the necessary tools and materials, such as composting containers, organic waste, and activators. In addition, task division within the team is carried out to ensure that every aspect of the activity can be executed well. The development of interactive delivery methods, such as demonstrations and hands-on practice, is also an important part of this stage to make it easier for the community to understand and apply the provided material. With thorough preparation methods, the community service activities are expected to yield optimal and sustainable results.

b. Socialization

The activity began with outreach and coordination with the Mluweh Village government, community leaders, and target groups including PKK mothers, youth organizations, and farmers. This stage aims to convey the activity plan, determine the implementation schedule, and obtain support and active participation from the community. In addition, an initial identification of the waste management issues within the community is conducted.

c. Training

This stage is the core of the community service activity aimed at improving the community's skills in waste management. The method used is direct demonstration and field practice so that the community can understand and apply it directly. The community was instructed to sort waste based on its type, namely organic and inorganic waste. The sorted waste is then collected to be used in training activities. This stage aims to familiarize the community with sorting waste from its source, which is the household. In this activity, the implementation team provides sorted trash bins.

d. Monitoring and Evaluation

The final stage will involve monitoring and evaluation to oversee the development and implementation of community service activities. Monitoring is conducted to ensure that activities are carried out according to plan, while evaluation is done to assess the achievements of the activities and their impact on the community

RESULTS AND DISCUSSION

In the results and discussion section, there is a description or explanation of the activities that have been carried out, including preparation, the socialization stage, the training stage, the program sustainability stage, and the monitoring and evaluation stage.

a. Preparation

The preparation stage is carried out to ensure that the activities can run smoothly. The activity began with the identification of the needs and problems faced by the community thru field visits and communication with village officials and community groups. Next, the service team prepares an activity plan that includes setting objectives, materials, implementation methods, and the activity schedule. Preparations also involve task distribution among team members, coordination with relevant parties, and the provision of necessary facilities and infrastructure, such as compost-making materials and supporting equipment for the service activities.



Figure 2. Coordination of the service team with representatives of KKN T students and the head of Mluweh village

b. Socialization

The implementation of the extension involved a team of Undip lecturers, KKN T students, Mluweh village officials, PKK, youth organization, and farmer groups from Mluweh village. The socialization was interactive with constructive discussions between the resource persons and the participants. Thru this activity, the community not only gains new knowledge but is also motivated to start managing organic waste independently and sustainably to preserve the environment and increase agricultural land productivity.



Figure 3. Implementation of Community Service Outreach in Mluweh Village



Figure 4. Implementation of Community Service Outreach in Mluweh Village

c. Traning

The stages of compost-making training are conducted step by step so that participants can thoroughly and applicably understand the process. The activity began with the presentation of material on the basic concepts of composting, the types of organic materials that can be used, and the benefits of compost for soil fertility and the environment. Next, participants were introduced to the tools and materials needed, such as household organic waste, leaves, and compost activators. In the practical stage, participants were invited to directly engage in the compost-making process, starting from sorting the materials, chopping, mixing, to arranging them in containers or composters. The training team provided direct assistance to ensure that each step could be carried out correctly. In addition, participants were also given explanations about the fermentation process, how to maintain moisture and aeration, as well as the signs of mature compost. At the end of the training, a discussion and Q&A session was held to reinforce the participants' understanding and address any challenges they might face in the field application. Thru this stage, it is expected that participants will be able to practice compost making independently and sustainably.

1) Waste Sorting

In the context of implementing community service activities, a series of systematic stages were carried out, starting with the provision of facilities in the form of segregated trash bins based on material type, specifically for plastic and glass bottles. The provision of

these facilities aims to encourage active community participation in waste sorting from the source. The next stage is the waste sorting process by the community according to the predetermined categories, which can enhance the effectiveness of waste management and reduce the potential for mixing different types of waste. After the sorting process is complete, the waste is weighed to identify the quantity of each type of waste collected. The data from the weighing process is then used as a basis for evaluating activities and as a reference in formulating more effective and sustainable waste management strategies at the community level.



Figure 5. Waste Sorting for Compost Production

2) Compost fertilizer production

In community service activities, the production of compost fertilizer is carried out as a follow-up to the previously conducted organic waste sorting process. The separated organic waste, such as food scraps and leaves, is then processed thru a structured

composting process, which includes shredding the materials, mixing with activators, and regulating moisture and aeration. This process aims to accelerate the decomposition of organic materials into mature and high-quality compost. During the composting process, regular monitoring is conducted to ensure optimal conditions for microbial activity. The final product in the form of compost fertilizer is utilized as an environmentally friendly fertilizer alternative that can be used by the community, while also serving as an effort to reduce the volume of organic waste and raise public awareness of sustainable waste management.



Figure 6. The making of compost fertilizer

The next stage in community service activities is the packaging process of mature and ready-to-use compost. The compost fertilizer that has undergone the sieving process to achieve a uniform texture is then packaged using appropriate packaging materials, such as plastic bags or eco-friendly sacks, in specific sizes to facilitate distribution and marketing. At this stage, product labeling is also carried out, containing important information such as product type, net weight, composition, and production date. A good packaging process aims to maintain the quality of compost fertilizer, increase its market value, and attract consumers. Thus, this activity not only contributes to sustainable waste management but also opens up economic opportunities for the community thru the marketing of compost fertilizer products.



Figure 7. Packaged compost fertilizer product

3) Monitoring dan evaluasi

The results of the community service activity on compost fertilizer production at the monitoring and evaluation stage showed a significant development among community members. Based on monitoring outcomes, most participants have been able to independently carry out the composting process by utilizing household organic waste. In addition, the quality of the compost produced is also considered good and has begun to be used for agricultural needs as well as home gardens. The evaluation conducted indicates an increase in knowledge and community awareness regarding the importance of environmentally friendly waste management. Nevertheless, several challenges still remain, such as limited time for compost maintenance and a lack of consistency in maintaining moisture and aeration. Through this stage, the service team provided further assistance and practical solutions to address these issues. Overall, this activity is deemed successful as it not only enhanced community skills, but also encouraged behavioral change toward more sustainable waste management and has the potential to provide economic value in the future.

CONCLUSION

The implementation of community service activities in the production of compost fertilizer in Mluweh Village, Ungaran Timur Subdistrict, carried out by the KKNT team of lecturers and students, overall proceeded well and has had a positive impact on the community. This activity has succeeded in enhancing residents' knowledge and skills in

managing organic waste into compost fertilizer, which benefits both the environment and agriculture. Through stages of outreach, training, as well as monitoring and evaluation, the community not only understands the concept of composting but is also able to practice it independently in daily life. Active participation from various community elements, such as village officials, PKK, youth organizations, and farmer groups, has been a supporting factor for the success of this activity.

In addition, this activity has also succeeded in fostering public awareness of the importance of environmentally friendly waste management and has opened up opportunities for the utilization of compost as a more economical alternative fertilizer. Nevertheless, some challenges remain, such as limited time and consistency in the compost maintenance process, which require further attention. Therefore, continuous assistance is needed so that the outcomes of the activity can continue to develop and provide long-term benefits. Thus, this community service activity not only provides a solution to organic waste problems but also encourages the creation of a cleaner, healthier, and more sustainable environment in Mluweh Village.

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