

Socialization of Organic Waste Management as a Circular Economy Solution for Food Security and Sustainable Livestock Farming in Kupang City

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Abstract: Waste management remains a significant environmental challenge in Oesapa Barat Village, Kota Kupang, where proper handling systems and community awareness have not kept pace with the annual increase in waste volume. Low participation in waste sorting and the absence of structured waste utilization have contributed to environmental degradation. This community engagement program aimed to enhance public awareness and skills in managing organic waste through educational activities and hands-on training. The program was delivered using presentations, group discussions, demonstrations, and direct practice on transforming organic waste into compost and maggot feed as part of a circular economy model. The results indicate a significant improvement in participants' understanding of waste impacts, the benefits of organic recycling, and the economic opportunities from maggot cultivation. Approximately 70% of participants expressed willingness to apply simple waste-processing techniques at home. These findings suggest that education-based interventions are effective in encouraging community participation and behavioral change toward sustainable waste management. This program is expected to initiate long-term ecological awareness and inspire independent waste management practices at the household and community levels. Therefore, the activity serves as both a preventive and practical model for organic waste management in local environments.

Keywords: Circular Economy, Food Security, Organic Waste Management, Sustainable Livestock.

Introduction

Waste management is one of the environmental challenges that continues to increase alongside population growth, urbanization, and consumption patterns.

Based on the graph, it can be seen that the amount of waste generated in Kupang City has increased every year from 79,382.39 tons in 2020 to 86,160.34 tons in 2024, while the amount of waste successfully transported to landfills has also increased, but not in proportion to the growth in waste generation, from 52,196.95 tons in 2020 to 60,246.75 tons in 2024 (Manulangga, 2022). The

difference between waste generated and transported ranges from 24,000 to 27,000 tons per year, indicating that a portion of waste is not optimally managed and could cause environmental pollution. This pattern indicates that the increase in population, economic activity, and consumption patterns has not been matched by adequate waste management capacity and infrastructure. This condition underscores the need for a more comprehensive waste management strategy, including public education, improvements to operational facilities, and the application of the reduce, reuse, recycle (3R) concept to reduce landfill burden and

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support environmental sustainability in Kupang City (Ndun et al., 2022).

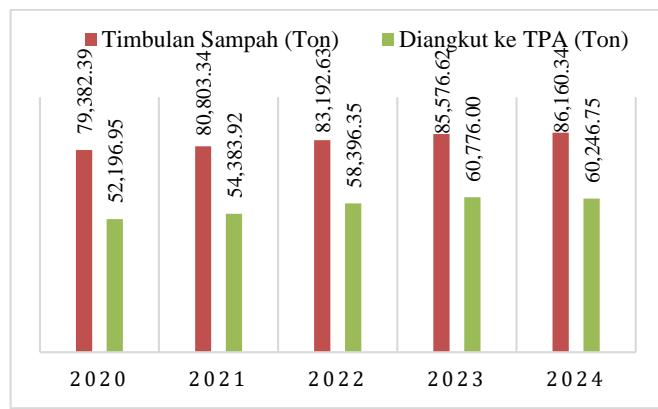


Figure 1. Amount of Waste in Kupang

However, in reality, waste management in Kupang City still faces various challenges. This can be seen in one of the sub-districts, namely Oesapa. In this sub-district, there are still significant challenges, especially in household waste collection and sorting. This condition is exacerbated by the low level of public awareness in applying the principles of reduce, reuse, and recycle in daily activities (Afum et al., 2022). In addition, the waste disposal system, which is not yet fully structured, causes accumulation in several residential areas. This situation causes visual discomfort and disturbs the aesthetics of the local environment. Furthermore, limited supporting facilities and infrastructure contribute to inefficiencies in the waste management process (Guo et al., 2020). This condition shows a gap between daily waste production and the community's waste management capacity. Therefore, this issue requires serious attention from various parties, both the government and the community.

The impact of suboptimal waste management in the area has begun to manifest in a decline in environmental quality. Accumulated waste can pollute water sources, soil, and air through odors and liquid waste (KC & Mahat, 2024). This problem also affects public health, as dirty environments become breeding grounds for disease vectors such as flies, cockroaches, and mosquitoes. In addition, these conditions can degrade the community's quality of life, as an unclean environment causes discomfort and reduces the availability of productive green space. If left unchecked, the risk of environmental disasters such as flooding and pollution will increase (Azami et al., 2025). This problem emphasizes that waste management is not only a technical issue, but also a social and health issue. Thus, strategic steps are needed to improve the situation as a whole.

Efforts to manage waste in Oesapa Barat Village can be carried out through various technical and

educational approaches. Technical solutions can include improving disposal facilities, managing waste banks, and optimizing the waste transportation system (Firdaus et al., 2025). In addition, the provision of supporting facilities such as separate waste bins can help the community understand the waste sorting process from the outset (Nurlaela et al., 2023). However, the success of technical solutions cannot run optimally without public awareness as users of the system. Therefore, the integration between physical facilities and public behavior is an important factor in solving the problem (Emenike et al., 2023). Thus, the solutions developed must include technical aspects and behavioral changes.

In addition to infrastructure-based solutions, an educational approach is an important strategy in overcoming waste problems. Education is needed to provide a correct understanding of the impact of waste on the environment and health (Anggraini & Djumiarti, 2019). Through increased awareness, the community can be encouraged to change its behavior in producing and managing waste. These educational programs can be carried out through training, socialization, and community-based outreach. In addition, the involvement of schools, places of worship, and community organizations can be a catalyst for disseminating information. Thus, an educational approach can have a long-term impact on community behavior (Wicaksono & Lesnusa, 2022).

Waste management does not focus solely on reducing waste volume. It can also be directed to provide economic added value. One form of organic waste utilization is the cultivation of Black Soldier Fly larvae, which naturally process waste. Maggots can decompose large amounts of organic waste, producing organic fertilizer and livestock feed with economic value. This program has the potential to become a business opportunity for the community if it is managed systematically and sustainably. In addition to being environmentally friendly, this innovation can be a new source of income for people who previously saw waste as nothing more than garbage. Thus, the use of maggots offers both ecological and economic benefits.

Increasing public knowledge is a relevant solution because it directly relates to changing mindsets (Sarma et al., 2024). A good understanding of the waste management system will influence individuals' decisions in sorting, reducing, and processing waste. In addition, adequate knowledge can increase community participation in government- and community-led environmental management programs (Zhang et al., 2020). Involving the community in the education process can also increase a sense of ownership of the programs being implemented. This enables the implementation of more sustainable environmental policies. Therefore,

environmental education is an important foundation for realizing more effective waste management. Researchers chose an educational approach as the basis for intervention because it is supported by empirical data and environmental behavior change theory. Various studies show that education has a significant contribution to increasing community participation in waste management. In addition, this approach is easier to implement because it does not require complex infrastructure. The educational approach also allows for adaptation according to the social and cultural context and the literacy level of the community. Thus, educational solutions are considered appropriate for implementation in Oesapa Barat Village.

This community service activity is highly relevant to the actual conditions in Oesapa Barat Village, which still faces waste management problems. The program focuses on improving community literacy through counseling, training, and household-based waste management practices. In addition, this program involves various community groups to ensure results are distributed evenly. This program is expected to be the starting point for transforming community behavior towards better waste management. Thus, this activity is not only informative but also applicable and sustainable.

Through a systematic approach, this community service activity is expected to have a significant positive impact on the environment and community in Oesapa Barat. With this community service activity, it is hoped that a collective awareness will emerge to protect the environment through better waste management practices. Overall, this program is a strategic step towards realizing a clean, healthy, and sustainable environment.

Method

The activity "Socialization of Organic Waste Management as a Circular Economy Solution for Food Security and Sustainable Livestock Farming in Kupang City" began with a community socialization phase using a persuasive and dialogical approach. At this stage, participants were introduced to the background of organic waste issues in their environment, including data on household waste volumes, waste disposal behavior, and the direct consequences for health, environmental aesthetics, and air quality. The material was delivered through visual media such as posters, short documentary videos, and simple simulations, making the information easily understandable to people of all ages. In addition to conveying information, discussion sessions were held to explore the community's perceptions of waste and the obstacles they have faced in managing it. This approach ensured that the activity was not just a one-way lecture, but also built

collective awareness and a sense of connection between the issue of waste and daily life (Dwinarko & Muhamad, 2023).

The second phase focused on strengthening understanding and skills through hands-on practice. Participants received in-depth material on the different types of waste, the circular economy concept, and the ecological and economic benefits of organic waste management. Demonstrations were carried out in stages, starting with sorting wet and dry waste, the fermentation process for making organic liquid fertilizer (POC), composting using simple methods, and the utilization of processed products for food crops and small livestock feed. During the practice, facilitators accompanied participants individually, ensuring each step was carried out correctly, safely, and in accordance with hygienic standards. This experience-based learning method provided the community with an opportunity to try, ask questions, evaluate, and understand the process of transforming waste into useful, economically valuable resources.

The closing stage was conducted through reflection and evaluation, in the form of discussions on the positive and negative impacts of organic waste management, to foster a critical, realistic, and sustainable understanding. Positive impacts such as reduced waste volume to landfills, improved soil quality, household savings on fertilizers and animal feed, and small business opportunities based on organic products were explained in measurable terms. On the other hand, potential risks such as unpleasant odors, fly infestations, fermentation failures, and contamination from inorganic materials are also explained to help the community understand the importance of procedural discipline and proper management. The activity concluded with the formulation of a joint action plan through a focus group discussion (FGD), including the formation of a local waste management group, a schedule for further practice, and opportunities for partnership with the village government. Thus, this activity not only produced technical knowledge but also built social commitment and a movement for change towards a healthier, more productive, and sustainable environment (Harahap, 2023).

Result and Discussion

The socialization program, which involved 31 participants, demonstrated the community's enthusiasm and concern for waste management issues in their neighborhood. The program was interactive, with participants actively asking questions and discussing the actual conditions of waste management in the local area. Through presentations, video screenings, and group discussions, the socialization process was effective and

easy to understand for various community groups. The success of this activity was also supported by the involvement of community leaders, ensuring that the message was well received. The presence of participants from various social backgrounds enriched the understanding and dynamics of the activity. Overall, this activity was an important first step in raising environmental awareness in the community. In addition, this activity became a shared learning space that supported behavioral change related to waste management. This marked the initial phase of social transformation towards a cleaner and more sustainable environment (Nursalam et al., 2024).



Figure 2. Community Service Material Presentation Activity

Participants, consisting of residents, village officials, lecturers, and the community service team, gained a new understanding of the real challenges in waste management in their area. Through the discussion, participants realized that the waste problem is not solely the government's responsibility but also requires the active participation of all sectors of society. Information about the large amount of unmanaged waste opened the participants' eyes to the fact that this problem requires a collective and sustainable solution. Participants also understood that the limited facilities and infrastructure for waste transportation are one of the main causes of waste accumulation. Thus, this activity helped the community see the waste problem from a broader and more realistic perspective. This new awareness became an important foundation in fostering a sense of shared responsibility for the environment. After the activity, participants showed increased concern for waste management. This condition was an early indicator that the socialization had a positive educational impact (Berry et al., 2024).

In addition to understanding the existing challenges, participants also learned about the various types of waste found in the surrounding environment. The material on the classification of organic, inorganic, and residual waste was presented in a simple manner so

that it was easy for all participants to understand, regardless of their level of education. Understanding the types of waste is very important because it forms the basis for sorting before the processing takes place. By knowing the characteristics of each type of waste, participants became more aware that not all waste should be disposed of in landfills. Participants were also introduced to the concept of waste reduction at the source, especially through changes in daily consumption behavior. This knowledge helps the community identify the most feasible waste management priorities in their environment. This activity also corrects the misconception that all waste is the same and cannot be reused. This step is the initial foundation for building a community-based integrated waste management system.



Figure 3. Discussion Activity with the Community

In addition to understanding the types of waste, participants also gained insight into the positive and negative impacts of waste on the environment based on the symptoms they encountered around them. Participants realized that unmanaged waste accumulation can cause unpleasant odors, soil and water pollution, and potential diseases. The discussion also showed that waste can contribute to flooding by clogging waterways. On the other hand, participants were introduced to the potential benefits of waste if appropriately managed, such as compost, recycled materials, or a source of maggot feed. This understanding strengthened participants' motivation to see waste as a resource, not just garbage. Thus, a change in mindset began to form through conceptual understanding and the community's real experiences. This material opened up a new perspective that waste management is a strategic step not only for cleanliness but also for environmental sustainability. This understanding became a catalyst for the emergence of

independent management initiatives at the household and community levels.

Participants' willingness to begin implementing waste management was an important development in this community service activity. The discussion revealed that most participants felt capable of independently carrying out simple waste management steps, such as sorting and composting. This willingness was triggered by the awareness that waste management has a positive impact not only on the environment but also on public health. In addition, participants stated that the waste management process was not complicated but required discipline and habits that developed gradually. The participants' readiness to apply good practices in their daily lives indicates that the outreach activity not only provided information but also encouraged behavioral change. This encouragement was further strengthened by fellow residents who reminded one another to adopt an environmentally conscious lifestyle. In the future, it is hoped that this commitment will develop into a broader community movement. Thus, waste management has the potential to become a sustainable collective practice.



Figure 4. Hands-on Activities

Significant results of the community service program are evident in participants' increased understanding of organic waste management. Participants can explain the concepts of sorting, processing, and the benefits of proper waste management. This increase in knowledge indicates that the knowledge transfer process in the community service program has been effective. Participants also showed increased confidence in understanding environmentally based solutions and in their application at the community scale. In addition, participants began to realize the potential of organic waste as an alternative resource with economic value. This shows a paradigm shift in viewing waste as an entity with potential benefits

when appropriately managed. The learning process became the basis for the formation of new habits and cultures in environmental management. Thus, this community service activity had a real social and educational impact on the community.

As many as 70% of participants expressed interest in starting simple waste management after participating in the outreach activity. This interest reflects an initial commitment to apply the knowledge gained into concrete actions in their homes and communities. Participants said that the guidance provided during the activity was invaluable in facilitating the first steps of waste management. In addition, they stated that simple methods, such as home composting, were more feasible because they did not require high costs or specialized equipment. This positive response indicates that the community has strong potential to participate in participatory waste management efforts. This commitment also marks a shift from simply receiving information to a desire to take action. This impact is an indicator of the program's success in creating awareness and motivation for behavioral change. Ultimately, the high level of community interest is the starting point for a sustainable local waste management ecosystem.

Conclusion

Socialization and training activities on organic waste management in Oesapa Barat Village have increased community knowledge and awareness of the importance of proper waste management and its use as an economic resource. The enthusiasm of the participants, especially the 70% who are interested in implementing independent practices, shows that an educational approach is effective in encouraging behavioral change and realizing community-based waste management. This program lays the foundation for a clean, healthy, and sustainable environmental culture.

Continued assistance is needed to ensure that the community remains consistent in managing waste independently and sustainably. The village government, local communities, and educational institutions are advised to form working groups or waste banks to strengthen the community-based management ecosystem. In addition, providing supporting facilities, further training, and business partnerships can expand the economic benefits of organic waste management practices, such as composting and maggot cultivation.

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