e-ISSN: 2745-9535
No. 105/E/KPT/2022
Jurnal Pengabdian Masyarakat
Member of: AJEBI
Editorial Office: Jl. Soekarno-Hatta, Rembuksari No. 1A, Malang, East Java, Indonesia, 65113
Contact: Phone: +62 (341) 478494 e-mail: jpm@asia.ac.id
The journal is published by Institut Teknologi dan Bisnis Asia Malang
Website: https://jurnal.stie.asia.ac.id/index.php/jpm
Indexed in: Google Crossref neliti GARUDA Journal Dimensions

Strengthening Community Capacity through Waste Sorting Education and Composting Technology

[1]Ika Pratiwi*, [1]Sri Suhesti, [1]Ahmad Abdul Aziz, [1]Danang Syagita, [1]Muhammad Rizky Heryansyah, [1]Alin Nursipa, [1]Vani Putri Aryanto
[1]Universitas Bina Bangsa, Indonesia
*Corresponding author
E-mail: ikapratiwix0s@gmail.com

Volume
7
Issue
2
Edition
November
Page
620-637
Year
2026

Article History

Submission: 31-08-2026
Review: 02-09-2026
Accepted: 20-11-2026

Keyword

Community Capacity;
Household Waste;
Waste Sorting;
Composting;
Biopore;
Appropriate Technology;

How to cite

Pratiwi, I., Suhesti, S., Aziz, A. A., Syagita, D., Heryansyah, M. R., Nursipa, A., & Aryanto, V. P. (2026). Strengthening Community Capacity Through Waste Sorting Education And Composting Technology. Jurnal Pengabdian Masyarakat, 7(2), 620–637. https://doi.org/10.32815/jpm.v7i2.3107

Abstract

Purpose: This community engagement aimed to strengthen household waste management capacity in Sukalaksana, Curug District, Serang City, by improving community knowledge and practical skills in waste sorting and organic waste processing.

Method: A participatory approach was implemented through socialization, demonstrations, hands-on practices, and mentoring. The activities introduced two appropriate technologies, namely Compost Biopores and Composters. Participants practiced preparing organic waste, installing biopore containers, applying EM4, assembling composters, and applying decomposition solutions.

Practical Applications: The program provided communities with practical knowledge and applicable technologies for processing organic household waste at its source. The activities also encouraged community participation and supported the development of environmentally responsible waste management practices.

Conclusion: The program strengthened community engagement and practical capacity in organic waste processing. Compost Biopores and Composters offer simple, replicable alternatives for household-scale waste management and can support sustainable community-based waste reduction.

CC BY

Introduction

Household waste management is an increasingly strategic environmental issue because it is directly related to environmental quality, public health, efficient use of resources, and sustainable development (Hartl & Hofmann, 2024). Increased household consumption, urban growth, lifestyle changes, and the increasing use of disposable products have resulted in a continuous increase in the volume and complexity of waste. Global studies show that waste management can no longer be viewed solely as a collection and disposal activity, but must be directed towards reducing waste generation, sorting at source, recovering materials, and implementing circular economy principles. (Hartl & Hofmann, 2024; Wang et al., 2023). Studies on global waste management show that the waste sector has a significant contribution to greenhouse gas emissions, so that improving the waste management system is part of the sustainable development and climate change mitigation agenda (Kurniawan et al., 2022, 2023).

National data shows that the problem remains very large. The National Waste Management Information System (SIPSN) recorded that in 2025 there were 29,197,599.98 tons/year of waste generated from 278 districts/cities that input data. Only 32.90% of the waste has been successfully managed, consisting of 2.14% of the waste reduced and 30.76% of the waste handled. Unmanaged waste still reached 67.10% or 19,591,413.40 tons/year (SIPSN, 2025). These data show that Indonesia's waste problem is not solely limited by transportation capacity and final processing facilities, but also weak waste reduction and sorting at the source.

Issues at the source level are becoming increasingly important because households are one of the primary sources of urban waste generation. Research on household waste management systems in Indonesia shows that household consumption patterns are closely related to the characteristics of waste generation and the need for more sustainable waste management (Widyaningsih et al., 2022). Other research in Indonesia shows that low levels of sorting at the household level result in reusable or recyclable materials being mixed with residual waste, increasing the burden on transportation and final processing systems.

The condition of Serang City shows a similar urgency (Serang, 2025). Serang City Government documents show that the volume of waste managed increased from 106,718.70 tons in 2020 to 135,706.06 tons in 2024. The percentage of total waste managed reached 70.21% in 2024, while recycling The rate increased from 1.61% in 2020 to 9.62% in 2024 (Serang, 2024). The Serang City Government also emphasized the need to strengthen the waste reduction system at source and expand recycling facilities to ensure sustainable waste management improvements.

The large amount of waste generated in Serang City is also related to pressure on downstream management systems. Regional development planning documents project Serang City's waste generation to be approximately 208,026,640 kg in 2025, increasing to approximately 258,146,798 kg in 2045 if there are no significant changes in waste generation and management patterns (Serang, 2024). The document also places waste reduction, sorting, recycling, utilization, and increasing public awareness as essential components of waste management.

The limited capacity of Serang City's waste management system reinforces the need for intervention at the household level. Data from the Serang City Environmental Agency indicates a limited waste collection fleet for 2025, while the need for such vehicles far exceeds the number of available vehicles (SIPSN, 2025). This situation demonstrates that an approach relying solely on transportation and final disposal has structural limitations. Waste reduction through sorting and processing at source is a rational strategy to reduce the burden on the city's waste management system.

Waste sorting at the household level is the initial stage that determines the success of the waste reduction, reuse, recycling, and processing process. Trushna et al., (2024) through systematic A review of 82 studies of household waste sorting interventions found that 72, or

approximately 87.8%, showed positive outcomes on sorting behavior. The study also found that information provision was the most widely used form of intervention, while intervention effectiveness increasingly requires a combination of information, incentives, and infrastructure support.

The effectiveness of education in encouraging waste sorting has been proven through various recent studies. Sembiring et al., (2024) in a study of households in Indonesia found that the use of visual cues, labels, descriptions, and intervention campaigns can improve knowledge and practice of waste sorting. The study specifically concluded that "visual cues are vital" to help people sort properly. These results provide the basis for sorting education to use visual media, concrete examples, simulations, and direct practice, not just verbal lectures.

Environmental education has an important relationship with the formation of sorting and recycling intentions. Tanjung et al., (2024) conducted a survey of over 530 respondents in Indonesian educational institutions, showing that environmental education, knowledge, and facilities are relevant factors in shaping sorting and recycling intentions. These findings emphasize that increasing knowledge needs to go hand in hand with providing conditions that enable people to carry out learned behaviors.

The relationship between knowledge and waste management practices is not always automatic. Sholihah et al., (2025) studied 114 households and found that knowledge of food waste management was generally good and influenced by outreach activities, while attitudes and practices remained at a moderate level. These findings indicate a gap between knowledge and practice, so community empowerment activities need to transform knowledge into skills through direct practice, mentoring, and habit strengthening.

Behavioral factors play an important role in the success of household waste sorting. Goh et al., (2022) found that personal norms, social norms and perceived behavioral control influences waste sorting behavior, with perceived behavioral Control was one of the strongest predictors. These findings indicate that people not only need to know that waste sorting is important but also need to feel capable of sorting, have access to facilities, and receive social support from their surroundings.

Research on the determinants of waste sorting also shows that internal and external factors interact with each other. A systematic study by Apriani et al., (2025) identified knowledge, attitudes, social norms, perceived behavioral control, facilities, information, and environmental characteristics as factors related to household waste sorting behavior. These results indicate that community service programs need to use a multidimensional approach that integrates education, behavior change, facilities, and community support.

The Stimulus-Organism-Response perspective provides further explanation regarding the relationship between knowledge and waste management behavior. Sembiring et al., (2026) found that, through a study of 131 households in Banyuwangi, knowledge significantly influences environmental awareness and concern, but knowledge does not directly influence sorting behavior. Environmental concern is actually an important mediator connecting knowledge with sorting behavior. These findings imply that education should be designed to build awareness and concern, not simply improve people's ability to answer questions about waste types.

Experimental research in the Indonesian context also shows a gap between knowledge and participation. The Balikpapan study found that most households had high levels of knowledge and awareness regarding single-use plastic waste, but participation in sorting and recycling was still relatively low (Bagastyo et al., 2023). The study recommends regular education and training, provision of recycling facilities, incentives, and consistent implementation of regulations as part of a sustainable waste management strategy.

The availability of facilities is a crucial component in converting knowledge into behavior. Trushna et al., (2024) showed that external factors such as information, incentives, and infrastructure can influence modifiable psychological factors and ultimately influence sorting behavior. These findings strengthen the argument that sorting education in Sukalaksana

Village needs to be accompanied by the practice of using sorting containers and the introduction of processing technologies that can be implemented at the household scale.

Organic waste processing is one of the opportunities for appropriate technology that can be developed at the community level. Sholihah et al., (2025) showed that rural communities need affordable and sustainable alternatives for organic waste processing, including the use of maggots to reduce organic waste while also providing benefits for agricultural activities. This approach is relevant for community service programs because organic waste can be reduced before it enters the transportation system and final processing facilities.

Waste processing technology doesn't always have to be complex and expensive. A community-based approach waste Community-based waste management allows simple technologies such as composting, material reuse, waste banks, organic processing, and upcycling to be developed according to community capacity. Research on community-based waste management in Indonesia shows that community participation, management capacity, institutionalization, and government support are critical elements for the sustainability of waste management systems (Afifah & Adi, 2022).

Waste banks can be an instrument for linking sorting with economic value. Research on waste bank policies in Makassar and Bantaeng shows that the successful implementation of waste banks is closely related to collaboration between the government, the community, and other stakeholders (Fatmawati et al., 2022). The collaborative model allows waste banks to function not only as a place to collect economically valuable materials, but also as a means of education and community empowerment.

Yandri et al., (2024) research on indicators of sustainable waste banks shows that waste bank sustainability can be seen from economic, social, environmental, technological, and institutional governance dimensions. The social dimension includes increasing the number of members, active participation, social interaction, and member knowledge, while the technological dimension includes the use of WhatsApp, internet portals, and Android-based applications. These findings demonstrate that community-based waste management can evolve from conventional activities to a more organized system utilizing digital technology.

The use of digital technology is also starting to become part of the transformation of waste management in Indonesia. Kurniawan et al., (2022) showed that digitalization can improve the recovery capacity of materials from waste streams and strengthen the link between waste banks and the circular economy. The study reported that digitalization of non-biodegradable waste management has the potential to increase waste avoidance by up to 65% in the context studied.

Malang City's experience illustrates that integrating technology and waste banks can strengthen the material recovery system. Kurniawan et al., (2023) found that recycling activities through waste banks contributed to waste reduction in Malang, while digitalization increased the efficiency of the sorting process. The study even reported that more than 95% of the waste in the studied system could be sorted through digitalization. These findings suggest that technological innovation can be directed not only at processing machines but also at information systems, recording, marketing, and waste management coordination.

Sorting also has an economic dimension because materials separated at the source can be directed to reuse or recycling processes (Andono et al., 2024; Asih et al., 2022; Fatmawati et al., 2022). Research on circular The Indonesian economy shows that most respondents still do not consistently sort household waste; the study found that 56.9% of respondents do not sort waste at home. This situation shows that developing a circular economy requires intervention at the earliest stage, namely changing household habits in separating waste based on its material characteristics.

Community involvement is a determining factor in program sustainability. Research on household participation in the waste bank program in Depok City shows that waste banks are a form of social engineering that encourages people to sort their waste while also providing opportunities for economic benefits. However, community participation remains a significant

challenge (Wahfiuddin & Riyanto, 2024). The success of the program is largely determined by the involvement of the surrounding community, so empowerment activities need to build shared ownership of the program.

Strengthening community capacity through a participatory approach has shown positive results in various community service programs. The community empowerment program based on a waste bank in Jururejo, Ngawi, uses a community-based approach. Environmental Management that prioritizes stakeholder engagement, capacity building, and collaborative planning (Reni & Prasetiyo, 2025). This approach aims to reduce environmental burdens, improve waste management practices, and open up alternative economic opportunities for the community.

Community service activities based on household sorting also demonstrate that education accompanied by the provision of facilities and practical examples can result in behavioral change. The program in Kesiman Village, Mojokerto, used observation, interviews, education, provision of sorting facilities, and direct evaluation of households (Andono et al., 2024). The evaluation results show that the community understands and has begun to implement waste sorting consistently, although obstacles are still found in the form of waste bin capacity and incorrect placement of waste types.

Participatory approaches have strong relevance to the context of Sukalaksana Village. Community empowerment programs in Indonesia have shown that a combination of education, discussion, sorting practices, and mentoring can increase understanding and encourage behavioral change. action Research has even been used to build awareness of organic and inorganic waste sorting at the community level, with the result that changes in practice emerge more easily when communities are involved in the process of problem identification, planning, action, and evaluation.

Sukalaksana Village, Curug District, Serang City, requires interventions that go beyond environmental hygiene education. The required program should integrate sorting education, demonstrations of processing technology, hands-on practice, provision of sample sorting facilities, mentoring, and strengthening community participation. This approach aligns with research evidence that effective sorting interventions rely not only on information but also on facilities, social norms, capacity to act, and institutional support.

The main problem addressed through this activity is the ongoing gap between community knowledge about waste and the ability to implement it in the form of sorting and processing behavior. Recent literature shows that knowledge can increase awareness, but does not always result in behavior if the community faces obstacles such as facilities, habits, perceptions of difficulty, weak social support, or the lack of processing mechanisms after waste is sorted. These conditions make community capacity building a more comprehensive approach than one-way outreach.

The urgency of this initiative is heightened because Serang City's waste management system still needs strengthening in terms of waste reduction at source. The Serang City Government has demonstrated improvements in waste management and recycling, but regional planning documents continue to emphasize the need to expand source reduction and recycling facilities. Programs at the village level can be a form of micro-intervention that supports the regional government's macro-targets by changing household behavior and improving the community's ability to process their own waste.

The technological innovations in this activity are focused on technologies that are simple, affordable, safe, easily replicated, and appropriate to the community's capacity. Organic waste can be directed for composting or bioconversion, depending on local conditions, while inorganic waste with economic value can be sorted, collected, reused, recycled, or distributed through waste banks. This principle aligns with the circular economy approach, which views waste as a resource that still has utility and economic value. The primary contribution of this community service activity lies in the integration of knowledge enhancement, skills development, technology application, and strengthening community

participation. This model is expected to shift the waste management paradigm from a collect-transport-dispose pattern to a sort-process-reuse pattern. This paradigm shift is crucial because reducing waste at the source will reduce the amount of material entering the transportation system and final processing sites while increasing the opportunities for reusing valuable materials.

The purpose of this community service activity is to strengthen the capacity of the Sukalaksana Village community, Curug District, Serang City in sorting and processing household waste through environmental education, sorting practices, and the application of simple and effective waste processing technology innovations. The activity's achievements are directed at increasing community knowledge regarding waste classification, improving sorting skills, increasing the ability to process organic and inorganic waste, increasing awareness of the environmental and economic benefits of waste, and forming a community commitment to implementing sustainable waste management. This approach is expected to become a model of community empowerment that can be replicated in other village environments in Serang City.

Method

This community engagement program employed a Participatory Action Research (PAR) approach, positioning the community as both the primary beneficiaries and active partners throughout the intervention. The approach was selected because the program was designed not only to provide information about household waste management but also to identify community needs, develop practical skills, implement appropriate waste-processing technologies, and evaluate changes resulting from the intervention. The implementation followed a participatory cycle consisting of problem identification, participatory planning, education, technology demonstration, hands-on practice, mentoring, evaluation, and follow-up.

The program was conducted in Sukalaksana Village, Curug District, Serang City, Banten Province. The target participants were community members involved in household waste management, including household representatives, environmental cadres, community leaders, women's groups, youth groups, and other residents interested in environmental management. The program methodology was designed to accommodate approximately 30–40 core participants so that education, discussion, demonstrations, practical exercises, and mentoring could be conducted interactively.

Data were collected through field observation, brief interviews, group discussions, pre-test and post-test questionnaires, and practical skills observation. Initial observation and interviews were conducted to identify existing household waste management practices, waste-sorting habits, dominant types of waste, availability of waste-management facilities, and community experience with organic waste processing. The findings from this initial assessment were used to determine the educational content and appropriate technology to be introduced.

The educational intervention consisted of interactive presentations, discussions, visual materials, demonstrations, and hands-on exercises. The educational materials covered household waste classification, organic and inorganic waste, residual waste, the 3R principle, waste sorting at source, environmental and economic benefits of waste management, and organic waste processing. Participants were also introduced to practical methods for separating household waste before proceeding to the application of processing technologies.

The main technological intervention involved Compost Biopores and Composters. Participants practiced preparing organic household waste, creating holes for Compost Biopore containers, placing containers filled with organic waste into the prepared holes, and applying diluted EM4 as an activating solution. The second technology involved preparing and assembling a drum-based composter, followed by the application of a decomposition solution consisting of water, rice-washing water, sugar, MSG, and EM4. These activities were

conducted through direct demonstrations followed by participant practice to transform conceptual knowledge into practical skills.

The practical sessions were organized in small groups. Participants were guided to identify waste types, separate organic and inorganic materials, prepare organic waste for processing, operate the introduced technologies, and observe the initial processing conditions. The practical approach was intended to strengthen participants' procedural knowledge and confidence in applying waste-processing technologies independently. The activity therefore emphasized learning by doing, in which participants learned through direct observation, guided practice, correction, and repetition.

The evaluation consisted of three main components: knowledge, practical skills, and waste-management practices. Knowledge was assessed using pre-test and post-test instruments covering household waste classification, the 3R principle, sorting techniques, organic waste processing, and the benefits of waste management. Each correct answer received a score of one, while an incorrect answer received a score of zero. The knowledge score was calculated as follows:

$$\text{Knowledge Score} = \frac{\text{Number of Correct Answers}}{\text{Total Number of Questions}} \times 100 \quad \text{..... (1)}$$

The change in knowledge was determined by comparing the pre-test and post-test scores. The percentage increase was calculated using:

$$\text{Increase (\%)} = \frac{\text{Post test} - \text{Pre test}}{\text{Pre test}} \times 100 \quad \text{..... (2)}$$

The assessment procedure followed the methodology established for the program, in which post-test results were compared with baseline knowledge to determine the contribution of the educational intervention.

Practical skills were assessed through direct observation using indicators covering waste identification, organic and inorganic waste separation, residual waste identification, appropriate use of waste containers, operation of the introduced technologies, and management of processed organic waste. A four-point scale was used: 1 = not yet competent, 2 = less competent, 3 = competent, and 4 = highly competent. The assessment focused on participants' ability to perform the procedures independently rather than merely explain them theoretically.

Changes in household waste-management practices were assessed through follow-up observation and interviews. The indicators included the availability of sorting containers, separation of organic waste, separation of economically valuable inorganic waste, reduction of mixed waste, household organic waste processing, involvement of family members, and continuation of sorting practices after the intervention. These indicators were used to assess whether the knowledge and skills obtained during the program had begun to be translated into practical household activities.

Quantitative data from the pre-test and post-test were analyzed descriptively using mean scores, percentages, minimum values, and maximum values. Changes between baseline and post-intervention scores were interpreted as an indication of changes in participants' knowledge following the educational intervention. Practical skill data were analyzed by calculating the percentage of participants achieving each competency indicator. Household practice data were compared before and after the intervention to identify observable changes in waste-sorting and organic waste-processing practices.

Qualitative data obtained from observations, interviews, and group discussions were analyzed through data reduction, data presentation, and conclusion drawing. The qualitative analysis was used to identify factors supporting or constraining the implementation of waste sorting and organic waste-processing technologies. The integration of quantitative and qualitative information enabled the evaluation to capture both measurable changes in participant knowledge and practical experiences during technology implementation. Program success was determined using participation, knowledge, skills, technology adoption, household practice, and sustainability indicators. The established targets included

participation of at least 80% of the participants in the complete activity series, improvement in post-test knowledge scores, at least 75% of participants demonstrating correct waste sorting, at least 75% achieving the competent skills category, the ability to operate at least one waste-processing technology independently, and the emergence of community-based waste-management cadres.

Sustainability was addressed through the development or strengthening of community waste-management cadres. Selected participants were expected to assist other residents in waste sorting, facilitate environmental education, support the operation of Compost Biopores and Composters, document implementation, and establish communication with the village government and potential waste-management partners. This mechanism was intended to reduce dependence on the community engagement team and encourage continued adoption of household organic waste management after the completion of the program.

The overall methodological framework was implemented through a series of systematically organized stages. The activity began with problem identification to understand the existing conditions and challenges related to household waste management in the community. This stage was followed by participatory planning, involving community members in determining the appropriate activities and waste-processing technologies. A pre-test was then conducted to assess participants' initial knowledge of household waste management. The intervention continued with waste-sorting education, followed by demonstrations and hands-on practice in sorting household waste. Participants subsequently practiced the application of Compost Biopore and Composter technologies, including the preparation of organic waste and the application of decomposition solutions. Mentoring was provided to support participants in applying the technologies correctly. A post-test was conducted to assess changes in participants' knowledge following the intervention. The results of the activities were then evaluated based on knowledge, practical skills, participation, and waste-management practices. The program also included community cadre development to strengthen local capacity and was concluded with sustainability planning to encourage the continued adoption and wider implementation of household waste-management practices. This framework integrates knowledge development, practical skills, appropriate technology, community participation, and institutional support into a community-based household waste-management program.

Result

Community service activities were carried out in Sukalaksana Village, Curug District, Serang City with a focus on strengthening community capacity in managing household organic waste through the implementation of Biopori Compost and Composter. The activities were designed using a participatory approach that combines socialization, demonstrations, direct practice, mentoring, and the introduction of simple technologies that can be applied to the household environment. This approach positions the community not only as recipients of information, but as actors who directly practice waste processing technology. A similar model in organic waste management community service shows that the combination of socialization, training, practice, and monitoring can improve community knowledge and skills in processing household waste into compost. Wulandari et al., (2024), for example, reported an increase in participants' understanding and skills after training on composting using EM4, with positive response rates increasing from 58.53% before training to 93% after training.

The initial stage of the activity was carried out through the socialization of Biopore Compost and Composter technology to the community. The socialization functioned to provide an understanding of the characteristics of organic waste, the benefits of reducing waste from the source, the basic principles of composting, the function of composting containers, and the stages of using activators. Documentation of the activity showed interaction between the implementation team and the community in an atmosphere of shared learning. This communication pattern is important in empowerment activities because the material is not only

delivered one way, but can be developed through questions, discussions, demonstrations, and clarification based on community experiences. Research by Sembiring et al., (2024) showed that educational interventions combined with visual cues, labels, and campaigns can improve knowledge and practices of household waste sorting in Indonesia.

Photo 1. Socialization of Biopore Compost making and Composter technology in Sukalaksana Subdistrict



Source: Private Documentation, 2026.

The socialization phase continued with a demonstration of making Biopore Compost. Participants were introduced to the principle of placing organic waste containers in the ground through prepared holes. Documentation photos show that participants were directly involved in soil excavation activities using simple tools. This activity demonstrates that the technology transfer process is carried out through learning by doing, namely that the community gains knowledge along with experience in carrying out each stage of the technology. The hands-on approach is relevant in waste management because the ability to process waste is not sufficiently formed through theoretical knowledge, but requires procedural skills and experience using available tools.

Photo 2. Making holes and installing Biopore Compost Containers





Source: Private Documentation, 2026.

Digging the holes is a crucial step because the position and construction of the biopores determine the technology's function as a medium for processing organic materials and as part of a water infiltration system. Biopore technology can be used to introduce organic materials into the soil, allowing them to gradually decompose. Research by Putri et al., (2024) showed that biopore infiltration holes can be used to treat household organic waste through the composting process. The study also showed that the addition of EM4 affected the decomposition process and increased several nutrient parameters in the resulting compost.

The containers used in the activity are filled with organic materials before being placed into the holes. The materials seen in the documentation are leaves and other organic materials available in the surrounding environment. The use of local organic materials has the advantage that the community does not need special raw materials to start the composting process. This principle is in line with source-based waste management, namely reducing waste from the location of generation by reusing materials that still have potential uses. Muyasaroh (2025) study shows that composting is one method of processing organic waste that can be applied at the household scale, while the choice of technology needs to consider

environmental conditions, community capabilities, family member willingness, and the utilization of the processing results.

The next step involves applying an EM4 solution to the organic material. The EM4 solution is first diluted with water and then sprayed onto the material placed in a container. EM4 acts as an activator, expected to aid the decomposition of organic material through the activity of microorganisms. Research by Putri et al., (2024) specifically tested the addition of EM4 to Biopore Infiltration Hole and shows that EM4 has an effect on the decomposition process and the time during which the composting process takes place.

Photo 3. Application of EM4 Solution on Organic Materials



Source: Private Documentation, 2026.

The use of activators in the composting process needs to be understood as a supporting component, not the sole determining factor for success. The decomposition process is also influenced by material composition, particle size, water content, aeration, temperature, pH, and carbon-nitrogen balance. Research by Akbari & Khadijah (2024) on aerobic composters for household organic waste shows that the use of EM4 can be applied in the composting process and that compost quality is influenced by physical and chemical parameters during the process. In this study, composting for 28 days produced compost with physical parameters that meet the standards used by researchers and a C/N ratio of 22–25.

The second stage uses composter technology as an alternative for processing organic waste at the household or community scale. Documentation shows the use of a large, modified drum equipped with supporting components as a composting container. The use of drums is a form of appropriate technology because the container can be made from relatively easy-to-obtain materials and can be reused. Research by Akbari & Khadijah (2024) shows that aerobic composters can be used to process household organic waste and produce compost through a relatively controlled process.

Photo 4. Preparation and Assembly of Composter Technology



Source: Private Documentation, 2026.

The composter used in this activity serves as a place where the decomposition process of organic material takes place. The composting principle used in this system is to provide conditions that support the activity of decomposing microorganisms. Organic material is placed in a container, then a decomposing solution is added periodically. Humidity and aeration management are important because conditions that are too dry can slow the activity of microorganisms, while conditions that are too wet can reduce oxygen availability and

increase the risk of undesirable anaerobic conditions. Research on aerobic composters by Akbari & Khadijah (2024) shows that composter system settings can produce process conditions that support the formation of compost with physical and chemical characteristics that meet the parameters used in the study.

Activation steps the composting process is carried out by spraying a decomposing solution used in practical activities. The solution consists of water, rice washing water, sugar, MSG, and EM4. These ingredients are introduced to the community as part of the organic waste processing practices used in the activities. Rice washing water can be used as one of the ingredients in making local microorganism solutions. Research on the use of MOL from rice washing water shows that the concentration of MOL can affect the rate of the household organic waste composting process.

Photo 5. Practice of Spraying Decomposing Solution on Composter



Source: Private Documentation, 2026.

The practice of spraying the decomposing solution provided participants with firsthand experience regarding the importance of maintaining the condition of the material during the composting process. Participants not only saw how to use the composter, but were also involved in preparing the material, adding organic matter, applying the solution, and observing the condition of the material. This learning model strengthened the skills aspect because the community had the opportunity to take direct action. The community service program using EM4 in Baturetno also demonstrated that the methods of socialization, training, and monitoring could improve the community's skills in processing organic waste into compost.

The solution application was followed by sprinkling with a solution of rice washing water, sugar, MSG, and EM4. This step was part of a demonstration of how organic material is treated during the initial composting process. The solution application must be measured to prevent the material from becoming too wet. Water management is a crucial aspect of the composting process because microorganisms require water for metabolic activity, while excess water can reduce porosity and oxygen availability.

Photo 6. Watering the Decomposing Solution on Organic Material



Source: Private Documentation, 2026.

The results of the activity show that the community capacity building process has been ongoing through the direct involvement of participants at each technological stage. Participants were involved in digging holes, installing Biopore Compost containers, filling with organic material, applying EM4, preparing the composter, spraying the decomposing solution, and watering the organic material. The documentation serves as evidence that the activity did not stop at the delivery of material, but has reached the stage of demonstration and technology practice.

The first achievement is increasing the community's practical experience in recognizing and utilizing organic waste. Organic waste such as leaves and household waste, which previously had the potential to become part of the waste stream, can be directed to a composting system. This processing provides an alternative to the traditional collect-transport-dispose management pattern by directing a portion of the waste to be processed at the source. Research on household organic waste management shows that composting is a technology that can be applied at the household level to reduce the burden of waste entering the final waste management system.

The second achievement is the formation of procedural knowledge regarding the use of Biopori Compost. Procedural knowledge differs from conceptual knowledge because participants not only know that organic waste can be composted, but also the steps required to implement it. Participants learn to determine the location, dig a hole, prepare the container, add organic material, use an activator, and perform maintenance. This experience is important because it affects perceived behavioral control. is one of the factors related to waste sorting and management behavior. People who feel capable of carrying out an action tend to have a greater opportunity to implement it in their daily lives (Goh et al., 2022).

The third goal is to gain experience using a composter as an organic waste processing technology. Participants gain an understanding of the drum's function, the materials used, the use of decomposing solutions, and the importance of maintaining process conditions. The use of a household composter is highly relevant because the technology can be placed close to the waste source. Akbari & Khadijah (2024) demonstrated that an aerobic composter can be used to process household organic waste and produce compost within 28 days.

The fourth achievement is the emergence of alternatives for reducing organic waste at the source. Every organic material that enters the Biopori Compost or Composter has the potential to reduce the amount of material that must be disposed of with other waste. The impact of this reduction will be even greater if the practice is implemented consistently by more households. Community service research on organic composting in Batu City shows that education and practice in composting can provide the community with the knowledge, insight, and skills to process food and vegetable waste into compost.

The fifth achievement relates to community empowerment through simple technology. The technology used does not require complex mechanical systems, making it relatively easy to learn and replicate. This characteristic is important in community service because the success of the technology is determined not only by the technical capabilities of the tool, but also by the suitability of the tool to the user's abilities, cost, availability of materials, ease of maintenance, and benefits perceived by the community. The study of household-scale organic waste processing methods emphasized that the choice of method needs to consider the family's ability and willingness, as well as the utilization of the processed product.

The sixth achievement is the formation of collective learning between the community service team and the community. Activity photos show the community working together during excavation, container installation, material filling, and composting operations. This interaction can strengthen positive social norms because waste management practices are not carried out solely as individual actions, but rather as a shared activity. Behavioral waste management theory suggests that social norms and perceived behavioral control are factors related to household sorting behavior (Goh et al., 2022).

The seventh achievement is the development of two alternative processing technologies that can be used according to environmental characteristics. Biopore Compost is more suitable for locations with available soil space and can integrate organic material processing with infiltration. Composter is more flexible for use in locations where digging multiple holes is not feasible. The combination of the two provides communities with technological options, enabling waste management to be more independent of a single method. Biopore Research Infiltration Hole shows that the technology can be used for processing organic waste while also being related to water infiltration capabilities, while the aerobic composter can be used as a system for processing organic materials in containers.

Discussion

This activity can be explained through the Community perspective. Empowerment Theory, namely empowerment as a process of increasing the community's ability to understand problems, make decisions, acquire skills, and manage resources independently. Biopore Compost and Composter technology is not positioned merely as a tool, but as a learning medium to increase community capacity. Community service research in Indonesia shows that the transfer of knowledge and technology for processing organic waste can result in increased skills when the community is involved through outreach, training, and monitoring (Bakti et al., 2024; Yuniarthe et al., 2025).

Learning perspective by Doing explains why hands-on practice is a crucial component of this activity. Knowledge about composting is procedural in nature, requiring participants to experience firsthand how to prepare materials, fill containers, add activators, and maintain process conditions. Documentation shows that participants actively carry out the technological steps, allowing the learning process to take place through concrete experiences. A similar approach to household composting training in Bandung showed that after training and mentoring, all participants successfully composted and used the compost for gardening.

Theory Perspective of Planned Behavior is also relevant to explaining program sustainability. Behavioral change is influenced not only by knowledge, but also by attitudes, subjective norms, and perceived behavioral control. Goh et al., (2022) showed that personal norms, social norms and perceived behavioral control is related to household waste sorting behavior. Research by Tanjung et al., (2024) also showed the importance of environmental education, knowledge, and facilities in shaping sorting and recycling intentions.

Activities in Sukalaksana Village have addressed all three aspects. Education is aimed at building positive attitudes toward organic waste, group practice fosters social norms, and the ability to use Biopori Compost and a Composter increases perceived behavioral control. The combination of these three aspects has the potential to increase the community's chances of maintaining waste management practices after the activities conclude.

Waste perspective hierarchy and circular Economics provides another foundation for this activity. Organic waste is not immediately positioned as material to be discarded, but as a source of organic matter that can be returned to the environment in the form of compost. This process reduces the need for disposal while creating a product that can be used for plants or to improve the quality of growing media. Household-scale composting therefore serves a dual purpose as a waste reduction and resource recovery strategy.

Appropriate technology is crucial because the sustainability of community innovations is heavily influenced by the technology's suitability to the user's needs. The composter used in these activities uses a drum that can be easily assembled and maintained, while the Biopori Compost system uses a container that is relatively easy to obtain. This approach offers the advantage of replication, as communities can create or develop similar systems without relying heavily on complex technological devices. This activity also demonstrates that technology and education must go hand in hand. Technology without knowledge can lead to misuse, while education without facilities can stop at increasing knowledge without changing practices. Research by Tanjung et al., (2024) showed the importance of a combination of education,

knowledge, and facilities in shaping sorting and recycling intentions. Sembiring et al., (2024) also showed that educational interventions using visual approaches and campaigns can improve knowledge and practices of sorting. Activator aspect of EM4 also provides an important technical dimension. EM4 is used in activities as an activator to support the decomposition process. Empirical evidence regarding Biopore Infiltration Hole demonstrated that adding EM4 can influence the decomposition process and increase the content of several elements in compost. The study used organic materials such as leaves and kitchen waste and observed for 15, 30, and 45 days.

The use of a solution made from rice washing water, sugar, MSG, and EM4 should be placed as a practical formulation introduced in activities, not as a standard composting formula that applies universally. Literature on composting shows that compost quality is influenced by many variables, including humidity, temperature, pH, aeration, material size, and C/N ratio. The use of activators must be adjusted to the characteristics of the material and process conditions. Akbari & Khadijah (2024) showed that the use of EM4 in household composters was carried out at a certain concentration and produced compost with physical parameters and a C/N ratio that met the research standard parameters.

The use of MSG in practical activities also needs to be carefully documented in scientific articles. While documentation does indicate the use of MSG as a component of the solution used by participants, the activity did not conduct experimental testing of MSG's effect on decomposition rate or compost quality. Community service articles should not conclude that MSG has been proven to improve compost quality in the absence of experimental data. A more accurate statement would be that MSG was used as an ingredient in the practical solution formulation introduced to the community.

Based on the implementation documentation, the main achievements of the activity can be grouped into four dimensions, namely knowledge, skills, technology application, and community participation. The knowledge dimension is reflected in the socialization and discussion activities; the skill dimension is reflected in the involvement of participants in digging the soil, adding organic materials, using EM4, and operating the composter; the technology application dimension is reflected in the formation of Biopori Compost and Composter; while the participation dimension is reflected in the involvement of the community together in the entire activity process.

Table 1. Evaluation of Program Achievements and Sustainability

Achievement Dimensions	Visible Forms of Achievement
Knowledge	Participants received an explanation regarding organic waste processing.
Skills	Participants carry out excavation and installation of Biopores
Activation	Participants apply EM4
Technology	The composter was successfully prepared and used.
Practice	Participants spray/water the solution
Participation	The community is involved directly and in groups
Replication	Technology can be applied to the household environment

Source: Author’s Work, 2026.

The long-term success of the program is not solely determined by the success of the Biopori Compost and Composter creation process during the activity. Sustainability requires maintenance, consistent replenishment of organic materials, monitoring of the composter's condition, timely removal of the compost, and proper utilization of the compost. The community service program conducted in Banyudono demonstrated that mentoring is necessary after technology transfer to enable the community to independently implement waste processing technology. The results of the activity demonstrated that participants were able to independently process household waste after receiving training and mentoring. Monitoring should be directed at several simple indicators, namely the number of households

implementing the technology, the number of active Biopori Compost, the number of composters used, the volume of organic waste input, the condition of the materials during the process, the maturation time, and the utilization of the resulting compost. These measurements will transform activity documentation into stronger academic evidence of achievement. Research by Akbari & Khadijah (2024) shows the importance of measuring temperature, humidity, pH, and the C/N ratio in assessing the quality of composting results.

Further activities could focus on developing a cadre of organic waste managers tasked with helping communities operate the technology, monitor the process, and document the results. A cadre approach can broaden the impact of the program because knowledge transfer extends beyond the initial participants. Experience with a community-based composting program in Bandung demonstrated that trained participants can serve as trainers for other residents, allowing the technology to be expanded from the core group to more households.

Overall, the activities in Sukalaksana Village resulted in an empowerment model that can be formulated as education, demonstration, practice, technology application, mentoring, and independent management. The integration of Biopore Compost and Composter provides two alternative organic waste processing methods that can be adapted to the characteristics of the space and community capabilities. The main strength of the program lies in the direct involvement of the community in the technology application process, while aspects that need to be strengthened in the next stage are quantitative monitoring of the volume of waste successfully processed, the quality of the compost, the consistency of technology use, and the number of households that adopt the practice.

Conclusion

The community engagement program aimed to strengthen the capacity of residents in Sukalaksana Village, Curug District, Serang City, in managing household organic waste through waste sorting education and the application of appropriate composting technologies. The activities combined socialization, demonstrations, hands-on practice, and mentoring using Compost Biopores and Composters. The results showed active community participation in preparing biopore holes, placing organic waste containers, applying EM4, assembling composters, and applying decomposition solutions. These activities provided participants with practical knowledge and skills for managing organic waste at its source. The main strength of the program lies in integrating environmental education with simple, affordable, and replicable technologies that can be implemented at the household level. The program was limited by the absence of long-term measurements of compost quality, waste volume reduction, and sustained behavioral changes. Future programs should include periodic monitoring, quantitative assessment, cadre development, and wider adoption across households to ensure program sustainability. The activity demonstrates that community-based education combined with appropriate technology can support sustainable household waste management.

Acknowledgements

The authors express their sincere gratitude to the Government of Sukalaksana Village, Curug District, Serang City, for providing support and facilitating the implementation of this community engagement program. Appreciation is also extended to the residents and community representatives who actively participated in the socialization, demonstrations, and hands-on practices of Compost Biopores and Composters. The authors gratefully acknowledge the institutional support provided by the authors affiliated institution throughout the preparation and implementation of the program. Special appreciation is given to all community members, field assistants, and technical personnel who contributed their time, knowledge, and assistance during the activities. Their participation and cooperation were essential to the successful implementation of the program and to the development of community capacity for sustainable household waste management.

Reference

Afifah, A. A. N., & Adi, T. B. (2022). Solidaritas Bank Sampah Berseri: Alternatif Program CSR Berbasis Pengelolaan Sampah Berkelanjutan Terintegrasi. Jurnal Intervensi Sosial Dan Pembangunan (JISP), 3(2), 65–77. https://doi.org/10.30596/jisp.v3i2.11234

Akbari, T., & Khadijah, A. (2024). Pengolahan Sampah Organik Rumah Tangga Menggunakan Komposter Aerobik. Jurnal Teknologi Lingkungan, 25(2), 196–203. https://doi.org/10.55981/jtl.2024.5769

Andono, F. A., Eriandani, R., Koan, D. F., Rinawiyanti, E. D., & Girindratama, M. W. (2024). Improving the environmental quality of Kesiman Village, Mojokerto Regency through household waste sorting. Journal of Community Service and Empowerment, 5(1), 111–119. https://doi.org/10.22219/jcse.v5i1.27875

Apriani, Y., Liquiddanu, E., & Hisjam, M. (2025). Tinjauan sistematis tentang faktor-faktor yang mempengaruhi perilaku pemilahan sampah rumah tangga. Jurnal Pengelolaan Lingkungan Berkelanjutan (Journal of Environmental Sustainability Management), 178–197. https://doi.org/10.36813/jplb.9.2.178-197

Asih, A. M. S., Trapsilawati, F., Sopha, B. M., & Normasari, N. M. E. (2022). Waste Bank Program for Households as A Means of Processing Inorganic Waste. Jurnal Pengabdian Kepada Masyarakat (Indonesian Journal of Community Engagement), 8(4), 177. https://doi.org/10.22146/jpkm.73409

Bagastyo, A. Y., Anggrainy, A. D., & Maharani Wiguna Hidayat Liang, M. S. (2023). Assessment of attitude and participation level among the households and local merchants toward single-use plastic waste management: A case study in Balikpapan Municipality, Indonesia. Case Studies in Chemical and Environmental Engineering, 7, 100361. https://doi.org/10.1016/j.cscee.2023.100361

Bakti, U., Loliyani, R., Hairudin, H., Astrid Aprica Isabella, Loliyana, R., & Adelita, I. (2024). The Influence of Brand Image and Digital Marketing on Consumer Purchasing Decisions (Case Study on Roja Bouquet Flower Shop). International Journal of Economics (IJEC), 3(2), 1380–1390. https://doi.org/10.55299/ijec.v3i2.1183

Fatmawati, F., Mustari, N., Haerana, H., Niswaty, R., & Abdillah, A. (2022). Waste Bank Policy Implementation through Collaborative Approach: Comparative Study—Makassar and Bantaeng, Indonesia. Sustainability, 14(13), 7974. https://doi.org/10.3390/su14137974

Goh, E., Esfandiar, K., Jie, F., Brown, K., & Djajadikerta, H. (2022). Please sort out your rubbish! An integrated structural model approach to examine antecedents of residential households' waste separation behaviour. Journal of Cleaner Production, 355, 131789. https://doi.org/10.1016/j.jclepro.2022.131789

Hartl, B., & Hofmann, E. (2024). To sort or not to sort? – Consumers' waste behavior in public. Journal of Cleaner Production, 475, 143677. https://doi.org/10.1016/j.jclepro.2024.143677

Kurniawan, T. A., Dzarfan Othman, M. H., Hwang, G. H., & Gikas, P. (2022). Unlocking digital technologies for waste recycling in Industry 4.0 era: A transformation towards a digitalization-based circular economy in Indonesia. Journal of Cleaner Production, 357, 131911. https://doi.org/10.1016/j.jclepro.2022.131911

Kurniawan, T. A., Meidiana, C., Dzarfan Othman, M. H., Goh, H. H., & Chew, K. W. (2023). Strengthening waste recycling industry in Malang (Indonesia): Lessons from waste management in the era of Industry 4.0. Journal of Cleaner Production, 382, 135296. https://doi.org/10.1016/j.jclepro.2022.135296

Muyasaroh, S. (2025). Tinjauan Metode Pengolahan Sampah Organik Skala Rumah Tangga di Indonesia: Review of Household Organic Waste Processing Methods in Indonesia. JERNIH : Journal of Environmental Engineering and Hygiene, 3(2), 120–136.

https://doi.org/10.31537/jernih.v3i2.2685

Putri, M. S. A., Sulistiono, E., Prasidya, D. A., Ni'am, A. C., & Affandy, N. A. (2024). The EM4 Addition Affect Water Absorption Time and Compost Quality in Biopore Infiltration Hole. JURNAL KESEHATAN LINGKUNGAN: Jurnal Dan Aplikasi Teknik Kesehatan Lingkungan, 21(1), 45–58. https://doi.org/10.31964/jkl.v21i1.715

Reni, D. S., & Prasetiyo, E. (2025). Community Empowerment through Waste Bank Program as an Eco-Centric Approach to Environmental Management in Jururejo Village, Ngawi Subdistrict. Indonesia Journal for Community Service and Empowerment, 1(1), 31–37. https://doi.org/10.59966/53tz5z54

Sembiring, E., Fenitra, R. M., Dangkua, A. R., Al Khoeriyah, Z. B., Van Der Laan, A. Z., Fan, Y., Ceschin, F., & Jobling, S. (2026). Exploring household waste management behavior through the stimulus-organism-response model. Acta Psychologica, 262, 106083. https://doi.org/10.1016/j.actpsy.2025.106083

Sembiring, E., Fenitra, R. M., Dangkua, A. R., Khoeriyah, Z. B. A., Van Der Laan, A. Z., Fan, Y., Ceschin, F., & Jobling, S. (2024). Improving household waste management in Indonesia: A mixed-methods approach for waste Sorting. Cleaner Waste Systems, 9, 100185. https://doi.org/10.1016/j.clwas.2024.100185

Serang, J. D. dan I. H. K. (2024). Peraturan Daerah Kota Serang Nomor 6 Tahun 2024 tentang Rencana Pembangunan Jangkka Panjang Daerah Tahun 2025-2045. Jaringan Dokumentasi Dan Informasi Hukum Kota Serang. https://jdih.serangkota.go.id//dokumen/peraturan-daerah-kota-serang-nomor-6-tahun-2024-tentang-rencana-pembangunan-jangkka-panjang-daerah-tahun-2025-2045

Serang, J. D. dan I. H. K. (2025). Peraturan Wali Kota Nomor 17 Tahun 2025 Tentang Rencana Kerja Pemerintah Daerah Kota Serang Tahun 2026. Jaringan Dokumentasi Dan Informasi Hukum Kota Serang. https://jdih.serangkota.go.id//dokumen/peraturan-wali-kota-nomor-17-tahun-2025-tentang-rencana-kerja-pemerintah-daerah-kota-serang-tahun-2026

Sholihah, S. M., Tumuyu, S. S., & Herdiansyah, H. (2025). Household Food Waste Management in Rural Communities: A Knowledge, Attitude, and Practice Study. Jurnal Pengelolaan Sumberdaya Alam Dan Lingkungan (Journal of Natural Resources and Environmental Management), 15(4), 632. https://doi.org/10.29244/jpsl.15.4.632

SIPSN. (2025). Data Indikatif Pengelolaan Sampah. Kementerian Lingkungan Hidup / Badan Pengendalian Lingkungan Hidup. SIPSN - Sistem Informasi Pengelolaan Sampah Nasional. https://sampahnasional.kemenlh.go.id/portal-indikatif/

Tanjung, A., Rachman, I., & Matsumoto, T. (2024). The impact of environmental education, knowledge, and facility on pre-service teachers' intention toward waste separation and recycling on campus: Teacher education institution in Indonesia case study. Journal of Material Cycles and Waste Management, 26(6), 3917–3927. https://doi.org/10.1007/s10163-024-02043-0

Trushna, T., Krishnan, K., Soni, R., Singh, S., Kalyanasundaram, M., Sidney Annerstedt, K., Pathak, A., Purohit, M., Stålsby Lundbog, C., Sabde, Y., Atkins, S., Sahoo, K. C., Rousta, K., & Diwan, V. (2024). Interventions to promote household waste segregation: A systematic review. Heliyon, 10(2), e24332. https://doi.org/10.1016/j.heliyon.2024.e24332

Wahfiuddin, M. H., & Riyanto, R. (2024). Partisipasi Rumah Tangga dalam Program Bank Sampah: Studi Kasus di Kota Depok. Jurnal Ilmu Lingkungan, 22(2), 464–471. https://doi.org/10.14710/jil.22.2.464-471

Wang, J., Nketiah, E., Cai, X., Obuobi, B., Adu-Gyamfi, G., & Adjei, M. (2023). What establishes citizens' household intention and behavior regarding municipal solid waste separation? A case study in Jiangsu province. Journal of Cleaner Production, 423, 138642. https://doi.org/10.1016/j.jclepro.2023.138642

Widyaningsih, N. L., Tjiptoherijanto, P., Widanarko, S., & Seda, F. S. S. E. (2022). HOUSEHOLD SOLID WASTE MANAGEMENT SYSTEM THROUGH SUSTAINABLE CONSUMPTION. Ecodevelopment, 3(2). https://doi.org/10.24198/ecodev.v3i2.39120

Wulandari, T. S. H., Nurtjahyani, S. D., Nuraida, D., Panggabean, C. I. T., & Sukisno, S. (2024). Effective Microorganisms 4 (EM-4) Application in The Process of Making Compost from Household Organic Waste to Increase Skills of PKK Members. Bubungan Tinggi: Jurnal Pengabdian Masyarakat, 6(2), 421. https://doi.org/10.20527/btjpm.v6i2.10251

Yandri, P., Budi, S., & Muhyidin, A. (2024). Formulasi dan Validasi Indikator Bank Sampah Berkelanjutan. Aspirasi: Jurnal Masalah-Masalah Sosial, 15(2), 205–222. https://doi.org/10.46807/aspirasi.v15i2.3629

Yuniarthe, Y., Hendro, D., Putra, A., Hendri, R., Hairudin, & Ikhwan, A. (2025). Transformasi Kompetensi Guru melalui Kolaborasi Pengabdian Masyarakat Berbasis Kecerdasan Buatan di Kabupaten Pesawaran Provinsi Lampung. Journal of Community Development, 6(2), 1228–1238. https://doi.org/10.47134/comdev.v6i2.1860