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Application of the Composting Method as an Emergency Measure for Household Organic Waste Management

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Abstract. *As a tourist destination, Kota Batu must prioritize environmental cleanliness, aesthetics, and urban management in its development. However, the waste management system, which previously functioned well, has significantly deteriorated, leading to a waste emergency. As a result, residents struggle to dispose of household waste as they did before. Initially, waste disposal was done independently, but now the community is required to manage their waste without adequate knowledge. This situation has led to irregular household waste disposal practices. As part of community service efforts, this study applies the composting method as an emergency solution for household organic waste management in Junrejo Village, Junrejo District, Kota Batu. This method is expected not only to address the waste emergency but also to serve as a reference for other regions facing similar challenges. The outcomes of this initiative include the creation of a sample landfill for organic waste management and community education on composting applications. It is hoped that this program can be expanded on a larger scale and serve as a model for community-based waste management. Consequently, this initiative contributes to raising public awareness of the importance of sustainable waste management while supporting the cleanliness and beauty of Kota Batu as a leading tourist destination.*

Katakunci: *Composting; Pengelolaan Sampah; Darurat Sampah.*

Abstrak. Kota Batu sebagai destinasi wisata harus menjaga keindahan, kebersihan lingkungan, dan tata kelola kota sebagai fokus utama dalam pengembangan potensi daerah. Namun, sistem pengelolaan sampah yang sebelumnya berjalan dengan baik mengalami kemunduran hingga memicu kondisi darurat sampah. Akibatnya, warga kesulitan membuang sampah rumah tangga seperti biasa. Awalnya, masyarakat dapat membuang sampah secara swadaya, tetapi kini mereka diharuskan mengelola sampah sendiri tanpa pemahaman yang memadai. Hal ini menyebabkan ketidakteraturan dalam skema pembuangan limbah rumah tangga. Sebagai upaya pengabdian kepada masyarakat, penelitian ini menerapkan metode composting sebagai solusi darurat dalam pengelolaan sampah organik skala rumah tangga di Desa Junrejo, Kecamatan Junrejo, Kota Batu. Metode ini diharapkan tidak hanya menyelesaikan permasalahan darurat sampah, tetapi juga menjadi referensi bagi daerah lain yang menghadapi tantangan serupa.

Hasil dari kegiatan ini meliputi pembuatan sampel lahan lubang gali untuk pengelolaan sampah organik serta sosialisasi kepada masyarakat mengenai penerapan metode composting. Diharapkan, kegiatan ini dapat diaplikasikan dalam skala yang lebih luas dan menjadi acuan dalam pengelolaan sampah berbasis komunitas. Dengan demikian, program ini berkontribusi pada peningkatan kesadaran masyarakat akan pentingnya pengelolaan sampah yang berkelanjutan serta mendukung kebersihan dan keindahan lingkungan Kota Batu sebagai destinasi wisata unggulan.

1 Introduction

Batu City is located in East Java Province, Indonesia and was formed in 2001 as a division of Malang Regency. Together with Malang Regency and Malang City, Batu City is part of a unified region known as Malang Raya. Batu City is known as an area with Agribusiness and Tourism potential. The economy of Batu City is largely supported through the tourism and agriculture sectors. Based on Law Number 11 of 2001 concerning the Establishment of Batu City, the administrative area of Batu City consists of 3 (three) Sub-districts, namely Batu Sub-district, Junrejo Sub-district and Bumiaji Sub-district. As a tourist destination, it is fitting that the beauty and cleanliness of the environment, as well as city governance and waste management become one of the main focuses in developing the potential in Batu City. Waste reduction or degradation can be done with three principles known as the 3Rs, namely reduce 'reduction', reuse 'reuse', and recycle 'waste recycling' (Anwar & Wati, 2024). Unfortunately, the waste management that has been well resolved has experienced a sharp decline to the condition of a waste emergency. This has made it difficult for Batu residents to even dispose of their household waste as before. Previously TPA Tlekung was the final disposal site that accommodated all waste in Batu City, the overloaded capacity triggered the government to implement systematic steps to think of smart solutions. If there are no serious steps in waste management, waste will certainly become a problem for survival (Tirmidi et al., 2021).

Head of the Batu City Environmental Agency (DLH) Aries Setiawan decided starting at the end of August 2023 to limit the acceptance of

waste from each village / kelurahan and business place, where only residual waste can enter TPA Tlekung (Inayati, 2024). Residual waste itself is waste that is difficult to recycle such as used nappies, used sanitary napkins, used chewing gum, or cigarette butts. With this target, all waste collected must be managed so that it does not just pile up. In this condition, the Batu City community can still dispose of waste by sorting, selecting and separating waste according to its type. Women usually manage their household waste (Yuliati, 2019a). The accumulation of waste is caused by several factors, including a very large volume of waste that exceeds the capacity of capacity. However, the condition became worse with the fire that occurred at Tlekung landfill on Friday, 20 October 2023.

This led to the closure of Tlekung landfill, which was accompanied by the emergence of a waste emergency in Batu City. People who were originally able to dispose of waste independently. Now they are encouraged to manage waste independently without being equipped with waste management knowledge. This has an impact on the irregularity of household waste disposal schemes in the community. In this case, the problem of household waste is the main problem faced by people in urban areas (Pambudi & Sudaryantiningsih, 2017). Although there have been many appeals posted along the road regarding the prohibition of garbage disposal, in fact this is not effective enough (Zheng et al., 2024). The government's encouragement to manage waste independently is also not strong enough, as evidenced by the fact that people's waste is still piled up and scattered in many places, especially public facilities (Pathak et al., 2023). This argument highlights the critical need to re-evaluate current strategies and explore innovative approaches grounded in diffusion theory to enhance the effectiveness of public awareness campaigns (Etim et al., 2024).

If the assumption is that each person produces 0.4 kg of waste and the population in Batu City is 202,333 people, then every day the waste produced reaches 80.93 tonnes per day, not including waste generated by tourists and industrial waste (Obersteiner et al., 2021). Education to the community regarding waste management is also important (Diniaty & Alpian, 2020). With the increasing amount of waste generated, poor

waste management has an impact on environmental problems (Hudawi et al., 2022). Another highlight is also aimed at the rubbish that has begun to be scattered along the riverbanks. This will clearly cause negative impacts, such as unpleasant odours, or an unsightly environment, and will become seeds of disease (Edo et al., 2024). Not to mention the increase in the quantity of green flies that have begun to enter people's homes. If this is not addressed immediately, it is feared that piles of community waste that are disposed of carelessly can become a source of disease spread. The conception of waste must be changed because waste is basically a man-made object that has no purpose or cannot fulfil the performance for which it was created (Kara et al., 2022).

Naturally, this problem is a common task and must be the responsibility of not only the government, but also the community on the smallest scale, namely the household. When viewed on a household scale, most women produce household waste from cooking activities in the kitchen (Yuliati, 2019b). Whereas organic waste has many benefits, one of which is as a soil fertiliser and organic fertiliser. Unfortunately, there are still many people and farmers who do not know the benefits of organic waste and how to process organic waste, even though knowledge about organic waste processing techniques is needed so that people can know and practice directly good and correct waste processing techniques (Zulfikar et al., 2021). Organic waste itself is one of the environmental problems that is increasingly complex along with the increasing human population and industrial activities and if not managed properly, organic waste can be a source of environmental pollution, increase greenhouse gas emissions, and contribute to various public health problems (Filonchyk et al., 2024). To anticipate this, a smart solution is needed in waste management that can be done on a household scale. So the author focuses on finding solutions on how the household scale can manage its own household waste using the composting method. It can be said that the composting method is a simple waste management method that can be applied by all lines of society. Therefore, there is a need for socialisation along with the application of waste management methods that can be done on a

household scale, namely through the composting method which can be a solution to household waste management of organic waste.

Organic waste is waste produced from biological materials that can be degraded by microbes or are biodegradable. Can come from living things, both humans, animals and plants, organic waste itself is divided into two, namely: wet organic waste has a high water content and dry organic waste, a material with a small water content (Pranata, L., Kurniawan, I., Indaryati, S., Rini, M. T., Suryani, K., & Yuniarti, 2021). This type of waste can easily be decomposed through natural processes. Among them are waste from the kitchen, food scraps, wrappers (other than plastic, rubber, styrofoam and the like), fruit peels, leaves and twigs (S. Vambol et al., 2024, p. 6). This paper will describe the definition and impact of waste, the patterns of management that have been carried out, as well as recommendations for proper waste management (Khan et al., 2022). On a household scale, this method is expected to overcome problems in the waste management system in Batu City, especially Junrejo Village, which can be applied by each individual in forming health independence. More precisely as a preventive measure in preventing the spread of various diseases such as diarrhoea and other conditions that may arise as a result of careless waste disposal.

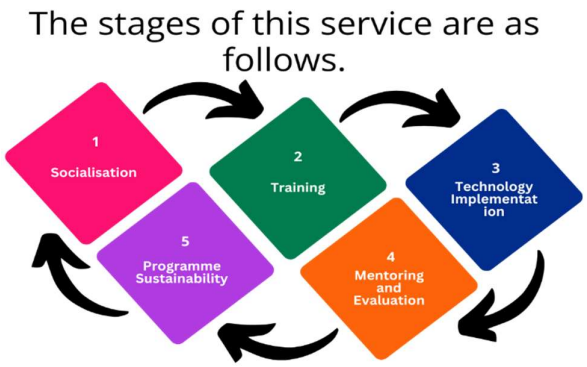
2 Method

The Asset-Based Community Development (ABCD) approach is highly suitable for empowering women in rural areas to enhance their economic value (Kretzmann & McKnight, 1996). This approach leverages the existing strengths and resources within a community to create sustainable development. The activities were conducted in Tegalsari Village, Plered District, Cirebon Regency, from July 15 to August 25, 2024. The target of the initiative was a group of housewives from Wadas Ilir Block, Tegalsari Village. Various tools and equipment were utilized during this program, including village demographic data, stationery, a camera, interview forms, buckets, catfish seedlings, kale seedlings, and pellet feed.

Reviewing the unique conditions possessed by the Batu Tourism City where rainfall, temperature and humidity in this area are quite high

coupled with the emergence of a waste emergency condition as a result of the inability of the community to manage waste after the Tlekung landfill which is a source of self-sustaining waste management for the Batu City community is closed. Causing anxiety in the community, especially in areas in Batu City that do not yet have a solution to this condition. This unending waste emergency condition is feared to cause new problems such as health problems, natural disasters and air pollution such as unpleasant odours and so on. To prevent new problems from arising, as well as a solution to the waste emergency problem that arises. This service focuses on organic waste management produced on a household scale. When referring to organic waste, there are various ways to manage it, including underground fermentation to be used as compost and also a medium for raising various kinds of waste degradator animals (Anwar & Wati, 2024).

This service emphasises more on asset development of household slaka organic waste (Al-Kautsari, 2019). In this service, the researcher tries to make a breakthrough with how to overcome this waste emergency condition by using the composting method, where what is meant in this case is that organic household waste can be used as fertiliser or depreciated but plastic waste or non-degradable waste suggested by the author is collected and sent to a craftsman or recycling place. The selection of this method was made after evaluating the geographical conditions of Batu Tourism City where with high rainfall intensity organic waste in particular will decompose faster and this will be beneficial if the waste management scheme uses the composting method. In addition to the faster decomposition process, this method can also anticipate the decay of waste that is disposed of carelessly by the community. In the implementation of this service, of course, there are methods / stages that must be passed. The stages of implementation of activities as in the diagram below:



The initial stage of this service implementation begins with socialisation conducted by the service team. Given that the service team's residence is not in the same location as the service object, the success of this program relies heavily on the participation of local partners, particularly Laskar Taruna. The active involvement of Laskar Taruna RW 4 Junrejo Village plays a crucial role in supporting the application of composting technology through socialisation and mentoring. This stage aims to raise public awareness regarding waste management policies and encourage effective waste sorting, as community participation is a key factor in the success of waste management efforts. The service team targets socialisation to at least five households, particularly those with small land, by engaging youth groups, students, and residents.

Following the socialisation phase, the next step is training. This stage begins with gathering residents in one location to watch an instructional video on the composting process. Afterward, the service team provides explanations through presentation sheets and other materials to enhance participants' understanding. The training ensures that residents acquire the necessary knowledge about composting and are prepared to implement the method in their households.

Once the training is completed, the technology application stage begins. At this stage, the service team, along with trained builders, assists in setting up composting media in residents' homes. The implementation is carried out progressively, rotating from one household to another, ensuring that at least five targeted households successfully adopt the composting technology as initially planned.

Throughout the technology implementation process, the service team provides continuous assistance to ensure proper application. Regular evaluations are conducted to address any challenges that may arise, such as issues with raw materials or workforce availability. Flexibility in problem-solving is crucial to maintaining the smooth progress of the program, ensuring that the composting technology is applied effectively without significant obstacles.

After the composting technology has been successfully implemented in the initial households, the service team continues to provide support for several months. The ultimate goal is to establish a sustainable program where composting is adopted by more than just the initial five households and expands to the entire community in Junrejo Village. This stage ensures that the project remains a long-term solution for waste management, bridging academic knowledge with real-world application and providing a practical response to the ongoing waste emergency in the community.

3 Results

He results of this community service program indicate that the implementation of the composting method as an emergency solution for household organic waste management in Junrejo Village has had a positive impact. Through the socialization phase, the community began to understand the importance of separating organic and inorganic waste, as well as the benefits of composting. The involvement of local partners, such as Laskar Taruna RW 4, helped accelerate information dissemination and increased residents' participation in this program.

During the training phase, participating residents were provided with knowledge about the composting process through educational videos and presentations delivered by the service team. Additionally, they received supporting materials to deepen their understanding of effective organic waste management techniques. The community's response to this training was quite positive, as evidenced by their enthusiasm in trying the method in their respective environments.

The application of composting technology was carried out by creating composting pits in five targeted households. However, some challenges arose during implementation, such as improper pit placement and high moisture levels due to Batu City's heavy rainfall. To address these issues, the service team modified the composting pits by adding covers to regulate moisture levels and accelerate the decomposition process of organic waste.

The mentoring and evaluation process was conducted periodically to ensure the program's success. Monitoring results showed that most participating residents successfully implemented the composting method. However, challenges such as a lack of discipline in waste sorting and limited land availability for some residents were still present. The service team provided solutions by recommending a more flexible composting system that could be applied in smaller spaces.

Program sustainability was a key focus of this initiative. The service team continued to provide assistance for several months to ensure that the composting method remained in practice and could be adopted by a larger number of residents. The ultimate goal is for this program not only to serve as a temporary solution to Batu City's waste emergency but also to become a model for other areas in managing organic waste independently and sustainably.

4 Discussion

The monitoring results from the first week of the budikdamber (fish farming in buckets) program showed varied outcomes among participants. Most of the housewives successfully maintained the survival of their catfish, with feeding frequency ranging from once to three times a day, depending on their schedules and understanding of feeding requirements.

This service activity produces a solution to the problems being experienced by the Junrejo Village community related to their household-scale organic waste management system. The service activity focuses on RW 4 of Junrejo Village, Junrejo District, which still does not have a self-help solution to their waste problems. The implementation of

this activity has also been carried out periodically through various observations in the partner environment. The result of the implementation of this activity is the making of a dug hole composting method that is applied directly to the community.

Monitoring results from the first week of the composting method showed varying results among participants. Most of the dug holes located in the neighborhood of fenced houses have been used according to their function, namely as a place to dispose of organic waste with the frequency of household organic waste disposal ranging from one to three times a day, depending on the cooking schedule of each household and the frequency of busy housewives. It was observed that the waste disposed of in the composting pit was in the form of organic waste from food waste and organic waste from cooking. Basically, this composting pit has been used as it should. To maximize the composting process so as not to be affected by water exposure, the dug holes that have been prepared are given a cover because some of the composting dug holes are located in open spaces as shown in Figure 3 below.

Figure 3. Example of a Composting Pit on Open Land

Figure 1 is an example of the dug pit that we built at Mrs. Agis' house, the picture shows that the location of the dug pit chosen is located on open land (not roofed) this increases the potential for excess moisture in the dug pit, mainly due to the high rain intensity in Batu City. Although in general in the first week of the dug pit the composting method has been used as it should. However, there were exceptions where problems arose. For example, the dug pit owned by Mr. Tanu who chose to place

the dug pit area near the rice fields where the intensity of waste disposal becomes untraceable due to the “open access” of the dug pit that has been prepared for independent use (household scale), due to the location of the dug pit close to the rice fields (without fences), it can easily be used by other residents as shown in Figure 2.

Figure 2. Location of Mr. Tanu's Dug Hole

In Figure 2, it is clear that the location chosen by Mr. Tanu is located very close to the rice field area. This made it impossible to measure the intensity of organic waste disposal in the composting pit, which was initially estimated for household-scale use. In addition, other problems also arose due to soil conditions that were quite wet when compared to other digging locations in the vicinity.

Entering the second week, the thing that was feared in the first week occurred where the high intensity of rainfall in Batu City, Junrejo village in particular made the quality of organic waste in the pit very humid and smelly. This happened to the composting pit which was located without a roof. Reviewing this, the service team decided to make a lid for the dug hole as a solution to the dug hole which is located without a roof. This is also quite a negative impact on the quality of compost in Mr. Tanu's dug hole which is located near rice fields, where with high rainfall. Causing the quality of the surrounding soil to also get wetter. Not to mention the unmeasured intensity of waste disposal. Fortunately, in this location, the type of waste disposal in the second week was still in accordance with the purpose of composting, namely organic waste.

In addition, we get positive results from the composting pit which is indeed located in the area of residents' homes. The waste disposal

routine can be measured with certainty, namely 1 - 3 times, with the type of waste that is also in accordance with the method that the service team uses, namely food waste and cooking waste which is organic waste. This week's monitoring also included some additional activities for the quality of the compost being made. The intensity of waste disposal, the condition of the organic waste disposed, as well as the environmental conditions of the composting pit are necessary to ensure the quality and success of the composting. The frequency of waste removal is adjusted to ensure that the composting process will run properly and smoothly. The intensity of waste disposal and the type of waste disposed are key to the implementation of this method and this step is also very important in overcoming the ongoing waste disposal problems in the community. In addition, the composting pit in each house will be covered. This step is necessary to ensure the moisture condition of the dug hole, and to ensure that there is no stagnation, because stagnant water on top of the waste can cause problems that are feared to affect public health such as mosquito breeding grounds, and so on. Covering the dug hole can help refresh the environment from possible odors that may arise from the composting process, as well as prevent any accidents that may arise from making the hole. Figure 4 illustrates the condition of Mr. Tanu's dug hole, where a wall is being made. This action is part of an ongoing effort to improve the condition of the dug pit which is quite wet as it is located in the vicinity of rice fields and ensure that the program will produce more sustainable and productive outcomes for all participants. Despite some challenges, the program is ongoing, and the monitoring team is optimistic about the future progress of the program.

Figure 3. Example Lubang Gali Basah

The program carried out by the Community Service Team faced several limitations, especially in its implementation efforts, because not all Junrejo RW 4 villagers in particular have large enough land for the implementation of this composting pit method. However, despite these shortcomings, this program still managed to focus on educating the participants, especially housewives, about the process of managing their household organic waste. This education was provided as part of the long-term plan and continuation of the program, with the hope of empowering household waste to be composted in the future. The emphasis on waste management education and literacy is essential to equip the participants with the necessary skills and knowledge to navigate the wider market for compost products once they are ready for distribution. At least this method can also help housewives to manage their own household waste products.

As part of the evaluation process, interviews were conducted with the participating men, who provided valuable insights into the challenges faced during the project. One of the key findings from these interviews was that some of the housewives failed to segregate their household waste. Several factors were identified as the cause of this failure. One of the most significant factors was the location of the dug pit not being close enough to the kitchen, which plays an important role in ensuring the composting process. The main problem was that residents were not diligent enough to sort their household waste. It was found that there were plastic bags used for food that were also thrown away along with their food waste. This affected the success of the composting method.

Despite the challenges, the program focused on overcoming the problems and improving the system. One of the main obstacles experienced by participants is the difficulty in sorting household waste and the limited land for program sustainability. These two aspects are a major concern, as the success of the dug pit composting method is highly dependent on the availability of land and community awareness in sorting waste. However, various factors caused this method to not work as expected. The challenges that arose in implementing the composting method indicate the need to improve the design and management of the pit-based waste management system. To address these issues, the

program is continuously monitored through periodic evaluation and continuous improvement. In addition, feedback from residents is an important element in identifying weaknesses and aspects that need to be adjusted, so that future iterations of the program can run more effectively. With the right adjustments, the dug hole method is expected to function more optimally. Eventually, it is hoped that this solution will also have an impact on solving other problems that are feared to arise due to the absence of self-help waste management, such as:

1. Indiscriminate Waste Disposal.

   With the dug holes that have been implemented in residents' houses. So, there is no need for residents who participate in this programme to have concerns about their waste disposal system, as well as no more excuses for littering. Both in the neighbourhood and riverbanks close to residential areas. As a result, the neighbourhood will be cleaner and free from littering.

2. Reducing the Potential for Health Problems

   The effects of good waste management not only have an impact on the more beautiful and clean environment. But it also improves the health of its citizens. If waste is disposed of carelessly, especially during the rainy season like now, it is possible that the waste can be inundated with water and become a breeding ground for mosquitoes. This will certainly endanger the community if not addressed immediately. Not to mention if you throw garbage in the river, of course it is feared that it can affect the quality of water used by residents. Therefore, the results of the application of this method will also have an impact on water quality and the health of residents.

The application of the composting method as an effort to handle waste emergencies in household-scale organic waste management management in Junrejo village, Junrejo sub-district, Batu city has provided education to the community regarding how their household waste management system. In addition, the application of this method also helps the community in alleviating their organic waste disposal problems. For those who participated in the programme, each household received a free compost pit. Broadly speaking, this method is

also easy to apply by neighbouring residents who have seen the process of digging the composting method. As an effort to solve waste management problems. The product of the composting method digging pit that has been applied will be able to provide benefits, namely a container for disposing of household organic waste for each household.

5 Conclusion

The condition of the waste emergency that occurred in Batu City affected how the waste disposal scheme/system was carried out by the community. An independent policy where each hamlet needs to make independent rules regarding how the waste management system in their neighbourhood makes there is no common policy in every community. The suggestion from the government in managing waste independently is not strong enough, this is evidenced by the fact that there is still community waste that is seen piling up and scattered in many places, especially in public facilities. To deal with this, the test team has a solution using the composting method.

It can be said that the composting method is a simple waste management method that can be applied by all lines of society. On a household scale, this method is expected to overcome problems in the waste management system in Batu City, especially Junrejo Village, which can be applied by each individual in forming health independence. More precisely as a preventive measure in preventing the spread of various diseases such as diarrhoea and other conditions that may arise as a result of careless waste disposal.

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