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Training on making composters and biopore holes as a solution to the organic waste problem

Retno Sulistyo Dhamar Lestari* [1], *Denni Kartika Sari, Dhena Ria Barleany, Endang Suhendi, Jayanudin

Universitas Sultan Ageng Tirtayasa, Jl. Jenderal Sudirman KM 3, Cilegon, Banten 42435, Indonesia

[1]*E-mail: rsdlestari@untirta.ac.id*

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ABSTRACT

Management of organic and inorganic waste is one of the problems that often occurs in society. Community development and the introduction of composting technology and biopore holes are efforts to increase environmental potential through organic waste management. The methods used in this service activity are counseling and Focus Group Discussion (FGD). The problem that often occurs is that household waste is left unsorted and sent directly to landfills, causing large amounts of waste to pile up in Final Disposal Sites (FDS). This program focuses on changing people's mindsets in handling household waste, sorting waste, making biopore holes in every house and open land, and making a composter to process organic waste into compost.

ABSTRAK

Pengelolaan sampah organik dan anorganik merupakan salah satu permasalahan yang sering terjadi di masyarakat. Pengembangan komunitas dan pengenalan teknologi pembuatan kompos dan lubang biopori merupakan upaya untuk meningkatkan potensi lingkungan berupa pengelolaan sampah organik. Metode yang digunakan dalam kegiatan pengabdian ini adalah penyuluhan dan *Focus Group Discussion* (FGD). Permasalahan yang sering terjadi adalah sampah rumah tangga yang dibiarkan tidak terpilah dan langsung dikirim ke tempat pembuangan sampah menyebabkan banyaknya sampah yang menumpuk di tempat pembuangan akhir (TPA). Program ini fokus pada perubahan pola pikir masyarakat dalam menangani sampah rumah tangga, memilah sampah, dan membuat lubang-lubang biopori di setiap rumah dan lahan terbuka serta membuat komposter untuk mengolah sampah organik menjadi kompos.

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1. Introduction

The continuous increase in waste production with the increasing population, changes in consumption patterns, and people's lifestyles has increased the amount of waste generation, types, and characteristics of waste. It is estimated that, on average, only around 40 to 60 percent of waste can be transported to Final Disposal Sites (FDS). The waste problem is one of the severe problems faced by the Cilegon City Government. Every day, the Cilegon City Environmental Service (ES) handles 400 tons of waste, which must be transported to the Bagendung Final Waste Disposal Site (FWDS) [1-3]. Based on data from the Ministry of Environment and Forestry, households produced 47.1% of waste from a total of 53.8 million tons of waste in 2022 [4-6]. Waste management carried out by the community currently still relies on the final approach. Namely, waste is collected, transported, and disposed of at the last waste processing site.

So far, The waste management system has yet to solve the problem. Still, it could cause new problems in other places because the landfill capacity can no longer handle the amount of waste the community produces. Large volumes of waste piled up at landfill sites have the potential to release methane gas (CH_4), which can increase greenhouse gas emissions and contribute to global warming. Household waste can be sorted into organic waste and inorganic waste. According to Law Number 18 of 2008 concerning waste management, what is meant by waste management is systematic, comprehensive, and sustainable activities that include reducing and handling waste. Therefore, waste management technology is an important part that needs to be implemented in urban environments. Organic waste management can be done in various ways, one of which is by composting. Composting means returning everything once alive to the soil and allowing nature to decompose naturally. There are many composting methods, namely using a drum composter and the biopore hole method.

Based on these problems, the community service team intends to reach out to residents of the Kranggot neighborhood by providing education on how to manage household waste properly and introducing organic waste management technology using composter drums and biopore holes. `The compost produced from the composter can be used as fertilizer. Organic food has economic benefits and value. This compost can loosen the soil, act as a planting medium, and reduce the use of inorganic fertilizers. This type of composter uses a plastic or metal drum with a hole in the bottom to get air circulation (aerobic). This type of composter is most suitable for use in narrow spaces or even indoors in apartments. This type of composter can even be placed in the kitchen. The composter has an air circulation installation to help speed up the aerobic composting process.

Biopore holes are cylindrical holes made vertically with a diameter of 10 - 15 cm and a depth of 100 - 120 cm. This biopore hole has several benefits: water absorption, processing of organic waste, and soil fertility. Biopore holes are an effective way to reduce waste disposal in landfills [7-10]. In the biopore hole, animals such as worms and ants in the soil will look for food and convert organic waste thrown into the hole into compost so that organic waste, which often causes the inhabitants of the bio pore hole, will eat an unpleasant odor. This Community Service Program activity aims to (a) introduce and apply science and technology regarding organic waste management using composter and biopore hole methods and (b) increase the knowledge of the Link community. Kranggot in applying composter technology and biopore holes for organic waste management. Through this composting program, it is hoped that the Kranggot Environmental community will be able to process organic household waste into a valuable compost fertilizer product in a way that is easier to make and with readily available materials.

2. Method

This community service activity was conducted in the Kranggot Environment, Sukmajaya Village, Jombang District, Cilegon City. The stages of activities are 1) face-to-face outreach activities regarding household waste management by making composters and biopore holes; 2) making and composting in composter drums and biopore holes. Participants in this activity were residents of the Kranggot area, Cilegon City, involving lecturers and students from the Untirta Chemical Engineering Department. The outreach activities explained how to sort organic and inorganic waste and process organic waste using a composter drum and biopore holes.

2.1. Making biopore holes

The tools and materials used to make biopore holes are:

- A manual drill with a length of 100 cm.
- A PVC pipe with a diameter of 10 cm is cut to a size of around 30 cm.
- A roster/pipe cover.

The steps for making biopore holes [11-13] are:

1. Determine the location point for making the biopore hole.
2. After determining the location, drilling is carried out into the ground with a hole depth of approximately 1 m and a hole diameter of 10 cm.
3. Flush the soil with water to facilitate the drilling process.
4. After making the hole, insert the PVC pipe.
5. Put organic waste into the biopore hole.
6. Cover the PVC pipe with a roster/pipe cover with a hole cut in the top.

2.2. Composter drum making

The materials and tools needed to make a drum composter include a plastic drum with a lid, an electric drill to make holes in the bottom of the drum, raw materials such as organic waste, rice washing water, and EM4 as a bioactivator to speed up decomposition. The manufacturing steps are:

1. Make holes in the bottom side of the drum for air circulation and to make it easier to collect the finished compost.
2. Fill the drum with a mixture of organic waste cut into small pieces to facilitate decomposition.
3. Flush the pieces of organic waste with rice washing water and EM4 liquid. Close the composter drum tightly and let the decomposition process occur.
4. Stir periodically.
5. Compost can be harvested in around 4-6 weeks, and the finished compost will be black and will not smell like rubbish.
6. Sift to get fine compost. The coarse part can be mixed as an activator in the composter drum.

3. Results and Discussion

3.1. Counseling on making composters and biopore holes

The outreach activity in the Kranggot neighborhood, Sukmajaya District, was attended by residents and lecturers from the Chemical Engineering Department of Sultan Ageng Tirtayasa University. Figure 1 shows the enthusiasm of residents to participate in the outreach activities; the community service activity team presented how to sort organic and inorganic waste and introduced the technology for making composter drums and biopore holes.

3.2. Practice of making composters and biopore holes

The technology that can be applied in the Kranggot environment is waste processing technology without producing leachate, namely with an aerobic composter. Even though it is known that leachate is a product of organic waste processing that can be used as liquid fertilizer, the resulting odor is not suitable for use in dense urban environments. The composter drum can be made from a blue drum, like in Figure 2a, which has holes around the drum for air circulation. The bottom of the drum is given access to collect the finished compost. Organic waste that has been finely chopped is put into an aerobic composter and then given starter bacteria to speed up the process of degrading organic waste into compost. Compost can be harvested after approximately 2 - 3 weeks. The finished compost product appears blackish, as in Figure 2b.

Figure 1. Counseling regarding waste management

a

b

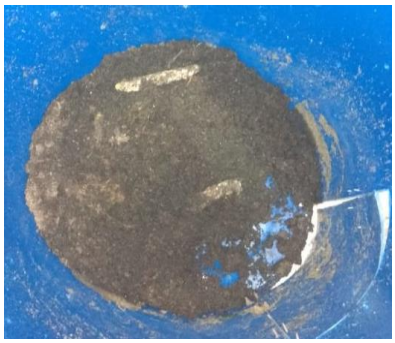

Figure 2. - (a) Practice inserting starter bacteria into the composter drum; (b) Compost products.

a.

b

Figure 3. - (a) Making biopore holes; (b) Installing biopore hole cover.

The second practical activity begins with determining the location of the biopore hole. After selecting the location, drilling is carried out into the ground with a hole depth of approximately 1 m and a hole diameter of 10 cm, as shown in Figure 3a. The top side of the hole can be strengthened by installing a 4-inch pipe approximately 30 cm long so that the walls of the hole do not collapse. After the biopore hole is finished, organic waste is put into the hole until it is complete so that the waste can be decomposed by worms and microorganisms in the soil and become compost. Then, the hole is closed in Figure 3b. The biopore hole is closed with a roster/paragon lid to prevent sand and inorganic waste from entering the biopore hole. After the creation of the biopore hole is complete, the community can carry out regular maintenance, such as checking whether the hole is clogged with rubbish and can add organic waste if the contents of the biopore hole have decreased and shrunk. The compost in the biopore holes can be harvested after 2-3 weeks.

Compost fertilizer obtained from the processing of organic waste produced by the community can be utilized by selling compost products so that the community can get more benefits from their activities, reducing unprocessed household waste and increasing family income from waste processing. One indicator of the success of the community service program is sustainability. After handing over the equipment in the form of composter drums and biopore drills, the implementation of the work program will continue, monitoring and evaluating continuously so that the work program can run optimally.

Figure 6. Handover of drum composter and biopore drill equipment from the Chemical Engineering Department to neighborhood administrators.

4. Conclusion

Community service programs can increase public knowledge and knowledge and raise public awareness of the importance of proper waste management. Compost products produced from processing household organic waste can be optimized in their manufacture and marketing to become a new source of income for the community. Apart from that, the condition of the village is clean and protected from various diseases caused by waste. This program should be carried out in other areas with the same goals and targets. It is hoped that it will create a clean and beautiful Cilegon City free from rubbish.

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