

Composting of Domestic Organic Waste as An Effort to Realize A Healthy and Clean Village

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ABSTRACT

The increasing population will significantly affect the production of waste from households. This has an impact on increasing household waste. Based on surveys in the village and interviews with the Head of the Pakintelan Village, Semarang, it was known that waste management in the village has not been carried out optimally. Although the city government has mandated a waste bank in every neighborhood association (*Rukun Tetangga*), not all neighborhoods have waste banks. In addition, waste managed by waste banks was limited to inorganic waste such as bottles, paper, cardboard, and metal. Residents have not managed organic waste, which often causes odor and aesthetic problems. Thus, the residents of Pakintelan Village need to gain the knowledge and skills to manage their domestic organic waste. Therefore, a community service activity was designed to help the village to manage domestic waste properly through the production of compost. The activity was conducted in stages, i.e., educating, training, and mentoring, then monitoring & evaluation. The results obtained from the activities were increasing the knowledge and skills of the Pakintelan residents in managing their household waste into compost. Therefore, a clean and healthy village can be realized.

I. INTRODUCTION

Domestic waste usually consists of leftover food such as vegetables, fruit skins, bone, and meat, as well as chicken and fish waste, which is considered wet or organic waste [1]. If not appropriately managed, this organic waste will cause health problems due to the presence of pathogenic bacteria.

Pakintelan Village is a village located in Gunungpati District, Semarang City. Based on data from the Central Statistics Agency of Semarang City, the total population of Pakintelan Village in 2020 was 5,833 people, with a population growth rate from 2010-2020 of 2.66 [2]. This population growth impacts increasing the amount of waste generated in each household.

Based on data from the National Waste Management System (SIPSN) of the Ministry of Environment and Forestry (KLHK) Indonesia, the majority composition of waste is waste from households (41.4%). The waste composition is dominated by food waste which reaches 28.1%. Plastic waste took second place (15.8%), wood/twig/leaf waste at 12.2%, and paper at 12.1% [3].

Based on surveys in the village and interviews with the Pakintelan Village Head, it was known that waste management in the village has not been carried out optimally. Although the city government has made it mandatory to have a waste bank in every neighborhood association or *Rukun Tetangga*, an administrative division of a village in Indonesia, not all neighborhoods in the Pakintelan Village area have a well-managed

waste bank. In addition, waste managed by waste banks was only limited to inorganic waste such as bottles, paper, cardboard, and metal. Domestic organic waste needs to be appropriately managed by residents. Usually, waste in the form of leaves, twigs, or mixed garbage was only burned. Residents who have large areas of land make holes in landfills, while residents who do not have enough land depend on their household waste disposal by garbage haulers. However, the low pick-up intensity of the garbage haulers resulted in a pile-up of waste at the residents' houses (Fig. 1). This produces smell and interferes with aesthetics.



Fig. 1. Piles of household garbage

Education on how to manage domestic organic waste was needed to increase the environmental awareness of the residents. Every year, the HATINYA PKK, a kind of village contest, is held by the government. The contest includes waste management, but based on the observations, only one composter is available in the TOGA or a traditional medicine plants garden. Very few bags or compost barrels exist in every resident's house. Even, the composter was barely taken care of. In some places, organic waste was scattered in the yard (Fig. 2).

Based on the description above, there was a need for education about the negative impacts caused by organic and inorganic waste, both in terms of health and the environment. In addition, it is also necessary to hold waste management

training, especially organic waste treatment into valuable products such as compost, eco-enzymes, feed for maggot cultivation, etc. Composting knowledge and skills at home provides an excellent opportunity to recycle organic waste at the source [4]. Therefore, this should be promoted to the public. Composting is the biological decomposition of organic matter (organic waste) under controlled aerobic and thermophilic conditions into stable products such as humus [5]. This decomposition process involves microorganisms acting at a specific temperature. Eco-enzyme is a product from the fermentation of organic waste such as leftover fruits and vegetables, sugar, and water. This eco-enzyme can be used as a mixture of cleaning agents and pesticides. Eco-enzyme materials use new and fresh litter, while compost can use new and old or rotten garbage. In addition to compost and eco enzymes, domestic organic waste is widely used for maggot cultivation as high-protein animal feed [6].



Fig. 2. Garbage left scattered

Based on the results of surveys and interviews in the village, the following problems can be identified.

1. Residents are not aware of the negative impact of improper waste management on health and the environment.
2. Residents have limited knowledge and skills to process organic waste into valuable products.
3. Residents have limited knowledge of marketing waste-based products.

II. METHOD

Based on problem identification, community service activity was designed and implemented as

follows. The activity begins with educating residents about waste, especially organic domestic waste and its problems, and how to manage the waste properly and correctly. The next stage was training and mentoring on composting process, and provision of the composting equipment.

The compost was made based on household organic waste through a fermentation process using EM4 bacteria, according to the method presented by Sulistyaningsih et. al [7]. Household wet waste is prepared as a nitrogen source, and dry leaf waste or cardboard is a carbon source. The size of the waste can be reduced by enumeration to accelerate decomposition by microorganisms. Then the waste is put in a compost bag. Spray the trash with EM4 solution or rice washing water that has been stored for several days until it is evenly distributed. The entire waste should not be too dry and should not be too wet. Close the compost bag tightly, and leave it until it matures (approximately two months, depending on the size of the waste being composted).

The next activity was monitoring and evaluation (Fig. 3). Monitoring was carried out periodically on several groups of residents. Meanwhile, evaluation was carried out by observing the skills of the residents and asking them to fill out a questionnaire. The questionnaire was created to measure the knowledge and skills of residents and to determine the quality of the product before it is marketed.

Problem identification – educating – training & mentoring – monitoring & evaluation

Fig. 3. Stages of the community service activity on the composting domestic waste in the Pakintelan Village

III. RESULTS AND DISCUSSION

Solid waste that consists of organic and inorganic materials must be managed to avoid endangering the environment. Calculation of the quantity of waste is important in waste management. This is related to planning the amount of equipment needed, planning landfill facilities, planning collection routes, and the number of transports. Garbage accumulation often damages the aesthetics of the environment and

creates a bad smell. Thus, it is important to educate the public [4].

In this community service activity, education on domestic waste management and training on composting have been carried out. In the education, it was conveyed about the types of waste, the composition of waste by type, household waste, and the National Policy and Strategy (*Kebijakan dan Strategi Nasional, JAKSTRANAS*) for managing household waste. In addition, several methods of managing organic waste, compost, and how to make compost as well as how to market the compost through an online marketplace were also presented. The waste managed in this program was domestic organic waste, waste originating from household activities, including food waste, leaf waste, fruit waste, and vegetable waste. Every household produces domestic waste, including residents in the Pakintelan Village. Furthermore, in the village, many residents have land or yard with plants that produce a lot of leaf waste. Thus, this program is feasible for Pakintelan residents.

Based on the questionnaire distributed to the residents, data was obtained that 15 respondents did not know about sorting and processing household waste. Eight respondents already knew, and 22 respondents knew about waste sorting, but they needed to learn how to process it. Then, training and discussion on waste and composting were conducted with the residents. Forty-five participants were attending the activity, they needed to learn how to make easy compost. The participants were enthusiastic about the material presented (Fig. 4), marked by the number of participants who asked questions in the question-and-answer session.



Fig. 4. Material Submission

After the presentation session, a joint practice of making compost was carried out (Fig. 5). The organic waste used was dried leaves as a source of carbon and vegetables, fruits, and other waste from the kitchen as a source of nitrogen. EM4 solution was added as a means of accelerating composting. If participants found difficulty getting EM4, it can be replaced using rice washing water that has been fermented or left for several days. Tap water can also be used, but it will take a longer time compared to EM4. EM4 needs to be activated first before being used. By this way, the bacteria work more optimally. The activation of bacteria was conducted by adding foodstuffs for bacteria, such as sugar, molasses, or coconut water.

At the end of the activity, participants have more knowledge regarding composting and its benefits. According to the questionnaire, the participants responded that the trained composting process was easy (30%) and very easy (70%). More than 2/3 of the participants planned to disseminate the knowledge and skills they gained to others, and all participants wanted to practice composting in their houses.



Fig. 5. Composting practices

The community service team also facilitated the participants with compost bags and EM4 liquid (Fig. 6). Thus, they could directly practice the trained composting technique in their house. It was hoped that the residents can independently manage their household organic waste to support the achievement of community self-reliance programs.



Fig. 6. Participants get compost bags and EM4

At the mentoring stage, the team checked and assisted with the composting process that was conducted by the residents. The participants of the activities who previously participated in the training have been able to do composting independently (Fig. 7). They have been able to manage household waste and organic waste around the house.



Fig. 7. Composting done by participants



Fig. 8. Compost harvesting

Some residents have harvested their homemade compost (Fig. 8) and used it to fertilize their plants. The compost was black and smelled

of soil. This compost can be added to the growing medium. The compost produced could be marketed. However, if this is to be done, the compost material needs to be chopped for a finer and more uniform size. In addition, the compost needs to be sieved and packaged in attractive packaging.

IV. CONCLUSIONS

Based on the results of the activities that have been carried out, it was concluded that with education on domestic waste and composting training, the knowledge and skills of residents or the target community increased. The residents have been able to do sorting and composting the waste and harvesting the compost independently. Moreover, it is potential to be marketed to get benefit from the waste.

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REFERENCES

- [1] S. N. Indonesia and B. S. Nasional, 'Spesifikasi kompos dari sampah organik domestik', 2004.
- [2] BPS, 'Kecamatan Gunungpati Dalam Angka Tahun 2022', *Semarang, BPS Kota*, 2022.
- [3] KLHK RI (Kementrian Lingkungan Hidup dan Kehutanan Republik Indonesia), 'Komposisi Sampah', *SIPSN (Sistem Inf. Pengelolaan Sampah Nasional)*, pp. 1–21, 2022, [Online]. Available: <https://sipsn.menlhk.go.id/sipsn/public/data/komposisi>.
- [4] A. Kunszabó, D. Szakos, A. Dorkó, C. Farkas, and G. Kasza, 'Household food waste composting habits and behaviours in Hungary: A segmentation study', *Sustain. Chem. Pharm.*, vol. 30, no. May, p. 100839, 2022, doi: 10.1016/j.scp.2022.100839.
- [5] R. Mouhoubi, M. Lasschuijt, S. Ramon Carrasco, H. Gojzewski, and F. R. Wurm, 'End-of-life biodegradation? how to assess the composting of polyesters in the lab and the field', *Waste Manag.*, vol. 154, no. September, pp. 36–48, 2022, doi: 10.1016/j.wasman.2022.09.025.
- [6] I. Ahmad *et al.*, 'Identification of the economics, composition, and supplementation of maggot meal in broiler production', *Saudi J. Biol. Sci.*, vol. 29, no. 6, p. 103277, 2022, doi: 10.1016/j.sjbs.2022.03.027.
- [7] T. Sulistyarningsih, N. Widiarti, W. Astuti, and D. Harjunowibowo, 'The proliferation of effective microorganism (EM) in vinasse and its application in the manufacture of livestock-waste based fertilisers', *J. Chem. Technol. Metall.*, vol. 54, no. 4, 2019.