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Liquid Organic Fertilizer (LOF) and Its Use for Plants: Community Based Organic Waste Empowerment Solution in Dusun Gesikan Bantul

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Abstract

Residents of Dusun Gesikan Rt 04 Panggungharjo, Sewon, Bantul have not managed household organic waste properly. Household organic waste management is very important to do to minimize environmental pollution. This activity aims to provide direction and assistance to residents to process organic waste into liquid organic fertilizer (LOF) using the Stacked Bucket method or Tong Kompas as well as utilizing LOF produced for plants that are planted independently in each resident's house. Although it has not been analyzed in the laboratory, the physical characteristics of the LOF produced are quite good in terms of color, odor, and viscosity. Indirectly, this activity reduces the dependence of the community on commercial fertilizers. Also, residents contribute to efforts to protect the environment so that it is free from waste. It is hoped that the resulting vegetables will not only be useful for food sources but also improve the health of citizens in the Covid-19. The community becomes more productive by empowering household organic waste to become more useful products.

Keywords: LOF, Community Based, Organic Waste

I. INTRODUCTION

Organic waste in rural areas, especially in Bantul Regency, is generally not fully transported to the final processing sites (in Indonesia is called TPA). In general, organic waste is only piled around rivers, irrigation canals, and even burned. This will become an environmental problem if not handled. The total waste generated by Bantul Regency which is disposed into TPA Piyungan reaches 70 tonnes/day or 25,550 tonnes/year, with the dominant component in the form of organic waste (50% – 70%) and around 75.49 tonnes/day produced by households. Meanwhile, the process of managing organic waste into compost is still relatively low at around 9% (DLH, 2018; KLHK, 2018; NAWASIS, 2020).

According to (Bharathiraja et al., 2018) organic waste can produce large amounts of Greenhouse Gases (GHG) including Methane (CH_4) (40 – 75%); carbon dioxide (CO_2) (15 – 60%); hydrogen

sulfide (H_2S) 0 – 5,000 ppm; ammonia (NH_3) 0 – 500 ppm when decomposed. If organic waste is dumped openly, GHG will contribute to global warming. Meanwhile, if organic waste is managed properly, it can be used as compost and liquid organic fertilizer (LOF). The conversion of organic waste into compost or LOF can reduce the rate of GHG emission that can be generated from open dumping in TPA. Every 1 ton of compost produced can reduce at least 5 – 7 tonnes of CO_2 GHG_{eq}. (Suprihatin et al., 2008). The conversion of organic waste to produce compost and LOF is one of the alternatives that has recently become attractive around the world as a form of implementing the concepts of Reduce, Reuse, Recycle (3R), and zero waste. The LOF is very useful for increasing plant fertility as a source of organic matter and nutrients. Physical characteristics that are easily observed for mature LOF are odorless, blackish in color, and have a stable temperature (Haydar & Masood, 2011; Setyorini & Saraswati, 2006).

Organic waste can be processed into LOF using the Stacked Bucket method. This method is one of the many methods of processing organic waste using plastic buckets or barrels arranged anaerobically. The use of this method can produce environmentally friendly organic fertilizers and can help efforts to enrich agricultural land (Kementan, 2019). This process makes it possible to involve the community in its implementation. Gerakan Integrated Waste Management Community or in Indonesia is called Komunitas Pengelola Sampah Terpadu Gesikan Resik Tertata dan Asri (Kompaster Gestari) is the initiator of community-based waste management in Dusun Gesikan RT 04 Panggungharjo, Sewon, Bantul. Some of the Kompaster Gestari activities that have been carried out include: waste banks, basic training in managing waste into compost and crafts, and processing used cooking oil (Muryani et al., 2020). Carrying the concept of the Super Liquid Fertilizer Compost Bin (in Indonesia is called Tong Kompas) in the stacked bucket method, Kompaster Gestari can produce LOF which can then be used for plants. Tong Kompas have simple construction, small in scale, cheap, and easy to operate. The LOF production using Tong Kompas is portable and very suitable for use in rural areas, thus helping to meet fertilizer needs and reduce organic waste generation.

This Community Service Activity (in Indonesia is called PBM) aims to provide direction and assistance to the community in making LOF using Kompas Tong with the Bucket Stack method and its use for plants in their home yards. It is hoped that the benefits can be felt directly by the community, especially to become a pioneer and activator in waste management, vegetable cultivation, and herbal remedies. Besides, this activity is also expected to provide *added value* on household organic waste, thus contributing to increasing household-scale food security without having to rely on commercial fertilizers. People can consume vegetables and herbal remedies that are planted themselves, so it is hoped that they will be healthier and can increase their immunity in the Covid-19 pandemic. Furthermore, this activity is also in line with the government's appeal to reduce the spread of Covid-19, because it can increase the productivity of people in their homes.

II. LITERATURE REVIEW

II.1. Kompaster Gestari

Kompaster Gestari was formed in 2019 by Community Service Activities (PBM), UPN "Veteran" Yogyakarta. According to Muryani et al. (2020), the activities carried out by Kompaster Gestari are integrated implementation of Reduce, Reuse, and Recycle (3R). This is in line with Sucipto (2012), integrated waste management includes activities for reducing waste, recycling, stabilization, and waste processing to the final disposal. The main activity that has been carried out by Kompaster Gestari is the management of inorganic waste through the Waste Bank. Meanwhile, organic waste is still not well managed.

II.2. Liquid Organic Fertilizer (LOF)

Problems that are often faced by solid waste processing include the large amount of organic waste that comes from kitchens, schools, agriculture, and plantations. Also, the residents still do not know

how to process organic waste properly (Ghufron et al, 2017). Several forms of organic waste processing include stacked buckets, dakimakura baskets, processing organic waste into worm feed, layered bricks, anaerobic digestion, and so on (Chaerul and Mardiyah, 2019; Ghufron et al., 2017; Kementan, 2019; Rahman et al., 2020; Satori et al., 2018). A stacked bucket is an organic waste processing method that can produce two types of products, namely solid compost and Liquid Organic Fertilizer (LOF). The LOF is the result of the decomposition process of organic waste in the form of liquid with the advantages of which it can be easily absorbed by plants, does not damage the soil, and contains lots of nutrients (N, P, K) so that it helps improve soil (Nur et al., 2016). Making LOF by anaerobic processes also has the potential to produce biogas which can also be utilized (Erwin dan Putu, 2012). In general, household organic waste in the form of vegetable residue can produce LOF and biogas with a characteristic moisture content of 88.78%; pH 7.68, and C/N ratio 33.56 (Sarjono et al., 2013). Meanwhile, food scraps can produce liquid fertilizer with the characteristics of N-1.15%; P- 0.308%; K- 0.7% (Unnisa, 2015).

II.3. Program Implementation Method

Sulistyawati et al., (2019) has implemented a mentoring program in making organic waste processing and hydroponic systems through several stages, namely: program socialization, counseling and manufacturing practices, extension, and monitoring and evaluation programs. The success of the program can be seen from improving community skills, forming waste bank groups, and increasing sales turnover from products made. Not different from that, Nurman et al. (2019) through extension activities and practice of making compost from agricultural and livestock waste can produce compost with good physical properties and can be used for community plants. The most popular methods of transferring information and technology for the community are counseling and field meetings, also supported by communication facilities such as mobile phones, use of pocketbooks/brochures, etc (Purnomo et al., 2015). Good communication needs to be built between extension agents and residents so that the activities can run effectively. The effectiveness of activities can be in the form of reciprocity, response, and enthusiasm of residents as recipients of information from extension agents (Jurnal & Ilmu, 2018).

III. RESEARCH METHODOLOGY

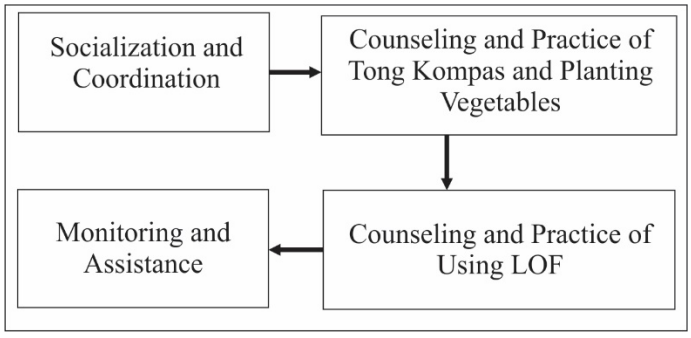

Figure 1. The Implementation program steps

III.1. Socialization and coordination

Socialization and coordination aim to introduce and build good relationships with Kompaster Gestari before this program is delivered to residents. At this stage, it is explained about: the importance of processing organic waste, how to process organic waste into Liquid Organic Fertilizer (LOF), and how to use LOF for plants. Socialization and coordination are carried out by direct explanation and using PowerPoint as media.

III.2. Counseling, the practice of Tong Kompas and Planting Vegetable

The counseling begins with direct explanations to residents, then continues with the practice of Tong Kompas and planting vegetable seeds. The tools and materials used to make Tong Kompas are plastic buckets (± 20 liters), drills for making holes, faucets, and kitchen waste. Practices Planting vegetable seeds uses the following ingredients: rice husk/straw, husk ash, dry leaves, ready-to-use LOF, seeds, soil, and seed containers.

III.3. Counseling and Practice of Using LOF

Introducing and directly practicing the use of LOF on plants. In this activity, the residents explained how much liquid fertilizer can be used for planting media. The residents were introduced to and practiced directly making planting media, then transferring the plant seeds to the planting medium.

III.4. Monitoring and Assistance

Monitor the results of activities that have been carried out by residents. This activity is carried out by discussing and sharing the results and obstacles encountered during the activity. This activity is monitored by Kompaster Gestapo.

IV. FINDING AND DISCUSSION

Together with Kompaster Gestari, this Community Service Program (PBM) generally aims to realize the concept of Reducing the potential for waste, Utilizing waste, Recycling waste, sorting waste, Saving waste, Minimizing residual waste entering the landfill, not throwing away garbage into the river, and Not Burning garbage for the Gesikan community (in Indonesia is called. 6M and 2TM). This activity focuses on the management of organic waste which has not been managed by processing household organic waste into liquid organic fertilizer (LOF) using the stacked bucket method.

IV.1. Socialization and Coordination

Socialization and coordination are the beginning of this PBM activity, the aim is to recognize the characteristics of the residents and adjust the effective explanation methods for the residents. This becomes necessary, considering that residents come from various backgrounds (ages, education, and different social levels). This activity began with socialization and coordination with the Kompaster Gestari (Figure 2). The materials presented at the meeting were about: waste problems in DI Yogyakarta, types of waste generated from household activities, description of the condition of solid waste in Dusun Gesikan, as well as several alternatives in reducing solid waste. This socialization and coordination were carried out through direct presentations and using PowerPoint materials. The Covid-19 health protocol is still implemented by requiring participants to keep social distancing, wear masks, and wash their hands before entering the socialization and coordination place. This activity received appreciation as well as received a good response, as evidenced by the enthusiasm of Kompaster Gestari members to participate in the activity.

Figure 2. Socialization and coordination with Kompaster Gestari

IV.2. Counseling and practice of using Tong Kompas

Counseling and practice of making Tong Kompas was carried out with members of Kompaster Gestari and residents of Dusun Gesikan. Activities are still carried out face-to-face while still prioritizing the Covid-19 health protocol, which requires participants to wear masks, keep their distance, wash their hands, and be carried out in open spaces. The activity begins by explaining directly the importance of processing household organic waste. Household organic waste processing needs to be done. Besides helping to reduce the generation of organic waste, it can also help the process of fertilizing resident's plants in their homes. So far, their household organic waste is only piled up and only a small part is used for animal feed. Then the residents were shown the form of stacked buckets that had been prepared previously. In general, making a Tong Kompas consists of 4 stages (Figure 3), namely: (1) cutting the bottom of the bucket; (2) Hollow out in a circle all over the bottom surface of the top bucket; (3) Install the faucet for the LOF output in the lower bucket; and (4) Stacking the top and bottom buckets into a Tong Kompas. The Tong Kompas can accommodate up to 20 liters of Liquid Organic Fertilizer.

Figure 3. The stages of making Tong Kompas

Tong Kompas consists of two parts, namely the top and bottom. The top bucket functions as a container for organic waste to be processed. This section is equipped with a lid at the top and small holes that fill the bottom of the bucket. The bottom bucket functions as a storage area for leachate or liquid organic fertilizer produced during the processing of household organic waste. This section is equipped with a faucet, as a place for the treated liquid fertilizer to come out. The principle of the performance of this stacked bucket is anaerobic or without the addition of oxygen. In this

explanation, the residents were also shown how to enter the waste to be processed. Starting with chopping the waste first to facilitate the waste decomposition process, put the household organic waste into the top bin, and close the top bin (Figure 4). The residents were very enthusiastic about this activity, as evidenced by a lot of questions from residents. Some residents directly practice using this stacked bucket. Communication takes place effectively between extension agents and residents, effectiveness in extension activities can increase the performance and participation of residents during the implementation of activities (Rozaq and Sudaryanto, 2018).

Figure 4. Introduction and practice of organic waste processing with Tong Kompas

IV.3. Counseling and practice of using LOF

Figure 5. Making planting media (1); Direct planting (2); and Transferring the plant seeds (3 and 4)

The results of the processing of household organic waste using the Kompas Tong are then used for plants. There are 2 types of planting methods, namely direct planting into planting media that has been mixed with LOF (no.2) and transfer of seeds that were previously grown on certain planting media (no.3 and 4). In this activity, the composition of using LOF for planting media was explained. The ratio of using LOF to water is 1: 100 or 10 mL LOF for 1 liter of water. Each mixture can be used for 5 to 10 plants. It would be better if the use of LOF is done after the plant grows leaves with a period of one week. Making planting media (no 1.) utilizes a mixture of manure, soil, and water. After getting an explanation about the making of planting media and transferring seeds, the residents then practiced it directly. The activity which was started with an

explanation was then continued with the practical practice directly proved to be effective. The residents became quick to understand the material provided. Also, this activity is documented and it is hoped that the resulting video can also attract other residents to practice it in their homes.

IV.4. Monitoring dan Assistance.

Figure 6. LOF harvesting at residents' homes

Based on the results of monitoring at the residents' homes, it can be seen that this program has been going on according to plans and targets. Considering that activities are not easy when it comes to conveying knowledge and information to the residents. Moreover, this activity lasted only about 4 months. The results of using the Tong Kompas to process household organic waste were quite good when viewed from the physical appearance of the LOF. In general, the LOF generated from processing household organic waste using a Tong Kompas owned by residents has physical characteristics: black or blackish brown, odorless, and runny. On average, residents can harvest LOF after approximately 2-3 months.

Figure 7. Harvesting activity

The harvested LOF is then used to fertilize the plants. The result is that plants can grow well, even vegetable crops can be harvested with fairly good results (Figure 7). The vegetables produced are fertile and grow well, although there has been no test of the quality of the liquid organic fertilizers produced. Some of the vegetables that are harvested include kale and spinach.

This program is very effective to increase community participation in reducing, processing, and indirectly increasing the economic value of household organic waste. Although the increase in the economic value of organic waste is not calculated, the community's dependence on buying

commercial fertilizers is decreasing. This has the potential to be utilized on a larger scale, even potentially commercialized if the quality of the fertilizer produced is by market needs. This activity can also increase the expertise and knowledge of residents about how to process organic waste properly and without causing environmental problems. Furthermore, it can increase the participation of residents of Dusun Gesikan in realizing a clean and healthy environment by empowering household organic waste into more useful products.

V. CONCLUSION AND FURTHER RESEARCH

Household organic waste can be processed by residents of Dusun Gesikan and Kompaster Gestari into Liquid Organic Fertilizer (LOF). The LOF results can be used as fertilizer for resident's plants, thereby reducing community dependence on commercial fertilizers. The quality of LOF is quite good even though it has not been tested in the laboratory, this can be seen from the LOF results that physically meet the requirements for liquid fertilizer. Plants given this LOF can also grow well. This activity can also increase the productivity of residents during the Covid-19 pandemic era.

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