

Training on Making Organic Fertilizer at SMPN 5 Satu Atap Labuhan Badas, Sumbawa Regency

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Abstract Organic fertilizer application is a fundamental approach to improving soil structure and nutrient content in order to encourage sustainable agricultural development and high economic benefits. Promoting the use of organic fertilizers for the young generation is one of the steps to educate them on how to utilize organic manure. The community service activity aimed to provide information and an introduction to plants through the use of school grounds for cultivation and to introduce the making of organic fertilizers at the junior high school level. The organic fertilizer was produced from decomposing organic materials such as dry leaves, cow manure, brown sugar, and bioactivator. The community service program presented a positive experience for students by gaining knowledge and experience in making organic fertilizer. They produced organic fertilizer that met the required parameters and was successfully applied to the schoolyard's plants. As a result, they can recognize the health benefits associated with the use of organic fertilizers.

1. INTRODUCTION

Intensive cropping systems are performed through the consistent use of synthetic chemicals around the world that can cause environmental pollution, residual toxicity towards microorganisms and humans, the development of plant pathogen resistance, biodiversity loss, and hazards to animal and human health (Alengebawy et al., 2021; De Corato, 2020; Pathak et al., 2022). According to Ni et al. (2011), fertilizer application and controlled-release fertilizers reduce excessive chemical fertilizer use and nutrient loss in agriculture. Growing concern regarding human health as a result of the negative impacts of dangerous synthetic chemicals and the widespread application of mineral fertilizers has prompted farmers to investigate safer and more environmentally friendly alternatives. One of the alternative practices is organic fertilizer. Compared to chemical fertilizers, which decreased by 30% through the use of organic fertilizers as supplements (Daniyan et al., 2017), organic fertilizers have more significant impacts on the composition of the microbial community (Wei et al., 2017) and contain

complete nutrients (Cui et al., 2020; Rostaei et al., 2018), both macronutrients such as nitrogen, phosphorus, and potassium, as well as micronutrients such as Fe, Co, and Mn (Yuniwati et al., 2023). The application of organic fertilizers instead of chemical fertilizers is economically feasible and is one of the environmentally sound long-term approaches to sustainable agriculture (Hui et al., 2017; Ning et al., 2017). The expansion of organic fertilizer application necessitates national policies that include subsidies in order to build the infrastructure required for collecting, storing, processing, distributing, and applying organic wastes to smallholder farms (Ndambi et al., 2019; Wang et al., 2018).

Organic fertilizers, such as animal manure, plant residues, and composted organic matter, can change the soil bacterial community structure and activity and affect the abundance of the N-cycling-related microbiome (Li et al., 2014). Organic fertilization positively affects agroecosystems by stimulating plant growth, enhancing crop productivity and fruit quality, and improving soil reducing production costs. Organic fertilizer can be

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made from various types of materials, including plant residues in the form of dry leaves and livestock manure. Organic materials are being utilized as soil conditioners and fertilizers. Organic matter is an essential component of soil that influences its chemical, biological, and physical properties (Bashir et al., 2021; Gurmu, 2019).

Organic fertilizer is made through fermentation; plants can quickly absorb the nutrients and organic compounds it contains. Organic fertilizer comes from organic materials, which can be made using a bioactivator (brand of EM4). Using bioactivator technology has the benefit of producing organic fertilizer faster than conventional methods (Indrawati et al., 2020). In addition, according to Olle & Williams (2013), bioactivators can also suppress the growth of soil pathogens, accelerate the fermentation of waste and organic waste, increase the availability of nutrients in plants, increase the activity of beneficial microorganisms, and reduce the need for chemical fertilizers and pesticides.

The emerging problem in developing countries is that recycling and reusing organic materials in agriculture as fertilizer is crucial. Organic fertilizer is an alternative to support the productivity of cultivated land. Moreover, the problem that occurs in the yard of SMPN 5 is that the cultivation land is classified as unsupportable due to a lack of soil fertility, the soil texture is predominantly sand, and water sources are insufficient. Therefore, initially, for the education of the younger generation, the target audience of this service activity is students at SMPN 5 Satu Atap Labuhan Badas. The purpose of this activity was to provide information and an introduction to plants through the use of school grounds for cultivation and the introduction of organic fertilizers at the junior high school level for achieving environmentally friendly agriculture. Furthermore, these activities, such as life skills, will later enable students to provide mature provisions, especially regarding their skills, so students will be better prepared when required to contribute to their community.

2. METHOD

This community service was carried out on October 13, 2023, involving students of SMPN 5 Satu Atap Labuhan Badas, Sumbawa Regency, Nusa Tenggara Barat, Indonesia (latitude 8°08'24.5"S and longitude 117°24'18.2"E). The number of participants consisted of 35 students and two teachers. Service activities begin with a survey in the field, application for activity permits, preparation for accommodation, and preparation for the implementation the activities.

Figure 1 presents the five stages that must be followed to produce organic fertilizer. This community service

provided an advisory service (a presentation) about the benefits of organic fertilizer, training in making organic fertilizer manually and training in making organic fertilizer using the bioactivator simulator, application of organic fertilizer as an organic planting medium in polybags in yards selected as the location for activities, and evaluation of the program.

2.1 The preparation making organic fertilizer

The preparation stage was aimed at preparing various objects and media related to the theme of this community service. These materials consisted of dry leaves, cow manure, brown sugar, bioactivator, and water.

2.2 Introducing organic fertilizer

This activity was carried out by presenting materials regarding the theory of using living pharmacy gardens and making organic fertilizer and how to apply it to plants cultivated in the schoolyard. In addition, the presenter taught the students about the benefits of using organic fertilizer as a planting medium for producing healthy food. The outreach stage was applying science and technology to the community by cultivating land plots with organic planting media to provide nutritious food.

2.3 Making organic fertilizer

Organic fertilizer requires crushed dry leaves, cow manure, brown sugar, and bioactivators. One kilogram of dry leaves was chopped in order to reduce particle size, which affects the activity of microorganisms. The small particle size will increase the surface area, thereby increasing contact between microorganisms and organic materials and speeding up the decomposition process. The next step was adding 1 kg of cow manure to a bucket (30×12 cm) containing dry leaves. Dissolve bioactivator 1 L, 50 gr brown sugar, and 5 L of water were mixed homogeneously with bucket 10 L, then poured into a bucket containing dry leaves and cow manure. All ingredients were mixed (Figure 2 (a)), fermented (Figure 2 (b)), and stored in an environment protected from direct sunlight for the anaerobic fermentation process to run well for 21 days. In order to prevent fermentation from overheating, the organic fertilizer was stirred regularly to maintain the temperature at around 40°C. After three days of treatment, the temperature and humidity were checked to maintain the fermentation process.

2.4 Organic fertilizer application

After 21 days, the application of organic fertilizer was done by sprinkling it on the soil's surface on yard plants like shallot (*Allium cepa* L. Aggregatum group), aloe vera (*Aloe vera* L.), and tomato (*Solanum lycopersicum* L.) around the schoolyard.

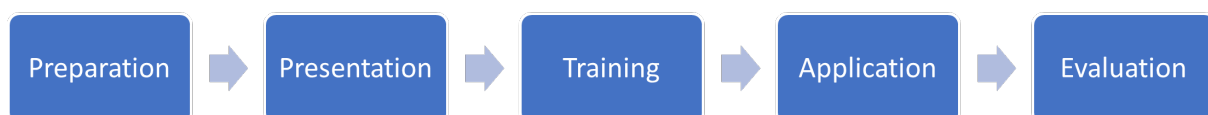


Figure 1 . The flow of the method of making organic fertilizer



Figure 2 . (a) The process of making organic fertilizer with students; (b) The result of organic fertilizer

2.5 Training evaluation

The training evaluation showed the student’s increased awareness of managing and making organic fertilizer. This activity was evaluated by administering a post-test in the form of a questionnaire organized after the training was implemented. Evaluation of this activity was carried out in two stages, the first of which was the introduction to making the fertilizer. This stage involved a quick review – asking questions to assess the students’ knowledge about organic fertilizers. The second stage was periodic training evaluations. These evaluations also functioned as a form of monitoring and mentoring after training was held. After the training had been completed, visits were scheduled periodically to observe the fermented organic fertilizer and provide necessary assistance if students wanted to ferment organic material to make organic fertilizer again.

3. RESULT AND DISCUSSION

The presented material comprised theories regarding the impact of using inorganic fertilizers continuously and in the long term, the meaning of organic fertilizers, the benefits of organic fertilizers, and their advantages compared to inorganic fertilizers (Figure 3).

The result of this training activity showed that all participants were interested and enthusiastic about listening to material on the use of living pharmacy gardens and organic fertilizer and participated directly in the training on making organic fertilizer. Participants also actively asked questions regarding processing materials for organic materials.

3.1 Making the organic fertilizer: Practice and evaluation

The process of fermenting or composting dry

leaves aimed to decompose the organic materials. To accelerate the fermentation process in making organic fertilizer, bioactivators were added, and they contained microorganisms that break down organic materials. The addition of these bioactivators was aimed at activating bacteria that decompose organic material into nutrients that are easily absorbed by plants quickly. Moreover, the concentration of bioactivator used also affects the fermentation duration, temperature, fertilizer color, and aroma of the liquid fertilizer produced (Natsir et al., 2016). Furthermore, the addition of brown sugar containing glucose functions as an energy source for microorganisms that decompose organic matter optimally.



Figure 3 . The presentation on making organic fertilizer

Several factors influence the nutrient and organic material content of organic fertilizer. The research results of Anggraini et al. (2019) show that the composition of the nutrients (substances) contained in liquid organic fertilizer depends on the material and method of composting. The plant material’s composition also influences the organic fertilizer’s nutrient content (Marinari et al., 2000). According to Saputra et al. (2024), macronutrients and micronutrients greatly influence plants. Therefore, fertilizer must be balanced according to the plants’ needs.

Table 1 depicts the decomposition and texture changes over time of the fertilizer that was composed of dry leaves, cow manure, bioactivator, and water. A bioactivator is a mixture of microorganisms containing photosynthetic bacteria, yeast, actinomycetes, and fermented fungi that assists in accelerating the decomposition of organic materials, especially dry leaves (Agustina, 2020; Handajaningsih, 2018). Moreover, a bioactivator can increase the fermentation and decomposition of organic waste and suppress the activity of pests and pathogenic microorganisms (Balogun et al., 2016).

Table 1 . Fertilizer decomposition and texture changes over time

No	Days	Results	Notes
1	1-7	The fertilizer made still shows blackish-yellow, original material dry leaves.	The material was not decomposed properly.
2	8-11	Their color started to change to brown.	It has a rough texture.
3	12-17	A brown color appeared.	It has a rough texture.
4	18-21	The material had changed color to brownish-black.	It has a smooth texture.
5	18-21	The material turned brownish-black.	The color change was due to the compost starting to decompose.

After fermenting for 21 days, the organic fertilizer can be harvested. Based on observations of the aroma and color, the organic fertilizer produced from this training was brownish-yellow and had a tape aroma, which indicated that the fermentation process was taking place perfectly. This organic fertilizer can be used as a plant fertilizer.

This community service has been carried out in accordance with the plans set by the community service team. The stages of the activity consisted of preparing tools and materials, setting the time and location, coordinating with training participants, and conducting the knowledge-sharing session according to the agreed-upon schedule.

Figure 4 shows that all participants attended the presentation session and training on making compost reached 100%. This is in accordance with the planned target number of participants attending the activity, namely 35 students. The level of achievement in understanding the material was good, namely 84%. This can be seen from the post-test results shared and filled in by participants. From the post-test, students understood organic waste in general, the types, and how to make organic fertilizer. Therefore, there was an increase in the knowledge received regarding organic waste processing. The results of the training in making organic fertilizer were also categorized as good, namely reaching 80%. This value was also measured by the post-test conducted after the training.

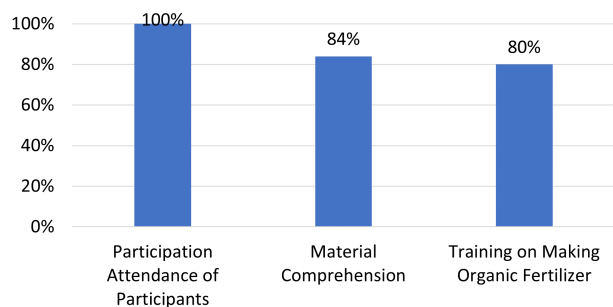


Figure 4 . Achievement percentages of the organic fertilizer training

The participating students were able to understand the materials and tools needed, as well as the stages and how to make organic fertilizer in a composter. According to monitoring from the service team, the training participants were very enthusiastic and actively involved in this activity. Due to limited tools and materials, some students practiced making organic fertilizer in turns during the practical activity, while others observed and took notes. Throughout the session, participants asked various questions, including inquiries about the composition of materials, the recommended storage duration for organic fertilizer, and the application methods for different plants.

The training achievements have not reached 100% because, during the training, the fertilizer results could not be seen immediately, and they had to wait for one to three weeks. This has made it difficult for students to determine the time to harvest fertilizer and the end of the composting process. From the training results, they have received new information and knowledge about how to utilize unused

plant residues. Participants can process and utilize waste with the knowledge and skills obtained during the training. This can be an opportunity for participants to develop and increase their creativity in using existing materials in their surroundings that have beneficial values for people’s lives. In addition, this is an alternative solution to increase the soil nutrient content needed by crops other than the use of chemical fertilizers, the prices of which have relatively increased. Therefore, community service activity can be said to have increased students’ knowledge and skills in processing organic waste into valuable new products.

After the training, the organic fertilizer can be used for growing plants (Figure 5). Students gain knowledge and experience in making organic fertilizer, which is beneficial for plants and a source of healthy food for the community. Organic fertilizer is environmentally friendly and contains better nutrition than traditional agriculture.



Figure 5 . Plants can be grown by utilizing organic fertilizers

4. CONCLUSION

This community service program was carried out to discover a positive impact on students at SMPN 5 Satu Atap Labuhan Badas by providing knowledge about organic fertilizer to the participating students. They successfully learned about plants and their environment and used organic fertilizer to enhance the quality of their produce, thereby influencing the food they cultivated and consumed. The organic fertilizer produced by the students met the required criteria and was successfully applied to the plants in the schoolyard. This community service activity needs to be carried out continuously so that the participants can understand the process of making and applying other types of organic fertilizers.

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CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest.

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