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Organic Fertilizer Making Training as an Effort to Implement Sustainable Organic Farming at the Gudangharjo Paranggupito Wonogiri Farmers Group

Siti Mardhika Sari[1*],Wiyono[1], Endang Suprapti[1], Agus Budiyono[1], Daryanti[1]
[1]Agrotechnology Faculty of Agriculture, Universitas Tunas Pembangunan Surakarta
*e-mail: mardhikasari.siti@gmail.com

Abstract
This community service activity aimed to provide training on organic fertilizer production as a practical step toward implementing sustainable organic farming. The program was conducted for members of the Gudangharjo Farmers Group, located in Paranggupito, Wonogiri, an area with significant agricultural potential but limited application of organic farming practices. The training focused on utilizing locally available materials such as cow manure, rice bran, banana leaves, molasses, and decomposer microbes to produce high-quality organic fertilizer. The methods employed included explanations, demonstrations, and hands-on practice to enhance participants' understanding and skills. Participants were introduced to the principles of organic farming, the benefits of organic fertilizers, and the technical steps of compost production, emphasizing the proper ratio of ingredients, aeration, and moisture management. The training outcomes showed an increase in participants' knowledge and motivation to adopt organic fertilizer production practices, supported by the availability of raw materials in the area. Members of the farmers' group who previously lacked skills in organic fertilizer production were able to independently apply the techniques after the training by utilizing easily accessible local materials. Training on organic fertilizer production is essential to enhance farmers' understanding of sustainable agriculture concepts that prioritize environmental preservation.
Keywords*: organic fertilizer, sustainable agriculture, training, community service.*

1. INTRODUCTION

Organic farming in the past was generally done naturally, without the use of synthetic chemicals such as pesticides and artificial fertilizers. Farmers used local resources, such as manure, compost, and crop rotation techniques to maintain soil fertility and control pests. This farming system was based on local wisdom and hereditary traditions that maintained the balance of the ecosystem. However, these practices were often subsistence, with lower yields and less standardization, making it difficult to compete in the modern market (Akhiroh et al., 2024).

Organic farming is an agricultural system that emphasizes environmentally friendly, sustainable, and ethical practices (Agus Susilo dan Noer Rahmi Ardiarini, 2017). The organic farming movement began to develop in the early 20th century as a reaction to the industrialization of agriculture that increasingly relied on the use of synthetic chemicals, such as fertilizers and pesticides. This industrialization has succeeded in significantly increasing agricultural productivity, but has also had serious negative impacts on the environment and human health. One of the main reasons for the emergence of organic farming is ignoring environmental degradation caused by the use of chemicals in agriculture. Excessive use of chemical fertilizers has led to decreased soil quality, loss of natural fertility, and pollution of soil and river air. Synthetic pesticides have also been shown to damage biodiversity by killing non-target organisms, including beneficial insects, birds, and even other animals at the top of the food chain. In addition, chemical residues in agricultural products have become a source of concern for human health because they can trigger various diseases, including cancer (Sapsuha et al., 2022).

This environmental crisis is exacerbated by climate change exacerbated by conventional agricultural practices. Greenhouse gas emissions from the use of synthetic nitrogen fertilizers and intensive livestock farming activities have contributed to global warming. In this context, organic farming offers a solution by reducing dependence on synthetic chemical inputs and adopting more natural and regenerative practices. Organic farming empowers crop rotation, compost, green manure, and natural pest control techniques

to maintain soil health and reduce negative impacts on the environment. In addition to environmental impacts, organic farming also emerged as a response to socio-economic problems caused by the industrialization of agriculture (Lamusa & Akrab, 2024). Agricultural systems tend to benefit large companies and disadvantage small farmers. Small farmers are often trapped in a cycle of dependence on expensive agricultural inputs and are vulnerable to market price fluctuations. Organic farming, on the other hand, emphasizes farmer independence and the use of local resources, making it more suitable for small and medium-scale farming.

The situation analysis of farmer groups that have not received training in making organic fertilizers and pesticides can be seen from several important aspects, including farmer knowledge and skills, environmental conditions, and farmer productivity and economic welfare (Roziq et al., 2024). Farmer groups that have not received training in making organic fertilizers and pesticides generally face several important challenges. Farmers' knowledge and skills in organic farming practices are still limited, so they tend to rely on chemical fertilizers and pesticides that are easily available, even though their long-term impacts on the environment and health are poorly understood. This dependence not only increases production costs but also makes farmers vulnerable to damage to chemical product prices and supplies. From an environmental perspective, this practice can cause soil degradation, decreased fertility, and air pollution due to chemical runoff, all of which have negative impacts on the local ecosystem (Amir et al., 2021). Agricultural productivity is also at risk of decreasing over time due to declining soil quality and pest resistance to chemicals. In addition, farmers' economic welfare can be threatened by high costs and suboptimal yields. Low awareness and limited access to sustainable farming practices are also obstacles to the implementation of more environmentally friendly methods. Overall, this situation indicates the need for education and training interventions to encourage the transition to more sustainable organic farming.

Based on the situation analysis above, the problem faced by Gapoktan Gudangharjo Paranggupito Wonogiri Regency is the lack of specific training on making organic fertilizer. In addition, the absence of training in making organic fertilizer causes farmers to continue to rely on chemical products (Nur Rohma & M. Syaikhudin, 2022). Without knowledge and skills in making organic fertilizer, conventional farming practices that use chemicals intensively can cause significant environmental degradation. Many farmers may not yet realize that organic farming is not only more environmentally friendly but can also increase the competitiveness of their products in a market that increasingly prioritizes healthy and natural products. The problems in the field require solutions to face these challenges, counseling and training are needed on organic fertilizer making techniques by utilizing livestock waste around the farmer's residence.

The purpose of training in organic fertilizer production for farmers is to enhance their understanding of the concept of sustainable and environmentally friendly agriculture. Through this training, farmers are provided with knowledge and practical skills in producing organic fertilizer using materials that are easily available in their surroundings, such as livestock manure, agricultural waste, and other organic materials. Additionally, the training aims to reduce farmers' dependence on expensive chemical fertilizers that have a negative impact on the environment, enabling them to lower production costs and maintain soil fertility naturally. By mastering organic fertilizer production techniques, farmers are expected to improve the productivity and quality of their agricultural yields, ultimately producing healthier and more environmentally friendly products.

2. METHOD

This training was conducted on August 28, 2024, in Paranggupito, Wonogiri, and was attended by all members of the Gudangharjo Farmers Group. Before and after the activity, the farmers' group completed a short questionnaire regarding the benefits and techniques of organic fertilizer production. This was aimed at assessing the members' level of understanding of the topic. Organic fertilizer making training usually uses interactive and practical methods to ensure that participants understand the concept and are able to practice it independently. Starting with a theory session, participants are introduced to the basics of organic fertilizer, such as types of raw materials, the decomposition process, and its benefits for soil and plants. After that, the training continues to direct practice, where participants are taught how to collect organic materials, such as kitchen waste, livestock manure, and leaves, as well as techniques for mixing and processing them using simple tools. The tools and materials used in this activity are:

1. Hoe
2. Embers
3. Sprayer
4. Manure
5. Bran
6. Sugarcane Molasses
7. Microbial solution
8. Banana tree trunk

3. RESULTS AND DISCUSSION

Organic fertilizer production training is an important need for the Gudangharjo farmer group, especially those who have never had access to training before. Many farmer groups in rural areas still rely on chemical fertilizers in their agricultural processes, which often have an impact on soil degradation and decreased land fertility in the long term. The lack of knowledge about environmentally friendly alternatives, such as organic fertilizers, makes farmers less able to optimize their agricultural output sustainably. In addition, limited access to information and technology is a major obstacle for farmer groups to switch to organic farming practices. Through organic fertilizer production training, farmers can learn to utilize agricultural waste and local organic materials effectively, reduce dependence on chemical fertilizers, and increase productivity while preserving the environment. Thus, this training not only provides direct benefits to farmers but also encourages the creation of a more sustainable agricultural ecosystem (Taberima et al., 2020).

The evaluation was conducted to measure the knowledge level of the Gudangharjo farmers' group before and after attending the organic fertilizer production training. The evaluation method used a short questionnaire containing questions related to the benefits and techniques of organic fertilizer production. Here is a description of the evaluation results regarding the farmers' group's knowledge of the benefits and techniques of organic fertilizer production in table format:

Table 1. Evaluation of Farmers' Knowledge on the Benefits and Techniques of Organic Fertilizer Production Before and After Training

Aspect	Before Training	After Training	Increase (%)
Understanding the Benefits of Organic Fertilizer	35 %	85 %	50
Understanding the Techniques of Organic Fertilizer Production	25 %	90 %	85
Average Increase in Knowledge	-	-	80

Source : Results of Observation

Based that table illustrates the significant improvement in the farmers' group knowledge after the training. Before the training, only 35% of the members understood the benefits of organic fertilizer, and 25% were familiar with the basic techniques of its production. After the training, 85% of the members could clearly explain the benefits, and 90% understood the technical steps involved, resulting in an average knowledge increase of 80%.

This training activity begins with the delivery of material with the aim that the audience can understand the background of this training. Preparation of the presentation of organic fertilizer making material requires careful planning so that the delivery of information runs effectively and participants understand the concepts and practices taught. The initial stage that must be done is to identify the needs of the participants, such as their initial level of understanding of organic fertilizer and the challenges faced in their farming. Based on these needs, materials can be designed systematically, starting from the introduction of the concept of organic fertilizer, its benefits for soil and plants, to practical techniques for making it. In addition, presentation materials must be well prepared, such as attractive visual slides, impressive videos, and other aids to clarify the explanation. No less important is the procurement of materials that will be used in direct accuracy, such as plant residues, livestock manure, and microbial activators, so that participants can immediately implement organic fertilizer making techniques. Before the training, the presenter also needs to master all aspects of the material, including how to answer technical questions that may arise(Hafid et al., 2022). The location and supporting facilities, such as a comfortable training room and teaching aids, must be prepared to create a conducive learning atmosphere. With thorough preparation, the presentation of the material will not only provide new knowledge to participants but also equip them with skills that can be directly applied in daily agricultural activities.

Figure 1. Socialization regarding organic farming and the fertilizer making process.

Organic fertilizer making practice

The raw materials for making fertilizer use materials that are available in large quantities around the farmer's residence. This aims to utilize manure that is usually not utilized optimally. Farmers in this practice do not have too much difficulty in obtaining raw materials, because the livestock manure collected by each farmer is more than enough to be used in practice. In addition, the use of easily obtained materials also aims to make it easier for farmers in subsequent practices, after this training is completed, a desired program is formed.

Making organic fertilizer with the main ingredients of livestock manure, bran, banana stems, microbial solution, drops, and water is a simple method to produce environmentally friendly natural fertilizer. The process begins by preparing ingredients such as nitrogen-rich livestock manure, bran as a source of microbial energy, chopped banana stems as a source of potassium, and microbial solution to accelerate fermentation (Minardi et al., 2023). These ingredients are mixed evenly with a solution of drops and water to maintain optimal humidity. This mixture is then fermented for several weeks until it turns into ready-to-use organic fertilizer. The fermentation process is carried out in closed conditions with regular stirring to ensure that fermentation takes place evenly. The resulting organic fertilizer can be used to increase soil fertility and support plant growth naturally.

The initial step in making is to prepare cow dung that has been mixed with straw which is placed on the ground and the sides are given wooden borders to make it easier to mix with other ingredients. The place used for making chooses a shady location under trees so that it is not exposed to direct sunlight, because the sulfur and nitrogen content in the fertilizer will evaporate if exposed to too much sunlight. Furthermore, bran is sprinkled on top of the mixture of cow dung and straw and then mixed. In another place, make a mixture of water and molasses with a ratio of 1 liter of water: 10ml of molasses. The mixture is then poured over the dung using a watering can and then stirred evenly with a hoe. The final process of making this fertilizer is to cover the fertilizer with leaves so that the temperature is maintained and the fermentation process runs well (Utami et al., 2020).

The use of molasses and bran in the manufacture of organic fertilizer mixed with animal waste is a strategic step to improve the quality and efficiency of the decomposition

process. Molasses, which is liquid waste from the sugar industry, is rich in simple sugars such as sucrose and glucose. This substance is a source of energy that is easily accessible to decomposer microorganisms, thus accelerating the decomposition process of organic materials. In addition, molasses also contains important minerals such as calcium, magnesium, and phosphorus which contribute to increasing the nutrient value of the fertilizer. The presence of molasses in this mixture not only accelerates the fermentation process but also helps increase the nutrient content in organic fertilizer, making it more effective in supporting plant growth.

Meanwhile, rice bran functions as a carbon source needed to balance the carbon and nitrogen ratio (C/N ratio) in the mixture (Hasan et al., 2020). This ratio is very important to create ideal conditions for the activity of microorganism decomposers. Bran also contains fiber, protein, and various vitamins that can support the growth of microorganisms, thereby increasing the effectiveness of the decomposition process. The combination of bran and molasses with animal waste creates a synergy that produces high-quality organic fertilizer with more complete nutrient content. With these ingredients, the organic fertilizer produced is not only environmentally friendly, but also more economical and effective in increasing soil fertility and plant productivity sustainably.

Figure 2. Bran mixing process Figure with cow dung

3. Making a drop solution with water and microbial solution

Figure 4. Adding banana stem slices.

Figure 5. Covering the fertilizer with coconut leaves.

Addition of molasses in the manufacture of organic fertilizer is an important innovation in increasing the effectiveness and quality of the fertilizer produced. Molasses, which is liquid waste from sugar processing, is rich in simple sugars, minerals, and other organic compounds that are very useful as a source of energy for decomposing microorganisms (Harahap et al., 2019). In the process of making organic fertilizer, microorganisms play an important role in decomposing organic materials into nutrients that are more easily absorbed by plants. With the addition of molasses, the activity of microorganisms can increase significantly because they get an abundant supply of energy for their metabolic processes. In addition, the mineral content in molasses such as potassium, magnesium, and phosphorus also adds to the nutritional value of organic fertilizers, so that it can improve soil structure, increase cation exchange capacity, and improve air retention in the soil. The fermentation process in making organic fertilizers also becomes more efficient because molasses can speed up the decomposition time of organic materials such as agricultural waste, livestock manure, or food waste.

However, the use of molasses must be done in the right dosage. Excessive addition can cause an imbalance of nutrients in fertilizers and trigger the growth of pathogenic microorganisms. Therefore, it is important to consider the ratio of the main organic materials, molasses, and decomposing microorganisms in the manufacturing process. With the right formulation, the addition of molasses not only supports the decomposition of agro-industrial waste but also provides a solution for more efficient, environmentally friendly, and productive organic farming. Making of this organic fertilizer also adds thinly sliced banana stem stalks. Banana stalks are one of the agricultural wastes that have great potential to be used in making organic fertilizers. As a part of the banana plant that is often considered worthless, banana stalks actually contain many beneficial organic compounds, such as lignin, cellulose, and hemicellulose, which can be explained as important nutrient components for soil and plants (Khairi et al., 2024). The addition of banana stalks in making organic fertilizers acts as a source of organic material that helps improve soil structure, increase organic matter content in the soil, and support the life of soil microorganisms.

In the composting process, banana stems can be chopped first to make it easier to be explained by decomposing microorganisms. Banana stems also have a fairly high potassium content, thus increasing the nutritional value of the organic fertilizer produced. Potassium is one of the macronutrients that is very important for plant growth, especially in strengthening stems, improving the quality of harvest results, and increasing plant resistance to pests and diseases. In addition, banana stems also have the ability to absorb air, which makes them a good additive to maintain moisture in the compost pile, so that the decomposition process can run optimally. In order for the banana stem composting process to be more efficient, it is necessary to balance it with other materials containing nitrogen, such as animal manure or green leaves, to create an ideal carbon and nitrogen ratio (C/N ratio) (Atman et al., 2018). Banana stems that have a high carbon content need to be mixed with materials rich in nitrogen so that the decomposition process does not take too long. Periodic stirring is also needed to ensure sufficient oxygen supply for decomposing microorganisms. With proper processing, the addition of banana stems in the manufacture of organic fertilizer not only helps reduce agricultural waste but also produces high-quality fertilizer that supports sustainable and environmentally friendly agricultural practices.

Finished fertilizer ingredients are then watered with a mixture of microbial solution and molasses. The addition of microbial solution in the manufacture of organic fertilizer plays an important role in accelerating the decomposition process of organic materials and improving the quality of the fertilizer produced. Microbes, such as decomposing bacteria, decomposing fungi, and actinomycetes, function to decompose complex organic materials such as lignin, cellulose, and protein into simpler compounds that are easily absorbed by plants, such as nitrogen, phosphorus, and potassium. Microbial solution also helps maintain the balance of the microbial ecosystem in the compost pile, so that the fermentation process runs more efficiently. In addition, certain microbes can fertilize organic fertilizers by adding micronutrients such as iron, manganese, and zinc, and produce bioactive compounds that can increase plant growth and resistance to disease. The use of microbial solution can also reduce unpleasant odors during the composting process and minimize the risk of forming harmful compounds such as ammonia or methane. Thus, microbial solution not only speeds up the time it takes to make organic fertilizer, but also ensures that the fertilizer produced is more environmentally friendly and beneficial for soil and plant health.

Making of organic fertilizer in this community service activity uses the following comparative measurements for each ingredient:

Table 2. Composition of ingredients (in weight or volume)

Material	In weight or volume (%)	Utility
Cow dung	60-70	The main ingredients are rich in nitrogen and organic matter
Bran	10-15	Source of carbon and nutrients for microbes
Banana stem	10-15	Carbon source and improve structure
Sugarcane molasses	3-5	Energy source to accelerate microbial activity
Decomposing microbes	0.5-1	Speed up the fermentation process

Source: Purbaya, MR, et al. (2018)

Success of making organic fertilizer is influenced by several important factors that must be considered during the process. First, the composition of the raw materials used greatly determines the quality of the fertilizer produced. Materials with balanced carbon (C) and nitrogen (N) content, such as animal waste, bran, banana stems, and additional materials such as molasses, are needed to support the decomposition process. The ideal C:N ratio is in the range of 25–30:1 to ensure that microbes can work optimally. Second, the activity of decomposing microbes plays a major role in accelerating the decomposition of organic materials. Adding decomposing microbes, such as EM4 or local microbes, helps speed up the fermentation process. Third, environmental conditions, including temperature, humidity, and aeration, greatly affect the success of fermentation (Yusuf et al., 2024). The ideal temperature

ranges from 40–60°C, while the optimal humidity is around 50–60%. Lack of oxygen due to poor aeration can result in anaerobic processes that produce unpleasant odors and reduce the quality of the fertilizer. Fourth, periodic stirring or turning is needed to maintain even oxygen distribution, prevent overheating, and ensure that all materials decompose evenly (Yusuf et al., 2024). Fifth, the duration of composting is also an important factor. Generally, composting takes 4–6 weeks, depending on the type of raw material and the efficiency of the process. By paying close attention to these factors, the organic fertilizer making process can run optimally, producing high-quality fertilizer that is rich in nutrients for plants.

4. CONCLUSION

This community service activity successfully increased the knowledge and skills of Gapoktan members in making organic fertilizer. Through this training, participants understand the importance of using organic fertilizer in supporting sustainable agriculture and environmental conservation. The use of local materials such as cow dung, bran, banana stems, molasses, and decomposer microbes also encourages cost efficiency and encourages agricultural practices in the area. Participants were able to spread the technique of making organic fertilizer independently, starting from the preparation stage of materials, the fermentation process, to maintaining the final results. In addition, this activity successfully motivated participants to reduce dependence on chemical fertilizers and switch to more environmentally friendly methods.

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