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How is organic fertilizer produced and applied to eggplant plants?

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ABSTRACT By enhancing soil properties, organic fertilizers boost plant growth and yield. Based on the soil's physical properties, organic fertilizer can increase the soil's capacity to retain water, thereby increasing plant access to water. This investigation seeks to determine how to produce organic fertilizer from rice stalks for use on vegetable plants. Methods include counseling, training, program implementation, and program evaluation. The research revealed that fermented rice husk organic fertilizer was directly applied to eggplant plants previously planted in nurseries with two different treatments and then transplanted into polybags. The growth of eggplant plants using husk fertilizer was greater than growth using only inorganic fertilizer, which was planted in polybags containing organic growing media, which was quite excellent because the application of organic fertilizer improved soil properties. Improving soil properties involves enhancing its physical, chemical, and biological characteristics. This research unearthed some intriguing findings. There will be a discussion of facts and methods for alerting farmers when the key ingredient for producing fertilizer is in short supply.

1. INTRODUCTION

Improving soil properties through the application of organic fertilizer is very necessary to improve plant growth and yield (Li, 2020; Y. Wang, 2018). In relation to the physical properties of the soil (Kim, 2017; Szufa, 2020), Organic fertilizer can increase the soil's ability to hold water (Muddarisna et al., 2020; Nobile, 2020), thereby increasing water availability for plants. In terms of chemical properties (Hussain, 2020; Moharana, 2017; Tahir, 2018), organic fertilizer contains complete nutrients (Cui, 2020; Rostaei, 2018; Yuniwati et al., 2008), both macronutrients such as Nitrogen, Phosphorus, and Potassium, as well as micronutrients such as Fe (Fitriana et al., 2021; Muddarisna et al., 2021), Co and Mn. The research results of (Fitriana et al., 2020) show that the macro (Hong, 2017), and micro nutrient content of liquid organic fertilizer is N-total 0.33% (Joshi, 2020; Tirtashi, 2019), providing rice straw compost can increase organic C and P available in Ultisol soil and increase the growth and yield of corn plants (Guglielmo et al., 2021; Ma, 2015; Meisinger, 2015).

Graha Tartila Village Neighborhood Many farmers continue to rely on chemical fertilizers to satisfy the nutrient requirements of newly grown plants. However, they contain comparatively high levels of nutrients that can have lasting effects on plants and the environment. Consequently, the use of chemical fertilizers should be gradually supplanted with the use of organic fertilizers (Geng, 2019; Tang, 2018; Yuniwati & Lestari, 2021), particularly organic fertilizers that are accessible in a can and readily available in the area (Li, 2018; Tao, 2017). Rice hulls, which are a byproduct of rice mills and are commonly found in rural areas, are one of the organic ingredients that are simple to preserve in the countryside. Rice husks can be used as a primary material in the production of organic rice husk fertilizer. According to the findings of (Beesigamukama, 2021), and (Mupambwa, 2018), the nutrient content of rice husks is N-total 0.31% and P-total C-organic 45.06 %.

In addition to having an impact on the environment (Glencross, 2022), the continuous use of chemical fertilizers can also reduce the quality of the food produced. By consuming healthy food, the family's dietary demands must be able to meet nutritional and health standards. Consuming organic food satisfies dietary requirements for optimal health. However, the existing reality is that there is production. Many commodities, particularly vegetables, are still produced with chemical fertilizers and pesticides.

Provision of plant nutrients essential for sustenance production Utilizing organic fertilizer is a method for achieving good health. The presence of organic fertilizer in the soil will increase the activity of soil organisms, such as earthworms, resulting in the formation of macro pores that can rapidly absorb water and influence plant growth and yield. In accordance with the findings of (Fallah, 2018; F. Wang, 2017), the addition of organic fertilizer to peanut plantings substantially increased the weight of 100 seeds (Holland & Schmid, 2005), the number of seeds per planting (T. Wang, 2020), and the number of seeds per plot (Siqueira, 2018). Because organic materials can enhance the physical

properties of soil, the ability of organic materials to promote plant growth is crucial. According to (Ahanger, 2021; Liu, 2022), the application of organic fertilizer can enhance the physical properties of the soil, thereby facilitating the absorption of nutrients by the roots. Enhance the capacity of the soil to bind water. This service seeks to discover how to create organic fertilizer from rice husks and how to apply it to vegetable plants (Hassan, 2016).

2. METHOD

From June to August of 2023, activities were performed. The activity will take place in Graha Tartila Village, Pasuruan. This service is provided by providing counseling about the benefits of organic fertilizer, training in making organic fertilizer manually and training in making organic fertilizer using the EM4 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. Figure 1 describes the research phases.

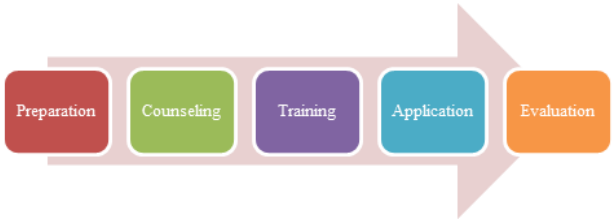

Figure 1. Flow of the method for making rice husks Fertilizer

Figure 1 depicts the research process for producing organic rice fiber fertilizer. There are five procedures that must be taken:

2.1 The preparatory stage

The preparation stage is geared toward preparing various objects and media related to the theme of service, namely: residents of Graha Tartila Village, Pasuruan, materials or teaching materials for counseling, materials and tools used, namely hoes/shovels, tarpaulins/mats plastic, EM4, poly bag, seeds plants (celery, chilies, tomatoes, kale, spinach, mustard greens), and rice husks and other organic remains.

2.2 Counseling stage

Counseling stage outreach stage on the application of science and technology to the community by utilizing yard land with organic planting media in an effort to provide healthy family food and nutrition is conducted by educating residents on the advantages of organic fertilizer as a planting medium for producing healthy food. Residents of the village of Graha Tartila have access to counseling services. Through this phase of outreach, it is anticipated that community members will comprehend the significance of organic fertilizer as a planting medium for the production of healthy, nutritious food. In addition, it is anticipated that, through outreach, residents can utilize factory-generated organic waste in the form of rice husks.

2.3 Pe training stage

Training phase the training phase of implementing the service will consist of direct community practice in the production of organic fertilizer. Community-based practice This consists of four stages: Collecting materials to be used in the production of organic fertilizer from rice husks and producing organic fertilizer from rice husks using the EM4 simulator.

2.4 Creation/Application Stage

Creation/Application Stage Application of organic fertilizer as a planting medium in a poly bag, which was placed in the yard of the resident's residence designated as the location for the implementation activity.

2.5 Evaluation Stage

Evaluation Phase The evaluation is performed at the conclusion of the activity by observing the growth of plants in organic growing media with and without the EM4 simulator.

3. RESULT & DISCUSSION

Among the functions of the agricultural sector are its ability to absorb labor without restriction, its contribution to the national income, its provision of sustenance for the entire population, and its production of a variety of export goods. From the results of observations that have been made, the community in Graha Tartila Village is experiencing problems in the agricultural sector, namely a decrease in sales of their harvests and weakening prices for farmers' commodities in Graha Tartila Village.

Graha Tartila is one of the Pasuruan villages with vacant property that has been unused for a long time. Even though this land is extremely fertile, it was previously used to cultivate vegetables, as evidenced by interviews with several locals and land inspectors. Landowners are hesitant to replant due to seasonal changes, particularly in modern times. In addition to the expense of seedlings, this is primarily due to a dearth of fertilizer for the plants, which prevents their healthy development. People's purchasing power decreased as a result of the effects of the Covid-19 pandemic that was occurring at the time. Other factors, such as changes in people's behaviors, also had an impact on the aforementioned phenomenon. The COVID-19 pandemic has prompted people to recognize the significance of sustaining health, particularly in terms of maintaining all types of intake. As a result, people are presently very fond of consuming everything that is grown organically, as everything that is grown organically has significantly greater benefits. Beneficial for the organism. However, villagers in Graha Tartila continue to use inorganic fertilizers purchased from agricultural stores. However, some farmers already use organic fertilizer purchased from stores at relatively high prices, so the farmers' profits will remain relatively unaffected.

Research and observations of compost conducted without the EM4 simulator have yielded numerous results.

Table 1 depicts the initial findings of research on rice husk compost. According to these findings, rice husk compost retains its original aroma (Gil-Loaiza, 2016). The compost remains identical to the original material (Corato, 2020;). Due to the condition of the material, which has not decomposed, this is the case (Braun, 2021). The second result already emits a foul odor, which is characteristic of banana rice husks. The condition of this odorous material indicates that there has been an increase in the water content during the decomposition process, resulting in the

Table 1. Results of Research on Making Fertilizer

No	Days	Results	Information
1	1-7	The fertilizer made still shows a blackish -yellow, color like the color of the compost material, which is made from yellow rice husks	the material has not decomposed properly, so the shape still resembles the original material
2	8-12	The color starts to change to brown	Rough texture
3	13-17	Still brown	Still rough
4	18-20	The compost material has changed color to almost brownish-black	Start smooth
5	18-20	The compost material turns brownish-black	The color change is due to the compost starting to decompose, plus the compost being frequently aired so that the color, which was previously black due to the humidity, starts to turn brown due to the decreasing humidity. The texture of the compost is crumbly and not rough. The texture at the end of the composting process is also the same as the soil texture.

leaching of nutrients (Roehrdanz, 2019). As a consequence, the activity of microorganisms will decrease, and fermentation will occur, causing a foul odor. On the third day, it still scents and has a moist texture. Frequent mixing of the compost is required so that the texture clumps and adheres together only occasionally. The fourth result was that the compost still had a faint odor, albeit one distinct from the second activity. The fifth result indicates that the compost's condition has begun to undergo a change in odor; it now scents like soil, and its texture is smooth/crumbly rather than coarse. The substance of the finished compost is identical to that of the soil. This occurs because the compost's moisture content has begun to decrease. This outcome is the culmination of mature decomposition. The unprocessed organic material has been transformed into a stable compost product through a lengthy series of processes. To determine the compost's maturity level based on its C/N ratio, it can be tested in a laboratory (Gavilanes-Terán, 2017; Usmani, 2021).

Prior to conducting the study, it was known that the initial C/N ratio in the rice husk mixture met the requirements of the Minister of Agriculture of the Republic of Indonesia Regulation regarding organic fertilizer, biological fertilizer, and soil conditioner (Jara-Samaniego, 2017; Zhong, 2018). C The /N ratio of compost ranges from 14 to 24. As a result of the carbon and nitrogen obtained, compost with this yield value can be used for vegetation and to increase soil fertility (Chen, 2018; Ye, 2020).

It is essential for plant growth in the fertilization procedure. The obtained compost results were in accordance with the Agriculture Minister's regulations. Government of Indonesia Number: 70/Permetan/SR.140/10/2011 with C/N ratio for compost containing 1.2 kg of rice husks and other mixtures (Bhunia, 2021; Y. Cheng, 2018). It demonstrates that in the compost test for eggplant vegetable plantings, the final measurement or weighing value for eggplant vegetables was obtained, where those not given compost had an average weight of 528 grams and those given compost obtained a weighing result of 1014 grams. Given compost fertilizer made from rice husks (M. Arif, 2017; Bhatt, 2019), the plant will thrive well and weigh more than if not given compost fertilizer.

This application is unsettling to some residents due to the prolonged treatment. There are numerous terms and measurements that residents find challenging. In other words, this term or activity is extremely difficult. However, fertilizer production activities persist. Residents are also encouraged to create simple fertilizer using the EM4 simulator (H. Cheng, 2020; Hafez, 2021).

Implementation of the production of organic fertilizer and its application to vegetable plantings in Graha Tartila Village, Pasuruan, in collaboration with a number of local producers and residents. It is anticipated that the technology obtained by farmers through extension and training can be disseminated to public member farmers. And others who did not have time to attend counseling, so the application of manufacturing technology fertilizer EM4 organic simulation using rice husks can be extensively used by farmers, particularly those who engage in home garden and dry land agriculture. Partners' education level is generally elementary school with social status as cultivators (Han, 2021; J. Zhang, 2019). The problem partners confront is a lack of understanding of land management technologies with low organic matter content, which can lead to increased soil density, decreased water infiltration, and a decrease in the soil's capacity to retain water.

Transferring research results on technology for making organic fertilizer using the EM4 simulator, in this instance the use of organic rice husk materials, from lecturers as researchers to farmers through counseling and demonstrations constitutes research activities (Mangalassery, 2019). Partners perform an active role, particularly in technical field implementation. Farmers embraced the executed community service program. Farmers are optimistic that they will be able to utilize what they have learned in the field because this technology is simple to implement.

In general, rice husks are utilized as a farming medium, as husk charcoal briquettes, as a substrate for animal feed, or they are destroyed by random combustion. The neighborhood does not utilize them. Rice husks are not

used commercially due to several obstacles, including a lack of public knowledge and awareness of their potential. These technological obstacles prohibit the processing of rice husks into products with a higher selling price and exacerbate social and economic issues.

The application of rice husk organic material will provide several benefits, namely, increasing soil organic matter, which will have implications for enhancing plant growth due to improvements in the physical, chemical, and biological properties of the soil. Khairatun and (Bashan, 2002) state that organic fertilizer can also reduce soil Fe concentrations through a chemical reaction. The chelation of organic compounds resulting from the decomposition of organic materials also contributes to the hara of macronutrients such as nitrogen, phosphorus, potassium, and micronutrients. El-Lithy (2004) research indicates that the application of organic fertilizer influences the weight of 100 seeds (g), the weight of seeds per plant, and the weight of seeds per allotment.

Mustard greens can be fertilized with compost that has been created using rice husk and the EM4 activator for a number of days, and the compost can make the soil looser or more hollo, thereby increasing the mustard greens yield. Additionally, soil oxygen adds nutrients that plants require. The application of organic materials improves the soil's physical properties, particularly in terms of increasing the soil's ability to retain water, thereby increasing the amount of water available to plants. According to (Etesami, 2018; Lo, 2020), the effect of organic matter on the soil's capacity to retain water varies depending on the soil's texture. The effect of changes in organic matter content on the soil's capacity to retain water is more sensitive in coarse-textured soils than in fine-textured soils. Even in soils with relatively high clay content, the soil's capacity to hold water decreases with increasing material content soil organic (Danish, 2020).

In terms of chemical properties, the decomposition of organic matter releases inorganic elements that can serve as plant nutrients... Humus, the end product of the decomposition of organic matter, has sufficient cation exchange capacity to retain and exchange elements. Nutritional factors Cationic nutrients required by plants. In accordance with what (Uchino et al., 2017) stated, soil with a high CEC is commonly regarded as more fertile because it can assimilate and retain nutrients in the form of cations.

High water absorption into the soil is supported by the presence of high levels of organic matter applied to the root area, preventing water from fleeing leaving the root zone. This is due to the fact that organic materials have a moderate capacity to bind or retain water. Due to the administration of organic fertilizer, the soil will have a high capacity to retain water, which will result in a high water supply for plants. Water plays a crucial role in growth, particularly as a solvent for soil nutrients. Remembering that nutrients can only be assimilated by plants in soluble form, the presence of a substantial amount of nutrients in the soil will only be significant for plants if there is water in the root zone.

Residents of the South Nggulo village in the Tilongkabila District are the focus of the service program. Through this service activity, it is anticipated that community members will be able to use organic fertilizer to cultivate vegetable crops that will provide nutritious food for family consumption. The success of service activities is largely determined by the participation of the intended community in all service phases. Community participation is carried out beginning with the preparation, counseling, training, application, and evaluation phases. Participation of the community in the planning of each program in the service process will be advantageous so that the community is aware of the problems it faces and continually seeks solutions. In addition to community participation, the village authority must play a role in the implementation of community service by directly providing the necessary facilities and infrastructure.

In addition, exciting items were discovered during this research's activity. This occurs because farmers and residents prefer simple and uncomplicated items. In other words, farmers in this village already have access to a variety of crop-problem solutions. Combining the two allows farmers to cultivate additional vegetable commodities and sell them on the market, thereby stimulating the economy. Organic materials, such as rice husks, must be composted before being used as plant fertilizer, according to a number of studies, including the following: a) if the soil contains sufficient air and water, the decomposition of organic materials occurs rapidly and can inhibit plant growth (Cham, 2018; Khurshid, 2021); b) if the soil contains insufficient air and water, the decomposition of organic materials occurs slowly and does not interfere with plant growth (Resnick, 2012); and if the decomposition of fresh materials contributes very little humus and nutrients to the soil (Ren, 2022); c) the structure of fresh organic material is very coarse and its water-holding capacity is small, causing the soil to become very brittle if it is directly incorporated (Saura, 2020); d) Cow dung is not always available when required, so a substitute must be found. Composting is a method of preserving organic material prior to its application as fertilizer (Cordier, 2021; Shang, 2023).

After finding a solution to this problem, the author eventually educated the farmers of the Luwus village via the WhatsApp group by sharing previously-made videos about the benefits and production of this organic fertilizer. This education received a relatively good response from farmers, which was indicated by farmers actively asking questions about organic rice husk fertilizer. The author conducted post-education monitoring to determine the crop yields of farmers who used organic rice fiber fertilizer versus those who did not use this organic fertilizer. The soil surrounding plants that use organic rice husk fertilizer appears more fruitful than the soil surrounding plants that do not use organic rice husk fertilizer.

4. CONCLUSION

Rice husks, which are generated in large quantities by rice milling factories, can be used as the primary raw material in the production of organic fertilizer to improve soil quality. Organic fertilizer can enhance the physical, chemical, and biological properties of soil, thereby enhancing the growth of a variety of organically grown vegetable plants. The weight of eggplant plants that have been treated with compost made from rice husks is greater than those that have not been treated.

It is anticipated that the outcomes of this study can provide an alternative method for managing organic waste as the primary ingredient in composting. It is anticipated that future researchers will focus more on compost quality and the C/N Ratio when conducting research. In addition, it

is essential to present methods that are easier for producers to implement and comprehend in order to ensure their long-term viability.

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