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Organic Fertilizer as an Eco-Friendly Solution: Enhancing the Potential of Besan Village Through Waste Utilization

Ida Bagus Gde Agung Yoga Pramana *, Ni Wayan Yuli Anggreni, Anela Devi Sutanto
Department of Psychology, Universitas Pendidikan Nasional
Jl. Bedugul No.39, Sidakarya, Denpasar Selatan, Kota Denpasar, Bali 80224, Indonesia

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ABSTRACT

The sustainability of the agricultural industry, especially in rural regions like Besan Village, Klungkung Regency, Bali, is profoundly influenced by the management of organic waste. Intensified agricultural practices and population growth have caused environmental issues, particularly in organic waste management, which is often poorly addressed, resulting in soil and natural resource contamination. On November 9, 2024, a community service effort conducted by Universitas Pendidikan Nasional aimed to teach and train the locals of Besan Village in the conversion of organic waste into valuable organic fertilizer. The training results revealed that 41 out of 50 participants effectively transformed organic waste into fertilizer, hence improving soil fertility and reducing dependence on synthetic fertilizers. The initiative significantly improved community awareness on the importance of waste management for sustainable agriculture and environmental conservation. In the long term, it is expected that the inhabitants of Besan Village will utilize organic fertilizers to reduce agricultural production costs and improve their well-being, thereby establishing a model for other villages in adopting sustainability principles and innovation.

Corresponding Author:

Ida Bagus Gde Agung Yoga Pramana
Universitas Pendidikan Nasional
Email: yogapramana@undiknas.ac.id

INTRODUCTION

Waste management and the sustainability of the agricultural sector are among the most intricate environmental challenges of the contemporary era. Waste, encompassing both organic and inorganic materials, has emerged as a substantial concern for communities, particularly in rural regions. Besan Village, situated in Klungkung Regency, Bali, possesses significant agricultural potential. Nonetheless, the expansion of agricultural practices and population has resulted in increasingly intricate environmental concerns. Waste produced by agricultural practices, residential areas, and small-scale companies is frequently mismanaged, resulting in possible environmental contamination. This situation diminishes soil quality and adversely affects agricultural productivity (Muliarta et al., 2023).

Organic waste contamination adversely impacts soil quality, evidenced by diminished fertility and reduced productivity as a growth medium. The economic welfare of farmers diminishes due to this circumstance, which directly affects agricultural production. Furthermore, inadequate waste management can pollute water sources, exacerbating environmental degradation and heightening health risks for surrounding communities. Consequently, to prevent more severe and enduring environmental impacts, effective waste management is essential.

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One of the primary sources of organic waste in Besan Village is unmanaged agricultural by-products, such as leaves, plant stems, and vegetable leftovers. The inadequate utilization of these waste products has heightened the risk of environmental pollution due to the community's limited comprehension of their conversion into valuable organic fertilizer (Nadjmi, 2020). This underscores the importance of advice and educational programs in waste management.

The excessive reliance on chemical fertilizers in agriculture has been demonstrated to diminish soil fertility, adversely affecting plant health and the ecosystem (Malik et al., 2022). The use of chemical fertilizers in excessive amounts not only drives up production costs but also leads to nutrient imbalances in the soil, which ultimately results in a decrease in agricultural producing capacity. Continuing soil degradation has the potential to destabilize ecosystems and long-term production, which can represent a severe danger to the agricultural sector's ability to remain sustainable if it is not addressed (Safitri et al., 2023).

Among the primary obstacles that stand in the way of the implementation of sustainable farming practices is the fact that the people who live in Besan Village are not aware of the significance of efficient waste management. Due to the farmers' poor grasp of the advantages and methods involved in the manufacturing of organic fertilizer, there is a lack of innovation in the utilization of waste to improve the fertility of the soil. In addition, the limited availability of essential training and support makes the situation even worse, making it more challenging for the community to adjust to farming practices that are less harmful to the environment and more sustainable (Suseno, 2022).

The dependence on chemical fertilizers has considerable economic ramifications, in addition to environmental effects. The exorbitant expense of artificial fertilizers frequently encumbers farmers, particularly those with constrained agricultural land. The escalating financial burden adversely impacts farmers' incomes, resulting in a decline in their quality of life. This dependency may ultimately exacerbate the economic disparity between small-scale farmers and major agribusinesses, undermining the viability of local farmers in a progressively competitive market.

In light of these concerns, the application of organic waste as fertilizer in Besan Village may represent a feasible alternative. Organic fertilizer provides necessary nutrients for plants, improves soil structure, aids water retention, and promotes soil biodiversity (Abdullah et al., 2015). By employing an innovative and participatory methodology, the community may engage in the transformation of garbage into premium organic fertilizer. This will not only diminish trash disposal but also enhance soil fertility and augment agricultural yields.

The community service initiative organized by Universitas Pendidikan Nasional in Besan Village on November 9, 2024, was motivated by the pressing necessity to tackle organic waste management. This program aims to educate and train the community on converting organic waste into organic fertilizer that enhances agriculture. The program employed a participative approach to improve the community's practical abilities in the sustainable management of local resources. The program aimed to promote agricultural sustainability while also enhancing awareness of the significance of environmental preservation. This course aims to enable the community to maximize the utilization of organic waste, diminish reliance on artificial fertilizers, and enhance the environmental sustainability of their village.

The training and assistance offered in this activity aim to motivate the residents of Besan Village to convert garbage into valuable resources. Enhancing skills and knowledge is expected to boost agricultural productivity while reducing adverse environmental effects. This effort adheres to the tenets of sustainable development, wherein the community gains economically from enhanced agricultural productivity while also aiding in environmental conservation. Through training and support for transforming organic waste into high-quality fertilizers, the community is anticipated to convert waste into valuable resources, thereby enhancing their agricultural capacity and general welfare. Consequently, Besan Village has the potential to serve as a paradigm for other communities in the execution of sustainability principles and advances in natural resource management.

METHOD

The approach used to address the issues in this community service activity was by conducting education and training on the management of organic waste into organic fertilizer. This activity was carried out in Besan Village, Klungkung Regency, Bali, and was divided into the following four stages:

1. Observation:

Before the activity was implemented, the team conducted observations and discussions with the village officials of Besan Village to identify the issues related to organic waste and local agricultural practices. From these discussions, it was found that organic waste such as leaves, plant stems, and vegetable scraps were often left to decompose or burned, and farmers tended to rely heavily on chemical fertilizers. These findings became the basis for designing a training program that aligned with the community's needs.

2. Preparation:

In the preparation stage, the community service team gathered various materials and tools that would be used for the education and training activities in Besan Village. The training materials were specifically designed to address the organic waste management problems faced by the community and to introduce the importance of using organic fertilizers in agriculture. The team also prepared the necessary tools for making organic fertilizer, such as simple compost bins, raw materials for composting (leaves, plant stems, and vegetable scraps), and supporting tools like shovels, buckets, and soil moisture measurement instruments. Additionally, visual aids such as composting process diagrams and samples of finished organic fertilizer were prepared to help participants understand the material more easily.

3. Program Implementation:

The main activity took place on November 9, 2024, in Besan Village. The program began with a presentation on the importance of managing organic waste and the negative impacts of improperly managed waste on the environment and agriculture. This presentation was followed by a discussion and Question and Answer session, where participants could gain a deeper understanding of the material and ask questions about the challenges they faced on the ground. Afterward, the activity continued with a practical training session on how to process organic waste into organic fertilizer. Participants were taught how to make simple compost using organic materials available around them, such as vegetable scraps, leaves, and plant stems. During this session, participants were given the opportunity to actively engage in the composting process, with guidance from the community service team. After the training, an evaluation session was conducted to assess participants' understanding and provide feedback to help them implement the knowledge gained in their daily lives.

4. Evaluation:

The success of this community service activity was evaluated by measuring how well the participants in Besan Village could implement the knowledge gained during the training. The primary evaluation was conducted by examining the participants' success in processing organic waste into useful compost. Additionally, the evaluation involved assessing the level of understanding and the benefits perceived by participants after attending the educational and training sessions. To gain deeper insight into the impact of the training, the community service team also conducted interviews with several participants. These interviews aimed to explore the participants' experiences and the changes in their perceptions that occurred as a result of the training.

RESULTS

The community service activity conducted in Besan Village focuses on the management of organic waste as an effort to support the sustainability of the agricultural sector. Through socialization and training, this activity aims to enhance the community's understanding of the importance of organic waste management, the benefits of organic fertilizers, and the techniques for producing them. The training on managing organic waste into organic fertilizer was attended by 50 participants, consisting of local farmers and the residents of Besan Village.

Before the socialization activity, the implementation team held intensive discussions with the village officials to understand the local context and the community's behavior patterns regarding waste management. From the discussions, it was found that organic waste in Besan Village was often not properly managed, leading to environmental pollution. Additionally, the dependency on chemical fertilizers was identified as one of the factors contributing to soil degradation and increasing production costs. This information served as the basis for developing materials that were relevant to the community's needs.

The materials prepared for this activity covered several key topics, including basic concepts about organic waste, its impact on the environment and soil productivity, as well as techniques for making organic fertilizer. The team also provided visual aids, such as composting process diagrams and samples of finished organic fertilizer, to facilitate participant understanding. With structured materials and interactive methods, this activity aimed to provide the community of Besan Village with a deeper understanding of efficient organic waste management.

The socialization activity was held on the weekend in the morning to ensure optimal participation from the community. The event began with an introductory session led by the village head, who explained the goals and benefits of the activity in the context of village development. The village head emphasized the importance of sustainability in the agricultural sector and how organic waste management could have positive effects on both the environment and the village's economy. This session was intended to motivate the community to become more open to environmentally friendly organic waste management practices.

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After the introductory session, the presentation continued with a discussion on the importance of organic waste management and the benefits of using organic fertilizers, followed by an explanation of the steps involved in creating simple organic fertilizer using a compost bin. The activity was conducted interactively, giving participants the opportunity to ask questions and engage in discussions. Through this approach, it is hoped that participants would not only gain theoretical knowledge but also practical skills that they can immediately apply in their daily lives.

Figure 1. Presentation of Material by the Speaker

Organic fertilizers are types of fertilizers made from natural materials, such as organic waste, plant residues, animal manure, or other biodegradable substances. The main advantage of organic fertilizers lies in their ability to improve soil fertility sustainably, enhance soil structure, and provide essential nutrients for plants without harmful environmental side effects (Rani & Kapoor, 2024). In contemporary agriculture, emphasizing sustainability, organic fertilizers are essential for diminishing reliance on chemical fertilizers, which frequently adversely affect soil and the environment.

The training process commences with the aggregation of raw materials, specifically organic waste, including leaves, plant stems, straw, and food remnants. These components are meticulously chosen to guarantee their absence of chemical contamination, so preserving the integrity of the compost. Subsequently, participants are instructed on how to reduce the components into smaller dimensions to expedite the breakdown process (Singh et al., 2012). The shredded materials are organized in layers, alternating between moist and dry, with an optimal ratio of 2:1. Activators like EM4 or mature compost are utilized to enhance the activity of microorganisms in decomposing organic resources (Palmonari et al., 2020). During the composting process, participants are taught to maintain aeration by turning the compost regularly every 7–10 days. Temperature and moisture levels are also monitored periodically, as these factors are crucial for supporting microbial activity. Within 4–8 weeks, the organic materials successfully decompose into mature compost, which has a loose texture, dark brown color, and an earthy smell resembling soil.

Figure 2. Training on Organic Fertilizer Production

The organic fertilizer produced not only provides the essential nutrients needed by plants but also has a positive impact on soil structure, such as increasing the soil's capacity to retain water and supporting the life of microorganisms essential for soil fertility. Compared to chemical fertilizers, organic fertilizers offer significant environmental advantages, as they do not cause the accumulation of harmful chemicals in the soil. The use of organic fertilizers also reduces the risk of groundwater contamination and helps restore the natural balance of the soil ecosystem, ultimately contributing to the long-term sustainability of agriculture (Fajar et al., 2024).

After the socialization and education sessions, the participants developed a more comprehensive understanding of the detrimental effects of improperly managed organic refuse on agricultural productivity and the environment. The majority of participants indicated that they had just lately acknowledged the significance of managing organic waste to enhance the sustainability of the agriculture industry. Before the activity, the community generally disregarded the potential of organic waste as a useful resource. Organic waste was frequently neglected or incinerated without additional treatment. This signifies a substantial rise in community understanding of the significance of organic waste management.

Figure 3. Handing Over the Finished Organic Fertilizer

The outcomes exhibited by participants in the organic fertilizer production training utilizing organic waste reflected a commendable level of comprehension. Forty-one participants successfully implemented the straightforward techniques demonstrated, including the use of composters, to produce organic fertilizer. Post-training evaluation indicated that participants successfully processed organic waste, demonstrating an enhancement in their waste management skills. This training effectively altered the Besan Village community's perception of garbage, leading them to recognize it as a precious resource with considerable economic advantages and beneficial effects on environmental and agricultural sustainability.

The results of this training are anticipated to empower the Besan Village community to employ organic fertilizer, hence decreasing agricultural production expenses and fostering the long-term viability of the village's agricultural system. Additionally, this activity enabled the community to manage waste more efficiently while enhancing awareness of the significance of environmental protection.

CONCLUSION

The organic waste management training in Besan Village has successfully transformed the community's perspective and practices regarding waste and the use of organic fertilizers, which were previously considered an environmental problem. After attending the training, the community now realizes that organic waste holds great potential as a resource to enhance soil fertility, improve soil structure, and reduce dependence on expensive and ecosystem-damaging chemical fertilizers. A total of 41 participants demonstrated a good understanding of converting waste into fertilizer, as reflected in the post-training evaluation results. The positive impact of this training not only increased agricultural productivity but also provided economic benefits by reducing agricultural production costs and improving farmers' welfare. Additionally, the community's awareness of environmental preservation through efficient organic waste management strengthens social and environmental resilience in Besan Village. With continued assistance and support from various stakeholders, this initiative has the potential to become a sustainability model that can be implemented in other villages, creating lasting impacts on the agricultural sector and environmental conservation in the future.

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