

Agro-tourism Waste Processing Innovation with Vertical Composting in Harapan Farmer Group Palangka Raya

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Abstract : *Palangkaraya, with more than 500,000 hectares of peatland, faces major challenges in the management of its natural resources. Acidic and infertile peatlands require a special approach to increase agricultural productivity without damaging the environmental balance. One relevant approach is the application of the zero waste concept, where organic waste from agriculture and agro-tourism can be processed into high-quality compost. This community service program aims to introduce Organic Waste Composting Machine technology with Vertical Aerobic Composting method to Harapan Farmer Group in Palangkaraya. The program includes training in the use of technology and mentoring in organic waste management to improve peatland fertility. The results showed a significant increase in partners' understanding and skills in utilizing compost technology, and successfully supported the zero waste program by converting organic waste into useful compost. This program not only supports environmental sustainability, but also contributes to the improvement of partners' economic welfare through reduced dependence on chemical fertilizers.*

Keywords: *Peatland, Zero Waste: Compost; Organic Waste; Sustainable Agriculture; Green Economy*

INTRODUCTION

Palangkaraya, known for its more than 500,000 hectares of peatland, faces major challenges in the sustainable management of its natural resources. The acidic and infertile nature of peat soil has led to low agricultural productivity in the area, while organic waste from agricultural and agro-tourism activities has accumulated and has not been optimized as a valuable resource (Annisa Khoerani et al., 2023). During the need to increase agricultural productivity, the problem of organic waste management is increasingly urgent to overcome in order to prevent wider environmental impacts (Freeman et al., 2022).

This community service activity, which is focused on the application of Organic Waste Composting Machine technology with the Vertical Aerobic Composting method, plays an important role in supporting zero waste goals. Zero waste is an approach that aims to minimize waste discharged into the environment by recycling, processing, and reusing organic materials generated from human activities, including the agro-tourism sector (Pietzsch et al., 2017; Popovski et al., 2023). Through the processing of organic waste into high-quality compost, the program not only reduces the volume of waste, but also produces a product that is beneficial to local agriculture (Sayara et al., 2020).

The Harapan Farmer Group in Palangkaraya, a partner in this activity, will be trained and assisted in utilizing organic waste processing technology to support a more productive and environmentally friendly agricultural system. With this compost machine, previously unused organic waste will be processed into compost that can improve the quality of peat soil, so that agricultural productivity increases without having to use excessive chemical fertilizers.

In addition to contributing to the achievement of zero waste, this program is also in line with the principles of a green economy. Green economy is an economic approach that not only pursues economic growth, but also ensures environmental sustainability and social welfare (Alfanaar et al., 2023; Merino-Saum et al., 2020). Through organic waste processing and the application of environmentally friendly technology, this activity supports sustainable development by reducing greenhouse gas emissions, improving soil quality, and creating economic added

value for farmer groups. Effective organic waste management also has the potential to open new business opportunities in the compost production sector, which is in line with the green economy's goal of creating a more efficient and sustainable circular economy (D'Amato et al., 2017).

Thus, this program is expected to not only increase agricultural productivity on peatlands, but also create a broader impact on environmental conservation and community empowerment. This waste management program will serve as a model for the development of green economy practices in the agriculture and agro-tourism sectors in the Palangkaraya region, while supporting the commitment to zero waste at the local level.

METHOD

This community service activity is carried out through several main stages which include tool making, technology transfer, and training to partners. Each stage is carried out systematically to ensure the implementation of Organic Waste Composting Machine technology and the Vertical Aerobic Composting method runs effectively and according to partner needs. The following are the stages of implementation carried out:

(a) Tool Making

The initial stage of the implementation of this activity is the manufacture of the Organic Waste Composting Machine tool that will be used by the Harapan Farmer Group. Tool making is carried out by considering the required compost production capacity, availability of local materials, and efficient use of energy and resources. This composting machine is specifically designed to be able to process organic waste effectively with the vertical composting method, which maximizes the decomposition process of organic matter aerobically (Figure 1).

The process of making the tool involves several technical stages, from design to physical manufacture of the tool, which is then adjusted to the conditions in the field so that the tool can be operated optimally by partners. After the tool is

completed, an initial trial is carried out to ensure that the tool functions properly and according to the planned specifications.

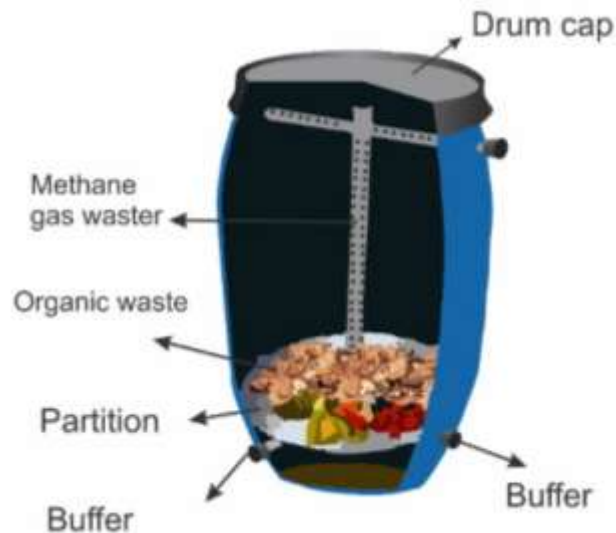


Figure 1. Design of Organic Waste Composting Machine

(b) Technology Transfer

After the tool is completed, the next step is to transfer the technology to the Harapan Farmer Group. This technology transfer aims to ensure that partners understand how to work and use the tool. Technology transfer activities include the following aspects:

1. Technology socialization: Partners are explained the basic working principles of the Organic Waste Composting Machine, how this tool helps in the composting process, and the long-term benefits for the sustainability of their farm.
2. Hands-on demonstration: In this stage, a demonstration of how to use the composting machine is conducted, starting from how to put the raw material (organic waste) into the machine, the process of setting up and monitoring the tool during the composting process, to the final stage of collecting the compost that is ready for use.

3. Provision of technical information: Important technical information related to the care and maintenance of the equipment was provided to the partners so that they can keep the equipment functioning properly in the long run.

(c) Training

The final stage of implementation is to provide comprehensive training to partners on the entire process of processing organic waste using the composting machine. This training aims to improve partners' skills in operating the equipment and managing the composting process independently. The training materials include:

1. Introduction to the vertical composting method: Partners are taught in theory and practice about the Vertical Aerobic Composting method, how to maximize the decomposition of organic materials with aerobic processes, and important steps in maintaining the quality of the compost produced.
2. Machine operation practice: Partners are directly trained to operate the composting machine, including organic waste input management, temperature and aeration settings, and monitoring of compost results. With this training, partners are expected to be able to run the entire composting process without technical problems.
3. Equipment maintenance: Partners are also trained on how to maintain the equipment regularly to ensure the machine remains in optimal condition. This includes regular checking of the machine components and cleaning of the equipment after use.

This training is provided gradually and intensively, with the aim that partners fully understand the entire organic waste treatment process from start to finish. Thus, this activity does not only transfer technological tools, but also the knowledge and skills needed to run the composting process independently.

RESULTS AND DISCUSSION

The community service activities carried out in Harapan Farmer Group, Palangkaraya, have successfully achieved the expected targets in the application of

organic waste processing technology. The initial stage of making Organic Waste Composting Machine has been completed well. This composting machine is designed with specifications that allow the processing of organic waste using the Vertical Aerobic Composting method (Kulcu & Yaldiz, 2004), which is proven effective in accelerating the decomposition process of organic matter aerobically. The machine is capable of processing organic waste into high-quality compost that is ready to be used as organic fertilizer, providing an appropriate solution to the challenges of agricultural waste management in Palangkaraya's peatlands.

The technology transfer process has also been well implemented (Figure 2). Through socialization and hands-on demonstrations, partners gained an in-depth understanding of how the composting machine works and the application of the vertical composting method. Harapan Farmers Group now can operate the machine independently, managing the entire waste treatment process from start to finish. The training also covered the technical aspects of equipment maintenance, ensuring partners can maintain optimal machine performance in the long term. The application of compost technology involving aerobic stirring systems can increase the efficiency of the composting process and reduce greenhouse gas emissions, which is also one of the advantages of the method applied in Palangkaraya.

In addition to producing compost as the main product, this activity also increased the capacity of human resources (HR) in Harapan Farmer Group. Farmer group members now have a better understanding of the Vertical Aerobic Composting method and the technical skills needed to operate and maintain the compost machine. This knowledge enables them to utilize organic waste more efficiently and independently, reduce dependence on chemical fertilizers, and improve the sustainability of their farms. In this context, improved knowledge and skills not only impact agricultural efficiency, but also support zero waste and green economy programs, which are in line with sustainable development principles.



Figure 2. (a) The process of shredding animal manure, (b) the process of shredding organic waste (twigs, leaves, and fruit), (c) mixing the results of shredding animal manure and organic waste, (d) group photo with community service partners Harapan Farmers Group.

The long-term impacts of this activity are expected to include improved economic welfare of the Harapan Farmer Group through reduced costs of purchasing chemical fertilizers and increased land productivity. In addition, the success in organic waste management through the application of appropriate

technology is also expected to serve as an example for other agricultural communities in the Palangkaraya region and beyond. Independent compost production not only supports environmental conservation efforts through the concept of zero waste, but also contributes to the creation of a more sustainable circular economy, where waste is no longer considered a useless material, but rather a valuable resource.



Figure 3. Comparison of Scores Before and After Training

The evaluation of the activity was carried out by comparing the scores before and after the training on three main aspects: **Technology Utilization**, **Technology Transfer**, and **Zero Waste Impact**. Based on the evaluation results shown in **Figure 3**, there was a significant increase in the **Technology Utilization** aspect from 60 before the training to 90 after the training. This shows that the training and application of **Organic Waste Composting Machine** technology is very effective in improving partners' understanding and skills in utilizing the technology.

In addition, the **Technology Transfer** aspect also showed an increase from 80 to 100, reflecting the success of the training in strengthening partners' knowledge of the appropriate technology used, as well as their ability to operate and maintain the composting machine independently. Meanwhile, the score on **Zero Waste Impact** remained at the maximum number of 100, indicating that from

the beginning until after the training, waste management activities have been running optimally, supporting the achievement of the **zero-waste** program in the partner community.

CONCLUSION

Community service activities in Harapan Farmer Group, Palangkaraya, successfully achieved the main objectives through the application of **Organic Waste Composting Machine** technology and **Vertical Aerobic Composting** method. The training provided has improved our partners' understanding and skills in utilizing the technology, allowing them to operate the composting machine independently. Organic waste management becomes more efficient, producing quality compost that can be used to increase agricultural productivity. In addition, this activity contributes positively to the achievement of the **zero-waste** program, where organic waste is optimally processed, supporting environmental sustainability. The results of this activity not only have an impact on improving technical skills but also provide economic benefits to farmer groups by reducing dependence on chemical fertilizers. With the successful application of the technology, this program can serve as an example for other communities in supporting sustainable agricultural practices and a **green economy**.

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