

Community Assistance in Producing Environmentally Friendly Mol Organic Waste Based on Banana Stems and Corm in Koya Koso Village, Abepura District, Jayapura Regency, Papua, Indonesia

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ABSTRACT

Koya is one of the agricultural areas in the Jayapura region, Papua Province. It is expected to become a hub for horticultural crops in Papua. However, the current agricultural system needs improvement by utilizing liquid organic fertilizer known as MoL (Microorganism Local) or biofertilizer, which is environmentally friendly. The main ingredients of MoL are banana stems and corm, and coconut water is used as a substitute for water in the mixture. The goal of this community assistance project is to introduce MoL as an eco-friendly organic fertilizer with significant benefits for soil, plants, and human health. This activity was conducted in three stages: mediation and survey, socialization, and assistance in making MoL from banana stems and corm. The results showed a positive response from the farming community in Koya Koso, who adopted the organic and environmentally friendly farming system. The organic fertilizer is affordable and easy to make domestically. Further activities are recommended to apply MoL to vegetable crops cultivated by farmers in Koya Koso.

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INTRODUCTION

Banana is one of the most widely cultivated plants in Indonesia because it can grow on various types of soil across the country. Bananas have numerous benefits for the Indonesian population, and almost all parts of the banana plant hold commercial value. The fruits can be processed into snacks such as cakes, chips, fried bananas, or banana sales, and other products. The leaves can be used for wrapping food, the stem can be used as animal feed or even as a vegetable in certain regions, and the corm can be processed into food ingredients such as jelly or nata. However, in reality, banana stem waste is underutilized and is simply discarded after harvest. This is due to the limited knowledge of farmers regarding the technology for utilizing banana stem waste (Manullang et al., 2017, p. 290).

Aside from being a food source, banana corm can also be processed into biofertilizer (liquid organic fertilizer). The banana corm contains a high carbohydrate content of about 66%, protein 4.35%, water, minerals, and it also contains microbes that degrade organic materials (Suhastyo, 2011). The microorganisms identified in banana corm include *Bacillus* sp., *Aeromonas* sp., *Aspergillus niger*, *Azospirillum*, *Azotobacter*, and cellulolytic microbes, which act as decomposers of organic materia (Budiyani et al., 2016).

Given the composition of the banana corm, it has great potential to be used as biofertilizer or Local Microorganism (MoL), which can enhance soil fertility and promote plant growth. Moreover, the abundance of agricultural waste, such as banana stems, can be utilized to enhance agricultural productivity in an environmentally friendly manner (Panudju, 2011, p. 289). The nutrients in the banana corm provide a beneficial environment for microbes, supporting their proliferation in soil and aiding in plant nutrient absorption.

The bacteria in MoL are living microorganisms that can convert unavailable nutrients into forms accessible to plants through biological processes, whether by living freely in the soil or in association with plants (Tien et al., 1979). The application of MoL improves soil fertility, functioning as a liquid fertilizer produced from the fermentation of various locally available resources. The application of Microorganism Local (MoL) provides an environmentally friendly solution in supporting agriculture for the production of solid organic fertilizers and liquid organic fertilizers (Prasetyo & Rahayu, 2019, p. 26).

Globally, including in Indonesia, organic farming systems are increasingly being promoted amidst the rapid advancements in modern agricultural technology. MoL from banana corms presents a suitable solution for farmers to support organic farming systems, yielding high-quality, healthy agricultural products while promoting sustainable farming practices.

One region that has potential as a horticultural crop production hub is Koya, located in Jayapura Regency, Papua Province. Koya is home to a community of transmigrants from Java, who have established farmer groups cultivating vegetables and other crops. The region's vast land area and fertile soil make it ideal for horticultural crop production, supplying vegetables to communities in Papua and beyond.

Unfortunately, the current farming practices heavily rely on chemical fertilizers such as urea. However, the abundant local resources like coconut and banana plants inspired the PkM team from Petra Baliem College of Agricultural Sciences to introduce organic farming to the farmers in the region.

METHOD

The community assistance was conducted with farmers in Koya Koso Village, Jayapura, Papua, over a full day on August 15, 2024. The PkM team from Petra Baliem College of Agricultural Sciences consisted of final-year students and four field supervising lecturers. The assistance process was carried out in three stages: mediation (observation), socialization, and assistance in making MoL from banana stems and corm. Outreach or extension programs are crucial in enhancing farmers' understanding of the materials being

taught. Other research findings reveal that extension programs can improve participants' comprehension (Rozikin et al., 2019, p. 2216). Similarly, Dedi H., et al. (2022) found that conducting empowerment activities, initiated through outreach efforts, had a positive impact on the community's knowledge regarding waste management and compost production using the Takakura method (Dedi H et al., 2022, pp. 2212–2218).

After the incubation period, farmers were advised to check the MoL mixture to ensure its success. If the mixture emitted an alcohol-like smell or the scent of fermented food like "tape" when the lid was opened, the MoL was deemed successful and ready for application. The MoL application on horticultural crops was performed by diluting the MoL at a 1:14 ratio (1 liter of MoL to 14 liters of water) and spraying the mixture onto the plants twice a week, starting seven days after planting (DAP), continuing until the crops were ready for harvest.

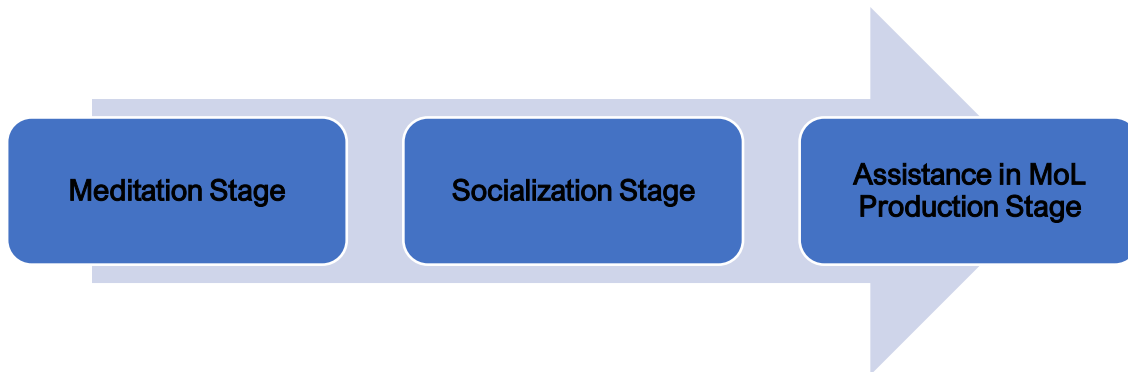


FIGURE 1. Diagram of community Service Stage

RESULTS AND DISCUSSION

To support organic farming and sustainable agriculture systems, a community service activity was conducted focusing on the utilization of locally abundant crops, creating innovative products that benefit the growth and development of healthy horticultural plants. This also helps in maintaining soil fertility. Several lecturers, staff, and students from Petra Baliem College of Agricultural Sciences, Wamena, conducted a survey at the location, identifying the need for assistance in producing and applying liquid organic fertilizer in the form of MoL (Microorganism Local) or biofertilizer to enhance soil nutrient content and ease the work of plant roots in absorbing organic substances decomposed by the microbes present in MoL.

The survey revealed that the agricultural land in Koya Koso has great potential for producing various types of vegetables that contribute to food security in Jayapura and beyond. However, the continual use of chemical fertilizers is slowly damaging the soil structure and depleting the beneficial microorganisms that help decompose organic material into nutrients for plants.

Additionally, the survey highlighted the abundance of local resources, particularly coconut and banana plants. This led the PkM team to develop a simple innovation utilizing these crops to prevent soil degradation, protect the microbial life in the soil, and produce healthy vegetables that support public health. The project involved training farmers in Koya Koso to produce liquid organic fertilizer (MoL) using banana stems, corm, and coconut water.

The primary reason for using banana stems and corm is their abundance in the region. The banana corm contains essential nutrients and microorganisms such as *Bacillus* sp., *Aeromonas* sp., *Aspergillus niger*, *Azospirillum*, *Azotobacter*, and cellulolytic microbes (Sari et al., 2012), which play a crucial role in soil nutrient decomposition (Wulandari, 2009) dan (Budiyani et al., 2016). Coconut water was used as a substitute for regular water due to its rich nutrient content, which supports the growth and proliferation of microorganisms, making it ideal for MoL production.

The community assistance program enhanced the farmers' capability to manage their farming systems by adopting environmentally friendly practices and utilizing the natural resources around them. Even though

the farmers in Koya Koso are predominantly transmigrants from Java, many were unaware of liquid organic fertilizer (MoL), which can be used as an eco-friendly alternative to chemical fertilizers.

This assistance program was conducted in stages, beginning with mediation and observation of the farmers' needs, followed by socialization, and finally, hands-on assistance in producing MoL from banana stems and corm. The mediation and survey aimed to confirm the farmers' need for an organic fertilizer that is affordable, easy to produce, and effective in improving crop yields and soil health. The survey also identified the agricultural practices in Koya Koso and the availability of natural resources that could serve as the primary ingredients for MoL production.

Following the survey, a socialization session was held to begin the community assistance activities. The socialization aimed to educate the farming community in Koya Koso about the importance of developing an environmentally friendly agricultural system, providing knowledge on how to utilize the abundant plant materials, and offering guidance on how to produce and apply liquid organic fertilizers to their cultivated horticultural crops.



FIGURE 2. Socialization Activities

The final stage is the creation of the MoL from banana stems and pseudostems. At this stage, methods are provided for creating and practicing the production of MoL as an environmentally friendly liquid organic fertilizer, beneficial for public health as well as for the health of plants and soil. The assistance in creating this MoL was carried out for 2 hours on the same day after the socialization. The mixture that has been prepared is then incubated in the large bucket and will be applied after the incubation period reaches 14 days or more.

Based on information obtained from farmers participating in this activity, the MoL they produced successfully met the desired characteristics, exhibiting a yellowish-brown color and a smell of alcohol or fermented tape after 14 days of fermentation. This finding is consistent with the results of the assistance program conducted by Sandra et al. (2021), which reported that MoL fermented or incubated for 14 days after the activity showed signs of success, indicated by its alcohol-like smell and brownish color. Furthermore, it was noted that one of the challenges in MoL production is the need for special care during the fermentation process, such as ensuring that the MoL is not exposed to direct sunlight to prevent gas buildup (Sandra et al., 2021, p. 293).



FIGURE 3. Assistance Activities for the Production of Banana Stem and Pseudostem MoL

The response from the farming community in Koya Koso is very positive, as evidenced by the numerous questions raised during the accompanying activities. The active listening during the socialization and creation of the MoL is also evident from their seriousness in listening and participating in the activities. How could this environmentally friendly organic fertilizer have such a significant impact on soil fertility, crop production, and public health? The results of the activities conducted by Inrianti et al. (2022) in Wamena reveal that MoL can restore soil nutrients, revitalize damaged soil, and improve the quality of harvests, making them durable, tasty, and capable of controlling pest infestations on plants (Inrianti et al., 2022). In addition, it can help reduce the volume of organic waste disposed of in the environment (Amir et al., 2021, p. 2217).

Thus, this program is highly beneficial in enhancing farmers' knowledge in utilizing banana stems and corms, which were previously discarded after harvest. Therefore, such activities need to be continuously conducted to strengthen the knowledge and skills of farmers in Koya Koso. Zahanis et al. (2018, p. 30) added that continuous activities are crucial to ensure that the knowledge and skills acquired by farmers can be further developed and applied on a larger scale (Zahanis et al., 2018, p. 30). Latifah et al. (2024) also stated that ongoing assistance programs, involving both government and private sectors, should be sustained to provide both technical and material support (Latifah et al., 2024, pp. 26–30).

CONCLUSION

The community assistance activities that were carried out had a positive impact on the farming community in Koya Koso by improving their agricultural practices towards more environmentally friendly farming. The program supported the government's initiative to implement sustainable and eco-friendly agriculture. Through this assistance program, the community's agricultural practices shifted from relying on chemical fertilizers to using alternative fertilizers that are more affordable, easily accessible, and have a significant positive impact on the environment, as well as the health of the soil, plants, and the community.

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