

## Environmentally Friendly Livestock Waste Management in High-Population Areas in Karang Ploso Malang Regency East Java

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### Abstract

**Purpose:** This abstract explores the need for integrated development in the agricultural and livestock sectors of Ngenep Village, Karangploso, Malang Regency, focusing on utilizing livestock waste effectively.

**Method:** The study details the steps to develop a system for producing organic fertilizer and animal feed from agricultural and livestock waste. It highlights the successful implementation within the "Langgeng Mulya" dairy cattle farming community, emphasizing the utilization of waste for organic fertilizer in chili and tomato cultivation.

**Practical Applications:** The research findings showcase the positive response of local farmers to the utilization of livestock waste, addressing the scarcity of organic fertilizer, particularly for tomato and chili growers. This sustainable approach fosters self-sufficiency and offers insights into waste-to-resource strategies.

**Conclusion:** This study underscores the importance of integrating the agricultural and livestock sectors for sustainable waste management and resource utilization. It provides valuable lessons for enhancing the efficiency of rural development programs.



## Introduction

Agricultural land spanning 576 hectares and an active dairy cattle farming group producing up to 300 liters of milk per day are the strengths of the agriculture-livestock sector in Ngenep Village, Karangploso Subdistrict, Malang Regency. The "Langgeng Mulya" cattle farming group in Ngenep Village, established in 2013, is an active dairy cattle farming group consisting of twenty members. The development of Ngenep Village can leverage an integrated farming-livestock model by converting livestock waste into organic fertilizer through fermentation.

Cattle farm waste consists of solid and liquid waste, with each cow producing approximately 20-30 kilograms of solid waste and 100-150 liters of liquid waste (Raksun et al., 2019), which has not been managed effectively. Disposing of livestock waste into the environment is a concern as it can lead to environmental damage and have negative health impacts on the community. However, the cattle farming group members have not fully understood the consequences of the waste generated by their livestock. Each cow, for instance, excretes around 12% of its body weight in waste daily (Sukamta et al., 2017), containing NH<sub>3</sub>, NH, and other compounds that could potentially contaminate the consumed water sources, and leaving waste untreated increases the risk of spreading infectious agents (Huda & Wikanta, 2016).

The processing of cattle waste into organic fertilizer has not been optimally implemented due to the farmers' lack of knowledge and understanding of waste treatment methods (Sipayung et al., 2022). So far, cattle waste has only been collected and used as manure directly applied to the soil without undergoing any processing. However, cattle waste is valuable for producing organic fertilizer (Dewi et al., 2017) (Purnamasari et al., 2022).

The Community Engagement Program (PkM) aims to improve the community's understanding and skills in optimizing waste utilization. The hope is that livestock waste will no longer be a cost burden but a valuable byproduct with a high economic value. Therefore, future livestock farming endeavors should be built sustainably to contribute to long-term income and sustainability.

## Method

The community service activities were conducted from July to December 2020 in Ngenep Village, Karangploso Subdistrict, Malang Regency. The target livestock group for this program was the "Langgeng Mulya" Dairy Cattle Farming Group, with a series of activities including (a) socialization and discussions with the "Langgeng Mulya" cattle farming group to plan the implementation of the activities; (b) Organic Fertilizer Demonstration Plot; (c) Demonstration Plot for the application of organic fertilizer production to chili and tomato crops; (d) activity evaluation.

## Result

Based on the conducted community service activities, the results of the activities are as follows:

1. Socialization and Coordination Meetings

The implementation of community service began with a socialization session with village officials, followed by a discussion with the Chairperson of the "Langgeng Mulya" Cattle Farming Group. The purpose of the socialization was not only to introduce the community engagement program (PKM) but also to explain the training materials, focus group discussions (FGD), and coordination regarding the schedule for the demonstration plot due to the conditions during the COVID-19 pandemic Figure 1.

358) Environmentally Friendly Livestock Waste Management in High-Population Areas in Karang Ploso Malang Regency East Java, Arwani, M., Hakim, A., Budiarto, A., Ciptadi, G., Oktanella, Y.

*Figure 1. Socialization and Coordination Meetings*



This socialization activity included discussions on the issues faced by the cattle farming group regarding waste management. One planned activity was making organic fertilizer using specified equipment and materials. The socialization involved some members of the cattle farming group, and the discussions with the farmers indicated the hope that cattle farmers and farmers in Ngenep Hamlet could utilize the processed fertilizer to enhance agricultural productivity.

## 2. Organic Fertilizer Training Demonstration Plot

The activity was divided into two sessions: first, there was an information session where issues in the field were discussed, followed by a presentation on livestock waste management. The second session involved hands-on practice in making organic fertilizer, conducted directly by one of the cattle farmers within the dairy cattle group. The practical demonstration of organic fertilizer production was carried out with the participation of the implementation team as an example for farmers to follow. While the farmers practiced making organic fertilizer, the implementation team simultaneously conducted a demonstration plot and guided the sub-groups to ensure two-way interactions during the activity.

*Figure 2. Organic Fertilizer Training Demonstration Plot*



Introducing the Organic product to the cattle farming group aimed to encourage farmers to switch to using organic materials as decomposers in processing cattle feces waste into organic fertilizer. The first step in fertilizer production involved drying the cow dung to reduce its moisture content (Figure 2). Once the moisture content reached 60%, the dung was mixed with Orgadec fermentor. This method could also be modified by adding rice husks to help raise the pH level because cattle dung typically has a low pH (around 4.0-4.5), and Orgadec prebiotics were used to facilitate rapid dung decomposition (Trivana, Pradhana, 2017). Afterward, the dung was manually mixed thoroughly and covered with tarpaulin to maintain the fermentation temperature within 30-60°C (Tallo & Sio, 2019) (Welerubun & Sairudy, 2023). This also served to eliminate pathogenic microorganisms and weeds. After two days, the dung was remixed to ensure a

high oxygen content. It was repeated periodically for two weeks or until the temperature dropped to ambient levels, and no odor was detected, indicating the completion of decomposition by microorganisms (Pepadu et al., 2023) (Ratriyanto et al., 2019).

### 3. Application of Organic Fertilizer to Chili and Tomato Plants

Fertilizers are crucial in enhancing crop yields, especially in soils with low nutrient content. Organic fertilizers contain a more comprehensive range of nutrients than chemical fertilizers (Sukamta et al., 2017). Organic fertilizers can stimulate and increase the population of soil microorganisms more effectively than chemical fertilizers. Organic fertilizers can also improve soil structure and fertility, and another advantage is their ability to prevent soil erosion. Essentially, the production of organic fertilizer aims to enrich the nutrient content of the fertilizer by utilizing solid cattle waste (feces) as a bioculture (Marlina et al., 2019) (Sunarno et al., 2023).

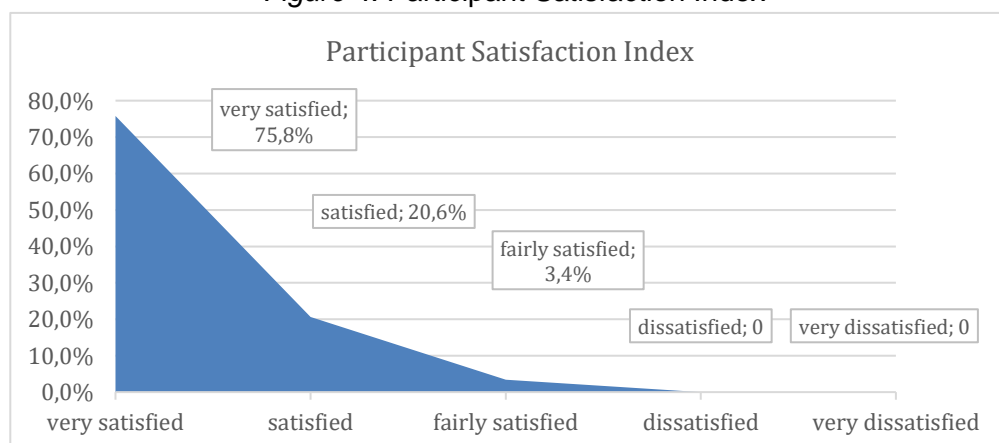
Figure 3. The results of plants fertilized with organic fertilizer produced from the processing of dairy cattle manure waste



### 4. Evaluation

At the end of this activity, the satisfaction with the entire community engagement program was evaluated. The knowledge and skills gained about waste management in the dairy cattle farming group are expected to stimulate the creativity of the cattle farming group in turning cattle waste into higher-value products. The satisfaction results of the PKM activity can be seen in the following graph.

Figure 4. Participant Satisfaction Index



360) Environmentally Friendly Livestock Waste Management in High-Population Areas in Karang Ploso Malang Regency East Java, Arwani, M., Hakim, A., Budiarto, A., Ciptadi, G., Oktanella, Y.

A total of 21 respondents provided evaluations of the activities, including the suitability of the activity title and the program's implementation, the expertise of the facilitator in delivering materials during training, and other aspects. It was found that 75% of respondents were delighted with the materials and demonstration plots provided in the community engagement program. The future expectation following the implementation of this community engagement activity is the improvement of the cattle farming group's skills in processing organic fertilizer from livestock waste toward the provision of self-sustaining organic fertilizer through the application of an integrated farming livestock system.

## **Discussion**

The introduction presents an overview of the agricultural and livestock sector in Ngenep Village, highlighting its strengths, such as vast agricultural land and an active dairy cattle farming group. The potential for integrated farming-livestock practices is emphasized, mainly through converting livestock waste into organic fertilizer (Escobar et al., 2007) (Mulyani et al., 2019). The section also discusses the issue of ineffective waste management in the cattle farming group, with solid and liquid waste being produced daily. The potential environmental and health risks associated with untreated livestock waste are mentioned, underscoring the need for proper waste management. Additionally, the introduction touches upon the lack of knowledge among cattle farming group members regarding waste treatment methods, leading to the underutilization of valuable resources. It introduces the Community Engagement Program (PkM) as a solution to improve waste utilization and transform livestock waste into a valuable economic asset.

The method section outlines the timeline and activities conducted during the community service program, emphasizing the target group, which is the "Langgeng Mulya" Dairy Cattle Farming Group. The activities include socialization, training on organic fertilizer production, practical demonstrations, and evaluation. The outcomes of the community service activities improved waste management and economic benefits from organic fertilizer production. Proper waste management can mitigate environmental and health risks, improve soil fertility, and enhance agricultural productivity (Kazemiyeh et al., 2021).

## **Conclusion**

Processing organic fertilizer is a solution to minimize the negative impact of dairy cattle manure waste in the "Langgeng Mulya" cattle farming group, making it possible to integrate it as a supply of organic fertilizer for farmers. Members of the farming group "Langgeng Mulya" have successfully produced organic fertilizer from cow dung by applying Orgadec fermentor technology. Generally, the organic fertilizer produced has physical characteristics of a dark brown color, a non-pungent odor, and a relatively solid texture. The impact of the cattle waste processing activities, as experienced by the farmers, includes a cleaner barn environment, and the issue of odor pollution around the barn has been resolved. For chili and tomato farmers, the organic fertilizer produced becomes a new source of organic fertilizer that has the potential to be further developed in their agricultural endeavors.

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361) Environmentally Friendly Livestock Waste Management in High-Population Areas in Karang Ploso Malang Regency East Java, Arwani, M., Hakim, A., Budiarto, A., Ciptadi, G., Oktanella, Y.

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362) Environmentally Friendly Livestock Waste Management in High-Population Areas in Karang Ploso Malang Regency East Java, Arwani, M., Hakim, A., Budiarto, A., Ciptadi, G., Oktanella, Y.

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