

Optimizing Goat Manure Management at Galang Kangin Goat Farmers' Group

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ABSTRACT

Activities at Galang Kangin Goat Farming Group aim to improve partners' knowledge and skills in fermenting solid and liquid goat waste and maintaining pen sanitation. The methods used include outreach, extension services, technology transfer, training, and mentoring. Education on pen management and sanitation is geared toward adopting the concept of a circular economy. Hands-on practice is designed to enable partners to independently produce high-quality fertilizer. It is hoped that these activities will raise partners' awareness of the importance of creating clean and comfortable pens through the utilization of waste, which will indirectly increase their income from the sale of organic fertilizer. Pen sanitation also provides benefits in the form of improved livestock health, increased productivity, and a tangible contribution to environmental conservation.

INTRODUCTION

Apuan Village is a village that offers a blend of cultural richness, spirituality, and natural beauty. This makes it one of the most attractive tourist destinations in Tabanan Regency. In addition, Apuan Village also has great potential for raising crossbred Ettawa goats thanks to its fertile land suitable for growing forage crops. According to Masruri et al., (2023) state that the feed typically given to goats consists of forage and supplements (concentrates). Goat farming is often associated with the pungent odor of goat manure. Proper processing of goat manure can be an effective way to address the environmental pollution it causes, while also opening up opportunities for additional income through the production of compost or organic fertilizer from this waste (Safriana et al., 2024).

On the other hand, this waste can also be converted into nutrient-rich organic fertilizer, which can improve soil fertility and crop productivity (Aulia et al., 2024). (Berek, 2018) notes that using organic fertilizer can reduce reliance on chemical fertilizers, which often cause water pollution and soil degradation. From an economic perspective, Azzahra et al., (2022) state that innovations in livestock manure processing contribute to rural economic development by creating jobs in the agricultural and waste management sectors. Livestock waste treatment technologies such as anaerobic fermentation, vermicomposting, and bioconversion by microorganisms have been proven to convert livestock waste into high-quality organic fertilizer with stable nutrient content that is safe for the environment (Mulijanti & Tedy, 2019).

Organic fertilizer made from livestock manure can be a solution to environmental pollution due to its various advantages, such as its generally lower cost, ease of availability, and environmental friendliness. However, in practice, the processing of goat manure faces various challenges. Nurdin et al., (2023) state that low farmer awareness regarding the use of organic fertilizer, limited access to efficient waste-processing technology, and issues with the distribution and marketing of organic fertilizer products pose major challenges in livestock waste management. Collaboration among livestock agribusiness stakeholders to develop business models that utilize livestock waste as the primary raw material for organic fertilizer products can serve as a solution for business sustainability, increased income, and improved well-being for farmers in rural areas (Abdullah et al., 2023).

Improvements in goat productivity are determined by many factors. In addition to waste management and processing, another area that requires attention is pen sanitation. As part of biosecurity, pen sanitation is a relevant method that is easy for farmers to implement to address health issues and keep pens free from diseases that can affect their livestock (Ediset & Jaswandi, 2017). Sirat et al., (2021) state that pen sanitation is a preventive measure that includes maintaining the cleanliness of the pen and its surroundings to safeguard the health of both the livestock and their owners. Proper pen management and biosecurity are key factors determining the success of livestock farming operations (Malesi et al., 2024). The development and implementation of a circular economy is one solution for maintaining the sustainability and harmony

of the environmental ecosystem, in addition to the economic rationale (Ambarwati et al., 2024). Environmental sustainability through the processing of solid and liquid goat manure into high-quality organic fertilizer, as well as efforts to promote livestock health through pen sanitation, form the basis for the community service activities carried out at the Galang Kangin Goat Farming Group.

IMPLEMENTATION AND METHODS

A community service activity was conducted at the Galang Kangin Goat Farming Group in Banjar Tinungan, Apuan Village, Baturiti Subdistrict, Tabanan Regency, on May 21–22, 2026. The methods used in this activity began with an orientation on the PKM activity plan, followed by counseling, technology transfer, training, and mentoring provided to 10 group members. The types of activities carried out were as follows: (1) Dissemination of the community service program; (2) Education on pen and environmental sanitation; (3) Goat husbandry management based on the circular economy concept; and (4) Technology transfer and guidance on techniques for processing solid goat waste using the fermentation method. The implementation methods used with the partners were:

1. Education on farm and environmental sanitation programs:
 - a. The extension program was conducted through presentations and discussions on the importance of farm and environmental sanitation programs in livestock management.
 - b. Extension activities through presentations and discussions on the economic impacts resulting from the implementation of farm and environmental sanitation program.
2. Education on the concept of the green economy in running a livestock business:
 - a. Extension activities through lectures and discussions on goat farming management based on the circular economy concept for members of partner groups.
 - b. Distribution of compost bags, fermentation materials, plastic, tools for sewing sacks and plastic packaging, and other supporting equipment.
3. Techniques for processing solid goat manure using the fermentation method:
 - a. Introduction to and transfer of proper fermentation techniques for processing solid goat manure into high-quality organic fertilizer.
 - b. Hands-on practice and guidance in processing solid goat manure using the fermentation method until participants are able to independently and sustainably produce high-quality organic fertilizer.

RESULTS AND DISCUSSION

The community service activity began with opening remarks by the Chair of the Galang Kangin Goat Farming Group, speaking on behalf of the group, followed by remarks from the head of the community service team from Warmadewa University. Before the extension session began, members of the partner group were given a pre-test to assess the farmers' level of knowledge regarding the material to be covered in both the extension session and the hands-on training. The administration of the pre-test to participants is shown in Figure 1.



Figure 1. Administration of the Pre-test

The first topic covered by the outreach team was an educational session – through lectures and discussions-on the important benefits of barn and environmental sanitation programs in livestock management, as well as the economic impacts resulting from the implementation of such sanitation programs. A key factor contributing to low goat productivity is farmers' limited knowledge of livestock health management (Widyastuti et al., 2017). Diseases in goats generally stem from viruses, bacteria, and parasites. Barn sanitation is a component of biosecurity. The implementation of biosecurity involves several key steps, including controlling access in and out of the premises, restricting animal movement, maintaining environmental cleanliness, properly managing waste, monitoring livestock health, and conducting routine vaccinations (Handarini et al., 2021).

Generally, in the field, coop sanitation is carried out by spraying the entire coop with a disinfectant solution. From the discussion sessions held, it was found that none of the group members had ever sanitized the coop. In their daily routines, group members only clean the inside and outside of the pens without ever spraying them with disinfectant solution. Putri & Suseno, (2023) state that disinfectants are substances that inhibit the growth of and eliminate pathogenic microorganisms, such as viruses and bacteria, on the surfaces of inanimate objects. Through the education provided, the farmers finally learned and understood the importance of maintaining the cleanliness of the coop environment and implementing coop sanitation. This demonstrates that the

extension materials provided by the extension team were indeed needed by the farmers in the partner group. The extension activities and discussions are shown in Figure 2 below.



Figure 2. Extension and Discussion on the Program for Barn and Environmental Sanitation in Livestock Management

The second session continued with an educational program featuring lectures and discussions on goat husbandry management based on the circular economy concept for members of the partner group. The educational program on the circular economy concept for the Galang Kangin Goat Farming Group was designed to enhance farmers' understanding of how to manage their businesses more efficiently and economically, while remaining environmentally friendly. This education helps farmers view manure, urine, and feed waste not as waste, but as resources that can be reused. The circular economy is a development approach that views resource efficiency and environmental protection as two interrelated and inseparable elements. The implementation of this system aims to support sustainable development, improve environmental quality, promote economic prosperity, and achieve social justice for current and future generations (Kirchherr et al., 2017). The management of livestock manure (both solid and liquid fractions) through a biorefinery approach is believed to be an inevitable solution for future sustainable development to meet the requirements of a circular bioeconomy (Khoshnevisan et al., 2021).

The implementation of a circular economy in goat farming through the processing of solid and liquid manure into organic fertilizer is a wise solution that can also increase farmers' income. Proper processing of goat manure can help prevent environmental pollution while increasing its economic value (Şonea et al., 2024). During educational activities, such as extension sessions and discussions, partner group members were seen paying close attention to the material presented. Furthermore, during the discussion session, group members asked many questions regarding both the presented material and topics beyond it though still related to goat husbandry management. The presentation of the extension material and the question-and-answer session with partner group members are shown in Figure 3.



Figure 3. Training on Goat Maintenance Management Based on the Circular Economy Concept

After the two community service team members finished presenting the material, the event continued with the distribution of manual knapsack sprayers, liquid disinfectant, compost bags, fermenters, plastic sheeting, sewing kits for sacks and plastic packaging, and other supporting equipment. The donation of these tools was requested by the group members, as the group did not yet possess such equipment and machinery. With the realization of this assistance, the group members were delighted and felt greatly helped by the community service activities carried out by the service team from Warmadewa University.



Figure 4. Handover of Equipment Grants to Group Members

After handing over the equipment to the group members, the service team then provided an introduction and technology transfer on the proper fermentation techniques for processing goat manure into high-quality organic fertilizer. On this occasion, group members were invited to directly participate in the fermentation of goat manure. Through hands-on practice in processing goat manure using the fermentation method, it is hoped that the partner group members will be able to process the manure successfully to produce high-quality organic fertilizer independently and sustainably in the future. Fermented organic fertilizer has several advantages, including ease of application, the use of raw materials available in the local environment, and the ability to reduce farmers' dependence on chemical fertilizers (Fathoni et al., 2026). In the market, demand for organic fertilizer derived from goat manure is quite high and positively correlates with its selling price. Safuad et al., (2022) noted that goat manure

contains 2.43% nitrogen, 1.35% potassium, 0.73% phosphorus, 0.56% magnesium, 1.95% calcium, 291 ppm zinc, 42 ppm copper, 468 ppm manganese, and 2,891 ppm iron. The results of a study by Shivakumara & Kiran (2019) show that income from livestock manure as a byproduct is highest in intensive systems, followed by semi-intensive systems, while extensive systems generate the lowest income from manure. Hands-on activities involving the processing of goat manure into solid organic fertilizer and the implementation of pen sanitation are shown in Figure 5.



Figure 5. Hands-on Practice in Processing Goat Manure into Solid Organic Fertilizer and Implementing Farm Sanitation

Overall, the community service activities at the Galang Kangin Goat Farming Group proceeded smoothly and successfully. This success is the result of good cooperation between the service team and all group members. The active participation of all partner group members—both in discussions and in the hands-on practice of making solid organic fertilizer—also reflects the group members' high level of curiosity regarding the processing of goat manure into high-quality organic fertilizer. Solutions to the challenges of processing goat manure into high-quality organic fertilizer and implementing proper sanitation in the pens and surrounding environment are indeed urgently needed by the group members. By processing goat manure into high-quality solid organic fertilizer, it is hoped that goat farmers will gain additional income beyond what they earn from selling goats. Processing livestock waste into organic fertilizer not only helps reduce environmental pollution but also provides economic value to the community. Livestock waste management is not only beneficial for

environmental sustainability but can also support improvements in community well-being (Murdiono et al., 2021).

Increased awareness among partner group members regarding barn sanitation and its impact on the environment is expected to lead to improved health among all goats in their care. Education and improvements in farmers' knowledge, attitudes, and practices are key components in efforts to control livestock diseases (Ngoshe et al., 2023). Healthy livestock generally exhibit increased production and productivity. Health issues often affect overall farm performance, which can lead to reduced milk production, slow livestock growth, and even death (Putra et al., 2022). As the goats being raised become healthier, this automatically leads to increased income and well-being for the farmers. In addition to the positive economic impacts, environmental sustainability is also maintained by minimizing the amount of pollutants generated by livestock operations, as well as the spread of pathogens that are harmful to livestock or pose zoonotic risks. This is consistent with the findings of Septian et al., (2020) who noted that farmers who maintain good hygiene in their livestock environments tend to achieve higher production levels, along with a decrease in livestock mortality due to infectious diseases.

The primary objective of this community service activity was to improve the knowledge and skills of the partner group's members. To determine whether participants' knowledge had increased during the community service activity, a post-test was administered. Figure 6 below shows the partner group members completing the post-test.



Figure 6. Partner Group Members Completing the Post-Test

Based on the results of the pre-test and post-test, the average initial knowledge of the partner group members regarding the material presented was 68%. Furthermore, after receiving instruction and hands-on practice, their knowledge increased to 88%.

CONCLUSIONS AND RECOMMENDATIONS

The community service activity at the Galang Kangin Goat Farming Group ran smoothly and successfully, as evidenced by the achievement of all set targets. The primary goal was for group members to be able to properly ferment solid goat manure, so they could sell the resulting organic fertilizer to supplement their income or use it themselves to reduce fertilizer costs in their farming operations (rice paddies or fields). Through training on farm and environmental sanitation, farmers' awareness of creating a clean, healthy, and comfortable environment for both livestock and humans has increased. By managing waste and maintaining farm sanitation, farmers have indirectly implemented a circular economy based on the zero-waste concept. The success of this initiative is evident in the sustainability of their operations, as farmers continue to process goat manure into solid fertilizer using fermentation technology. These activities also help maintain the cleanliness of the pens and the surrounding environment, prevent the spread of dangerous diseases among the goat herd, and increase farmers' capacity to expand their herds thanks to their mastery of manure fermentation technology.

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