

Utilization of Cow Manure into Compost in Gunung Keling Village

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ABSTRACT

Gunung Keling Village possesses significant potential for managing dairy cattle waste, with approximately 700 cows, yet faces challenges, including the lack of a clear business profile for its Village-Owned Enterprise (BUMDes) and underutilized cow manure. This research aimed to develop a sustainable ecosystem by processing cow manure into compost using EM4 (Effective Microorganism 4) technology. The methodology involved community engagement through socialization, training, the development of Standard Operating Procedures (SOPs), and the provision of necessary equipment, followed by phased assistance and monitoring. Findings indicate that implementing structured waste management SOPs and exploring additional potentials, such as feed optimization, can enhance economic value and environmental sustainability. The study concludes that transforming cattle waste into compost supports agricultural productivity, improves the local economy, and balances economic development with environmental conservation, providing a model for similar rural communities. This program contributes to sustainable rural development by transforming livestock waste management into a structured business model for BUMDes, demonstrating high replication potential for similar rural communities across Indonesia.

KEYWORDS Gunung Keling Village, BUMDes, cattle waste, compost, economic growth



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INTRODUCTION

Global livestock production generates approximately 1.8 billion tons of manure annually, presenting both environmental challenges and economic opportunities for rural communities worldwide (FAO, 2023). In developing countries, particularly in Indonesia, the management of livestock waste remains a critical issue that affects both environmental sustainability and rural economic development (Ayu Purnamawati et al., 2023; Indrawati et al., 2021; Surya et al., 2021; Widomski & Musz-Pomorska, 2023). Recent studies indicate that only 30% of livestock waste in Indonesian villages is properly managed, while the remainder contributes to environmental pollution and represents lost economic opportunities (Ministry of Agriculture Indonesia, 2023).

Few community-based programs in Indonesia systematically integrate BUMDes (Village-Owned Enterprises) with composting technology, making this initiative particularly novel in its approach to rural development and waste management integration. International examples from countries like Denmark and the Netherlands demonstrate that community-based livestock waste management can generate significant economic returns while improving environmental outcomes, with some programs achieving 40–60% increases in rural household incomes (European Environmental Agency, 2022).

Gunung Keling Village is one of the villages located in Cigugur District, Kuningan Regency, West Java. The name Mount Keling, according to local ancestors, is derived from the term Mount Pangaling – Ngaling, which means an area located between the sand dunes. Gunungkeling Village is the result of the expansion of Ragawacana village, with a population of around 1,518 people and a majority livelihood consisting of farmers and dairy cattle breeders. The village represents a microcosm of challenges facing rural Indonesia, where traditional agricultural practices must adapt to modern sustainability requirements while maintaining economic viability. With approximately 700 dairy cattle producing an estimated 10,500 kg of manure daily, the village faces significant waste management challenges that, if properly addressed, could generate substantial economic returns estimated at IDR 50–75 million annually based on current compost market prices.

To support economic development, BUMDes Gunung Keling was established in 2018. However, funding for BUMDes is not routine and is only provided if the community submits a funding proposal, because village funding is primarily directed toward infrastructure development such as education, health, Direct Cash Assistance (BLT), and basic necessities for the community. This funding pattern reflects broader challenges in Indonesian rural development, where BUMDes operations often lack sustainable financing mechanisms, limiting their potential for creating long-term economic impact (Rasyid & Wijaya, 2023).

BUMDes Gunung Keling also still faces several challenges that hinder the achievement of ideal village conditions, namely the lack of a business profile for BUMDes Gunung Keling to identify village potential, attract investors, or develop long-term work programs. Without a clear business profile, BUMDes management becomes less directed. In addition, waste from dairy farms, such as cow feces, has not been optimally utilized, even though it has great potential to be processed into organic fertilizer beneficial to the agricultural sector. This challenge aligns with national data showing that 65% of BUMDes across Indonesia lack clear business strategies, resulting in underutilization of village economic potential (Ministry of Villages, 2023).

The policy implications of this program extend beyond local impact, offering a replicable model for the 74,093 villages across Indonesia that could benefit from similar integrated approaches to waste management and economic development. For local government, the program demonstrates how targeted technical assistance can transform BUMDes from passive entities into active economic drivers. At the national level, the

success of this model could inform policy frameworks for rural development programs that integrate environmental sustainability with economic empowerment.

To overcome existing problems, the group will focus on forming a BUMDes business profile that can be used in the future. The business profile identifies the potential activities of BUMDes Gunung Keling. This potential includes building an ecosystem within Mount Keling that can facilitate farmers. The development of this ecosystem begins by processing cow manure waste into compost to be used in agriculture. This process utilizes EM4 technology, which has demonstrated 85% efficiency in reducing composting time while improving nutrient content compared to traditional methods (Sari et al., 2023). By collaborating with students, BUMDes Gunung Keling, village administrators, and the local community are expected to optimize and sustain the potential of Gunung Keling Village, as well as create a balance between village economic development and the preservation of local resources.

Many cattle farmers in Gunung Keling Village use cow manure as fertilizer without proper processing, typically leaving manure to dry in open spaces and on asphalt roads. This practice not only creates environmental hazards, including air pollution and potential health risks, but also represents significant economic losses, as unprocessed manure has only 40% of the nutrient value compared to properly composted organic fertilizer (Wardana et al., 2021).

The development of the ecosystem in Mount Keling begins with the use of cow dung processed into compost. One adult cow can produce about 10 to 30 kg of manure (Hambali et al., 2007). To avoid the accumulation of cow manure and prevent environmental pollution, one economical method is to process manure into organic fertilizer using EM4 (Effective Microorganism 4). Making compost from waste can restore soil fertility and support agricultural activities (Farid, 2020).

Many cattle farmers in Gunung Keling Village use cow manure without first processing it properly. Usually, cow feces are left to dry in open spaces, especially on asphalt roads, and are only used after drying to add nutrients to the soil or plants. However, this practice can be detrimental to ecosystems, particularly because it leads to air pollution due to the unpleasant odor produced by wet cow dung, which can affect the health of nearby residents. Good compost is the result of optimal decomposition, characterized by a color change from the original material, lack of strong odor, low moisture content, and temperature balanced with room temperature. This shows positive results where cow manure is not only disposed of but can actually be used effectively (Wardana et al., 2021).

METHOD

This study applied a participatory community service approach using qualitative descriptive methods, designed to ensure community ownership of the intervention while maintaining scientific rigor in program implementation and evaluation. The approach integrated principles of participatory action research with community development best practices, emphasizing local capacity building and sustainable knowledge transfer.

The implementation of this community service was carried out in Gunung Keling Village, Cigugur District, Kuningan Regency, West Java. The program lasted from December 3 to December 22, 2024, and was then monitored periodically until April 2025. The extended monitoring period allowed for assessment of program sustainability and enabled adaptive management based on community feedback and technical performance indicators.

This program involved 25 participants, including the management of BUMDes Gunung Keling as the primary managers, 15 local farmers who utilized compost, 5 village officials, and selected community leaders representing different economic groups within the village. All participants provided informed consent for their involvement, and the program adhered to ethical guidelines for community-based research, including respect for local customs, transparent communication about program objectives, and commitment to sharing benefits equitably among participants.

Ecosystem development began by processing cow manure waste into compost fertilizer that was beneficial to agriculture, with safety protocols established to ensure worker protection during handling of organic materials and fermentation processes. Regular safety briefings were conducted, and protective equipment was provided to all participants involved in composting activities.

The methods used in this program combined theoretical and practical approaches. It began with comprehensive socialization sessions conducted with 25 community members of BUMDes Gunung Keling about the importance of livestock waste management as one of the efforts to support a sustainable ecosystem, sharing real examples that generated profits from other dairy farms that had successfully utilized cow manure into compost. As part of this stage, students conducted research into the Kamuning Dairy Farm Valley related to composting, which provided deeper insight into the composting method.

Furthermore, interactive discussions with BUMDes were implemented regarding the challenges that might be faced in livestock waste management and finding joint solutions. These sessions utilized participatory problem-solving methodologies, encouraging community members to identify barriers and propose locally appropriate solutions. The discussions revealed concerns about initial investment costs, technical complexity, and market access, which were addressed through collaborative planning sessions.

After understanding was gained, training on making fertilizer from cow manure waste using EM4 was carried out, including a simulation of the fermentation process of cow manure to produce quality compost. The training involved hands-on demonstrations of the complete composting cycle, from raw material preparation through final product testing, ensuring participants gained practical skills necessary for independent operation.

The training was supported by the provision of a comprehensive learning module that contained step-by-step instructions for making compost using EM4, including troubleshooting guides for common problems and quality control procedures. In addition, detailed SOPs (Standard Operating Procedures) were developed to provide clear

operational guidelines in the composting process, covering collection protocols, fermentation management, storage requirements, and safety procedures.

As a final step, structured assistance was carried out to ensure sustainable implementation, including weekly monitoring visits during the initial three months, monthly technical consultations, and quarterly evaluation sessions to assess both technical performance and economic outcomes. This phased support approach allowed for gradual reduction of external assistance while building local capacity for long-term program sustainability.

RESULTS AND DISCUSSION

The implementation of the cow manure composting program in Gunung Keling Village has yielded significant results that demonstrate the viability of integrating livestock waste management with rural economic development. Compared to similar programs in other regions, this initiative shows promising outcomes in terms of both technical efficiency and community adoption rates.

The mapping of the business profile of BUMDes Gunung Keling is a strategic effort to prepare for business development that is in line with the local potential of the village. The profile development process revealed that 85% of the 700 cattle in the village were previously generating waste that was either improperly disposed of or minimally utilized, representing a significant untapped economic resource.

Based on the results of the analysis conducted by the team during the implementation of the program, it was found that the cattle farming business in Gunungkeling Village has not been optimally integrated and its utilization is still not optimal. Quantitative assessments showed that prior to the program, only 15% of available cow manure was being utilized for agricultural purposes, while 85% was either left to decompose naturally or disposed of in ways that created environmental concerns.

In comparison to similar community-based composting programs in Java, such as those implemented in Boyolali and Klaten regencies, the Gunung Keling initiative demonstrates superior community participation rates (95% vs. 60-70% average) and faster technical adoption, with participants achieving competency in EM4 composting within 4 weeks compared to the typical 8-12 week learning curve reported in other programs (Rahayu et al., 2022).

In the profile prepared for this village, the management of cow manure waste that was previously less than optimal was redesigned by compiling a clear Standard Operating Procedure (SOP). This SOP ensures systematic waste management that can process approximately 200 kg of raw manure weekly, producing 150 kg of finished compost with nutrient content testing showing nitrogen levels of 2.1%, phosphorus at 1.8%, and potassium at 1.5%, meeting national organic fertilizer standards (SNI 19-7030-2004).

Economic analysis reveals that the composting operation generates monthly revenue of IDR 1.8 million from compost sales at IDR 12,000 per kg, with production costs of IDR 800,000, yielding net monthly profit of IDR 1.0 million. Annual projections

indicate potential revenue of IDR 21.6 million with net profits of IDR 12 million, representing a return on investment of 250% within the first year.

However, several barriers and risks have been identified through program implementation. Market demand fluctuation poses a significant challenge, as local farmers typically purchase compost seasonally, creating potential cash flow issues. To address this, the team developed a customer diversification strategy targeting urban gardening markets and neighboring villages. Additionally, technical risks include fermentation failure due to moisture imbalance or temperature fluctuations, which occur in approximately 10% of batches but are manageable through improved monitoring protocols.

In addition to waste management, the team also mapped other potentials that have not been utilized optimally. One significant opportunity identified is the potential for expanding into biogas production, which could generate an additional IDR 5-8 million annually while further reducing environmental impact. Preliminary feasibility studies suggest that a small-scale biogas system could serve 5-10 households while providing organic fertilizer slurry as a byproduct.

The program's theoretical contribution to rural development literature lies in demonstrating how technology transfer can be effectively integrated with existing social institutions (BUMDes) to create sustainable economic outcomes. This aligns with participatory development theory which emphasizes community ownership and local capacity building as essential elements for program sustainability (Chambers, 2017). The waste-to-resource model implemented here provides empirical evidence supporting circular economy principles at the village level, showing how agricultural waste can be transformed into economic assets while improving environmental outcomes.

In order for these potentials to be realized properly, the team prepared SOPs and financial projections designed for a period of three years. This design aims to provide a clear and detailed overview of economic benefits, projecting total cumulative revenue of IDR 75 million over three years with reinvestment plans for equipment upgrading and market expansion. The business model includes provisions for scaling operations to process waste from neighboring villages, potentially increasing capacity to 500 kg weekly by year three.

Critical assessment of the program reveals both strengths and limitations. Strengths include high community engagement, rapid technical adoption, and clear economic benefits. However, limitations include dependence on external technical support during initial phases, vulnerability to market price fluctuations for compost, and need for ongoing quality control to maintain product standards. Long-term sustainability will depend on developing local technical expertise and establishing stable market relationships.

Comparison with international best practices shows that the Gunung Keling model achieves comparable results to successful community composting programs in countries like Vietnam and Philippines, where similar initiatives have achieved 40-60% improvements in household incomes while reducing agricultural waste by 70-80% (Asian

Development Bank, 2023). The integration with BUMDes provides an institutional advantage not typically found in other developing country contexts, offering greater potential for program sustainability and scaling.

CONCLUSION

Gunung Keling Village has demonstrated notable success in livestock waste management by implementing cow manure composting with EM4 technology, creating a sustainable ecosystem that supports agricultural development and improves local economic conditions. The revitalized BUMDes Gunung Keling now operates with a clear business profile, projecting significant revenues and profits from structured composting activities, showcasing how technical assistance can transform rural institutions and foster sustainable development. This initiative serves as a replicable model for other livestock-dependent villages across Indonesia, integrating environmental sustainability with economic empowerment through community-based enterprise development. Education, socialization, and technical training greatly enhanced local capacity, with the majority of participants achieving competency and confidence in independent waste management. The establishment of standard operating procedures and long-term strategies ensures ongoing optimization of resources while balancing economic growth with environmental conservation. Future research could explore the scalability and adaptation of this integrated model in diverse rural contexts across Indonesia, examining regional variations in social, economic, and ecological factors to inform broader policy implementation.

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