

Green Economy in Rural Areas: Utilizing Cow Waste as Organic Fertilizer in Kubang Village

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ABSTRACT: This community service activity aims to implement the concept of a green economy by utilizing cow dung waste as an organic fertilizer to improve the welfare of the Kubang Village community. The program was implemented using a participatory approach, encompassing socialization, technical training, production assistance, and outcome evaluation. Participants consisted of local farmers and livestock breeders who were actively involved in every step of the activity. The results showed that the community experienced increased knowledge and skills in processing livestock waste into solid and liquid organic fertilizers. The resulting organic fertilizer products have proven effective in improving soil fertility and increasing agricultural yields. Furthermore, this activity has led to reduced environmental pollution and the formation of small business groups specializing in waste management. Economically, this activity increases community income and reduces agricultural production costs by reducing dependence on chemical fertilizers. The program also fosters collaboration among universities, the village government, and the community in achieving sustainable development based on local resources. Overall, this activity demonstrates that implementing a green economy at the rural level can be an innovative solution to improve community welfare while preserving the environment.

KEYWORDS: Green Economy, Cow Waste, Organic Fertilizer, Community Empowerment, Sustainable Development.

1. INTRODUCTION

Rural economic development in the modern era emphasizes not only increasing productivity and community income, but also environmental sustainability (Marku et al., 2024). The concept of the green economy has emerged as a new paradigm for promoting economic growth that aligns with the preservation of natural resources and the reduction of negative environmental impacts (Mulastih et al., 2024). One sector with significant potential for realizing a green economy in rural areas is the livestock sector, particularly the management of livestock waste, which has often been viewed as a problem rather than a valuable resource (Mutalib, 2024).

Kubang Village, located in Sukaresmi District, Cianjur Regency, is a village with a high level of cattle farming activity. Most residents are farmers and livestock breeders operating in small to medium-sized enterprises. However, this livestock activity has created a new problem: the accumulation of poorly managed cow dung waste. This waste is often discarded directly into open fields or waterways, leading to environmental pollution and unpleasant odors. However, the economic potential of this waste is actually significant if it is processed into value-added products, such as organic fertilizer.

Utilizing cow dung waste as organic fertilizer can be a strategic solution to address two problems simultaneously: environmental pollution and low farmer incomes (Mardiharini et al., 2022). Through a simple processing process that utilizes fermentation and composting methods, cow manure can be converted into solid or liquid organic fertilizer, which can improve soil structure, increase fertility, and reduce dependence on chemical fertilizers (Maolida et al., 2025). In addition to its ecological benefits, this activity also has a significant economic impact, as organic fertilizer products have a high selling value and stable market demand, particularly in the growing organic farming sector (Argianti et al., 2025).

Unfortunately, most farmers in Kubang Village lack the knowledge and skills to process livestock waste into organic fertilizer. The lack of outreach and training on appropriate technology prevents the community from optimally utilizing this potential. Therefore, participatory and educational community service activities are needed to increase farmers' capacity in managing livestock waste sustainably.

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Various previous studies and community service activities have shown that the utilization of livestock waste, particularly cow manure, has significant potential to support green economic development in rural areas. Processing livestock waste into organic fertilizer not only reduces environmental pollution but also provides new economic value for farming communities.

Research conducted by Budiyo et al., (2023) demonstrated that training and mentoring in processing cow manure into organic fertilizer in Banyumas Regency successfully increased farmers' capacity to manage livestock waste sustainably. This activity resulted in solid and liquid organic fertilizer products that have been proven to increase agricultural productivity while reducing dependence on chemical fertilizers. This Research emphasizes the importance of a participatory approach and sustainability in any environmental service program.

Furthermore, (Sahara, 2024) revealed that utilizing cow manure as organic fertilizer can have a multiplier effect on the community's economy. In addition to reducing agricultural production costs, this activity creates new business opportunities in the sale of organic fertilizers and environmentally friendly agricultural consulting services. This Research reinforces the view that livestock waste management can be a strategy for empowering the local economy based on circular economy principles.

From an environmental perspective, (Song et al., 2025) found that applying simple fermentation technology to cow dung waste can reduce the levels of ammonia and methane gas produced from the accumulation of livestock waste. Therefore, such programs not only impact the local economy but also make a positive contribution to climate change mitigation at the local level.

Meanwhile, Kusmiyati et al., (2025), through community service activities in Boyolali Regency, emphasized the importance of synergy between village governments, farmer groups, and higher education institutions in implementing appropriate technology for livestock waste management. This multi-stakeholder collaboration proved effective in expanding the impact and sustainability of community-based green economy programs.

From a local context, Rukmini & Andriani (2022) conducted community service activities in Bandung Regency, focusing on producing liquid organic fertilizer from cow dung using local microorganisms (MOL) as an additive. The results showed that the use of MOL not only accelerated the fermentation process but also improved the quality of the resulting organic fertilizer. This local technology approach is considered suitable for implementation in rural areas with limited resources, such as Kubang Village.

Several other studies, such as those conducted by Apriyanti et al., (2025) and Indrarosa et al., (2025), also demonstrated that livestock waste processing can be an effective means of educating the public about the importance of a green economy and sustainable natural resource management. These studies confirm that the success of livestock waste processing programs depends not only on the technology used, but also on active community participation and policy support from local governments.

Based on the results of various previous studies and community service programs, it can be concluded that utilizing cow dung as organic fertilizer is strongly relevant to efforts to improve the welfare of rural communities while simultaneously protecting the environment. However, each region has different social, economic, and ecological characteristics, necessitating program adaptations to local conditions. Based on this, the community service program in Kubang Village is crucial as an effort to implement the green economy concept, which focuses on community empowerment and environmental sustainability at the rural level.

Therefore, this community service program aims to empower farmers and livestock breeders in Kubang Village to utilize cow dung waste into economically valuable organic fertilizer. Through a Participatory Rural Appraisal (PRA) approach and appropriate technology-based training, this activity is expected to increase community knowledge, skills, and awareness of the importance of green economy practices at the local level. Furthermore, this activity is expected to be the first step toward environmentally based village economic independence by sustainably utilizing available local resources.

This activity also aligns with the Sustainable Development Goals (SDGs), specifically Goal 8 on Decent Work and Economic Growth and Goal 12 on Responsible Consumption and Production. By integrating economic, social, and environmental aspects, the processing of cow dung into organic fertilizer is expected to become a model for implementing a green economy at the rural level, not only improving community welfare but also preserving local ecosystems.

2. IMPLEMENTATION METHOD

This community service activity was carried out in Kubang Village, Sukaresmi District, Cianjur Regency, West Java Province, a geographically agricultural area dominated by farmers and cattle ranchers. The location was selected based on initial observations, which indicated that cattle manure waste in the village was not being optimally utilized and had the potential to cause environmental pollution. Therefore, Kubang Village was deemed suitable for implementing a green economy program based on livestock waste management.

This community service activity lasted for 40 days, from the preparation stage to the final evaluation. The implementation involved a team of lecturers, students, village officials, and local farmers and livestock groups as key partners. The approach used in this activity was Participatory Rural Appraisal (PRA), a participatory approach that positions the community as both the subject and the primary actor in all stages of the activity. With this approach, the community is not only a beneficiary but also actively involved in planning, implementing, and evaluating the activity.

2.1 Preparation Stage

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The initial phase of the activity began with a field survey and problem identification. The community service team conducted interviews and focus group discussions with village officials and livestock groups to explore the challenges faced, potential resources available, and the community's readiness to participate. Based on this identification, a training program was designed to address the local socio-economic conditions.

2.2 Training and Technology Transfer Stage

The next stage involves training in the production of organic fertilizer from cow dung. This training covers two types of products: solid organic fertilizer and liquid organic fertilizer. The training activities are delivered interactively using lectures, demonstrations, and direct field practice. The training materials include: a) Introduction to the concept of a green economy and the importance of livestock waste management; b) The process of processing cow dung using fermentation and composting methods; c) Use of natural additives such as rice husks, bran, and local microorganisms (MOL) to accelerate the decomposition process; d) Packaging, storage, and quality standards for organic fertilizer products. In this activity, the community is directly involved to ensure the transfer of knowledge and skills. A learning-by-doing approach is employed to ensure that participants thoroughly understand the stages of fertilizer production and can repeat them independently.

2.3 Production Assistance Stage

Following the training, intensive mentoring was provided to farmers and livestock groups in producing organic fertilizer sustainably. This mentoring aimed to ensure the implementation of appropriate processing techniques and maintain product quality. The community service team also assisted the community in calculating production costs, determining selling prices, and developing simple community-based marketing strategies. At this stage, the target group was tasked with forming a joint business group to facilitate the production and distribution of organic fertilizer products.

2.4 Monitoring and Evaluation Stage

The final stage of the program is monitoring and evaluation, which is conducted to measure the program's success and impact on the community. The review was conducted through interviews, field observations, and questionnaires with participants. Aspects assessed included increased knowledge, skills, and behavioral changes in livestock waste management. Additionally, simple calculations were conducted to determine the agricultural cost efficiency and increased income resulting from the use of locally produced organic fertilizer. Monitoring was conducted periodically after the main program ended to ensure the program's sustainability. The evaluation results indicated that community involvement and support from the village government were key factors in the program's success.

2.5 Success Indicators

Several indicators of the success of this activity include: 1) The formation of a group of farmers and livestock breeders who process organic fertilizer independently; 2) Increased knowledge and skills of participants in processing cow dung into organic fertilizer; 3) The creation of solid and liquid organic fertilizer products that are ready for use or marketing; 4) Increased income and fertilizer cost efficiency for farmers; 4) Increased public awareness of green economy practices and sustainable environments. With this participatory and practical implementation method, the community service activities in Kubang Village are expected to become a model for implementing a green economy at the village level. This program not only produces environmentally friendly products but also enhances the economic independence of the community by utilizing previously neglected local resources.

3. RESULTS AND DISCUSSION

3.1 Initial Conditions of Society

Before the community service activities, the implementing team conducted a field survey to obtain a general overview of the social, economic, and environmental conditions of the Kubang Village community. Observations indicated that the majority of the village's residents depend on agriculture and household-scale cattle farming for their livelihoods. Livestock farming is generally managed traditionally, with between two and five cows per family. Although this livestock activity has the potential to generate additional income, most residents are unable to maximize the byproduct, namely cow dung waste.

The cow dung produced daily is mostly simply piled up around the pen or dumped on vacant land without further processing. This situation creates environmental problems, such as unpleasant odors, an increase in fly populations, and the potential for groundwater pollution due to wastewater runoff. Furthermore, some farmers still rely on chemical fertilizers for their agricultural needs because they are considered more practical and provide faster results, without realizing their long-term impacts on soil fertility and ecosystem balance.

Interviews with several farmers and livestock breeders revealed that community knowledge regarding cow dung waste management is still very limited. Some residents do not understand that this waste actually has significant economic value if properly processed into organic fertilizer. When asked about the possibility of processing waste into marketable products, most respondents

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stated they lacked the skills, equipment, or technical knowledge to do so. Limited access to information and appropriate technological assistance are major factors contributing to the untapped economic potential of livestock waste.

Furthermore, the community's mindset tends to be consumerist and lacks innovation in utilizing local resources. Economic activities are predominantly oriented toward seasonal agricultural products without sustainable business diversification. In this context, green economic practices that emphasize resource efficiency and waste management are not yet fully recognized and implemented by the Kubang Village community.

Institutionally, the village lacks any groups or cooperatives specifically managing livestock waste. Although there are active farming and livestock groups, their activities primarily focus on animal husbandry rather than waste processing. This indicates a persistent gap in the implementation of the circular economy concept, which involves reusing resources generated from the production process to create new added value.

The community's continued reliance on traditional practices also impacts the level of participation in environmental innovation-based activities. Some residents consider processing cow dung into fertilizer to be costly and labor-intensive, so they prefer to sell the dung in its raw form at very low prices, or even let it pile up around the barn.

On the other hand, observations also indicate significant potential for development. The Kubang Village community exemplifies a spirit of mutual cooperation and openness to external development initiatives, particularly those that directly benefit the economic well-being of their families. The potential for livestock waste as a raw material is abundant and available year-round, making it highly suitable for sustainable use as a base for organic fertilizer. Support from the village government has also been quite positive, particularly in providing trial land and facilitating meetings with farmer groups.

Given these initial conditions, Kubang Village faces both challenges and significant opportunities in developing a green economy based on livestock waste processing. The primary challenge lies in the community's limited knowledge, skills, and institutional capacity, whereas its primary potential lies in the availability of raw materials, community participation, and support from the village government. Therefore, this community service activity aims to bridge this gap through an educational, participatory, and applied approach, enabling the community to transform from conventional livestock farming practices to sustainable green economy practices.

3.2 Implementation of Activities

The community service program in Kubang Village was implemented in stages over three months, starting with the planning process, followed by socialization, technical training, production assistance, and evaluation of results. This program involved a team of lecturers and students from the implementing university, village officials, and farmer and cattle rancher groups as the main partners. The program's implementation was based on participatory principles, with the community actively involved at every stage to ensure the effective and sustainable transfer of knowledge and skills.

The initial phase began with program socialization and the formation of working groups. The socialization took place at the village hall, attended by the village head, representatives of farmer groups, and local cattle ranchers. During this activity, the implementing team explained the objectives, benefits, and implementation plan of the community service program, and introduced the concept of a green economy as an environmentally friendly approach to natural resource management, oriented towards improving community welfare. Participants' enthusiasm was high, demonstrated by their eagerness to participate in the training and try their hand at producing organic fertilizer independently. This phase resulted in the formation of a working group comprising 15 farmers and cattle ranchers as the primary participants.

The next phase included training and a technical demonstration on processing cow dung into organic fertilizer. The training was conducted on local farms using a learning-by-doing approach, allowing participants to directly put the material into practice. The training was divided into two sessions: solid organic fertilizer production and liquid organic fertilizer production. In the first session, participants were introduced to the necessary materials, such as fresh cow manure, rice husks, bran, and a local microorganism activator (MOL). The community service team explained the fermentation stages, mixing ingredients, humidity control, and decomposition time. In the second session, participants were taught how to make liquid fertilizer using fermented cow manure, water, brown sugar, and MOL solution as the main ingredients. Participants were also taught how to package, store, and utilize it on farms.

The two-day training included the distribution of training modules containing practical guidelines for the production of organic fertilizers. The community service team also introduced simple tools based on appropriate technology, such as a manual mixer and a fermentation container with a ventilation system, which the community can build themselves using local materials. Initial evaluations showed that participants understood the process well and were interested in implementing it independently at home.

Following the training, the program continued with four weeks of field mentoring. The community service team regularly visited participant groups to monitor the fermentation process, provide technical guidance, and assist in addressing any challenges, such as suboptimal moisture management and extended fermentation times. During this phase, participants also began trialing the application of organic fertilizer to their farmland, particularly on vegetables and rice. Initial results showed improved soil fertility and enhanced plant growth compared to the previous period.

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In addition to technical aspects, mentoring also covered business management and marketing of organic fertilizer products. Participants were provided with explanations on calculating production costs, determining selling prices, and community-based marketing strategies. The community service team encouraged the community to form joint business groups that would serve as a platform for producing and distributing organic fertilizers. The village government supported this initiative by providing a small plot of land for integrated processing and planning, as well as certification of organic fertilizer products through collaboration with the local agricultural office.

From the overall implementation of the activities, the Kubang Village community demonstrated a high level of participation and enthusiasm for the cattle waste processing program. Some participants even began producing their own fertilizer for use on their own farmland, thereby reducing their dependence on chemical fertilizers. The success of this program is measured not only by improved technical skills but also by a shift in the community's mindset, which is now more open to the concept of a green economy and the importance of sustainable waste management.

Overall, this program successfully achieved its objectives of transferring knowledge, fostering environmental awareness, and opening new economic opportunities based on local resources. The program's implementation also demonstrated that synergy between universities, the village government, and the community is a key factor in ensuring the success and sustainability of environmental service-based activities in rural areas, such as Kubang Village.

3.3 Activity Results

The implementation of community service activities in Kubang Village has yielded various tangible achievements across technical, social, economic, and environmental aspects. This program has successfully increased community knowledge, skills, and awareness of the importance of environmentally friendly and economically valuable livestock waste management. Generally, the results of the activities can be categorized into four main outcomes: increased community capacity, the creation of organic fertilizer products, changes in waste management behavior, and the economic impact on local farmers and ranchers.

The first stage that showed positive results was the increase in community capacity and knowledge. Before the activities began, most ranchers and farmers in Kubang Village lacked an adequate understanding of the productive use of cow manure. Waste was typically simply piled around the barn without proper management, resulting in unpleasant odors and potential environmental pollution. After participating in a series of outreach and training sessions, the community began to understand the concept of a green economy and the basic techniques for processing waste into organic fertilizer. Based on the post-training evaluation, more than 85% of participants were able to explain the steps for making solid and liquid organic fertilizers and correctly practiced the fermentation process. This demonstrates the effectiveness of the knowledge transfer process.

Furthermore, in terms of production and appropriate technological innovation, this activity successfully produced two main products: solid organic fertilizer and liquid organic fertilizer. Solid fertilizer is made by fermenting a mixture of cow manure, rice husks, bran, and local microorganism activator (MOL) for approximately two weeks. The final product is a crumbly, dark-colored, and odorless fertilizer, indicating complete decomposition. Meanwhile, liquid organic fertilizer is produced by fermenting cow manure with water, brown sugar, and MOL for 10-14 days. This liquid fertilizer can be applied directly to plants or as a soil amendment. A trial application of the fertilizer on agricultural land showed positive results: vegetable and rice plants grew more vigorously, with greener leaves and looser soil structure.

Beyond the technical results, this activity also led to changes in community behavior and an increase in environmental awareness. Previously considered a problem, the community now views it as a valuable economic resource. Some participants have even begun processing waste from neighboring farms as an additional source of fertilizer. There has also been a collective initiative to maintain the cleanliness of the surrounding area and separate organic waste from non-organic waste. This behavioral change is an indicator of the program's success in promoting the values of sustainability and environmental responsibility within rural communities.

From an economic perspective, this community service activity has had a direct impact on increasing the income of farmers and livestock breeders. Survey results after three months of implementation showed that some participants were able to sell their processed organic fertilizer for Rp 15,000–20,000 per kilogram for solid fertilizer, and Rp 10,000 per liter for liquid fertilizer. Although still small-scale, this activity has opened up new business opportunities based on livestock waste management. With the local market becoming interested in using organic fertilizer, especially among vegetable farmers around the Sukaresmi area, the people of Kubang Village are beginning to see the economic benefits of this innovation. Furthermore, the use of organic fertilizer on their own land has also helped reduce agricultural production costs by 20–30%, as farmers are no longer entirely dependent on chemical fertilizers, whose prices fluctuate and become increasingly expensive.

This activity also established a collaborative network between the community, village government, and universities. The village government provided support by allocating a small plot of land for integrated fertilizer processing and supplying basic equipment. Meanwhile, the university's community service team continued to provide assistance in developing product brands and packaging, and assisted with the business licensing process, enabling farmer-livestock groups to market their products legally. This synergy demonstrates an effective model of collaboration between academics and the community in implementing the Tri Dharma

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(three pillars) of higher education, particularly in the aspects of community service and environmentally-based economic empowerment.

Overall, the results of the activity demonstrate that the application of a green economy concept, utilizing cow waste as an organic fertilizer, has had a multidimensional impact on the Kubang Village community. This activity not only addresses waste issues but also improves the village's economic well-being and environmental quality. In the long term, the trained community groups will likely serve as role models for surrounding villages, encouraging them to develop similar innovations and create a sustainable, environmentally friendly, and economically independent agricultural ecosystem.

3.4 Impact of Activities

The implementation of community service activities in Kubang Village has had various tangible and measurable positive impacts, both in the short and medium term. These impacts can be categorized into three main dimensions: social and environmental impacts, economic impacts, and impacts on increasing community capacity and independence. Each dimension exhibits significant changes, serving as indicators of the successful implementation of a green economy program centered on livestock waste management.

From a social and environmental perspective, these activities have had a significant impact on changing community behavior and increasing awareness of the importance of maintaining cleanliness and ecological sustainability. Before the program was implemented, cow dung often accumulated around the barn, emitting a pungent odor, thus degrading the quality of the residential environment. After the program, the community began implementing routine and planned waste management. Some livestock groups built special storage areas for fermentation, while others started utilizing processed organic fertilizer on their own farmland. The environment around the barn has become cleaner and free of stagnant waste, and the previously high fly population has gradually decreased. Furthermore, the community has become increasingly aware of the value of sustainability and the importance of maintaining ecosystem balance through environmentally friendly agricultural practices.

From an economic perspective, these activities have had a significant impact on increasing income and improving production cost efficiency. Some of the training participants who actively developed organic fertilizer processing were able to sell their products to fellow farmers in surrounding villages. The additional income they earned averaged between Rp 300,000 and Rp 700,000 per month, depending on the scale of production and the number of orders. While still relatively small, this income was sufficient to meet household needs, especially for farming families who previously relied solely on seasonal harvests. Furthermore, the use of homemade organic fertilizer has reduced farmers' expenditures on chemical fertilizers by around 25–40%, directly increasing their profit margins. Thus, this activity not only opened new business opportunities but also strengthened the economic resilience of the farming and livestock households in Kubang Village.

Another positive impact was seen in the increased capacity, skills, and independence of the community. Before the activity, most residents lacked the technical skills to process waste into marketable products. After training and mentoring, residents were able to independently carry out the fermentation process, mix ingredients, and package products. Some groups even began creating simple labels and brands for their organic fertilizers. This demonstrates the growing self-confidence and entrepreneurial spirit among the village community. Furthermore, the formation of a small, organized group of organic fertilizer processors also marks the beginning of a community-based economic institutional model. This group has the potential to develop into a micro-enterprise unit that contributes to the village economy.

The impact of this activity is also felt in the educational and collaborative aspects between universities, the village government, and the community. Through this program, students and lecturers can apply relevant science and technology directly in the field, while the community gains access to new knowledge that was previously inaccessible. The village government, on the other hand, gains an empowerment model that can be replicated in different sectors, such as household waste or agricultural waste processing. This synergy strengthens the collaborative ecosystem for sustainable development at the local level, while also expanding the social impact of community service activities.

Overall, this activity has had a transformational impact on the mindset of the Kubang Village community. People who previously viewed livestock waste as a problem now recognize it as a resource that can be managed to enhance both economic well-being and environmental quality. Furthermore, this activity promotes a culture of innovation and mutual cooperation in village resource management, aligning with green economy principles that emphasize efficiency, sustainability, and ecological balance. With the various results and impacts achieved, this program is expected to be the first step towards establishing independent, productive, clean, and economically empowered villages through the sustainable use of local resources.

3.5 Analysis and Discussion

A community service activity focused on utilizing cattle waste as organic fertilizer in Kubang Village demonstrated a strong relationship between increasing environmental awareness, community economic empowerment, and the implementation of green economy concepts in rural areas. Based on implementation results and field observations, the analysis indicates that this activity not only successfully created a useful product but also significantly encouraged socio-economic changes and ecological behavior in the community.

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From a green economy perspective, this activity demonstrates that livestock waste management can serve as a model for implementing sustainability principles at the village level. According to UNEP (United Nations Environment Programme, 2019), a green economy emphasizes resource efficiency, waste reduction, and improving community well-being without harming the environment (Chairunnisa & Kusumadewi, 2024). The application of this concept in Kubang Village is evident in the processing of cattle waste into organic fertilizer that has economic value while improving environmental quality. This activity serves as a concrete example of how green economy principles can be contextually adapted to the lives of rural communities, which are largely dependent on agriculture and livestock.

Further analysis reveals that processing livestock waste into organic fertilizer offers a range of multifaceted benefits. Environmentally, this activity reduces pollution from waste accumulation, improves agricultural soil quality, and reduces dependence on chemical fertilizers that hurt soil ecosystems (Ramana, 2024). From a social perspective, this activity raises public awareness of the importance of environmental protection and encourages active participation in collective village activities (Mutalib, 2024). Meanwhile, from an economic perspective, this activity opens new business opportunities, diversifies income sources, and improves the cost efficiency of agricultural production (Rahmadi & Widyasari, 2023). The synergy of these three dimensions demonstrates the interconnectedness of ecological, social, and economic aspects, as explained in the triple bottom line concept: people, planet, and profit (Jeurissen, 2000).

Interviews and observations also identified a shift in community mindset as a key factor in the success of this activity. Before implementation, the majority of residents viewed waste as useless and a nuisance. However, after receiving training and mentoring, this view shifted to a more productive and innovative one. This shift aligns with findings by Zikargae et al., (2022), who emphasized that participatory education plays a crucial role in shaping pro-environmental behavior in rural communities. This reinforces evidence that a community-based empowerment approach is an effective strategy for internalizing sustainability values.

Furthermore, this activity also demonstrates the importance of collaborative work between academics, village governments, and local communities. This collaboration creates a bridge between scientific knowledge and field practice, enabling effective knowledge transfer. Universities act as facilitators of innovation and sources of appropriate technology, while the village government provides policy support and basic infrastructure (Priyanto et al., 2023). This collaboration yields a simple quadruple helix model at the local level, involving academics, the community, government, and the business sector (through fertilizer partners and farmer groups) to support the sustainability of green economy activities. This collaborative approach has also been recognized as effective in strengthening the village innovation ecosystem (Valverde-Orozco et al., 2024).

However, the analysis also indicates that several sustainability challenges remain that require attention. First, fertilizer processing activities still rely on the enthusiasm of individuals or small groups; therefore, long-term sustainability requires the establishment of more formal institutions, such as cooperatives or joint business groups (KUB). Second, marketing and product legality remain obstacles that must be overcome to ensure Kubang Village's organic fertilizer products can compete in the wider market. Third, further training is needed on packaging, labeling, and product quality standardization to increase sales value. These challenges are important to evaluate for the sustainability of future activities.

Theoretically, this activity demonstrates how environmentally based socio-economic transformation can be realized through a participatory and educational approach. Strengthening local capacity and implementing appropriate technology are key to driving the shift from a consumerist to a productive society. This aligns with Pereira et al., (2022) findings, which state that active community participation in local resource-based activities can increase village economic competitiveness while strengthening ecological resilience.

Overall, the analysis of this activity indicates that it not only impacts the knowledge and skills of residents but also initiates a paradigm shift toward an inclusive and sustainable green economic system. Processing cattle waste into organic fertilizer has proven to be a practical solution that integrates environmental and financial interests. With ongoing institutional support and cross-stakeholder collaboration, Kubang Village has the potential to become a concrete example of green economic implementation at the rural level, successfully empowering communities in a sustainable manner.

4. CONCLUSION

The community service activities carried out in Kubang Village successfully demonstrated that the application of the green economy concept, through the utilization of cattle waste as an organic fertilizer, can provide significant environmental, social, and economic benefits. This program successfully transformed the community's perspective on livestock waste from merely a polluting waste to a productive resource of high monetary value. Through a participatory and educational approach, the community not only gained new knowledge but also practical skills in processing waste into solid and liquid organic fertilizers that can be used locally or sold as value-added products. From an environmental perspective, this activity successfully reduced pollution from livestock waste and improved the quality of the agricultural ecosystem. The soil became more fertile, and agrarian productivity increased after the use of organic fertilizer. From a social perspective, the community became more aware of the importance of environmentally friendly waste management and demonstrated a spirit of mutual cooperation in every stage of the activity. Meanwhile, from an economic perspective, this activity opened new business opportunities and helped reduce agricultural production costs, thereby providing

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additional income for local farmers and livestock breeders. This activity also demonstrated the importance of synergy between universities, village governments, and the community in implementing empowerment-based community service. This collaboration facilitated the effective transfer of knowledge and developed a model for implementing a green economy that is both applicable and contextual in rural areas. However, the sustainability of these activities still requires institutional support and capacity building, particularly in terms of business management, product legality, and sustainable marketing strategies. Overall, these community service activities have successfully built community awareness, skills, and independence in sustainably managing local resources. Kubang Village now has the potential to become a model for a green village based on environmentally friendly agriculture and livestock farming. The implementation of these activities can be replicated in other rural areas in Indonesia, as a concrete step towards developing an inclusive, independent, and competitive green economy.

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