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DEVELOPING THE SUSTAINABILITY OF CATTLE FARMING BASED ON THE GREEN ECONOMY FROM AN ISLAMIC ECONOMICS PERSPECTIVE

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Abstract

This study examines the application of green economy principles in converting cattle manure into biogas in Barebbo Subdistrict, Bone Regency, South Sulawesi. It analyzes the challenges faced by farmers and evaluates this waste management from an Islamic economics perspective regarding sustainability and public welfare. This study employed a qualitative approach using the case study method. Data collection was conducted through observation, interviews, and documentation involving cattle farmers, village heads, and relevant stakeholders in Barebbo Subdistrict. Subsequently, the data were analyzed descriptively using the principles of the green economy and the maqasid syariah perspective as the analytical framework to describe the opportunities and challenges in realizing sustainable, productive, and environmentally friendly livestock farming.Research findings indicate that applying the principles of the green economy by converting cattle manure into biogas provides both economic and environmental benefits. These benefits include reducing the use of LPG, curbing environmental pollution caused by livestock waste, and utilizing the byproducts of the processing as organic fertilizer. However, the implementation of biogas in Barebbo Subdistrict is still not optimal due to several constraints, such as limited raw materials, low technical understanding among farmers, declining functionality of biogas installations, and insufficient support from the government. From an Islamic economics perspective, this waste management practice reflects the values of public interest, trustworthiness, and responsibility toward environmental conservation, thereby having the potential to serve as an effort to improve farmers' welfare while supporting the sustainability of the cattle farming industry.

Keywords: Green Economy, Cattle Farming, Livestock Manure, Biogas, Sustainability.

1. Introduction

The cattle farming sector plays a vital role in supporting national food security and serves as a pillar of the economy, particularly in rural areas of Indonesia. The increase in the cattle population, driven by market demand and government policy support, has simultaneously led to a rise in the volume of livestock manure. The management of this waste has become a critical issue with significant environmental implications. If not effectively managed, cattle manure can cause soil, water, and air pollution, as well as contribute to greenhouse gas emissions that exacerbate climate change (Badan Pusat Statistik, 2024). In a global context, integrating the food system with the principles of the green economy offers innovative solutions, one of which is the conversion of organic livestock waste into renewable energy sources such as biogas (Fauzi et al., 2025).

Bone Regency, particularly Barebbo Subdistrict, is one of the major centers of cattle farming in South Sulawesi. The majority of its residents depend on this sector for their livelihoods. Barebbo Subdistrict has significant livestock potential, as evidenced by the higher number of cattle compared to water buffalo and horses (Barebbo Subdistrict Office, 2026). However, this potential comes with sustainability challenges. The increase in livestock population is directly proportional to the increase in the volume of manure waste, which is often not managed optimally. Unmanaged waste can cause serious environmental problems and threaten the long-term sustainability of the livestock industry (Hardi & Soedarto, 2023).

The concept of the green economy offers a framework for addressing these challenges. By emphasizing resource efficiency, controlling environmental impacts, and fostering sustainable economic activities, the green economy integrates environmental protection into development strategies (Irawan, 2024). The conversion of cattle manure into biogas is a concrete example of the green economy's application in the livestock sector. This practice not only reduces methane emissions and potential pollution but also generates renewable energy that has economic value (Kusmiyati et al., 2023). In Barebbo Subdistrict, particularly in Lampoko Village, several livestock farmers have begun adopting biogas technology, demonstrating the potential to improve business efficiency, strengthen farmers' economies, and support environmental sustainability.

Nevertheless, the implementation of green economy principles in Barebbo Subdistrict remains limited and uneven. The processing of cow manure into biogas is still primarily found in Lampoko Village, while in other areas, livestock waste is often viewed as a worthless byproduct. In fact, the potential for increasing economic value through the processing of waste into biogas or organic fertilizer is enormous. Limited knowledge, awareness, and access to technology among livestock farmers pose barriers to the implementation of sustainable and environmentally friendly livestock farming practices (Firmansyah, 2022).

This study aims to conduct an in-depth examination of the application of green economy principles in cattle farming businesses in Barebbo Subdistrict, with a focus on the management of livestock manure as a source of biogas. This study will also analyze the factors that pose obstacles for farmers in implementing these sustainable practices and explore them from an Islamic economics perspective. The integration of the green economy concept with the principles of Islamic economics is expected to provide a comprehensive understanding of the opportunities and challenges in establishing productive, environmentally friendly, ethical, and sustainable cattle farming operations, as well as to contribute to improving the well-being of farmers and the community.

2. Literature Review

The Concept Of A Green Economy

The concept of the green economy refers to a development model that integrates environmental sustainability, economic growth, and social equity as its fundamental pillars. It is not merely

the adoption of environmentally friendly technologies, but rather a reorientation of the economic system to achieve participatory and sustainable growth, while reducing negative impacts on ecosystems and natural resources (Fauzi et al., 2025). The green economy aims to improve human well-being and social justice by reducing environmental degradation and resource constraints. Its key principles include efficient use of resources and energy, stimulating environmentally friendly investment, transforming the economic structure toward a knowledge- and innovation-based economy, promoting social inclusion and justice, and strengthening effective governance (Irawan, 2024) .

The Concept of Sustainability

Sustainability, as defined by the Brundtland Commission (WCED, 1987), is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This concept encompasses three main dimensions: economic, social, and environmental. Economic sustainability means maintaining long-term economic performance and growth through effective and responsible resource management. Social sustainability refers to improving the well-being of society and reducing social inequality. Environmental sustainability relates to the ability to maintain ecosystem balance and prevent environmental degradation (*Konsep Dan Definisi Sustainable [Keberlanjutan]*, 2025).

The implementation of a green economy through the conversion of cattle manure into biogas is a concrete manifestation of the three dimensions of sustainability. Economically, biogas can reduce farmers' operating costs and produce value-added organic fertilizer. Socially, clean energy and fertilizer improve quality of life and foster community cooperation. Environmentally, this process reduces waste, pollution, and greenhouse gas emissions (Dewantara et al., 2024). The relationship between the green economy and business sustainability is very close; green economy practices encourage the integration of sustainability principles into business operations, which ultimately strengthens a business's environmental performance, reputation, and long-term value (Yudawisastra, n.d.).

Sustainability from an Islamic Economics Perspective

In Islamic economics, business sustainability is closely linked to the concepts of maslahah (public interest) and justice. Every economic activity must provide broad and sustainable benefits to society and the environment, while avoiding harm (mafsadah) (Quran 2:205). Natural resources must be utilized wisely and responsibly, in accordance with the principles of maintaining the balance of nature and the equitable distribution of benefits (QS. Al-A'raf: 56). The prohibition against environmental destruction (fasad) underscores the importance of environmentally conscious and responsible economic practices (QS. Al-Qashash: 77).

The principle of amanah (trust and responsibility) is also crucial in resource management. Humans have a duty to utilize the blessings of Allah SWT responsibly, without causing harm, and to maintain environmental balance (QS. Al-Anfal: 27; QS. An-Nisa': 58). In the context of cattle farming, converting manure waste into biogas reflects the application of the principles of

maslahah and amanah. This process not only provides economic benefits through energy savings and organic fertilizer but also contributes to reducing environmental pollution and creating healthier living conditions, in line with the maqashid of Sharia to achieve comprehensive and sustainable well-being (falah).

3. Research Method

This study employs a qualitative approach using a case study design to gain an in-depth understanding of the application of green economy principles in cattle farming businesses in Barebbo Subdistrict, Bone Regency, South Sulawesi Province. The research data consists of primary and secondary data. Primary data were collected through in-depth interviews with cattle farmers who use biogas systems, leaders of farmers' groups or community leaders, as well as village or subdistrict officials involved in livestock activities. Meanwhile, secondary data were obtained from various scientific literature, official government documents, livestock statistics, village profiles, and normative Islamic sources such as the Qur'an, hadith, and fiqh al-muamalah literature relevant to the study. Data collection was conducted through field observations, in-depth interviews, and documentation to obtain comprehensive data on livestock waste management practices, the challenges faced, and the implementation of green economy principles from a sharia economics perspective.

The researcher served as the primary instrument in the data collection and analysis process, supported by observation guidelines, interview guidelines, a voice recorder, and a camera as supplementary instruments. Data analysis utilized the Miles and Huberman interactive model, which comprises three stages: data reduction, data presentation, and drawing conclusions and verification. Data reduction was conducted through the processes of selecting, grouping, and simplifying information in accordance with the research focus, while data presentation was organized in the form of descriptive narratives and tables to facilitate the identification of patterns and relationships among findings. Conclusions were then drawn through a continuous verification process by applying source triangulation and methodological triangulation to enhance the credibility and validity of the data. The analysis results were subsequently interpreted based on the concepts of the green economy, sustainable development, and the principles of Islamic economics—specifically the values of amanah (trust), maslahah (public interest), and responsibility toward environmental sustainability.

4. Results

Lampoko Village, Barebbo Subdistrict, Bone Regency, has a rich history as an agricultural area with a strong spirit of mutual cooperation. According to administrative data, the village covers an area of 6 km² and features lowland topography. In 2026, Lampoko Village's population was recorded at 1,750 people from 548 households, with the majority earning their livelihoods in the agriculture and livestock sectors. The village has received an award under the Program to Enhance the Role of Women Toward Healthy and Prosperous Families (P2WKSS) and was

designated as the "Wanua Ewako Bone" Resilient Village in 2020, demonstrating significant progress in community development and food security.

Geographically, Lampoko Village borders other villages in Barebbo Subdistrict. Demographic data show a balanced population between men and women. A map of Barebbo Subdistrict and the village's organizational structure are available to provide a spatial and administrative overview of the study site.

Implementation of the Green Economy in Livestock Manure Management

The implementation of green economy principles in Barebbo Subdistrict particularly in the management of cattle manure to produce biogas has shown mixed results among livestock farmers. The concept of the green economy is understood as a strategic effort toward sustainable development, which focuses not only on economic growth but also on environmental balance and social justice (Irawan, 2024). In the livestock sector, this is realized through optimal waste management, such as the conversion of cattle manure into biogas and organic fertilizer.

A study in Lampoko Village identified indicators of green economy implementation related to livestock manure management, biogas energy utilization, economic benefits, environmental benefits, and sustainable management. Based on interviews with four livestock farmers (Hj. Kartia, Nani, H. Juri, and Hasnawati), the study found that:

Table 1. Interviews with Livestock Farmers in Lampoko Village

Farmer	Livestock Manure Management	Economic Benefits	Environmental Benefits	Level of Implementation
Hj. Kartia	Cow manure is processed into biogas and used for household needs.	Reducing the cost of purchasing LPG	Reducing pollution and odors	High
Nani	The facility has a biogas system, but its operation is not yet optimal because some parts of the equipment are damaged and outdated	None yet	A cleaner environment	Medium
H.Juri	Cow manure is processed into biogas for cooking, thereby reducing the use of LPG.	Reducing the cost of purchasing LPG	Used to fertilize plants around the house	High
Hasnawati	We have used biogas in the past, but its use is currently limited due to damage to the treatment facility	None yet	Reducing odors in the coop	Medium

High Level of Adoption: Farmers such as Hj. Kartia and H. Juri demonstrate a high level of green economy adoption. They actively process cow manure into biogas for household needs (cooking), thereby reducing LPG expenses. This practice is sustainable; the biogas systems operate optimally and provide significant economic benefits (cost savings) as well as environmental benefits (reducing odors and pollution). H. Juri also uses the residual biogas as organic fertilizer.

Moderate Level of Implementation: Nani and Hasnawati are at the moderate level of implementation. They have biogas systems, but their use is not yet optimal due to equipment damage or a lack of regular maintenance. Although these systems have not yet provided stable economic benefits, their presence still contributes to reducing odors in the barns and improving the surrounding environment.

These differences in adoption rates are influenced by several factors, including the age and condition of the biogas systems, the availability of feedstock—which depends on the number of livestock owned and the farmers' level of understanding regarding system operation and maintenance techniques. Aged and damaged biogas systems tend to perform suboptimally, thereby limiting their utilization. Furthermore, the larger the number of livestock owned, the greater the potential availability of cattle manure as a feedstock for biogas production. On the other hand, farmers' limited knowledge and skills in performing routine maintenance also pose a challenge that affects the sustainable use of the systems. Therefore, optimal biogas management requires continuous maintenance, capacity building for farmers through mentoring or training, and adequate infrastructure support so that economic and environmental benefits can be realized sustainably.

Factors That Pose Challenges in Implementing the Management of Cattle Manure into Biogas

Although biogas technology offers dual benefits, its implementation in Barebbo Subdistrict faces several significant challenges. Based on interviews with informants, several major challenges were identified that affect the implementation of livestock waste management for biogas production in Barebbo Subdistrict. One of the obstacles faced is the limited number of livestock as a source of biogas feedstock. Hj. Kartia explained that the number of cattle owned is still relatively small, so the volume of manure produced is not yet sufficient to support optimal and sustainable biogas production. The small scale of livestock operations results in a limited daily supply of feedstock, causing the gas pressure produced to be often unstable and unable to fully meet household energy needs.

In addition, limited technical understanding of biogas plant maintenance is also a constraining factor. Nani explained that when damage or malfunctions occur in the plant, she has difficulty making repairs on her own due to limited knowledge, technical skills, and supporting equipment. These conditions result in the system not functioning optimally and often require assistance from others with expertise in biogas system repairs. This highlights that capacity

building for farmers through technical training remains essential to enable them to manage the system independently.

The next challenge relates to unstable gas pressure and a decline in the performance of the biogas system. H. Juri explained that the pressure of the gas produced is not always stable, especially during the rainy season, so its use as an energy source is often disrupted. According to him, changes in weather conditions, such as temperature and humidity, also affect the fermentation process inside the digester, while the condition of the plant—which has been in use for a long time has also led to a decline in gas production efficiency. This situation has reduced the effectiveness of biogas in meeting daily energy needs.

In addition, Hasnawati noted that a lack of regular maintenance is one of the main causes of the declining effectiveness of biogas systems. Failure to perform routine maintenance leads to damage to several components of the installation, causing the system's performance to deteriorate further. These findings indicate that the success of biogas utilization is not only determined by the availability of the installation but also depends on continuous maintenance, the technical capabilities of the farmers, and adequate support and facilities to ensure that the biogas system can operate optimally and sustainably.

In addition to technical and operational challenges at the farmer level, institutional support from the village government remains limited. The village head of Lampoko, Ahmad Said, acknowledged that the program to convert cow manure into biogas has not yet received specific support from the village government; it is being carried out largely through the farmers' own initiative, without active outreach or coordination from the village authorities. This indicates that institutional factors and policy support need to be strengthened to ensure the program's sustainability.

The Application of Green Economy Principles from an Islamic Economics Perspective

The implementation of the green economy in the management of livestock waste into biogas in Barebbo Subdistrict can be examined from the perspective of Islamic economics, particularly the principles of maslahah (public interest) and amanah (responsibility). The Principle of Maslahah: Hj. Kartia explained that processing livestock waste into biogas provides economic benefits (LPG savings) and environmental benefits (reduction of odors and pollution). H. Juri added that biogas also produces organic fertilizer, optimizing resources without harming the environment. This practice aligns with Islamic teachings that encourage the utilization of resources for the common good and the avoidance of harm (Quran 2:195; 28:77). The management of livestock waste into biogas reflects efforts to achieve integrated public welfare, encompassing economic, social, and environmental benefits, in accordance with the objectives of Islamic economics to attain falah (well-being).

The Principle of Trustworthiness: Nani emphasizes the importance of managing livestock waste responsibly, even though her biogas system is not yet operating optimally due to damage. She feels a duty to manage the waste so that it does not pollute the environment or harm the

community (QS. Al-Anfal: 27). Hasnawati also demonstrates the principle of amanah through her efforts to maintain the cleanliness of the pens and manage waste regularly to prevent odors and adverse environmental impacts (QS. An-Nisa': 58). Although technical challenges exist, the farmers' awareness of their responsibility for environmental management reflects the implementation of Sharia values.

Overall, the practice of converting livestock waste into biogas in Barebbo Subdistrict, despite facing challenges, shows significant potential for integration with the principles of the green economy and the Islamic economy. This not only contributes to the sustainability of livestock businesses from both economic and environmental perspectives but is also consistent with Islamic ethics and values regarding resource management.

5. Discussion

Implementation characteristics *Green Economy* on livestock waste management in Lampoko Village shows that the use of cow manure as a raw material for biogas has developed as a form of more efficient and sustainability-oriented use of resources. The practice not only reduces waste that previously had the potential to pollute the environment, but also converts livestock residues into alternative energy sources that have economic value. The findings of the study show that farmers who are able to operate biogas installations optimally get real benefits in the form of reduced household expenditure due to reduced LPG consumption while enjoying a cleaner cage environment. These conditions show that the concept *Green Economy* does not stop at efforts to maintain the quality of the environment, but rather creates a mutually reinforcing relationship between economic efficiency, environmental protection, and improving community welfare (JUNIOR & others, 2024). This kind of implementation also illustrates the transition process from a conventional waste management pattern to a circular economy system that reuses resources to generate added value. This perspective is in line with the view *United Nations Environment Programme* which places resource utilization efficiency, emission reduction, and improvement of community welfare as the main characteristics of sustainable development. Research (Azizi & Irawan, 2026) By also emphasized that livestock waste management through biogas technology is a form of implementation *Green Economy* which is able to create economic benefits while improving the quality of the environment. The findings in Lampoko Village strengthen this argument because waste management practices not only produce energy, but also reduce the burden of farmers' household expenses and improve environmental conditions around the cages.

The results of the study also show that there is a variation in the level of implementation *Green Economy* between breeders. Hj. Kartia and H. Juri have achieved a high level of implementation because they are able to operate biogas installations in a sustainable manner so that they produce economic and environmental benefits at the same time. Unlike the two, Nani and Hasnawati are still at a moderate level of implementation due to installation damage and limited system maintenance. These differences show that the successful implementation of *Green Economy* Not only is it influenced by the availability of technology, but it is also highly dependent on the

ability of users to operate and maintain the technology in the long term. The existence of biogas installations has not automatically produced benefits if it is not followed by routine maintenance and mastery of technical aspects (Nugraha *et al.,* 2024). This condition shows that technological sustainability is a combination of infrastructure readiness, human resource capacity, and institutional support. This phenomenon is in accordance with the latest research that explains that the level of adoption of environmental innovations in the agriculture and livestock sectors is greatly influenced by farmers' technical capabilities, experience in operating technology, and the existence of assistance services. The higher the user capacity, the greater the chances of the technology generating economic benefits consistently. On the other hand, weak technical capabilities often cause technology to be used only in the early stages and then stop operating when minor damage occurs (Lasmi & others, 2025).

The economic benefits obtained by farmers are an indicator that biogas-based waste management is able to increase household cost efficiency. Reducing the use of LPG provides space for farmers to allocate expenses to other productive needs so that the economic value generated is not only in the form of energy cost savings, but also increases the economic resilience of farmer families. This cost efficiency is very important, especially for rural households who are mostly still dependent on income from the agricultural and livestock sectors with relatively fluctuating income levels. The use of biogas as an alternative energy source creates a diversification of household energy sources so that dependence on fossil-based energy is decreasing. These changes reflect the principle of economic efficiency which is one of the foundations *Green Economy*, which generates economic benefits through the use of local resources without increasing pressure on the environment. Research in recent years has also shown that biogas technology has a greater economic impact when used sustainably because of relatively low operational costs compared to the use of fossil energy. Saving household energy costs ultimately increases the economic resilience of rural communities when facing rising conventional energy prices (Sudarmanto, 2024).

The environmental aspects found in the study show an equally important contribution to the economic benefits. The use of livestock waste into biogas reduces pollution due to the accumulation of cow manure which has been a source of unpleasant odors and has the potential to pollute soil and water. The condition of the cage environment becomes cleaner so that it has a positive impact on the health of the surrounding community (Syahputra *et al.,* 2025). H. Juri also utilizes biogas residues as organic fertilizers so that the entire waste management process takes place without producing wasted residues. This practice illustrates the application of the circular economy concept because one type of waste produces several benefits at once, namely energy and organic fertilizers. The use of residues as fertilizers also has the potential to reduce farmers' dependence on chemical fertilizers so as to support a more environmentally friendly agricultural system. The latest research explains that the integration of livestock with organic fertilizer production is able to improve soil quality, improve organic matter content, and reduce greenhouse gas emissions from livestock waste. The findings show that environmental benefits

are not only felt at the household scale of farmers, but also contribute to sustainable agricultural development at the village level (Sri) *et al.,* 2024).

The difference in the level of implementation between farmers also shows that the success of *Green Economy* It cannot be measured only based on the existence of biogas installations, but rather determined by the consistency of its utilization. Farmers who are able to operate the installation regularly receive economic, social, and environmental benefits simultaneously, while farmers who face installation damage have not been able to experience optimal economic benefits even though the cage environment continues to improve (Maulita *et al., n.d.*.). The findings show that the implementation of *Green Economy* It is a dynamic process and requires continuous adaptation. Technical capacity, experience, and user commitment are factors that determine long-term success. This condition also shows that the success of environmental programs is not enough only through the provision of physical facilities, but requires strengthening the capacity of the community so that technology can continue to be used productively. This approach is in line with the concept of sustainable development which places communities as the main actors of change through increasing knowledge, skills, and the ability to manage local resources independently.

The research findings show that the sustainability of implementation *Green Economy* in livestock waste management in Barebbo District is not only influenced by the economic and environmental benefits obtained by farmers, but also faced with various obstacles that affect the effectiveness of the use of biogas installations. These obstacles include the limited number of livestock as a source of raw materials, low technical capacity of farmers, decreased installation performance due to age of use, gas pressure instability, and lack of institutional support. The existence of these various obstacles shows that the success of environmentally friendly technology is not enough to be determined by the availability of physical facilities, but also requires the readiness of human resources, institutional support, and a mentoring system that is able to maintain the sustainability of technology operations. The sustainable development perspective explains that the adoption of environmental innovation is a process that is influenced by the interaction between technical, social, economic, and institutional aspects so that all of these components must develop in a balanced manner so that innovation can provide long-term benefits. The conditions in Lampoko Village illustrate that biogas technology has been accepted by the community, but its supporting capacity has not developed optimally, so some installations have decreased function. This phenomenon is in line with the Food and Agriculture Organization (2022) report which explains that the success of rural bioenergy development is greatly influenced by the sustainability of the maintenance system, the availability of technical services, and the ability of the community to manage technology independently. Research by (Irawan, 2024), It also shows that the failure of various renewable energy programs in rural areas is more influenced by weak operational capacity than by the limitations of the technology itself.

The limited number of livestock owned by farmers is the first factor that affects the success of biogas production. Based on the results of the interviews, the volume of cow manure produced has not been able to provide a consistent supply of raw materials so that gas production often fluctuates and has not fully met household energy needs. This situation shows that there is a direct relationship between the scale of the livestock business and the productivity of the energy produced. The fewer cattle are raised, the smaller the potential for organic matter to be fermented in the digester. As a result, gas pressure becomes unstable and system efficiency decreases. These findings show that the development of household-scale biogas requires planning that takes into account the capacity of raw materials so that the technology can operate according to its technical specifications. The development of biogas systems also needs to be adjusted to the characteristics of smallholder farms which generally have a relatively limited number of livestock, so that a communal or group-based approach can be an alternative to improve the continuity of waste supply. Recent studies show that biogas management models are collectively able to improve the efficiency of gas production because the supply of raw materials comes from several farmers at once, so the risk of waste shortage can be minimized. This approach also strengthens community cooperation in managing renewable energy together so that economic and environmental benefits can be felt more widely (Firmansyah, 2022).

The next obstacle is related to the limited technical ability of farmers in maintaining biogas installations. The results of the study show that when there is damage to several components of the installation, farmers have difficulty making repairs independently due to the lack of knowledge about the digester working system, gas distribution channel, and periodic maintenance procedures (Hardi & Soedarto, 2023). This condition causes installations that actually still have energy production potential to not be utilized optimally. This situation shows that the successful application of environmentally friendly technology requires not only investment in physical aspects, but also investment in increasing human capacity. Mastery of operational skills is a factor that determines the sustainability of technology after the development stage is completed. Technical assistance that is carried out on an ongoing basis allows farmers to understand how to detect damage early, carry out routine maintenance, and maintain fermentation efficiency in the digester. Research conducted by various international institutions during the period 2021–2025 shows that continuous technical training has a significant influence on the success rate of community bioenergy programs because it is able to increase users' confidence in operating technology independently. This capacity also reduces dependence on experts from outside the village so that the sustainability of the program is easier to maintain (Kusmiyati *et al.*, 2023).

The decline in installation performance due to the age of use also affects the effectiveness of biogas utilization by farmers. The results of the interviews show that gas pressure changes frequently, especially when weather conditions are less favorable to the fermentation process. Changes in temperature and humidity affect the activity of microorganisms in the digester so that the volume of gas produced is not always stable. The condition is exacerbated by the age of the installation that has been used for many years without rejuvenation of the main

components. The decline in performance illustrates that renewable energy technology still requires maintenance cycles and equipment updates to maintain efficiency. Without periodic maintenance, minor damage will develop into a larger nuisance, resulting in increased repair costs and declining technology utilization rates. Studies on rural bioenergy systems show that the technical life of the installation is greatly influenced by the quality of preventive maintenance, not just by the length of use. Periodic inspections of distribution pipes, valves, digesters, and gas storage systems are able to extend the operational life of the installation while maintaining the stability of energy production. This preventive approach is an important part of management *Green Economy* because it aims to maintain the efficiency of resource utilization without excessively increasing the need for new investment (*Concept and definition of sustainable*, 2025).

Another finding that has important implications is that there is still limited institutional support from the village government for biogas development. Based on the results of the interviews, the livestock waste treatment program developed more through the initiative of farmers than the results of structured village development planning. This condition shows that community innovation has grown independently, but has not been strengthened through local policies, technical assistance, and adequate resource allocation. In fact, the success of community-based programs is greatly influenced by the existence of local institutions that are able to act as facilitators, coordinators, as well as liaisons between the community and various parties who have technical competence. The support of the village government can be realized through the provision of training, the formation of a biogas management group, the preparation of an installation maintenance agenda, and cooperation with universities and technical agencies that have expertise in the field of renewable energy. The rural development literature shows that collaboration between communities, governments, and supporting agencies results in higher levels of program sustainability compared to approaches that rely solely on individual initiatives. This synergy creates a shared learning system so that the innovations that have developed do not stop when there are technical problems or changes of actors (Dewantara *et al.*, 2024).

The perspective of Islamic economics provides a broader dimension to the practice of managing livestock waste into biogas as found in this study. The use of livestock waste is not only seen as an economic activity that generates financial benefits, but also as a form of effort to realize *maslahah* through the productive and responsible use of resources. The savings in energy costs, the creation of a cleaner environment, and the use of biogas residues as organic fertilizers reflect the benefits felt collectively by the farmer's family and the surrounding community. This concept is in line with the purpose of sharia (*maqāṣid al-syarī'ah*) which directs economic activities to generate benefits, reduce damage, and maintain a balance in the relationship between humans and nature. Waste management that was previously a source of pollution was then converted into energy and fertilizer shows the transformation of value from something unproductive to a source of welfare. The study of contemporary Islamic economics in the period 2021–2025 also explains that the implementation *of the green economy* has a strong conformity

with the principles of *maqāṣid al-syarī'ah* because they both emphasize the sustainability of resources, environmental protection, and the improvement of community welfare through the wise use of natural resources.

The principle *of trust* is also reflected in the awareness of farmers to continue to manage waste responsibly even though biogas installations have not functioned optimally. Awareness of maintaining cage cleanliness, reducing pollution, and preventing negative impacts on the environment shows that ecological responsibility has become part of people's behavior. This perspective shows that the success of the *implementation of the green economy* does not only depend on technological sophistication, but is also determined by the values that underlie the behavior of its users. As moral awareness develops, society tends to maintain environmental management practices despite facing various technical limitations. The integration between *trust* values and technological innovation creates a stronger foundation for sustainable development because it is oriented not solely on economic benefits, but also on responsibility for future generations and the preservation of Allah's creation. in Lampoko Village is not only a change in waste management technology, but also a process of strengthening social, ethical, and spiritual values that runs simultaneously so that resource management practices become more sustainable in terms of economy, environment, and Islamic values. Reference: QS. Al-Baqarah: 195; QS. Al-Qashash: 77; QS. Al-Anfal: 27; QS. An-Nisa': 58; and a study of contemporary Islamic economics for the period 2021–2025 regarding *maqāṣid al-syarī'ah* and sustainable development.

6. Conclusion

This study found that the application of green economy principles in cattle farming operations in Barebbo Subdistrict, Bone Regency, has shown progress, particularly through the conversion of cattle manure into biogas and organic fertilizer. Although implementation has not yet been optimal among all cattle farmers due to constraints such as equipment breakdowns, limited maintenance, and uneven institutional support, awareness of the importance of responsible waste management has begun to grow. These practices provide economic value through energy savings (reduced LPG use) and the use of organic fertilizer, and contribute to environmental improvement by reducing waste accumulation and the potential for pollution.

From an Islamic economics perspective, the conversion of livestock waste into biogas reflects the implementation of the principles of amanah (responsibility in utilizing the resources bestowed by Allah SWT) and maslahah (creating widespread benefits for oneself, society, and the environment). This practice aligns with Islamic teachings to maintain the balance of nature, avoid corruption (fasad), and achieve comprehensive well-being (falah). Therefore, the development of a green economy-based cattle farming business in Barebbo Subdistrict has the potential not only to enhance business sustainability and farmers' well-being but also to align with Islamic ethical and legal values.

7. Author Contributions

Nur Aynil Marzuki contributed to the conceptualization of the study, methodology development, data collection, data analysis, and preparation of the original draft. Arifin Sahaka contributed to research supervision, methodology validation, critical review of the scientific content, and manuscript writing, review, and editing. Muhammad Yamin contributed to the review of the analytical results, refinement of the manuscript, final review and editing, and provided academic input to improve the quality of the article. All authors have read, reviewed, and approved the final version of the manuscript and agree to be accountable for the content of the study.

8. Conflict of Interest Statement

The authors declare that there are no financial, professional, or personal conflicts of interest that could have influenced the conduct of the research, the analysis of the data, the preparation of the manuscript, or the decision to publish this article.

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