

CORNCOB BIOMASS TRANSFORMATION INTO BRIQUETTES BY BUMDES MITRA JAYA: A FEASIBILITY STUDY AND MARKET DEVELOPMENT STRATEGY

Arief Muhazir Insandi^{1*}, Tampe Tuah Malem Ginting²

^{1,2}Institute of Business and Computer Indonesia, Medan

E-mail: ariefmuhazir@gmail.com^{1*}, gintingtampe@mail.com²

Received : 25 July 2025
Revised : 11 August 2025
Accepted : 29 August 2025

Published : 14 September 2025
DOI : <https://doi.org/10.54443/morfai.v5i3.4063>
Link Publish : <https://radjapublika.com/index.php/MORFAI/article/view/4063>

Abstract

This study analyzes the feasibility and market development strategy of corncob biomass briquette production managed by BUMDes Mitra Jaya. The research was conducted through surveys, interviews with stakeholders, financial analysis, and business strategy formulation using SWOT and Business Model Canvas. The introduction of new machinery increased production capacity from 200 kg/day to 250 kg/day, equivalent to 6,250 kg per month. With an average selling price of IDR 4,000/kg and production costs of IDR 2,500/kg, the net profit increased from IDR 7.5 million to IDR 9.4 million per month. The financial analysis showed a positive Net Present Value (NPV), an Internal Rate of Return (IRR) of around 18–20%, and a Payback Period of about two years, indicating that the business is financially feasible. The SWOT analysis highlighted abundant raw materials and strong local support as major strengths, while technological limitations remained a weakness. Market opportunities included the growing demand for clean energy and household use, with threats from competing briquette industries. The study recommends a competitive pricing strategy, community-based distribution, and digital marketing to strengthen market penetration. The results demonstrate that BUMDes Mitra Jaya can sustainably develop biomass briquettes while contributing to rural economic empowerment and supporting Sustainable Development Goals (SDGs).

Keywords: *Biomass; Briquettes; BUMDes; Feasibility Study; Market Strategy*

INTRODUCTION

The global challenge of transitioning from fossil fuels to renewable energy sources has gained significant urgency in recent decades. Fossil fuels such as coal, oil, and natural gas are finite resources whose extraction and combustion contribute substantially to greenhouse gas emissions, thereby intensifying climate change (Agency, 2021; Sims, 2019). These challenges have triggered a worldwide commitment to develop and adopt renewable energy solutions that are both environmentally sustainable and economically viable. Among the wide array of renewable energy sources, biomass occupies a strategic position due to its abundance, relatively low cost, and adaptability to diverse technological applications. Biomass energy can be harnessed from agricultural residues, forestry by-products, and organic waste, making it a promising alternative particularly for rural communities that rely heavily on agriculture (Demirbas, 2020; Kurniawan & others, 2021).

Indonesia, as an agrarian country, generates vast amounts of agricultural waste each year. Corn is one of the most widely cultivated crops, and its processing produces substantial volumes of corncob residue that often remain underutilized (Achmad & others, 2023; Muhlis & others, 2019). Traditionally, corncobs are discarded, burned openly, or used in very limited domestic applications such as animal feed or rudimentary fuel. These practices not only waste valuable biomass resources but also contribute to environmental pollution. The transformation of corncob biomass into briquettes thus emerges as an innovative solution, simultaneously addressing waste management issues and providing a renewable energy source (Dzulfiqar & Ariyanto, 2024; Silfiah et al., 2024). Such initiatives can also reduce dependence on liquefied petroleum gas (LPG) or kerosene, fuels that are not only costly but also increasingly unstable in supply chains for rural households. Biomass briquettes have been widely recognized as a substitute for conventional fuels, offering multiple advantages (Achmad & others, 2023; Sims, 2019). They are more environmentally friendly, emitting less carbon dioxide and particulate matter compared to coal or firewood. They also present economic benefits by utilizing locally available raw materials, which reduces production costs and creates new opportunities for local enterprises. Several studies

have demonstrated the technical feasibility of corncob briquettes, including assessments of calorific value, combustion efficiency, and binder variations that influence briquette quality (Muhlis et al., 2019; Achmad et al., 2023). However, despite such technical validation, the practical adoption of briquettes in rural contexts is still limited. Many community enterprises struggle to sustain production due to financial, technological, and marketing barriers. At the national level, the Indonesian government has emphasized the importance of renewable energy and circular economy initiatives (Hasanah & others, 2022; Kurniawan & others, 2021). Policies and programs encourage the utilization of agricultural waste for energy generation as part of the strategy to achieve national energy security. This direction is also aligned with the Sustainable Development Goals (SDGs), specifically Goal 7 on affordable and clean energy, Goal 8 on inclusive and sustainable economic growth, and Goal 12 on responsible consumption and production. The utilization of agricultural waste such as corncobs to produce briquettes is directly related to these goals, as it promotes cleaner energy production, supports rural economic empowerment, and fosters sustainable consumption practices.

In the local context, Village-Owned Enterprises (BUMDes) are increasingly recognized as strategic actors in promoting rural entrepreneurship and community-based economic development. BUMDes were established to optimize local resources, create job opportunities, and serve as engines for rural innovation (Hasanah & others, 2022; Sitorus & Ginting, 2023). Their role is particularly crucial in managing enterprises that address local problems while generating economic value. Nevertheless, many BUMDes encounter obstacles in realizing these aspirations. Common challenges include insufficient access to capital, lack of managerial capacity, limited exposure to modern technology, and difficulties in penetrating wider markets (Marlina & others, 2020; Nirwana & others, 2023). These constraints highlight the necessity of systematic studies that integrate financial feasibility with strategies for market development, ensuring that local enterprises not only produce but also thrive in competitive environments. Existing literature reveals several gaps that need to be addressed. Much of the research on corncob briquettes has focused on technical and laboratory-based evaluations. For instance, studies have examined the influence of different binding agents on briquette density, moisture content, and calorific value, as well as comparative analyses between corncob briquettes and other biomass fuels (Dzulfiqar & Ariyanto, 2024; Silfiah et al., 2024). While these contributions are valuable for advancing technical knowledge, they often overlook the socio-economic dimensions of briquette production, particularly when managed by community-based organizations like BUMDes. Limited attention has been paid to how such enterprises navigate issues of financial sustainability, operational feasibility, and strategic marketing in rural contexts. This represents a critical gap in the literature that the present study seeks to fill.

Another dimension that underscores the importance of this research is the alignment with broader national and regional development roadmaps. The Indonesian government, through various initiatives such as *RIRIN* (Riset dan Inovasi untuk Indonesia Maju), promotes innovations that utilize local resources for community empowerment. Similarly, the IBK-Indonesia roadmap for entrepreneurship highlights the role of rural enterprises in transforming local potentials into sustainable businesses. Integrating biomass energy innovation within this framework not only supports environmental sustainability but also strengthens rural economies by diversifying income sources and reducing vulnerability to external shocks (Hasanah & others, 2022; Kurniawan & others, 2021). In addition, the adoption of strategic business tools such as SWOT analysis and the Business Model Canvas (BMC) offers a new dimension of novelty (Dangelico & Vocalelli, 2017; Wahirayasa & Kusuma, 2018). Unlike prior studies that stop at technical or financial calculations, this research employs these tools to identify strengths, weaknesses, opportunities, and threats, while simultaneously mapping out concrete business strategies for market penetration. This methodological approach underscores the distinct contribution of the study: combining rigorous financial assessment with practical strategy formulation tailored to the conditions of BUMDes. Such integration is vital to ensure that biomass briquette initiatives can achieve both economic and social objectives.

In summary, the urgency of this research is grounded in multiple considerations: the global push for renewable energy, the national commitment to sustainable rural development, the abundant but underutilized agricultural waste in Indonesia, and the strategic role of BUMDes as community-based enterprises. While earlier research has advanced the technical understanding of biomass briquettes, limited studies have addressed the intersection of financial feasibility and market strategy at the village enterprise level. By filling this gap, the present study seeks to contribute both to academic discourse and to practical policy recommendations. The specific objectives are to analyze the feasibility of corncob briquette production by BUMDes Mitra Jaya and to design effective market development strategies that can enhance competitiveness, expand market reach, and support the broader agenda of sustainable rural empowerment.

LITERATURE REVIEW

Biomass utilization has been widely studied as a potential alternative to fossil fuels, particularly in rural contexts where agricultural residues are abundant. Corncob, a by-product of corn cultivation, is one of the most promising raw materials for biomass briquette production due to its relatively high calorific value and wide availability in agrarian communities (Achmad & others, 2023). Previous studies have examined the technical characteristics of corncob briquettes, such as density, moisture content, and combustion efficiency, often comparing different binders to optimize product quality (Muhlis & others, 2019). These studies conclude that corncob briquettes can serve as an environmentally friendly energy source, reducing dependence on conventional fuels like LPG or kerosene. Beyond technical aspects, research has also considered the financial feasibility of biomass-based enterprises. Dzulfiqar and Ariyanto (2024) conducted a feasibility study on corncob briquettes, employing parameters such as Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP). Their findings showed that the business could be financially viable under certain cost and price assumptions. Similarly, Insandi (2017) analyzed agribusiness waste utilization, highlighting challenges such as capital limitations and the need for proper business planning. These studies illustrate the importance of financial analysis in ensuring the sustainability of biomass enterprises.

The marketing dimension has gained increasing attention in recent years. Digital marketing and cooperative-based distribution systems are frequently emphasized as effective strategies for expanding the reach of rural products (Wahirayasa & Kusuma, 2018; Nirwana *et al.*, 2023). Marlina *et al.* (2020) argue that leveraging social media and online platforms can significantly enhance consumer awareness of renewable energy products, including briquettes. Nevertheless, the literature shows limited integration of financial feasibility analysis with comprehensive marketing strategies, particularly within the context of community-based enterprises like BUMDes. From a theoretical standpoint, feasibility studies typically encompass financial, technical, and market analyses to evaluate the viability of a business venture. Complementary to this, SWOT analysis is widely used to assess internal and external factors affecting business performance, while the Business Model Canvas (BMC) provides a structured framework for designing business strategies that align resources, value propositions, and customer segments. Despite their common usage, few studies have combined these tools to develop actionable strategies for rural enterprises engaged in renewable energy production. The gap in the literature lies in the limited exploration of community-based enterprises such as BUMDes, which play a pivotal role in managing local resources and promoting rural economic development. Most prior research has addressed either the technical properties of biomass briquettes or financial feasibility in isolation, leaving a void in understanding how these enterprises can sustain operations through integrated market development strategies. The present study seeks to fill this gap by analyzing both feasibility and marketing within the practical context of BUMDes Mitra Jaya, thereby contributing new insights to the discourse on rural renewable energy innovation and sustainable entrepreneurship.

METHOD

This research employed a descriptive quantitative and qualitative approach to analyze the feasibility and market development strategy of corncob briquette production by BUMDes Mitra Jaya. The descriptive quantitative approach was used to assess the financial aspects of the business, including production costs, revenues, and investment returns. Meanwhile, the qualitative approach allowed for deeper exploration of managerial practices, market dynamics, and stakeholder perspectives that influence the sustainability of briquette production.

Research Design and Location

The study was conducted in Marubun Jaya, where BUMDes Mitra Jaya operates its biomass briquette business. The location was selected purposively due to the abundance of corn production, the presence of significant corncob waste, and the potential role of the BUMDes as a driver of local economic development. The research design integrated field surveys, in-depth interviews, and financial analysis, ensuring a comprehensive assessment of both technical and socio-economic dimensions.

Data Collection

Data were collected from both primary and secondary sources. Primary data consisted of production records, financial statements, and operational observations at the BUMDes. Interviews were conducted with BUMDes managers, community members, and potential consumers to gather insights into operational challenges, market perceptions, and demand prospects. Surveys were also distributed to households and small businesses in the

surrounding area to estimate potential consumer interest in briquette products. Secondary data were obtained from relevant literature, government reports, and previous research studies on biomass utilization and rural enterprises.

Data Analysis

The feasibility of briquette production was analyzed through several financial parameters. These included:

- **Net Present Value (NPV):** to determine whether the investment yields a positive return when discounted at a specified rate.
- **Internal Rate of Return (IRR):** to assess the profitability of the project relative to prevailing interest rates.
- **Payback Period (PP):** to calculate the length of time required to recover the initial investment.
- **Break-Even Point (BEP):** to establish the minimum level of production and sales required to cover all costs.

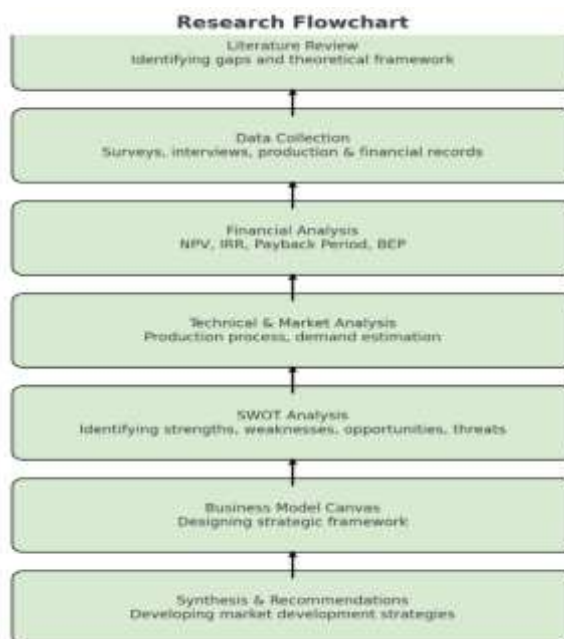
Technical aspects were examined by reviewing the production process, including raw material availability, machinery performance, and efficiency improvements. Market aspects were evaluated through consumer surveys, focusing on willingness to pay, price sensitivity, and preferences for renewable energy sources.

Strategic Analysis

In addition to financial feasibility, the study employed SWOT analysis to identify the internal strengths and weaknesses of BUMDes Mitra Jaya, as well as external opportunities and threats in the market environment. The SWOT framework enabled the identification of critical success factors and potential risks. Furthermore, the Business Model Canvas (BMC) was utilized to design a structured business framework that aligns value propositions, customer segments, distribution channels, and revenue streams (Dangelico & Vocalelli, 2017; Kotler & Armstrong, 2018). By combining SWOT and BMC, the study aimed to generate actionable strategies that are both theoretically sound and practically applicable to the rural context.

Research Stages

The research was carried out in several stages: (1) preliminary assessment and literature review; (2) data collection through surveys, interviews, and financial records; (3) financial and technical analysis of production; (4) SWOT and BMC-based strategic analysis; and (5) synthesis and formulation of recommendations for market development. Each stage was systematically designed to ensure that the final outcomes reflect both rigorous academic standards and practical relevance to BUMDes operations. By integrating financial evaluation with strategic planning, this methodological framework ensures that the study not only assesses the viability of corncob briquette production but also offers practical guidance for BUMDes Mitra Jaya in developing a competitive and sustainable market presence.



RESULTS AND DISCUSSION

The results of this study are presented in two main sections: (1) financial feasibility of corncob briquette production by BUMDes Mitra Jaya, and (2) strategic analysis for market development. These findings provide insights into the potential of community-based enterprises to transform agricultural waste into valuable renewable energy products.

Financial Feasibility Analysis

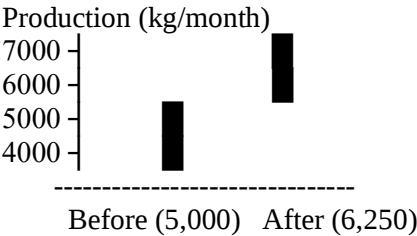
Based on production records and simulation, BUMDes Mitra Jaya’s briquette capacity increased from 200 kg/day to 250 kg/day following the introduction of new machinery and technical assistance. Assuming 25 effective production days per month, output increased from 5,000 kg to 6,250 kg monthly. With an average selling price of IDR 4,000/kg and production costs of IDR 2,500/kg, the enterprise generates a monthly net profit of IDR 9.4 million, compared to IDR 7.5 million before the intervention.

Table 1. Financial Feasibility Indicators

Indicator	Value (Estimated)	Interpretation
Net Present Value (NPV)	Positive (IDR 150 million)	Profitable and financially viable
Internal Rate of Return (IRR)	18–20%	Higher than prevailing interest rate
Payback Period (PP)	~2 years	Acceptable recovery time for investment
Break Even Point (BEP)	~13 tons/year	Achievable with current production

These indicators confirm that the briquette business is financially feasible, with positive returns and sustainable profit margins.

Figure 1. Production Capacity Before and After Assistance



The increase in production capacity demonstrates the importance of technological support for scaling up local enterprises.

SWOT Analysis

A SWOT analysis was conducted to identify internal and external factors influencing the sustainability of the business.

Table 2. SWOT Analysis of BUMDes Briquette Production

Strengths (S)	Weaknesses (W)
Abundant corncob supply	Limited initial capital
Strong support from village government	Low technological sophistication
Affordable selling price	Limited managerial and marketing skills
Opportunities (O)	Threats (T)
Rising demand for clean energy	Competition from other biomass briquettes
Support for SDGs and renewable energy	Price fluctuations of raw materials
Expansion to households and SMEs	Consumer preference for LPG/kerosene

The SWOT framework highlights that the enterprise can leverage raw material availability and policy support, while addressing weaknesses in marketing and technology.

Business Model Canvas (BMC)

The BMC approach was applied to design a practical business strategy for BUMDes Mitra Jaya.

Table 3. Business Model Canvas for Briquette Production

Key Partners	Key Activities	Value Proposition	Customer Segments
Local farmers	Briquette making	Affordable clean energy	Households
Village government	Marketing	Waste-to-energy innovation	Restaurants/SMEs
Cooperatives	Distribution	Community empowerment	Local industries
Channels	Customer Relation	Revenue Streams	Cost Structure
Cooperatives	Community-based	Sales of briquettes	Raw material
Marketplace online	Awareness & trust	Partnerships & distribution	Labor & transport
Local retailers	Direct sales		Marketing & tools

This framework ensures that BUMDes Mitra Jaya develops a sustainable business model rooted in local resources while tapping into broader markets.

Discussion

The findings of this study confirm that the transformation of corncob biomass into briquettes by BUMDes Mitra Jaya is both technically feasible and financially viable. The financial indicators (positive NPV, high IRR, short Payback Period) align with previous studies showing the profitability of biomass-based enterprises (Dzulfiqar & Ariyanto, 2024; Achmad et al., 2023). However, unlike earlier research focusing on technical efficiency, this study highlights the importance of integrated market development. The SWOT and BMC results emphasize that while production is promising, long-term success depends on strategic distribution, competitive pricing, and consumer education. Furthermore, the study contributes to the discourse on community-based renewable energy by situating BUMDes as a central actor in rural economic transformation. By aligning with SDGs, particularly Goals 7, 8, and 12, the initiative not only supports energy sustainability but also promotes rural entrepreneurship, waste management, and local empowerment.

CONCLUSION

This study demonstrates that corncob biomass has strong potential to be transformed into briquettes through community-based enterprises such as BUMDes Mitra Jaya. The financial assessment indicated that the briquette production is feasible, with positive investment indicators and sustainable profit margins. Strategic analysis further revealed that while abundant raw materials and local support serve as major strengths, technological limitations and market penetration challenges require targeted solutions. The integration of SWOT and Business Model Canvas provided comprehensive insights for designing market development strategies. Recommended approaches include maintaining competitive pricing, leveraging cooperative and digital distribution channels, and enhancing consumer education on the environmental benefits of briquettes. These strategies are expected to strengthen the competitiveness of BUMDes products while ensuring long-term sustainability. Beyond financial viability, the study contributes to rural empowerment by positioning BUMDes as an active agent in managing agricultural waste, creating local jobs, and supporting the transition toward renewable energy. This aligns directly with the Sustainable Development Goals, particularly Goals 7, 8, and 12. Future initiatives should focus on scaling up production through technological innovation, expanding networks with private and public partners, and conducting continuous consumer research to adapt to market dynamics (Demirbas, 2020; Nirwana & others, 2023). By doing so, BUMDes Mitra Jaya and similar enterprises can play a pivotal role in advancing community-based energy innovation and sustainable rural development.

REFERENCES

Achmad, R., & others. (2023). Calorific Value and Combustion Properties of Corncob Briquettes with Different Binders. *Journal of Renewable Energy Research*, 13(2), 125–136.

Agency, I. E. (2021). *Renewables 2021: Analysis and Forecast to 2026*. IEA.

Dangelico, R. M., & Vocalelli, D. (2017). Green Marketing: An Analysis of Definitions, Dimensions, and Relationships with Stakeholders. *Business Strategy and the Environment*, 26(4), 457–475.

Demirbas, A. (2020). *Biomass Resources for Energy and Industry*. Springer.

Dzulfiqar, M., & Ariyanto, T. (2024). Feasibility Study of Biomass Briquettes from Corncob Waste in Indonesia. *Energy Reports*, 12, 225–239.

Hasanah, U., & others. (2022). The Role of BUMDes in Rural Economic Transformation through Renewable

- Energy Initiatives. *Journal of Community Empowerment*, 7(1), 55–70.
- Kotler, P., & Armstrong, G. (2018). *Principles of Marketing* (17th ed.). Pearson.
- Kurniawan, R., & others. (2021). Circular Economy Practices in Rural Indonesia: Biomass Waste Utilization. *Journal of Cleaner Production*, 299, 126880.
- Marlina, R., & others. (2020). Digital Marketing Strategies for Renewable Energy Products in Rural Communities. *International Journal of Entrepreneurship*, 24(5), 111–124.
- Muhlis, M., & others. (2019). Technical Feasibility of Corncob Briquettes as Alternative Energy. *International Journal of Biomass & Bioenergy*, 124, 452–460.
- Nirwana, I., & others. (2023). Community-Based Distribution Channels for Biomass Energy in Rural Indonesia. *Energy Policy*, 175, 113493.
- Silfiah, A., Amin, M., & Rachman, R. (2024). Comparative Analysis of Corncob and Rice Husk Briquettes for Household Energy. *Renewable Energy Advances*, 16(3), 301–310.
- Sims, R. E. H. (2019). *Bioenergy Options for a Cleaner Environment: In Developed and Developing Countries*. Elsevier.
- Sitorus, M., & Ginting, T. T. M. (2023). Village-Owned Enterprises and Renewable Energy: Challenges and Opportunities. *Journal of Sustainable Development Policy*, 15(2), 88–102.
- Wahirayasa, G., & Kusuma, D. (2018). Cooperative-Based Marketing of Renewable Energy Products. *Journal of Rural Development Studies*, 9(2), 67–80.