

The Analysis of Financial Efficiency and Feasibility of Green Investment in Sustainable Agroindustry SME's at Jember Regency

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Abstract: This research aims to analyze in-depth the financial efficiency and feasibility of green investments in sustainable agro-industrial Small and Medium Enterprises (SMEs) in Jember Regency. Jember Regency has abundant agricultural and plantation commodity potential, but SMEs face significant challenges related to limited capital, efficient budget allocation, and eligibility criteria for environmentally friendly investments. The research approach used was a qualitative descriptive-comparative approach with a multiple case study framework. Data were collected through in-depth interviews, participant observation, and microfinance report documentation. The results showed that integrating financial efficiency principles with green investments can increase operational competitiveness, minimize production waste residue, and open access to sustainable financing (green financing). The implications of this research provide strategic recommendations for public policymakers and SMEs in designing investment schemes based on environmental sustainability.

Keywords: Green Investment, Efficiency, Feasibility, Financial, Agroindustry and Sustainable SME's.

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I. INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play a central role as the backbone of the Indonesian economy, contributing 61% to the national Gross Domestic Product (GDP) and employing up to 97% of the total workforce. However, the MSME sector also contributes significantly to greenhouse gas emissions, amounting to approximately 216 million tons of CO₂ in 2022, representing nearly two-thirds of the nation's total industrial emissions. This paradox highlights the urgency of transforming toward sustainable business practices that balance economic growth with environmental preservation.

The transformation towards a green economy in Indonesia's MSME sector shows a positive trend but still faces various multidimensional challenges. Empirical data shows that Indonesia's Green Economy Index (GEI) has increased from 47.2% in 2011 to 59.17% in 2020, indicating measurable progress towards a sustainable economy. The government projects that the green economy transformation can drive average GDP growth of 6.1-6.5% per year until 2050 while creating 1.8 million environmentally friendly jobs by 2030. Furthermore, estimates show that if 10% of the informal MSME sector transforms into green businesses, a green

economic value of 798 trillion rupiah will be created, and this figure can increase to 2,390 trillion rupiah if 30% of MSMEs successfully transform. However, the reality on the ground shows that only a small proportion of MSMEs have integrated environmental sustainability principles into their operations. This indicates a gap between the potential for green economic transformation and actual implementation at the business actor level (Zhang & Zhu, 2019).

Jember Regency has historically been known as one of the main agribusiness centers in East Java, with its leading commodities being coffee, tobacco, cocoa, and edamame. The agro-industrial sector in this region serves as the backbone of the regional economy, employing a significant workforce. However, recent global market dynamics demand a transformation of the industry from traditional patterns to environmentally friendly production practices. Agro-industrial SMEs are required to pursue not only short-term profitability but also consider the environmental impact of their production activities. Therefore, a thorough understanding of financial efficiency and green investment is crucial (Rahman *et al.*, 2021).

The main challenge faced by agro-industry SMEs in Jember is limited operational capital allocation, which results

in inefficient financing structures. Most SMEs still employ fragmented and conventional financial recording systems. This makes it difficult for them to estimate production costs and measure profit margins objectively. Without sound financial efficiency, SMEs' resilience to fluctuations in agricultural raw material prices becomes highly vulnerable. This financial vulnerability ultimately hinders business actors' intentions to adopt clean technology (Pratama & Setiawan, 2023).

On the other hand, issues of climate change and environmental pollution are urging the agro-industrial sector to implement green investment concepts. Green investment encompasses capital allocation for wastewater treatment plants, energy-efficient technologies, the use of renewable raw materials, and environmentally friendly certification. Although green investment has been proven to reduce variable costs in the long term, the initial investment costs (upfront costs) are often considered too high by SMEs. This perception of high financial risk poses a significant psychological and financial barrier to clean industrial transformation in Jember Regency (Suryani *et al.*, 2022).

Academic exploration of how SMEs combine internal financial efficiency with green investment feasibility remains limited, particularly in the context of developing regions like Jember. Most previous literature focuses on large corporations with unlimited access to capital. However, SMEs face very different managerial dynamics, flexibility, and capital constraints than larger companies. Therefore, in-depth qualitative studies are needed to capture the realities on the ground, business owners' perceptions, and the dynamics of environmentally-based financial decision-making (Wibowo & Kusuma, 2024).

This research focuses on agro-industry SMEs in Jember that have begun to implement sustainable practices. The study focuses on how efficient cash management, inventory efficiency, and debt management can build internal financial capacity that supports green investments. Furthermore, this study examines the qualitative factors that determine the feasibility of environmentally friendly investments in the eyes of micro-entrepreneurs. By mapping these supporting and inhibiting factors, a more applicable model for sustainable SME development can be formulated (Hidayat *et al.*, 2025).

The urgency of this research is also driven by regulatory policies regarding green taxonomies and sustainable financial instruments, which are increasingly being promoted by financial institutions. Banks and non-bank financial institutions in Indonesia are beginning to require environmental sustainability indicators as criteria for business credit distribution. Agro-industry SMEs in Jember that fail to adapt to green standards risk future financial exclusion. Therefore, integrating financial efficiency and green investment feasibility is an urgent need for long-term business sustainability (Nugroho & Lestari, 2020).

This study aims to identify and analyze the financial efficiency patterns applied to sustainable agro-industry SMEs in Jember Regency; Analyze the qualitative evaluation

process and the feasibility level of green investment from the perspective of agro-industry SME owners and managers and formulate an integration scheme between financial efficiency and green financing to increase the competitiveness and resilience of agro-industry SME businesses in a sustainable manner.

Theoretically, this research contributes to the development of environmental accounting and SME finance literature, particularly in mapping green investment decision behavior at the micro-small business level. Practically, the results of this study can serve as a contextual reference for agro-industry SMEs in designing efficient, environmentally friendly capital allocations. For policymakers in Jember Regency, this research presents strategic recommendations for designing incentive programs and green financing schemes that align with the characteristics of the regional agro-industry.

II. LITERATURE REVIEW

➤ Sustainable Finance Theory

Sustainable finance theory emphasizes that capital allocation decisions should not be based solely on financial returns, but rather integrate environmental, social, and governance (ESG) aspects. In the context of SMEs, sustainable finance serves as the foundation for long-term value creation that is resilient to external shocks. Sustainable finance practices encourage capital transformation from conventional, environmentally damaging investments to resource-efficient ones. Implementing this concept requires restructuring internal cash allocations to accommodate the burden of ecosystem maintenance investments (Adinugroho *et al.*, 2022).

Sustainable finance also emphasizes the importance of transparent financial information and the environmental impacts of industrial activities. Agro-industrial SMEs often dispose of liquid or solid waste that pollutes the surrounding environment due to a lack of capital allocation for waste management. Through a sustainable finance approach, waste management expenditures are no longer viewed as a cost center but rather as a strategic investment that adds value to products (value creation). This paradigm shift is crucial for the sustainability of SMEs amidst changing global consumer preferences (Budianto & Santoso, 2023).

➤ Financial Efficiency in the SMEs Sector

Financial efficiency in the SMEs sector is the ability of management to optimize the use of limited capital resources to maximize output. This efficiency indicator includes cash conversion cycle management, operational cost control, waste management, and energy savings. In the agro-industry, raw material cost efficiency is a key determinant due to the highly volatile price fluctuations of agricultural products. Well-planned cash flow management enables SMEs to maintain liquidity during times of crisis (Firmansyah *et al.*, 2021).

Measuring financial efficiency from a qualitative perspective focuses on disciplined accounting records, a

rational ratio of operational expenses to revenue, and the appropriate allocation of reserve funds. Many agro-industrial SMEs fail not because of a lack of market share, but because of a mismatch between the owner's personal and business finances. Systematic financial efficiency creates a healthy capital structure, providing business owners with room to maneuver and make strategic investment decisions. Therefore, financial efficiency serves as a key foundation before SMEs undertake expansion or new investments (Kusumawardani *et al.*, 2024).

➤ *The Concept and Feasibility of Green Investment*

Green investment refers to the allocation of financial resources to projects, technologies, or business practices aimed at reducing carbon emissions, saving energy, minimizing waste, and preserving biodiversity. For the agro-industry, green investments can take the form of biogas installations from organic waste, the use of solar panels for drying commodities, or the use of biodegradable packaging. The feasibility of green investments is not only measured by conventional Net Present Value (NPV) or Internal Rate of Return (IRR), but also includes non-financial benefits such as brand reputation and regulatory risk mitigation (Prasetyo & Wijaya, 2022).

The feasibility of green investments in SMEs is multidimensional, encompassing technical, operational, financial, and socio-environmental feasibility. Investments are considered feasible if the adopted environmentally friendly technology can be operated independently by local workers without inflating maintenance costs. Furthermore, the feasibility of green investments is strongly influenced by consumer awareness of environmentally friendly products. When consumers are willing to pay a green premium, the financial efficiency and returns from green investments will increase dramatically (Ramadhan *et al.*, 2025).

➤ *The Characteristics of Jember Agroindustry*

Sustainable agro-industry is a system of agricultural processing that balances the principles of ecological sustainability, social justice, and economic viability. Jember Regency has a unique agro-industrial ecosystem, dominated by plantation and food commodities with complex supply chains. The processing of commodities such as coffee and edamame generates significant amounts of wet organic waste. If not managed properly, this waste can lead to groundwater pollution and methane emissions, damaging the region's ecological reputation (Setyawan & Handayani, 2020).

Agro-industry SMEs in Jember are characterized by strong ties with local farmers as primary raw material suppliers. This partnership influences cost structures and the level of certainty of raw material supply. The sustainability of SMEs in this region is highly dependent on the stability of the local agricultural ecosystem. Therefore, the adoption of green investment by agro-industry SMEs in Jember has a dual impact: preserving the local environment while securing the sustainability of future agricultural raw material supplies (Yulia & Arifin, 2023).

III. METHOD

This research used a qualitative approach with a multiple case study design. The qualitative approach was chosen because it allows for a naturalistic exploration of the phenomenon of financial efficiency and subject considerations in green investment. Through multiple case studies, researchers were able to conduct a comparative analysis across agro-industrial SMEs in Jember Regency to obtain a comprehensive picture. This design allows researchers to understand the local context, social dynamics, and intuitive considerations of business owners that are not captured by quantitative statistics alone (Ahsan *et al.*, 2021).

The research was conducted in Jember Regency, East Java, with a focus on sub-districts that are centers of agro-industrial growth such as Patrang, Summersari, Sukorambi, and Arjasa. The research subjects were determined using a purposive sampling technique. The subject inclusion criteria included: (1) SMEs engaged in agricultural/plantation product processing, (2) have been operating for at least 5 years, (3) have initiated or implemented green investment practices (such as waste processing, energy efficiency, or the use of environmentally friendly packaging), and (4) are willing to provide open access to financial and operational information (Fauzi & Nurhayati, 2024). Data collection was carried out through three main techniques: in-depth interviews, field observations, and documentation studies. In-depth interviews were conducted with SME owners, financial/operational managers, and representatives of relevant agencies in Jember Regency. Field observations were carried out directly on the production process, waste processing facilities, and green technology installations at SME locations. Documentation includes internal financial bookkeeping, energy expenditure records, sales reports, and environmental certification documents held by the research subjects (Ginting *et al.*, 2022).

Data validity was tested using source and method triangulation techniques. Source triangulation was conducted by comparing information provided by SME owners, operational workers, and external parties such as cooperative/trade agencies and local community leaders. Method triangulation was conducted by comparing verbal interview results with financial documentation records and physical realities found during field observations. Furthermore, member checking was conducted by reconfirming draft findings with key informants to avoid biased interpretation by the researchers (Lestari & Haryanto, 2023).

The data analysis technique refers to the interactive model of Miles, Huberman, and Saldana, which includes three main stages: data condensation, data display, and conclusion drawing/verification. Data condensation was carried out by sorting, focusing, and transforming raw data from interviews and observations into key themes related to financial efficiency and green investment. The data presentation is structured in a descriptive narrative supported by a comparative matrix between cases. Conclusions were

drawn gradually by comparing field findings with relevant theories and literature (Mahendra *et al.*, 2025).

IV. RESULTS AND DISCUSSION

➤ *The Financial Efficiency Patterns in Agro-Industry SMEs in Jember*

Financial efficiency practices in agro-industrial SMEs in Jember are characterized by the implementation of simple digital app-based record-keeping and tightening of variable operational costs. SME A's owner revealed that the disciplined separation of personal and company cash is the first step in establishing an efficient financial structure. Using a smartphone-based record-keeping app allows for real-time monitoring of cash inflows and outflows. This clarity in cash records reduces operational fund waste, which previously often occurred due to poorly planned raw material purchases (Rahmat & Hartati, 2021).

In terms of inventory management, the SMEs studied implemented a partial just-in-time method to minimize holding costs and the risk of spoilage of agricultural raw materials. Raw materials such as edamame soybeans and coffee cherries were supplied based on daily contracts with local farmer groups. This approach successfully reduced the need for liquid working capital tied up in raw inventory. Inventory efficiency directly freed up daily cash flow capacity, which was then allocated to emergency reserves and production equipment maintenance (Saputra *et al.*, 2023).

Controlling energy and fuel costs is also a crucial pillar in the financial efficiency of agro-industrial SMEs in Jember. Most agricultural processing processes require intensive heat and electricity for drying and cooling. SME B successfully reduced daily operational costs by replacing its LPG-fueled drying machine with biomass drying technology utilizing waste coffee shells and skins. The cumulative capital efficiency gains from this reduced energy expenditure reached tens of millions of rupiah per month, significantly improving the company's net profit margin (Siregar & Puspita, 2022). However, qualitative financial efficiency at the SME level is often hampered by a lack of understanding of asset depreciation calculations. SME owners tend to only calculate direct cash outflow without accounting for the decline in the economic value of processing machinery. This creates an illusion of profitability, where the business appears highly profitable on paper, but experiences a liquidity crisis when production machinery suddenly breaks down. Therefore, education on asset depreciation recording is crucial for maintaining sustainable capital efficiency (Tanujaya *et al.*, 2024).

The business financing structure of Jember's agro-industry SMEs remains largely dominated by bootstrapping and informal family loans. Reluctance to access commercial bank loans stems from concerns about the burden of fixed interest rates, which are perceived as burdensome amidst fluctuating harvests. However, SMEs that successfully implement strict financial efficiency have been shown to have a better bargaining position when applying for People's

Business Credit (KUR). Proper cash management demonstrates managerial professionalism, improving their creditworthiness in the eyes of financial institutions (Wicaksono *et al.*, 2020).

Overall, the financial efficiency model for Jember's agro-industry SMEs focuses on three main aspects: cash digitization, energy cost efficiency through technology transfer, and optimization of the local supply chain. The integration of these three elements creates a stable financial foundation. The cash flow balance achieved through operational efficiency allows business owners to shift their attention and capital allocation to long-term, environmentally friendly investment initiatives (Yuniarti & Triyono, 2025).

➤ *A Perception and Evaluation of Green Investment Feasibility*

The perception of agro-industry SME owners in Jember regarding green investment has undergone a paradigm shift, from a cost to a value-added investment (asset). Initially, green investment was viewed as an external obligation imposed by government regulations or the demands of large-scale buyers. However, with increasing awareness of resource efficiency, SME owners have begun to see that investing in environmentally friendly technologies can create recurring cost savings. This shift in mindset has become a key driver of green investment adoption at the micro level (Arikunto & Sujarwo, 2022).

The process of evaluating the feasibility of green investments by SMEs tends to use a pragmatic-qualitative approach rather than complex accounting formulas. Business owners focus more on the qualitative payback period, namely how quickly the green technology can reduce monthly operational costs to the point where it equals the purchase price of the equipment. For example, installing a biogas reactor to process coffee wastewater is considered feasible because it immediately eliminates waste disposal fees and instantly replaces the need for LPG in production kitchens (Baskoro *et al.*, 2021).

Technical feasibility and ease of operation are critical considerations before SMEs decide to make green investments. Many high-level environmentally friendly technologies fail to be adopted due to maintenance complexity and the lack of spare parts in the local Jember market. SMEs prefer green technologies that are appropriate, easily repaired by local technicians, and use affordable maintenance materials. This technical feasibility determines whether green investments can provide sustainable economic impacts without disrupting the smooth running of daily production processes (Cahyono & Indrawati, 2023).

Ecosystem support and strategic partnerships also influence the eligibility criteria for green investment in agro-industry SMEs. SMEs that are members of commodity associations or partner with local universities in Jember receive easier access to technology and assistance with due diligence. Technical guidance from academics reduces the risk of green investment failure and increases business owner confidence. These partnerships have been shown to reduce

research and development (R&D) costs, which are typically beyond the reach of small-scale SMEs (Darmawan *et al.*, 2024). In addition to internal efficiency benefits, the feasibility of green investment is measured by the potential for high-value market penetration (green market). Agro-industrial products that are certified environmentally friendly or implement zero-waste processing methods are more attractive to urban consumers and export markets. SME owners confirm that products with an environmentally friendly label can be sold at a premium price (green premium price). The assurance of this extra profit margin serves as a powerful financial incentive for sustainable green investment (Effendi & Marlina, 2020).

However, the main obstacle to evaluating the feasibility of green investments remains limited access to green financing. Regional banking institutions often employ conventional credit assessment schemes that equate the risks of green investments with those of general investments. The absence of special interest rate incentives for environmentally friendly projects at the SME level slows down the repayment process. This situation requires regional government policy intervention to create a guarantee mechanism for green credit (Fitriani *et al.*, 2026).

➤ Synergy of Financial Efficiency and Green Investment in Increasing Competitiveness

The synergy between internal financial efficiency and green investment financing creates a positive domino effect on the competitiveness of agro-industry SMEs in Jember. Financial efficiency, which successfully reduces daily operational costs, creates free cash flow that can be allocated directly to gradually fund small-scale green projects. Conversely, the results of green investments—such as electricity savings and wastewater reuse—automatically lower the company's variable cost structure in the long term (Gunawan & Kurniawan, 2021).

The integration of these two elements also strengthens the business resilience of SMEs against external shocks. When fuel prices or electricity tariffs rise, SMEs that have invested in independent renewable energy are relatively unaffected. This stability in production costs allows SMEs to maintain competitive product prices in the market, while conventional competitors must raise prices due to rising energy costs. This resilience is a highly strategic competitive advantage in the agricultural processing industry (Handoko *et al.*, 2023).

From a business reputation and stakeholder relationship perspective, financially efficient and ecologically responsible SMEs command significantly higher levels of trust. Modern consumers, social investors, and grant-making institutions tend to prioritize businesses with clear environmental commitments. This green reputation opens up opportunities for marketing collaborations and access to broader distribution networks, both nationally and internationally. This positive image-building represents an intangible dividend from green investment (Irawan & Susanto, 2022).

Financial efficiency and green investment are mutually reinforcing in a circular fashion. Efficiently managed finances are the initial driving force behind the procurement of environmentally friendly technologies. The positive impacts of environmentally friendly technologies then feed back, strengthening the efficiency of the company's total cost structure. This synergy creates a virtuous cycle of growth that ensures the long-term sustainability of agro-industrial SMEs in Jember Regency (Jatnika *et al.*, 2024). Implementing this circular model requires a strong leadership commitment from SME owners. The decision to divert a portion of cash profits to green investments requires a vision for the future that transcends short-term profit orientation. Business owners with an ecopreneurial orientation have proven more successful at integrating financial efficiency with green policies. Initial financial barriers can be overcome through creative operational savings and community collaboration (Kurniyanto & Prabowo, 2025). As a final implication, the successful integration of financial efficiency and green investment in Jember's agro-industrial SMEs provides a concrete illustration of the win-win situation that environmental sustainability and economic profitability can go hand in hand. Conventional business models that ignore environmental impacts have proven increasingly costly due to social penalties and energy waste. A green transformation based on financial efficiency offers a path for regional-scale agro-industrial SMEs to develop independently, be highly competitive, and sustainably (Laksana & Novita, 2020).

V. CONCLUSION AND RECOMMENDATIONS

Based on the analysis results and discussion, it can be concluded that 1) The financial efficiency pattern in sustainable agro-industry SMEs in Jember Regency focuses on controlling daily operational costs through digitalization of cash recording, implementation of just-in-time inventory management, and substitution of conventional energy fuels. An efficient capital structure has been proven to generate free cash flow that is crucial for business operational resilience; 2) Evaluation of the feasibility of green investment by agro-industry SMEs relies on qualitative-pragmatic criteria, which prioritize local technical convenience, payback period based on monthly cost savings, and the potential for increasing selling prices through environmentally friendly labels. Appropriate green technology is considered the most feasible to be adopted by SMEs and 3) The synergy between internal financial efficiency and green investment has been proven to significantly increase the competitiveness and resilience of agro-industry SMEs. Financial efficiency provides capital for the adoption of environmentally friendly technologies, while green investment returns consistently reduce variable cost structures and open access to green markets and sustainable financing instruments.

Recommendations that can be given include 1) For Agro-industry SMEs to improve financial accounting discipline through the adoption of digital recording applications and start allocating them to green investment reserve funds gradually. Business actors are also advised to strengthen partnerships with educational institutions for the

transfer of environmentally friendly technology cheaply and efficiently; 2) For the Jember Regency Regional Government: It is necessary to design regional fiscal incentive policies, such as exemption from waste management fees for SMEs that implement zero waste, as well as holding regular sustainable financial bookkeeping training and 3) For Financial and Banking Institutions, it is hoped that they will launch green micro-financing products with qualitative criteria tailored to SME capacity, as well as competitive interest rates supported by the local government credit guarantee scheme.

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