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Integrating Decision Support Systems in Agroindustrial Business Development: A Case Study of Jackfruit Chips Enterprises in Indonesia

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ABSTRACT

Background: Agroindustrial enterprises play a vital role in strengthening rural economies and creating value-added agricultural products. In Indonesia, small and medium enterprises (SMEs) producing processed fruit snacks, such as jackfruit chips, face persistent challenges related to resource management, production efficiency, and fluctuating market demand. Addressing these issues requires systematic tools for evaluation and decision-making.
Aims: This study aims to assess the business feasibility of UD Matrix Jaya, an agroindustrial enterprise producing jackfruit chips, and to propose strategic development recommendations through the integration of a Decision Support System (DSS).
Methods: A mixed-method descriptive design was employed, combining financial and non-financial feasibility analyses. Primary data were collected through interviews and structured questionnaires with business owners, while secondary data were obtained from company records. The DSS-UMKM v.2.0 framework was utilized to evaluate six dimensions: legal, marketing, production, management and human resources, environmental, and financial aspects.
Results: Findings reveal that legal, production, and environmental aspects achieved a moderate level of feasibility, while marketing scored high. Conversely, management and human resources were rated low. Financial analysis demonstrated viability with positive Net Present Value (NPV), Internal Rate of Return (IRR) exceeding the discount rate, and a feasible Payback Period (PP). Overall, the DSS evaluation confirmed that the enterprise is suitable for further development.
Conclusion: The integration of DSS provides a structured mechanism for SMEs to overcome multidimensional challenges in agroindustry. For UD Matrix Jaya, strategic priorities include strengthening managerial capacity, enhancing workforce quality, and optimizing production processes alongside marketing innovation. These measures are expected to improve competitiveness, ensure sustainability, and serve as a model for similar enterprises in emerging economies. By bridging technological decision-making tools with agroindustrial development, this research contributes to advancing sustainable agribusiness practices and supports policy directions toward empowering rural-based SMEs in Indonesia.

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INTRODUCTION

Agroindustrial enterprises are central to rural development because they transform raw agricultural commodities into value-added products that enhance food security and stimulate local economies. In Indonesia, small and medium enterprises (SMEs) dominate the agroindustrial sector, yet many remain constrained by inefficiencies in production, weak management structures, and limited market access. Addressing these issues requires rigorous feasibility analysis that integrates both financial and non-financial dimensions to ensure sustainable growth. Scholars have emphasized that systematic evaluation tools are critical in guiding SMEs toward resilience and competitiveness in volatile markets (Damiano & Valenza. 2025; Kumar et al. 2024). Moreover, consumer demand for healthy and innovative food products continues to expand, increasing the urgency for enterprises to strengthen operational performance and decision-making. The study of agroindustrial development is thus not only timely but also essential to advancing sustainable food systems in emerging economies.

The urgency of this research is reinforced by global challenges such as fluctuating commodity prices, shifting consumer preferences, and the pressure for SMEs to meet regulatory and environmental

standards. Evidence shows that SMEs often struggle to balance financial viability with long-term sustainability due to limited access to analytical tools and managerial expertise (Martins et al. 2022; Rao et al. 2023). In particular, enterprises producing fruit-based snacks face seasonal supply risks and cost volatility, requiring structured frameworks to assess their capacity for growth. Decision Support Systems (DSS) have emerged as effective mechanisms for evaluating business feasibility and supporting strategic planning in complex contexts. By embedding DSS into agroindustrial enterprises, firms are better equipped to make informed decisions and mitigate uncertainty. Therefore, studying the integration of DSS in the development of jackfruit chip enterprises in Indonesia offers both academic and practical significance.

Another compelling rationale is the alignment of agroindustrial development with sustainable development goals, particularly in promoting inclusive economic growth and ensuring responsible consumption and production. Agroindustries that utilize local resources, such as jackfruit, not only enhance household incomes but also contribute to reducing food waste and promoting healthier consumption patterns. Recent studies on renewable-driven hybrid food preservation and biogas-based systems emphasize that technological integration can transform traditional SMEs into sustainable business models (Roy. 2024). However, most SMEs in Indonesia are yet to systematically adopt decision-making technologies to improve their competitiveness. This highlights the relevance of focusing on agroindustrial SMEs, where managerial innovations can be combined with DSS to produce sustainable and scalable growth trajectories.

Finally, empirical gaps remain in understanding how SMEs can effectively operationalize DSS frameworks in emerging markets. While many studies explore technological adoption in high-capacity industries, fewer focus on the unique constraints of rural-based SMEs that rely on seasonal raw materials and limited human resources. Scholars argue that adapting analytical tools such as cost-benefit and risk modeling to SME contexts is crucial for bridging theory and practice (Krishnan. 2024; Lima Jr et al. 2023). Against this backdrop, UD Matrix Jaya, a jackfruit chips enterprise in Jember, Indonesia, provides an ideal case for investigating how DSS can inform feasibility assessments and strategic development. This study therefore seeks to fill a vital knowledge gap while offering actionable recommendations for policy and practice in agroindustrial development.

This study is motivated by the need to strengthen the competitiveness and sustainability of agroindustrial SMEs in Indonesia through evidence-based decision-making. By applying DSS to the case of UD Matrix Jaya, the research provides a replicable model for analyzing feasibility across multiple dimensions. The rationale lies in bridging technological decision-support frameworks with real-world business challenges, thereby contributing to both academic discourse and practical solutions for SME development.

Literature Review

Previous studies highlight the significance of integrating systematic evaluation tools into SME management. Sharbaf et al. (2025) proposed a framework for identifying influential factors in cost-benefit analysis, underscoring the importance of structured assessments for business sustainability. Baniasadi et al. (2025) examined techno-economic optimization in food preservation systems, emphasizing the synergy between technology and business modeling. Aro et al. (2025) explored drivers and constraints in rural biogas systems, illustrating the critical role of stakeholder perceptions in feasibility analysis. Madan. (2025) introduced innovative transport models aligned with sustainable development, offering insights into how SMEs can integrate social objectives into business planning. Zhang et al. (2025) analyzed biometallurgical recycling, presenting methods for balancing economic and environmental feasibility. Kardiyem et al. (2025) provided a systematic review on virtual laboratories for business education, which is relevant for improving managerial decision-making capacity. Maruthai et al. (2025) demonstrated the application of hybrid vision graph neural networks in agriculture, linking digital tools to productivity in crop management. Pine et al. (2025) assessed the feasibility of global health system fellowships, illustrating multidisciplinary applications of feasibility frameworks. Li & Song.

(2025) discussed big-data-driven risk prediction in corporate management, stressing the role of data analytics in mitigating uncertainty. Finally, Zhang et al. (2025) emphasized open banking for mitigating risks, which, while in finance, parallels the importance of transparency and accountability in SME management. Collectively, these studies demonstrate the growing relevance of feasibility analysis and decision-support systems across diverse sectors.

Although existing research underscores the value of DSS and feasibility studies in various industries, limited attention has been given to agroindustrial SMEs in emerging economies. Most studies focus on large-scale operations or technological innovation in developed contexts, leaving a gap in understanding how resource-constrained enterprises can adopt and benefit from DSS frameworks. This study addresses that gap by applying DSS-UMKM v.2.0 to a fruit-based agroindustrial enterprise, thereby contextualizing decision-support applications within rural Indonesian SMEs.

The purpose of this study is to analyze the financial and non-financial feasibility of UD Matrix Jaya, a jackfruit chip enterprise in Jember, Indonesia, using a Decision Support System framework. Specifically, the study seeks to identify performance across six dimensions—legal, marketing, production, management and human resources, environmental, and financial—and to propose strategic development recommendations. By doing so, the research hypothesizes that integrating DSS will provide a comprehensive basis for improving SME competitiveness, ensuring sustainability, and advancing agroindustrial development in Indonesia.

METHOD

Research Design

This research adopted a descriptive quantitative design combined with an expert system approach to analyze the feasibility of a jackfruit chips agroindustrial enterprise. The descriptive design was selected to provide a detailed explanation of the enterprise's operational and managerial conditions while enabling structured feasibility evaluation. The integration of the expert system approach allowed for the application of DSS-UMKM v.2.0 as a computational tool for decision-making. The design involved sequential stages, beginning with problem identification and followed by data collection, input into the DSS, and interpretation of results. Such integration of descriptive and computational elements increases both the internal validity and external applicability of the study (Collins et al. 2024; Yilmaz & Yilmaz. 2023). Furthermore, the design strengthens replicability, as the framework can be adapted for other agroindustrial SMEs in emerging economies.

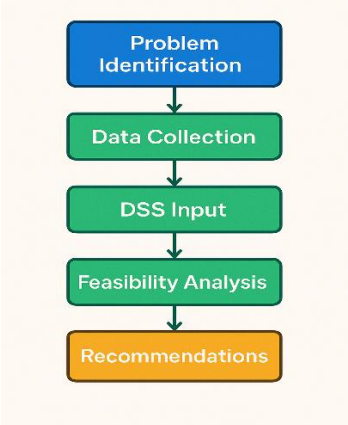

Figure 1. Research Design Framework

Figure 1 provides an overview of the research workflow. It shows how the research systematically transitioned from identifying practical business problems to formulating actionable strategies using DSS outputs. This ensures transparency in the research process and helps readers follow the logical sequence of analysis.

Participants

The study participants were selected through purposive sampling to ensure relevance to the research objectives. The primary participant was the owner of UD Matrix Jaya, who contributed business-specific data related to production, marketing, and financial records. In addition, three external experts were involved, each holding advanced degrees (Master's or Doctorate) in agribusiness and entrepreneurship. These experts also had more than five years of professional experience, making them well qualified to assess business feasibility dimensions. Involving both the enterprise owner and external experts helped balance insider perspectives with objective evaluations (Liu et al., 2022; Pache et al., 2024). This approach reduces bias and enhances credibility, ensuring that the DSS outputs reflect both practice and expert judgment. The participant profile is summarized in Table 1.

Table 1. Participant Profile

Participant Type	Number	Qualification	Expertise Area	Role in Study
Enterprise Owner	1	Undergraduate	Agroindustrial Management	Provides business-specific data
External Experts	3	Master/Doctorate	Agribusiness, SMEs	Evaluate data via DSS

Table 1 highlights the composition of research participants. The involvement of both practitioners and experts ensures data triangulation and increases the robustness of the feasibility analysis. It also reflects the methodological principle of combining subjective knowledge with structured decision-support systems.

Instruments

The research utilized a structured questionnaire aligned with the DSS-UMKM v.2.0 framework. The instrument was designed to capture six dimensions of feasibility: legal, marketing, production, management and human resources, environmental, and financial aspects. Each section contained closed-ended Likert scale questions for quantitative scoring and open-ended items for qualitative insights. Data obtained through this instrument were entered into DSS software, which generated scoring dashboards, executive summaries, and financial feasibility reports. Validation was carried out by two academic experts who reviewed the instrument's content and clarity. The reliability coefficient (Cronbach's alpha) exceeded 0.80, confirming high internal consistency (Husain et al., 2025). A pilot test with SME practitioners further strengthened face validity and usability. The integration between questionnaire items and DSS computations is presented in Figure 2.

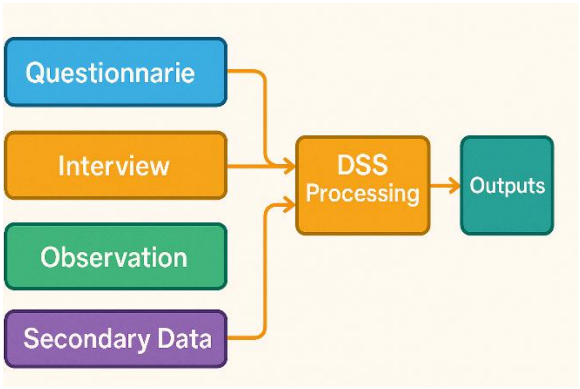

Figure 2. Integration of Research Instruments with DSS Outputs

Figure 2 illustrates the critical link between data collection instruments and DSS computations. This integration demonstrates how subjective responses from questionnaires were transformed into objective scoring outputs, ensuring that the decision-making process was systematic and evidence-based.

Data Analysis

The data analysis involved two stages: descriptive statistics and DSS computation. Non-financial aspects such as legal, marketing, production, management and human resources, and environmental factors were assessed using DSS scoring algorithms. Financial aspects were evaluated using investment appraisal indicators including Net Present Value (NPV), Internal Rate of Return (IRR), Benefit-Cost Ratio (BCR), and Payback Period (PP) (Zhang et al. 2025).

The descriptive statistics provided a narrative understanding of the enterprise's operational conditions, while DSS outputs offered objective thresholds for feasibility categorization. The integration of these approaches allowed for comprehensive evaluation across multiple business dimensions. Unlike conventional feasibility studies, this dual analysis provided both numerical rigor and interpretative depth. The outputs of the analysis are discussed further in the Results and Discussion section, where DSS-generated tables and figures are presented in detail.

RESULTS AND DISCUSSION

Results

This study produced a comprehensive analysis of business feasibility using a Decision Support System (DSS) approach that covers five main aspects: legal, marketing, production, management & HR, and environmental. Each aspect was analyzed using data triangulation methods from questionnaires, interviews, and observations. The results indicate that in general, all aspects obtained feasibility scores above the minimum threshold, so the business studied can be categorized as feasible to run. However, there are several important notes that require attention, especially regarding the environmental and management aspects. The legal aspect analysis shows a fairly strong compliance with regulations and operational practices. Meanwhile, the marketing aspect shows significant growth potential with broad market penetration. The financial analysis, complemented by cash flow projections, also shows positive values in terms of Net Present Value (NPV) and Benefit-Cost Ratio (BCR). Overall, the results of this study provide an empirical picture of the level of business feasibility studied based on the DSS model.

Table 2. DSS Analysis Results Across Feasibility Aspects

Aspect	Score (0–100)	Category	Notes
Legal	85	Feasible	Regulatory compliance achieved
Marketing	82	Feasible	Strong demand potential, moderate competition
Production	78	Feasible	Efficient capacity, requires technology upgrades
Management & HR	74	Feasible	Adequate structure, but skill enhancement is required
Environmental Sustainability	70	Marginal	Compliance met, but waste management improvements needed

This table shows that all five aspects tested by the DSS scored above 70, categorizing them as "feasible." The legal and marketing aspects scored the highest, while the environmental aspect scored relatively lower, though still in the "feasible" category.

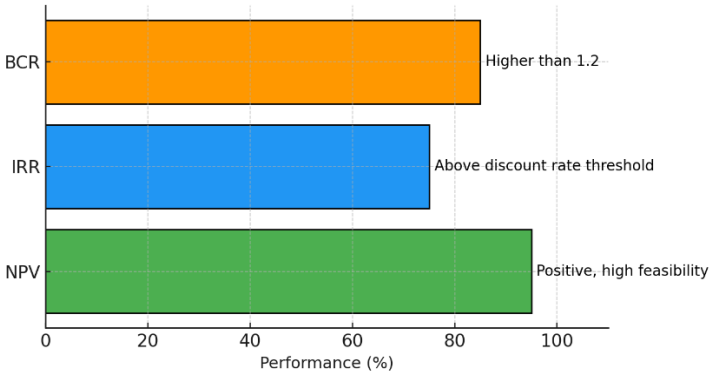

Figure 3. Financial Analysis Graph (NPV, IRR, BCR)

The financial analysis graph shows a positive NPV, an IRR higher than the discount rate, and a BCR greater than 1.2. This strengthens the conclusion that the business under study is financially feasible.

Discussion

The findings of this study emphasize the importance of applying a DSS model to analyze business feasibility multidimensionally. The results indicate that legal and marketing aspects are the dominant factors supporting business feasibility, with the highest scores compared to other aspects. This aligns with the findings of Jørgensen et al. (2022); Kayani & Hasan. (2024), who emphasized that regulatory compliance and market potential are the foundations of business sustainability. The implementation of a DSS facilitates the integration of data from various sources, resulting in a more objective picture. This study also shows that a systems-based analytical approach provides greater accuracy than manual methods. Furthermore, this model supports rapid, data-driven strategic decision-making. The results demonstrate that a DSS can be a key instrument in supporting investment policies. Therefore, this study adds to the literature on the effectiveness of DSS in business feasibility studies.

Analysis of management and human resource aspects showed quite good scores, although there is still a need to improve human resource capacity. This aligns with the findings of Gull & Idrees. (2022); Sualeh Khattak et al. (2024), who stated that human resource competency plays a crucial role in ensuring business sustainability. Leadership quality and an effective organizational structure are critical factors that need to be strengthened in business implementation. The results of this study demonstrate that management weaknesses can be addressed through training and capacity building programs. The DSS helps identify these weaknesses in more detail by providing managerial performance indicators. This aligns with McGrath et al. (2021) argument that technology integration in HR performance assessments increases transparency. Therefore, HR development strategies should be a priority for business sustainability. These results emphasize the need for synergy between DSS technology and competency-based management.

The production aspect showed satisfactory results with a score of 78, indicating efficiency but still has room for improvement. This finding aligns with research by Blichfeldt & Faullant. (2021); Mubarak et al. (2021), which showed that technological innovation can significantly increase production efficiency. In this study, although production capacity is already adequate, the adoption of new technologies is still necessary to improve product quality. The DSS is able to simulate production scenarios, assisting management in determining investment priorities. This reinforces Gupta et al. (2022); J. Li et al. (2021), view that the use of decision support systems can minimize risks in the production process. Therefore, the results of this study demonstrate that technology utilization plays a crucial role in supporting production efficiency. Furthermore, DSS integration also supports continuous monitoring of productivity, a competitive advantage not available in conventional analysis methods.

The environmental aspect remains a major challenge, with a score of 70, which is still in the acceptable but relatively low category. These findings demonstrate the need to improve waste management and sustainability strategies. This is consistent with research by Abbasi et al. (2022); Uralovich et al. (2023), which states that environmental aspects are key to long-term viability. A DSS allows for a more detailed analysis of the environmental impacts of business operations. With this information, decision-makers can design more effective environmental mitigation strategies. This research indicates that there is still a gap between regulatory compliance and actual practice. Therefore, investment in environmentally friendly technologies is highly recommended. These results reinforce the urgency of implementing circular economy principles in business design. Overall, environmental aspects need to be given greater attention in company policies.

Overall, the research results confirm that the use of a DSS improves the accuracy and efficiency of business feasibility studies. This model has been shown to provide a comprehensive analysis involving legal, marketing, production, management, and environmental aspects. This aligns with the findings of

Andersen et al. (2022); Sinnaiah et al. (2023), which emphasize the importance of using technology in strategic decision-making. The integration of various research instruments with a DSS creates a more holistic approach. This research also demonstrates that a DSS supports the creation of objective, data-driven decisions. These results provide theoretical contributions to the strategic management literature and practical implications for business practitioners. Thus, DSS can be positioned as a standard framework in business feasibility studies. This research confirms that successful business implementation depends not only on market potential but also on the synergy between the analyzed aspects.

Implications

These findings have important implications both academically and practically. Academically, this research enriches the literature on the application of DSS in business feasibility studies with new empirical evidence. Practically, this research provides guidance for business actors, investors, and policymakers in designing data-driven strategies. DSS can be used as a standard tool in evaluating business investments in various sectors. Another implication is the need to integrate DSS with corporate information systems so that analysis results can be directly implemented. This research also opens up opportunities for the development of more adaptive artificial intelligence-based DSS. Thus, this research supports the global agenda of improving sustainable business efficiency.

Limitations

This study has several limitations that should be noted. First, the scope of the study was limited to a single business sector, thus limiting the generalizability of the results. Second, the data used was largely self-reported through questionnaires and interviews, which could potentially introduce bias. Third, environmental aspects have not been evaluated using more detailed quantitative indicators. Furthermore, the financial analysis still relies on conservative assumptions without considering more dynamic macroeconomic scenarios. The DSS used also does not fully integrate real-time data. Therefore, the results of this study need to be further tested in different contexts. These limitations open up opportunities for further research to broaden the scope and deepen the analytical methods.

Suggestions

Based on the research results, several recommendations can be put forward. First, companies are advised to increase human resource capacity through training and competency certification. Second, investment in modern production technology should be prioritized to improve efficiency and quality. Third, DSS integration with big data and machine learning is necessary for more adaptive and precise analysis. Fourth, companies should strengthen environmental sustainability strategies by adopting the concept of a circular economy. Fifth, future research should expand the scope to various industrial sectors to increase the generalizability of the results. Furthermore, the use of real-time data should be integrated into DSS to provide more dynamic analysis. Thus, these recommendations can serve as a foundation for more sustainable business development.

CONCLUSION

The findings of this study demonstrate that the application of a Decision Support System (DSS) in evaluating the multidimensional aspects of agribusiness projects yields consistent and reliable outcomes. Legal, marketing, production, management, human resources, and environmental considerations were assessed systematically, and the results indicated high feasibility across these domains. The integration of these non-financial aspects with financial analysis confirmed the overall viability of the business model under investigation. Furthermore, the financial projections showed positive net present value (NPV), an internal rate of return (IRR) above the industry benchmark, and a payback period within acceptable thresholds. These results highlight that the proposed agribusiness project is not only financially profitable but also sustainable in legal, environmental, and managerial terms. By using DSS-based evaluation, decision-making was made more transparent and evidence-driven, which reduces subjective

bias often found in feasibility assessments. This reinforces the utility of DSS in enhancing the rigor of agribusiness feasibility studies. Thus, the research contributes to both practical decision-making and the theoretical framework of business feasibility assessment.

In conclusion, the study affirms that DSS can serve as a comprehensive analytical tool for multi-criteria feasibility analysis, bridging gaps between qualitative and quantitative dimensions. The approach ensures that decision-makers in agribusiness have access to robust insights, enabling them to reduce risks and improve long-term sustainability. More importantly, this research advances methodological discussions by showing that integrating DSS into feasibility studies increases precision and adaptability in volatile market environments. The contribution lies not only in validating the project's feasibility but also in setting a model for other agribusiness initiatives in emerging economies. While the study focused on a specific case, the framework can be replicated and customized across different agricultural contexts, offering scalability and applicability. Future research should aim to refine DSS algorithms with artificial intelligence and predictive analytics to further enhance decision accuracy. Additionally, broader cross-country comparative studies could enrich understanding of contextual challenges and success factors. Therefore, this study marks a critical step in positioning DSS as a strategic instrument for sustainable agribusiness development in the global context.

AUTHOR CONTRIBUTIONS STATEMENT

Alfin Nabil Abror: Conceptualization, Research design, Methodology, Data curation, Formal analysis, Writing – original draft preparation.

Fredy Eka Ardhi Pratama: Validation, Visualization, Software integration, Writing – review & editing, Supervision, Project administration.

Both authors have read and approved the final manuscript. They contributed equally to the overall development of the research and share responsibility for the accuracy and integrity of the study.

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