

Dynamic Model of Community-Based Agritourism Development in Batu City**Syifa Aulia, Fitria Dina Riana*, Rachman Hartono**

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*Corresponding author:
Email: fitria.fp@ub.ac.id**ABSTRACT**

Background: At Lumbung Stroberi, agriculture, tourism, and community institutions are already interconnected, but their linkages remain insufficiently strong and continuous. Local strawberry production declined from 14,194.45 quintals in 2024 to 1,601.44 quintals in 2025 (BPS, 2026), contributing to dependence on external strawberry supplies, while limited processing and weaknesses in training, institutional cooperation, community participation, and promotion constrain value creation and agritourism performance.

Purpose: This study aims to analyze the structure and behavior of the agritourism development system and to formulate policy scenarios that optimize system performance across economic, social, and production dimensions.

Design/methodology/approach: A system dynamics approach was employed using a mixed-methods design, combining quantitative data from questionnaires and qualitative insights from interviews. The analysis involved identifying key variables, developing a causal loop diagram, constructing a stock-and-flow model, validating the model, and simulating policy scenarios.

Findings/Results: The results show that Scenario C-High, which integrates upstream and downstream interventions, produces the best outcomes compared with the Business as Usual (BAU) condition and the other scenarios. This scenario increases agritourism revenue to IDR287,806,000, raises visitor numbers to 8,105, and improves production to 995 kg, with 858 kg classified as salable yield, indicating enhanced efficiency and product quality. Socially, community participation and institutional capacity remain stable and supportive of sustainability.

Conclusion: These findings suggest that an integrated strategy combining production improvement, product quality enhancement, institutional strengthening, and human resource development is the most effective approach for sustainable agritourism development. The model provides a practical tool for policymakers and stakeholders to design adaptive and system-based strategies, although its implementation requires adequate resources, coordination, and infrastructure readiness.

Originality/value (State of the art): This study develops an integrated system dynamics model that simultaneously captures the interactions between agricultural production, tourism performance, and community institutional capacity in community-based agritourism. The study evaluates alternative policy scenarios through dynamic simulation, providing evidence-based recommendations for sustainable community-based agritourism development.

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INTRODUCTION

Agritourism has emerged as a strategic approach to rural development by integrating agricultural activities with tourism services, thereby supporting key dimensions of rural development, including agricultural productivity, tourism-based income generation, community participation, and local institutional capacity, while also contributing to the preservation of local culture and environmental sustainability. In many regions, community-based agritourism is increasingly promoted because of its potential to empower local communities as primary actors in managing and benefiting from tourism activities. Cavalleri et al. (2022)

and Ruiz-Labrador et al. (2023) emphasize that agritourism contributes significantly to sustainable development by balancing economic growth, environmental conservation, and social inclusion. Furthermore, Riady et al. (2024) state that community-based approaches strengthen local institutions and ensure a more equitable distribution of tourism benefits. Despite its potential, the development of community-based agritourism in Batu City, particularly in Bumiaji District, still faces fundamental challenges. Batu City is recognized as one of the main strawberry-producing areas in East Java, supported by favorable agroclimatic conditions and attractive rural landscapes. However, recent data indicate a significant decline in strawberry production in Bumiaji District,

from 14,194.45 quintals in 2024 to 1,601.44 quintals in 2025, representing a decrease of 88.72% (BPS, 2026). This decline should be interpreted as substantial year-to-year variation in the agricultural resource base rather than as evidence of a single causal factor. Based on field information obtained from strawberry farmers and agritourism stakeholders, high rainfall was reported as one of the factors affecting the quality and quantity of salable produce during certain production periods. As a result, agritourism operators have sourced strawberries from other regions, such as Bandung, to maintain the availability of strawberries for tourism-related activities (Yunita, 2026). In parallel, tourist visits to Pandanrejo Village decreased from 20,470 in 2024 to 19,779 in 2025, or by 3.38% (BPS, 2026), which is associated with suboptimal promotional activities. These conditions indicate that agritourism in Batu City lacks resilience in both agricultural production and tourism performance.

Similar issues are observed in Lumbung Stroberi Agritourism, a community-based initiative in Bumiaji District. Although designed to involve local farmers, farmer participation has declined significantly, from 40 farmers in 2021 to only 18 at the time of data collection, based on an on-site interview with the manager. This decline was driven by the threat of crop failure, leading farmers to shift to alternative crops. In this study, farmer participation refers to farmers who were registered and involved as partners in supporting Lumbung Stroberi's agritourism activities. In addition, according to the manager, promotional efforts through social media are inconsistent, ranging from a maximum of four times a month to just once in other months, leading to limited destination visibility and fluctuating tourist arrivals. From a production perspective, the availability of salable strawberries remains unstable due to climate variability, particularly excessive rainfall, as reported by relevant stakeholders during the field study.

Djuwendah et al. (2023) and Khadry and Silalahi (2024) argue that weak resource management, inadequate documentation of tourism activities, and low community participation are key factors hindering agritourism development. Taken together, these empirical indicators suggest that the issue at Lumbung Stroberi is not the absence of linkages among agricultural production, tourism activities, and socio-institutional capacity, but rather that these linkages have not yet been sufficiently strengthened to support stable production, tourism performance, and community participation. These findings highlight the interconnected nature of agritourism systems, where disruptions in one component can influence the overall system performance.

Previous studies have provided important insights into agritourism development, particularly through system-based approaches. Santoso et al. (2022) underline the importance of analyzing interrelationships among variables in rural tourism development using a systems perspective. Fatina et al. (2023) developed a dynamic system model integrating social, economic, and environmental aspects, demonstrating that community participation and institutional collaboration are critical to sustainability. However, the existing studies reviewed here have generally focused on specific dimensions or subsystems, such as tourism development, community participation, institutional collaboration, or sustainability

indicators, rather than explicitly modeling the dynamic interaction between agricultural production variability and tourism performance together with community and institutional capacity within a single community-based agritourism model.

This gap indicates the urgency of adopting a more comprehensive and dynamic analytical approach to understand the complexity of agritourism systems. A system dynamics approach is considered appropriate because it can capture causal relationships, feedback mechanisms, and changes in system behavior over time (Santoso et al., 2022; Solano-Pereira et al., 2025). Through this approach, key components such as agricultural production, community participation, and tourist visits can be analyzed holistically, enabling the identification of leverage points and effective policy interventions. In particular, the approach allows the study to examine how changes in agricultural production may affect tourism performance and how tourism outcomes, community participation, and institutional interventions may in turn influence the capacity of the system to maintain and improve agricultural and tourism activities over time.

Therefore, this study aims to develop a dynamic model of community-based agritourism in Lumbung Stroberi Agritourism, Bumiaji District, Batu City. The model is designed to analyze causal relationships among economic, social, and environmental factors and to simulate various policy scenarios to improve production stability, enhance community participation, and optimize tourist visits. The novelty of this research lies not merely in integrating agricultural production dynamics with tourism performance, but in identifying and simulating the feedback mechanisms through which changes in agricultural production can influence tourism performance and economic outcomes, while community participation and institutional interventions can modify the system's response over time. This perspective enables the identification of leverage points and policy combinations that may generate long-term outcomes different from those of interventions applied to individual components of the agritourism system. This research is expected to contribute both theoretically to the development of agritourism studies and to supporting policymakers and stakeholders in designing more effective and sustainable agritourism development strategies.

METHODS

This study employed a mixed-methods approach to obtain a comprehensive understanding of community-based agritourism development. The quantitative approach was used to measure selected economic, social, and production conditions using ratio-scale numerical data obtained from structured questionnaires and secondary data, while the qualitative approach explored system dynamics, stakeholder perceptions, and interactions among actors involved in agritourism management (Fatina et al., 2023; Waruwu et al., 2025). The quantitative results were used to describe the existing conditions of the agritourism system and to support the identification and formulation of relevant variables in the system dynamics model. The integration of both approaches enabled the study to capture empirical conditions as well as the underlying mechanisms linking key variables, supporting the development of a system dynamics model (Santoso et al., 2022).

The research was conducted at Lumbung Stroberi Agritourism in Batu City, which was selected purposively because of its relevance to the research problem, particularly the decline in strawberry production, limited record-keeping practices, and varying levels of community participation (Rahmah et al., 2021). The study was carried out from August to December 2025, covering data collection, model development, and simulation stages.

The respondents were selected using purposive sampling based on their roles and involvement in the agritourism system. Instead of relying on a large sample size, this study emphasized stakeholder representation and information sufficiency, which are more critical in system dynamics modeling (Richardson, 2011; Sterman, 2002). A total of three key informants were involved, consisting of an agritourism manager, a representative of the farmer group, and a leader of the women farmer group engaged in processing activities. The study utilized both primary and secondary data. Primary data were collected through structured questionnaires and in-depth interviews, while secondary data were obtained from reports, previous studies, and relevant documents (Ramdhan, 2021). Data collection was conducted using a survey method, supported by structured interview instruments to capture both quantitative indicators and qualitative insights (Makbul, 2021).

Data analysis was conducted using descriptive statistics and a system dynamics approach. Descriptive analysis was applied to summarize respondent characteristics and existing agritourism conditions using measures such as frequency, percentage, and mean values (Ćirić et al., 2021; Hosseini et al., 2025). The results were then used to support the development of the system dynamics model. The system dynamics approach involved identifying key variables, constructing causal loop diagrams to represent feedback relationships, and developing stock-and-flow diagrams to simulate system behavior over time (Blair et al., 2021; Ma et al., 2023). Model validation and scenario simulations were conducted to evaluate alternative policy interventions and their impacts on agritourism sustainability (Hou, 2025; Zuhdi et al., 2025). This combination of methods allowed the study not only to describe current conditions but also to analyze long-term system behavior and formulate adaptive policy recommendations.

RESULTS

The system dynamics model developed in this study focused on the integration of economic, social, and production dimensions within community-based agritourism development. The selection of variables was grounded in both theoretical considerations and empirical conditions observed at Lumbung Stroberi, Batu City. The model incorporated external factors such as rainfall and holiday periods, alongside internal factors including promotion, institutional collaboration, community participation, operational costs, production capacity, product quality, and

value-added processing activities. These variables were interconnected to capture the complexity of the agritourism system. The primary objective of the model was to analyze how these interacting factors collectively influenced tourist visits and agritourism income, while also reflecting the role of community involvement and production stability in shaping overall system performance.

Model Structure of Community-Based Agritourism System

The identification and classification of variables in Table 1 represented the initial stage of the system dynamics methodology, a critical step in defining the system boundaries and structural foundation for the community-based agritourism development model. Grounded in the conceptual framework of economic, social, and environmental sustainability (Noto & Cosenz, 2021), these variables were categorized into stocks (accumulations), flows (rates of change), and auxiliaries (descriptive factors) to ensure the model realistically captured the complex, non-linear interactions necessary for long-term policy simulation.

Following the initial identification and classification of variables, the research proceeded to the second stage of the system dynamics methodology, which involves the construction of the structural model. The structure of the community-based agritourism system in Lumbung Stroberi was developed using this approach to capture the interrelationships among economic, production, and social variables. The causal relationships were illustrated in Figure 1, which presented the Causal Loop Diagram (CLD). This stage was essential for identifying the reinforcing and balancing loops that explained the dynamic behavior of the system and dictated how the model would respond to various policy interventions.

Three main feedback loops were identified in the model. The first reinforcing loop (R1) represented the relationship between promotion, number of tourists, and income from agritourism. Increased promotion directly supported tourist arrivals by improving the visibility and awareness of Lumbung Stroberi as a tourism destination, based on stakeholder observations and field findings. Higher tourist arrivals increased agritourism income, which could be reinvested in promotional activities, creating a self-reinforcing growth cycle. This finding aligned with Santoso et al. (2022), who emphasized the importance of feedback relationships between tourism demand and economic performance in rural tourism systems.

The second reinforcing loop (R2) highlighted the role of community involvement and processed products. Increased training and institutional collaboration improved community participation, which enhanced the production of value-added processed products. These products contributed to higher income from agritourism and further encouraged community involvement. This loop reflected the argument by Riady et al. (2024) that active community participation strengthens the sustainability and economic resilience of agritourism initiatives.

Table 1. Variable identification

Variable	Component	Definition	Indicator	Unit	Data
Agritourism Income (Kotler et al., 2018)	Stock	Total monetary receipts obtained from all agritourism business activities within a certain period	Ticket sales revenue	Rupiah	Time series
			Fruit sales revenue		
			Processed product sales revenue		
			Rotten fruit sales revenue		
Operational Cost (Garrison et al., 2017)	Auxiliary	All economic resource sacrifices incurred to carry out routine agritourism activities	Cafe income	Rupiah	Constant
			Promotion costs		
			Utility costs		
			Labor costs		
Promotion (Kotler et al., 2018)	Auxiliary	Marketing communication efforts to inform and attract the interest of prospective tourists	Fuel costs		
Attraction (Cooper et al., 2009)	Auxiliary	Attractions or activities that serve as a factor for tourist visits	Social media content intensity	Activities	Time series
Number of Tourists (Cooper et al., 2009)	Auxiliary	The number of tourists visiting the agritourism area within a certain period	Number of attractions	Activities	Constant
Holiday (Hu et al., 2021)	Auxiliary	Total number of holidays that influence tourist arrivals	Number of visits per regular month	Person	Time series
			Number of visits per high season month		
Rainy Day (Gricar et al., 2021)	Auxiliary	Total number of rainy days that influence tourist arrivals	Number of holidays per month	Days	Constant
Processed Product Production (Epaga et al., 2019)	Auxiliary	Output from the transformation of agricultural raw materials into semi-finished or finished goods that have added value	Number of rainy days per month	Days	Time series
Society Involvement (Arnstein, 1969)	Stock	Active participation of local residents in operational activities and decision-making within the agritourism area	Production volume (units)	Products	Constant
			Diversity of processed product types		
			Price of processed products		
Policy (Perda No.7 Kota Batu, 2011)	Auxiliary	Legal framework and local-level policies governing the management and licensing of agritourism	Number of employees	Person	Constant
			Number of partner farmers		
Institutional Collaboration (Freeman et al., 2019)	Auxiliary	Formal relationships established between agritourism managers and external institutions (government, private sector, academia)	Number of KWT (Women Farmers Group) for processed products		
Training (Timothy & Tosun, 2003)	Auxiliary	Planned activities to improve the skills and knowledge of human resources in agritourism	Batu City Spatial Planning Mission	Index	Constant
Salable Fruit (Michael & Sangu, 2024)	Stock	Part of the total harvest that meets quality standards to be sold to consumers or tourists	Frequency of collaboration programs	Activities	Time series
Production (Elkington, 1997)	Auxiliary	Total amount of strawberry production produced by farmers within the agritourism area per certain period	Number of training sessions per month	Activities	Time series
Rainfall (Elkington, 1997)	Auxiliary	Climatological factor indicating the intensity of water falling from the atmosphere to the earth's surface at the location	Volume of non-rotten fruit	Kg	Time series
			Actual production volume	Kg	Time series
			Monthly rainfall depth	mm	Time series

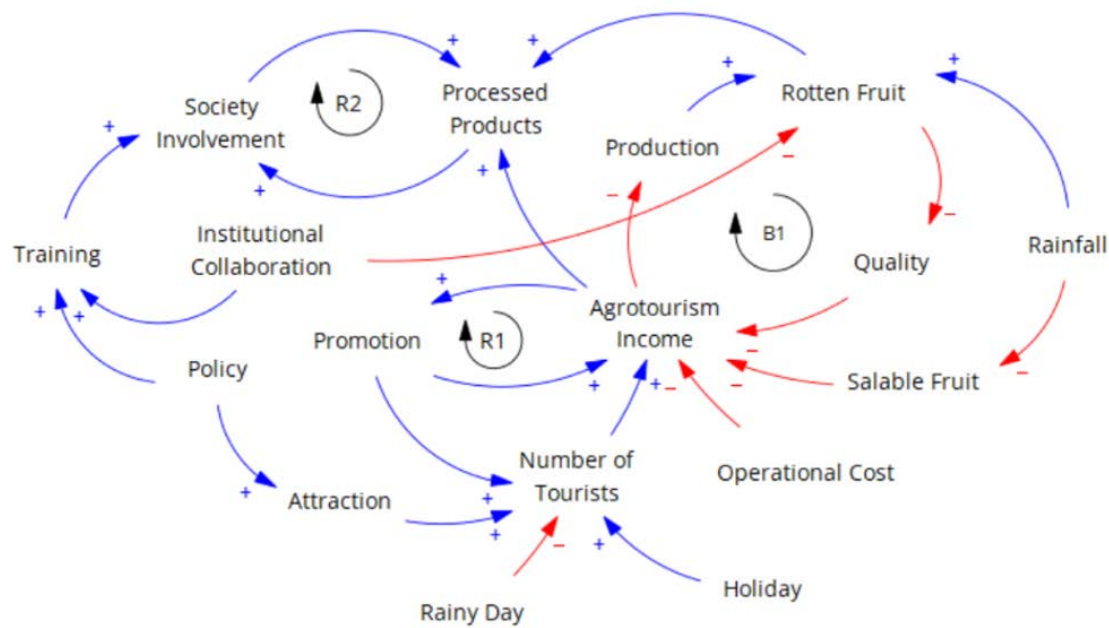


Figure 1. Causal loop diagram

In contrast, the balancing loop (B1) captured the limiting effect of environmental factors on production and quality. Higher rainfall increased the proportion of rotten fruit, which reduced product quality and the volume of salable fruit. This decline negatively affected agritourism income and overall system performance. This balancing mechanism demonstrated how environmental constraints can inhibit system growth, consistent with findings by Cavalleri et al. (2022) and Ruiz-Labrador et al. (2023), who noted that agriculture-based tourism is highly sensitive to environmental variability.

Additionally, the model showed interactions between operational cost, holidays, and rainy days, which influenced tourist visits and income fluctuations. For instance, holidays positively affected tourist numbers, while rainy days reduced visitation, indicating the sensitivity of tourism demand to temporal and climatic factors.

Following the development of the Causal Loop Diagram, the research advanced to the third stage of the system dynamics methodology, which involves the formulation of the Stock and Flow Diagram (SFD). This stage transformed the conceptual qualitative links into a quantitative structural framework to represent the dynamic behavior of the community-based agritourism system in Lumbung Stroberi. The model integrated three main subsystems production, tourism, and socio-institutional capacity which interacted through a precise set of stock variables, flow variables, and auxiliary variables. The overall structure of this quantitative model was presented in Figure 2.

In the production subsystem, the main stock variable was total strawberry production, which was influenced by inflows such as planting and harvesting processes, and outflows such as crop losses and non-salable yield. Production performance was strongly affected by environmental factors, particularly rainfall, as well as farming efficiency and cultivation practices.

An increase in production capacity contributed to a higher volume of salable strawberries, which became a critical input for agritourism activities.

The tourism subsystem was represented by the stock of tourist visits, which accumulated through the inflow of incoming visitors and decreased through outflows such as visitor decline. Tourist arrivals were influenced by several factors, including product availability, service quality, and promotional intensity. The availability of high-quality strawberries enhanced visitor satisfaction and increased revisit intention, thereby reinforcing the growth of tourist numbers. In contrast, limited product availability due to unstable production could constrain tourism performance.

The socio-institutional subsystem captured community participation and institutional capacity as key stock variables. Community participation increased through involvement in agritourism activities and capacity-building programs, while it could decrease due to declining interest or limited economic incentives. Institutional capacity influenced the effectiveness of management, coordination, and promotion, which in turn affected both production and tourism subsystems. Strong institutional support facilitated better resource management and improved the overall performance of the agritourism system.

The interactions among these subsystems formed a feedback-driven system. For example, increased tourist visits generated higher revenue, which could be reinvested to improve farming practices, product quality, and community capacity. This created a reinforcing feedback loop that supported system growth. However, the system also contained balancing mechanisms, such as environmental constraints and limited resource capacity, which could inhibit growth if not properly managed.

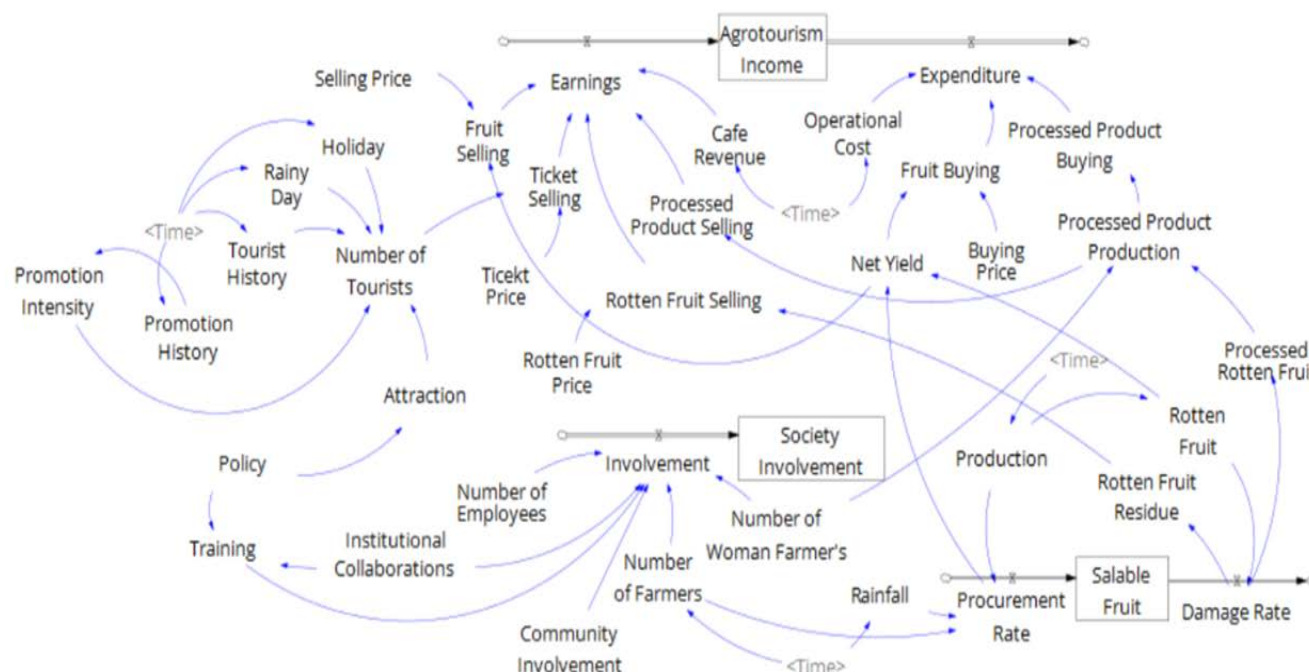


Figure 2. Stock and flow diagram

The fourth stage of the system dynamics methodology involved model testing, which began with running the Business as Usual (BAU) simulation. Within this stage, a behavioral test was conducted to verify the consistency between the model's behavior patterns and real-system behavior, particularly regarding trends, fluctuations, and the direction of change in key variables throughout the simulation period. The behavioral test was performed by comparing the model's simulation output with actual data using the Mean Absolute Percentage Error (MAPE) as the error indicator (Shrestha et al., 2021). The results of the test were presented in Tables 2 and 3.

Model Validation of Community-Based Agritourism System

To confirm the model's reliability, its behavioral integrity was evaluated by ensuring that simulation trends aligned with real-world observations, followed by formal validation using the Mean Absolute Percentage Error (MAPE) (Table 3). This metric served as the primary quantitative indicator to measure the precision of the system's outputs against empirical data, effectively highlighting the variance between predicted and actual results.

Overall, the behavioral test results demonstrated that all subsystems had MAPE values below the 10% tolerance threshold commonly used in system dynamics modeling. According to Najwa et al. (2025), a MAPE below 10% is categorized as excellent, thus confirming the model's behavioral validity. Consequently, the model was not only capable of following the direction and patterns of change in the actual system but was also suitable to serve as a reliable foundation for policy scenario analysis in the subsequent stage.

Scenario Simulation of Interventions for the 2030 Projection

Policy intervention simulations were conducted to evaluate how different management strategies influenced the behavior of key variables in the community-based agritourism system at Lumbung Stroberi. The scenarios were formulated based on observed baseline conditions, including declining production stability, fluctuating tourist visits, and limited community participation, as well as contextual assumptions derived from field findings. These simulations aimed to compare system performance under intervention scenarios with the Business as Usual (BAU) condition, thereby capturing both short-term adjustments and long-term system behavior.

The level of intervention was classified into low and high scenarios, represented by increases of 10% and 20%, respectively, to assess the sensitivity of the system to varying policy intensities (Suryani et al., 2021). Adjustments were applied to key variables in the model, including promotion intensity, production capacity, quantity of salable fruit, community involvement, institutional collaboration, and operational efficiency.

Table 4 presented the simulation results of three policy scenarios projected for 2030, namely, the Human Resources Optimization Scenario (A), the Production Optimization Scenario (B), and the Integrated Optimization Development Scenario (C), each evaluated under low (10%) and high (20%) intervention levels. The results indicated that higher intervention intensity generally led to improved system performance across economic, social, and production indicators. Scenario A, which emphasized promotion, attraction development, institutional collaboration, training, and farmer participation, demonstrated moderate improvements in agritourism income

and social collaboration, with salable fruit increasing slightly from 692 kg to 693 kg under high intervention. Scenario B, focusing primarily on production optimization, generated the highest agritourism income under the low-intervention condition (IDR 282,760,000) and substantially increased salable fruit production from 774 kg to 857 kg under high intervention, indicating strong responsiveness of production-oriented variables. Meanwhile, Scenario C, which integrated human resource development and production optimization, produced the highest overall performance under the high-intervention condition, achieving agritourism income of IDR 287,806,000, social collaboration involving 52 persons, and salable fruit production of 858 kg. These findings suggested that integrated policy interventions provided more balanced and sustainable outcomes by simultaneously strengthening production capacity, institutional collaboration, and agritourism attractiveness within the agribusiness system (Figure 3, Figure 4, and Figure 5).

Scenario C-High produced the highest modeled aggregate outcome among the simulated policy scenarios due to its ability to integrate and improve interactions among agribusiness subsystems simultaneously. Although Scenario B-High demonstrated higher responsiveness in the sensitivity analysis (Table 5), the simulation results revealed that Scenario C-High generated superior absolute outcomes, particularly in economic performance and production quality. Economically, this scenario produced the highest agritourism

income (IDR 287,806,000), nearly double that of the Business as Usual (BAU) condition (IDR 142,641,000), while tourist arrivals increased substantially from 2,701 to 8,105 visitors, indicating enhanced agritourism attractiveness. In terms of production, Scenario C-High achieved an optimal balance between quantity and quality, with harvest yield reaching 995 kg and marketable fruit amounting to 858 kg, reflecting substantial improvements in production efficiency and postharvest management while maintaining fruit loss at a controlled level. Furthermore, processed product output remained relatively stable, suggesting that the scenario successfully balanced fresh fruit sales and value-added processed products as dual income sources. Social and institutional indicators, including community involvement, local regulations, institutional cooperation, and training, also showed relatively high and stable values, indicating that economic improvements were accompanied by strengthened institutional capacity and long-term sustainability. From an agribusiness systems perspective, the superiority of Scenario C-High lay in its strong integration of upstream, farming, downstream, and supporting subsystems, creating synergistic effects that avoided imbalances between production, processing capacity, and market demand. Nevertheless, the implementation of this scenario would require greater coordination, investment, institutional capacity, and infrastructure readiness, making phased implementation essential to ensure practical feasibility in real-world agribusiness systems.

Table 2. Business as usual

Condition	Business as Usual
Agritourism Income (Rupiah)	105,925,417
Society Collaboration (Person)	48
Salable Fruit (Kg)	7,145

Table 3. Behavioral testing

Stock	MAPE (%)
Agritourism Income	0.01
Society Collaboration	5.91
Salable Fruit	0.95

Table 4. Scenario simulation

Scenario	Variable	Intervention	2030 Projection		
			Agritourism Income	Society Collaboration	Salable Fruit
Human Resources Optimization Scenario (A)	Promotion, Attraction,	10% (Low)	IDR 210,286,000	50 persons	692 kg
	Institutional Collaborations, Training, Number of Farmers	20% (High)	IDR 277,889,000	52 persons	693 kg
Production Optimization Scenario (B)	Promotion, Attraction,	10% (Low)	IDR 282,760,000	48 persons	774 kg
	Institutional Collaborations, Production	20% (High)	IDR 287,729,000	48 persons	857 kg
Integrated Optimization Development Scenario (C)	Promotion, Attraction,	10% (Low)	IDR 215,225,000	50 persons	774 kg
	Institutional Collaborations, Training, Number of Farmers, Production	20% (High)	IDR 287,806,000	52 persons	858 kg

Table 5. Sensitivity analysis of scenarios

Scenario	Intervention	Agritourism Income	Society Collaboration	Salable Fruit	Average
Human Resources Optimization Scenario	Low	0.55	0.04	0.19	0.26
	High	1.04	0.08	0.19	0.44
Production Optimization Scenario	Low	1.08	0.00	0.33	0.47
	High	1.11	0.00	0.47	0.53
Integrated Optimization Development Scenario	Low	0.58	0.04	0.33	0.32
	High	1.12	0.08	0.47	0.56

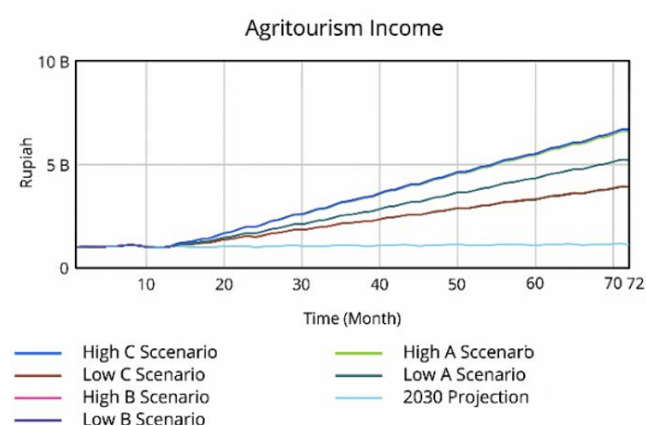


Figure 3. Agritourism income scenario results

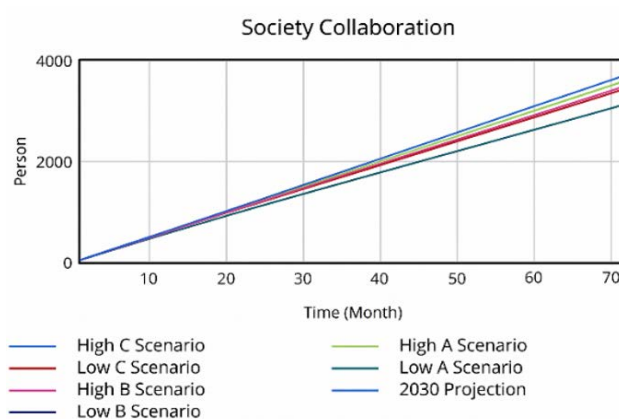


Figure 4. Society collaboration scenario results

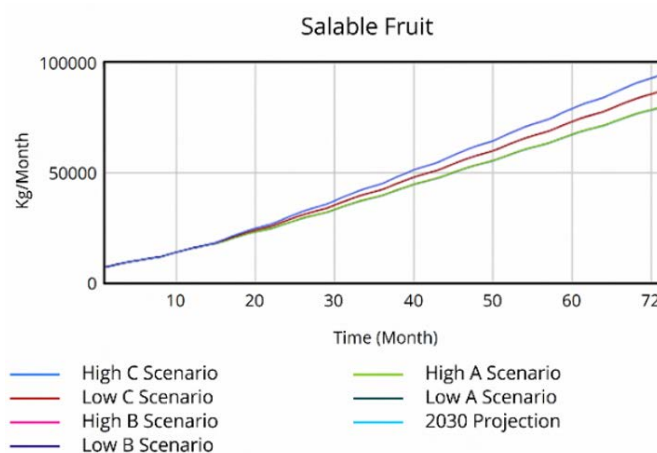


Figure 5. Salable fruit scenario results

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study shows that community-based agritourism development at Lumbung Stroberi operates as an integrated system where economic, social, and production dimensions are interdependent. The results indicate that agritourism performance is driven by the interaction between production stability, tourism demand, and institutional capacity. Simulation findings confirm that the integrated policy approach in Scenario C-High provides the best outcomes in increasing income, tourist visits, and product quality while maintaining community participation. These findings highlight that partial interventions are insufficient, and that coordinated

improvements across production, promotion, and institutional strengthening are essential for sustainable agritourism development. The system dynamics model also proves useful for understanding system behavior and supporting policy design, although its application remains context specific.

Recommendations

Based on the findings, it is recommended that agritourism managers increase the intensity and consistency of promotional activities, diversify tourism attractions to enhance visitor experience, and strengthen production capacity to ensure product availability and quality. In addition, improving human resource capacity through training and better postharvest management is essential to maintain system performance.

From a policy perspective, local governments and related institutions should support agritourism development through accessible financing schemes, infrastructure provision, and capacity-building programs that strengthen institutional collaboration. Furthermore, future research is encouraged to expand the model by incorporating additional external variables, such as climate variability and market dynamics, and by using longer time-series data to improve model accuracy and generalizability.

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