International Journal of Social and Education (INJOSEDU) e-ISSN: 3047-6151
Vol. 2 No. 7 August 2025, hal., 2154-2169

THE ANALYSIS OF POTENTIAL SCENARIOS FOR THE SUSTAINABILITY OF GRAPE AGROTOURISM IN SANGGALANGIT VILLAGE, BULELENG REGENCY

Made Chandra Sintia Dewi Wulandari
Faculty of Economics and Business, Udayana University
Corespondensi author email: dewiwulandari120.com@gmail.com

Ida Ayu Nyoman Saskara
Faculty of Economics and Business, Udayana University

Abstract

This study aims to analyze potential scenarios for the sustainable development of grape-based agrotourism in Sanggalangit Village, Buleleng Regency, and to identify the most effective scenario model to support the sector's long-term sustainability. The research is motivated by the current dominance of a production system focused on wine-making, limited product diversification, low participation of young farmers, and suboptimal stakeholder collaboration particularly with the private sector. A descriptive quantitative approach was employed, utilizing the SMIC-Prob Expert method as a probabilistic scenario analysis tool. Data were collected through questionnaires, in-depth interviews, field observations, and Focus Group Discussions (FGDs) involving 30 informants, including farmers, tourism managers, village and regency government representatives, and private sector actors such as Hatten Wines. Three main scenarios were analyzed: (1) maintaining the status quo of production, (2) market-driven product diversification, and (3) increasing local farmer participation, especially among the younger generation. The analysis reveals that the most favorable scenario is a combination of all three, with a stronger emphasis on product diversification and farmer participation. This integrated strategy is considered the most adaptive in responding to uncertainties while addressing structural challenges and leveraging development opportunities in grape-based agrotourism. Theoretically, the study reinforces the application of scenario analysis in local-based sustainable development planning. Practically, the findings offer guidance for policymakers and agrotourism stakeholders in designing training programs, facilitating innovation, and strengthening cross-sector collaboration to foster an inclusive and sustainable agrotourism ecosystem.

Keywords: Agrotourism, Grapes, Sustainability, Scenario, SMIC-Prob, Product Diversification, Farmer Participation, Sanggalangit Village.

INTRODUCTION

As an agrarian country, Indonesia has long regarded the agricultural sector as one of the main pillars of its economy, supported by abundant natural resources. Various agricultural commodities such as rice, coffee, cocoa, spices, and fruits are essential not only to meet national food demands but also for export. In addition, agriculture significantly contributes to rural welfare by creating job opportunities and strengthening local economies. On the other hand, the tourism sector also plays a

critical role in the Indonesian economy, especially in Bali Province, renowned for its natural beauty, arts, and unique culture. The diversity of attractions in nature, history, and culture has made Bali a prime destination for both domestic and international tourists. As a continually developing sector, tourism in Bali must adapt to technological advancements while preserving cultural values. Its development is expected to bring positive economic contributions, generate employment, and enhance the welfare of local communities. With synergy between the agricultural and tourism sectors, Bali's economic growth can remain sustainable and increasingly beneficial to the broader population (Made et al., 2024).

The synergy between agriculture and tourism in Bali can be further enhanced through innovation and product diversification. This combination offers opportunities for local entrepreneurs to create value-added agricultural products for the tourism sector, such as local cuisine, eco-tourism, and regional handicrafts. This approach allows local economies to grow while ensuring broader economic benefits for local communities. Government support and stakeholder collaboration are crucial in developing infrastructure, marketing, and education to improve the competitiveness of both sectors. Through strong collaboration, agriculture and tourism in Bali can develop sustainably and contribute positively to the community's prosperity.

Tourism development in Bali must be optimized to realize sustainable tourism. Sustainable tourism emphasizes development principles that encompass ecological sustainability, the preservation of local culture and wisdom (social and cultural sustainability), and economic sustainability that benefits current and future generations. Applying sustainable tourism development can positively impact the local environment and economy and improve social and cultural conditions. Therefore, sustainable development strategies must be optimally implemented to maintain the balance between economic, social, and environmental aspects, ensuring that Bali remains a premier tourism destination with wide-reaching benefits (Gede et al., n.d.).

The concept of sustainability is often referred to as "the most slippery" (Gibson, 2006). According to Fauzi (2019), the essence of sustainability lies in consistently maintaining harmonious relationships between humans and nature. Although seemingly simple, the sustainability concept is multidimensional and open to various interpretations (Akhmad Fauzi & Alex Oxtavianus, 2014). It includes the time dimension and the interaction between economic systems and natural resources. The time aspect emphasizes the importance of considering the long-term impacts of human activity on the environment, while the interaction aspect underlines the need for balance between economic development and environmental preservation. Policies that support sustainability must incorporate strategies focused not only on economic growth but also on environmental protection and social justice so that all elements can function harmoniously in the long term (Hapsoro & Bangun, 2020).

Tourism development inherently requires sustainable agricultural products as complementary elements, including fruits, vegetables, and livestock. The rapid growth of tourism should ideally be followed by an equally rapid increase in demand for local agricultural products. However, many agricultural products that could naturally be provided by local farmers are instead supplied by producers from outside Bali or even abroad (Putu Cintya Citra Devi et al., 2021).

In the context of sustainability, agritourism emerges as an alternative solution integrating agriculture and tourism. Agritourism serves not only as a tourist attraction but also as a tool for education, community empowerment, and environmental conservation. By combining tourism and agriculture, agritourism can raise awareness of sustainability issues and deliver positive impacts on both farmers and local ecosystems.

Bali, a leading tourism destination in Indonesia, is not only known for its beaches, culture, and rich traditions but also holds tremendous potential in agritourism. One of the emerging sectors is grape farming, which offers unique, educational, and interactive experiences for tourists. Supported by natural and human resources, Bali has considerable potential for agritourism development (Elvira et al., 2022). The development of agritourism in a region can bring positive effects, including job creation and increased income for local communities (Made et al., 2024). Furthermore, agritourism can educate tourists about sustainable farming practices and environmental preservation (Budiasa, 2011). These activities not only attract tourists but also raise community awareness of their local potential. Promoting local products and agricultural traditions can strengthen cultural identity while offering significant economic benefits to the community (Budiasa, 2011).

Grape agritourism has become an increasingly popular trend in Indonesia, offering visitors the unique experience of picking grapes directly from vineyards. Grapes are among the most sought-after horticultural commodities, both for fresh consumption and as raw materials for the food and beverage industry. However, grape production varies across provinces due to factors such as geography, cultivation technology, and government support. The differences in soil fertility and climate significantly affect the quantity and quality of grape production (Dermawanov et al., 2024).

Indonesia possesses vast potential in agricultural production, including grapes. Although grapes are not a primary crop, several provinces have shown significant progress in cultivation. Between 2019 and 2023, grape production exhibited notable fluctuations. National production reached 137,231 quintals in 2019 but fell to 119,052 quintals in 2020. A sharp increase was recorded in 2022, with production reaching 1,135,159 quintals before dropping again to 134,055 quintals in 2023. Bali consistently contributed the largest share of national grape production, with annual figures exceeding 100,000 quintals. Its peak production was 119,383 quintals in 2022. This success is attributed to favorable climatic conditions and a strong local grape-processing industry, especially for fermented beverages (Badan Pusat Statistik, 2024).

Bali, particularly Buleleng Regency, is one of Indonesia's grape production centers. Buleleng boasts natural beauty and abundant resources, making it a potential tourism hub. The region benefits from naturally suitable land, a hardworking farming culture, and religious traditions rooted in agriculture. Additionally, it has competitive advantages that can be enhanced through innovative technology, production efficiency, and the development of sustainable human resources. With fertile land and high market demand, horticultural commodities like grapes have high economic value and serve as a primary income source for farmers in Seririt District, Buleleng.

The number of productive grape plants increased from 368,506 in 2021 to 380,779 in 2022, then declined to 264,198 in 2023. Grape production in Gerokgak District fluctuated, producing 5,830 tons in 2021, slightly increasing to 5,868 tons in 2022, and significantly rising to 6,854 tons in 2023. Grape productivity (kg/tree) also improved, from 15.82 kg/tree in 2021 to 19.00 kg/tree in 2022, and sharply to 23.40 kg/tree in 2023. Despite minor changes in cultivated area and plant population, harvest efficiency and per-tree yield have increased in Gerokgak during 2021–2023.

This significant productivity increase suggests strong potential for grape-based agritourism development in Gerokgak. Agritourism not only adds value for farmers but also attracts tourists to engage in grape cultivation and harvesting. Farmer participation plays a crucial role in this development, as it strengthens agricultural activities and creates opportunities for involvement in sustainable, eco-friendly tourism, thereby improving community welfare (Daus, 2020).

Agritourism is a model that merges agricultural and tourism aspects to yield dual benefits. It is a form of tourism that highlights agricultural, livestock, and plantation products as primary attractions (Pertiwi et al., 2022). Grape-based products hold great potential to improve village welfare. Grape tourism offers visitors the opportunity to pick grapes, observe processing into food and beverages, and enjoy aesthetically pleasing locations (Masluki, 2024).

One of the most promising villages for grape agritourism development is Sanggalangit in Buleleng Regency. This village is located in the northern part of Bali, known for its scenic landscapes and coastal charm. It lies about 20–25 kilometers from Singaraja, the capital of Buleleng. Sanggalangit has fertile farmland and a favorable tropical climate.

Sanggalangit Village has considerable potential to become a leading grape agritourism destination. Tropical vineyards have different characteristics from those in temperate regions. With proper management—including irrigation, pruning, and regular maintenance—tropical vineyards can yield harvests up to twice a year. The tropical climate's variability, including altitude, rainfall distribution, and seasonal temperature changes, gives grapes unique characteristics and strong potential for quality wine production (Luh Putu Yuni Widyastuti & Ni Kadek Ema Sustia Dewi, 2023).

Wine tourism development in Bali has received attention in several studies. Wayan et al. (2023) highlighted that strategies at Hatten Wine Bali include educational tourism programs, quality improvement, and effective marketing to attract tourists. Gita Dewi Ayu et al. (2018) emphasized that wine tourism development in Buleleng requires synergy among agriculture, tourism, and local community involvement to generate economic and social value. Grape agritourism development in Sanggalangit holds similar potential to support sustainability and improve community welfare.

The unique tropical climate in Sanggalangit presents both challenges and opportunities. Unlike temperate regions, tropical vineyards require specific cultivation techniques to consistently produce high-quality grapes. Key factors include selecting appropriate grape varieties, applying efficient irrigation systems, and optimizing soil management.

With adequate land and increasing productivity, Gerokgak can capitalize on its advantages to build sustainable agritourism. Its consistent contributions highlight the

region's strong potential as a horticultural tourism hub. According to Wijayanti & Priyanto (2020), integrating agriculture and tourism enhances farmer welfare while offering environmentally friendly educational tourism. Therefore, integrated management and regional government support are vital to ensure sustainable grape sector development.

However, several challenges require serious attention. One major challenge is the lack of product diversification. Most grapes in Sanggalangit are sold fresh, with limited innovation. Product diversification would enhance market competitiveness and provide diverse experiences for tourists. Another challenge is the grape plants' vulnerability to diseases during the rainy season. High rainfall often causes fungal diseases, powdery mildew, fruit drop, and reduced sunlight exposure, all of which affect productivity.

Putu Ristiati et al. (2019) reported that grape plants in Bali are highly susceptible to environmental and biological diseases, reducing yield and affecting farmers who depend on their harvest. Common diseases include downy mildew, powdery mildew, leaf rust, dry rot, and fruit rot. Many farmers rely on chemical fungicides, which pose environmental risks if used excessively, potentially harming beneficial microorganisms.

Another significant challenge is the lack of close collaboration with stakeholders, particularly the private sector, which plays a crucial role in funding, marketing, and infrastructure development. Without active private sector involvement, grape agritourism in Sanggalangit may struggle in innovation, facility development, and market expansion. Strong partnerships among government, local communities, and the private sector are essential to build a supportive and sustainable agritourism ecosystem (Ministry of Tourism and Creative Economy, 2020).

Finally, sustainable agritourism strategies are essential to ensure tourism development is not only economically beneficial but also environmentally responsible and culturally respectful. Emphasizing the importance of scenario-based planning involving all stakeholders provides guidance for Sanggalangit Village to address risks such as environmental degradation, climate change, and reliance on non-renewable resources.

RESEARCH METHOD

This study employs a descriptive quantitative approach to systematically, factually, and accurately describe the phenomenon of grape agritourism sustainability based on numerical data. The research was conducted in Sanggalangit Village, Buleleng Regency, using both primary and secondary data collected through questionnaires, interviews, observations, and Focus Group Discussions (FGDs). The research subjects included local farmers, Hatten Wine managers, village residents, and local government officials such as the Agriculture Office and the Tourism Office. The variables examined in this study include the sustainability of agritourism, supporting infrastructure, farmers' roles, and market trends, all of which were analyzed to understand alternative sustainable policy scenarios and strategies (Ali et al., 2022; Sugiyono, 2017).

Sampling was conducted using purposive sampling, selecting respondents with knowledge and direct involvement in the development of grape agritourism. The sample consisted of 30 stakeholders representing key institutions in agritourism management, some of whom also participated in FGDs to deepen the discussion on sustainability scenarios. The collected data consisted of both qualitative and quantitative types. Primary data were obtained directly through interactions with respondents, while secondary data were sourced from official publications such as the Central Statistics Agency and the Agriculture Office of Buleleng Regency (Amin et al., 2023; Lenaini & Artikel, 2021; Sugiyono, 2013).

The analytical method used is SMIC-PROB, a probability theory-based method designed to construct scenario combinations based on expert judgments. This method integrates basic probabilities, conditional probabilities, and scenario sensitivity using mathematical modeling and quadratic programming. Assessments were conducted both individually and in aggregate, with data converted from Likert scales into probabilities. This analysis assists in identifying the most effective policy strategies to support the sustainability of grape agritourism. The method has proven reliable in strategic planning, as it produces systematic and data-driven scenarios for long-term decision-making (Godet et al., 2004; Fauzi, 2019; Gusti et al., 2024).

RESULTS AND DISCUSSION

Analysis of Research Data

Scenario Combination Analysis for the Sustainability of Grape Agritourism (SMIC-PROB Expert Analysis)

The initial step in the SMIC-PROB Expert analysis involves identifying the probability scenarios to be analyzed. In this study, the scenarios represent the possible actions of grape farmers in supporting the sustainability of agritourism. Based on the results of the questionnaires adjusted with FGD findings, three main scenarios (referred to as hypotheses in SMIC-PROB data input) were identified to support agritourism sustainability: (1) maintaining current production practices (Existing), (2) product diversification according to market needs (Diver), and (3) increased participation of local farmers in agritourism management (Partisipas).

Table 1. Simple Probability of Agritourism Sustainability Scenarios

Hypothesis	Probability	
	Raw Data	Net Data
H1- Production as usual (Existing)	0.5	0.586
H2- Product diversification according to market needs (Diver)	0.75	0.566
H3- Increasing the participation of local farmers in agrotourism management (Participation)	0.5	0.577

Source: Data Processed With Smic-Prob, 2025

The determination of potential sustainability scenarios is derived from the calibration process that converts raw data into net data, which is the initial step of SMIC-PROB Expert analysis to improve accuracy. Table 1 presents the changes from raw to net data. The simple probability for the Existing scenario increased from 0.5 (50%) to 0.586 (58.6%), and for Partisipas, from 0.5 (50%) to 0.577 (57.7%). On the other

hand, the probability for the Diver scenario decreased from 0.75 (75%) to 0.566 (56.6%). Subsequent analysis is based on the net data, where the highest probability scenario is Existing (58.6%), while Diver has the lowest (56.6%).

Table 2. Probability if Realized

C	Existing	Diver	Participation
1: Existing	0.586	0.564	0.418
2: Diver	0.545	0.566	0.554
3: Participation	0.412	0.554	0.577

Source: Data Processed With Smic-Prob, 2025

Based on the conditional probability analysis in Table 2, the Existing scenario has the highest likelihood of being realized at 58.6%. The probability for developing product diversification is 56.4%, while increasing local farmer participation stands at only 41.8% when the Existing scenario is realized. This implies that while the Existing scenario correlates more with product diversification, it is less effective in fostering farmer involvement.

In contrast, when the Diver scenario is implemented, the probability of maintaining the Existing scenario is 54.5%, Diver remains at 56.6%, and Partisipas is at 55.4%. This shows that product diversification has a relatively balanced effect in promoting the sustainability of agritourism from both production and farmer engagement perspectives.

Meanwhile, if the Partisipas scenario is realized, the highest probability is retaining Partisipas itself at 57.7%, followed by Diver at 55.4%, and Existing at only 41.2%. This finding indicates that increasing farmer participation more strongly promotes innovation through diversification rather than preserving the status quo in production.

Table1. Conditional Probability if Not Realized

	Existing	Diver	Participation
1: Existing	0	0.614	0.814
2: Diver	0.596	0	0.596
3: Participation	0.81	0.606	0

Source: Data Processed With Smic-Prob, 2025

If the Partisipas scenario (increasing local farmers' participation) is not implemented, as shown in Table 3, experts indicate a 59.6% probability for Diver and an 81% probability for Partisipas.

Table 4. Combined Scenario Probabilities Based on the SMIC-PROB analysis, there are 2^n scenario combinations, where n equals three scenarios, resulting in eight total combinations. A value of zero indicates a scenario is not realized, while a value of one means it is implemented. The combination with the highest probability is scenario number 2, with a probability of 0.192. This scenario (110) implies the realization of Existing and Diver, while Partisipas is not implemented. This indicates that the most

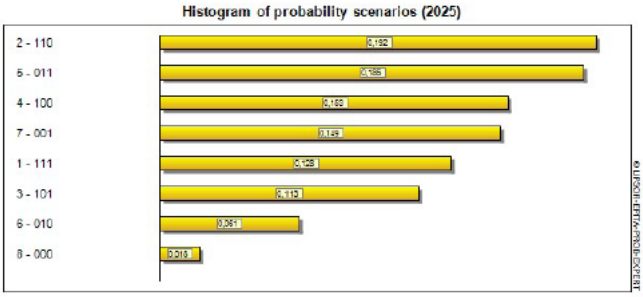
probable path for sustainable grape agritourism development is to maintain current practices while introducing product diversification.

Table 4. Probability of Combining Various Scenarios

No	Scenario Combination	Opportunity
1	111	0.128
2	110	0.192
3	101	0.113
4	100	0.153
5	011	0.186
6	010	0.061
7	001	0.149
8	000	0.018

Source: Data Processed With Smic-Prob, 2025

Figure 1. Hitogram of Probability Scenario



The probability of each sustainability scenario combination for grape agrotourism in Sanggalangit Village can be seen in Table 4. The highest probability is found in scenario combination number 2 (110), which consists of continuing current production practices and diversifying products according to market demand, without increasing the participation of local farmers, with a probability of 19.2 percent. The second highest probability is in scenario combination number 5 (011), where production is not continued as usual, but product diversification and increased local farmer participation are implemented, with a probability of 18.6 percent.

The lowest probability occurs in scenario combination number 8 (000), where none of the scenarios are implemented—neither continuing current production, diversifying products, nor increasing local farmer participation—with a probability of 1.8 percent. These results indicate that the combination of maintaining current production and product diversification is the most realistic option to implement, even without increased local farmer participation.

Table 5. The Effect of Realized Scenarios on Other Scenario Probabilities.

	Existing	Diver	Participation
1: Existing	0	-0.022	-0.168
2: Diver	-0.021	0	-0.022
3: Participation	-0.165	0.022	0

Source: Data Processed With Smic-Prob, 2025

The realization or non-realization of agrotourism sustainability actions will naturally affect other scenarios. Table 5 shows that if the "Existing" production scenario is realized, the probability of product diversification and increased local farmer participation will decrease by 2.2 percent and 16.8 percent, respectively.

Similarly, if the "Diver" scenario is realized, the probability of "Existing" decreases by 2.1 percent, and "Participation" decreases by 2.2 percent. Conversely, when the "Participation" scenario is realized, the probability of "Existing" drops significantly by 16.5 percent, but the probability of "Diver" slightly increases by 2.2 percent.

Table 6. The Effect of Unrealized Scenarios on Other Scenario Probabilities.

	Existing	Diver	Participation
1: Existing	-0.586	0.029	0.229
2: Diver	0.03	-0.566	0.03
3: Participation	0.233	0.029	-0.577

Source: Data Processed With Smic-Prob, 2025

Table 6 shows the probabilities when scenarios are not implemented. When the scenario of increasing local farmer participation in agrotourism is not realized, the probability of "Existing" increases by 23.3 percent and "Diver" increases by 2.9 percent. However, the probability of participation itself decreases significantly by 57.7 percent.

Analysis of the Driving Scenarios for Grape Agrotourism Sustainability

Elasticity, which measures the responsiveness of probability changes from one scenario to another, is referred to as sensitivity analysis in SMIC-Prob Expert. Table 7 presents the elasticity results, where the last column (horizontal summation) shows the absolute value of elasticity for each scenario, interpreted as the prime mover of the system. The last row (vertical summation) indicates the most conditioned scenarios.

Table 7. Scenario Elasticity

	Existing	Diver	Participation	Absolute Value
1: Existing	1	-0.753	-1.127	1.88
2: Diver	-0.6	1	-0.602	1,201
3: Participation	-1.09	-0.738	1	1,828
4: Absolute value	1.69	1,491	1,729	-

Source: Data Processed With Smic-Prob, 2025

Based on the scenario relationship matrix in Table 7, the "Existing" scenario has the highest absolute value (1.880), indicating the strongest effect in the sustainability system of grape agrotourism in Sanggalangit Village. However, the "Existing" scenario shows negative relationships with others: -0.753 with "Diver" and -1.127 with

"Participation", suggesting that maintaining current production is not aligned with diversification or local farmer involvement.

The "Diver" scenario has an absolute value of 1.201 and shows a negative effect on "Participation" (-0.602), implying that product diversification tends to be driven by business operators rather than local farmers. The "Participation" scenario has a high influence (1.828) but also negatively affects the other two, indicating that increasing farmer involvement may reduce the likelihood of maintaining production or diversification efforts.

Table 8. Recapitulation of Opportunities for Each Scenario

Number	Existing	Diver	Participation	Probability
2	1	1	0	0.192
5	0	1	1	0.186
4	1	0	0	0.153
7	0	0	1	0.149
1	1	1	1	0.128
3	1	0	1	0.113
6	0	1	0	0.061
8	0	0	0	0.018
	0.586	0.567	0.576	1,000

Source: Data Processed With Smic-Prob, 2025

Table 9. Comparison of Actual Production as Usual

Number	Scenario Combination	Existing Opportunities = 1	Number	Scenario Combination	Existing Opportunity = 0
5	“011"	0.186	2	“110”	0.192
7	“001”	0.149	4	“100”	0.153
1	“111”	0.128	6	“010”	0.061
3	“101”	0.113	8	“000”	0.018
	Amount	0.576		Amount	0.424

Source: Data Processed With Smic-Prob, 2025

Sensitivity analysis on the most likely scenarios and the size of the probability of implementation is presented in Tables 8 and 9. Table 8 shows that the "Existing" scenario has the highest overall probability (0.586 or 58.6%). Table 9 distinguishes between realization (‘1’ as the first digit) and non-realization (‘0’ as the first digit) of the "Existing" scenario. The probability of realization is 0.576, while non-realization is 0.424, confirming a higher chance of realization.

Sensitivity Analysis of the Sustainability Scenarios of Grape Agrotourism in Sanggalangit Village, Buleleng Regency

Sensitivity analysis was carried out to identify the role of each scenario in the sustainability system, whether as a driver or a dependent. Using the SMIC-Prob Expert approach, sensitivity is analyzed in two dimensions: influence sensitivity (the effect on other scenarios) and dependence sensitivity (how much a scenario depends on others). The results are visualized in histograms.

Picture1. Hitogram of Influence Sensitivity

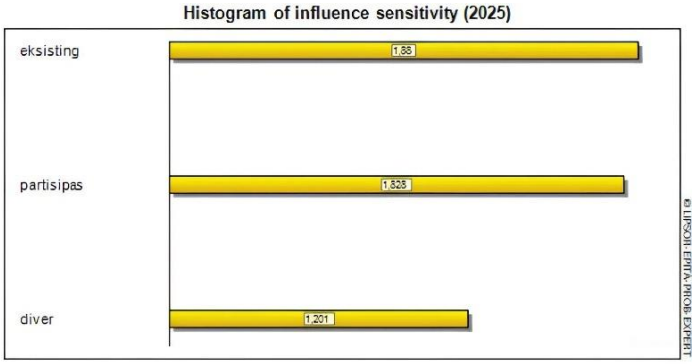


Figure 2. Histogram of Influence Sensitivity illustrates the extent to which each scenario affects other scenarios within the sustainability system of grape agrotourism in Sanggalangit Village. The higher the influence value, the greater the ability of a scenario to steer the overall dynamics of the system. Scenarios with high influence values are categorized as prime movers in the sustainability framework.

The analysis reveals that the Existing scenario (continuing current production practices) has the highest influence value of 1.880, followed by Participation (increased involvement of local farmers) at 1.828. Meanwhile, Diver (product diversification) shows the lowest influence value, at 1.201.

These findings indicate that Existing and Participation are the two scenarios with the most significant effect on the overall system's continuity. Although the Participation scenario does not appear in the most optimal scenario combination (110), this histogram underscores the strategic long-term importance of farmer participation. In other words, the sustainability of agrotourism should not solely rely on production stability and product innovation, but also heavily depends on the extent to which local communities are engaged in both planning and implementation processes.

Conversely, Product Diversification can be categorized as a strategic response, whose success is highly dependent on production stability and farmer involvement. In other words, diversification is not a primary driver, but rather a relevant strategic option to be pursued after the two main scenarios—Existing and Participation—are optimally executed.

Picture 2. Hitogram of Dependence Sensitivity

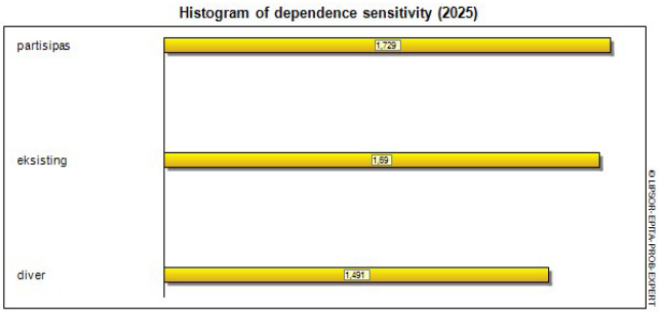


Figure 3. Histogram of Dependence Sensitivity measures the extent to which each scenario within the sustainability system is affected by other scenarios. A high dependence value indicates that the success of a given scenario is strongly influenced by the implementation of other interconnected scenarios. Scenarios with high dependence values are referred to as conditioned scenarios, meaning that they cannot operate optimally without support from other contributing factors.

The analysis shows that the Participation scenario (increased involvement of local farmers) has the highest dependence value at 1.729, followed by the Existing scenario (continuing current production practices) at 1.690. This implies that although both scenarios exert significant effects on the sustainability of the system, they are also highly dependent on the successful implementation of other scenarios. For example, local farmer involvement can only be effective if supported by a stable production system, adequate infrastructure, and responsive village-level institutions (Suryawan, 2018). Likewise, production activities cannot function optimally without efficient distribution systems, active government support, and community participation.

Meanwhile, the Diversification scenario (product innovation) holds the lowest dependence value, at 1.491, indicating that diversification is a more flexible strategy and relatively less reliant on the success of other scenarios. Nevertheless, its implementation still requires support from local farmers and a consistent supply of raw materials. Without sustained production and strong support from local business actors, the development of processed grape products could face significant challenges and may struggle to remain competitive.

Therefore, despite variations in the levels of interdependence among scenarios, the results emphasize that the sustainability of agrotourism necessitates effective coordination among various actors—farmers, local governments, tourism managers, and village communities so that all scenarios can reinforce one another and function synergistically.

CONCLUSION

This study aims to analyze strategic scenarios to support the sustainability of grape agrotourism in Sanggalangit Village, Buleleng Regency. Using the SMIC-Prob Expert method, a total of 110 scenario combinations were analyzed to evaluate the influence and dependence relationships among the scenarios. Among all combinations, three primary scenarios emerged as the focus: Business as Usual (Existing), Increased Participation of Local Farmers (Participation), and Product Diversification (Diversification).

The analysis results indicate that the Existing scenario has the highest influence value at 1.880, followed by the Participation scenario with 1.828, making them the most capable scenarios in driving the overall sustainability of the agrotourism system. However, both scenarios also exhibit high dependence values, 1.690 and 1.729 respectively, indicating that their implementation is highly reliant on other supporting systems, such as local institutions, production facilities, and agricultural distribution infrastructure.

Meanwhile, the Product Diversification scenario has the lowest influence and dependence values, at 1.201 and 1.491, respectively. This suggests that it is a flexible scenario and can be developed as a complementary strategy to the main initiatives. Product diversification may involve processing grapes into juice, syrup, snacks, or other value-added products. However, its success still depends on the sustainability of the raw material supply from production activities and the active participation of farmers.

In the context of external learning, the agrotourism development practices implemented by Hatten Wines in Bali illustrate efforts to integrate grape production with educational tourism through activities such as grape-picking tours. This form of tourism is particularly appealing to foreign tourists, who represent the dominant segment of visitors. Nevertheless, the involvement of local farmers in this system remains limited. Farmer participation, especially among younger generations, has yet to reach optimal levels due to low interest in agricultural activities and the dominance of corporate-based management systems. This indicates that approaches such as those implemented by Hatten Wines cannot be directly adopted in villages like Sanggalangit, which are better suited for community-based models. The development of agrotourism in rural areas should be designed with consideration of social values, community structures, and the available local capacities.

In conclusion, the analysis shows that the sustainability of grape agrotourism in Sanggalangit Village strongly depends on strengthening the production system and the active participation of farmers. Sustainable grape production serves as the main driver of the system, while farmer involvement is a key interrelated element. Both aspects must be implemented simultaneously and supported by local institutions, the provision of production facilities, and coordination among village stakeholders. Meanwhile, the product diversification strategy holds potential as a complementary element, provided that it is developed gradually and based on the strength of the core production system. The success of this agrotourism system lies in the synergy among local actors, long-term collaboration, and shared awareness in building an independent, innovative, and sustainable agrotourism model.

REFERENCES

Akhmad Fauzi, & Alex Oxtavianus. (2014). 445-2435-1-PB. *Pengukuran Pembangunana Berkelanjutan Di Indonesia*.

Ayu Nyoman Saskara, I., Putu Wiwin Setyari, N., Dewa Ayu Made Natasah Dewani, I., Made Marysha Dewi, D., & Putu Diah Merta Lestari, D. (2024). Prospective analysis of Simantri sustainability: A probability approach. *Jurnal Ekonomi Dan Bisnis*, *27*(1), 21–42. www.ejournal.uksw.edu/jeb

Ariani, N. M. P., & Utama, M. S. (2024). ANALISIS PENGARUH SEKTOR PARIWISATA DAN PDRB TERHADAP PAD KABUPATEN/KOTA DI PROVINSI BALI. *E-Jurnal Ekonomi dan Bisnis Universitas Udayana*, *13*(03).

Atkisson, A. 1999, Believing Cassandra: An Optimist Looks at a Pessimist's World. USA: Chelsea Green Publishing Company.

Ali, Mm., Hariyati, T., Yudestia Pratiwi, M., & Afifah Sekolah Tinggi Agama Islam Ibnu Rusyd Kotabumi, S. (2022). Metodologi Penelitian Kuantitatif Dan Penerapan Nya Dalam Penelitian. In *Education Journal.2022* (Vol. 2, Issue 2).

Budiasa, I. W. (n.d.). *KONSEP DAN POTENSI PENGEMBANGAN AGROWISATA DI BALI*.

Daus. (2020). *PARTISIPASI PETANI DALAM PENGEMBANGAN ECO-AGROWISATA DI SUBAK SEMBUNG KELURAHAN PEGUYANGAN KECAMATAN DENPASAR UTARA*.

Dewani, I. D. A. M. N., Saskara, I. A. N., & Setyari, N. P. W. (2023). The role of stakeholders in the sustainability of the Simantri program in Tabanan. *JPPI (Jurnal Penelitian Pendidikan Indonesia)*, *9*(2), 659–668.

Dermawanov, M. O., Sunardi, A. P., Arifa, H. T., & Annaba, A. R. (2024). Mitigasi Risiko Produksi Anggur Di Pusat Bibit Dan Edukasi Budidaya Anggur Tangerang Selatan. *Sharia Agribusiness Journal*, *4*(1). https://doi.org/10.15408/saj.v1i1.38187

Dragulanescu, I. V., Lanfranchi, M., & Giannetto, C. (2016). Agritourism farm in rural development framework and environmental sustainability. *Calitatea*, *17*(S1), 42.

Elvira, S., Putra, R. E., & Rahman, H. (2022). ANALISIS STATUS KEBERLANJUTAN AGROWISATA BERBASIS PERTANIAN BERKELANJUTAN: STUDI KASUS KEBUN STRAWBERRY UPANG. *JSEP (Journal of Social and Agricultural Economics)*, *15*(2), 123–136.

Fauzi, Akhmad. (2019). *Teknik Analisis Keberlanjutan*. Jakarta : PT. Gramedia Pustaka Utama.

Fuzi Akhmad, & Oxtavianus Alex. (n.d.). *Pengukuran Pembangunan Berkelanjutan di Indonesia*.

Gede, I., Joendra, D., Putra, S., Karmini, N. L., & Wenagama, W. (n.d.). *E-JURNAL EKONOMI DAN BISNIS UNIVERSITAS UDAYANA*. https://ojs.unud.ac.id/index.php/EEB/index

Gibson, R. B. (2006). Sustainability assessment: Basic components of a practical approach. *Impact Assessment and Project Appraisal*, *24*(3), 170–182. https://doi.org/10.3152/147154606781765147

Gita Dewi Ayu, P., Made Kusuma Negara, I., & Gede Leli Kusuma Dewi, L. (2018). *STRATEGI PENGEMBANGAN WINE TOURISM DI KABUPATEN BULELENG-BALI*.

Gusti, I., Mira, A., Putri, A., Ayu, I., & Saskara, N. (2024). Skenario potensial pariwisata berkelanjutan melalui pemberdayaan perempuan: Analisis skenario SMIC-Prob untuk Desa Penglipuran, Bali, Indonesia. *Jurnal Perspektif Pembiayaan Dan Pembangunan Daerah*, *12*(3), 2355–8520. https://doi.org/10.22437/ppd.v12i3.35575

Hapsoro, N. A., & Bangun, K. (n.d.). *L A K A R PERKEMBANGAN PEMBANGUNAN BERKELANJUTAN DILIHAT DARI ASPEK EKONOMI DI INDONESIA*.

Ingrassia, M., Altamore, L., Bellia, C., Grasso, G. Lo, Silva, P., Bacarella, S., Columba, P., & Chironi, S. (2022). Visitor's motivational framework and wine routes' contribution to sustainable agriculture and tourism. *Sustainability*, *14*(19), 12082.

Lenaini, I., & Artikel, R. (2021). *TEKNIK PENGAMBILAN SAMPEL PURPOSIVE DAN SNOWBALL SAMPLING INFO ARTIKEL ABSTRAK*. *6*(1), 33–39. https://doi.org/10.31764/historis.vXiY.4075

Luh Putu Yuni Widyastuti, & Ni Kadek Ema Sustia Dewi. (2023). Productivity and Brix value of Green Grapes (Vitis vinifera L var. Muscat Saint Vallier) at Different Location and Pruning Time in Buleleng Bali. *SEAS (Sustainable Environment Agricultural Science)*, *7*(2), 139–144. https://doi.org/10.22225/seas.7.2.8222.139-144

Made, N., Ariani, P., & Utama, M. S. (n.d.). *E-JURNAL EKONOMI DAN BISNIS UNIVERSITAS UDAYANA ANALISIS PENGARUH SEKTOR PARIWISATA DAN PDRB TERHADAP PAD KABUPATEN/KOTA DI PROVINSI BALI*. https://ojs.unud.ac.id/index.php/EEB/index

Made, P., Widiningsih, W., Ayu, P., & Purwanti, P. (n.d.). *ANALISIS FAKTOR-FAKTOR YANG MEMPENGARUHI TINGKAT PENDAPATAN PEKERJA PADA KAWASAN AGROWISATA DI KABUPATEN GIANYAR*

Medina, E., de Arce, R., & Mahía, R. (2015). Barriers to the investment in the Concentrated Solar Power sector in Morocco: A foresight approach using the Cross Impact Analysis for a large number of events. *Futures*, *71*, 36–56. https://doi.org/10.1016/j.futures.2015.06.005

Nugraha, I. G. P. (2017). Pengembangan Agrowisata Anggur Berbasis Masyarakat Di Desa Banyupoh, Kecamatan Gerokgak, Kabupaten Buleleng-Bali. *Jurnal Ilmu Sosial Dan Humaniora*, *6*(1), 20–30.

Nur Fadilah Amin, Sabaruddin Garancang, & Kamaluddin Abunawas. (2023). *KONSEP UMUM POPULASI DAN SAMPEL DALAM PENELITIAN*.

Pertiwi, T. A., Noechdijati, D., & Dharmawan, B. (2022). Analisis Kesediaan Membayar (Willingness to Pay) Pengunjung dalam Upaya Pengembangan Agrowisata "Sweetberry" di Kabupaten Cianjur. *Jurnal Ekonomi Pertanian Dan Agribisnis*, 6(2), 500. https://doi.org/10.21776/ub.jepa.2022.006.02.15

Putu Cintya Citra Devi, P., Kembar Sri Budhi, M., Wayan Wenagama, I., & Ekonomi Pembangunan Fakultas Ekonomi dan Bisnis, J. (2021). *ANALISIS STRUKTUR PASAR KOMODITAS ANGGUR BALI DI TINGKAT KONSUMEN LOKAL DAN PASCA DIPROSES MENJADI WINE*.

Putu Ristiati, N., Ayu Putu Suryanti, I., Putu Manik Widiyanti, N. L., Rai Sudiatmika, A., & Pradipta Utama, A. (2019). Characterization of endophyt fungi in bali grapevine (vitis vinifera l. var alphonso lavalle) in Buleleng, Bali. *Journal of Physics: Conference Series*, *1317*(1). https://doi.org/10.1088/1742-6596/1317/1/012083

Selma Hassan, W., Holtz, S., Tansey, J., & Whitelaw, G. (2005). *ASSESSMENT ROBERT B. GIBSON Criteria and Processes*.

Sugiyono. (2017). *Metode Penelitian Kuantitatif, Kualitatif Dan R&D*.

Suryawan. (2018). *E-Jurnal Agribisnis dan Agrowisata Model Partisipasi Petani dalam Pengembangan Agrowisata di*. *7*(3). https://ojs.unud.ac.id/index.php/JAA415

Wayan, N., Utami, A., Nur Efendi, M., Wayan, I., & Mahendra, E. (2023). *STRATEGI PENGEMBANGAN WINE TOURISM DI HATTEN WINE BALI*.

Wijayanti, D. E., & Priyanto, M. W. (2020). *AGRISCIENCE PENGARUH URBANISASI TERHADAP LAHAN GARAPAN DI INDONESIA THE EFFECT OF URBANIZATION ON ARABLE LAND IN INDONESIA*. https://journal.trunojoyo.ac.id/agriscience