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Sustainable Strategic Management for the Development of a Stingless Bee Agrotourism Park in Bukit Sandy, West Java, Indonesia

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ABSTRACT

Bukit Sandy is a citrus plantation area located in Bandung, Indonesia and has been integrated with the cultivation of stingless bees to increase the productivity of citrus fruits. The area is open for visitors, but the current facilities are still inadequate and the number of visitors to Bukit Sandy is still limited during the citrus harvesting season. Hence, this study aimed to evaluate the tourism potential of Bukit Sandy as a stingless bee agrotourism park using internal and external factor analysis as well as Strengths-Weaknesses-Opportunities-Threats analysis. In addition, strategic planning for the development of stingless bee agritourism using Quantitative Strategic Planning Matrix was also analyzed. The results revealed that Bukit Sandy has the potential to be developed as a stingless bee agrotourism park. Potential tourist objects and attractions in Bukit Sandy have been identified with the highest score recorded for market potential followed by tourism attractions. Based on the results of this study, 15 alternative strategies were formulated for the development of a stingless bee agrotourism park in Bukit Sandy which includes creating a site plan that emphasizes the education aspects of stingless bees and bee villages. The tourist capacity was calculated as 35 tourists per day, with an average visit duration of 3.07 hours, and targeting a market segment comprising individuals aged 15-35 years old. The recommended strategy for the development of stingless bee agrotourism in Bukit Sandy is the implementation of a tourism management system aligned with sustainable tourism principles. This finding provides valuable insight for development of stingless bee agrotourism in tropical regions, particularly in Indonesia.

1. INTRODUCTION

Stingless bees are eusocial bees characterized by a caste system comprising queens, males, and workers. These bees produce relatively small amounts of honey compared to honeybees but are known for producing six times more crude propolis [1, 2]. Stingless bees are prevalent in numerous tropical regions, with a significant presence in Indonesia. They have been extensively cultivated in Indonesian archipelago, including Sumatera, Java, Kalimantan, Sulawesi, Bali, Nusa Tenggara, and Maluku [3]. Numerous studies have been conducted on stingless bees, focusing on their role as pollinators for agricultural crops, and these studies consistently demonstrate can enhance pollination efficacy and increase overall productivity in agricultural crops [4-6].

The cultivation of stingless bees in agricultural crops, known as meliponiculture, has seen notable advancement in the past decade [7-9]. This practice can increase the economic value of agricultural crops such as chilies and tomatoes [10]. Furthermore, the economic value of the citrus variety Rimau Gerga Lebong (RGL) has increased in Bukit Sandy, Mekarsaluyu, Bandung Regency, West Java, Indonesia [5, 11]. Bukit Sandy is a tourist destination that integrates agrotourism, emphasizing the principles of organic farming [12].

Bukit Sandy is a hilly terrain and natural vegetation, and offers an enchanting natural landscape. The management envisions transforming this area into a popular destination, providing visitors with new and unique experiences. Currently part of RGL citrus picking tourism, the reliance on fruit picking is deemed unsustainable due to RGL citrus' limited harvest times. To address this issue, the development of stingless bee agrotourism in Bukit Sandy creates opportunities for collaboration between universities and Bukit Sandy's management. This collaboration could be motivated by universities' desire to demonstrate the results of downstream research, while also allowing Bukit Sandy's management to realize their vision.

Stingless bee agrotourism incorporates an educational concept that utilizes developed technologies, including beehives such us Modular Tetragonula Hives (MOTIVEs) [13], and techniques for utilizing stingless bee cerumen to produce propolis with high antioxidant properties [1, 2]. Tourists are going to learn a lot about new insights, experiences, and knowledge [14] about beekeeping and the use of its products. In addition, there will be an integrated farming concept that uses a variety of plants and animals to achieve zero waste and sustainable agriculture [15]. However, it is noteworthy that stingless bee agrotourism has not been

thoroughly investigated in terms of its appeal to tourists, presenting potential for development of sustainable tourism.

Sustainable tourism requires a comprehensive assessment of ecological, economic, and social aspects [16]. Balancing and integrating these dimensions are crucial for ensuring that tourism practices are environmentally responsible, economically viable, and socially beneficial in the long term [17, 18]. The collaboration of various stakeholders, including academia, government, and business owners, is essential to bring plans for sustainable tourism to succeed. This multi-faceted approach ensures that efforts are coordinated, and diverse perspectives are taken into account, facilitating the successful implementation of sustainable tourism initiatives [19].

This study aimed to evaluate the tourism potential of Bukit Sandy with a focus on identifying opportunities for stingless bee agrotourism using Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) with Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis. The findings from this analysis will be utilized to identify critical tourism components and inform strategic planning for the development of a stingless bee agrotourism in Bukit Sandy that focuses on education using Quantitative Strategic Planning Matrix (QSPM) analysis that can offer valuable insights for the sustainable strategic management of stingless bee agrotourism.

2. METHODS

2.1 Location and sampling of respondents

This study was conducted at Bukit Sandy (6°51'30.8" S, 10739'23.3" E, 1.078 meters above sea level). This location was selected based on inclusion criteria including agrotourism utilized organic farming with cultivated stingless bees and was easily accessible. Observations and data collection were carried out from March to September 2021.

The number of samples in this study was determined using a purposive sampling technique [17, 20]. Prospective tourists were sampled with all respondents residing in West Java, Indonesia. This criterion was applied as an initial step to review the interest of the people of West Java regarding the attractiveness of a stingless bee agrotourism as a tourist destination. The sample size was estimated based on the number of tourists from West Java Province in 2019 with the total tourist population estimated to be 38,429,728 people [21]. The number of samples was calculated using Slovin's formula as shown in Eq. (1).

$$n = \frac{N}{1 + N(e)^2} \tag{1}$$

where:
n = number of samples required
N = total population
e = sample error rate (in this study 10%)

According to the calculations, 100 potential tourists were sampled. Prospective tourists were prioritized according to their demographics: students, educational staff, and related agencies. However, potential tourists could come from a variety of backgrounds. Informed consent was obtained from all respondents in this study.

2.2 Data collection

Primary data in this study was obtained from observations, interviews, and questionnaires. Observations were carried out to see the immediate situation and potential that could be developed, while interviews were conducted with the Bukit Sandy management, the Tourism and Culture Department of Bandung Regency, the Secretary of Mekarsaluyu Village, the Tourism Awareness Group of Mekarsaluyu Village, related academics, and beekeepers. Questionnaires were given to prospective tourists. In addition, secondary data from the literature was also used in this study.

2.3 Data analysis

The potential of tourist objects and attractions in Bukit Sandy was analyzed using a scoring method based on the Guidelines for Natural Tourism Objects and Attractions Analysis from the Directorate General of Forest Protection and Nature Conservation, Ministry of Forestry in 2003 [22]. These methods were modified according to the particulars of the research location. Ten criteria were assessed by interviewing related parties and analyzing the data from field observations. These criteria were then analyzed and scored by using Eq. (2) [23]. The score obtained was determined by calculating the interval level of the potential of each criterion. Each criterion fell into one of three categories: low potential, average potential, and high potential [24]. The interval levels were calculated using Eq. (3).

$$S = N \times B \tag{2}$$

where:
S = score of a criterion
N = total value of the elements of a criterion
B = weighted value

$$Interval = \frac{Maximum\ score - Minimum\ score}{Number\ of\ classification\ categories} \tag{3}$$

In this study, physical carrying capacity refers to the maximum number of visitors who can physically enter the tourist area, which is dependent on the desired comfort of travel [25] as calculated using Eqs. (4) and (5). The real carrying capacity is the actual carrying capacity, which describes the maximum number of tourists that can be supported for a given suite of correction factors and can be calculated using Eq. (6). Correction factors can be calculated using Eq. (7) with the maximum value of the correction factor (Mt) for the rainfall index correction factor (Cf_1) was set to 7, the highest index value in the Schmidt-Ferguson classification. The Schmidt-Ferguson classification is a method commonly used to categorize regions into similar climates which is based on the ratio of the average number of dry months to the average number of wet months [26].

$$PCC = A \times \frac{1}{B} \times Rf \tag{4}$$

$$Rf = \frac{Number\ of\ area\ opening\ hours}{average\ visit\ time} \tag{5}$$

where,

PCC = Physical carrying capacity (tourists/day)
A = Area used for tourism (m^2)
B = Area needed so that tourists still get comfort (65 m^2)
Rf = Coefficient of rotation or exchange of visits per day

$$RCC = PCC \times Cf_1 \times Cf_2 \times \ldots \times Cf_n \quad (6)$$

$$Cf = 1 - \frac{Mn}{Mt} \quad (7)$$

where,
RCC = real carrying capacity (tourists/day)
PCC = physical carrying capacity (tourists/day)
Cf = correction factor

The Mt value of the slope correction factor (Cf_2) was set to 100 based on the Decree of the Minister of Agriculture No. 837 issued in 1980 regarding the classification of land slopes [27]. Finally, the Mt value for the vegetation correction factor (Cf_3) was set to 1 based on the Simpson Diversity Index, which is a measure of diversity that considers the number of species present and the relative abundance of each species [25]. The effective carrying capacity was a combination of the actual carrying capacity and the management capacity as calculated using Eqs. (8) and (9). In this study, the value used for the management capacity (MC) was based on the number of employees.

$$ECC = RCC \times MC \quad (8)$$

$$MC = \frac{Rn}{Rt} \times 100\% \quad (9)$$

where,
ECC = effective carrying capacity (tourists/day)
RCC = real carrying capacity (tourists/day)
MC = management capacity
Rn = number of actual employees
Rt = number of employees required

The first stage in strategic planning was to map the internal and external factors on an Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) matrix [20, 28, 29]. The IFE and EFE matrix were generated in five steps: (i) The key internal and external factors were listed, with strengths and weaknesses in internal factors. For external factors, opportunities were listed first followed by threats; (ii) Each factor was assessed ranging from 0.0 (not important) to 1.0 (very important); (iii) A rating was assigned to each factor based on the current conditions in Bukit Sandy. For key internal factors, a rating between 1 and 4 was given, with 4 indicating great strength and 1 indicating a significant weakness. For key external factors, the ratings ranged between 1 and 4, where 4 represented a superior response, 3 denoted an above-average response, 2 indicated an average response, and 1 represented a poor response; (iv) Each factor's weight was multiplied by its rating to obtain a balanced score; (v) The balanced scores were added up to calculate the total balanced score [30].

The Strengths-Weaknesses-Opportunities-Threats (SWOT) matrix was used during the matching stage of strategic planning. The SWOT matrix aimed at mapping the internal and external factors and using them to develop strategies. Four strategies were produced: S-O, W-O, S-T, and W-T. The steps used to formulate the SWOT involved the firm's key strengths, weaknesses, opportunities, and threat factors and then matched the internal strengths with external opportunities and then recorded them in the SO strategies cell. The same was recorded for matching other factors to produce WO, ST, and WT strategies [20, 30].

The last stage in strategic planning was the Quantitative Strategic Planning Matrix (QSPM). The steps taken to create a QSPM were as follows: (i) Input the list of internal and external keys that have been created in the IFE and EFE matrix; (ii) Input various alternative strategies in the top row of the QSPM and determine the attractiveness score; (iii) Multiply the weight with the attractiveness score to calculate the Total Attractiveness Score (TAS); (iv) Add up all TAS scores to find out the most attractive strategy from each alternative strategy [20, 30].

3. RESULTS AND DISCUSSION

3.1 Identification of tourism objects and attractions in Bukit Sandy

Potential tourism objects and attractions were investigated to identify, assess, and analyze the aspects of Bukit Sandy that could support tourism activities. The assessment on five indicators was categorized as having high potential, such as tourist attraction, accessibility, market potential, security, and accommodation (Table 1). Four indicators were categorized as having average potential, such as the conditions around the area, facilities and infrastructure, the availability of clean water, and the relationship with surrounding tourist objects. Criteria that were deemed to have low potential were management and service.

Tourist attractions need to satisfy and create special memories in tourists [31]. Views of the Bandung City and RGL's citrus plantations were the main highlights of Bukit Sandy. The intrinsic natural view of a location was a distinct and captivating draw for tourists [32]. Similarly, accessibility was the main factor that must be considered to assess the tourism potential of the location. The market potential of tourism was positively influenced by being closer to the city center [33]. Bukit Sandy was located less than 10 km from the provincial capital, indicating that it has a high potential for the development of tourism. The assessment of the high market potential of the region also considered the sociodemographic status of the West Java population, who have a relatively high ability to travel. Sociodemographic factors can affect the potential of the tourism market and can be used as a variable to predict travel behavior patterns [34].

Activities that could interfere with security included the use of pesticides by the local community in the agricultural land within the tourist area. Guaranteed tourist security could contribute to the creation of a positive image for a tourist destination, especially agritourism [35]. In addition, accommodations in tourist destinations were defined as commercial facilities that provided locations to rest and offered temporary lodging [36]. Accommodation in the area surrounding Bukit Sandy was judged to have high potential because it was supported by many inns that were less than 3 km from Bukit Sandy. The conditions around the Bukit Sandy area were categorized as having an average potential for tourism development.

Table 1. The assessment results of the identification potential objects and tourist attractions in Bukit Sandy

No.	Criteria	Total Score	Category
1.	Tourism attractions • Panorama • Variety of tourism activities • The number of prominent natural resources • Distinctiveness within the region • Comfort of an area • Location cleanliness	858	Very potential
2.	Availability of clean water • Volume • Distance to the location of clean water • The ability of water to flow to tourist sites • Eligibility of consumption	675	Potential
3.	Accessibility • Conditions and mileage from the capital • Travel time from the provincial capital • Frequency of transportation to the area	350	Very potential
4.	Conditions around the area • Space for visitors • Local community unemployment rate • Education level • Soil fertility • Community response to tourism objects	588	Potential
5.	Market potential • Total population of province • Level of tourism demand	925	Very potential
6.	Safety • Visitor safety • Fire • Illegal logging • Encroachment	500	Very potential
7.	Management and services • Management • Language skills • Service	240	Less potential
8.	Facilities and infrastructure • Facilities • Infrastructure	126	Potential
9.	Accommodation • Number of rooms (Maximum distance 15 km from tourist area)	90	Very potential
10.	Relationship with surrounding attractions • Distance up to 50 km (Similar and dissimilar attractions)	130	Very potential

The unemployment rate in the Mekarsaluyu Village community ranged between 6-15%, this could be an opportunity to recruit employees from the local community. Supporting facilities and infrastructure were also categorized as having an average potential. Facilities and infrastructure are essential because they can affect tourist satisfaction and comfort at tourist destinations [37, 38]. The relationship with surrounding tourist objects indicator was used to review other attractions in the nearby area. There were more than five dissimilar attractions within 50 km. The only similar tourist attraction was Tani Kota. Dissimilar tourist objects could potentially allow for the creation of tour packages that could support additional visits [17, 35]. Management and services were considered to have a low potential in the development of tourism. One factor that affected the poor management and services in Bukit Sandy was the lack of human resources. Human resources are critical factors in tourism because they contribute to the creation of new values in the tourism market [32]. In addition, the construction of facilities at Bukit Sandy is progressing slowly, and visitor services were directly handled by the owner.

3.2 Internal and external factors analysis for Bukit Sandy

Identifying internal and external factors was one of the initial stages of strategic planning and was considered an essential component in the sustainable development process [29]. Internal and external factors were mapped using the IFE and EFE matrices. The mapping of the internal and external factors associated with Bukit Sandy revealed that the highest score in the strengths category was the diversity of vegetation in Bukit Sandy that supported the food sources for stingless bees (Tables 2 and 3). The diverse vegetation could help stingless bees obtain backup sources of feed when their preferred feed sources were not available [39]. The presence of stingless bees was reported to have increased RGL citrus productivity by around 20% compared to wind pollination in Bukit Sandy [5].

The biggest weakness of Bukit Sandy was that the management was not prepared for natural disaster mitigation (Table 2). A few months earlier, a typhoon hit Mekarsaluyu Village and caused damage to the infrastructure in Bukit Sandy. However, the management of Bukit Sandy did not intend to pursue any plans for natural disaster mitigation. The planning and management of tourist areas had to take disaster mitigation seriously to ensure the safety of tourists [40].

Three opportunity factors shared the highest score: (1) there were no stingless bee agrotourism tourist destinations in West Java, (2) creates job opportunities for local communities, and (3) the tourism awareness group in Mekarsaluyu Village has a vision that aligns with tourist destinations in Bukit Sandy (Table 3). The opportunity to open new tourist destinations in West Java, especially Bandung Regency was high due to Bandung was the top tourist area in all regencies or cities across Indonesia [21].

The threat factor with the highest score was competition with similar natural scenery-based attractions. This assessment was made because the Cimenyan District already has many tourist attractions that offer views of the city of Bandung. However, similar natural scenery across tourist objects does not necessarily pose a threat when the attributes of the tourist products are different. Five main components comprise the attributes of tourism products; this includes the attractions offered, amenities, accessibility, the image of the destination, and price [35]. The analysis of the internal and external factors at Bukit Sandy revealed an internal factor score of 2.48, while the external factors had a score of 3.02. The internal factor score was slightly below the average threshold value of 2.5, indicating that Bukit Sandy was slightly weak internally. However, the external factors had a score that was above the average threshold, indicating that the external

conditions at Bukit Sandy were more robust than the internal conditions [20].

Table 2. Assessment on the Internal Factor Evaluation matrix

Internal Factor	Weight	Rating	Score
Strengths			
1. Soil conditions that are quite fertile and have not been exposed to pesticides are suitable for planting types of tourism-supporting plants	0.06	4	0.21
2. The location is close to the city center	0.06	4	0.22
3. Microclimate conditions (temperature and humidity) are suitable for stingless beekeeping	0.06	3	0.21
4. The natural vegetation at Bukit Sandy is diverse and supports bees as a source of stingless food	0.07	4	0.26
5. Have a large enough vacant land for the development of a tourist attraction	0.06	4	0.24
6. Have a beautiful panorama to see Bandung City from a height	0.04	4	0.15
7. There are an RGL orange plantation and photo spots that can be a tourist attraction	0.06	4	0.20
8. Currently collaborating with academics to develop the potential and improve the quality of human resources in Bukit Sandy	0.06	4	0.23
Weaknesses			
1. Workers are not sufficient for a land area of approximately 9 Ha	0.06	2	0.10
2. The employee organization has not been officially formed	0.05	2	0.08
3. There is no SOP for workers to serve visitors properly	0.05	2	0.07
4. There is no data collection on the number and identity of visitors	0.05	2	0.09
5. The knowledge of stingless beekeeping is still minimal	0.05	2	0.08
6. Managers have not prepared for natural disaster mitigation	0.06	1	0.06
7. The boundaries of the Bukit Sandy's area are not closed so that it can be entered from another entrance	0.06	1	0.07
8. Tourism promotion has not been maximized	0.05	2	0.08
9. Development funds for tourism are limited because managers rely on private funds	0.05	2	0.08
10. Tourist attraction facilities and infrastructure are decent but still limited	0.05	2	0.08
Total	1		2.48

Table 3. Assessment on the External Factor Evaluation matrix

External Factor	Weight	Rating	Score
Opportunities			
1. Create job opportunities for local communities	0.06	4	0.23
2. The local community is interested in learning about stingless beekeeping	0.07	3	0.18
3. Mekarsaluyu Village already has a tourism awareness group and is ready to cooperate with Bukit Sandy	0.05	4	0.19
4. The Mekarsaluyu Village tourism awareness group has the vision to create a tourism village based on educational tourism and in line with tourism objectives in Bukit Sandy	0.07	4	0.23
5. Trends in nature tourism are in demand by tourists who visit Bandung Regency	0.06	4	0.22
6. Consumption of products that can increase the body's immune (propolis and honey) is currently widespread in Indonesian society	0.05	4	0.17
7. There is no stingless bee agrotourism tourist destination in West Java yet	0.06	4	0.23
8. Cooperate with other tourism actors and travel agents to make tour packages in Cimenyan Regency	0.06	3	0.20
9. The development of the stingless bee agrotourism in Bukit Sandy is in line with Permenristekdikti Number 13 of 2019, which regulates the Master Plan for the Development of National Science and Technology Areas for 2015 - 2030	0.04	3	0.12
10. The use of technological innovation in beekeeping in the concept of stingless bee agrotourism	0.05	4	0.20
11. Conducting social service activities for the local community by the manager of Bukit Sandy	0.05	3	0.15
12. Allow local people to take grass as animal feed in Bukit Sandy's areas	0.05	3	0.14
Threats			
1. The local community's interest is low to work in Bukit Sandy	0.05	2	0.08
2. Unpredictable climate and extreme weather can threaten infrastructure and land	0.06	2	0.13
3. Competition with similar landscape-based attractions	0.06	3	0.17
4. Waterways for plantations and visitors' needs are not sufficient when the dry season arrives	0.07	3	0.16
5. The use of pesticides on agricultural land around the Bukit Hills can threaten beekeeping	0.06	2	0.11
6. The number of competitors selling stingless bees' derivative products (honey, propolis, and bee pollen)	0.04	3	0.11
Total	1		3.01

3.3 SWOT analysis for Bukit Sandy

Matching each internal and external factor resulted in the formulation of 15 alternative strategies. These consisted of three S-O strategies, five W-O strategies, four S-T strategies, and three W-T strategies (Table 4). An S-O strategy refers to

a promising strategy that can influence the prospects for sustainable development and business [41, 42]. The W-O strategies were created to overcome the weaknesses associated with the development of educational tourism in a stingless bee agrotourism given the pre-existing opportunities. S-T strategies aimed to prevent threats that may arise from the utilization of existing strengths. Furthermore, W-T strategies referred to suggestions aimed at overcoming weaknesses and preventing threats. In general, these strategies proposed technical solutions that support the concept of a stingless bee agrotourism focused on educational tourism.

3.4 The development of a stingless bee agrotourism park in Bukit Sandy

The components of a tourism product refer to the combination of elements that affect the satisfaction of tourists visiting a destination [31]. The proposed components were formulated by synthesizing the strategies developed during the SWOT analysis. They were divided into site planning, tourism attributes, carrying capacity analysis, and market segmentation for potential tourists. Site planning was a land management activity that attempts to resolve the problems with the area [32]. Bukit Sandy, with an area of 8.14 ha, can be regionally zoned to group tourism activities. The proposed regional zone consists of nine zones (Figure 1) which consists of a reception zone, a bee education zone, an RGL citrus picking tourism zone, a public facilities zone, a lodging zone, the stingless bee village zone, a farming zone, a service zone, and a multipurpose zone. The stingless bee education zone was designed to allow tourists to get to know stingless bees directly and it will be supported by tour guides (Figure 2). In the bee village zone, tourists can learn about stingless bees from the facilities provided. Other attractions in Bukit Sandy that were empowered by the proposed stingless bee agrotourism include RGL orange picking tourism. This tourist attraction can be opened during the RGL orange harvest season.

Table 4. Strategy matching using the Strengths-Weaknesses-Opportunities-Threats matrix

SWOT Strategies
S-O strategies
1. Develop stingless bee agrotourism as the primary educational tourism in Bukit Sandy
2. Building partnerships with tourism awareness groups in Mekarsaluyu Village, the Ministry of Tourism and Culture of Bandung Regency, and academics for the development of tourism potential in Bukit Sandy
3. Build appropriate facilities to increase the comfort of tourists to the tourism potential that already exists in Bukit Sandy
W-O strategies
1. Recruit workers who come from local communities by adjusting the surrounding social and cultural conditions
2. Creating training related to stingless bees for workers and communities around Bukit Sandy
3. Cooperating with external parties in the tourism sector to initiate the manufacture of Cimenyan District tour packages
4. Conducting training and mentoring for workers in Bukit Sandy and assisted by other tourism actors
5. Ensuring territorial boundaries and improving facilities and infrastructure to support the safety and comfort of tourists
S-T strategies
1. Mapping the area by adjusting the natural conditions and potential that have been identified in Bukit Sandy
2. Using the concept of terracing for sloping land and collecting rainwater for use during the dry season
3. Adding stingless bee's preferred feed
4. Designing an attractive downstream concept for innovations that academics have created
W-T strategies
1. Design a robust infrastructure by adjusting the topography and regional mapping
2. Implement a tourism management system that refers to the principles of sustainable tourism
3. Creating an effective marketing strategy and expanding capital financing in the development of a stingless bee agrotourism in Bukit Sandy

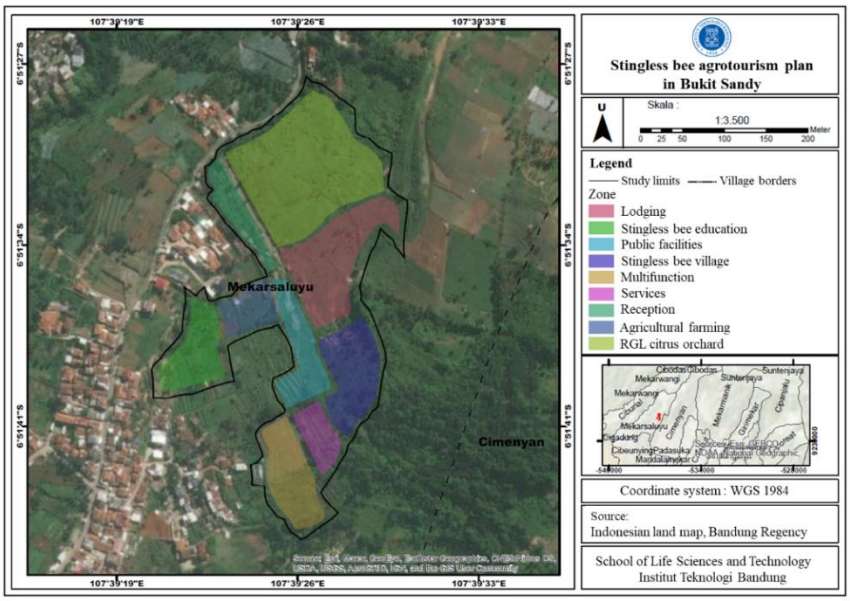

Figure 1. Stingless bee agrotourism map in Bukit Sandy

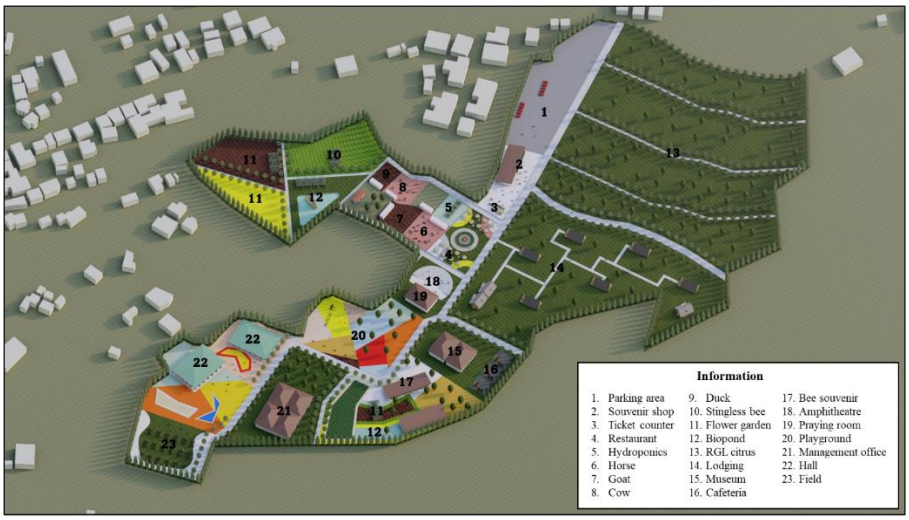

Figure 2. Stingless bee agrotourism site plan in Bukit Sandy

The lodging and public facilities zones can provide amenities to meet tourist demands. In general, the design of the site was based on the principles of ecological architecture [43]. Ecological architecture refers to a form of regional planning that pays close attention to the environment and minimizes the possibility of natural damage. The planned tourism activities at the stingless bee agrotourism were arranged based on the highest attraction and provide tourist support facilities (Table 5). Market segmentation was also carried out at an early stage by grouping consumers based on their needs, behavior, or characteristics and developing marketing strategies based on these groups [44]. The market segments in the stingless bee agrotourism concept were determined by looking at the characteristics and behavior of potential tourists that might visit the stingless bee agrotourism. The characteristics of potential tourists as well as their reasons for visiting the stingless bee agrotourism were categories into ages, profession, income per month (Table 6). The leading market segment is potential tourists aged 15-35 years old because they might be interested in visiting the stingless bee agrotourism as an educational tourism destination. Potential tourists were dominated by students, college students, and teachers or lecturers who are interested in innovation. The use of social media as a source of information can be used as a promotion tool to attract tourists [45]. However, potential tourists outside the leading market segment can also enjoy the stingless bee agrotourism activities.

Another critical component that must be considered is the carrying capacity of the tourist area. This is related to the maximum number of tourists that can be accommodated without causing damage to the environment and without decreasing travel satisfaction within a certain period [25, 46]. The estimated physical, real, and effective carrying capacity of Bukit Sandy are shown in Table 7 and Table 8. The analysis of the physical carrying capacity of Bukit Sandy suggests that the number of potential tourists that can be accommodated is 3,126 tourists per day for all stingless bee agrotourism zones, with an average visit time of 3.07 hours. In addition, the real carrying capacity was estimated to determine the number of tourists that can be allowed to visit a tourist area based on the calculated physical carrying capacity while considering additional factors that were based on regional characteristics [25]. The correction factors included the rainfall index, slope, and vegetation and can be applied to determine the comfort of tourism activities, especially in open spaces. The effective carrying capacity was calculated with reference to the management capacity of the management. A management capacity of 8% was used for the calculation, and it was found that the number of tourists that can be accommodated is 35 tourists per day. Furthermore, these carrying capacity values are not constant and can change based on several factors, including the development of new infrastructure, area expansion, additional employees, and can also be dependent on the season [24, 26].

Table 5. Planned tourism activities in the stingless bee agrotourism park in Bukit Sandy

Tourist Zones	Activities	Facilities / Infrastructure
Reception zone	1. Park the vehicle 2. Transaction for in and out of tourist areas 3. Obtaining information related to tourist areas 4. Shopping	1. Parking lot 2. Information center 3. Souvenir stall 4. Ticket booth 5. Garden 6. Information board
RGL citrus tourism zone	1. Citrus picking tourism 2. Obtain information about the cultivation of RGL citrus and the interaction of stingless bees with these plants 3. Tracking in the citrus grove 4. Taking photos 5. See natural scenery	1. RGL citrus garden 2. Tracking path 3. Shelter 4. Information board 5. Route signage 6. Photo spot
Lodging zone	1. Stay at the lodge 2. See the natural scenery from the lodge	1. Lobby 2. Lodging room
Stingless bee education zone	1. Introduction of stingless bees (characteristics, life cycle, uniqueness, cultivation methods, new technologies and other information) 2. Honey and propolis harvesting training as well as stingless bee colony separation training	1. Stingless bee screen house 2. Training room for honey and propolis harvesting and processing 3. Pool 4. Flower garden

Public facilities zone	1. Culinary activities 2. Worship/pray 3. Watch ongoing shows/events 4. Photo activities 5. Children's play area	1. Food and beverage kiosk 2. Fountain 3. Mosque 4. Toilet 5. Children's play area 6. Gazebo *7.* Amphitheatre
Stingless bee village zone	1. Shop for unique bee-themed souvenirs 2. Photo activities 3. Culinary activities typical of processed bee products 4. Interact with stingless bees directly 5. Visit the bee museum	1. Flower garden 2. Bee museum 3. A unique bee-themed gift shop 4. Equipment shop for beekeeping 5. Bee-themed cafeteria 6. A bee-themed photo spot 7. Unique beehive
Services zone	Management of all activities in tourist areas	1. Management office 2. Warehouse 3. Garden
Multipurpose zone	Doing activities with many participants	1. Field 2. Hall

Table 6. Characteristics of potential visitors to the stingless bee agrotourism park in Bukit Sandy

Parameter	Frequency (%)
Ages	
15-25	70
26-35	16
36-45	4
46-55	6
>56	4
Total	100
Profession	
Private employees	8
Teachers/Lecturers	17
College Students	27
Students	23
Farmers/Breeders	10
unemployed	5
Government employees	10
Total	100
Income per month	
< Rp750.000,00	19
Rp750.000,00 - Rp1.500.000,00	15
Rp1.500.001,00 - Rp2.250.000,00	10
Rp2.250.001,00 - Rp3.000.000,00	15
> Rp3.000.000,00	41
Total	100
Source of information about tourism	
Print media	4
Social media	75
Family/relatives	18
Electronic media	3
Total	100
Interested in visiting stingless bee agrotourism	
Yes	90
Possible	10
Total	100

3.5 Strategic planning of development stingless bee agrotourism in Bukit Sandy

The strategic development of stingless bee agrotourism was analyzed using Quantitative Strategic Planning Matrix (QSPM) analysis (Table 9). The priority strategy for developing stingless bee agrotourism as educational tourism in Bukit Sandy was the implementation of a tourism management system that is aligned with the principles of sustainable tourism, with a total attractiveness score of 6.46. Sustainable tourism refers to tourist activities that are focused on both present and future social, economic, and environmental impacts. The first step in developing a sustainable tourist destination is the awareness to apply the concept of sustainable tourism to every aspect that is associated with tourism activities. The sustainable tourism cannot be developed without the vision and mission of the stakeholders as well as related sectors such as the public sector, tourists, and the managers themselves [47]. This system of tourism must be developed holistically between the industrial and institutional communities and must include human resources, organizations, and regulations.

Table 7. Estimated physical carrying capacity for the stingless bee agrotourism park in Bukit Sandy

Activity	Zona Area (m^2)	Comfort Area (m^2)	Rotation Factor		Physical Carrying Capacity (tourist/day)
			Duration (hour)	Average of Visit (hour)	
All tourism activities	59.759	65	9	3.07	3.126
Stingless bee education	4.978				225
RGL citrus picking tourism	19.337				872
Bee village	6.612				298

Table 8. Estimated real carrying capacity for the stingless bee agrotourism park in Bukit Sandy

Activities	Rainfall Index (Cf_1)	Slope (Cf_2)	Vegetation (Cf_3)	Physical Carrying Capacity (tourist/day)	Real Carrying Capacity (tourist/day)
All tourism activities	0.93	0.65	0.22	3.126	416
Stingless bee education				225	30
RGL citrus picking tourism				872	116
Bee village				298	40

Table 9. Quantitative Strategic Planning Matrix for the suggested Strengths-Weaknesses-Opportunities-Threats strategies for the stingless bee agrotourism park in Bukit Sandy

Strategies	Total Attractiveness Score
WT2 - Implementing a tourism management system that refers to the principles of sustainable tourism	6.46
ST4 - Designing an attractive downstream concept for innovations that academics have created	6.44
WT3 - Creating an effective marketing strategy and expanding capital financing in the development of a stingless bee agrotourism in Bukit Sandy	6.35
WO4 - Conducting training and mentoring for workers in Bukit Sandy and assisted by other tourism actors	6.09
SO1 - Develop stingless bee agrotourism as the primary educational tourism in Bukit Sandy	6.00
ST3 - Adding stingless bee's preferred feed	5.87
SO2 - Building partnerships with tourism awareness groups in Mekarsaluyu Village, the Ministry of Tourism and Culture of Bandung Regency, and academics for the development of tourism potential in Bukit Sandy	5.84
WO1 - Recruit workers who come from local communities by adjusting to the surrounding social and cultural conditions	5.72
WO5 - Ensuring territorial boundaries and improving facilities and infrastructure to support the safety and comfort of tourists	5.60
WO2 - Creating training related to stingless bees for workers and communities around Bukit Sandy	5.57
SO3 - Build appropriate facilities to increase the comfort of tourists to the tourism potential that already exists in Bukit Sandy	5.49
WT1 - Designing robust infrastructure by adapting topography and regional mapping	5.32
ST1 - Mapping the area by adjusting the natural conditions and potential that have been identified in Bukit Sandy	5.11
ST2 - Using the concept of terracing for sloping land and collecting rainwater for use during the dry season	4.92
WO3 - Cooperating with external parties in the tourism sector to initiate the manufacture of Cimenyan District tour packages	4.79

4. CONCLUSIONS

Bukit Sandy was assessed for potential tourist objects and attractions, revealing its suitability as a tourist destination due to various factors such as attractiveness, clean water availability, accessibility, local conditions, market potential, security, supporting facilities, infrastructure, accommodation, and its relationship with surrounding attractions. The strategic planning for developing stingless bee agrotourism in Bukit Sandy involved creating a site plan that emphasized the stingless bee education and bee village zones. To ensure tourists' comfort, the capacity was set at around 35 tourists per day, with an average visit time of 3.07 hours, targeting a market segment of individuals aged 15-35 years old, including students, college students, and education staff. The recommended strategy for the development of educational-based stingless bee agrotourism in Bukit Sandy was the implementation of a tourism management system aligned with sustainable tourism principles. The market segmentation and economic potential of the stingless bee agrotourism park in Bukit Sandy were not investigated in this study. Potential future research can be directed to examine the market segmentation and economic potential of developing a stingless bee agrotourism park in Bukit Sandy. The results will be very helpful in providing insights for the development of a stingless bee agrotourism park, particularly in Bukit Sandy in specific and other places as well, with the potential to enhance tourism by providing valuable knowledge and experiences.

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