Determination of the location of dragon fruit agrotourism development in Bangorejo Sub-district, Banyuwangi based on agrotourism development factors and land carrying capacity

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Abstract. Bangorejo Sub-district has abundant dragon fruit potential and can be developed into an agrotourism area. However, there are still problems including the drop in the price of dragon fruit when the main harvest arrives, the lack of added value of dragon fruit, and problems related to the land carrying capacity in which Bangorejo Sub-district contains expansive soil, namely land that is expanding and shrinking. This research was conducted to determine the location of dragon fruit agrotourism development in Bangorejo Sub-district, Banyuwangi based on the land carrying capacity. The methods used were the content analysis method for the first objective, namely identifying the factors that influence the development of dragon fruit agrotourism in Bangorejo Sub-district and scalogram analysis as well as the overlay for the second objective, namely identifying prospective agrotourism locations for agrotourism development in Bangorejo Sub-district based on agrotourism development factors and land carrying capacity. The results of this research found that the suitable villages for the dragon fruit agrotourism development includes Sukorejo, Ringintelu, Sambirejo, Sambimulyo, Temurejo, and Kebondalem Villages with the widest suitable land is at Kebondalem Village.

Keywords: Agrotourism, Bangorejo, Dragon Fruit, Land Carrying Capacity

1. Introduction

Agrotourism is a natural tourism activity that combines agricultural and tourism activities [1]. One of the areas that has tourism and natural resource potential is Banyuwangi Regency. Banyuwangi is one of the regencies in East Java which has potential in the field of tourism and natural resources. Tourism is one of the supporting factors for economic development in Banyuwangi. Apart from the tourism sector, the economic structure in Banyuwangi Regency is dominated by the agricultural sector, with the role of the agricultural sector reaching 46.24% [2]. Horticultural commodities have been considered as one of the new sources of growth in the agricultural sector because they have high market potential. Based on data from the Agriculture Office of Banyuwangi Regency, dragon fruit is included in the 7 leading commodities in the horticultural sub-sector. Dragon fruit is popular because it has good quality and abundant production. Many residents grow dragon fruit because it does not have a certain harvest season and the fruit continues to produce [3].

However, the large amount of dragon fruit production in Banyuwangi is not always profitable. It is because the price of dragon fruit, which is on average Rp. 10,000/kg, during the harvest season, can decrease to Rp. 3,500-Rp. 4,000/kg. Moreover, the price of dragon fruit has dropped to Rp. 1,500 to Rp. 2,000 per kilogram [4]. In addition, the abundant amount of dragon fruit production is not matched by the addition of added value by the local residents. Agricultural products are exported to other regions without any processing [5]. If the price of dragon fruit continues to decline, dragon fruit farmers in
Bangorejo Sub-district will go out of business because they experience losses. Apart from the price, the problem also comes from the land carrying capacity. Bangorejo Sub-district contains expansive soil, namely soil that is expanding and shrinking, the groundwater level rises high during the rainy season and will burst during the dry season [6]. The level of groundwater that rises high during the rainy season will soak the dragon fruit and interfere with the growth of dragon fruit. Dragon fruit can still grow on wet soil, but will produces less fruit. So that in developing agrotourism, it is necessary to pay attention to the land carrying capacity aspect [7].

2. Research Method

2.1 Data Collection Methods
The data were collected with primary and secondary survey methods. Primary survey includes observation, interview, and questionnaires to examine the existing condition of the area and to obtain in-depth information related to the development factors of dragon fruit agrotourism. Meanwhile, secondary survey was used to gain the data that can’t be observed directly in the location of the research.

2.2 Variables of the Research
This research used variables that were obtained from several literature reviews. Here are the variables used in this research:

| No. | Indicators              | Variables        | Operational Definitions                                                                 |
|-----|-------------------------|------------------|----------------------------------------------------------------------------------------|
| 1.  | Human Resources         | Manager capabilities | The ability of managers to determine and offer tour packages and promotions             |
|     |                         | Residents capabilities | The ability of residents to communicate with the tourists and manage the agrotourism.       |
|     |                         | Supports of the government | The government’s involvement in organizing and determining policies about agrotourism.   |
|     |                         | Natural beauty    | There is natural scenery in and around tourist objects                                      |
| 2.  | Natural resources      | Parking area        | The availability of parking area for vehicles at the tourist site                        |
|     |                         | Directions and road signs | The availability of directions and road signs to the tourist site                        |
|     |                         | Information and service center | The availability of information and service center                                     |
|     |                         | Trash can          | The availability of trash can at the tourist site                                        |
|     |                         | Toilet/bathroom    | The availability of toilet or bathroom at the tourist site                                |
|     |                         | Mosque/prayer room | The availability of mosque/prayer room at the tourist site or the area around the tourist site |
|     |                         | Hotel/accommodation | The availability of accommodation at the tourist site or the area around the tourist site |
|     |                         | Souvenir center    | The availability of places that sell dragon fruit or processed dragon fruit as souvenirs |
|     |                         | ATM center         | The availability of ATM at the tourist site                                               |
|     |                         | Food stall          | The availability of food stall at the tourist site or the area around the tourist site    |
| 3.  | Facilities             | Parking area        | The availability of parking area for vehicles at the tourist site                        |
|     |                         | Directions and road signs | The availability of directions and road signs to the tourist site                        |
|     |                         | Information and service center | The availability of information and service center                                     |
|     |                         | Trash can          | The availability of trash can at the tourist site                                        |
|     |                         | Toilet/bathroom    | The availability of toilet or bathroom at the tourist site                                |
|     |                         | Mosque/prayer room | The availability of mosque/prayer room at the tourist site or the area around the tourist site |
|     |                         | Hotel/accommodation | The availability of accommodation at the tourist site or the area around the tourist site |
|     |                         | Souvenir center    | The availability of places that sell dragon fruit or processed dragon fruit as souvenirs |
|     |                         | ATM center         | The availability of ATM at the tourist site                                               |
|     |                         | Food stall          | The availability of food stall at the tourist site or the area around the tourist site    |
| 4.  | Infrastructures        | Telecommunication network | Affordability of telephone and internet signals                                           |
|     |                         | Electrical network  | The availability of electric network                                                     |
|     |                         | Clean water network | The availability of clean water network                                                  |
| No. | Indicators | Variables | Operational Definitions |
|-----|------------|-----------|-------------------------|
| 5   | Transportation route | The condition of transportation route to the tourist site |
| 6   | Evacuation route | The availability of evacuation route |
| 6   | Primary agricultural business subsystem | Types/varieties of agricultural products | Dragon fruit varieties that grow in the area |
| 7   | Agricultural industrial subsystem | Processed products | The availability of processed dragon fruit products |
| 7   | How to market processed products | The method used in marketing processed dragon fruit products |
| 8   | Land carrying capacity | Rainfall | Rainfall conditions for optimal growth of dragon fruit with a value of 60 mm/month or 720 mm/year |
|     | Altitude | The altitude conditions for optimal growth of dragon fruit range from 0-400 masl |
|     | Soil texture | Soil texture condition for optimal growth of dragon fruit is sandy loam soil |
|     | Slope | The slope condition for optimal dragon fruit growth is <8% |
|     | Erosion hazard | Erosion hazard conditions for optimal growth of dragon fruit are a safe zone (not vulnerable) |

2.3 Analysis Method
To find out the direction of dragon fruit agrotourism development in Bangorejo Sub-district, three stages of analysis are used, namely:

1) Identifying the factors that affect the development of dragon fruit agrotourism in Bangorejo Sub-district

Content analysis was used to identify the influencing factors. Content analysis is a type of analysis used to find out the tendency of communication content. This analysis was carried out through interviews with selected stakeholders.

Table 2. Stakeholders of the Research

| No. | Stakeholder                                                                 |
|-----|----------------------------------------------------------------------------|
| 1   | Regional Development Planning Board of Banyuwangi Regency                  |
| 2   | Department of Culture and Tourism of Banyuwangi Regency                    |
| 3   | Department of Agriculture of Banyuwangi Regency                           |
| 4   | The Government of Bangorejo Sub-district                                  |
| 5   | The Residents of Bangorejo Sub-district in the field of agriculture and tourism |

2) Identifying prospective agrotourism locations for agrotourism development in Bangorejo Sub-district based on agrotourism development factors and land carrying capacity

In order to achieve the second goal, the first step was identifying prospective agrotourism locations based on agrotourism development factors using scalogram analysis. Scoring was carried out on each agrotourism development variable based on the parameters that have been determined from the literature review. Villages with high and medium potential categories were used as the input for the next stage. The following is a clustering of agrotourism class categories.
Table 3. Agrotourism Class Categories

| Scores | Categories | Descriptions       |
|--------|------------|--------------------|
| 18-30  | III        | Low potential      |
| 31-43  | II         | Medium potential   |
| 44-56  | I          | High potential     |

The second step was analyzing the land carrying capacity using the overlay analysis with tools at ArcGIS, namely weighted sum overlay. At this stage, the overlaid variable is land carrying capacity. After that, to determine the prospective agrotourism location, an overlay analysis was used with intersect tools on the prospective agrotourism location map based on agrotourism development factors, dragon fruit land carrying capacity maps, and existing agricultural maps of Bangorejo Sub-district.

3. Results and Discussions

3.1 Identifying the factors that influence the development of dragon fruit agrotourism in Bangorejo Sub-district

To determine the influencing factors, the interviews were carried out with the selected stakeholders which were then analyzed using content analysis method. After the interviews were carried out and transcribed, the following step was coding which is the process of marking emergent variables based on the codes in the form of letters and colors that had been determined formerly. Based on the analysis results, the factors that influence the development of dragon fruit agrotourism are as follow:

Table 4. The Influencing Factors/Variables

| No. | Indicators                  | Descriptions                                                      |
|-----|-----------------------------|-------------------------------------------------------------------|
| 1.  | Human resources             | Manager capabilities                                               |
|     |                             | Residents capabilities                                             |
|     |                             | Supports of the government                                        |
| 2   | Natural resources           | Natural beauty                                                    |
| 3   | Facilities                  | Parking area                                                       |
|     |                             | Directions and road signs                                          |
|     |                             | Information and service center                                    |
|     |                             | Trash can                                                         |
|     |                             | Toilet/bathroom                                                   |
|     |                             | Mosque/prayer room                                                |
|     |                             | Souvenir center                                                    |
|     |                             | Food stall                                                         |
| 4.  | Infrastructures             | Telecommunication network                                          |
|     |                             | Electrical network                                                |
|     |                             | Clean water network                                               |
|     |                             | Transportation route                                               |
| 5.  | Primary agricultural business subsystem | Types/varieties of agricultural products |
| 6.  | Agricultural industrial subsystem | Processed products       |
3.2 Identifying prospective agrotourism locations for agrotourism development in Bangorejo Sub-district based on agrotourism development factors and land carrying capacity

The first step was scoring related to agrotourism development variables based on agrotourism development factors. Here are the scores of each agrotourism development variable:

Table 5. Variable Parameter Scores

| No. | Variables               | Parameters                                                                 | Scores |
|-----|-------------------------|---------------------------------------------------------------------------|--------|
| 1.  | Manager capabilities    | There is no manager of dragon fruit agrotourism in the village            | 1      |
|     |                         | There is manager of dragon fruit agrotourism in the village               | 3      |
| 2.  | Residents capabilities  | There is no indication that residents of the village are open to agrotourism | 1      |
|     |                         | There is indication that residents of the village are open to agrotourism  | 3      |
| 3.  | Supports of the government | There is no government’s involvement in organizing and determining policies about agrotourism | 1      |
|     |                         | There is government’s involvement in organizing and determining policies about agrotourism | 3      |
| 4.  | Natural beauty         | There is no natural attraction                                           | 1      |
|     |                         | There is natural attraction                                              | 3      |
| 5.  | Parking area           | There is no parking area at the agrotourism in the village               | 1      |
|     |                         | There is parking area at the agrotourism in the village                  | 3      |
| 6.  | Directions and road signs | There are no directions and road signs to the agrotourism location in the village | 1      |
|     |                         | There are directions and road signs to the agrotourism location provided by individual parties in the village | 2      |
|     |                         | There are directions and road signs to the agrotourism location provided by the department of transportation in the village | 3      |
| 7.  | Information and service center | There is no information and service center in the village                  | 1      |
|     |                         | There is information and service center in the village                   | 3      |
| 8.  | Trash can              | There is no trash can at the agrotourism in the village                  | 1      |
|     |                         | There is trash can at the agrotourism in the village                     | 3      |
| 9.  | Toilet/bathroom        | There is no toilet/bathroom at the agrotourism in the village            | 1      |
|     |                         | There is no toilet/bathroom at the agrotourism in the village            | 3      |
| 10. | Mosque/prayer room     | There are 0-5 mosques/prayer rooms in the village                        | 1      |
|     |                         | There are 6-10 mosques/prayer rooms in the village                       | 2      |
|     |                         | There are >10 mosques/prayer rooms in the village                       | 3      |
| 11. | Souvenir center        | There is no souvenir center in the village                               | 1      |
|     |                         | There is souvenir center in the village                                  | 3      |
| 12. | Food stall             | There are 0-10 food stalls in the village                                | 1      |
|     |                         | There are 11-20 food stalls in the village                               | 2      |
|     |                         | There are >20 food stalls in the village                                 | 3      |
| 13. | Telecommunication network | The maximum coverage distance of the BTS signal strength is 10 km from each BTS |        |
|     |                         | A = BTS signal coverage ≤ 1 km                                          |        |
|     |                         | B = BTS signal coverage 1-2 km                                          |        |
|     |                         | C = BTS signal coverage ≥ 2 km                                          |        |
|     |                         | Most of the locations in the village are in category C                  | 1      |
|     |                         | Most of the locations in the village are in category B                  | 2      |
|     |                         | Most of the locations in the village are in category A                  | 3      |
| 14. | Electrical network     | Not covered by the electrical network                                    | 1      |
|     |                         | Covered by the electrical network                                        | 3      |
| 15. | Clean water network    | There is clean water from raw water sources in the nearest village      | 1      |
|     |                         | There is clean water from local water company or raw water sources in the village | 2      |
After scoring each variable, the scores were added up so that the agrotourism development class category per village was obtained. The following are the total scoring results for each village:

**Table 6. Total Scores and Class Categories of Each Village in Bangunrejo Sub-district**

| No. | Village      | Total Scores | Categories |
|-----|--------------|--------------|------------|
| 1.  | Sukorejo     | 32           | II         |
| 2.  | Ringintelu   | 36           | II         |
| 3.  | Sambirejo    | 39           | II         |
| 4.  | Sambimulyo   | 31           | II         |
| 5.  | Temurejo     | 37           | II         |
| 6.  | Bangorejo    | 29           | III        |
| 7.  | Kebondalem   | 33           | II         |

Source: Analysis, 2021

**Figure 1. Map of villages that have agrotourism potential based on agrotourism development factors.**
After obtaining the information about high and medium potential villages, the next step was to analyze the dragon fruit land carrying capacity by overlaying the map of the land carrying capacity variables, namely maps of rainfall, altitude, soil texture, slope, and erosion hazards. The following is the map of the dragon fruit land carrying capacity:

![Image of dragon fruit land carrying capacity maps]

**Figure 2.** Dragon fruit land carrying capacity maps in Bangorejo Sub-district

To find out the prospective location of the dragon fruit agrotourism development, the *intersect overlay* method was carried out. The input of this analysis was villages that have high and medium potential according to agrotourism development factors, dragon fruit land carrying capacity maps, and existing agricultural maps. The following is the map of the existing agricultural areas in Bangorejo Sub-district:

![Image of existing agricultural areas]

**Figure 3.** Map of the existing agricultural areas in Bangorejo Sub-district
The three data inputs, namely the map of villages that have agrotourism potential based on agrotourism development factors, the map of land carrying capacity, and the map of existing agricultural areas, were overlaid with intersect tools in order to obtain prospective villages. The following is the map of prospective agrotourism locations based on agrotourism development factors and the carrying capacity of the overlay results:

![Map of prospective location for dragon fruit agrotourism in Bangorejo Sub-district](image)

**Figure 4.** Map of prospective location for dragon fruit agrotourism in Bangorejo Sub-district

The analysis results of the location of agrotourism development based on the analysis results of overlay intersect in Bangorejo Sub-district are as follow.

**Table 7.** Area of the Location of Agrotourism Development in Bangorejo Sub-district

| No  | Villages    | Land Suitability | Area (Acres) | Percentages (%) |
|-----|-------------|------------------|--------------|-----------------|
| 1.  | Sukorejo    | Suitable         | 150.17       | 22.7%           |
|     |             | Not suitable     | 511.76       | 77.3%           |
| 2.  | Ringintelu  | Suitable         | 182.67       | 19.2%           |
|     |             | Not suitable     | 768.64       | 80.8%           |
| 3.  | Sambirejo   | Suitable         | 124.66       | 12.7%           |
|     |             | Not suitable     | 853.79       | 87.3%           |
| 4.  | Sambimulyo  | Suitable         | 84.8         | 7.6%            |
|     |             | Not suitable     | 1,029.19     | 92.4%           |
| 5.  | Temurejo    | Suitable         | 173.22       | 2.8%            |
|     |             | Not suitable     | 6,008.67     | 97.2%           |
| 6.  | Kebondalem  | Suitable         | 322.91       | 25.9%           |
|     |             | Not suitable     | 919.58       | 74.1%           |

Source: Analysis, 2021

Based on the results of analysis above, it was found that the prospective villages for agrotourism development comprises Sukorejo, Ringintelu, Sambirejo, Sambimulyo, Temurejo, and Kebondalem Villages. Village with the largest location for agrotourism development is Kebondalem Village with an area of 322.91 Acres. Meanwhile, village with the smallest location for agrotourism development is Sambimulyo Village with an area of 84.8 Acres.
4. Conclusions
The recommended locations for dragon fruit agrotourism development be located in Kebondalem Village that have the agrotourism potential in terms of supporting infrastructure for agrotourism and the carrying capacity of dragon fruit plants. The potential location for dragon fruit agrotourism is Sukorejo, Ringintelu, Sambirejo, Sambimulyo, Temurejo, and Kebondalem Villages with the largest area of suitability for dragon fruit is located in Kebondalem Village.

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