Community-Based Agro-Ecotourism Sustainability in West Java, Indonesia

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Abstract: Community-based agro-ecotourism is a tourism activity that utilizes the agricultural, natural, and cultural potential of environmentally friendly rural communities as tourism objects whose management is carried out by the local community. This study analyzes the sustainability and sensitivity of attributes that affect community-based agro-ecotourism in West Java. The study used a survey method of 237 agro-tourism actors spread across five tourist villages. The five tourist villages were selected purposively to represent the diversity of agricultural commodities and the zoning of West Java’s strategic crossroads. Data were analyzed using Multi-Dimensional Scaling in the Rapid Appraisal-agro-ecotourism technique (Rap-Agro-ecotourism). The results showed that community-based agro-ecotourism in West Java was sufficiently sustainable. The social dimension sustainability index has the highest score, while the technology dimension sustainability index has the lowest score. The most sensitive attributes affecting the sustainability of community-based agro-ecotourism in West Java are the number of tourist visits, availability of transportation facilities and infrastructure, cooperation with outsiders, preservation of agricultural businesses, waste management, and cultural arts festivals. This study contributes to the sustainability of community-based agro-tourism comprehensively through economic, social, cultural, institutional, ecological, and technological dimensions, so it is expected that adding literature on agro-ecotourism and become input material in the formulation of agro-ecotourism-based rural development policies, especially in West Java.

Keywords: agro-ecotourism; sustainability; community; West Java; Indonesia

1. Introduction

The implementation of regional development that focuses more on economic growth efforts has now become effective and efficient utilization of regional resource potentials accompanied by efforts to realize regional competitiveness. Utilizing local resource potential following regional characteristics is a rational policy choice and regional development direction.

One crucial aspect in exploiting potential resources is broadly focusing on the determinants of resources such as the agricultural sector. The potential of natural resources in agricultural land, water, animal husbandry, and human resources is sufficient to support agribusiness development [1]. In regional development, rural agricultural development has a significant role in environmental sustainability and the community’s economy. Agriculture provides oxygen and food, a source of livelihood, socio-political factors, industrial raw materials, the tourism industry, and spiritual health [2].

Several countries in the world take advantage of the opportunity to discover the agricultural potential in rural areas through the integration of agriculture and tourism so that it becomes an alternative attraction for agro-based tourism. Various agricultural activities such as cultivating the land, planting and harvesting vegetables, raising livestock,
taking cow’s milk, and catching fish provide interesting knowledge and experiences for tourists outside the countryside. In Europe, agro-tourism is considered part of a model of changing agricultural development from productive to multifunctional and sustainable [3]. Agro-tourism has successfully promoted rural development and protection of the environment because agro-tourism tends to develop more sustainable techniques that positively impact the conservation of biodiversity, landscapes, and natural resources [4]. Agro-tourism as a rural economic diversification strategy occurs in several countries such as South Africa, Uganda (Uganda Tourism Board), and Botswana and has developed a lot in Asia, Europe, and North America [5].

The development of agro-tourism is becoming increasingly popular as a tourism niche worldwide. A shift in demand from tourism towards alternative mass tourism has driven its emergence and popularity. This situation is motivated by lifestyle changes back to nature, green consumption, and adventurous style into a form of recreation for groups of tourists from the upper middle class, experienced, educated, and millennial generations who are familiar with the use of information technology and strategic environment who are aware of the importance of environment conservation and local community empowerment [6,7]. Developing agricultural resources into a tourist attraction that is in harmony with the trend of tourism towards alternative tourism has encouraged and provided further opportunities for developing ecotourism, agro-tourism, and rural tourism as a synergy between agriculture and tourism [8–10].

Agro-tourism, ecotourism, and rural tourism have the potential to be developed in Indonesia, which is known to be an agricultural country with beautiful natural conditions and cultural diversity of its people. The beginning of agriculture-based rural tourism developed into an agro-tourism destination in Indonesia was recorded in data from the Directorate General of Tourism for 1994/1995. Eight provinces have agro-tourism destinations: North Sumatra, Riau, West Java, Central Java, Yogyakarta, East Java, West Nusa Tenggara, Central Kalimantan, and West Kalimantan. At that time, the developed agro-tourism objects were generally agricultural business areas from large companies managed by adopting Western cultural management, capital-based, object-oriented prioritizing natural beauty, and had not yet explored the uniqueness and characteristics of local communities [11].

However, Indonesia’s potential for agro-tourism and ecotourism is poorly managed in its development. There is a decrease in the number of tourist visits, a reduction in the carrying capacity of the land, environmental pollution in agro-tourism areas, and agro-tourism competitiveness is relatively low; government participation is not optimal, low contribution to local community income, and limited knowledge of biodiversity in ecotourism development which has an impact on damage and depletion of biodiversity and the global environment so that the contribution of ecotourism to conservation and sustainable development is relatively low [12–14].

The concept of agro-ecotourism has recently emerged, integrating agro-tourism and ecotourism as alternative tourism to support sustainable development. The idea of agro-ecotourism has begun to be implemented in several countries including Costa Rica, the Philippines, Thailand, India, and Uzbekistan. Agro-ecotourism combines ecotourism and agrotourism based on nature tourism to preserve culture and nature while promoting agriculture as a tourist attraction that focuses on sustainable tourism. Characteristic elements of ecotourism and agro-tourism also characterize agro-ecotourism [15]. Agro-ecotourism is a long-term rural tourism development strategy that allows visitors to learn about agricultural situations, agricultural work, local goods, traditional foods, the daily life of rural people, and components of culture and traditions [16]. Developing agro-tourism that prioritizes local culture in utilizing land will increase farmers’ income and efforts to conserve land resources, local culture, and technology (indigenous knowledge), which are generally appropriate for rural environmental conditions [17].

West Java is one of the strategic tourist destinations in Indonesia. In 2021, West Java had 1174 natural tourist objects, 622 cultural tourism objects, and 787 particular interest
tourist objects [18]. This situation motivates tourists to visit tourist attractions in West Java. The regional Government of West Java is promoting the development of agro-tourism and ecotourism-based tourist villages. Regarding information from the Department of Tourism and Culture of West Java Province, there are 251 tourist villages spread across 27 regencies and cities. Community-based agro-ecotourism implemented in tourist villages in West Java is expected to provide welfare for local communities internally and externally and have an impact that spreads to the surrounding area to create economic equity and rural development. Therefore, the design of community-based agro-ecotourism development should be regulated to establish sustainable rural tourism development from diverse dimensions.

Little literature on community-based agro-ecotourism as an alternative tourism concept that integrates agro-tourism, ecotourism, and community-based tourism (CBT). Several previous studies [19–23] only assessed the sustainability of agro-tourism, ecotourism, and tourist villages from the economic, sociocultural, technological, and environmental dimensions. This study was conducted to apply the fundamental theory for community-managed agro-eco-tourism sustainability research based on sustainable and community-based tourism development theories.

Thus, this study aims to analyze the sustainability level of community-based agro-eco-tourism through six sustainable dimensions, namely economic, cultural, social, environmental, institutional, and technological, and to describe in detail the most sensitive attributes that affect the level of sustainability. The practical implications resulting from this research for agro-ecotourism managers are to become the basis for developing agro-ecotourism in the application of aspects of environmentally friendly farming technology and agro-ecotourism promotion technology to improve tourism services, nature conservation, and tourist visits which, in turn, can contribute to increasing the income of local communities. For the Government, the results of this study are expected to become material for consideration of sustainable rural tourism development policies by the potential characteristics of natural and social resources, especially in West Java.

2. Literature Review

2.1. Sustainability Development

The objective of regional development is to achieve the welfare of the people. Tourism and agriculture as development sectors should be prioritized to achieve sustainable development goals (SDGs). Sustainable agricultural development is the administration and utilization of agricultural ecosystems while preserving biodiversity, efficiency, recovery capacity, essentialness, and capacity to meet current and future financial and social needs at surrounding, national, and worldwide levels [24]. Sustainable tourism is defined by United Nations World Tourism Organization (UNWTO) as tourism that takes complete account of its present and future economic, social, and environmental impacts, responding to the needs of visitors, the (tourism) industry, the environment, and the host community [25].

Sustainable tourism development is ideal for developing countries to face future challenges in the era of globalization by paying attention to social, cultural, economic, and political aspects [26]. Sustainable tourism development must also be based on developing relationships between the tourism industry, environmental advocates, and society [27]. Sustainable tourism indicators are valuable tools for evaluating and handling tourism sustainably [28,29].

UNWTO establishes five fundamental pillars in sustainable tourism: economic growth, social inclusiveness, environmental protection, inheritance of cultural values, peace, and security [30]. Current technological developments also determine the sustainability of tourism. Technology in transportation, information, and communication infrastructure can increase accessibility and competitive advantage of tourist destinations [31]; therefore, technological sustainability becomes one of the pillars of sustainable tourism.
2.2. Community-Based Agro-Ecotourism

One of the determining factors in sustainable tourism is tourism that follows the potential of its natural resources and positively impacts local communities. Community-Based Tourism (CBT) empowers the community to develop skills, culture, and natural potential without destroying it—communities as owners, managers, and beneficiaries of the tourism business. CBT is considered a prerequisite for sustainable tourism development. CBT is an effective way to promote the development and utilization of resources, has the potential to promote long-term management and transformation of the ecological awareness of rural communities, and opens up inclusive opportunities for community empowerment members under sustainable development goals [32,33].

Agrotourism is a tourism product diversification that combines agricultural (agro) and recreational activities in an agricultural environment [34]. Agro-tourism is a tourism activity that aims to increase knowledge and experience of agricultural and recreational activities in an agricultural environment which is carried out through various conservation efforts to preserve natural resources, society, and culture [35]. Whereas ecotourism is a form of responsible travel to unspoiled areas to protect the environment and culture and improve the welfare of the local community [36].

Agro-ecotourism is the development of agro-tourism and ecotourism that offers visitors experience in carrying out various activities by farmers in rural areas. Agro-ecotourism is agricultural tourism that applies ecotourism principles, namely nature-based tourism, focuses on learning human interaction with resources, is not consumptive, contributes to conservation, is managed ethically, and has a low impact on the environment, initiatives, controls, and benefits for the community locally [37,38].

As CBT, Community-Based Agrotourism (CBAT), is a tourism activity that uses agricultural and cultural possibilities involving local community participation in its management [39]. In contrast, Community-Based Ecotourism (CBET) is tourism that maintains ecological sustainability based on nature-based education, prioritizing a sociocultural perspective where management, ideas, control, and benefits are for local communities [40,41].

The development of agro-ecotourism in Indonesia has become an integrated part of community-based tourism management, so it is expected to maintain cultural and environmental values and improve people’s welfare [42]. Community-Based Agro-ecotourism (CBAET) is a tourism activity that utilizes the potential of environmentally friendly agriculture, nature, and culture of rural communities as a tourist attraction that supports the involvement of local communities in planning, implementing, evaluating, and utilizing the results. It can be concluded that (CBAET) has a very close relationship with sustainable development. CBAET is one of the strategies to realize sustainable development in rural areas.

The terms ‘sustainable’ and ‘CBAET’ are combined to form “sustainable CBAET” to enhance the visitor experience while minimizing environmental and cultural damage, increasing local community control and participation, and contributing to economic growth.

3. Material and Methods

The conceptual framework of this research is based on the theoretical basis of various references. It is supported by the results of previous studies, which are the theory of sustainable (regional) development based on the potential of local resources through the integration of agriculture and tourism [1,2], the concept of agrotourism and ecotourism [8–10,35,36], factors driving and inhibiting sustainable agrotourism and ecotourism [12–14], the idea of agro-ecotourism [15–17], sustainable agriculture and sustainable tourism [24,25], indicators of sustainability dimensions [26–31], community-based tourism [32,33], and the concept of community-based agro-ecotourism [37,39]. Based on these concepts, the research conceptual framework is presented in Figure 1.
3.1. Data

This research was conducted in five tourist villages that represent the diversity of agro-ecotourism commodities and represent the zoning of West Java. The five villages are the tourist village of Pasanggarahan, Bojong Sub District, Purwakarta Regency based on food crop farming, Cibuntu Tourism Village, Pasawahan Sub District, and Kuningan Regency based on food crop farming and animal husbandry. Suntenjaya Village, Lembang Sub District, West Bandung Regency and Sukalaksana Tourism Village, Samarang Sub District, and Garut Regency based on agricultural and horticulture commodities, Alamendah Tourism Village, Rancabali Sub District, and Bandung Regency based on horticulture farming and coffee plantations. This study used survey methods and sampling techniques using proportional stratified random sampling involving 237 stakeholders managing agro-ecotourism in five tourism villages.

Respondents in this study consist of several communities involved in tourism, namely tourism village officials, homestay owners, community leaders, artist groups, culinary business groups, farmer and rancher groups, tour guides, tour agents, and officers from agencies related to agro-ecotourism such as tourism and agricultural department.

3.2. Selection of Variables and Attributes

The variables used in this study consist of six dimensions: economic, social, cultural, ecological, institutional, and technological. Attributes in each dimension are achieved through field observations and literature studies. In this study, there were 34 attributes analyzed, respectively: seven economic dimensions (community funding, income from agro-ecotourism, number of tourist visits, availability of souvenir shops, availability of business processing, increased employment and business opportunities, and variety of travel packages), five social dimensions (development of community pride, community participation in management, conflicts of interest between residents, level of security, and preservation of agricultural business), four cultural dimensions (preservation of cultural heritage, attractions of local cultural arts, cultural exchanges, and festivals of cultural traditions), six ecological dimensions (maintenance of natural landscapes, waste management, utilization of alternative energy, air and water pollution, conservation activities, and
environmental conservation education), six institutional dimensions (availability of tourism management agencies, cooperation with external parties, technical guidelines for tourism operations, coordination between stakeholders, guidance from related agencies, and support for local ownership rights), and six technological dimensions (internet network, environmentally friendly farming technology, transportation infrastructure and facilities, availability of clean water facilities, tourism promotion technology, and product processing technology).

Each attribute in each dimension is given a score based on the scientific considerations of the score maker. The score ranges from 0–3, from bad (0) to good (3), based on the affordability of each dimension obtained through filling out the questionnaire.

3.3. Multi-Dimensional Scaling

The level of sustainability of community-based agro-ecotourism in West Java is explained using descriptive analysis and multi-dimensional scaling (MDS) analysis methods. MDS is a statistical technique used to measure the closeness between objects and determine the affordability value of each attribute on an ordinal scale for each dimension and as a whole [34,36,43]. Sustainability analysis uses the Rap-Agro-ecotourism approach. This approach is a modified approach from Rapfish (Rapid Appraisal for Fisheries) developed by the University of Columbia’s Fisheries Center [44].

This study’s data analysis stages include attribute prices, assessment of each attribute, analysis of coordination with MDS, sustainability index analysis and status, sensitivity analysis (Leverage Analysis), and development analysis (Monte Carlo Analysis). The results of the MDS analysis in the form of a sustainability index are used as a score to determine the level of sustainability of community-based agro-ecotourism. Viewing rate rating categories are presented in Table 1.

Table 1. Sustainability Level Category Based on Rap-Agro-ecotourism Index Results.

<table>
<thead>
<tr>
<th>Index Score (%)</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–25</td>
<td>Bad (Unsustainable)</td>
</tr>
<tr>
<td>25.01–50</td>
<td>Less (Less Sustainable)</td>
</tr>
<tr>
<td>50.01–75</td>
<td>Sufficient (Sufficiently Sustainable)</td>
</tr>
<tr>
<td>75.01–100</td>
<td>Good (Highly Sustainable)</td>
</tr>
</tbody>
</table>

Another result of the MDS analysis is the value of S-Stress (Standardized Residual Sum of Square) and the coefficient of determination (R²), both of which reflect compatibility in the MDS analysis, which are used to see whether additional attributes are needed, or the existing points reflect the accuracy of each analyzed dimensions. A low S-Stress value indicates a good match, and a high value demonstrates the opposite [45]. The model is good if the S-Stress value is less than 0.25 and R² is close to 1 (100%), meaning these attributes can explain almost 100% of the existing models [46,47].

Leverage analysis describes the sensitivity of each attribute to the value of sustainability and is used to identify sensitive attributes. Sensitive attributes are obtained by changing the Root Mean Square (RMS) ordination on the X-axis or the sustainability scale. The greater the value of the RMS change due to the loss of specific attributes, the more significant the role of these attributes in forming the sustainability index [48,49]. In the next stage, Monte Carlo simulation is a mathematical calculation to assess the consequence of random errors in every dimension. Monte Carlo simulation estimates the effect of error (error) at the 95% confidence level; in other words, it considers uncertainty. The Monte Carlo index value is then compared with the MDS index value. The closer the Monte Carlo index value is to the MDS index value. In conclusion, the MDS analysis has a lower error rate [49]. MDS, leverage, and Monte Carlo analyses were performed using Rapfish 3.1 software downloaded from www.rapfish.org accessed on 20 January 2023.
4. Results

The Rap-Agro-ecotourism analysis using the MDS method and Monte Carlo analysis yielded a community-based agro-ecotourism sustainability index in West Java covering five dimensions, namely economic, social, cultural, ecological, institutional, and technological dimensions. The analysis produces statistical parameters that can be seen in Table 2.

Table 2. Results of Community-Based Agro-ecotourism Sustainability Status in West Java.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>MDS</th>
<th>Monte Carlo</th>
<th>Difference</th>
<th>S-Stress</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-dimensional</td>
<td>57.07</td>
<td>55.78</td>
<td>1.29</td>
<td>0.15</td>
<td>0.94</td>
</tr>
<tr>
<td>Economy</td>
<td>47.53</td>
<td>46.83</td>
<td>0.7</td>
<td>0.16</td>
<td>0.94</td>
</tr>
<tr>
<td>Social</td>
<td>73.64</td>
<td>71.53</td>
<td>2.11</td>
<td>0.15</td>
<td>0.94</td>
</tr>
<tr>
<td>Culture</td>
<td>62.78</td>
<td>61.42</td>
<td>1.36</td>
<td>0.17</td>
<td>0.93</td>
</tr>
<tr>
<td>Ecology</td>
<td>61.67</td>
<td>58.13</td>
<td>3.54</td>
<td>0.16</td>
<td>0.94</td>
</tr>
<tr>
<td>Institutional</td>
<td>49.33</td>
<td>47.21</td>
<td>2.12</td>
<td>0.16</td>
<td>0.94</td>
</tr>
<tr>
<td>Technology</td>
<td>45.61</td>
<td>43.10</td>
<td>2.51</td>
<td>0.15</td>
<td>0.94</td>
</tr>
</tbody>
</table>

Source: Primary Data (processed).

Table 2 shows the S-Stress value between 0.15–0.17, and the R² value is at 0.93–0.94, indicating that the Goodness of fit value in the Rap-Agro-ecotourism analysis is accurate. As stated in [50], the coefficient of determination (R²) depicts the attribute’s capacity to clarify and participate in the framework evaluated’s sustainability. If the S-Stress value is less than 0.25%, accordingly, the attribute configuration can describe the original information; furthermore, it can be argued that the indicators analyzed are precise and statistically justifiable.

Based on the results of the Rap-Agro-ecotourism analysis of agro-ecotourism in West Java using the MDS method, the multi-dimensional sustainability index generator is 57.07, which is in the range 51–75 and belongs to the “sufficiently sustainable” category based on Table 2. This condition aligns with research [51,52], which states that the multi-dimensional agro-tourism sustainability index value is sufficiently sustainable.

Meanwhile, the effect of scoring fault is relatively low as the difference between MDS and Monte Carlo at the 95% confidence interval or 5% error rate is between 0.7–3.54. The value of the difference in this analysis is <5%, so the MDS analysis results are sufficient to estimate the sustainable index [53].

All dimensions have attributes that become indicators for the sustainability of community-based agro-ecotourism. The order index value for every dimension is depicted in the kite diagram (Figure 2). The sustainability index of every dimension is illustrated on a kite diagram. The nearer the analysis space to the zero scores, the smaller the sustainable index and conversely [54].
The kite diagram in Figure 2 illustrates that the technological dimension has the lowest score for the sustainability index, followed by the economic, institutional, ecological, and cultural dimensions.

Based on Figure 2, the social dimension has the highest score. The regularity index value of every dimension on the kite chart is still not exact, which means that every consistency measurement is still not connected equally.

The kite chart illustrates the community-based agro-ecotourism sustainability level in West Java, which combines several dimensions of sustainability: economic, social, cultural, institutional, ecological, and technological dimensions. The calculation outcome is depicted in Figures 3 and 4; further explanation is described in each sustainable dimension of the discussion section.

Figure 3. Level of sustainability for each dimension.
Figure 4. Leverage value for each dimension.

5. Discussion

5.1. Economic Dimension Sustainability Status

The economic dimension is essential in the sustainability of community-based agro-ecotourism because this tourism activity aims to generate income for farmers and local communities. The economic dimension is also one of many aspects of the sustainable development concept stated in [55], precisely economic success, which implies sage financial resources utilization for social welfare. Furthermore, seven measurement attributes in the economic dimension are evaluated by Rap-Agro-ecotourism analysis; those are (a) Increased employment and business opportunities, (b) Income from agro-ecotourism, (c) Diversity of tour packages, (d) Number of tourist visits, (e) Availability processing business, (f) Availability of souvenir shops, and (g) Community funds [56,57].

The value analysis results show that the sustainability of the economic dimension of community-based agro-ecotourism is 47.53 (Figure 2), was in the 26–50 range, and was categorized as less sustainable. The ordinate analysis on the economic dimension produces $R^2$ and S-Stress values of 0.94 and 0.16, respectively. Analysis of the economic dimension implies that the Goodness of the fit condition is categorized as sufficient, and the attributes examined in the economic dimension describe and are close to the original model. The economically unsustainable status of tourism aligns with the existing conditions in the agricultural-based tourism village of Ngargoretno in Magelang, Central Java [58]. This study’s results align with the study [59], which states that the sustainability of the economic dimension in agro-tourism is still less sustainable due to the COVID-19 pandemic.

Sensitivity on the economic dimension is analyzed by leverage analysis method utilizing Rapfish software, which depicts the seven attributes analyzed. Two compassionate attributes which affect the sustainability of community-based agro-ecotourism in West Java are the number of tourist visits with an RMS value of 3.8 and income from agro-ecotourism with an RMS value of 1.78 (Figure 3). According to [60], the more significant the leverage analysis value, the more sensitive this attribute has an impact.
The number of tourists visiting the agro-ecotourism area is very influential in the development of tourist objects and the carrying capacity of the things. Therefore, data on the number of tourist visits to these tourist objects are needed to predict the trend and the negative impacts that will be caused on the thing and its carrying capacity. The number of tourists visiting agro-ecotourism in West Java has decreased significantly due to the COVID-19 pandemic. The spread of the COVID-19 virus has made people decide not to travel. This impact was felt by the tourism industry including hotels, resorts, restaurants, airlines, and travel agents outside and within the country. This situation is inseparable from agro-ecotourism areas in West Java [61,62]. However, after the new average era, tourists returned to traveling and implementing hygiene protocols at tourist attractions.

The second attribute that most influences the sustainability of community-based agro-ecotourism in West Java on the economic dimension is agro-ecotourism business income. A decrease in the number of tourist visits can affect the opinion of tourism actors. The agro-tourism sector is crucial in increasing revenue, creating jobs, and developing tourism infrastructure through income and income. The decrease in the number of tourists impacts companies in the tourism sector, also affecting a drastic reduction in revenue and operating profits [63]. Many financing sources for business development can be accessed by surrounding business actors including income from tourism [64].

Agro-ecotourism activities in West Java during the COVID-19 pandemic can be divided into two phases: First, during the early period of the pandemic in early 2020 to mid-2021, namely during Pembatasan Sosial Berskala Besar (PSBB) or Large-Scale Social Restrictions. During the implementation of the social restrictions period, agro-ecotourism business activities continued as usual even though the number of visitors was minimal, resulting in decreased income. Second, during Pemberlakuan Pembatasan Kegiatan Masyarakat (PPKM) or Implementation of Restrictions on Community Activities, at the end of July to early September 2021, agro-ecotourism activities in West Java completely stopped due to a policy from the Government to reduce the spread of COVID-19.

5.2. Social Dimension Sustainability Status

Social sustainability is a crucial part of sustainable development, which aims to improve the quality of life that is healthy and prosperous, equitable, and access to quality education without poverty and hunger [65].

There are five attributes picked in this research to evaluate the sustainability of community-based agro-ecotourism in West Java on the social dimension, namely (a) level of security, (b) sustainability of agricultural businesses, (c) conflict of interest between residents, (d) development of community pride, and (e) community participation in management [66–69]. Regarding the Rap-Agro-ecotourism analysis outcome with five attributes on the social dimension, the sustainability index value of community-based agro-tourism in West Java, the social dimension was 73.64 (Figure 2), which is sufficiently sustainable.

Previous research [70] shows that many rural communities participate in managing agrotourism; this shows community interest in activities to carry out agrotourism, which has the potential to be developed together. This study result is also in line with the concept of CBT and agro-ecotourism as tourism which takes into account aspects of social sustainability where the community carries out the management through the active participation of citizens. There is social justice and it creates a sense of community pride [71].

Regarding the sensitivity (leverage) analysis outcome evaluated on the five social dimension attributes, it can be seen that the most significant leverage values affect the sustainability status of the social dimension, namely agricultural conservation efforts and community pride which has an RMS value of 4.82 and 3.07 (Figure 3), respectively. The condition of agro-ecotourism in West Java is still lacking in optimizing agricultural preservation efforts that can provide tourist selling points. The important thing from the development of agro-ecotourism in West Java is to give education on environmentally friendly agricultural techniques such as technical integration of farming. Providing direct education on environmentally friendly farmers effectively introduces ecologically friendly
agriculture to the younger generation. Also, doing direct practice can add to the tourism experience [72]. Agro-ecotourism does not only take advantage of the natural beauty and diversity of agricultural activities, but many agro-tourism models have emerged that utilize particular agricultural objects.

The development of community pride is the second sensitive attribute in the social dimension of sustainability. One of the factors causing the decline in the area’s vitality is the absence of a social/community organization that regulates the area. This condition is also supported in [73], which states that decreased life and environmental quality are caused by the absence or weakening of the community or organization that represents the local community. Efforts to develop community-based agro-ecotourism in West Java require interaction, collaboration, and support between actors (farmer groups, community groups, traditional groups, Lembaga Masyarakat Desa Hutan (LMDH), Karang Taruna, village government, sub-district Government, district government, and provincial Government) to have a vision and mission. as well as a sustainable agro-ecotourism development activity program. It is necessary to pay attention to the attributes of business attacks and develop community pride to improve the sustainability status of community-based agro-ecotourism in West Java on the social dimension.

5.3. Sustainability Status of the Cultural Dimension

Community-based development is a concept that highlights community empowerment to comprehend the values and resources they possess, for example, culture, traditions, culinary food, and way of life [74]. In creating tourism, the community must autonomously mobilize these resources and values to appeal to the tourist travel experience. Through Community-Based Tourism, each person is coordinated to contribute to the financial tourism chain, so people’s abilities outpour to create little businesses.

Measurement of the sustainability of community-based agro-ecotourism in West Java in the cultural dimension utilizes four measurement attributes, namely (a) local cultural arts attractions, (b) local cultural tradition festivals, (c) cultural exchange, and (d) preservation of cultural heritage [75–78]. The results of the Rap-Agro-ecotourism analysis on the sustainability of community-based agro-ecotourism resulted in a cultural dimension of sustainability index of 62.78 (Figure 2) and is in the sufficiently sustainable category. The $R^2$ value of 0.93 and the S-Stress value of 0.17 indicate that the Goodness of fit is in the accurate category. This enough sustainable result is in line with the concept of CBT and agro-ecotourism as tourism which takes into account the aspect of cultural sustainability, which shows the preservation of cultural values and pride in the culture of the community [71]. Moreover, previous research [72] confirms that community-based agro-ecotourism in rural areas displays existing cultural attractions as selling points to tourists.

Based on the leverage analysis outcome, the two most sensitive attributes affecting the implementation of the cultural dimension are local cultural tradition festivals, which have an RMS value of 5.91, and cultural heritage, which have an RMS value of 5.36 (Figure 3). The low frequency of local cultural tradition festival activities in each agro-ecotourism area in West Java holds community-based agro-ecotourism from a cultural dimension. Local cultural festivals are based on physically and non-physically introducing or preserving local cultural traditions. Physical appearance is in dance, traditional food, locally processed products, and musical instruments. Non-physical performances include the introduction of local languages, local history, ancestry, agro-tourism history, and ethics (rules).

Cultural tourism is a form of industrial culture because it collectively uses different cultural aspects in its production system. As social capital, culture is aligned with other resources such as natural and economic (financial) resources [79]. One of the worldwide trends is the increasing awareness of tourists to comprehend the cultural heritage of the past. Endeavors to understand the past’s cultural legacy are conducted inside and outside across countries. Cultural tourism is a double-edged sword in utilizing cultural heritage
as a tourist attraction. Past cultural legacy is viewed as capital in the improvement of cultural tourism.

On the one hand, cultural tourism can benefit local communities economically and generate funds and education to restore or preserve tangible and intangible cultural heritage. On the other hand, it poses a severe threat if the tourism culture is mismanaged. Tourist attractions are essential in the tourism sector, especially in attracting tourist visits to a destination. Local cultural festivals in agro-ecotourism play a role in attracting the attention of tourists.

The following sensitive attribute is the preservation of cultural heritage. Cultural Conservation is the nation’s cultural wealth as a form of thought and behavior in human life, which is exceptionally critical for the comprehension and advancement of history, science, and culture within the life of society, country, and state so that it should be protected and managed appropriately through endeavors to ensure, create, and utilize within the setting of advancing national culture for the most notable success of the individuals.

Agro-ecotourism in Java still lacks education about the importance of preserving cultural heritage in communities around tourism. Attempts can be made by making information boards, websites, and pocketbooks. Preserving the cultural heritage of agro-ecotourism in the West Java region can protect the nation’s culture from foreign cultural influences and prevent civilization from being recognized by other countries. Tourists come to West Java for agro-ecotourism not only because of its natural beauty but also because of its beauty, diversity, and cultural uniqueness, and this is a pretty good opportunity besides bringing in income for the local community [80].

West Javanese culture can be a source of pride because it can be recognized nationally and internationally. It embodies community development to increase knowledge about the local culture that West Java owns and increase the love for learning and making it happen. With this awareness, the relationship between people will be better and more harmonious because it creates a sense of mutual respect and respect for one another and creates a more intimate and pleasant atmosphere. Preserving cultural heritage, in particular local culture, can also build a sense of nationalism, namely a sense of mutual care and respect.

5.4. Sustainability Status of the Environmental Dimension

Ecologically sustainable tourism development does not harm the local ecosystem [81]. In addition, conservation is a necessity that must be endeavored to protect natural resources and the environment from the harmful effects of tourism activities. One of the requisites for sustainable natural resource management is to preserve the function of the precious natural resource. Furthermore, it has to possess eco-efficiency criteria, implying it is financially and ecologically efficient. Attributes on the ecological dimension were chosen to illustrate how utilizing natural resources and the environment impacts sustainability [82].

Measurement of community-based agro-tourism development in West Java on the environmental dimension uses six measurement attributes which are evaluated using the Rap-Agro-ecotourism analysis; those are (a) utilization of alternative energy, (b) waste management, (c) conservation activities, (d) air and air pollution, (e) maintenance of natural landscapes, and (f) conversion of educational land [83]. Based on the results of the Rap-Agro-ecotourism analysis, the community-based agro-tourism sustainability index value in West Java on the environmental dimension is 61.67 (Figure 2), which is in the sufficiently sustainable category. The coordination analysis on the sustainability of the ecological dimension yields an $R^2$ and an S-Stress value of 0.94 and 0.16, respectively. This result indicates an accurate fit of the model. According to [84], agro-ecotourism can increase agricultural production and income while maintaining environmental sustainability (reducing environmental impacts). These results align with a previous study [85] from the ecological dimension, which is in the sufficiently sustainable category; this condition strongly supports the sustainability of agro-ecotourism.
The leverage analysis outcome explains that waste management has an RMS value of 1.34, and alternative energy utilization has an RMS value of 1.33. These are the two attributes that most influence the sustainability of community-based agro-ecotourism in the environmental dimension.

The impact of tourism activities on the ecology is the occurrence of water pollution, noise, and waste [86]. Based on agro-ecotourism conditions, many visitors create destruction by bringing organic and non-organic waste from outside tourist sites. Even though the management has provided trash bins, the community is still not enthusiastic about the disposing of trash in these places.

Garbage is very closely related to public health because, from this waste, various disease-causing microorganisms (pathogenic bacteria) and insects as disease spreaders (vectors) will live. Therefore, waste must be appropriately managed not to disturb or threaten public health as little as possible. Good waste management is not only for the benefit of health but also for the beauty of the environment in agro-ecotourism areas [87].

The use of alternative energy is the second attribute that affects environmental sustainability. Most agro-ecotourism activities in West Java still lack optimal use of alternative energy such as using organic waste for fertilizer, biogas, and hydroelectric power plants.

5.5. Institutional Dimension Sustainability Status

Institutional authorities, responsibilities, and roles encourage the exertion of tourism activities. Tourism institutions are explained in the Tourism Law of the Republic of Indonesia number 10 of 2009 as all government agencies, both central and local Government, private and community, human resources, operational mechanisms, and regulations related to tourism. Measurement of the sustainability of community-based agro-ecotourism in West Java on the institutional dimension uses six measurement attributes, namely (a) technical guidelines for organizing tourism, (b) cooperation with external parties, (c) availability of tourism management agencies, (d) guidance from related agencies, (e) coordination between stakeholder interests, and (f) support of local property rights for resource management [88–90].

The Rap-Agro-ecotourism analysis yielded R² and S-Stress values of 0.94 and 0.16, indicating that the Goodness of fit value in the dimensional analysis of sustainable agrotourism development was in reasonably good condition and fulfilled the MDS analysis requirements. In connection with the results of the Rap-Agro-ecotourism analysis on the institutional dimension, it was stated that the community-based agro-tourism sustainability index value in West Java was 49.33 (Figure 2) included in the less sustainable category. These results indicate that the institutional dimension still requires attention and development in the future.

This condition can be explained in [59,84], which stated that there were obstacles to community-based agro-ecotourism policies. Hence, those caused less sustainable community-based agro-ecotourism in the institutional dimension. However, tourism’s unsustainable status contradicts the conditions in the agricultural-based tourism village of Ngargoretno in Magelang, Central Java [58], and the concept of CBT and agro-ecotourism as tourism that upholds institutional (political) sustainability. This condition is due to unprofessional management and a lack of coordination with external parties (Government) regarding area development efforts [91].

Based on the leverage analysis outcome, cooperation with outsiders is the first attribute most sensitive to the sustainability of community-based agro-ecotourism in West Java on the institutional dimension, which has a 2.48 RMS value (Figure 3). The lack of cooperation between various parties in agro-ecotourism management results in a decrease in the aesthetic value of agro-ecotourism development. Negative impacts can be suppressed if external parties provide information, processes, and processes and determine mechanisms, monitoring, and evaluation. The involvement of outsiders in tourism management includes (1) an exchange of opinions in determining policy, (2) technical consultation on
the implementation of management policies, and (3) high-level decision-making [92]. Therefore, the active involvement of the community and community institutions around the area with parties outside of tourism is expected to impact efforts to manage and build agro-ecotourism positively. The research results show a lack of coordination between agencies/stakeholders.

Sustainable agro-ecotourism management is a complex business because it requires accommodative nature and synergistic cooperation mechanisms between various related parties to sit together representing their respective institutions so that planned sustainable tourism management activities run well. Governments must revitalize and reform institutions to function effectively by adapting to the organization’s culture and values. Culture and norms between organizations in formulating planning, implementation, and control are together. The togetherness is important to clarify each institution or sector’s duties, functions, and authorities [93].

Technical guidelines for tourism implementation are the second sensitive attribute influencing the sustainability of community-based agro-ecotourism in West Java. There are no technical guidelines for agro-ecotourism governance from tourism management. The study found that implementing this policy was still lacking in carrying out the compliance function. This condition is probably due to a lack of understanding from managers and a lack of availability of data regarding accessible facilities. The absence of operational policies and data collection can cause the failure to implement operational tourism guidelines.

5.6. Technology Dimension Sustainability Status

Technology sustainability is using and adopting technology in agro-ecotourism to facilitate access and tourist information. One crucial component in tourism activities is the accessibility or smooth mobility of people from one place to another. Various means of transport can be enjoyed quickly and comfortably with advances in science and technology to perform the required coating means of transportation.

Measurement of community-based agro-ecotourism development in West Java on the technological dimension uses six measurement attributes, namely (a) tourism promotion technology, (b) internet network, (c) product processing technology, (d) transportation infrastructure and facilities, (e) environmentally friendly agricultural technology, and (f) availability of clean water facilities [91,92].

The results of the Rap-Agro-ecotourism analysis of R² and S-Stress values of 0.94 and 0.15 indicate that the Goodness of fit analysis of agro-ecotourism sustainability on the technological dimension is accurate. In connection with the results of the Rap-Agro-ecotourism analysis of the sustainability of community-based agro-tourism in West Java on the technological dimension, it produces a sustainability index of 45.61 (Figure 2); it is included in the less sustainable category.

The research results show that the sustainability of technology is still lacking. This result aligns with a previous study [59], which shows that the sustainability of technology and agro-tourism support facilities in Upang Strawberry Farm is less sustainable. This condition is also related to providing transportation facilities and infrastructure to ecotourism areas that are still limited. Meanwhile, farmers in agro-ecotourism areas have widely applied the technology for integrating environmentally friendly crop farming, livestock, and fisheries.

Based on the results of the leverage analysis, it is known that the two attributes which have the most influence on the sustainability of community-based agro-ecotourism in West Java are the attributes of transportation facilities and infrastructure with an RMS value of 6.40 and attributes of environmentally friendly agricultural technology with an RMS value of 5.88 (Figure 3). This condition indicates that it is necessary to consider the attributes of these technologies to improve the dimension of sustainability status.

Some conditions in agro-ecotourism areas are still experiencing difficulty accessing due to public transportation facilities and infrastructure availability. The majority of
tourists use private vehicles when visiting tourist areas. The availability of transportation facilities will provide convenience and satisfaction for tourists to visit tourist attractions. In addition to the availability of sufficient public transportation facilities, it is also necessary to provide unique local transportation facilities in agro-ecotourism areas to provide tourist satisfaction such as “Delman” or horse-drawn carriages, tricycles, bentors, and jeeps.

Environmentally friendly agricultural technology is the second attribute that influences agro-ecotourism implementation. Integrative Farming Systems and organic farming are environmentally friendly local technologies that farmers in rural areas commonly apply to become agricultural education in agro-ecotourism that attracts tourists [94]. Local technology in agricultural cultivation, such as “Talun Kebun” and agroforestry systems in rural areas, are agricultural technologies that can be used as tourist attractions in agro-ecotourism. This local technology has proven to be quite capable of controlling soil fertility through vertical nutrient cycling. In addition to efficiently utilizing nutrients, this technology can also properly use solar energy and in situ organic matter according to the level of need. Thus, we can understand our local technology through agrotourism to reduce dependence on foreign technology [95, 96].

6. Conclusions

The multi-dimensional sustainability of community-based agro-ecotourism in West Java (a combination of economic, social, cultural, institutional, ecological, and technological dimensions) is entirely sustainable. The dimensions that have a sensitive influence on the sustainability status of community-based agro-ecotourism in West Java are social, cultural, environmental, institutional, technological, economic, and technological dimensions.

The most sensitive attribute that influences the sustainability of community-based agro-ecotourism in the social dimension is the preservation of agricultural businesses because environmentally friendly agricultural enterprises contribute to the conservation of natural resources and are the main attraction in agro-ecotourism. In the cultural dimension, the attributes of local cultural festivals are most sensitive to the sustainability of agro-ecotourism because cultural festivals are events that can introduce and preserve local cultural arts as well as being an attraction for tourists to visit agro-ecotourism areas. Waste management is the attribute that most influences the sustainability of community-based agro-ecotourism from the environmental dimension because the unmanaged waste will contaminate and reduce the aesthetic value of the environment as a tourist attraction. On the other hand, the waste processing business provides educational value and is a tourist attraction. In the institutional dimension, cooperation with outsiders is most sensitive to the sustainability of agro-ecotourism because cooperation with outsiders is a strategy for bringing together stakeholders so that the planning and implementation of agro-ecotourism can proceed according to sustainable tourism goals. Finally, in the technological dimension, the most sensitive attribute is the availability of transportation facilities and infrastructure because to ease of access and mobility in agro-ecotourism areas, road facilities, and modes of transportation are needed, which are sufficiently available and easily accessible to tourists.

The limitations of this study are examining all agro-ecotourism locations in each region and comparing general tourism with agro-ecotourism from a sustainability standpoint. And then, it was reviewed from the view of tourists related to the level of sustainability of agro-ecotourism. The results of this study may be applied to other areas with similar characteristics to this study. Furthermore, future research may conduct studies with broader or more heterogeneous features (for instance, regarding culture, climate, and environment) than those involved in this study.

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References


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