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

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Posted Date: 5 June 2023

doi: 10.20944/preprints202306.0304.v1

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Article

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Abstract: Agro-ecotourism is a tourism development activity in a location with ecological and agricultural advantages, leading to business utilization to generate economic value. Agro-ecotourism in West Java has a selling point in the form of natural potential, agriculture, arts, handicrafts, to the traditional culinary processing typical of the village. This research aims to analyze the sustainability level and the sensitive factors or attributes that affect the level of sustainability of community-based agro-ecotourism in West Java. The study used a survey method on 237 agritourist actors. Data were analyzed using Multi-Dimensional Scaling in the Rapid Appraisal-Tourism technique. The study results show that community-based agro-ecotourism in West Java is quite sustainable (57.07). This study analyzed sustainability through economic, social, cultural, institutional, ecological, and technological dimensions. The social dimension has the highest value because agriculture-based village tourism is carried out in the community. Meanwhile, the lowest value is the technology dimension. The availability of infrastructure influenced the value obtained and means of transportation as well as environmentally friendly farming techniques.

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

1. Introduction

Contextually sustainable development consists of economic, socio-cultural, and environmental-ecological dimensions. The meaning is contextually the development of additional exposure that the process of implementing development must provide economic, socio-cultural, and environmental benefits to an area or development area [1]. The implementation of regional development, which has focused more on economic growth efforts, has now been changed to the effective and efficient utilization of local resource potential, followed by efforts to realize regional competitiveness. Utilizing local resource potential in accordance with regional characteristics has become a rational policy choice and direction of regional development.

One of the essential aspects in utilizing potential resources is the attention to the determinants of resources, such as the agricultural sector, in a broad sense which many regions have. The potential of natural resources in the form of agricultural land, water, livestock, and human resources is sufficient to support agribusiness development [2]. In regional development, rural agricultural development has a major role in environmental development and the community's economy. Among the benefits of agriculture for environmental sustainability and human life are agriculture as a provider of oxygen, air, and food, source of livelihood, sociopolitical factors, a provider of industrial raw materials, tourism industry, and spiritual health [3].

The agricultural sector has recently grown and developed rapidly through agribusiness and agro-industry approaches combined with aspects of natural beauty. This situation has become an important icon in regional development in Indonesia. However, it cannot be denied that agricultural development has also received a lot of criticism. Agricultural development strategies have not been

 doi:10.20944/preprints202306.0304.v1

optimal or failed to create rural communities apart from poverty, environmental damage, and degradation of land resources [4].

Some of the problems in agricultural development include a) the high rate of conversion of agricultural land to non-agricultural land, b) the decline in the quality of agricultural land due to improper land management, c) the interest of the younger generation to work in agriculture is decreasing, d) inappropriate agriculture's image, e) community appreciation of agriculture is still low, f) the exchange rate of some agricultural products is low, g) rural and urban development is not yet balanced and h) the education level of people in rural areas is relatively low [5].

Several countries in the world are taking advantage of opportunities to empower agricultural potential in rural areas through the integration of agriculture and tourism so that they become alternative tourist attractions based on agro-tourism. In Europe, agro-tourism is considered part of the changing model of agricultural development from productivity to multifunctionality and sustainability [6]. Herminingrum argues that combining agricultural activities with tourism creates harmony between humans and the natural environment so that agriculture and tourism have a symbiotic relationship of mutualism [7]. In other words, agricultural resources can be utilized to diversify tourism products and provide new experiences to tourists. The activities of tourists will impact community business activities, create jobs, and diversify the economic activities of rural communities to provide economic and socio-cultural benefits for the community.

Consumption of environmental services in the form of tourism is one of the needs of humankind. At this time, tourism development tends to shift from mass tourism to alternative tourism. 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 middle to upper class, experienced, educated, and millennial generations who are familiar with the use of information technology and strategic environment which realize the importance of environmental conservation and empowering local communities [8,9].

The development of agricultural resources into a tourist attraction that is in harmony with the trend of tourism towards alternative tourism has encouraged and provided opportunities for the further development of ecotourism, agro-tourism, and rural tourism as a synergy between agriculture and tourism [10–12]. Rural tourism includes agricultural tourism (agro-tourism), nature tourism (ecotourism), tours in rural areas, and other services such as events, celebrations, outdoor recreation, production and sale of handicrafts, and agricultural products. Five types of tourism can be developed in rural areas: educational tourism, agro-tourism, natural tourism, cultural tourism, and culinary tourism. Agro-tourism has the potential to be developed in Indonesia because of its natural resources and people's lifestyle trends. Agro-tourism in rural areas is based on various commodity resources and agricultural systems (including large plantations, smallholder plantations, food crops and secondary crops, animal husbandry, and fisheries) as an alternative to providing a different experience to tourists.

The beginning of the development of agriculture-based rural tourism into agro-tourism destinations in Indonesia was recorded in data from the Directorate General of Tourism for 1994/1995; eight provinces had agro-tourism objects, namely North Sumatra, Riau, West Java, Central Java, DIY, 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 [13].

The International Ecotourism Society, abbreviated as TIES (2015), defines ecotourism as professionally trained and packaged travel to natural areas that consider cultural heritage, participation, and welfare of local residents as well as efforts to conserve natural resources and the environment. Therefore, ecotourism can be seen as a concept of developing nature-based sustainable tourism to support efforts to preserve the environment and increase community participation in its management [14].

However, in its development, Indonesia's potential for agro-tourism and ecotourism is poorly managed. Priyono and Santosa found the problem of poverty, a decrease in the number of tourist

 doi:10.20944/preprints202306.0304.v1

visits, a reduction in the carrying capacity of the land, and environmental pollution in rural areas used as agro-tourism areas [15]. Santoso revealed that the contribution of agro-tourism to increasing the income of the majority of village communities, especially farmers, is still relatively low. Even though there is an economic motive for cultivating agriculture for agro-tourism needs, the community has difficulty managing it as a primary source of income [16]. The competitiveness of agro-tourism is relatively low due to weak management capabilities and business orientation, lack of institutional support, and limited quantity and quality of tourism infrastructure facilities [17].

The same thing exists in ecotourism. Problems in ecotourism include; a) low contribution to the economic interests of local communities, b) government policy systems do not understand ecotourism comprehensively, and the government's participation is not yet optimal, c) knowledge of biodiversity in ecotourism development is not yet comprehensive so that it has an impact on damage and depletion of biodiversity and the environment global, d) human resource capacity and management do not meet ecotourism development standards and e) the low contribution of ecotourism to the interests of conservation and sustainable development [18].

The concept of agro-ecotourism has recently emerged, integrating agro-tourism and ecotourism as alternative tourism to support sustainable development. The concept of agro-ecotourism has begun to be implemented in several countries, including Costa Rica, the Philippines, Thailand, India, and Uzbekistan. Agro-ecotourism is tourism that integrates the natural base and farming, providing opportunities for visitors to carry out various life activities by farmers, ranchers, and fishermen in rural areas [19]. Cavaliere defines agro-ecotourism as a market-related concept to protect biodiversity and develop sustainable rural communities [20]. The characteristic elements of ecotourism and agro-tourism also become characteristics of agro-ecotourism. Agro-ecotourism combines ecotourism and agro-tourism based on nature tourism to preserve culture and nature while promoting agriculture as a tourist attraction that focuses on sustainable tourism [21]. Agro-ecotourism is a long-term tourism development strategy in rural areas that allows visitors to learn about agricultural situations, agricultural work, local goods, traditional food, the daily life of rural people, and components of culture and traditions [22]. Development of agro-tourism that highlights local culture in utilizing land will increase farmers' income along with efforts to conserve land resources, conserve culture and local technology (indigenous knowledge), which are generally appropriate to rural environmental conditions [23]. Thereby, Agro-ecotourism is a tourism concept that unites agricultural or rural environments with ecologically and socially responsible agribusiness activities.

Since the Government Regulation No. 24 of 1979, West Java has become one of the national strategic tourism destinations because it has a variety of natural, cultural, and artificial tourist attractions. In 2017 West Java had 586 objects of natural tourist attractions, 311 objects of cultural tourist attractions, and 221 objects of special interest tourist attractions (data.jabarprov.go.id 2020). This situation motivates and encourages tourists to visit objects in West Java.

In 2017 - 2021, the number of foreign tourist visits to West Java has increased and is growing significantly. In 2015 the number of foreign tourists was 2,2027,629 people, and in 2017 there were 4,984,035 people. The growth of foreign tourists is fluctuating. Compared to foreign tourists, domestic tourists in West Java Province continue to increase significantly, so the total number of tourists in West Java Province increases each year

Currently, the regional government of West Java, through the Community Empowerment Service and the Tourism and Culture Office, is promoting the development of tourist villages. Based on data from the Department of Tourism and Culture of West Java Province, there are 251 tourist villages spread across 27 regencies and cities. According to the Deputy Chairman of Commission 2 DPRD West Java in 2020, the function of the tourism village is as a forum for the community for tourism potential, the creation of *Sapta Pesona* in tourist destination areas, an element of partnership for the provincial government and regional governments in efforts to realize and develop tourism in the region. Tourism villages can support government programs in tourism development, explore village potential for community development, and expand employment and business opportunities for villagers. This condition will encourage village economic equality, encourage city people to enjoy going to the village for recreation, reduce urbanization, accelerate assimilation between non-

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indigenous people and indigenous people, strengthen national unity, and overcome disintegration [24].

Community-based agro-ecotourism developed in tourist villages in West Java is expected to internally be able to provide welfare for local communities and externally to have an impact that spreads to the surrounding area in order to create equitable economic and rural development. There are still few literatures on community-based agro-ecotourism as an alternative tourism concept that integrates agro-tourism, eco-tourism and CBT. Several previous studies [25–29] concerned sustainability in terms of tourism in general, and there were also studies on agro-tourism. The interesting thing about this study is the inclusion of the sustainability of community-based agro-ecotourism in terms of more complex aspects, namely the economic dimension, cultural dimension, social dimension, environmental dimension, institutional and technological dimension. When referring to previous research, there has been no research connecting the six dimensions to review the level of agro-ecotourism managed by the community. Therefore, the inclusion the concept of community-based agro-ecotourism from this study is expected to be an alternative to environmentally sustainable development in West Java.

West Java Province has excellent potential to develop agro-ecotourism [30]. However, much improvement is still needed regarding administration, environmental management, infrastructure provision and other supporting facilities, including increasing human resources and promotion. The development of community-based agro-ecotourism is expected to minimize the negative impacts and optimize the positive impacts of tourism in rural areas in accordance with the potential of local resources that are pro-communities around tourist objects and are sustainable. Community-based agro-ecotourism development can support sustainability from various aspects. Economically beneficial for the region and society, socially and culturally acceptable to all stakeholders, and ecologically demonstrating the achievement of sustainability.

2. Materials and Methods

2.1. Sustainability Development

Sustainable development has three pillars, namely economic, ecological and social pillars. The economic pillar emphasizes revenue generation based on the efficient use of resources. The ecological approach emphasizes the importance of protecting biodiversity, which will contribute to the balance of the world's ecosystems, while the social approach emphasizes maintaining the stability of socio-cultural systems, including avoiding conflicts of justice, both between present and future generations [31].

The concept of sustainable tourism development is the management of all resources in such a way as to meet economic, social and aesthetic needs while maintaining cultural integration, important ecological processes, biological diversity and life support systems [32]. Sustainable tourism development must also be based on the development of relationships between the tourism industry, environmental advocates and society [33].

Another view of sustainable tourism development is tourism development that meets the needs of the present without compromising the ability of future generations to meet their own needs [34]. UNWTO (United Nations World Tourism Organization) defines tourism as fully accounting for the environmental, social and economic impacts of the present and future, the (tourism) industry, responding to visitors' needs, the environment and the host community. Sustainable tourism not only consumes natural and cultural resources but conserves those that benefit a few people and are distributed more widely among stakeholders and communities. Where sustainable tourism is an overarching concept intended for all kinds of tourism businesses both in urban and rural areas, large and small scale, government and private, it indicates that sustainable tourism development is an essential public agenda for all stakeholders at all levels. With the development of the current technological era, the sustainability of tourism can be seen from the use of technology in marketing and providing information to the broader community about the advantages of a tour [35].

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2.2. Agro Ecotourism

Agro-tourism is a series of tourism activities that utilize the potential of agriculture as a tourist object, both in the form of the natural landscape of the agricultural area and the peculiarities and diversity of production activities and agricultural technology and the culture of the farming community. Agro-tourism activities aim to broaden knowledge, recreational experience and business relations in the agricultural sector, including food crops, horticulture, plantations, fisheries and animal husbandry. In addition, what is included in agro-tourism is forestry and agricultural resources. If managed properly, the combination of natural beauty, rural community life, and agricultural potential can develop tourist attractions. With the development of agro-tourism in a tourist destination area, it will provide benefits for increasing the income of the community and government, in other words, the function of tourism can be carried out with the function of agricultural cultivation and rural settlements as well as a conservation function [36,37].

2.3. Data

This research was conducted in five tourist villages representing the diversity of agro-tourism commodities. The five villages are the tourist village of Pasanggarahan, Bojong Subdistrict, Purwakarta District with a food crop commodity base, Pasanggarahan Village representing the northern route. Cibuntu tourism village, Pasawahan District, Kuningan Regency with a livestock commodity base, Alamendah tourism village, Rancabali Subistrict, Bandung District with a horticulture and coffee plantation commodity base, Suntenjaya Village, Lembang Subdistrict, West Bandung District with a horticulture and livestock commodity base. Cibuntu, Suntenjaya, and Alamendah Village represent the middle lane of West Java. The Sukalaksana tourism village, Samarang Subdistrict, Garut District, represents the southern route of West Java Province. This study uses a survey method. The sampling technique used in this study was proportional stratified random sampling involving 237 stakeholders who manage agriculture-based tourism obtained from 5 West Java tourism villages.

The data analysis used in this study is a sustainability analysis carried out using the Multi-Dimensional Scaling (MDS) approach. Multi-Dimensional Scaling is a statistical technique used to measure proximity between objects [38,39]. The stages of data analysis in this study include: determining attributes, assessing each attribute, ordinating analysis with MDS, assessing indexes and sustainability status, sensitivity analysis (Leverage Analysis), and uncertainty analysis (Monte Carlo Analysis).

2.4. Multi Dimensional Scaling

Multi Dimensional Scaling is a multivariate method that can analyze metric data (ordinal or nominal data). MDS is also one of the ordination methods in a reduced space (dimensional) so that multi-dimensional diversity can be projected in a more superficial plane. This analysis tool determines the sustainability value of each attribute used in the ordinal scale of each dimension and as a whole [40,41]. This study grouped attributes into six dimensions: economic, social, cultural, ecological, institutional, and technological. These attributes are grouped based on "good" or "bad" criteria, which are then coordinated using the existing MDS method in the Rap-Tourism technique (Rap fish modified). The output of this analysis is the sustainability index of agro-ecotourism in West Java from the six dimensions. Each dimension is shown in the form of a score with a scale of 0-100 and illustrated by a kite diagram.

The results of the MDS analysis in the form of a sustainability index are used as a score to determine the sustainability level based on the sustainability category. The assessment category for the level of sustainability can be seen in Table 1.

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Table 1. Sustainability Level Category Based on RAP-Tourism Index Results.

Index Score (%)	Category
0 – 25	Bad (Unsustainable)
25,01 – 50	Less (Less Sustained)
50,01 – 75	Sufficient (Sufficiently Sustained)
75,01 – 100	Good (Highly Sustainable)

Other results from the MDS analysis are the S-Stress (Standardized Residual Sum of Square) value and the coefficient of determination (R^2), both of which reflect the goodness of fit in the MDS analysis, which is also used to see whether additional attributes are needed, or attributes that are there has reflected the accuracy of each dimension analyzed. A low S-Stress value indicates a good fit, and a high value demonstrates the opposite [42]. The model is said to be good if the S-Stress value is less than 0.25 and R^2 is close to 1 (100%), which means that these attributes can explain almost 100% of the existing model [43,44].

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 RMS change value due to the loss of a particular attribute, the more significant the role of this attribute in forming the sustainability index [45,46]. In the next stage, Monte Carlo analysis is a simulation method to evaluate the impact of random error on all dimensions [46]. Monte Carlo analysis is used to estimate the effect of error (error) at the 95% level of confidence, or in other words, taking into account 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, it can be concluded that the MDS analysis has a smaller error rate. MDS analysis, leverage analysis, and Monte Carlo analysis were performed using Rapfish 3.1 software downloaded from www.Rapfish.org.

3. Results

Sustainable tourism development is characterized by four conditions, namely: a) community members must participate in the tourism planning and development process; b) education for hosts, industry players, and tourists; c) wildlife habitat quality, energy use and microclimate must be understood and supported; d) investment in alternative forms of transportation [47,48].

The sustainability status indicates the sustainability of community-based agro-ecotourism in West Java through established sustainability indicators. Rap-Agrotourism analysis shows the value of goodness of fit, which reflects the value of S-Stress and R^2.

A good model is if the S-Stress value is <0.25 and R^2 is close to 1 (100%). The S-Stress value generated in each dimension and multi-dimensional has a value of <2.50, the smaller than 0.25, the better the S-Stress value [49]. The S-Stress and R^2 values indicate that all the attributes used and analyzed dimensionally and multidimensionally have met the statistical criteria and are appropriate to explain the sustainability of community-based agro-ecotourism.

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

Criteria	MDS	Monte Carlo	Difference	S-Stress	R^2
Multi-dimensional	57,07	55,78	1,29	0,15	0,94
Economy	47,53	46,83	0,7	0,16	0,94
Social	73,64	71,53	2,11	0,15	0,94
Culture	62,78	61,42	1,36	0,17	0,93
Ecology	61,67	58,13	3,54	0,16	0,94
Institutional	49,33	47,21	2,12	0,16	0,94
Technology	45,61	43,10	2,51	0,15	0,94

Source: Primary Data (processed).

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Table 2 shows that the S-Stress value is between 0.15 – 0.17, and the R^2 value is at 0.93 – 0.94, so it can be interpreted that the goodness of fit value in the Rap-Agrotourism analysis has been fulfilled. According to [50], the coefficient of determination (R^2) describes the attribute's ability to explain and contribute to the system's sustainability is analyzed. If the S-Stress value is met, the attribute configuration can reflect the original data so that it can be stated that the indicators analyzed have been accurate and can be accounted for statistically.

The difference between MDS and Monte Carlo at the 95% confidence level or 5% error rate is between 0.7 – 3.54, so it can be interpreted that the impact of scoring errors in the analysis is relatively small. The value of the difference in this analysis is <5%, so the results of the MDS analysis are sufficient as an estimator of the sustainability index [51].

The results of the multi-dimensional Rap-Agrotourism analysis using the Multi-Dimensional Scaling method yielded a community-based agro-ecotourism sustainability index value in West Java of 57.07, which means this value is in the range of 50-75 and is included in the "quite sustainable" category with the S-Stress value is 0.15. The R^2 value is 0.94, as shown in the following ordination scale:

Based on the results of the Rap-Agrotourism analysis in Figure 1, the multi-dimensional index value of community-based agro-ecotourism in West Java is 57.07. This value is influenced by the calculation of a combined analysis of all dimensions (economic, social, cultural, institutional, environmental, and technological) called multi-dimensional analysis. Thus, it can be concluded that community-based agro-tourism in West Java is quite sustainable, in line with the research [52,53] stating that the multi-dimensional agro-tourism sustainability index value is quite sustainable.

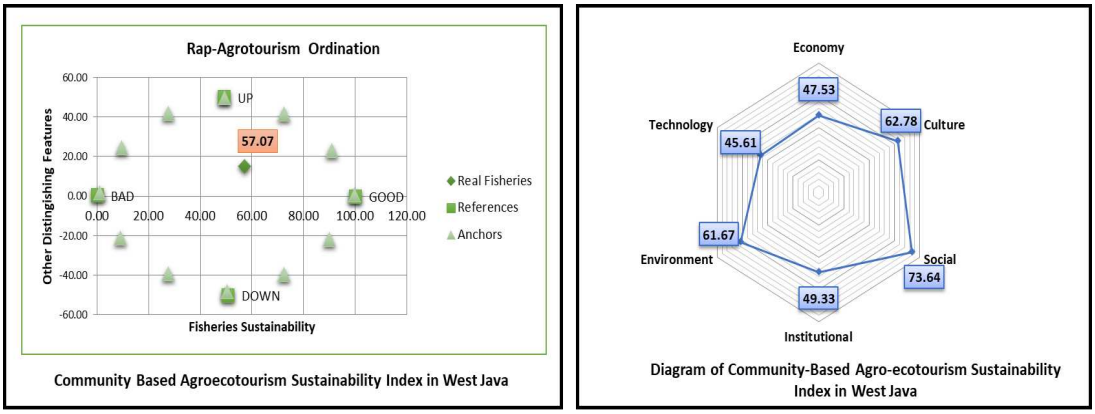

Figure 1. Sustainability of Community-Based Agro-ecotourism in West Java.

Each dimension has attributes that become parameters for the sustainability of community-based agro-ecotourism. The agro-ecotourism sustainability index value is obtained based on an assessment of the 32 sustainability attributes of each dimension. The sustainability index value for each dimension projected in the fly diagram (Figure 1) means that the further the sustainability point is away from the number 0, the greater the sustainability value. According to [54], fly charts are often called "radar" diagrams. The closer the analysis distance is to the zero point, the more it shows low sustainability and vice versa. Based on the flyover, it can be seen that the sustainability index value of the technological dimension has the lowest value, followed by the economic dimension, institutional dimension, ecological dimension, cultural dimension, and the dimension with the highest value is the social dimension. The sustainability index value of each dimension based on the fly chart is still not precise, meaning that each dimension of sustainability is still not applied evenly and in a balanced way.

The fly chart can describe the sustainability status of community-based agro-ecotourism in an integrated manner between the various dimensions of sustainability consisting of the economic, social, cultural, institutional, ecological, and technological dimensions. The calculations' results are shown in more detail in the following figure.

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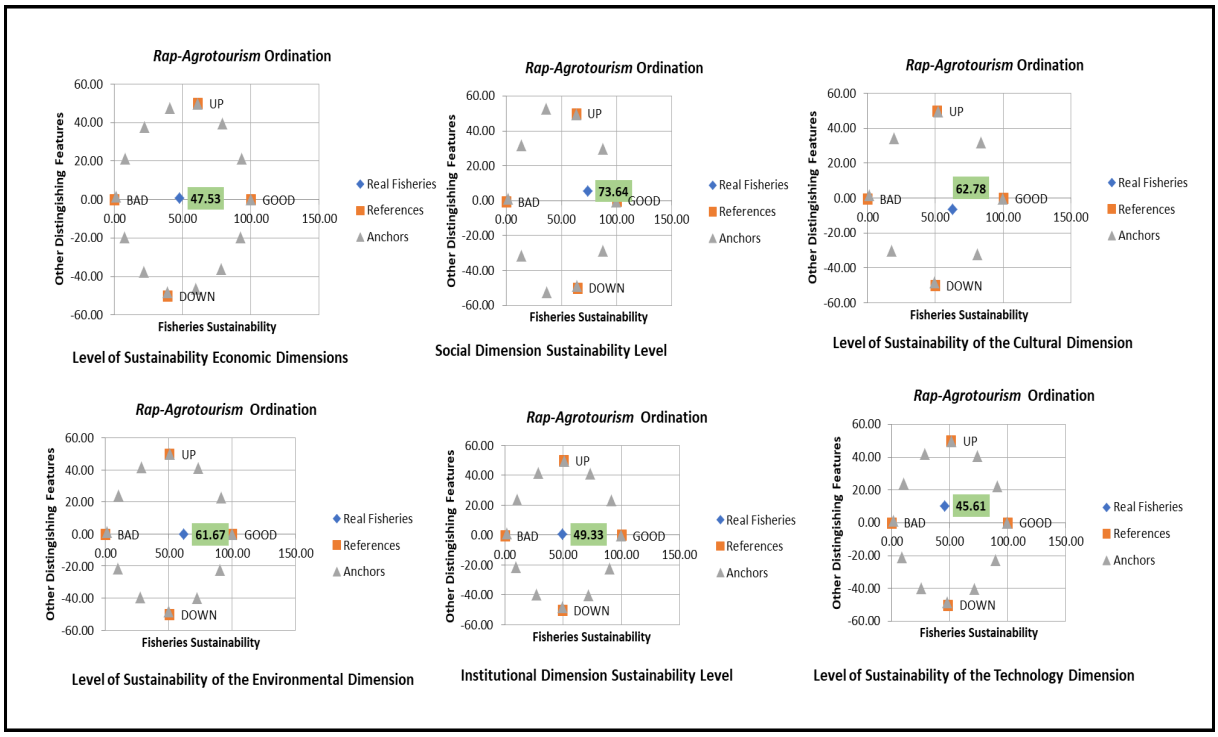

Figure 2. Level of Sustainability for each Dimension.

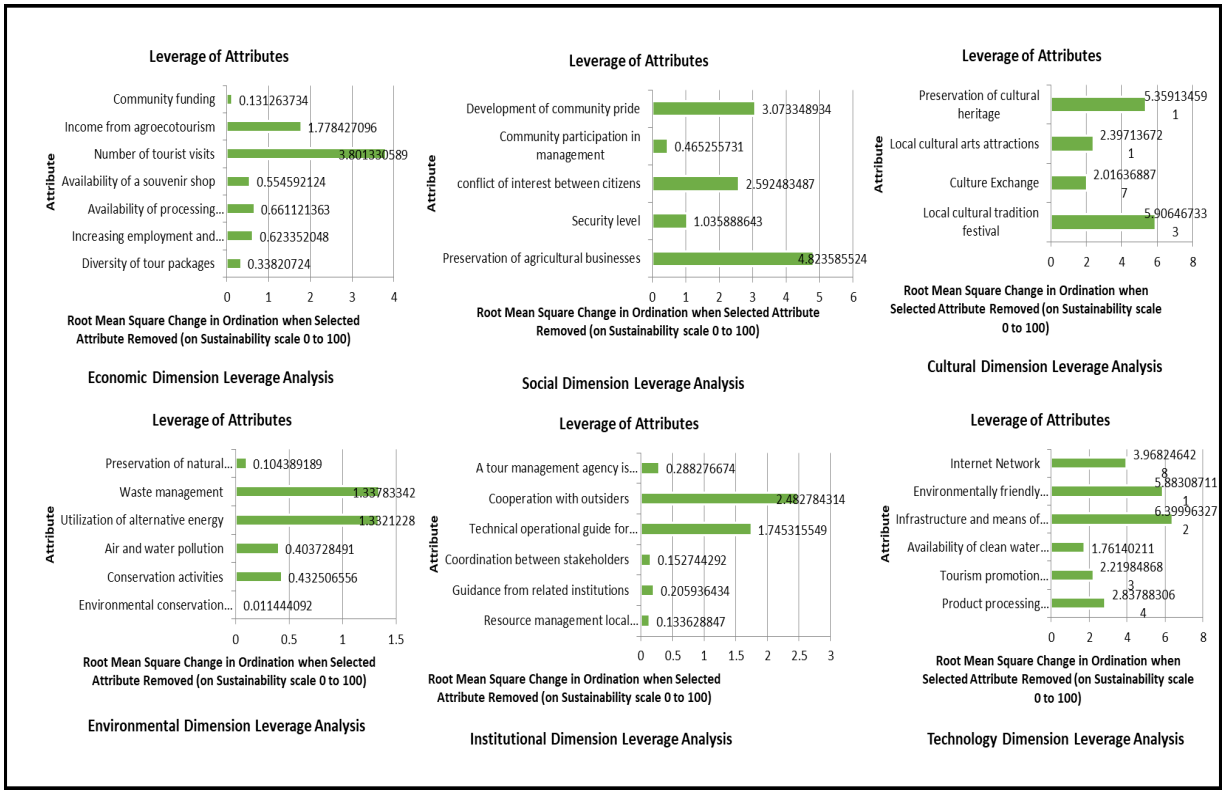

Figure 3. Leverage value for each dimension.

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4. Discussion

4.1. Economic Dimension Sustainability Status

Covering the economic aspect, sustainable agro-tourism development is closely related to economic growth and how to find ways to advance the economy in the long term and can increase the welfare of the present generation without reducing the ability of nature, society and the economy to increase the welfare of future generations. So, if the current generation can progress, then the value of the sustainable development of agro-tourism will continue to progress and develop in the future [55].

The economic dimension is an essential criterion in measuring the sustainability of community-based agro-ecotourism. The economic dimension is also one of the responsibilities in the concept of sustainable development stated [56], namely economic success, which means the wise use of financial resources for the welfare of society. There are seven measurement attributes in the economic dimension that are analyzed by Rap-Agrotourism analysis, including: a) Increasing employment and business opportunities, b) Income from agro-ecotourism, c) Diversity of tour packages, d) Number of tourist visits, e) Availability of processing businesses, f) Availability of souvenir shops and g) Community funding [57,58].

The results of the sustainability analysis of the economic dimension of community-based agro-ecotourism for all attributes show that the index value of the sustainability of the economic dimension is 47.53 and is included in the less sustainable category, according to the value range of 25 – 50. The ordinate analysis in the economic dimension produces a value of $R^2 = 0.94$ and an S-Stress value of 0.16 or 16%. The analysis of the economic dimension in this study shows that the goodness of fit condition is in the fair category. According to [59], analysis in Multi-Dimensional Scaling is said to be good and acceptable if the S-Stress value is <25% or (<0.25) and the R^2 value is close to 1 or 100%. This situation shows that the attributes tested in the economic dimension can explain or approach the model 100% of the original model.

Sensitivity analysis on the economic dimension using the leverage analysis method in the RAPFISH software shows that of the seven attributes tested, it is known that there are two sensitive attributes that most influence the sustainability of community-based agro-ecotourism in West Java, namely the number of tourist visits with an RMS value of 3.8 and income from agro-ecotourism with an RMS value of 1.78. According to [60], the greater the leverage analysis value, the more sensitive this attribute influences sustainability. The previous description shows that it is necessary to pay attention to and consider these two attributes to improve sustainability's status from the economic dimension.

The first attribute that most influences the sustainability of community-based agro-ecotourism in West Java on the economic dimension is the number of tourist visits. The number of tourists visiting the location of agro-tourism areas is significant in developing tourist objects and the carrying capacity of objects. Therefore, data on the number of tourist visits to these attractions is needed so that trends can be predicted, as well as the negative impacts that will be caused on the object and its carrying capacity. The number of tourists visiting agro-ecotourism in West Java has decreased significantly due to the Covid-19 pandemic. Its spread has made people decide not to travel during the pandemic. This impact is felt by the tourism industry, including hotels, resorts, restaurants, airlines, and travel agencies outside and within the country. This situation is inseparable from the agro-ecotourism area in West Java [61,62]. However, tourists return to travel after the new normal and the implementation of hygiene protocols at tourist attractions.

The following attribute that most influence the sustainability of community-based agro-ecotourism in West Java on the economic dimension is income from agro-ecotourism. Based on the number of tourist visits, a decrease can certainly affect the actors' income. The agro-ecotourism sector is essential in increasing income, creating jobs, and developing infrastructure for tourist sites through revenue and income. The decline in the number of tourists has impacted companies in the regional tourism sector; apart from affecting people's income, it has also affected the income and operating profit earned to decrease drastically [63]. Many financing sources for business development can be accessed by surrounding business actors, including income from tourism [64].

 doi:10.20944/preprints202306.0304.v1

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 until mid-2021, namely during the PSBB (*Pembatasan Sosial Berskala Besar* or Large-Scale Social Restrictions) implementation period, agro-ecotourism business activities ran as usual even though the number of visitors is very minimal so that the impact on decreased income. Second, during the PPKM (*Pelaksanaan Pembatasan Kegiatan Masyarakat* or Implementation of Restrictions on Community Activities) period, namely from the end of July to the beginning of September 2021, agro-ecotourism activities in West Java stopped entirely due to a policy from the government to reduce the number of Covid 19.

4.2. Social Dimension Sustainability Status

The social aspect is an essential criterion in realizing the sustainability of community-based agro-ecotourism. The social aspect is one of the pillars of sustainable development that can contribute to rural development and reduce poverty [65]. Nasdian argues that the social aspect is part of the three main perceptions of sustainability, namely the social definition aimed at continuously fulfilling basic needs for security, justice, freedom, education, employment, and recreation [66].

In this study, there are five attributes used to analyze the sustainability of community-based agro-ecotourism in West Java on the social dimension, namely a) level of security, b) preservation of agricultural businesses, c) conflict of interest between residents, d) development of community pride, and e) community participation in management [67–70]. Based on the results of the Rap-Agrotourism analysis with five attributes on the social dimension, the sustainability index value of community-based agro-ecotourism in West Java on the social dimension is at a value of 73.64 including in the range of values 51 - 75, the social dimension category is quite sustainable [71].

The results of the Rap-Agrotourism analysis test stated that the position of community-based agro-ecotourism sustainability in West Java on the social dimension had a value of 73.64. The ordinate analysis shows that the goodness of fit condition is in the fair category with a determination value of $R^2 = 0.94$ and an S-Stress value of 0.15 or 15%. These results comply with the statistical principles of Multi-Dimensional Scaling analysis.

Sensitivity analysis (leverage) was conducted to determine the most sensitive attribute influencing the sustainability of community-based agro-ecotourism in West Java on the social dimension. The more significant the change in the RMS value, the more sensitive the role of this attribute is to an increase in the sustainability status. Based on the results of the sensitivity analysis (leverage) carried out on the five social dimension attributes, it is known that two attributes have the highest leverage values that affect the sustainability status of the social dimension, namely the preservation of agricultural businesses with an RMS value of 4.82 and the attribute development of community pride with an RMS value of 3,07.

The preservation of agricultural businesses is the most sensitive attribute that affects the sustainability status of the social dimension. The condition of agro-ecotourism in West Java is still lacking in optimizing the agricultural sector, which can obtain selling points to tourists. The important thing from the development of agro-ecotourism in West Java is to provide education or knowledge about the world of agriculture, such as plant cultivation. Providing education through direct plant cultivation activities is very effective for introducing the younger generation. Besides that, doing direct practice can also add to the tourist experience [72]. Agro-ecotourism does not only take advantage of the natural beauty and diversity of agricultural activities, but many agro-tourism models have been created that utilize particular agricultural objects, such as horticultural agro-tourism, plantation crop agro-tourism, or variants of plantation gardens are examples of the many agro-tourism that can be developed.

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 organization/community that regulates the area. This condition is also supported by the opinion of Setiawan, which states that the phenomenon of decreased vitality and quality of the area is caused by the absence or weakening of the community or organization that embodies local communities [73]. The effort to develop community-based agro-ecotourism in West Java requires interaction,

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collaboration, and support between actors (farmer groups, community groups, traditional groups, LMDH, Karang Taruna, Village Government, District Government, Regency Government, and Provincial Government) to have a vision and the mission and program of sustainable agro-ecotourism development activities [74]. The above description also indicates that in terms of increasing the sustainability status of community-based agro-ecotourism in West Java on the social dimension, it is necessary to pay attention to the attributes of preserving agricultural businesses and developing community pride.

4.3. Sustainability Status of the Cultural Dimension

The dimension of sustainable culture is that local people can adapt to a quite different tourist culture. Community-Based Development is a concept that emphasizes community empowerment to understand better the values and assets they have, such as culture, customs, culinary cuisine, and lifestyle [75]. In tourism development, the community must independently mobilize these assets and values to become the main attraction for tourists' travel experiences. Through the concept of Community Based Tourism, every individual in the community is directed to become part of the tourism economic chain. For that, individuals are given the skills to develop small businesses.

Measurement of the sustainability of community-based agro-ecotourism in West Java in the cultural dimension uses four measurement attributes, namely a) local cultural arts attractions, b) local cultural tradition festivals, c) cultural exchange, and d) preservation of cultural heritage [76–78]. The results of the Rap-Agrotourism analysis on the sustainability of community-based agro-ecotourism resulted in a cultural dimension of sustainability index of 62.78 and is in the fairly sustainable category. This situation shows that the implementation of culture by the community is still not optimal. Rap-Agrotourism analysis on the cultural dimension yields an R^2 value = 0.93 and an S-Stress value of 0.17 or 17%. Thus, the analysis of the cultural dimension in this study shows the condition of the goodness of fit in the fair category.

Leverage analysis was carried out to determine the key attributes or attributes that are most sensitive in influencing the sustainability dimensions of community-based agro-ecotourism sustainability in West Java. Based on the four attributes analyzed, the two most sensitive attributes that affect the sustainability of the cultural dimension are the local cultural tradition festivals, with an RMS value of 5.91, and the attribute of cultural heritage preservation, with an RMS value of 5.36. This condition improves the sustainability status of the cultural dimension, and paying attention to and considering these attributes is necessary.

A sensitive attribute that influences the sustainability of the cultural dimension in the sustainability of community-based agro-ecotourism in West Java is the festival of local cultural traditions. The lack of frequency of local cultural tradition festival activities at each agro-ecotourism location in West Java shows the acquisition of this assessment. This activity is based on introducing or preserving local cultural traditions both physically and non-physically. Physical appearance in dances, traditional food, locally processed products, and musical instruments. In comparison, non-physical performances include the introduction of regional languages, local cultural history, ancestry, agro-ecotourism history, and ethics (rules).

Cultural tourism is a form of the cultural industry because it collectively uses different cultural aspects in its production system. As cultural capital (resources), culture is aligned with other resources, such as natural and economic (financial) resources [79]. One of the global trends is the increasing awareness of tourists to understand the cultural heritage of the past. This condition is to determine the density and cultural identity of the tourists involved. Efforts to understand the cultural heritage of the past are carried out not only within the territory of the country itself but also across countries. Past cultural heritage is considered cultural capital in cultural tourism development. Cultural tourism is a double-edged sword in utilizing cultural heritage as a tourist attraction.

On the other hand, cultural tourism can provide economic benefits to local communities, generate funds and education for the restoration or preservation of cultural heritage, both tangible and intangible, and simultaneously pose a severe threat if cultural tourism mismanages. The tourist attraction has a crucial place on the side of the tourism sector, especially in attracting tourists' visits

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to destinations. The role of local cultural festivals in agro-ecotourism is to draw attention from 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 essential for the understanding and development of history, science, and culture in the life of society, nation, and state so that it needs to be preserved and managed appropriately through efforts to protect, develop and utilize in order to promote national culture for the greatest prosperity of the people.

Agro-ecotourism in Java is still lacking in providing education on the importance of preserving cultural heritage around tourism. Efforts can be made by making information boards, websites, and pocketbooks. Preserving the cultural heritage of agro-ecotourism in West Java areas can protect the nation's culture from foreign cultural influences and prevent culture from being recognized by other countries. Tourists flock to West Java agro-ecotourism not only because of its natural beauty but also because of its beauty and diversity and cultural uniqueness, and this is a pretty good opportunity besides being able to bring in income for the local community [80,81].

West Javanese culture can be a source of pride because it can be recognized nationally and internationally. It realizes community development to increase knowledge about the local culture that West Java owns and increase a sense of love to study and preserve it. With this realization, the association between human beings will be better and harmonious because it is based on mutual respect and respect for one another and can create a more intimate and pleasant atmosphere. Preserving cultural heritage in particular and local culture, in general, can also build a sense of nationalism, namely a sense of mutual care and mutual respect.

4.4. Sustainability Status of the Environmental Dimension

Ecologically sustainable tourism development does not have a negative effect on the local ecosystem [82]. In addition, conservation is a need that must be pursued to protect natural resources and the environment from the negative effects of tourism activities. One of the requirements for sustainable processing of natural resources (SDA) is to maintain the function of the previous natural resources. In addition, it must have Eco-Efficiency criteria which means economically and environmentally efficient. Attributes on the ecological dimension were chosen to reflect how using natural resources and the environment impacts sustainability [83].

Measurement of the sustainability of community-based agro-ecotourism in West Java on the environmental dimension uses six measurement attributes which are analyzed using Rap-Agrotourism analysis, including a) utilization of alternative energy, b) waste management, c) conservation activities, d) air and water pollution, e) maintenance of natural landscapes, and f) land conversion education [84,85]. Based on the results of the Rap-Agrotourism analysis, the sustainability index value of community-based agro-ecotourism in West Java on the environmental dimension is 61.67 and is in the fairly sustainable category. The ordination analysis on the sustainability of the environmental dimensions yields a value of $R^2 = 0.94$ and an S-Stress value of 0.16 or 16%. Thus, the analysis of the sustainability of community-based agro-ecotourism in West Java on the environmental dimension shows the goodness of fit condition in the less category.

Leverage analysis is an advanced stage after the Rap-Agrotourism analysis is carried out. This analysis shows the most sensitive attributes affecting the sustainability of community-based agro-ecotourism in West Java on the environmental dimension. The results of the leverage analysis stated that the two most sensitive attributes in influencing the sustainability of community-based agro-ecotourism in West Java on the environmental dimension were waste management with an RMS value of 1.34 and alternative energy utilization with an RMS value of 1.33.

Waste management is the first attribute that affects the sustainability of community-based agro-ecotourism in West Java on the environmental dimension. The impact of tourism activities on ecology is the occurrence of water pollution, noise, and the amount of waste [86]. Based on agro-ecotourism conditions, many visitors bring waste from outside tourist sites, both organic and non-organic waste. Even though the management has provided trash bins, sometimes people are still not enthusiastic about throwing them in these places.

 doi:10.20944/preprints202306.0304.v1

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

The following attribute affecting the sustainability of community-based agro-ecotourism in West Java on the environmental dimension is using alternative energy. Most agro-ecotourism in West Java still lacks optimal alternative energy, such as using organic waste to become fertilizer and power generation from water. According to [88], the uniqueness of local technology resulting from natural selection is an agro-tourism attraction asset to be proud of. Even this local technology can be packaged and offered for sale to other parties. Thus, local technology, which is indigenous knowledge, can be preserved. Local technologies such as Talun Kebun or Yard, which have developed in the people of Central and East Java, are examples that can be offered for agro-tourism. This local technology has been proven to be sufficiently capable of controlling soil fertility through vertical nutrient cycling. Besides efficiently utilizing nutrients, this technology can also utilize solar energy and in situ organic matter properly according to the level of need. Thus, through agro-tourism we can understand our local technology so that dependence on foreign technology can be reduced.

4.5. Institutional Dimension Sustainability Status

Institutions with authority, responsibility, and role support implementing tourism activities. Tourism institutions are described in the Law on Tourism number 10 of 2009 as all government institutions, 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 tourism operations, b) collaboration with external parties, c) availability of tourism management agencies, d) guidance from related institutions, e) coordination between stakeholders, and f) support for local ownership rights for resource management [89–91].

Based on the results of the Rap-Agrotourism analysis on the institutional dimension, it is known that the sustainability index value of community-based agro-ecotourism in West Java on the institutional dimension of 49.33 is in the range of values 26 - 50 and is included in the less sustainable category. These results conclude that the institutional dimension still needs improvement and improvement in the future. Rap-Agrotourism analysis in the institutional dimension was carried out by producing $R^2 = 0.94$, and the S-Stress value was 0.16 or 16%. Then the goodness of fit value in the sustainability analysis of the institutional dimension of sustainable agro-ecotourism is in fair condition and meets the requirements of a good institutional dimension MDS analysis. Based on the leverage analysis, it is known that two attributes are most sensitive to influencing the sustainability of the institutional dimension, namely cooperation with outsiders and technical guidelines for tourism operations.

Cooperation with outsiders is the first attribute most sensitive to the sustainability of community-based agro-ecotourism in West Java on the institutional dimension, with an RMS value of 2.48. The lack of cooperation with parties in tourism management results in a decrease in the aesthetic value of the agro-ecotourism development. The negative impacts that will arise can be suppressed if outside parties provide information, processes, and processes and determine mechanisms, monitoring, and evaluation. The involvement of outsiders in tourism management includes; 1) exchange of opinions in determining policies, 2) consulting on technical policy implementation of management, and 3) making high-level decisions [92]. Therefore, the active involvement of the community and community institutions around the area and parties outside tourism are expected to positively impact efforts to manage and safeguard agro-ecotourism. Coordination between agencies/stakeholders outside of research shows a lack of implementation. This condition indicates an institutional vacuum and that various stakeholders' interests in minimizing the decline of agro-tourism are not adequately fulfilled [93].

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Management of sustainable agro-ecotourism is a very complex business to carry out because these activities require accommodative nature and the existence of a synergistic cooperation mechanism between various related parties to sit together to represent their respective institutions so that each planned sustainable tourism management activity goes well. According to [94]., the government must revitalize and reform institutions to function effectively by adapting to the culture and values owned by the organization. Culture and inter-organizational values in planning formulation to implementation and control are in the form of togetherness. Togetherness is important to clarify each institution or sector's tasks, functions, and authority.

The second most sensitive attribute affecting the sustainability of the institutional dimension is the technical guidelines for tourism operations. The condition of agro-ecotourism in West Java currently has no technical guidelines for tourism operations from the tourism manager. From the results of the research conducted, it was found that the implementation of this policy was still lacking in implementing the compliance function, which was then seen as several possibilities that caused this to occur, including a lack of understanding from managers and a lack of provision of data related to accessible facilities. The absence of operational and funding policies can also fail to implement tourism's operational technical guidelines.

4.6. Technology Dimension Sustainability Status

The sustainability dimension of technology is the use and adoption of technology in agro-tourism in facilitating access to and obtaining tourist information. One of the essential components of tourism activities is the accessibility or smoothness of the community from one place to another. The movement can be in close, medium, or long distances. To make the move, of course, means of transportation are needed. When traveling, various forms of desire cross the minds of tourists. Some want to go fast, and some want to take it easy. Based on the background of tourists, some can pay high prices, and those who cannot afford to pay high costs, but usually, more people want cheap. Various transportation facilities can be enjoyed quickly and comfortably with advances in science and technology [95].

Measurement of the sustainability of community-based agro-ecotourism 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 farming technology, and f) availability of clean water facilities [96,97].

The results of the Rap-Agrotourism analysis on the sustainability of community-based agro-ecotourism in West Java on the technology dimension resulted in a technological dimension sustainability index of 45.61. They were included in the less sustainable category. This situation shows that implementing the technological dimension is still not optimal. Rap-Agrotourism analysis on the technological dimension was carried out with 2 (two) iterations resulting in an R^2 value = 0.94 and an S-Stress value of 0.15 or 15%. Thus, the analysis of the technological dimensions in this study shows the condition of the goodness of fit in the less category.

Leverage analysis was carried out to determine the key attributes or attributes that are most sensitive in influencing the sustainability of community-based agro-ecotourism in West Java on the technological dimension. Based on the six attributes analyzed, the two most sensitive attributes that affect the sustainability of the technological dimension are the attributes of infrastructure and transportation facilities with an RMS value of 6.40 and the attributes of environmentally friendly farming technology. This condition shows that it is necessary to pay attention to and consider these attributes to improve the sustainability status of the technological dimension.

Transportation infrastructure and facilities are sensitive attributes that influence the sustainability of community-based agro-ecotourism in West Java on the technological dimension. Several conditions in the agro-ecotourism area are still experiencing difficulties regarding public transportation infrastructure and facilities. The majority of tourists use private vehicles when visiting tourist areas. The availability of transportation facilities will provide satisfaction for tourists to visit tourist objects. The availability of transportation facilities is measured from four indicator items: the

costs incurred to use transportation facilities, easy access to obtain transportation facilities, timely use of transportation facilities, and the quality of transportation personnel services [98].

The following most sensitive attribute is environmentally friendly farming technology. The majority of products sold in agro-ecotourism areas are processed traditionally, such as chips, handicraft products, and others. Most of the product systems use makeshift tools. Many technological developments can process processed agricultural products more efficiently. Technology transfer activities carried out positively impacted consumers. Increased efficiency and production capacity in product processing positively benefit consumers' ability to meet market demand [99].

5. Conclusions

The level of sustainability of community-based agro-ecotourism in West Java is quite sustainable in terms of the economic, social, cultural, institutional, ecological, and technological dimensions. Of the six dimensions, the most sensitive main attributes that can affect sustainability include visiting the number of tourists, preserving agricultural businesses, festivals of local cultural traditions, waste management, collaboration with external parties, and transportation infrastructure and facilities. Suggestions from research are that it is necessary to plan for the development of collaborative agro-ecotourism areas as a process towards integrated planning both hierarchically (Province, District, City) and sectorally (various institutions/ ministries) and synergy between stakeholders (academics, entrepreneurs, community, government, and media). All parties must be open, honest, and respectful to each other so that there is "trust" between the various parties who will collaborate. The approach must be cooperation or synergy in order to achieve common goals.

Author Contributions: Conceptualization, Endah Djuwendah and Eliana Wulandari; methodology, Tuti Karyani; software, Endah Djuwendah.; validation, Pradono Pradono, Tuti Karyani, and Eliana Wulandari; formal analysis, Endah Djuwendah; investigation, Tuti Karyani.; resources, Eliana Wulandari; data curation, Endah Djuwendah; writing—original draft preparation, Endah Djuwendah; writing—review and editing, Endah Djuwendah; visualization, Pradono; supervision, Tuti Karyani; project administration, Endah Djuwendah, Tuti Karyani, Eliana Wulandari, and Pradono Pradono; funding acquisition, Endah Djuwendah. All authors have read and agreed to the published version of the manuscript.

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