



Organic farming in Bogor, West Java, Indonesia: measuring how far its sustainability

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Abstract. Sustainable organic farming management combines ecological/environmental, economic, and social interests in its implementation. This study aims to determine the sustainability status of organic agriculture in Bogor, West Java Province, on the ecological, economic, and social dimensions. The analytical method used is Multi-Dimensional Scaling (MDS) through the Rap-Organic Farm (Rapid Appraisal for Organic Farm) ordinance technique. The results showed that the sustainability status of organic farming in Bogor was categorized as Fairly Sustainable (58.57) on the ecological dimension. Still, the economic and social dimensions were moderately sustainable (52.09 and 53.70, respectively). Leverage attributes that very sensitive influenced the sustainability of organic agriculture are the availability of fertile land, the presence of organic product seeds, community consumption level for organic products, the market potential for organic products, average additional community income from organic product cultivation, and involvement of community institutions in organic farming development. The six attributes of levers must be prioritized for managers through the preparation and implementation of appropriate policies so that the sustainability of organic farming in Bogor, West Java, can be maintained.

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INTRODUCTION

Organic farming is a type of farming that has been proliferating. It helps the economy, the environment, and the community. To make sure organic farming keeps helping, people need to plan and make strategies. This helps ensure enough resources and that the community benefits from the farming. It's important to have good plans and ideas from different people, like farmers and researchers, to make sure organic farming is successful (Sutanto 2002). Efforts to optimize organic farming management in Bogor, West Java, require the application of the concept of sustainable management. The sustainable development triangle framework is base of this concept, which describes that sustainable development is oriented towards a balance of three dimensions of sustainability (ecological, economic, and social) that are mutually supportive and interrelated. However, the management of organic farming in Bogor is still not effective and optimum.

Various problems related to organic farming in Bogor, West Java, are caused by the imbalance of ecological, economic, and social management (Fitroya 2018). The development of organic agriculture in Bogor faces various obstacles, one of which is that the organic product business is still limited to farmer groups with a small number. The implementation of organic product development is still based on the farmers' unilateral wishes, not on a local government policy that is directly monitored. In addition, the limited agricultural land, especially in Bogor town, which is increasingly narrow, has hampered the development of organic farming on a larger scale in the future. On the other hand, Bogor Regency has relatively larger agricultural land and could become a potential for cultivating organic products in the future, but it is constrained by market access. In addition, the consumption of organic products among the general public is still uneven. This is presumably because there are still very few organic products produced in Bogor Town and Bogor Regency, and organic products are still expensive for some people in the two regions.

Previous research has explained much about the urgency and benefits of organic farming to meet various needs in supporting people's lives. If appropriately managed, organic farming can increase people's income (Aminah 2017). Farmer empowerment programs in organic land management can improve community food security (Laily et al. 2014). Promoting organic farming needs the involvement of all stakeholders (Hamka et al. 2018; Nugraheni et al. 2013; Utary et al. 2013). In general, previous studies have only partially focused on the biophysical aspects of organic farming and have yet to comprehensively study other aspects such as ecology, economy, and society. Comprehensive research (multi-dimensional) is fundamental, primarily to assess and evaluate the sustainability status of organic farming in Bogor, West Java. It's important to study all of these things together to see if organic farming is a good and sustainable way to grow food in Bogor, West Java. This information can help us make better choices and take care of the land and the people who live there.

Good organic farming management should aim to create productive and sustainable agricultural land. According to Kurniawan (2012), sustainability in natural resource management is to apply the guideline of equity to the environmental/ecological, financial, and social divisions. One strategy to survey the maintainability of a normal asset is the multi-dimensional scaling (MDS) approach. This approach has been utilized to decide the maintainability of a natural resource (Mukhlisi et al. 2014; Karlina et al. 2016; Schaduw 2015). The Multi-dimensional Scaling (MDS) strategy was utilized to survey a common resource's supportability status comprehensively and rapidly (Fauzi and Anna 2002; Walla et al. 2016; Putri et al. 2019; Yumansyah et al. 2021).

The study aimed to decide the sustainability status of organic farming management in Bogor, West Java. Deciding the maintainability status of natural cultivating is exceptionally imperative as a premise for future approach arranging. The supportability status of natural cultivating will be closely related to the quality of natural cultivating arrangements and education. On the off chance that the administration status of natural cultivating is less feasible, it can be expected that the arrangement and regulation conditions are not working well, and bad habit versa. This study's sustainability of organic farming management is seen from the ecological, financial, and social measurements.

METHODS

Study Area

This research was carried out within the Indonesian area of West Java, in Bogor. The buffer zones around Jakarta's capital, domestic to at slightest 6.5 million individuals, are Bogor town and district. 1,052,359 individuals are staying in Bogor Town, and 5,489,536 individuals are staying in Bogor District, with 86% of them dwelling in urban zones (BPS 2022). Bogor town and district are moreover recognized as places where the development of the eatery, inn, and cafe businesses has outgrown their unique employments. Inns, eateries, and cafes require crude materials, counting rural products, to fabricate suppers.

The development of this industry encompasses a great impact on Bogor's economy, as seen by its commitment to municipal revenue.

The 39,000 hectares of rural arrive within the Bogor District have a part of potential for the development of organic cultivating, particularly within the development of organic cultivating development. With an arrival range of 298,838.3 hectares, 16.7% of the arrival within the Bogor District is appropriate for agribusiness (Widiatmaka et al. 2016). In Bogor District, there are group organic farmers in 18 of the 40 subdistricts. The Bogor District has 106.03 sections of land of certified organic. The area for agricultural cultivation in Bogor Town is 2,910.97 hectares, which is essentially less than the range of Bogor District. The organic area in Bogor Town is 14.5 hectares.

Data Collection

Both primary and secondary data were used in this investigation. Thirty farmers and thirteen stakeholders participated in in-depth interviews, which were used to gather primary data. Purposive sampling was used to choose informants, and snowball sampling was used to identify stakeholders. Concurrently, the Focus Group Discussion (FGD) technique examined a number of sociocultural and economic factors. Various stakeholders were involved in this approach, including the Indonesian Organic Alliance (IOA), the Organic Certification Institute (OCI), farmer groups, organic product entrepreneurs, Agriculture and Technology Park (ATP) IPB, universities, the community, and the Department of Food and Agriculture Security (DFAS) of the City and Regency of Bogor, Bappeda. Experts in organic farming from each stakeholder represented participated in the FGD. The results of prior research and literature from a number of pertinent agencies, including village profiles, monographs, agricultural census books, research reports, and other documents about duties, laws and regulations, and strategic management plans, were used to collect secondary data.

Data Analysis

Multi-dimensional scaling (MDS), a statistical technique that attempts to translate multimedia into more focused dimensions, is the analytical approach employed through the Rap-Organic Farm (Rapid Appraisal for Organic Farm) ordination technique (Fauzi and Anna 2005). A multi-dimensional analytical tool for assessing the sustainability of organic farming in Bogor, West Java, the University of British Columbia, Canada, developed RAPFISH (Rapid Appraisal for Fisheries), which was modified into Rap-Organic Farm (Kavanagh 2001). Rap-Organic Farm is predicated on the MDS ordination technique, which places objects on a measurable attribute order (Fauzi and Anna 2002). When compared to other multiple variable analysis techniques (such as factor analysis), the MDS methodology in RAPFISH yields consistent results (Fauzi and Anna 2005).

The present study employed a multi-stage approach to analyze the Rap-Organic Farm Ordination (Figure 1). These stages include: (1) Determination of attributes, encompassing three dimensions (environmental, economic, and socio-cultural); (2) Assessment of each attribute on an ordinal scale (scoring) grounded in the sustainability criteria of each dimension; (3) Ordination analysis of Rap-Organic Farm using MDS method to determine ordinance and stress value; (4) Evaluation of the index and sustainability status of organic product development in Bogor, West Java in multi-dimensional and each dimension; (5) Leverage Analysis to identify sensitive variables affecting sustainability; and (6) Monte Carlo analysis to examine the uncertainty aspect. Evaluation of the effect of errors on the process of estimating the value of sustainability coordination can be carried out by using “Monte Carlo” analysis.

Grouping was done based on the Rap-Organic Farm method's sustainability index, which has a value between 0 (bad) and 100 (good). Index intervals of 0–25 (poor sustainability), 26–50 (less sustainable), 51–75 (moderately sustainable), and 76–100 (good sustainability) are the groupings that are used (Abdullah et al. 2011). In conclusion, Figure 1 summarizes the steps of the MDS and sustainability analysis with Rap-

Organic Farm. Table 1 displays the parameters and characteristics of the organic farming sustainability analysis in Bogor, West Java.

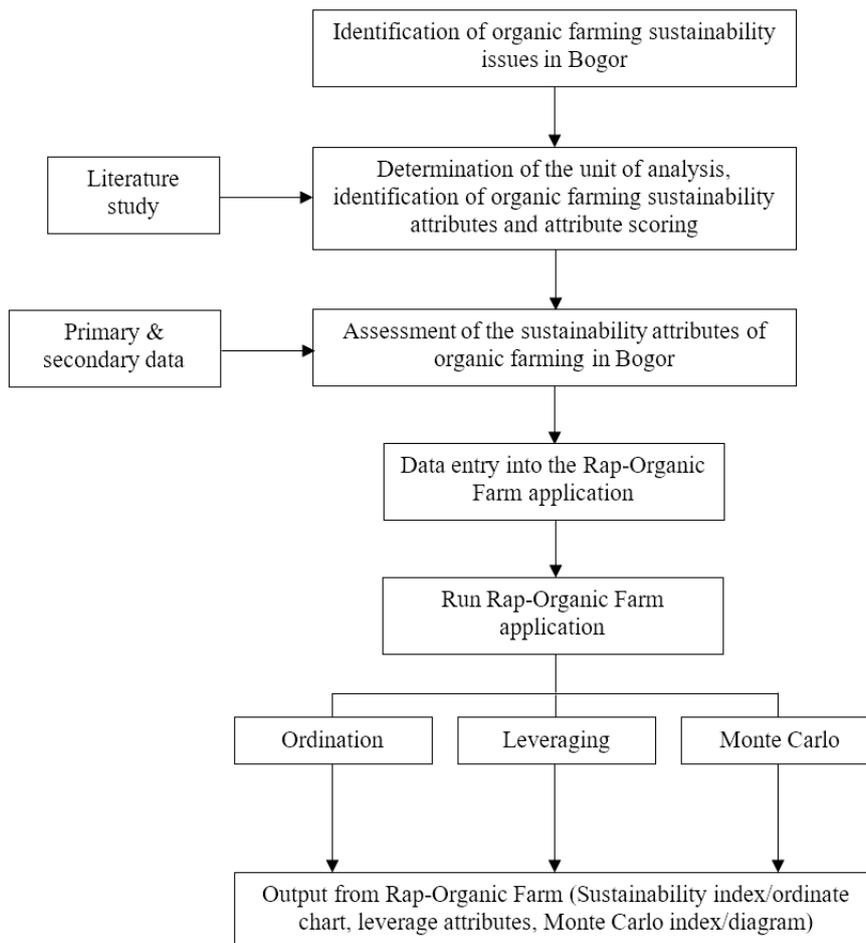


Figure 1 Stages of sustainability analysis (Fauzi 2019)

Table 1 Dimensions and attributes of sustainable organic farming in Bogor, West Java

Ecological/environmental dimension
(1) Diversity of organic product types (Hubeis et al. 2013)
(2) The existence of organic product seeds (BSN 2016; Imani et al. 2018)
(3) Availability of lush land (BSN 2016; Mayrowani 2012)
(4) Improving ecosystem quality and environmental health (BSN 2016)
(5) Appropriate application of organic product cultivation techniques (BSN 2016)
(6) Processing of environmentally friendly organic products (BSN 2016)
(7) Use of recyclable organic product packaging (BSN 2016)
Economic dimension
(1) Contribution of organic products to PAD (BSN 2016)
(2) The average additional income of the community from the cultivation of organic products (Akmalia and Barlan 2020)
(3) Contribution of organic products to food security (Hubeis et al. 2013)
(4) The level of public consumption of organic products (Hubeis et al. 2013; Mayrowani 2012)
(5) The potential market for organic products (Hubeis et al. 2013)
(6) Employment in the organic product production sector (Mayrowani 2012)

Social dimension

- (1) Availability of organic farming infrastructure (Nasir et al. 2021)
- (2) Farmer education level (Nasir et al. 2021)
- (3) Community knowledge related to organic farming (Mayrowani 2012; Alamsyah 2016)
- (4) Farmer participation in organic product certification (Mayrowani 2012)
- (5) Involvement of community institutions in developing organic farming (Nasir et al. 2021)
- (6) Government policy support in developing organic farming (Nasir et al. 2021)
- (7) The existence of partnerships between farmers and organic farming entrepreneurs (Mayrowani 2012)
- (8) Public education regarding the urgency of organic farming (Alamsyah 2016; Mayrowani 2012)

RESULT AND DISCUSSION

Evaluation of Organic Farming Sustainability Status on the Ecological Dimension

On a scale of 0 to 100%, the ecological sustainability status of organic farming in Bogor, West Java, is 58.57, or fully sustainable. According to the sustainability status, there is still room for improvement and the situation is still not ideal. According to Abdullah et al. (2011), the 51–75 sustainability status is moderately sustainable. It is still possible to enhance ecological characteristics in the ecological dimension to help Bogor, West Java, organic farming management remain sustainable.

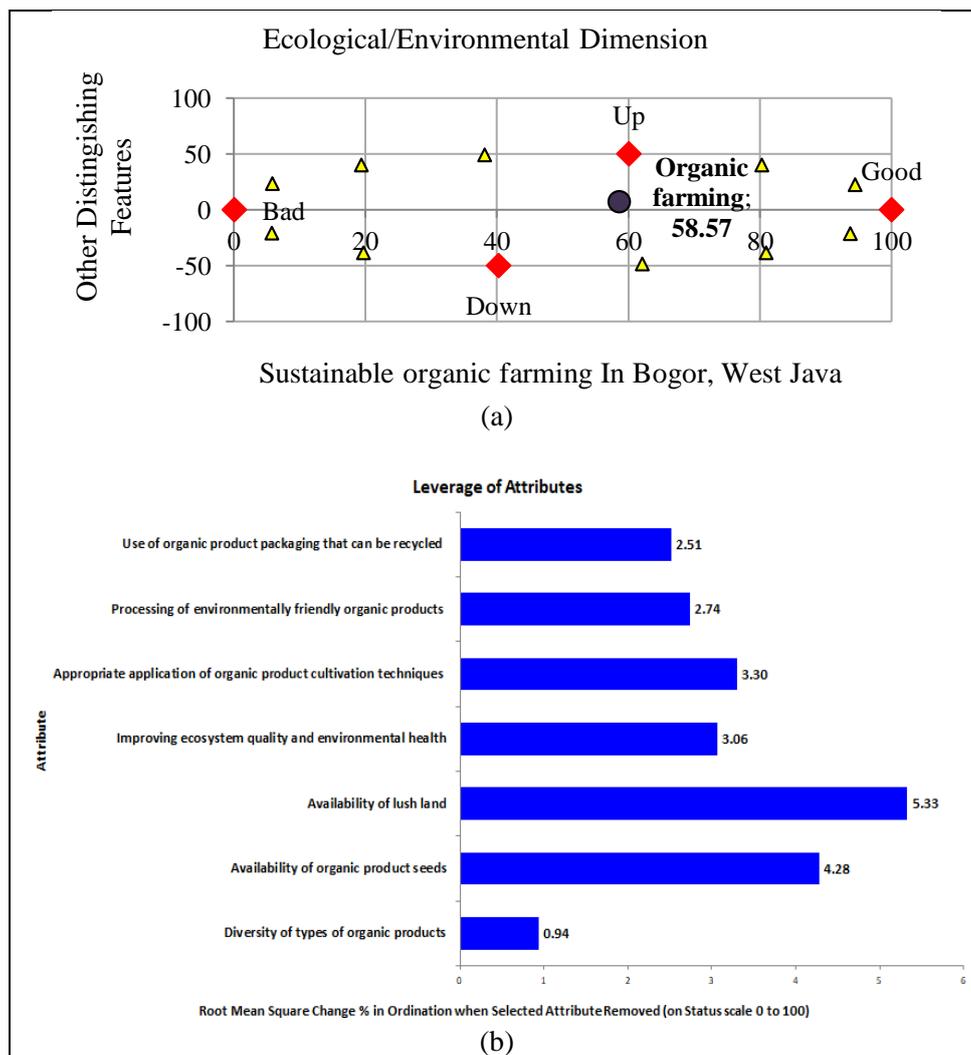


Figure 2 Chart of ordination and leverage analysis of organic farming sustainability attributes on the ecological dimension

Figure 2 shows a graph of the methods and findings of the examination of the ecological sustainability of organic agriculture. Two of the seven ecological dimension attributes from the leverage attributes are sensitive, according to the results of the leverage analysis. Because the changes will affect the sustainability index value on the ecological dimension—the availability of fertile land and the presence of organic seeds—policy intervention is necessary. To increase sustainability in the ecological dimension, the management must take these attributes seriously and handle them accordingly.

The availability of lush land for the cultivation of organic products is still the main obstacle to developing organic products, especially in Bogor Town. Narrow land is the main factor hindering the development of Bogor City's organic farming. While on the other hand, Bogor City is a tourist destination with consumers of organic farming products. In contrast to Bogor Regency, the land for organic farming in Bogor Regency is quite large. It needs to be optimally managed and get serious attention from the local government. Meanwhile, Bogor Town and Bogor Regency are local, national, and international tourist destinations. The availability of lush land will significantly affect the availability of organic products in Bogor, West Java. So that the availability of organic farming products can be fulfilled sustainably.

Likewise, organic product seeds dramatically affect the availability of organic products in quantity and quality. The private sector currently provides organic seeds; the local government provides some. It is just that the organic farming development program has yet to receive serious attention from the local government, so to get organic product seeds, the community must pay a lot of money. The seeds used must be seeds that have been certified by an authorized institution (Imani et al. 2018). Using certified seeds can increase the productivity of organic farming. Thus, it can increase the sustainability of organic farming.

Evaluation of Organic Farming Sustainability Status on the Economical Dimension

In terms of the economy, the sustainability value of organic farming is 52.09, falling within the 51–75 range of the sufficiently sustainable category. Similar to the ecological dimension, this value denotes an unstable status of sustainability (at the lower threshold), indicating that the sustainable status will change to become less sustainable if the management of the economic dimension's attributes deteriorates. Thus, to support the sustainability of organic farming management in Bogor, West Java, the economic attributes in this dimension must be continuously improved so that the value of the sustainability status increases. Figure 3 depicts the graph of sustainability coordination on the economic dimension.

Leverage attributes that are sensitive to the sustainability of organic farming in the economic dimension are three (3), according to the findings of the leverage analysis: (1) The amount of organic products consumed by the general public; (2) The potential market for organic products; and (3) The average additional revenue generated by the community's organic product cultivation. Appropriate policy interventions are needed for these three sensitive attributes in order to support the long-term viability of organic farming in Bogor, West Java.

The most important factor affecting the sustainability of organic agriculture is the amount of organic products consumed by the community (Figure 3). One important factor that has to be taken into account when calculating the quantity of organic agricultural production is the level of public consumption. An area's requirement for producing agricultural products increases with the community's consumption of organic products. This suggests that the local population is becoming more aware of the need for and benefits of organic products. If people perceive the advantages of organic products—health, environmental sustainability, and other advantages—they will eat them. Therefore, the local government must continue socializing and educating the public to switch to organic products to maintain physical and ecological health. This education is also needed to explain business opportunities from organic products with high economic value.

The sustainability of organic farming in Bogor, West Java, is also sensitive to the potential market for organic products. If there is a sizable market for organic goods, people will be inclined to convert from conventional to organic agriculture. Therefore, the local government must continue to support and create market opportunities for organic products for organic product farmers in order to maintain the sustainability of organic farming in Bogor, West Java. The market for organic products is both domestic and international, with the potential for exportation. To maintain competitiveness in local, national, and international markets and to produce high-quality organic products, support programs for farmers of organic products must be maintained.

Besides the factors of consumption level and market availability of organic products, people's income from cultivating organic products is also a lever attribute sensitive to the economic dimension. The average community motivation in managing organic farming is economical, namely wanting to get value-added income in everyday life. People do not infrequently make organic farming a side job, but most people make it their main livelihood. Farmers' participation in organic farming will affect farmers' income levels (Akmalia and Barlan 2020; Purwanto et al. 2019). Therefore, the local government must assist organic farming farmers, especially in the management aspects of organic farming businesses, so that their products can provide significant additional income.

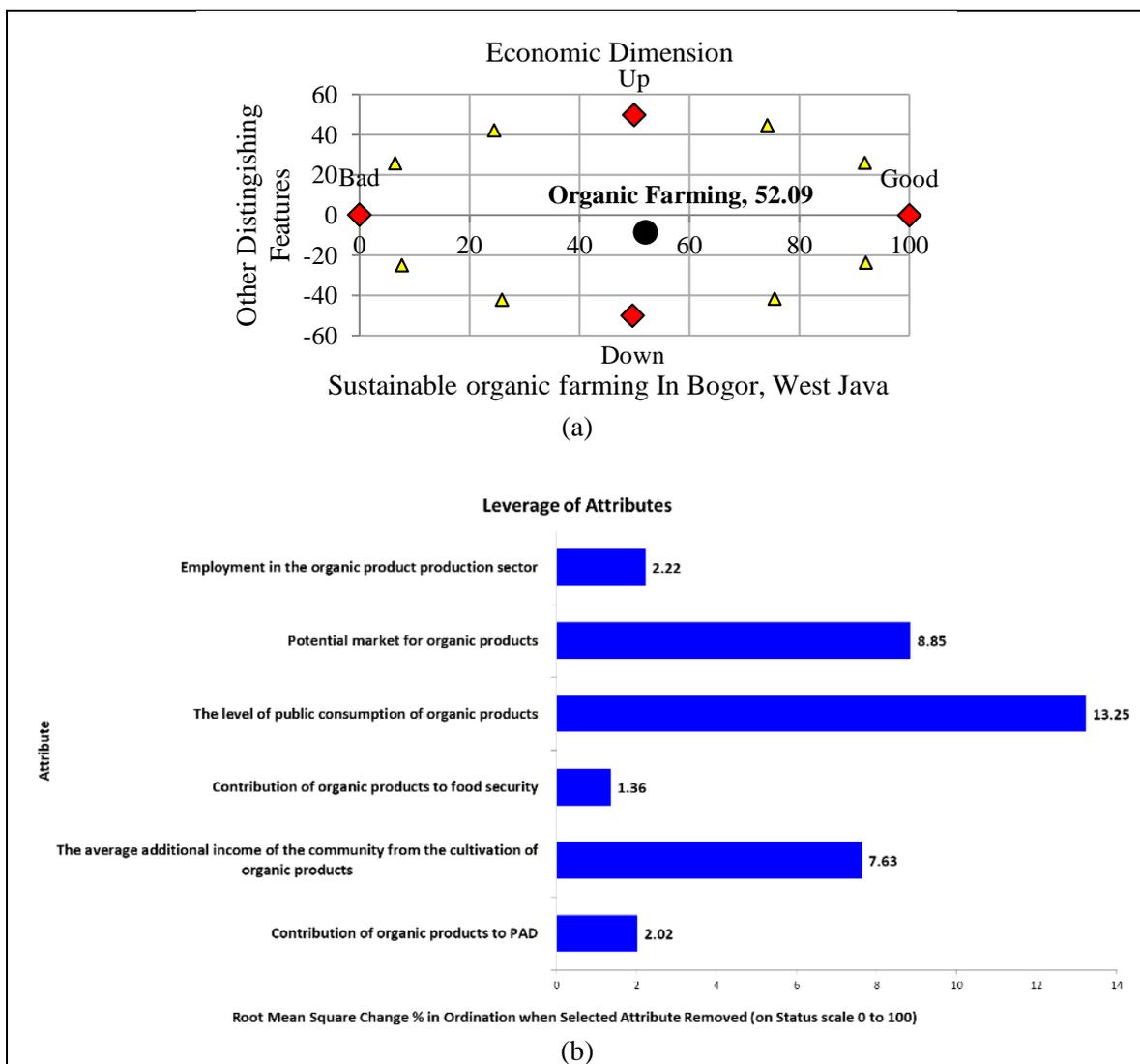


Figure 3 Chart of ordination and leverage analysis of organic farming sustainability attributes on the economic dimension

Based on the description above, education and assistance programs to increase the consumption level of organic community products, develop the market potential for organic products, and assistance programs for business management of organic community products must be priority programs for local governments to ensure the sustainability of organic farming in Bogor, West Java.

Evaluation of Organic Farming Sustainability Status on the Social Dimension

The social dimension analysis of the organic farming sustainability status in Bogor, West Java, yielded a value of 53.70, placing the farm in the Sufficiently Sustainable category. The category of sufficiently sustainable on the social dimension is still regarded as unsafe for the sustainability of organic farming development in Bogor, West Java, as the status of sufficiently sustainable in this dimension is still below the lower threshold, specifically in the range of 51–75. This indicates that Bogor, West Java's organic agriculture is not as well managed sustainably due to factors in the social dimension. This indicates that in order to maintain the sustainability of organic farming in Bogor, West Java, the social dimension's characteristics still need to be strengthened and expanded. Figure 4 displays the ordination graph and the outcomes of the leverage analysis of the social dimension sustainability of organic farming management.

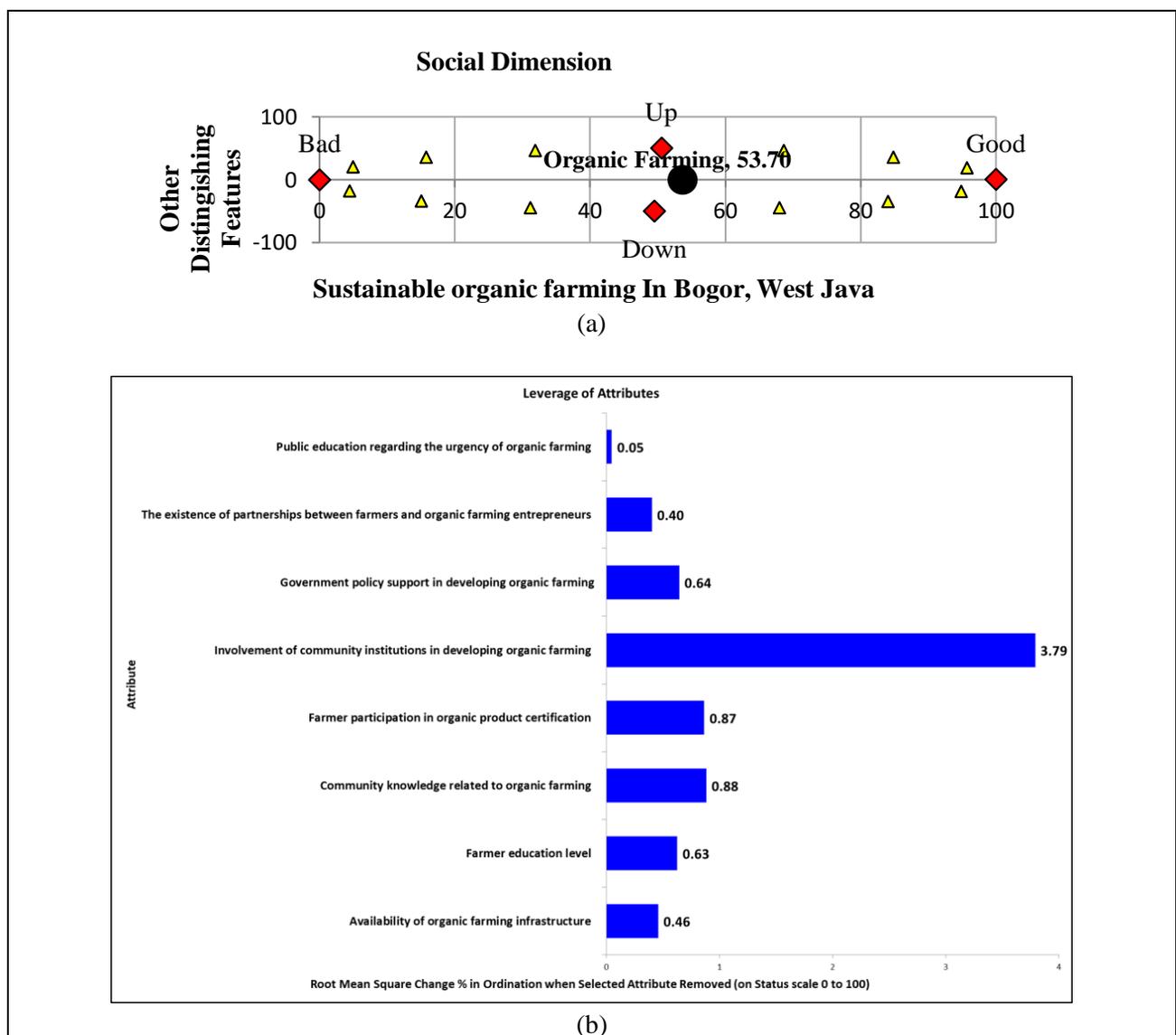


Figure 4 Chart of ordination and leverage analysis of organic farming sustainability attributes on the social dimension

The social dimension's leverage analysis results indicate that one attribute in particular is a lever attribute that is sensitive to its impact on the sustainability of organic agriculture and necessitates the right kind of policy interventions because the change has an impact on the social dimension's sustainability index value. The sensitive feature is how local institutions are contributing to the growth of organic agriculture. In the future, improper management of the lever attribute will be detrimental to the sustainability of organic farming in Bogor, West Java. The key to successfully managing organic farming in a sustainable manner is the participation of local institutions in the development of organic farming. The Indonesian Organic Alliance and the Organic Certification Institute are community organizations that are a part of the development program for organic farming. In Bogor, West Java, these two establishments are essential to the management of organic farming.

The two organizations have assisted and educated organic farmers in a variety of ways, particularly in relation to the certification procedure for organic products. Parties directly associated with organic farming are highly sought after by the organic farming community. However, the regional government still does not make the most of these two institutions' existence to advance organic farming in Bogor, West Java. For instance, the expensive process farmers must go through to get their organic products certified. As of right now, farmers cannot receive government assistance in obtaining organic product certification from organizations that certify organic products. According to Nasir et al. (2021), community organizations engaged in organic farming need to be involved at every stage, from program evaluation to planning.

It is therefore anticipated that the sustainability of organic farming in Bogor, West Java, will increase as a result of initiatives to support community institutions and include community institutions in local government programs farming to develop organic farming. Future planning and execution of local government policies must take the mentoring and fostering of community institutions program into consideration. The results of the assessment of the sustainability status of organic farming in Bogor, West Java, on the ecological, economic, and social dimensions previously described briefly can be seen in Table 2. They can be presented as a sustainability flysheet (Fauzi 2019) (Figure 5).

Table 2 Status of sustainability of organic farming management

No	Dimension	Index	Sustainability status
1.	Ecological	58.57	sufficient
2.	Economy	52.09	sufficient
3.	Social	53.70	sufficient

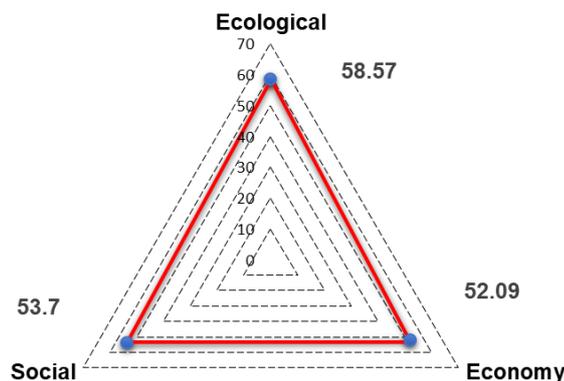


Figure 5 Diagram of the sustainability of organic farming management

Overall, the findings of the evaluation of the sustainability of organic farming in Bogor, West Java, indicate that there is enough sustainability. The sustainability index of all dimensions, which varies from the lowest at 52.09 to the highest at 58.57, demonstrates this. This value indicates that, in Bogor, West Java, organic farming still necessitates the field application of suitable policies. To raise the degree of

sustainability of organic farming management, all dimensions must have their qualities improved through the use of suitable policy interventions. The implementation of these policy interventions needs to be based on sensitive attributes, which are lever attributes as shown in Table 3.

Table 3 Sensitive attributes of organic farming management in Bogor, West Java

No	Dimension	Sensitive attributes
1.	Ecological	- Availability of lush land - Availability of organic product seeds
2.	Economy	- The level of public consumption of organic products - Market potential for organic products - Average additional income for the community from cultivating organic products
3.	Social	- Involvement of community institutions in developing organic farming

Validity of Multi-dimensional Scaling (MDS) Analysis Results

The Monte Carlo analysis results, displayed in Table 4, demonstrate the validity of the MDS analysis. The difference between the MDS analysis's index results and the Monte Carlo analysis's small index results (value less than 1) suggests that there was some error in the analysis process when it came to assigning relatively small scores, that variations in scores resulting from disagreements were minimal, that the analysis process was repeatable and stable, and that mistakes in data entry or missing data could be avoided. This indicates that the MDS analysis's validity is sufficient to evaluate the organic farming in Bogor, West Java, in terms of sustainability.

Table 4 Comparison of the MDS sustainability index and Monte Carlo analysis on three dimensions

	Dimension	MDS	Monte carlo	Distinct
1.	Ecological	58.57	58.03	0.54
2.	Economy	52.09	52.24	0.15
3.	Social	53.70	53.90	0.20

Additionally, the goodness of fit value—that is, the stress value and the coefficient of determination (R²) at the 95% confidence level—may be used to test the validity of the MDS analysis results. Table 5 demonstrates that the R² value is nearly one, and the stress value is less than 0.25. This demonstrates that statistical reasoning can account for the validity of the analysis results. This suggests that in the case under study, attributes are not needed, and the aspects are accurately analyzed in relation to the real conditions; the attributes employed are able to explain the state of organic farming's sustainability, and the findings are able to both characterize and facilitate further research into the topic.

Table 5 Value of goodness of fit (stress value and coefficient of determination (R²))

No.	Dimension	Stress value	R ² -value
1.	Ecological	0.154	0.945
2.	Economy	0.141	0.932
3.	Social	0.158	0.944

CONCLUSION

The status of sustainability of organic farming in Bogor, West Java, is quite sustainable (58.57) on the ecological dimension, moderately sustainable (52.09) on the economic dimension, and moderately sustainable (53.70) on the social dimension. This research explains holistically several aspects/attributes

(ecology, economy, and social), which are the determining factors that can be used as a reference in preparing organic farming management programs sustainably and sustainably.

All things considered, the following factors are relevant to the long-term viability of organic farming in Bogor: the availability of fertile land; the existence of organic product seeds; the degree to which the community consumes organic products; the potential market for organic products; the average additional income generated by cultivating organic products; and the degree to which community institutions are involved in the development of organic farming. In order to increase the sustainability of organic farming in Bogor, it is necessary to enhance the quality of human resources. This includes raising awareness of the value of organic farming among the public, farmers, and government agencies—particularly the Department of Agriculture—as well as providing support for infrastructure based on organic farming and agricultural counseling.

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