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SUSTAINABILITY OF OSING TRIBE FARMING IN KEMIREN VILLAGE, BANYUWANGI

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ABSTRACT

Sustainable agricultural development offers benefits and environmental concerns, but challenges arise in land conversion processes in today's age. Kemiren Village, also known as Osing Village, is where most people are farmers. Rice production and farmers' income are decreasing yearly due to several factors that cause the importance of sustainable development planning. Based on these problems, this study aims to analyze the index and sustainability status of farming in Kemiran Village, Glagah District, Banyuwangi. This research instrument was carried out using observation, structured interviews, and distributed questionnaires, and it was analyzed by multi-dimensional scaling (MDS). The reliability test confirms all dimensions are reliable for sustainable status testing, the availability of rice pest predators influenced the ecological sustainability index value, the certification of rice seeds used, and the application of pesticides following recommendations. The economic sustainability index had savings, adequate farming equipment, and infrastructure facilities in the agricultural sector. Savings, adequate farming equipment, and adequate infrastructure facilities in the agricultural sector influenced the economic sustainability index. The sustainability status of sustainable agriculture needs to be considered with each dimension: ecological dimension 33.51, economic dimension 32.00, and social dimension 40.00 so that it is categorized as less sustainable because it is in the range of 25.01 - 50.00. MDS analysis shows that the error factor in each attribute was relatively small, in the differences in each respondent's assessment of the attributes studied, errors in entering data, and missing data.

Keywords: *land conversion, multi-dimensional scaling, osing Tribe, sustainable agriculture, sustainable development*

BACKGROUND

Sustainable agriculture is an agricultural condition that can provide a profitable farm income while promoting environmental stewardship such as improving and protecting soil quality, reducing dependence on non-renewable natural resources (fuel, chemical fertilizers, and pesticides), minimizing adverse impacts on wildlife safety, water quality, and other environmental resources and promoting stable and prosperous farm families (De Corato, 2020; Topcuoğlu, 2023). The challenges faced today in agricultural land conversion processes are climate change, energy, water, land shortages, food demands, land struggles, and others (Parmawati, 2019).

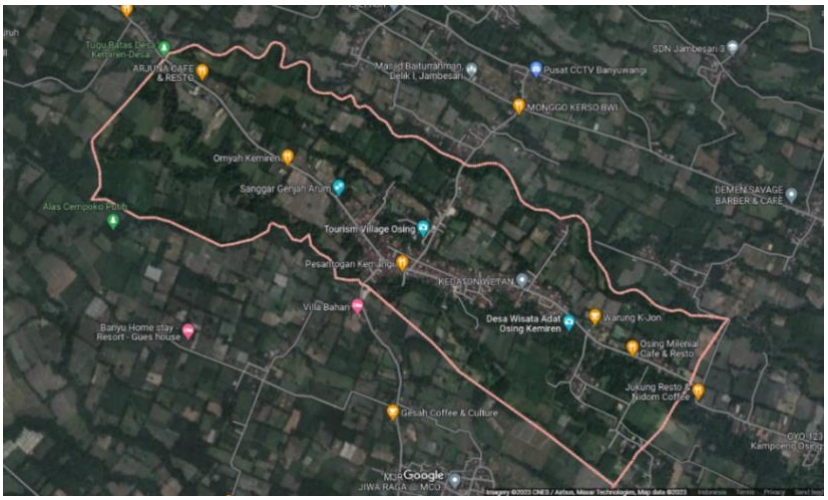
In Kemiren Village, most residents work as farmers planting rice (Shofwan et al, 2022). The problem faced is converting agricultural land for tourism purposes into hotels, restaurants, and entertainment venues. Land use in Kemiren Village is mostly used for settlements and tourism,

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 590-601, June 2024

amounting to 27,494 ha/m^2. while agricultural land is 105 ha/m^2 (Parmawati et al, 2023). Compared to the previous year, rice production and farmers' incomes in Kemiren Village have tended to decline; the decline in income was caused by several factors, such as the transition of farmland so that the number of rice plants was small, weather that was difficult to predict, pest attacks, and expensive chemical fertilizers. Agricultural failure factors are climate change, low agricultural productivity and innovation, many pests and diseases, conflicts, crises and natural disasters, and competition for natural resources There are fears of a food crisis if the agricultural failure continues (FAO, 2017; Fan et al., 2021). The situation of Osing farmers in the Kemiren Village area was considered to have experienced a decline in the value of traditional knowledge of agricultural culture (Prasetyo et al, 2018). Local knowledge that emphasizes natural balance may be slowly lost due to the introduction of unsustainable development concepts. A study is needed to determine a sustainable agricultural development plan in Kemiren Village. The importance of sustainable development planning in an area by considering the three pillars of sustainability, including ecological, economic, and social, is inseparable because all three are causal relationships (Streimikiene et al., 2021). Based on the above problems, the research analyzes farms' index and sustainability status in Kemiren Village, Glagah District, Banyuwangi.

RESEARCH METHODS

Research activities on agricultural sustainability were carried out from January to March 2023 in Kemiren Village, Glagah District, Banyuwangi. Kemiren Village is known as Osing Tourism Village because the majority of the people are the Osing tribe, which is the original tribe of Banyuwangi Regency. The research location is shown in Figure 1.



Gambar 1. Map of Kemiren Village, Glagah District, Banyuwangi Regency
Source: Google Earth (2023)

Data collection instruments in the research were realized in several ways: observation, structured interviews, and distributing questionnaires. Structured interviews have determined the boundaries of the questions used to explore data. An interview guideline was used, which consisted of several sub-chapters of questions by the research factors (Hakim, 2014; Hartono, 2018). The questionnaire uses a Likert scale in the form of a measure that states the categories, ranks, and distances of the constructs measured with details: 5 = strongly agree, 4 = agree, 3 = neutral, 2 =

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 590-601, June 2024

disagree, and 1 = strongly disagree (Sugiyono, 2019). Then, the questionnaire was tested for validity and reliability.

The dimensions and indicators of agricultural sustainability in Kemiren Village (Table 1) are determined and assessed based on open attributes namely each independent expert is free to make suggestions, which are then reviewed and determined by researchers based on benchmarks (Pitcher & Preikshot, 2001). Ordinal scoring in the range of 1 - 3, or 1 - 4 or according to the character of the attribute illustrates the strata of assessment from the lowest (1) to the highest (4). Score 1 is bad and score 4 is good. Attribute assessment is done by comparing the condition of the attribute by giving an assessment of poor (1), moderate (2), good (3) or very good (4) (Suwarno, 2011).

Tabel 1. Dimensions and Indicators of Sustainability of Agriculture in Kemiren Village

	Ecological dimensions
1	The annual rainy season always occurs in the same months
2	The intensity of agricultural land conversion to non-agricultural land was reduced
3	No contamination of the paddy fields by industrial waste
4	Rice productivity in the last 5 years has increased
5	Rice seeds used have been certified
6	The use of tractors that do not have an impact on the soil
7	Keeping rice pest predators available
8	Application of pesticides following recommendations
9	Application of organic fertilizer
10	Application of chemical fertilizers with the right
11	Utilizing rice field waste for animal feed
12	Irrigation water availability sufficient for agricultural needs
	Economic dimensions
1	Selling the rice crop without difficulty
2	The selling price of crops was stable
3	Make a profit from crops.
4	Infrastructure facilities in the agricultural sector are adequate
5	Farming capital from own money
6	Capital for the agricultural business can be easily obtained from cooperatives or banks.
7	Own equipment for farming (not borrowing/renting)
8	Have savings deposits
9	Income from farming is the main income
10	Agricultural income sufficient to meet daily needs
11	The profits from the farm are sufficient to cover the educational needs of the children.
	Social dimensions
1	Farmer education is an important factor in the success of a farm.
2	Farm development advice and training is often available.
3	Farmers are always trying to improve their knowledge about farming.
4	Farmer health factor is significant
5	The existence of farmer groups is beneficial
6	Family support is needed
7	Having labor for farming
8	Farmer and family welfare is the main goal

Research methods were applied to identify a component by analyzing qualitative and quantitative data as data or evidence that reinforces previous information. The research was analyzed

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 590-601, June 2024

with multi-dimensional scaling (MDS). MDS is a method of statistical analysis techniques, each dimension and multidimensional dimensions of rice farming (Afandi, 2020). The MDS used was modified from the RAPFISH (rapid assessment techniques for fisheries) program developed by the Fisheries Center, University of British Columbia (Kavanagh, 2001) in Table 2. In data analysis with MDS in this study, three main dimensions of sustainability were used economic (micro and macroeconomic factors), ecological (natural resource population and environmental parameters), and social (community, social, and anthropological factors). Furthermore, the MDS was approached with leverage analysis and Monte Carlo analysis.

Table 2. Sustainability Index Value based on Rapfish Analysis

Index values	Categories
0 ± 25.00	Poor (unsustainable)
25.01 ± 50.00	Less (less sustainable)
50.01 ± 75.00	Fair (sustainable enough)
75.01 ± 100.00	Good (very sustainable)

Source: Pitcher & Preikshot (2001)

RESULT AND DISCUSSION

Validity and Reliability of Questionnaire Results

The collected questionnaires were tested for validity and reliability. Validity is a requirement in testing the accuracy of research variables. Validity measures the extent to which the instrument's ability to measure the research conducted (Triana and Widyarto, 2013). Reliability measurement on research instruments in this study aims to measure the consistency of quantitative research questionnaires. A questionnaire will be reliable if it provides a consistent score in each measurement, even at different times. In the research, the results of calculating the validity test of the three dimensions, namely the ecological, economic, and social dimensions, have valid results shown in Table 3.

Table 3. Results of Questionnaire Validity Analysis

Dimensions	Question Item	r table	r count	Description
Ecological dimensions	L1	0.198	0.724	VALID
	L2	0.198	0.568	VALID
	L3	0.198	0.622	VALID
	L4	0.198	0.554	VALID
	L5	0.198	0.361	VALID
	L6	0.198	0.496	VALID
	L7	0.198	0.467	VALID
	L8	0.198	0.371	VALID
	L9	0.198	0.596	VALID
	L10	0.198	0.268	VALID
	L11	0.198	0.431	VALID
	L12	0.198	0.668	VALID
Economic dimensions	E1	0.198	0.392	VALID
	E2	0.198	0.351	VALID
	E3	0.198	0.431	VALID

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 590-601, June 2024

Dimensions	Question Item	r table	r count	Description
Social dimensions	E4	0.198	0.317	VALID
	E5	0.198	0.304	VALID
	E6	0.198	0.598	VALID
	E7	0.198	0.349	VALID
	E8	0.198	0.378	VALID
	E9	0.198	0.312	VALID
	E10	0.198	0.247	VALID
	E11	0.198	0.417	VALID
	S1	0.198	0.577	VALID
	S2	0.198	0.505	VALID
	S3	0.198	0.240	VALID
	S4	0.198	0.282	VALID
	S5	0.198	0.295	VALID
	S6	0.198	0.360	VALID
	S7	0.198	0.708	VALID
	S8	0.198	0.293	VALID

Source: Primary Data (2023)

The reliability test using SPSS has shown that the Cronbach's Alpha score in each dimension (ecological, economic, and social) is more significant than 0.5, so it can be stated that all dimensions are reliable and can be used in the sustainability status test. Cronbach's Alpha values of less than 0.5 are generally not acceptable (Arulogun et al., 2020).

Tabel 4. Questionnaire Reliability Analysis Result

Dimensions	Cronbach's Alpha
Ecological	0.632
Economic	0.539
Social	0.736

Source: Primary Data (2023)

Sustainability Index of Sustainable Farming

Ecological Dimension Sustainability Index

The ecological dimension's sustainability level includes consistent rainfall, reduced agricultural land conversion, no industrial waste contamination, increased rice productivity, certified rice seeds, non-impact tractors, pesticide use, organic and chemical fertilizers, rice field waste for animal feed, and sufficient irrigation water for agricultural needs. Attributes that are sensitive in influencing the sustainability index of the ecological dimension, a Leverage analysis was conducted. Mahida (2020) states that the sensitive attribute in Leverage analysis has the highest Root Mean Square (RMS) value. The ecological dimension leverage analysis (Figure 2) showed that of the 12 attributes analyzed, three sensitive attributes affect sustainable agriculture in overcoming land conversion in Kemiren Village, Glagah District, and Banyuwangi Regency.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 590-601, June 2024

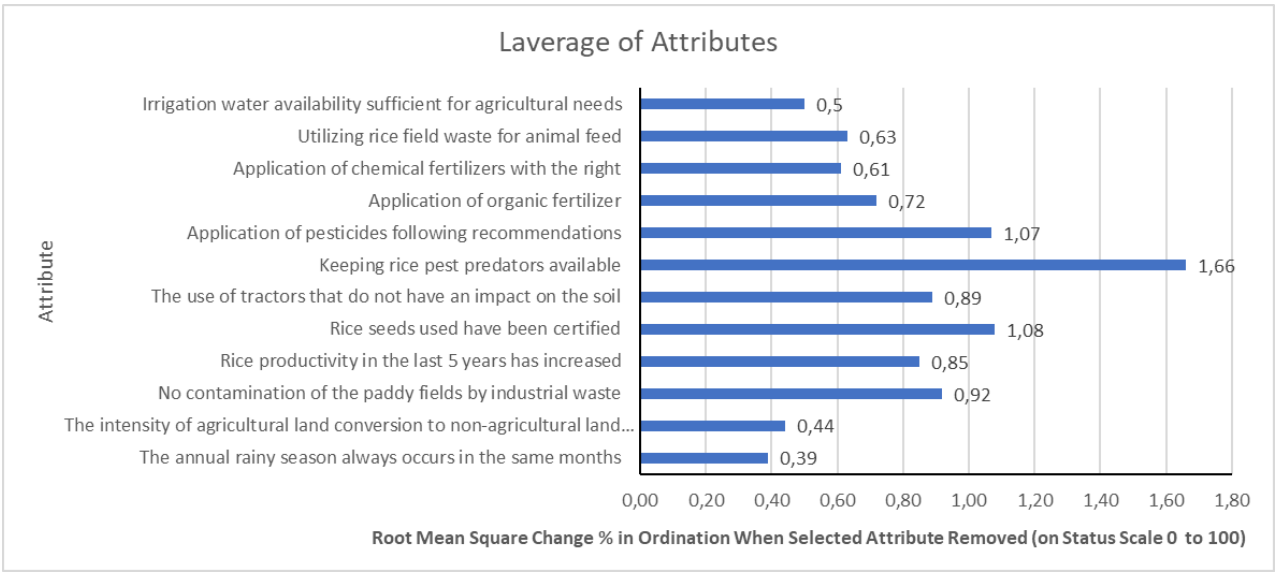


Figure 2. Leverage Value of Ecological Dimension

Based on the results of the leverage analysis, sensitive attributes that need to be considered because they influence the value of the ecological sustainability index are (1) Keeping rice pest predators available (RMS = 1.66), (2) rice seeds used have been certified (RMS = 1.08), and (3) Application of pesticides following recommendations (RMS = 1.07). Changes in the value of RMS are the value obtained from the final results of the analysis; the more significant the change in the value of RMS leverage, the more sensitive the role of these attributes in improving the status of sustainability. Therefore, to increase the sustainability of the ecological dimension, it is necessary to keep the pest predators that occur in rice plants, increase the certified rice seeds used by farmers, and increase farmers' awareness to use pesticides following the recommendations.

Pests and diseases in rice are the cause of decreased rice productivity. For handling, farmers use chemical pesticides, which, if used continuously, can harm the environment (Nuraida and Nasution, 2018). The negative impact of chemical pesticides is the emergence of chemical residues in the soil that can damage the ecology of organisms that are good for rice plants, carried into rice plants, and even water sources (Djunaedy, 2009). The use of light traps is one method that can be used in environmentally friendly rice pest control. Pests that can be trapped include green and brown planthoppers, real leafroller moths, false leafroller moths, white stem borer moths, yellow stem moths, and walang sangit because these pests are active at night. Light traps can detect the presence of rice pests (Wati, 2017). Diseases that often arise in rice plants are virus-induced diseases such as hollow dwarfism, grass keril, and tungro (Sudarma et al., 2016). With the successful eradication of pests and diseases in rice, the number of farmers who practice sustainable agriculture will likely increase so that there is no land conversion in Kemiren Village, Glagah District, Banyuwangi Regency.

Land resource management is still related to the quality of the land used for rice cultivation. Rice field management usually requires high technology in soil and water management. Intensive cultivation with chemicals and continuous use of cultivation machinery gradually affect soil density and quality, so soil quality gradually deteriorates over time (Agustina et al., 2020; Oktha, D. A. 2023; Vasu et al., 2020). Restoring soil quality requires increasing the nutrients N, P, K in the soil. One easy and inexpensive way is by burying rice straw into the soil or adding organic materials such as

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 590-601, June 2024

compost. When human factors such as land management are done very well, it will positively impact the environment and provide an optimal dimension for plants in their growth process, which in turn can support plants to produce rice with good quality and productivity (Agustina et al., 2020).

Economic Dimension Sustainability Index

The sustainable economic dimension was characterized by stable crop selling prices, consistent profit, adequate infrastructure, easy access to business capital, ownership of farming equipment, savings, primary income from farming, sufficient profits to meet daily needs, and sufficient profits for children's education. The results of the Leverage analysis of the economic dimension (Figure 3) have shown that of the 11 attributes analyzed. Three sensitive attributes affect sustainable agriculture in overcoming land conversion in Kemiren Village, Glagah District, Banyuwangi Regency. The order of sensitive attributes in the economic dimension is the status of (1) having savings deposit (RMS = 1.78), (2) own equipment for farming (not borrowing/renting) (RMS = 1.69), and (3) Infrastructure facilities in the agricultural sector are adequate (RMS = 1.58).

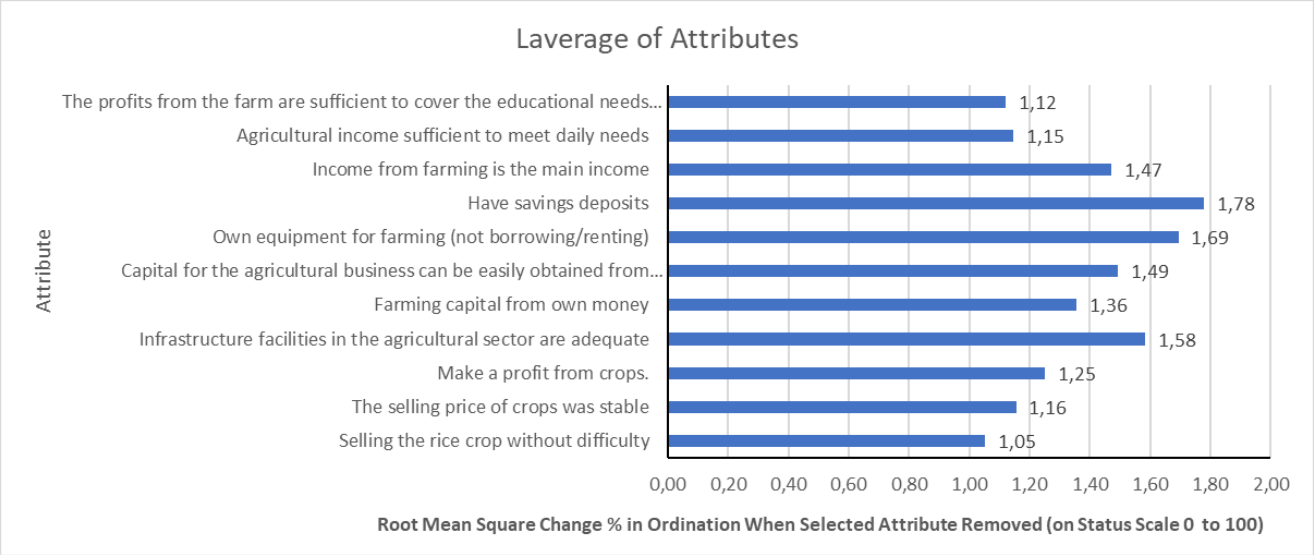


Figure 3. Leverage Value of Economic Dimension

Increasing the status of sustainable agriculture in overcoming land conversion can increase the sustainability of the economic dimension because many farmers own their land, so that it can improve farmers' economies faster. Agricultural land tenure affects the average income received by rice farmers (Manatar et al., 2017). Farmer income affects farmer household consumption (Pani et al., 2019). Marketing healthy rice needs to use strategies to expand access to healthy rice marketing, namely (1) providing education about the benefits of healthy rice to the general public, (2) utilizing advances in information technology to access market information, (3) maximizing the utilization of available capital and production resources, (4) develop the best methods to improve the productivity and quality of healthy rice, (5) enhance the promotion of organic rice, (6) leverage growing region advantages for marketing, and (7) expand the network (Fauzi and Martadona, 2019).

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 590-601, June 2024

Social Dimension Sustainability Index

The results of the MDS analysis have shown that the social dimension has a less sustainable status with a sustainability index value of 40.00. The sustainability index value of a social dimension was determined by eight attributes: farmer education, farm development advice, knowledge improvement, health, farmer groups, family support, labor availability, farm and family welfare. Leverage analysis was conducted to identify sensitive attributes influencing the social dimension sustainability index. The selected attribute is the attribute that has the highest Root Mean Square (RMS) value. The more significant the change in the RMSL leverage, the more sensitive the role of the attribute in improving the sustainability score.

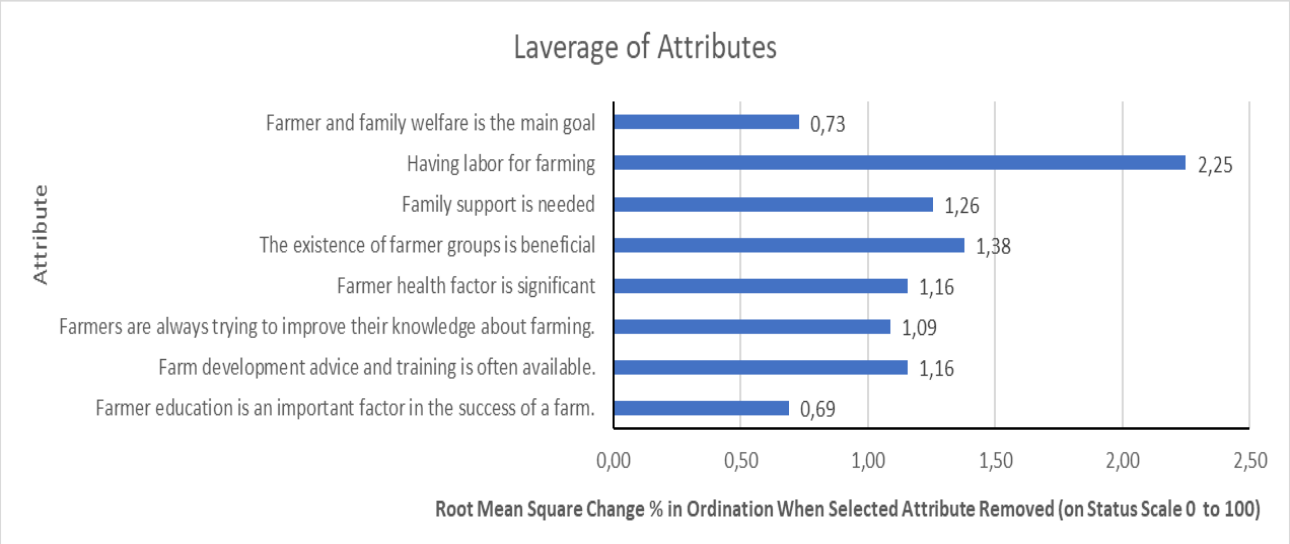


Figure 4. Leverage Value of The Social Dimension

The results of the Leverage analysis of the social dimension (Figure 4) show that of the eight attributes analyzed, three sensitive attributes affect sustainable agriculture in overcoming land conversion in Kemiren Village, Glagah District, Banyuwangi Regency. In order the sensitive attributes in the social dimension are (1) having labor for farming (RMS = 2.25), (2) the existence of farmer groups is beneficial (RMS = 1.38), and (3) family support is needed (RMS = 1.26).

Member participation in regular farmer group meetings includes activities to strengthen ties within the farmer group. Another goal is that it can help farmer group members exchange information related to rice farming that is carried out either by extension workers, marketing, or technology (Falo, 2017). Sustainable agriculture in Kemiren Village, Glagah Subdistrict, Banyuwangi Regency mostly has livestock to raise and take or buy livestock manure from group members who have livestock to be used as organic fertilizer. However, with chemical fertilizers, farmers are reluctant to buy or take livestock manure as organic fertilizer because, according to the local community's perceptions, chemical fertilizers are more efficient and easy to apply.

The existence of farmer groups and the participation of group members have a positive relationship in increasing rice production. Factors related to increasing rice production substantially are how farmer groups determine agricultural business patterns by compiling several aspects such as agricultural business plans, agricultural assessments, adherence to collective agreements, increasing the sustainability of natural resources, and managing the agricultural business (Nugroho, 2013).

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 590-601, June 2024

Some constraints experienced during production and marketing include a declining production period due to still-occurring pests and diseases. Manage the constraints experienced, technological advances, and information must be used to access the prevailing market price of rice at harvest time (Fauzi dan Martadona, 2019).

Sustainability Status of Sustainable Agriculture

Kemiren Village, Glagah Sub-district, Banyuwangi Regency was reviewed from 3 (three) dimensions of sustainable agriculture, namely the ecological dimension (12 attributes), economic (11 attributes), and social (8 attributes). Through the MDS approach using Rapfish software, the analysis results of the three dimensions show a less sustainable category with an index value of 35.17. In the kite diagram (Figure 5). All dimensions show sustainability with the sustainability index value of each dimension: ecological dimension 33.51, economic dimension 32.00, and social dimension 40.00. The resulting index values indicate that each dimension analyzed falls into the less sustainable category because it ranges from 25.01 to 50.00. The smaller the index value for each dimension, the more the total value will influence the determination of the desired index category. The current status of research shows that interventions must be carried out to improve and develop rice farming in Kemiren Village holistically or comprehensively (Wahyuni et al, 2023). Reducing sensitive attributes and providing reinforcement to each stakeholder through an integrated approach impacts sustainable agricultural development.

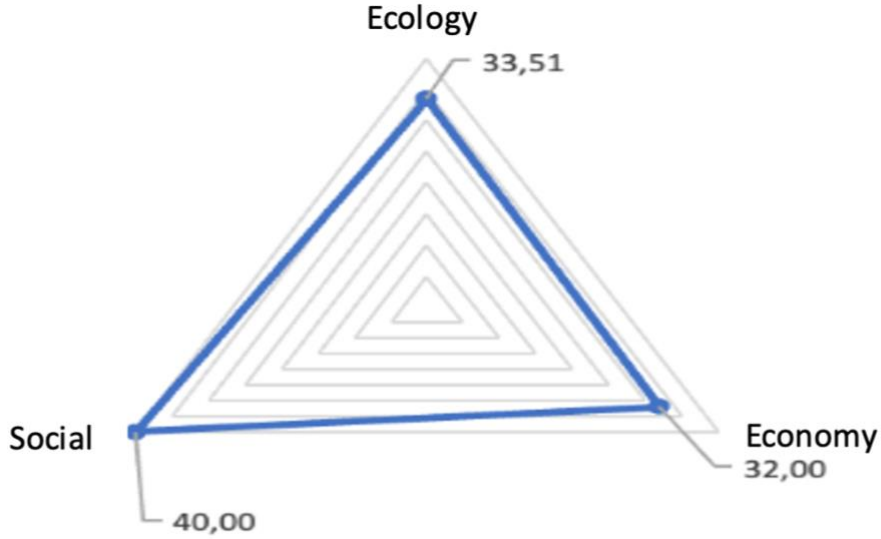


Figure 5. Sustainability Status of Sustainable Agriculture in Overcoming Land Conversion in Kemiren Village, Glagah District, Banyuwangi Regency

Analysis can be done to see the error level in MDS analysis by comparing the difference between Rapfish and Monte Carlo values. The results of the Monte Carlo analysis at the 95% confidence interval obtained results that are not different from those of the Monte Carlo analysis with MDS, namely a value of 0 (zero). The error factor in each attribute is relatively small, from differences in the assessment of each respondent on the attributes studied, errors in entering data, and missing data (Kavanagh, 2001). Index values of MDS and Monte Carlo analysis are shown in (Table 4).

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 590-601, June 2024

Table 4. Results of MDS and Monte Carlo Analysis at 95% Confidence Interval

Variable	Rapfish	Monte Carlo	Deviation
Ecological	33.51	33.51	0
Economic	32.00	32.00	0
Social	40.00	40.01	-0.01

CONCLUSION AND SUGGESTION

Indexes and sustainability status of farming in Kemiran Village, Agricultural Land in Kemiren Village, Glagah District, Banyuwangi Regency show that each dimension analyzed (ecological, economic, and social) was less sustainable. Ecological dimension recommendations are in the form of extension to farmers to raise awareness about the importance of sustainable agriculture by using pesticides following recommendations to reduce the use of chemical pesticides that harm the environment, controlling green and brown planthopper pests using light traps, selecting certified rice seeds, and using organic fertilizers and burying rice straw to improve soil quality. Economic dimension recommendations increase the role of farmer groups to support farmers in various aspects, such as knowledge, market access, and technical assistance. Reducing dependence on agriculture as the main source of income by developing alternative income streams, such as tourism. Recommendations for the Social dimension include regulating land use change by regional spatial plans and maximizing information technology to access market information and support the marketing of agricultural products. Considering the impact on agriculture and the environment, it is crucial to plan for sustainable development. Sustainable development should be a priority. Continuous monitoring and evaluation of agricultural sustainability in the context of land conversion is essential for improved decision-making.

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