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Assessment of Rice Farming Sustainability after Changes in Fertilizer Subsidy Policy in Pademawu District, Pamekasan Regency

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ABSTRACT

The strategic role of rice commodities is the basis for the government to enact policies encouraging increased production. One of the policies issued is the fertilizer subsidy policy, which has been in place for a long time, but its implementation pattern has often changed. The last policy change occurred in 2022 by reducing subsidized fertilizers from six types to two: Urea and NPK. Rice farming requires these two types of fertilizers, as well as other fertilizers such as KCL, SP-36, and organic fertilizers. The implementation of the new policy may affect the sustainability of rice farming. This study aimed to analyze the sustainability of rice farming in the Pademawu District, Pamekasan Regency. The location was purposively selected because the area is the center of rice production. The sample in this study consisted of 30 people, including farmers, farmer group leaders, and extension workers. The analytical method used was the analysis of the Rapfarm approach by applying the Multidimensional Scaling Technique. The dimensions analyzed include environmental, economic, and social. The study results illustrated that rice farming in Pademawu District is included in the less sustainable category based on environmental and economic dimensions. Meanwhile, the social dimension was included in the category of moderately sustainable farming. Efforts that can be made to improve are increasing harvest waste for composting and animal feed, selling harvest waste products, reducing the use of SP-36 fertilizer, intensifying the role of farmer groups, and intensifying the intensity of extension worker assistance.

Keywords: Assessment, Fertilizer Subsidy Policy, Rice Farming, Sustainability

INTRODUCTION

Rice is an agricultural commodity that supports food security and has a strategic role in the Indonesian economy. The strategic role of rice commodities can be seen from its function as a food provider for the Indonesian population, whose numbers are increasing. Food needs that depend on rice commodities in 2023 reached 80,905 kg/capita/year (KementerianPertanian, 2023). The significant demand for food, especially rice, drives increased rice production, especially in East Java Province, known as the national rice barn. Based on data from BPS East Java in 2024, the amount of rice production in 2022 amounted to 9.53 million tons of GKG (milled dry grain), and in 2023 amounted to 9.71 million tons of GKG (BPSJawaTimur, 2024). The increase in rice production by 1.93%, equivalent to 184.15 thousand tons, was due to increased land productivity (Keson et al., 2023). The government has made various efforts to increase rice production, including implementing a fertilizer subsidy policy (Debbarma et al., 2021). The fertilizer subsidy policy was implemented to help farmers meet their fertilizer needs at a more affordable price. In addition, the policy is also an effort to realize food security (Kagan et al., 2024; Mthombeni et al., 2022; Wesenbeeck et al., 2021). Another objective of fertilizer subsidies is to enable farmers to purchase fertilizer at the correct scale and to support effective and efficient fertilization practices according to land conditions (Lero, 2024).

The fertilizer subsidy policy has been in place since 1970. However, the fertilizer subsidy scheme has changed frequently. The last change in fertilizer policy occurred in 2022, as stipulated in Ministry of Agriculture (MOA) Regulation No. 10 of 2022. The policy explains that fertilizer subsidies are given to two types of fertilizers (Urea and NPK) and nine priority commodities, including rice, corn, chili, soybeans, shallots, garlic, sugarcane, coffee, and cocoa. Meanwhile, the previous policy included six types of fertilizers and 72 subsidized commodities (Fauziyah et al., 2024). In addition to the types of fertilizers and commodities subsidized, the latest policy adds rules related to the application and distribution mechanism. Fertilizer subsidies can only be accessed by farmers who are members of farmer groups and have submitted RDKK (Definitive Plan of Group Needs); they can be accessed using farmer or non-farmer cards (Prayitno et al., 2021; Swami & Parthasarathy, 2024). The change in fertilizer subsidy policy significantly impacts rice farming activities. Rice farming requires urea, NPK fertilizers, KCl, SP-36, and organic fertilizers (Sugai et al., 2024). Therefore, reducing subsidized fertilizer types will increase farming costs, leading to decreased income (Gaytancıoğlu & Yılmaz, 2024; Islam et al., 2024; Van Niekerk et al., 2024).

However, there are positive aspects to the change in subsidized fertilizer policy. Reducing the use of chemical fertilizers can reduce negative impacts on the environment and support sustainable agriculture's realization (Foguesatto et al., 2020). *Sustainability* is an effort to meet the needs of the present without sacrificing future generations by covering interrelated systems, namely the environment, economy, and society (Hidayati et al., 2021; Jones-Crank, 2024). Sustainability from the environmental dimension focuses on the quality of inputs and the efficiency of agricultural management. Sustainability from the economic dimension focuses on generating increased market opportunities, lower production costs, sustainable profits, selling price effects, marketing system efficiency, and business partners (Khan & Khan, 2024). Sustainability assessment of the social dimension addresses stakeholders' participation conditions in agricultural activities (Semin et al., 2021). Therefore, sustainable agriculture is the implementation of agriculture that refers to the environment, focusing on long-term sustainability to avoid negative impacts on the environment and improve the standard of living for farmers and the whole community (Budi, 2021). Sustainable agricultural systems are characterized by (1) economically profitable and accountable (*economically viable*), (2) *ecologically sound*, (3) *socially acceptable*, (4) *environmentally non-degrading*, *conserving resources*, (5) *technically appropriate*, (6) respect for local culture and adaptability (Puntsagdorj et al., 2021).

Pademawu District is one of the main centers of rice production in Pamekasan Regency, with an average annual rice production of 24,331.7 tons per (Prasetyowati et al., 2023). Rice farmers in Pademawu District use Urea (N) fertilizer excessively, while Phosphorus (P) fertilizer, KCl (K) fertilizer, and organic fertilizer are rarely used (Syamsiyah & Wicaksono, 2023). Thus, soil fertility is classified as very low because plants' nutrient content needs cannot be adequately fulfilled. The 2022 fertilizer subsidy policy influenced the condition of agricultural institutions in Pademawu District. This is indicated by an increase in the performance of farmer groups in managing resources and access to subsidized fertilizers, which has a good impact on the economic conditions of farmers (Fajriyah, 2023). Based on this background, this study aims to analyze the sustainability index of rice farming in Pademawu District after the fertilizer subsidy policy in 2022.

RESEARCH METHOD

This research was conducted in three villages in Pademawu District, Pamekasan Regency. The three villages were Jarin, Baddurih, and West Pademawu. The location was chosen purposively because rice production in the four villages was higher than in other villages (Fajriyah, 2023). The research was conducted from September to October 2024. This study used primary data obtained through data collection techniques by conducting interviews using structured questionnaires and FGD (Focus Group Discussion) directly with farmers, farmer group leaders, and extension officers. The interview collects data by conducting direct interactions between researchers and informants (Ardiansyah et al., 2023). The questionnaire is a tool that can be used to obtain data by asking informants questions per the structured research objectives (Nusa Bhakti et al., 2022). Focus Group Discussion (FGD) is a data collection technique that involves discussions with several parties to obtain a lot of information related to problems or specific topics and issues that allow it to be discussed from various points of view (Sugarda, 2020).

The sample in this study was determined using the purposive sampling technique, which is a way of determining the sample by using certain considerations according to specific characteristics that are considered to have a significant relationship to the characteristics already known beforehand (Isabella et al., 2024). The criteria determined the sample: farmers who are members of farmer groups and obtain subsidized fertilizers and stakeholders who understand the farming conditions and the distribution flow of subsidized fertilizers for rice commodities. The number of samples was determined from the calculation of the number of dimensions multiplied by a value of 3 to 10 as the desired level of confidence, so this study used the number of dimensions three multiplied by a value of 10, which obtained a sample size of 3 × 10 = 30 samples (Djatola & Hilal, 2023).

This quantitative research uses analytical tools, namely Rapfarm, Multidimensional Scaling (MDS), Leverage Analysis (Sensitivity Analysis), and Monte-Carlo Analysis. Sustainability assessment using Rapfarm analysis, in general, has three stages, which include 1) determining indicators in each dimension of sustainability, 2) assessing indicators in each dimension based on filling out research questionnaires, 3) analyzing indices and sustainability status using MDS ordination analysis, Leverage Analysis (sensitivity analysis) and Monte-Carlo Analysis (anomaly analysis) (Setiacahyandari & Hizbaron, 2024). Rapfarm (Rapid Appraisal of the Status of Farming) is a modified analysis of the Rapfish (Rapid Appraisal for Fisheries) method to analyze rapidly (rapid appraisal) the relationship between the dimensions of sustainability (Sigalingging & Handajani, 2024). MDS (Multidimensional Scaling) analysis is a method used to show the position and value of the object under study using an understanding of similarity (Joviandi & Kesumawati, 2024). Leverage Analysis (Sensitivity Analysis) is used to determine sensitive indicators that influence sustainability, to identify indicators that have the most important role in each dimension, as seen from the Root Mean Square value of the indicator (Nugrahapsari et al., 2020). Based on the Root Mean Square value, sensitive indicators are seen from Leverage Analysis to determine indicators sensitive to sustainability. The recommendations are based on dimensions with Root Mean Square accumulation values contributing significantly to sustainability (Setiacahyandari & Hizbaron, 2024). The value is calculated by summing the values of all indicators for each dimension.

Monte Carlo Analysis is used to assess the validity of the data and models used. The validity test is based on the Monte-Carlo ordination value at the 95% confidence level obtained from the Rapfarm analysis results in each dimension. Monte-Carlo is used to assess validity, which is obtained from calculating the difference between the MDS value of the sustainability index and the Monte-Carlo ordination value in each dimension. Then, the value for multidimensions is calculated on average from the results of the difference value. The difference value of less than 1 indicates that the Rapfarm model with the MDS approach is valid (Ekopsi et al., 2023). The following equation calculates the validity of the Monte-Carlo:

Monte-Carlo validity = MDS ordination value - Monte-Carlo value

Table 1. Dimensions, Indicators, Statements, and Reference Sources to Assess the Sustainability of Rice Farming in Pademawu District after the Change in Fertilizer Subsidy Policy in 2022.

Dimension	Indicator	Statements	References Source
Environmental	The use of Urea fertilizer	After the 2022 fertilizer subsidy policy, farmers use Urea fertilizer in fertilizer in smaller quantities	(Singh et al., 2024)
	The use of NPK fertilizer	After the 2022 fertilizer subsidy policy, farmers use smaller amounts of NPK fertilizer	(Singh et al., 2024)
	The use of ZA fertilizer	After the 2022 fertilizer subsidy policy, farmers used less ZA fertilizer	(Singh et al., 2024)
	The use of SP-36 fertilizer	After the 2022 fertilizer subsidy policy, farmers used less SP-36 fertilizer	(Singh et al., 2024)
	The use of compost fertilizer	After the 2022 fertilizer subsidy policy, farmers used more compost fertilizer	(Kanchanapiya & Tantisattayaku, 2024)
	The use of manure	After the 2022 fertilizer subsidy policy, farmers use more manure in larger quantities	(Nleya et al., 2024)
	The use of chemical pesticides	After the 2022 fertilizer subsidy policy, farmers use fewer chemical pesticides in smaller quantities	(Ahmad et al., 2024)
	The use of non-chemical pesticides	After the 2022 fertilizer subsidy policy, farmers use a higher amount of non-chemical pesticides	(Nitzko, 2024)
	The Rotation of Rice Varieties	After the 2022 fertilizer subsidy policy, farmers are rotating rice varieties (seeds) to increase yields	(Suryania et al., 2022)

	The use of crop waste for compost	After the 2022 fertilizer subsidy policy, farmers use crop harvest waste to make compost	(Kanchanapiya & Tantisattayaku, 2024; Puntsagdorj et al., 2021)
	The utilization of harvest waste for animal feed	After the 2022 fertilizer subsidy policy, farmers use crop waste to feed livestock	(Sobhi et al., 2024)
Economic	The cost of purchasing Urea fertilizer	After the 2022 fertilizer subsidy policy, farmers spent less money on Urea fertilizer.	(Islam et al., 2024; Thapa et al., 2024)
	The cost of purchasing NPK fertilizer	After the 2022 fertilizer subsidy policy, farmers spent less money to buy NPK fertilizer	(Islam et al., 2024)
	The cost of purchasing ZA fertilizer	After the 2022 fertilizer subsidy policy, the cost incurred to purchase ZA fertilizer has increased	(Thapa et al., 2024)
	The cost of purchasing SP-36 fertilizer	After the 2022 fertilizer subsidy policy, the costs incurred to buy SP-36 fertilizer are increasing	(Thapa et al., 2024)
	The cost of purchasing compost fertilizer	After the 2022 fertilizer subsidy policy, the costs incurred to purchase compost fertilizer are increasing	(Danso et al., 2023)
	The cost of purchasing manure	After the 2022 fertilizer subsidy policy, the costs incurred to buy manure are increasing	(Danso et al., 2023)
	Selling price	After the 2022 fertilizer subsidy policy, the selling price of crops received by farmers is higher	(Suryania et al., 2022)
	Farmer income	After the 2022 fertilizer subsidy policy, the income earned by farmers has increased	(Suryania et al., 2022)
	Access to subsidized fertilizer	After the 2022 fertilizer subsidy policy, farmers have easy access to subsidized fertilizers	(Miah et al., 2019)
	Access for farmer cards	After the 2022 fertilizer subsidy policy, farmers who have a farmer card can easily access subsidized fertilizer	(Miah et al., 2019)
	Access for non-farmer cardholders	After the 2022 fertilizer subsidy policy, farmers who do not have a farmer card can easily access subsidized fertilizer	(Miah et al., 2019)
	Product quality	After the 2022 fertilizer subsidy policy, the quality of products produced by farmers is better	(Suryania et al., 2022)
	Product quantity	After the 2022 fertilizer subsidy policy, the quantity of products produced is better	(Suryania et al., 2022)
	The sales of compost from harvest waste	After the 2022 fertilizer subsidy policy, compost made from crop waste is sold	(Kanchanapiya & Tantisattayaku, 2024)
	The sale of waste products	After the 2022 fertilizer subsidy policy, farmers sell harvest waste products	(Kanchanapiya & Tantisattayaku, 2024)
Social	Farmers' willingness to look for alternatives	After the 2022 fertilizer subsidy policy, farmers are looking for alternatives or solutions to overcome the problem of declining fertilizer purchasing power	(Kanchanapiya & Tantisattayaku, 2024)
	The implementation of alternatives	After the 2022 fertilizer subsidy policy, farmers participated in training aimed at increasing their knowledge	(Alam et al., 2024)

		and skills in cultivating organic systems	
	Assistance from extension workers to farmers	After the 2022 fertilizer subsidy policy, extension workers are more intensive in assisting farmers, especially in introducing more environmentally friendly cultivation techniques	(Alam et al., 2024)
	Extension assistance in the preparation of RDKK	After the 2022 fertilizer subsidy policy, extension workers intensively assisted in the preparation of RDKK	(Alam et al., 2024)
	Farmer group communication with farmers	After the 2022 fertilizer subsidy policy, farmer groups conducted independent activities oriented towards the use of more environmentally friendly technology	(Alam et al., 2024)

Indicators of environmental, economic, and social dimensions to assess the sustainability of rice farming in the study area are shown in Table 1. Respondents will assess sustainability indicators using a Likert scale of 1 to 5) indicating respondents strongly disagree to strongly agree with statements describing the sustainability indicators of rice farming. After the data is analyzed, the sustainability index of rice farming will be generated. Sustainability categories are presented in Table 2.

Table 2. Categories of Rice Farming Sustainability Index in Pademawu District After the Change in Fertilizer Subsidy Policy in 2022.

Index Value (%)	**Category**
0,00-25,00	Bad (unsustainable)
>25,00-50,00	Poor (less sustainable)
>50,00-75,00	Fair (moderately sustainable)
>75,00-100,00	Good (very sustainable)

Source : Setiacahyandari & Hizbaron (2024).

RESULTS AND DISCUSSION

The respondents selected in this study were farmers who were members of farmer groups and received subsidized fertilizer. Farmers follow extension activities from farmer groups and agricultural extension workers on average once a season. The average age of farmers in Pademawu District who became respondents was 49 years old, with an education level mainly at the elementary school level (SD). Farmers have rice farming experience ranging from 20 to 26 years. These farmer characteristics may affect the sustainability of rice farming in Pademawu District.

Given the commodity's strategic role, assessing rice farming's sustainability is essential. The results of this sustainability index assessment can be used as an evaluation material for policymakers and business actors to make decisions to maintain or improve business sustainability. The overall sustainability index of rice farming (multidimensional scaling) after the 2022 fertilizer subsidy policy is presented in Figure 1. The value of the sustainability index in each dimension is shown in a scatter diagram in Figure 2. Based on the results of the analysis of the environmental, economic, and social dimensions, the sustainability of rice farming in Pademawu District after the change in fertilizer subsidy policy in 2022 is included in the category of less sustainable in the environmental and economic dimensions and moderately sustainable for the social dimension.

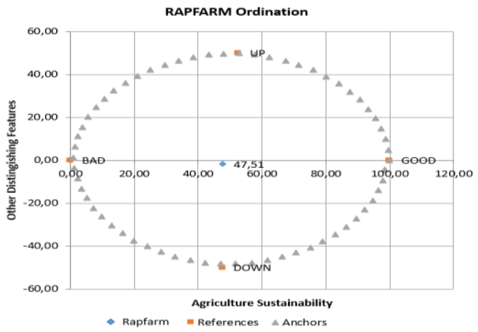

Figure 1. Multidimensional Sustainability Index of Rice Farming

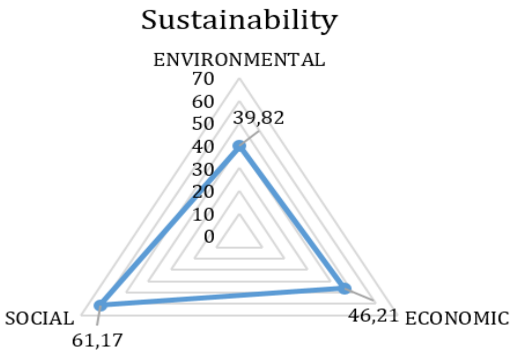

Figure 2. Sustainability of Rice Farming in Pademawu District

The results of multidimensional Rapfarm analysis using ordination techniques through the MDS (Multidimensional scaling) method resulted in a value of 47.51. This indicates that the sustainability of rice farming in the research location, after the change in fertilizer subsidy policy, is categorized as less sustainable. This sustainability value is obtained based on an assessment of 31 indicators consisting of 11 indicators of the ecological dimension, 15 indicators of the economic dimension, and five indicators of the social dimension. The results of this MDS analysis have a coefficient of determination (R2) of 0.95. This value means that 95 % of the sustainability model of rice farming in Pademawu District after the change in subsidy policy 2022 can be explained by the dimensions and indicators included in the model. The results of the Multidimensional Scalling and Monte-Carlo analysis on Rapfarm analysis showed a 95% confidence level and a difference of 0.10 (Table 3). The difference value of less than 1 indicates that the Rapfarm model with the MDS approach is valid (Ekopsi et al., 2023).

Table 3. Monte-Carlo Analysis Results on Rapfarm Analysis with 95% confidence level

Dimension	MDS (%)	Monte-Carlo (%)	Deviaton
Environmental	39.82	40,37	-0,55
Economic	46.21	45,61	0,6
Social	61.17	60,92	0,25
Multidimension	49,07	48,97	0,10

Source: Primary data, processed in 2024

Several things can cause the unsustainable aspect of the environment. One of them is the decline in environmental quality that can come from the excessive use of chemical fertilizers because the amount does not follow the recommendations, which results in decreased land quality (Kagan et al., 2024). Most rice farmers in Pademawu District use several chemical fertilizers (Urea, KCl, NPK, SP-36, and ZA). The use of Urea fertilizer in the area is in an amount exceeding the recommendations given based on the level of productivity of rice farming, which consists of low (< 5 tons/ha), medium (5-6 tons/ha), and high (> 6 ton/ha). According to the Minister of Agriculture Regulation number 40, the recommended use of Urea fertilizer in low, medium, and high productivity conditions is 200 kg/ha, 250-300 kg/ha, and 300-400 kg/ha (Husnain et al, 2021). The average use of Urea fertilizer in Pademawu District is 250 kg/ha, while the recommended amount is 150 kg/ha (Husnain et al, 2021). In addition, excessive pesticide use can threaten biodiversity and agricultural sustainability (Gaytancıoğlu & Yılmaz, 2024; Qiu et al., 2020).

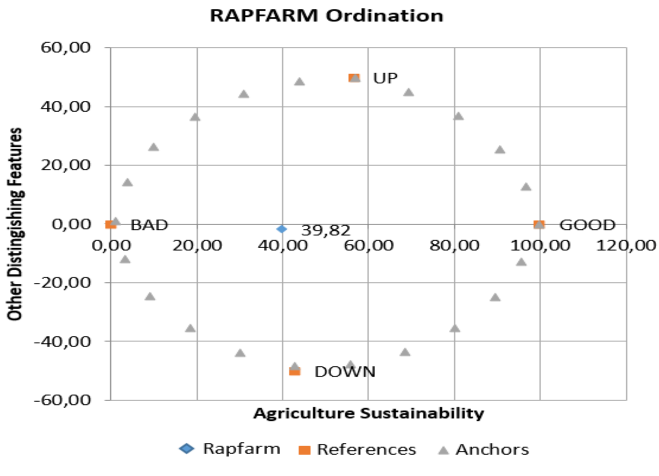

Figure 3. Environmental Dimension Sustainability Index

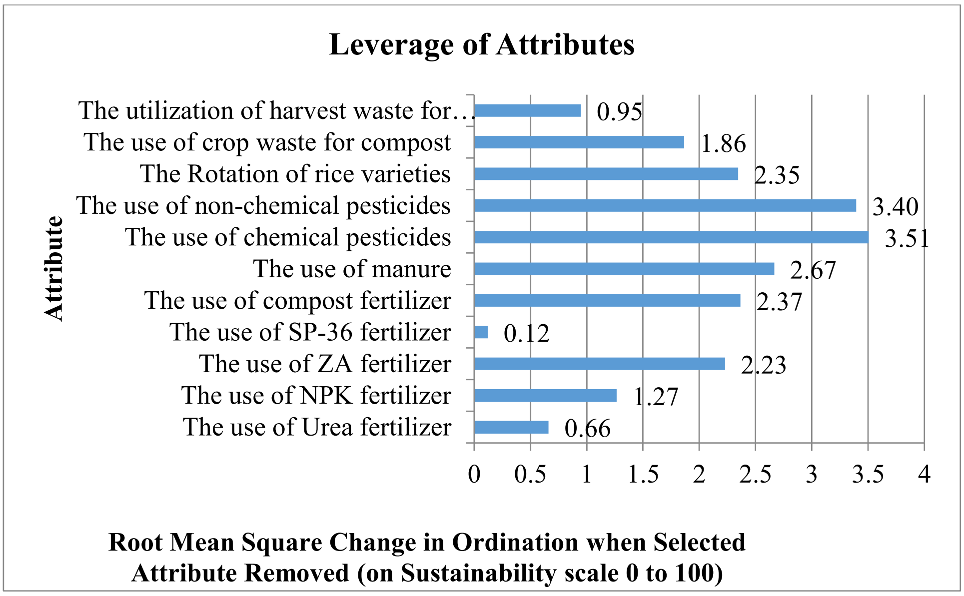

Figure 4. Environmental Sustainability Sensitive Indicators

Based on the *Leverage* analysis (Figure 4.), several indicators are sensitive to the environmental dimension, including more non-chemical pesticides, less chemical pesticides, and increased use of manure and compost. Non-chemical pesticides made from natural ingredients are an alternative to chemical pesticides to reduce impacts that can harm the environment (Bukhari, 2024). The use of non-chemical pesticides in Pademawu District after the 2022 fertilizer subsidy policy has increased along with the decrease in the use of chemical pesticides. Farmers in Pademawu District use non-chemical pesticides to prevent and treat pests and diseases that attack rice in the form of biological agents such as PGPR (*Plant Growth Promoting Rhizobacteria*), which includes *Pseudomonas* species *Pseudomonas fluorescens* (PF) and *Paenibacillus* (PB).

Using compost fertilizer can help improve soil structure, absorption capacity, and aeration so that plants can grow better during uncertain climatic conditions, which can help increase the carrying capacity of the environment and the quality and quantity of agricultural production (Masciarelli et al., 2024; Rompato et al., 2024). Farmers in Pademawu District partly use bokashi fertilizer obtained from farmer groups. Bokashi is a fertilizer from animal (cow) manure and fermentation of organic materials such as straw with a fast and low-emission process (Indraloka et al., 2022; Lavagi et al., 2024). The increase in fertilizer use is one indicator that affects the sustainability of rice farming in Pademawu District.

The indicator that needs to be considered to improve sustainability in the environmental dimension is the use of SP-36 fertilizer, which has decreased after the 2022 fertilizer subsidy policy. Although SP-36 fertilizer is no longer subsidized, farmers still use the fertilizer to meet the needs for nutrients supporting plant growth. The use of SP-36 fertilizer, which is a chemical fertilizer, can be reduced and replaced with organic fertilizers such as compost and bokashi fertilizer to improve soil fertility and provide nutrients for plants (Lavagi et al., 2024; Rompato et al., 2024; Van Niekerk et al., 2024).

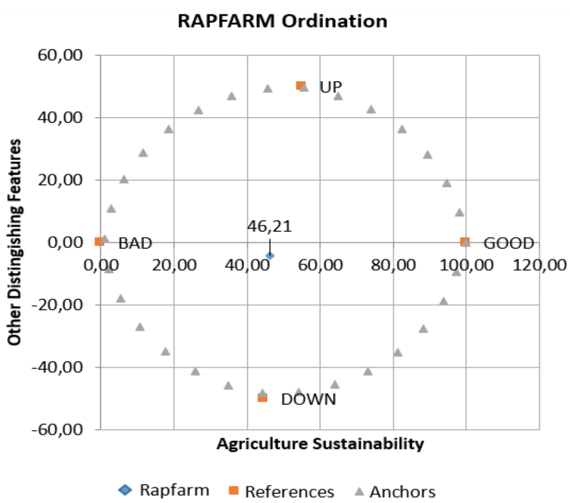

Figure 5. Economic Dimension Sustainability Index

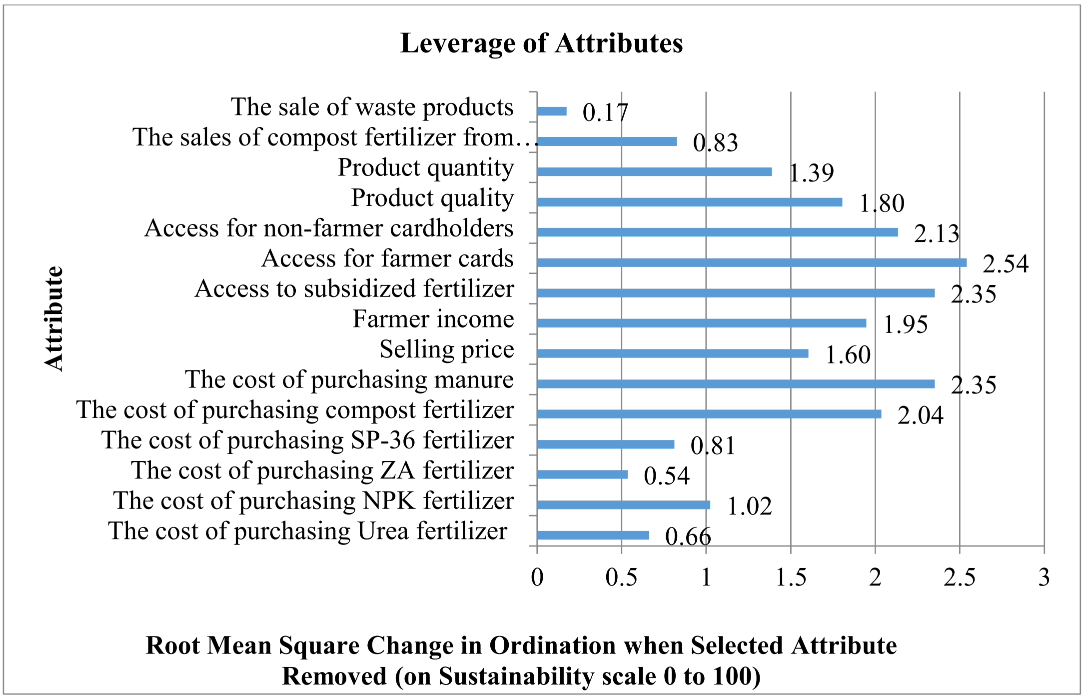

Figure 6. Economic Sustainability Sensitive Indicators

The economic dimension of rice farming in the Pademawu Subdistrict falls into the category of less sustainable farming after the change in fertilizer subsidy policy in 2022. When viewed from the *Leverage* analysis (Figure 6), several indicators support the sustainability of rice farming from the economic dimension, including ease of access to purchasing fertilizer using farmer cards and non-farmer cards. Farmers' access to subsidized fertilizer in Pademawu District is easier using non-farmer cards in the form of ID cards because farmer cards are not applied to buy subsidized fertilizer. Meanwhile, farmer cards are still not optimal because they tend to be more complicated to use because they have to deal with banks.

The sale of waste products is an indicator that must be considered to support improving the sustainability of rice farming in the economic dimension. Farmers in Pademawu District have not utilized rice straw as a saleable waste. After harvesting, farmers tend to burn the dried straw without selling the waste, which can be an additional source of income. Rice straw waste can also be sold as a mixture for making organic fertilizer (Nyathi et al., 2021). The sale of rice waste can increase farmers' income in Pademawu District, which can affect sustainability in the economic dimension.

The sustainability of rice farming in Pademawu District based on the social dimension (Figure 7) has a better sustainability level than the other two dimensions because it falls into the category of entirely sustainable. The indicator that contributes significantly to this sustainability is the assistance of agricultural extension workers in preparing RDKK. Agricultural extension officers become facilitators who help guide farmers who are members of farmer groups in the RDKK preparation process (Mushi et al., 2024). Agricultural extension officers provide assistance to farmers in understanding the use of new technologies, such as e-RDKK, to reduce the possibility of errors in the RDKK preparation process (Alam et al., 2024). The role of extension workers in assisting farmers in preparing RDKK in the Pademawu District is well implemented to greatly influence agricultural sustainability in the social dimension.

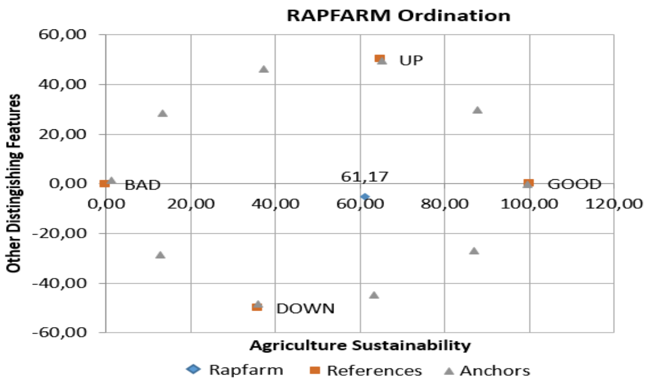

Figure 7. Social Dimension Sustainability Index

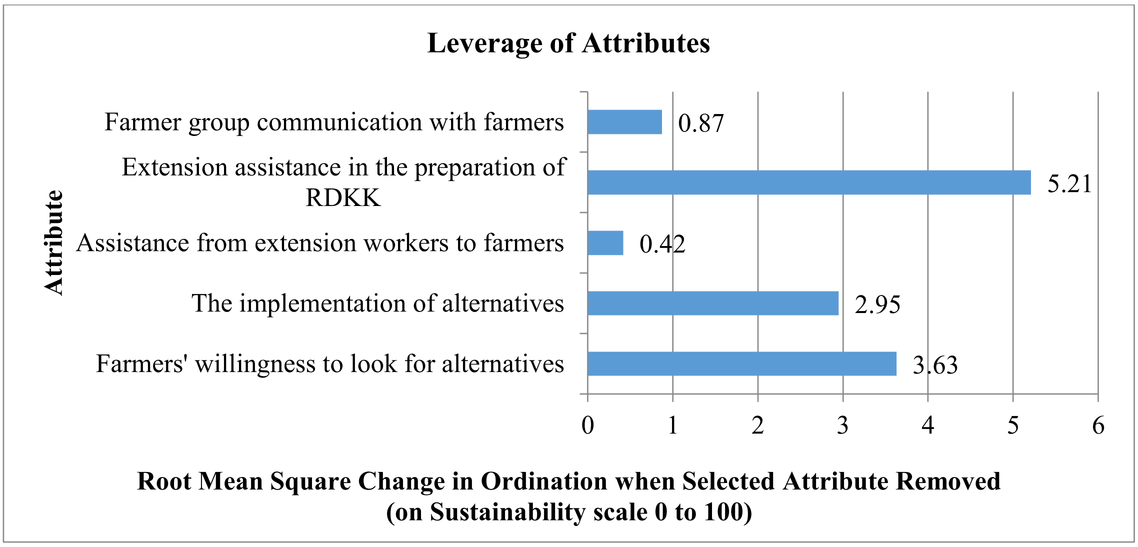

Figure 8. Social Sustainability Sensitive Indicators

The social dimension is also related to the culture of the community. Madurese people are known to have a strong spirit and will to make a living and not easily despairing to find solutions to the problems faced. The character of the Madurese community is highly persevering in doing business according to the Madurese philosophy, namely *Bharenteng alakoh* (working hard), which means that Madurese is very active in carrying out work without being lazy (Fitriyah, 2020). In addition, they are also known to have a powerful kinship and mutual cooperation, one of which is in the field of agriculture to improve close relationships between neighbors and minimize the costs that farmers have to incur in cultivation (Mthombeni et al., 2022).

To optimize the social dimension, efforts are still needed, such as intensifying the existence of farmer groups and increasing the role of extension workers as agents of change, especially in introducing more environmentally friendly rice cultivation techniques (Van Niekerk et al., 2024; Zenda & Malan, 2021). Concerning the problems that arose after the change in fertilizer subsidy policy in 2022, farmers have made various efforts, including farmers struggling to find alternatives or solutions to overcome the problem of decreased purchasing power of fertilizers whose subsidies were withdrawn. In discussions with farmer groups and field extension officers, they have substituted some SP-36 fertilizer and organic fertilizer by using livestock waste and harvest waste to make manure and compost. This can be done because manure and compost generally contain macro and micronutrients and microorganisms that can help increase P (phosphorus) content to increase soil fertility and plant growth (Masciarelli et al., 2024). The results of this study are in line with the study produced by Imana & Zenda (2023) and Van Niekerk et al. (2024), which explains that improving the social dimension in farming can be done using agricultural extension assistance in improving the development and performance of farmer groups to carry out sustainable agricultural practices.

Based on the assessment of the three dimensions, it was found that the economic dimension contributed the most to the sustainability of rice farming after the 2022 fertilizer policy change. This can be seen from the accumulated RMS summation in the economic dimension, which reached 22.18 percent. Meanwhile, the environmental and social dimensions contributed 21.39 and 13.08 percent, respectively. Priority recommendations to improve the sustainability of rice farming in Pademawu District based on the total value of RMS is to maintain indicators that have contributed significantly to the sustainability of rice farming and increase the contribution of still low indicators. Indicators that need attention to improve sustainability are the processing and selling of harvest waste products that can be used for bokashi and animal feed (Nyathi et al., 2021). Reducing the use of SP-36 fertilizer is also an important indicator that farmers must consider to support the sustainability of rice farming. Furthermore, optimizing the role of extension workers in assisting farmers to introduce more environmentally friendly agricultural practices is also important to improve the sustainability of rice farming after the 2022 fertilizer subsidy policy change (Zenda & Malan, 2021).

CONCLUSION AND RECOMMENDATION

The 2022 fertilizer subsidy policy significantly impacts the sustainability of rice farming in Pademawu District, Pamekasan Regency. The change in fertilizer subsidy policy in 2022 indicates less sustainable farming activities, especially in the environmental and economic dimensions. The social dimension shows indications of sustainability. Some indicators that need to be considered for the sustainability of rice farming after the fertilizer subsidy policy are processing and selling waste products, reducing the use of SP-36 fertilizer, and optimizing the role of extension workers.

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Conflict of Interest: This research has no conflict of interest with the object of research. The research was conducted based on the interests of scientific development for UTM lecturers, and as an effort to contribute to the development of Madura Island.

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