

The Analysis of Rice Commodity Procurement Sustainability in Pasar Induk Cikurubuk, Tasikmalaya, West Java

Gina Siti Nuwardani^{1*}, Iwan Setiawan¹, Trisna Insan Noor¹

¹Faculty of Agriculture, Padjadjaran University, Jatinangor, West Java, Indonesia

*Corresponding author: gina20001@mail.unpad.ac.id

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ABSTRACT

Food needs are increasing along with the increase in population because food is the most important basic human need, especially rice as a staple food. The purpose of this research is to analyze the level of sustainability of rice commodity procurement. This research was conducted in Pasar Induk Cikurubuk, Tasikmalaya, West Java. Researchers used the survey method in this study. The types of data used in this study are primary data and secondary data. Sampling in this study used stratified proportional random sampling with a total of 77 rice traders who were analyzed descriptively. The results showed that the sustainability of rice commodity procurement in multidimensional (economic dimension, social dimension, ecological dimension, institutional dimension, technological dimension) using the multidimensional scaling (MDS) method resulted in a sustainability index value of 76.80 which is included in the "very sustainable" category.

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1. Introduction

Food needs are increasing along with the increasing population because food is the most basic human need (Lestari, 2020). Rice is the main food commodity for the people of Indonesia. Widiarsih (2012) stated that the rice price position determines the amount of product demand. If the character of food products has a low demand elasticity value, it will cause price increases. This means that rice has an inelastic demand elasticity because if the price of rice rises, buyers are reluctant to look for a substitute (because it is the staple food product). This character of rice demand elasticity tends to encourage traders to increase the rice price. In line with the results of research by Setiawan, A, F dan Hadianto (2014), the average change in rice prices fluctuates. Seasonal patterns in rice price data are thought to be influenced by the harvest season, namely, an increase in prices occurs at its peak during the lean season. Conversely, the decrease in rice prices occurs when entering the harvest season.

Cikurubuk Main Market, Tasikmalaya City, is the largest traditional market in the East Priangan region of West Java Province. Food commodity procurement transactions are very broadly intertwined and mutually integrated between actors within the city and outside the region. Various types of products are traded, including groceries and groceries which are sold wholesale and retail. The majority of large and small traders already have their respective customers, both from within and outside the region. So that it can be described that the Cikurubuk Main Market has a very important role in food procurement in the East Priangan region. So that it can be emphasized that the Cikurubuk Main Market has an important role in the supply of food products.

According to Heryanah (2016), for the government and urban managers, the importance of food security, needs and availability, both regarding food entry, food exit, stock/availability, affordability, distribution, markets, consumption, and food production is not only related to protection and adjustment efforts but also related to efforts to anticipate various possible risks and uncertainties.

According to Saragih, Rachmina, and Krisnamurthi, (2020), sustainable development is a development concept to meet current human needs without disrupting the ability of future generations to meet their needs. Hidayat (2007) added that sustainable development is currently an important issue and a demand in various fields of development, especially in development related to natural resources, including staple food supply.

Food commodity distribution is a system that is integrated. This integration will have an impact on various aspects, especially social, economic, technological, environmental, and institutional aspects (Suardi *et al.* 2022; Putra *et al.*, 2020; Lovell 2010; Khurana 2021). These five aspects can be felt by various parties, especially distributors (corporations, wholesalers, large traders, and small traders), central and local governments, and the wider community as end consumers. This study aims to analyze the sustainability of rice commodity procurement among wholesalers, large traders, and small traders in Pasar Induk Cikurubuk in terms of five dimensions, namely economic, social, environmental, institutional, and technological dimensions.

2. Methodology

The research design was carried out through a quantitative approach using survey methods through a stratified proportional random sampling technique, based on the level of wholesalers and small traders of rice commodities in the Cikurubuk Central Market, 338 wholesalers consisting of 35 traders and 303 small traders. Based on the calculation of the Slovin formula, the samples obtained were 77 traders. Data were analyzed using Multidimensional Scaling (MDS) to assess the sustainability of rice commodity food procurement at the Cikurubuk Main Market, Tasikmalaya City.

Multidimensional Scaling (MDS) is used to assess the sustainability of the procurement of rice commodities at the Cikurubuk Central Market, Tasikmalaya City. MDS is a multivariate statistical analysis method used to determine locations based on similarities or differences between variables or concepts (Saeed *et al.* 2018; (Bánhidi *et al.* 2020; Jaworska and Chupetlovska-Anastasova 2009; Eom 2009). The MDS analysis used in this study is to evaluate the sustainability status index based on the five dimensions of sustainability, namely the economic, social, environmental, institutional and technological dimensions and to identify the most sensitive attributes or factors of these dimensions (Susilo 2020; Rachman *et al.* 2022; Purwanti *et al.* 2021).

The tool used is the RapFselfficiency program which is a refinement of the RAPFISH (Rapid Fishery Assessment) program method developed by the Fisheries Center of the University of British Columbia (Kavanagh, P., & Pitcher 2004; Fauzi, A., & Anna 2002). Analysis of the sustainability of rice commodity procurement at the Cikurubuk Main Market is carried out in several stages, namely as follows:

1. Determine the dimensions to be analyzed;
2. Determine the attributes of each dimension;
3. Scores for each attribute are based on an ordinal scale

Expert judgment is used for scientific judgment to evaluate the attributes of each dimension. To determine the value of the sustainability index and the status of sustainable development based on the estimated score for each dimension. The sustainability index criteria are divided into four categories as shown in Table 1.

Table 1. Categories of Staple Food Procurement Sustainability in Main Markets

Index Value (%)	Category
0.00 – 25.00	Bad (unsustainable)
25.01 – 50.00	Less (less sustainable)
50.01 – 75.00	Sufficient (sufficiently sustainable)
75.01 – 100.00	Good (very sustainable)

Sensitivity analysis to determine attributes or factors as sensitive variables that contribute or leverage factors to the sustainability of rice commodity procurement at the Cikurubuk Main Market. The influence of each attribute can be seen in changes in the "root mean square" (RMS) (Kavanagh, P., & Pitcher 2004). The greater the RMS value, the more sensitive the attribute is and contributes to influencing the sustainable performance of staple food procurement. The RMS formula can be stated as follows:

$$RMS = \sqrt{\frac{\sum_{i=1}^n \epsilon_{i-1} - \{Vf(i,1) - Vf(1)\}^2}{n}}$$

Information

Vf(i,1): MDS output value (after rotation and flipping)

Vf (1) : median MDS output in column-1

Monte Carlo analysis is used to take into account the dimensions of uncertainty and evaluate the effect of errors by assessing ordination. Errors can be caused by mistakes in making scores due to an imperfect understanding of attributes or field conditions, variations in scores due to differences in opinions or researchers' assessments, repeated MDS analysis processes, wrong data input or missing data, iteration stability, and high-stress scores (Kavanagh, P., & Pitcher 2004; Fauzi, A., & Anna 2002). The goodness of fit in MDS is reflected in the sum of the stress S values calculated based on the S and R2 values. A lower stress (S) value describes a condition of conformity while a high S value indicates the opposite. Through the Rap-Fselfsufficiency approach, a good model can be shown from a stress value that is smaller or less than 0.25 or $S < 0.25$ and a Good R2 total value close to 1.0 (Kavanagh, P., & Pitcher 2004).

3. Results and Discussion

Table 2. The Goodness of fit results of RAPFISH Analysis and Sustainability Status of Rice Food Commodities in Pasar Induk Cikurubuk, Tasikmalaya.

Criteria	MDS	Monte Carlo	Gap	S-Stress	R2
Multidimensional	76.80	74.83	1.97	0.23	0.89
Economy	74.92	72.92	2.00	0.17	0.88
Social	66.17	64.63	1.54	0.15	0.91
Environment	71.45	69.86	1.59	0.16	0.93
Institution	74.85	72.55	2.30	0.17	0.88
Technology	66.96	65.87	1.09	0.19	0.93

Source: Primary Data Processed (2021)

Table 2 shows that the S-Stress value is between 0.15 - 0.23 and the R2 value is at 0.88 - 0.93. It can be interpreted that the goodness of fit value in this RAPFISH analysis has been fulfilled. According to (Saragih *et al.* 2020) the coefficient of determination (R2) value

illustrates the ability of attributes to explain and contribute to the sustainability of the analyzed system can be fulfilled. Furthermore, if the S-Stress value is met, the attribute configuration can reflect the original data. Thus, it can be stated that the analyzed indicators are accurate, and this can be justified statistically. The difference between MDS and Monte Carlo analysis at the 95% confidence level or 5% error rate is in the difference between 1.09 - 2.3, so the impact of scoring errors in the analysis is relatively small. If the difference between the two analyses is <5%, the results of the MDS analysis are adequate for estimating the value of the sustainability index (Kavanagh, P., & Pitcher 2004).

The results of the multidimensional RAPFISH analysis by using the multidimensional scaling (MDS) method produced a sustainability index value of rice procurement in Pasar Induk Cikurubuk, Tasikmalaya. The sustainability index value of rice procurement is 76.80. This value is in the range of 75.01 - 100. Therefore, is included in the "very sustainable" category with the S-Stress value of 0.23 and the R2 value of 0.89.

This value is influenced by the calculation of a combined analysis between all dimensions (economic, social, environmental, institutional, and technological) called multidimensional analysis. From the calculation of the combined analysis, the social and technological dimensions have the lowest value and affect the results of multidimensional sustainability. According to Fauzi, A., & Anna (2002) in the MDS analysis, a value in the range of 75.01-100.00 is included in the "very sustainable" category. This is because of the 5 variables of the sustainability dimension tested in this study, the average has a sustainability index value with a fairly sustainable status. Thus, it can be concluded that the procurement of rice commodities in Pasar Induk Cikurubuk is in the highly sustainable category. In line with research conducted by Nurmalina (2008), the multidimensional RAPFISH analysis in national rice procurement obtained a result of 64.51 and was included in the moderately sustainable category.

Each dimension has attributes that become the parameters of the sustainability of rice procurement in Pasar Induk Cikurubuk. The sustainability index value is obtained based on an assessment of 21 sustainability attributes from each dimension, which is explained in more detail in Figure 1.

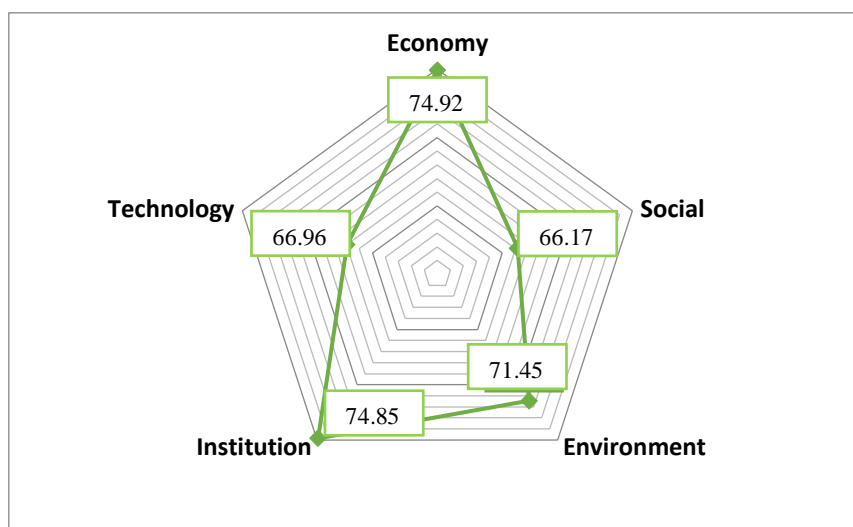


Figure 1. Kite Diagram of Rice Commodity Procurement Sustainability Index in Pasar Induk Cikurubuk Main Market

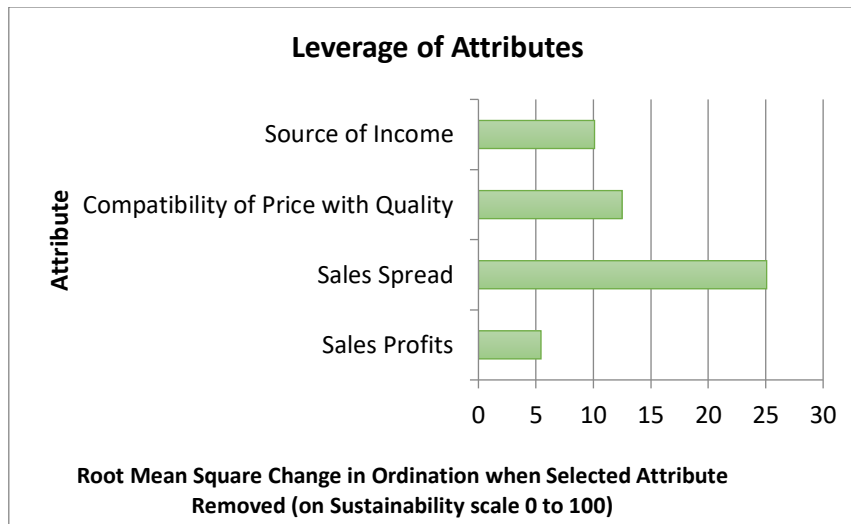


Figure 2. Results of the Economic Dimension Leverage Analysis

The sustainability index value of each dimension is projected in a kite diagram (Figure 2) which means that the more the sustainability point moves to 0, the greater the sustainability value. According to Fauzi, A., & Anna (2002), the kite diagram is often referred to as a "radar" diagram where the closer the distance of the analysis to the zero point, the lower the sustainability and vice versa. Based on the kite diagram, it can be seen that the sustainability index value of the social dimension has the lowest value, followed by the technological dimension, environmental dimension, and institutional dimension and the dimension with the highest value is the economic dimension. The kite diagram can illustrate the sustainability status of rice commodity procurement in Pasar Induk Cikurubuk in an integrated manner between the various dimensions of sustainability. The following are the details of the five dimensions of the sustainability analysis of rice procurement in Pasar Induk Cikurubuk.

3.1. Economic Dimension

According to Saragih *et al.* (2020), the economic dimension is the ability of traders, corporations, and the government to fulfil the procurement of rice commodities sustainably. There are 4 measurement attributes in the economic dimension analyzed by RAPFISH analysis including the (a) source of income; (b) price compatibility with quality; (c) sales distribution; and (d) sales profit.

3.1.1 *RAPFISH Analysis*

The results of the economic dimension analysis of the sustainability of rice commodity procurement in Pasar Induk Cikurubuk using RAPFISH software on all attributes show that the economic dimension sustainability index value is 74.92 and is included in the "moderately sustainable" category, following the value range of 50-75 stated by (Fauzi, A., & Anna 2002).

Ordination analysis in the economic dimension with some iterations of 2 (two), resulting in a value ($R^2 = 0.88$) and the S-Stress value is 0.17 or 17%. Thus, the analysis of the economic dimension in this study shows the condition of the goodness of fit in the fair category.

3.1.2 *Sensitivity Analysis (Leverage)*

Sensitivity analysis on the economic dimension using the Leverage analysis method in the RAPFISH software shows that from the 4 attributes tested as shown in Figure 2, it is known that there is 1 sensitive attribute that most affect the sustainability of rice commodity procurement in Pasar Induk Cikurubuk, namely sales distribution with an RMS value of 25.08.

Kusrini and Rizieq (2019); and Suwanda *et al.* (2020)) argue that the greater the value of Leverage analysis, the more sensitive the attribute is in affecting sustainability.

The attribute that most affect the sustainability of rice commodity procurement in the economic dimension is the distribution of sales. Based on the observations, the results obtained that the rice traders in Pasar Induk Cikurubuk already have regular customers, both within and outside the Tasikmalaya City area. The existence of these regular customers indicates that the traders have built good relationships with customers. Lemon and Verhoef (2016) state that understanding the importance of consumers is an important task for marketers. Marketers try to understand consumer purchases so that they can offer greater satisfaction to consumers.

In addition, rice is the staple food commodity that is needed and consumed by the community at all times so rice supplies will always run out. This condition is in line with the results of research by Zakari *et al.* (2014); Lantarsih *et al.* (2011) that people need the availability of rice in sufficient quantities, evenly distributed over time at affordable prices and meeting the criteria for adequate consumption.

3.1.3 Monte Carlo Analysis

Monte Carlo analysis is intended to see the level of stability of the ordination analysis results carried out with 10 iterations. The results of the Monte Carlo simulation on the economic dimension are that the ordination points are not scattered, which means that the ordination is stable. Fauzi, A., & Anna (2002) stated that the stability of ordination can represent the sustainability of rice procurement in Pasar Induk Cikurubuk well.

3.2. Social Dimension

The social aspect is one of the reference pillars of sustainable development relating to social elements. In this study there are 5 attributes used to analyze the sustainability of the social dimension, namely: (a) Participation among traders; (b) Relationship with consumers; (c) Conflict status; (d) Development of the number of traders; (e) Facilities and infrastructure.

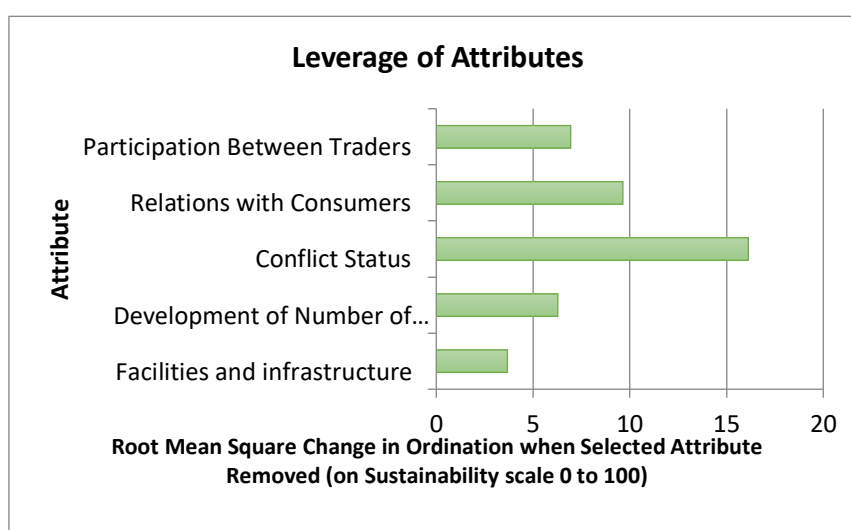


Figure 3. Results of the Social Dimension Leverage Analysis

3.2.1 RAPFISH Analysis

Based on the results of the RAPFISH analysis, the social dimension sustainability index value is at a value of 66.17 which is included in the value range of 50-75, so the social dimension category is "quite sustainable". The ordination analysis carried out with the number

of iterations three times, shows the condition of the goodness of fit in the fair category with the coefficient of determination ($R^2 = 0.91$) and the S-Stress value is 0.15 or 15%.

3.2.2 Sensitivity Analysis (Leverage)

Based on the results of the sensitivity analysis (Leverage) conducted on the 5 attributes of the social dimension, it is known that there is an attribute that has the highest leverage value, as shown in Figure 3. The attribute is the status of conflict with an RMS (Root Mean Square) value of 16.13%. It can be interpreted that conflicts between traders are very rare, so this condition contributes well to the sustainability status. Therefore, efforts to maintain good communication and relationships between traders and consumers need to be fostered and maintained both through group activities and existing trader forums (*paguyuban*). According to Qin *et al.* (2020), conflicts of interest in resource management are part of the dynamics of community life. This can occur because existing resources are understood to be common property.

3.2.3 Monte Carlo Analysis

Monte Carlo analysis is used to see the level of stability of the ordination analysis results. Furthermore, Nurmalina (2008) states that Monte Carlo analysis is to take into account aspects of uncertainty. Based on the results of the Monte Carlo analysis conducted with 10 iterations, the ordination point does not spread and is at one point which states that the ordination is stable.

3.3. Environmental Dimension

According to Kospa (2016), one of the requirements in sustainable natural resource management is to maintain the previous function of natural resources. Besides, it must have Eco-Efficiency criteria which means it is efficient both economically and environmentally. Moldan *et al.* (2012); Wu and Pagell (2011) stated that the environmental dimension is a key dimension because it can determine the balance of natural resource utilization and the environment. Environmental attributes are chosen to reflect how environmental conditions impact sustainability.

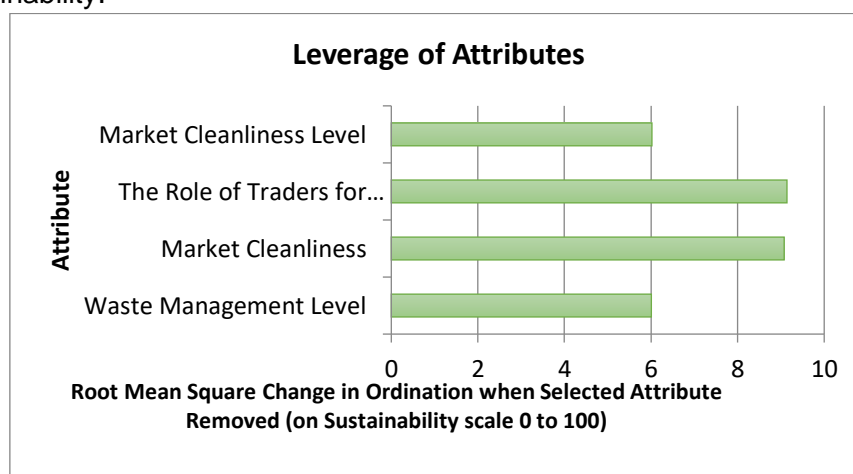


Figure 4. Results of the Environmental Dimension Leverage Analysis

The measurement of the sustainability of the environmental dimension of rice commodity procurement using 4 measurement attributes analyzed using RAPFISH analysis, including (a) The level of market cleanliness; (b) The role of traders for sustainability; (c) The cleanliness of the market environment; and (d) The level of waste management.

3.3.1 RAPPISH Analysis

Based on the results of the RAPPISH analysis, the sustainability index value of the environmental dimension of rice procurement is 71.45 and is in the "moderately sustainable" category. This shows that the condition of the sustainability index value of the environmental dimension is in the same category as the sustainability index value of the economic and social dimensions. This condition occurs because rice commodities do not produce waste.

Ordination analysis on the sustainability of the environmental dimension is carried out with some iterations of 2 (two) times, resulting in a value ($R^2 = 0.93$) and the S-Stress value is 0.16 or 16%

3.3.2 Sensitivity Analysis (Leverage)

The results of the Leverage analysis state that there is the most sensitive attribute in influencing the sustainability of the environmental dimension of rice commodity procurement in Figure 4, namely the role of traders for sustainability with a Root Mean Square (RMS) value of 9.14. According to Indiatuti *et al* (2008), market cleanliness is a major value towards increasing consumer attractiveness. Based on the results in the field, rice traders have begun to apply environmentally friendly rice packaging (without using plastic), namely in the form of paper materials.

3.3.3 Monte Carlo Analysis

Based on the Monte Carlo simulation, the ordination points are not scattered which states that the ordination is stable. it can be concluded that the result of the MDS analysis for the environmental dimension is in good condition.

3.4. Institutional Dimension

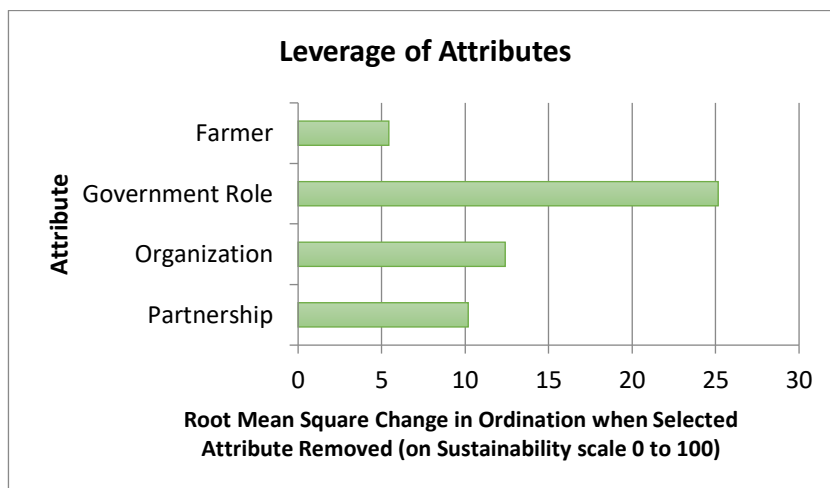


Figure 5. Results of Institutional Dimension Leverage Analysis

The sustainability of the institutional dimension is the ability of group integration in the procurement of rice commodities in carrying out institutional functions to facilitate business activities and information (Saragih *et al.* 2020). Institutional parameters are indicators of the availability of legal and institutional tools to encourage the sustainable use of Natural Resources (SDA) as well as the environment (Najmi *et al.* 2019). When it is viewed from the institutional aspect, Pasar Induk Cikurubuk's condition has an association and the person in charge of each block so that it can support information about rice commodities.

The measurement of the sustainability of the institutional dimension of rice commodity procurement used 4 measurement attributes, namely: (a) Farmers; (b) Government roles; (c) Organization; and (d) Partnership

3.4.1 RAPFISH Analysis

Based on the results of the RAPFISH analysis on the institutional dimension, it is known that the sustainability index value of the institutional dimension of rice commodity procurement is 74.85 which is in the range of values 50 - 75 and is in the "fairly sustainable" category. These results conclude that the institutional role still needs improvement in the future. RAPFISH analysis in the institutional dimension was carried out with iterations of 2 (two) times and resulted in a value ($R^2 = 0.88$) and the S-Stress value was 0.17 or 17%.

3.4.2 Sensitivity Analysis (Leverage)

A sensitivity analysis was conducted to see the most sensitive attributes influencing the sustainability of the institutional dimension of rice commodity procurement. From the results of the Leverage analysis, it is known that there is an attribute that most sensitively affects the sustainability of the institutional dimension, namely the role of the government, as presented in Figure 5 with a Root Mean Square (RMS) value of 25.15. From the research results, the government's contribution is less than optimal, such as incomplete database, and price control information. In line with research by Erkip *et al* (2014), it is stated that the role of the government for traditional market traders is still not optimal, such as the spatial arrangement and place to sell, the capacity of traders, the cleanliness of the market environment and the setting.

3.4.3 Monte Carlo Analysis

The analysis aimed at seeing the level of stability of the ordination analysis results was carried out by Monte Carlo analysis with 10 iterations. Based on the results of the Monte Carlo analysis, the ordination point is at one point which illustrates that the ordination is stable.

3.5. Technological Dimension

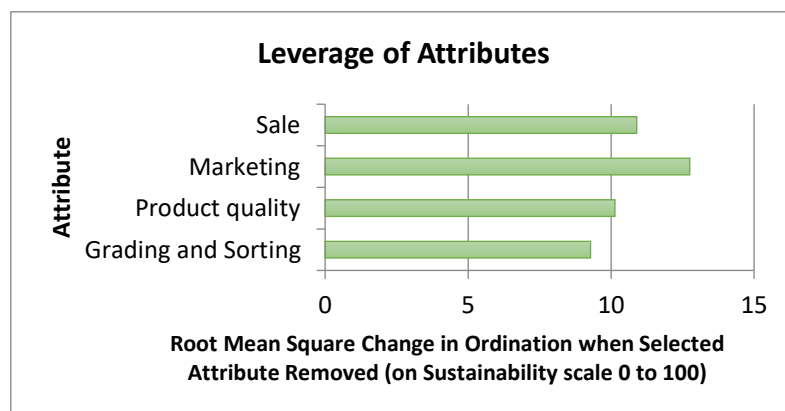


Figure 6. Results of the Technology Dimension Leverage Analysis

According to Saragih *et al.* (2020), the sustainability of the technological dimension is the use and adoption of technology in the procurement of rice commodities in Pasar Induk Cikurubuk. Suwanda *et al.* (2020) added that the technological aspect is an important requirement in achieving the efficiency of the rice commodity procurement business. If the technological aspects are available and fulfilled, it will support the sustainability of rice commodity procurement. This era of globalization cannot be separated from the role of technology. Likewise, the sales and marketing system of a product or service requires technology that is more effective and efficient. The measurement of the sustainability of the

technological dimension of rice commodity procurement uses 4 measurement attributes, namely: (a) Sales; (b) Marketing; (c) Product quality; and (d) Grading and sorting.

3.5.1 *RAPFISH Analysis*

The results of the RAPFISH analysis on the sustainability of the technology dimension resulted in an index value of 66.96 and fell into the "moderately sustainable" category. This also shows that the implementation of technology by traders in Pasar Induk Cikurubuk is still not optimal. RAPFISH analysis on the technological dimension was carried out with iterations of 2 (two) times, resulting in a value ($R^2 = 0.93$) and an S-Stress value of 0.17 or 17%.

3.5.2 *Sensitivity Analysis (Leverage)*

Leverage analysis is conducted to determine the key attributes or the most sensitive attributes in influencing the sustainability of the technological dimension of rice commodity procurement. From the 4 attributes analyzed, there is an attribute that most sensitively affects the sustainability of the technological dimension as presented in Figure 6, namely marketing with a Root Mean Square (RMS) value of 12.75.

During the pandemic, restrictions on activities and transactions have caused traders to implement a marketing system in various ways, such as utilizing social media to be able to market products. The current condition of rice commodity traders in Pasar Induk Cikurubuk Market has implemented a marketing system through social media, such as WhatsApp. Consumers simply order via cellphone and the trader will prepare the product according to the order. This system makes it easier for traders and buyers effectively and efficiently. In line with the results of research by Rachmawaty (2021), it is stated that currently, people are learning to understand the situation, do many activities from home, and adapt to shopping online. The role of social media as one of the tools used in the field of digital marketing is an important medium for increasing sales.

3.5.3 *Monte Carlo Analysis*

Monte Carlo analysis is intended to see the level of stability of the ordination analysis results carried out with 10 iterations. Based on the Monte Carlo simulation, the ordination points are not scattered which states that the ordination is stable and it can be concluded that the MDS analysis for the sustainability of the technology dimension is in good condition.

4. Conclusion

The level of sustainability of rice commodity procurement in a multidimensional by using the Multidimensional Scaling (MDS) method results in a sustainability index value of 76.80 which is included in the very sustainable category. Each dimension has a sustainability index value of the economic dimension of 74.92, the social dimension of 66.17, the environmental dimension of 71.45, institutional dimension of 74.85, and the technological dimension of 66.96. The five dimensions are in the index value of 50.01-75.00 with a fairly sustainable status category.

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