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Implementation of Additive Ratio Assessment Method in Decision Making on Fertilizer Supplier Selection at BBTPH Banyumas

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ABSTRACT

This study addresses the issue of fertilizer supplier selection at BBTPH Banyumas by introducing a decision support system (DSS). Inadequate performance of fertilizer suppliers can impact crop yield and quality. Thus, it's crucial to select the most suitable suppliers. The Additive Ratio Assessment (ARAS) method, which ranks alternatives based on specific criteria, is employed. Criteria include quality, price, service, delivery, product, and warranty. Data from BBTPH Banyumas is processed using ARAS, comprising steps like criteria identification, weighting, alternative determination, evaluation, scoring, and solution suggestion. The results identify Supplier A as the best choice, with an ARAS value of 0.421, excelling in price, quality, and reputation. This research aids BBTPH Banyumas in informed supplier selection, showcasing the efficacy of ARAS in decision-making processes. The ARAS method offers objectivity backed by data, making it a viable tool for organizations with similar challenges.

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1. INTRODUCTION

Information technology that continues to evolve has had a significant impact on various aspects of business, including supply chain management and supplier selection. In the context of BBTPH Banyumas, the selection of the right fertilizer supplier is very important to ensure the quality of crops, efficiency, and quality of horticultural commodities.

With the existence of a decision support system, it is expected to be provided information that can provide alternative solutions to the problems being faced [1]. Several previous studies have shown the importance of DSS in various fields. For example, research conducted by Djasmayena et al. (2019) used the Multi Attribute Utility Theory method for drug supplier selection at pharmacies, which succeeded in increasing the efficiency and effectiveness of the supplier selection process [2]. Then, research by Tirkolaee et al. (2020) applied the Fuzzy method to optimize a sustainable multi-level multi-product supply chain and transportation network to distribute perishable products [3]. Furthermore, Jiskani et al. (2021) developed DSS with fuzzy methods to analyze challenges and pathways to promote climate-smart and green mining [4]. Meanwhile, research by Sztubecka et al. (2020) uses a multi-criteria method to help improve the energy efficiency of municipal buildings by identifying potential locations for increased energy efficiency and investing in renewable energy sources [5]. Finally, research by Turker et al. (2020) applies a decision support system for scheduling dynamic job shops [6]. In this study, the method used was the Additive Ratio Assessment (ARAS) method.

The ARAS method is one of the methods used in DSS for alternative ranking based on specified criteria. The ARAS method has also been used in recent research. For example, research by Muttakin et

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al. (2022) applied the ARAS method with the results of the study successfully evaluating and recommending the best feature selection method for psychosocial education data using the teacher psychosocial risk level dataset [7]. Meanwhile, a study by Sihombing et al. (2021) using the ARAS method for course branch selection shows that the Additive Ratio Assessment (ARAS) method is very suitable for use in decision support in choosing a new branch location of Murni Sadar English Course [8]. In research by Maulana et al. (2019), the ARAS method was used for the determination of savings and loan credits [9]. Furthermore, research by Artika et al. (2019) uses the Additive Ratio Assessment Method for Selection of Prospective Warehouse Staff [10]. Meanwhile, research by Hummairoh et al. (2022) with the ARAS method with results can help the selection of the best environmental head in SudirejoI Village. While this research uses a decision support system with the [11]Additive Ratio Assessment (ARAS) method used for the selection of fertilizer suppliers at BBTPH Banyumas.

A fertilizer supplier is a company or individual that produces and/or distributes fertilizer for sale to farmers or agricultural companies. Based on regulations from the Central Java Provincial Government, namely Central Java Governor Regulation No. 26 of 2018 concerning the Organization and Work Procedures of Technical Implementation Units at the Agriculture and Plantation Service, there are 7 Service Technical Implementation Units (UPTD) that have been formed. One of them is the Food Crops and Horticulture Seed Center (BBTPH) Banyumas Region. BBTPH Banyumas Region is responsible for managing 11 Seed Gardens owned by the Agriculture and Plantation Office of Central Java Province. The eleven seed gardens are spread across several districts in the former Banyumas and Pekalongan residencies. The 11 Seed Gardens consist of 5 Rice Seed Gardens, 2 Palawija Seed Gardens and 4 Horticultural Seed Gardens. To meet fertilizer needs, BBTPH Banyumas Area still has problems in determining suppliers.

The selection of fertilizer suppliers at BBTPH Banyumas experienced problems related to the quality of supplier performance that did not meet the standards. Previously, supplier selection was only based on intuition or relationship relationships, without using the right methods and criteria. This is less effective because it can cause discrepancies in the amount of fertilizer ordered, inappropriate product quality, and delays in delivery.

BBTPH Banyumas has also experienced problems with late delivery of fertilizers by suppliers which disrupted the company's operational activities and resulted in late delivery of goods to horticultural commodities. If this continues, it will cause losses for commodities both in terms of time, cost, energy. This has an impact on crop yields, efficiency, and quality of horticultural commodities. In addition, supplier selection still takes a long time because it has not been done computerized. If the supplier selection process can be done computerized, then the time required can be shorter and more efficient. To overcome these problems, the solution offered is the use of the ARAS method in SPK for ranking alternative suppliers based on specified criteria, such as quality, price, service, delivery, product, and warranty. With the use of this method, it is expected that supplier selection can be done more effectively and efficiently.

The perceived benefits of this research include more objective decisions supported by clear data, and ARAS methods can be adopted by other organizations to address similar problems. By using the ARAS method in SPK, BBTPH Banyumas can choose fertilizer suppliers that suit their needs and preferences, thereby improving the quality of crops, efficiency, and quality of horticultural commodities.

Based on the background provided, the difference between this study and previous research is the focus on the use of the Additive Ratio Assessment (ARAS) method. Previous research mentioned used various methods such as Multi-Attribute Utility Theory, Fuzzy method, and other multi-criteria methods in various contexts, such as drug supplier selection, multi-level supply chains, climate-smart and green mining, building energy efficiency, and job-shop scheduling. However, this study specifically applies the ARAS method in the context of fertilizer supplier selection.

The novelty offered by this study is the application of the ARAS method in the Decision Support System for the selection of fertilizer suppliers at BBTPH Banyumas. In this context, the ARAS method is expected to help BBTPH Banyumas in overcoming the problems faced, such as unclarity in determining supplier selection criteria, inefficiencies in the decision-making process, and fluctuations in fertilizer availability and prices. By using the ARAS method, it is hoped that the selection of fertilizer suppliers can be carried out more objectively, effectively, and efficiently, and supported by clear data.

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In addition, another benefit offered by this study is the possibility of adoption of ARAS methods in Decision Support Systems by other organizations facing similar problems in supplier selection. Thus, this research can contribute to the development of better and more efficient supplier selection methods and practices in various industrial sectors.

2. RESEARCH METHOD

2.1 Research Stages

Research methodology is a set of procedures used by researchers in the collection, analysis, and interpretation of data. This method is usually used to answer a research question or hypothesis and provide a clear and systematic framework for research.

In this research for the development of decision support systems carried out using several stages of research which can be seen in Figure 1.

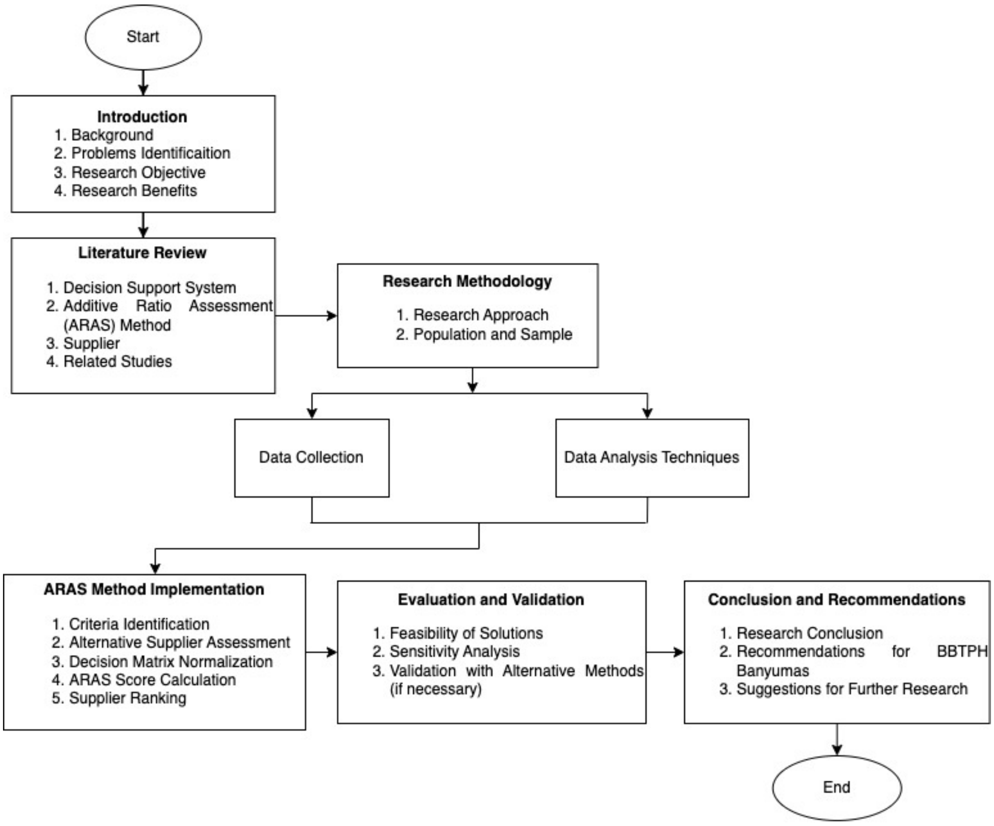

Figure 1. Stages of Research

From figure 1. There are several stages carried out, namely "Introduction, Literature review, Research Methodology, Data Collection and Data Analysis techniques, ARAS Method Implementation, Evaluation and Validation, Conclusion and recomendations. The explanation of the activities carried out is as follows:

1. Introduction
   The background of this research is to overcome problems in the selection of fertilizer suppliers at BBTPH Banyumas. Problem identification is done by analyzing the performance of existing suppliers and evaluating the criteria used in supplier selection. The purpose of this study is to develop a decision support system that can help in choosing the best fertilizer supplier. The benefit of this research is that it can increase efficiency and effectiveness in the selection of fertilizer suppliers.
2. Literature Review
   In this study, a decision support system based on the Additive Ratio Assessment (ARAS) method will be used. This method was chosen because it can provide objective alternative ranking based

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on predetermined criteria. In addition, this research will involve suppliers as research subjects. Therefore, previous research involving suppliers will be used as related studies.

3. Research Methodology
   This study uses a quantitative approach with the population of fertilizer suppliers at BBTPH Banyumas. Samples were taken using purposive sampling techniques.
4. Data Collection
   Data will be collected through observation, interviews, and document studies. The data collected includes supplier selection criteria, supplier performance, and related information.
5. Data Analysis Techniques
   The data that has been collected will be analyzed using the ARAS method. This method will identify the most important criteria in supplier selection, assess alternative suppliers, normalize decision matrices, calculate ARAS scores, and rank suppliers.
6. Implementation of the ARAS Method
   The ARAS method will be implemented by identifying supplier selection criteria that are relevant to the needs of BBTPH Banyumas. Furthermore, an assessment of alternative suppliers will be carried out based on predetermined criteria. The decision matrix will be normalized to avoid bias in judgment. Using ARAS score calculations, alternative suppliers will be ranked from best to worst.
7. Evaluation and Validation
   The feasibility of the solution provided will be evaluated by considering the sensitivity of the analysis to changes in the weight of criteria and supplier alternatives. In addition, validation with alternative methods will also be carried out if needed.
8. Conclusions and Recommendations
   Based on the results of the study, it can be concluded that the ARAS method can be used to choose the best fertilizer supplier. The recommendation for BBTPH Banyumas is to implement a decision support system that has been developed in the selection of fertilizer suppliers. The suggestion for future research is to consider other factors that may affect the selection of fertilizer suppliers.

2.2 Decision Support System

Decision Support Systems are developed to assist decision makers in dealing with situations where there are several potential solutions to a problem and none of them is objectively better than the other; The selection of alternatives is based on the preferences of the decision maker (subjective) [12]. In general, decision support systems are differentiated into active and passive models. Where the passive model collects information and organizes it in an effective way and does not give any suggestions or decisions from the information collected [13].

The application of decision support systems includes Assessing and Prioritizing Sustainable Urban Transportation [14], to identify prescriptions with a high risk of medication error [15] and many other studies.

2.3 ARAS Method Process

The ARAS (Additive Ratio Assessment) method is a multi-criteria decision-making method based on ranking using the degree of usefulness by comparing the overall index value of each alternative with the overall index value of the optimal alternative [16]. The ARAS method has the following calculation steps:

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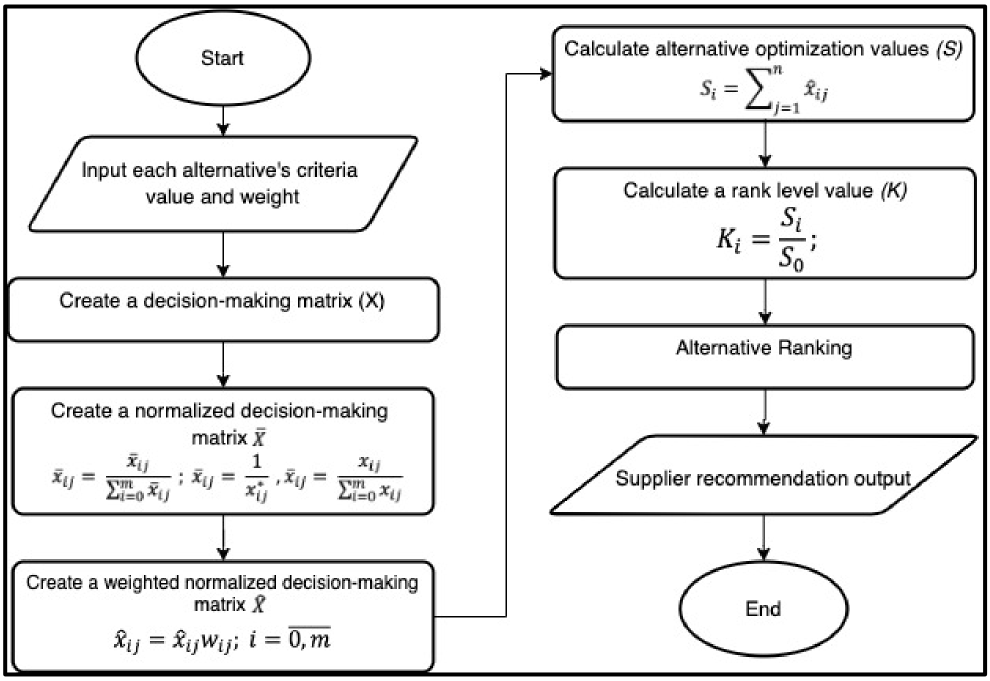

Figure 2. Stages of the ARAS Method

3. RESULTS AND DISCUSSION

3.1 Input Each Alternative's Criteria Value and Weight

After the data collection stage is carried out, the data will be displayed in Table 1 and Table 2.

Table 1. Criteria Data

No	Criteria	Weight	Type
1	C1	0,25	Benefit
2	C2	0,15	Cost
3	C3	0,15	Benefit
4	C4	0,1	Cost
5	C5	0,1	Benefit
6	C6	0,15	Cost
7	C7	0,1	Benefit

In Table 1. the criteria refer to C1 = Quality, C2 = Price, C3 = Product Availability, C4 = Delivery Time, C5 = Customer Service, C6 = Safety in Use and C7 = Reputation in Supplier Experience. In Table 1. is data whose criteria are used as indicators of assessment of suppliers. The supplier data is shown in Table 2.

Table 2. Supplier Data

Supp	C1	C2	C3	C4	C5	C6	C7
A	4	3	5	1	4	1	4
B	4	4	3	2	4	3	3
……	……	……	……	……	……	……	……
P	4	2	3	4	2	4	1
Q	4	3	1	1	5	1	5

Data in Table 2. based on a predetermined rating scale, where Product Quality has a rating scale in the form of very good = 5, good = 4, good enough = 3, bad = 2, very bad = 1. Very expensive price = 5, expensive = 4, medium = 3, cheap = 2, very cheap = 1. Product availability highly available = 5, available = 4, limited = 3, hard to obtain = 2, not available = 1. Very fast delivery time=1, fast=2, fast time=3, late=4, very late=5. Customer service, highly responsive=5, responsive=4, moderately responsive=3,

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less responsive=2, very less responsive=1. Safety in use, very safe = 1, safe = 2, medium = 3, less safe = 4, very less safe = 5. The reputation and experience of the supplier is very good=5, good=4, quite good=3, bad=2, very bad=1.

3.2 Create a Decision Making Matrix (x)

The creation of matrix (x) is based on tahapan Input Each Alternative's Criteria Value and Weight.

$$x_{ij} = \begin{bmatrix} 4 & 3 & 5 & 1 & 4 & 1 & 4 \\ 4 & 4 & 3 & 2 & 4 & 3 & 3 \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ 4 & 2 & 3 & 4 & 2 & 4 & 1 \\ 4 & 3 & 1 & 1 & 4 & 1 & 5 \\ 57 & 48 & 53 & 40 & 62 & 40 & 58 \end{bmatrix}$$

After making the decision matrix, then a normalization process will be carried out on the decision matrix.

3.3 Create Normalized Decision Making Matrix (x)

At this stage, each value on the matrix will be normalized so that the results will be used for making matrix D. Based on Table 1, that criteria C1, C3, C5 and C7 are Benefit categories so they are processed using the formula (4).

$r01 = 4/57 = 0{,}070$ $\quad r61 = 4/57 = 0{,}070$ $\quad r121 = 3/57 = 0{,}053$
$r11 = 4/57 = 0{,}070$ $\quad r71 = 3/57 = 0{,}053$ $\quad r131 = 4/57 = 0{,}070$
$r21 = 3/57 = 0{,}053$ $\quad r83 = 4/57 = 0{,}070$ $\quad r141 = 3/57 = 0{,}053$
$r31 = 4/57 = 0{,}070$ $\quad r91 = 4/57 = 0{,}070$ $\quad r151 = 4/57 = 0{,}070$
$r41 = 3/57 = 0{,}053$ $\quad r101 = 1/57 = 0{,}018$ $\quad r161 = 4/57 = 0{,}070$
$r53 = 1/57 = 0{,}018$ $\quad r111 = 4/57 = 0{,}070$

For criteria C3, C5 and C7 also carried out the normalization process in the same way. Furthermore, a process will be carried out for the criteria categorized as Cost, namely C2, C4 and C6 are Cost categories so they are processed using formulas (5) and (6).

Stage 1

$r02 = 1/3 = 0{,}333$ $\quad r62 = 1/2 = 0{,}500$ $\quad r122 = 1/3 = 0{,}333$
$r12 = 1/4 = 0{,}250$ $\quad r72 = 1/4 = 0{,}250$ $\quad r132 = 1/2 = 0{,}500$
$r22 = 1/3 = 0{,}333$ $\quad r82 = 1/3 = 0{,}333$ $\quad r142 = 1/2 = 0{,}500$
$r32 = 1/3 = 0{,}333$ $\quad r92 = 1/3 = 0{,}333$ $\quad r152 = 1/2 = 0{,}500$
$r42 = 1/3 = 0{,}333$ $\quad r102 = 1/1 = 1{,}000$ $\quad r162 = 1/3 = 0{,}333$
$r52 = 1/3 = 0{,}333$ $\quad r112 = 1/4 = 0{,}250$

Stage 2

$r02 = 0{,}333/6{,}750 = 0{,}049$ $\quad r62 = 0{,}500/6{,}750 = 0{,}074$ $\quad 122 = 0{,}333/6{,}750 = 0{,}049$
$r12 = 0{,}250/6{,}750 = 0{,}037$ $\quad r72 = 0{,}250/6{,}750 = 0{,}037$ $\quad r132 = 0{,}500/6{,}750 = 0{,}074$
$r22 = 0{,}333/6{,}750 = 0{,}049$ $\quad r82 = 0{,}333/6{,}750 = 0{,}049$ $\quad r142 = 0{,}500/6{,}750 = 0{,}074$
$r32 = 0{,}333/6{,}750 = 0{,}049$ $\quad r92 = 0{,}333/6{,}750 = 0{,}049$ $\quad r152 = 0{,}500/6{,}750 = 0{,}074$
$r42 = 0{,}333/6{,}750 = 0{,}049$ $\quad r102 = 1{,}000/6{,}750 = 0{,}148$ $\quad r162 = 0{,}333/6{,}750 = 0{,}049$
$r52 = 0{,}333/6{,}750 = 0{,}049$ $\quad r112 = 0{,}250/6{,}750 = 0{,}037$

In Criteria C4 and C6 the same calculation process is also carried out. Furthermore, the results of the normalization of all criteria will be shown in matrix form

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$$x^* \begin{bmatrix} 0{,}070 & 0{,}074 & 0{,}094 & 0{,}100 & 0{,}065 & 0{,}086 & 0{,}069 \\ 0{,}070 & 0{,}055 & 0{,}057 & 0{,}050 & 0{,}065 & 0{,}029 & 0{,}052 \\ 0{,}053 & 0{,}044 & 0{,}019 & 0{,}025 & 0{,}032 & 0{,}017 & 0{,}017 \\ 0{,}070 & 0{,}074 & 0{,}094 & 0{,}100 & 0{,}065 & 0{,}018 & 0{,}086 \\ 0{,}053 & 0{,}044 & 0{,}094 & 0{,}050 & 0{,}065 & 0{,}086 & 0{,}069 \\ 0{,}018 & 0{,}074 & 0{,}019 & 0{,}025 & 0{,}048 & 0{,}017 & 0{,}034 \\ 0{,}070 & 0{,}044 & 0{,}094 & 0{,}100 & 0{,}081 & 0{,}086 & 0{,}086 \\ 0{,}053 & 0{,}055 & 0{,}057 & 0{,}025 & 0{,}032 & 0{,}021 & 0{,}052 \\ 0{,}070 & 0{,}074 & 0{,}019 & 0{,}050 & 0{,}065 & 0{,}086 & 0{,}086 \\ 0{,}070 & 0{,}074 & 0{,}094 & 0{,}100 & 0{,}065 & 0{,}086 & 0{,}052 \\ 0{,}018 & 0{,}044 & 0{,}019 & 0{,}025 & 0{,}081 & 0{,}017 & 0{,}017 \\ 0{,}070 & 0{,}055 & 0{,}094 & 0{,}050 & 0{,}065 & 0{,}086 & 0{,}086 \\ 0{,}053 & 0{,}074 & 0{,}057 & 0{,}025 & 0{,}032 & 0{,}017 & 0{,}052 \\ 0{,}070 & 0{,}044 & 0{,}019 & 0{,}100 & 0{,}081 & 0{,}086 & 0{,}069 \\ 0{,}053 & 0{,}055 & 0{,}094 & 0{,}050 & 0{,}048 & 0{,}086 & 0{,}069 \\ 0{,}070 & 0{,}044 & 0{,}057 & 0{,}025 & 0{,}032 & 0{,}021 & 0{,}017 \\ 0{,}070 & 0{,}074 & 0{,}019 & 0{,}100 & 0{,}081 & 0{,}086 & 0{,}086 \end{bmatrix}$$

3.4 Create A Weight Normalized Decision Making Matrix (x)

Based on equation 7, the normalized matrix weight is determined as follows:

$D_{01} = 0{,}070 * 0{,}25 = 0{,}018$
$D_{11} = 0{,}070 * 0{,}25 = 0{,}018$
$D_{21} = 0{,}053 * 0{,}25 = 0{,}013$
$D_{31} = 0{,}070 * 0{,}25 = 0{,}018$
$D_{41} = 0{,}053 * 0{,}25 = 0{,}013$
$D_{51} = 0{,}018 * 0{,}25 = 0{,}004$
$D_{61} = 0{,}070 * 0{,}25 = 0{,}018$
$D_{71} = 0{,}053 * 0{,}25 = 0{,}013$
$D_{81} = 0{,}070 * 0{,}25 = 0{,}018$
$D_{91} = 0{,}070 * 0{,}25 = 0{,}018$
$D_{101} = 0{,}018 * 0{,}25 = 0{,}004$
$D_{111} = 0{,}070 * 0{,}25 = 0{,}018$
$D_{121} = 0{,}053 * 0{,}25 = 0{,}013$
$D_{131} = 0{,}070 * 0{,}25 = 0{,}018$
$D_{141} = 0{,}053 * 0{,}25 = 0{,}013$
$D_{151} = 0{,}070 * 0{,}25 = 0{,}018$
$D_{161} = 0{,}070 * 0{,}25 = 0{,}018$

As for the calculation of D02, D03, D04, D05, D06 and D07 the process is the same as D01, From the calculation of normalized results against the weight of the above criteria can be the following matrix results:

$$D \begin{bmatrix} 0{,}018 & 0{,}007 & 0{,}014 & 0{,}010 & 0{,}013 & 0{,}004 & 0{,}007 \\ 0{,}018 & 0{,}006 & 0{,}008 & 0{,}005 & 0{,}013 & 0{,}001 & 0{,}005 \\ 0{,}013 & 0{,}007 & 0{,}003 & 0{,}003 & 0{,}006 & 0{,}001 & 0{,}002 \\ 0{,}018 & 0{,}007 & 0{,}014 & 0{,}010 & 0{,}013 & 0{,}003 & 0{,}009 \\ 0{,}013 & 0{,}007 & 0{,}014 & 0{,}005 & 0{,}013 & 0{,}004 & 0{,}007 \\ 0{,}004 & 0{,}007 & 0{,}003 & 0{,}003 & 0{,}010 & 0{,}001 & 0{,}003 \\ 0{,}018 & 0{,}011 & 0{,}014 & 0{,}010 & 0{,}016 & 0{,}004 & 0{,}009 \\ 0{,}013 & 0{,}006 & 0{,}008 & 0{,}003 & 0{,}006 & 0{,}001 & 0{,}005 \\ 0{,}018 & 0{,}007 & 0{,}003 & 0{,}005 & 0{,}013 & 0{,}004 & 0{,}009 \\ 0{,}018 & 0{,}007 & 0{,}014 & 0{,}010 & 0{,}013 & 0{,}004 & 0{,}005 \\ 0{,}004 & 0{,}022 & 0{,}003 & 0{,}003 & 0{,}016 & 0{,}001 & 0{,}002 \\ 0{,}018 & 0{,}006 & 0{,}014 & 0{,}005 & 0{,}013 & 0{,}004 & 0{,}009 \\ 0{,}013 & 0{,}007 & 0{,}008 & 0{,}003 & 0{,}006 & 0{,}001 & 0{,}005 \\ 0{,}018 & 0{,}011 & 0{,}003 & 0{,}010 & 0{,}016 & 0{,}004 & 0{,}007 \\ 0{,}013 & 0{,}011 & 0{,}014 & 0{,}005 & 0{,}010 & 0{,}004 & 0{,}007 \\ 0{,}018 & 0{,}011 & 0{,}008 & 0{,}003 & 0{,}006 & 0{,}002 & 0{,}002 \\ 0{,}018 & 0{,}007 & 0{,}003 & 0{,}010 & 0{,}016 & 0{,}009 & 0{,}009 \end{bmatrix}$$

3.5 Calculate Alternative Optimization Values (Si)

Based on equation 8, Si can be calculated by adding up each row in the alternative so that the following results are obtained:

$S_1 = 0{,}075$
$S_2 = 0{,}052$
$S_3 = 0{,}033$
$S_4 = 0{,}077$
$S_5 = 0{,}066$
$S_6 = 0{,}038$
$S_7 = 0{,}082$
$S_8 = 0{,}041$
$S_9 = 0{,}061$
$S_{10} = 0{,}074$
$S_{11} = 0{,}044$
$S_{12} = 0{,}070$
$S_{13} = 0{,}043$
$S_{14} = 0{,}069$
$S_{15} = 0{,}068$
$S_{16} = 0{,}048$
$S_{17} = 0{,}067$

After summing the value of each alternative, the maximum value of optimization (Si) is 0.082.

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3.6 Calculate A Rank Level Value (k)

Based on equation 9, we can set the value of Ki as follows:

$k_1 = 0{,}075/0{,}082 = 0{,}914$
$k_2 = 0{,}052/0{,}082 = 0{,}638$
$k_3 = 0{,}033/0{,}082 = 0{,}406$
$k_4 = 0{,}077/0{,}082 = 0{,}935$
$k_5 = 0{,}066/0{,}082 = 0{,}800$
$k_6 = 0{,}038/0{,}082 = 0{,}340$
$k_7 = 0{,}082/0{,}082 = 1{,}000$
$k_8 = 0{,}041/0{,}082 = 0{,}502$
$k_9 = 0{,}061/0{,}082 = 0{,}737$
$k_{10} = 0{,}074/0{,}082 = 0{,}894$
$k_{11} = 0{,}044/0{,}082 = 0{,}538$
$k_{12} = 0{,}070/0{,}082 = 0{,}852$
$k_{13} = 0{,}043/0{,}082 = 0{,}524$
$k_{14} = 0{,}069/0{,}082 = 0{,}842$
$k_{15} = 0{,}068/0{,}082 = 0{,}826$
$k_{16} = 0{,}048/0{,}082 = 0{,}581$
$k_{17} = 0{,}067/0{,}082 = 0{,}818$

At the stage of calculating a rank level value (k), a multiplication process is carried out between the sum results of each criterion from alternatives and then division with optimization results.

3.7 Alternative Ranking

After the multiplication results are obtained in the previous result, then the ranking process is carried out on alternatives by sorting the highest value to the lowest value.

Table 3. ARAS Ranking Results

Alternative	Value of Ki	Level	Alternative	Value of Ki	Level
Supplier G	1,000	1	Supplier I	0,737	10
Supplier D	0,935	2	Supplier B	0,638	11
Supplier A	0,914	3	Supplier O	0,581	12
Supplier J	0,894	4	Supplier K	0,538	13
Supplier L	0,852	5	Supplier M	0,524	14
Supplier N	0,842	6	Supplier H	0,502	15
Supplier O	0,826	7	Supplier C	0,406	16
Supplier Q	0,818	8	Supplier F	0,340	17
Supplier E	0,800	9			

After obtaining the ranking results, the process of selecting fertilizer supplier recommendations will be carried out.

3.8 Supplier Recommendation Output

Based on the recommendations from the final results of the ARAS method, it was found that Supplier G was recommended as a fertilizer supplier with a value of Ki 1.00.

3.9 System Implementation Results

Furthermore, the data of 17 suppliers obtained will be tested by inputting values into the system that has been built, with the results shown in Figure 3.

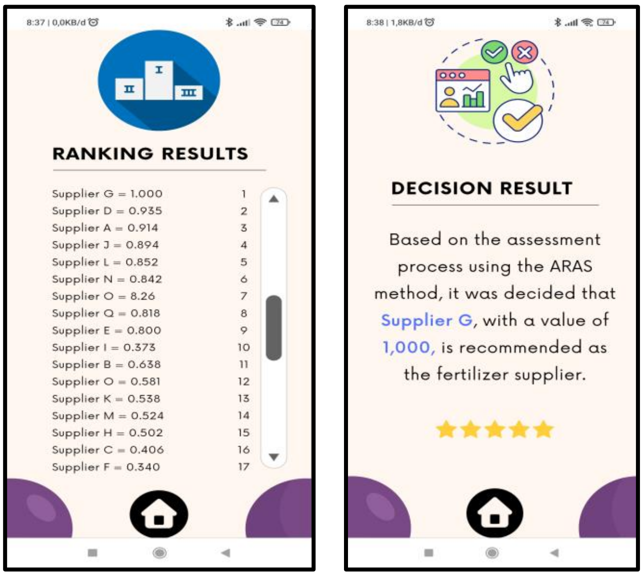

Figure 3. System Ranking and Decision Results

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In Figure 3. The ranking results of the system are shown in the form of first to last ranks, which are sorted based on the value obtained by each supplier. Furthermore, from the ranking, recommendations will be made based on the highest value, namely Supplier G with a value of 1,000.

4. CONCLUSION

Based on the core problem of the study, namely, the quality of fertilizer supplier performance that is less in meeting standards can have a direct effect on crop yields, affect the level of efficiency, and decrease the quality of horticultural commodities. This problem can be overcome using a decision support system with the ARAS method, this is evidenced by the results of processing 17 supplier data, a recommendation decision is obtained, namely supplier D with a value of 1,000, where the value possessed by Supplier G is in the form of "Good" Quality, "Cheap" Price, "Very Available" Product Availability, "Very Fast" Delivery Time, "Very Responsive" Customer Service, Security in Use " Very Safe", Reputation in "Excellent" Supplier Experience.

Based on tests carried out by inputting the value of criteria owned by each supplier get the same value, ranking and decision results. So that the decision support system built can be used as a solution in recommending fertilizer suppliers at BBTPH Banyumas.

Based on the conclusions that have been drawn from the research conducted on the quality of fertilizer supplier performance, it can be recommended to conduct further research with a focus on developing a decision support system using the ARAS method which is more complex and able to accommodate more criteria and sub-criteria. By conducting further research that is more in-depth and comprehensive, it is expected to provide better solutions in solving the problems faced by BBTPH Banyumas in choosing quality fertilizer suppliers and meeting standards.

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