Performance Evaluation of Coffee Raw Material Suppliers Using the Analytical Hierarchy Process (AHP) Method at Badbear Coffee Shop

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Abstract. This study aims to evaluate the performance of coffee raw material suppliers at Coffee Shop BadBear. This research was conducted using the Analytical Hierachy Process (AHP) method by involving expert judgment who is the operational manager, barista and a purchasing employee at Coffee Shop BadBear. Then data collection was obtained using a questionnaire filled out by expert judges at Coffee Shop BadBear. Then obtained the results of the assessment of quality criteria with a priority weight of 45%, 26% service criteria. Taste 17%, price 7% and delivery with a priority weight of 5% of the assessment results. The order of assessment of suppliers, namely Tatido with a value of 8.077, Hear with a value of 6.631, Sreg with a value of 1.791, Coffee Moi with a value of 1.501. It is concluded that Hear and Tatido are in the top position, must continue to maintain and optimize their performance on each criterion and sub-criteria, especially in several criteria and sub-criteria that are less than optimal. Coffee Moi and Sreg, as the two suppliers with the lowest ratings are expected to improve their performance based on all the criteria and sub-criteria evaluated in order to compete as suppliers of coffee raw materials.

Keywords: Analytical Hierarchy Process, Coffee Shop and Supplier.

1 Introduction

The coffee industry in Indonesia has experienced significant growth due to the high interest of the public, especially the millennial generation, in processed coffee products. In the face of growing demand, many entrepreneurs are interested in starting a coffee shop business. Changes in people's lifestyles have made processed coffee products a daily necessity. With these developments, Indonesia has experienced a shift in role from a coffee producer to a coffee consuming country. Data from the Global Agricultural Information Network proves that the utilization rate of domestic coffee consumption in the 2019/2020 period reached 294,000 tons, an increase of around 13.9% compared to the previous period, which was 258,000 tons in 2018/2019. This indicates that the Indonesian people's interest in coffee is increasing, creating a large market potential for coffee products in the country [1].

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In the face of rapid market development, every company, including Coffee Shop such as BadBear in Batam City, is required to compete globally, BadBear Coffee Shop itself can order from suppliers 15-20 kg of coffee beans per month due to high consumer interest in coffee. This competition poses its own challenges, where companies must fulfill various consumer desires, ranging from taste, price, quality, to service, to maintain good performance. Supplier selection is one of the key factors that support company performance.

Supplier selection plays a crucial role in supporting supply chain efficiency and ensuring product quality. However, a common challenge is that not all suppliers can fulfill all the criteria set by the company. BadBear, as a coffee shop in Batam City, has a significant appeal among the public because of its good service, comfortable environment, and quality of coffee that is the main highlight. The selection of good suppliers in the management of coffee shops has a direct impact on product quality, taste image, and the creation of customer loyalty value. Often, coffee shops do not have a standardized value of their coffee, so the selection of coffee supplier criteria is crucial to create a product advantage over competitors. The supplier's expertise in the divesification of coffee bean raw materials directly affects the quality, aroma, and taste of the coffee served. Supplier-related decision-making can be improved with the use of the Analytical Hierarchy Process (AHP) method. AHP, which was developed by Thomas L. When in the 70s, is a useful tool in the decision-making process. AHP helps solve complex problems by compiling a hierarchy of criteria and prioritizing based on a structured and reasonable process [2]. Therefore, this research has the title "Evaluation of Coffee Raw Material Supplier Performance Using the Analytical Hierarchy Process (AHP) Method".

2 Literature Review

2.1 Analytic Hierarchy Process Method

The Analytic Hierarchy Process (AHP) method was developed by Prof. Thomas L. Saaty in 1978 through the Wharton School to determine the priority stages of alternatives in solving a problem. In activities, we are often given situations where we have to choose between various alternatives. AHP helps in setting priorities and testing the consistency of the choices that have been made.

2.1 Supplier Performance

Supplier performance is an important factor in the supply chain because it plays a strategic role for companies in competing with other companies. This affects customer satisfaction and helps improve and maintain the company's service level in meeting customer demand [3].

In [4] with the title Analytical Hierarchy Process (AHP) application in supplier selection at the humbang cooperative ksu pom saw that Gani Silaban was recognized as a very potential coffee grain supplier, with a weight of 0.2194. Furthermore, in the selection of coffee green bean suppliers, quality also stands out as a key criterion with a weight of 0.54. The sub-criterion that is the focus in evaluating coffee green bean suppliers is greenbean conformity to specifications, with a weight of 0.4381. As a result, the most potential coffee greenbean supplier is Toke MS. This result reflects the prioritization of quality and conformity to specifications as the main factors in selecting coffee bean suppliers.

In [2], Sodiqin, Komarudin's research (2020) with the title Application of the Analytical Hierarchy Process Method to CCTV Brand selection, customer interviews revealed that Honeywell was the top choice of consumers in the CCTV camera category, dominating with a percentage value of 34.24%. Another brand that is quite attractive is Schneider with a weight of 27.81%, followed by Samsung which gets a weight of 17.18%. Meanwhile, Glenz and Hikvision obtained weighted values of 10.84% and 9.94% respectively, occupying a lower position in consumer preferences [2].

In the research of [5] with the title Selecting Green Supplier for Perishable Raw Materials using AHP Method at Nunia Boutique Villa Seminyak has the aim of selecting environmentally friendly suppliers for perishable raw materials at Nunia Boutique Villa Seminyak, the criteria taken into consideration include Quality, Cost (Price), Delivery, Flexibility, Responsiveness, and Environmental Management. After processing the criteria elements, the weighted results are obtained.

In the research of [6] with the title Decision Support System with Analytical Hierarchy Process (AHP) Method (Case Study: Determination of Internet Service Providers in the Home Network Environment) with the best ISP results that appear is Indi Home, considered the most ideal for use on wireless networks in the home environment area.

3 Research Methods

This research was conducted at BadBear Coffee Shop. The objects in this study are an operational manager, Barista and the supplier section, these objects were chosen based on their competence in assessing the criteria for evaluating supplier performance [7]. The variables used in analyzing this research were carried out using the Analytical Hierarchy Process method which consists of Price, quality, delivery, taste, service. The type of data processed is quantitative data. Data sources and data collection techniques in this study are questionnaires or questionnaires. Furthermore, the power processing techniques carried out in this study can be seen in Figure 1.

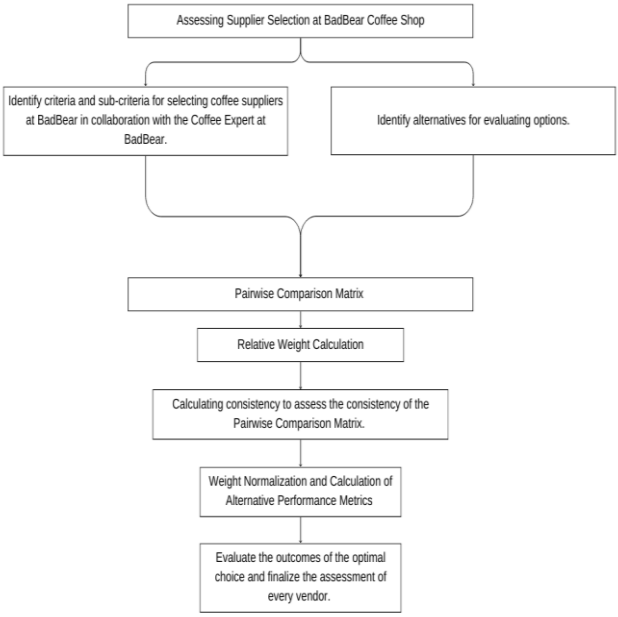

Fig. 1. Stages of Data Processing.

3.1 Analytical Hierarchy Process (AHP)

In completing data analysis using AHP, there are several steps that must be taken, namely as follows [8]

Decomposition. After defining the problem, the next step is to carry out the decomposition process, which is a process carried out to break the problem into small parts. This is done to obtain the appropriate criteria, then the part must be broken until the part cannot be broken down again. The result of the solution will then describe several levels of the problem. So, this process is then known as a hierarchy.

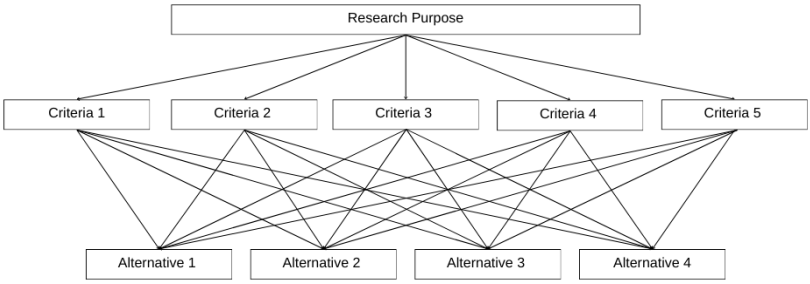

Fig. 2. Hierarchical Structure.
(Source: [8])

Comparative Judgement. This section focuses on assigning weights between two elements of importance contained within a certain level or levels that are at the same time related to the level above. This assessment is at the core of the AHP analysis, as it will affect the priority of each element. Then, a representation of the pairwise comparison matrix will be drawn based on the assessment results.

Table 1. Pairwise Comparison Matrix.

	A1	A2	A3
A1	1		
A2		1	
A3			1

(Source: [8])

Synthesis of Priority. After creating the pairwise comparison matrix, the eigenvector value can be determined to determine the local priority. Since the pairwise comparison matrix exists at each level, the global priority can be determined by synthesizing the local priorities. The synthesis procedure will differ depending on the hierarchy. The ranking of elements based on relative importance using this synthesis procedure is referred to as priority setting.

Measuring Consistency. Before determining the decision, it is necessary to assess how good the consistency of the existing decision is. To do this, there are several things that need to be done, namely as follows:

a. Multiply each value in the first column by the relative priority of the first element, then multiply the value in the second column by the relative priority of the second element, and so on.
b. Next, add up each row in the table.
c. Then the result of the sum is divided by the corresponding relative priority element.
d. After that, it sums the quotient with the number of elements present. The result of this sum is known as λ_{maks}.
e. Calculating Consistency Index (CI)

$$Ci = \frac{\lambda_{maks} - n}{n-1} \quad (1)$$

Where n = number of elements

f. Calculating the Consistency Ratio (CR)

$$CR = CI/IR \quad (2)$$

4 Results and Discussion

4.1 Determine Criteria and Subcriteria

The criteria and sub-criteria obtained were obtained from expert judgment and supported by several previous studies, Price criteria are an important factor in product marketing competition. Price plays a key role in influencing consumer decisions to buy a product [9]. Then the quality criteria which are dynamic criteria and are connected to various aspects, including products, human labor, processes and tasks, and the environment [10]. Delivery can facilitate the process of delivering products from one location to another, with the aim of making it easier for consumers [11]. And finally, the Taste criterion is an assessment or understanding of food and beverages which includes aspects such as appearance, aroma, taste, texture, and temperature [12].

4.2 Analytical Hierarchy Process (AHP)

In Figure 3, the decomposition used in this study consists of 5 main criteria, 19 sub-criteria, and 4 alternatives.

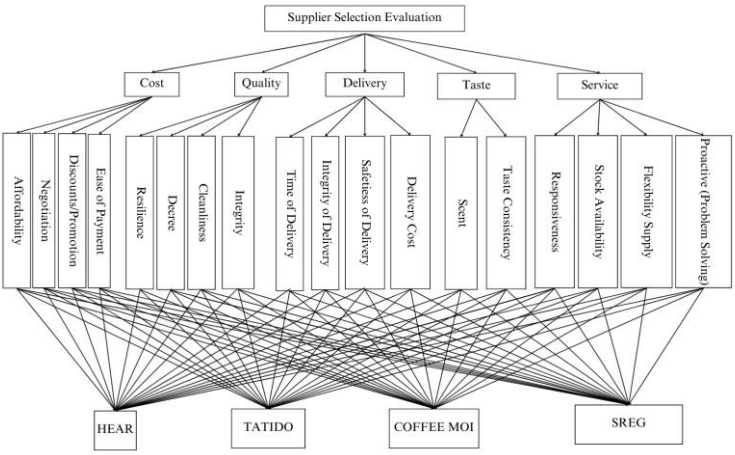

Fig. 3. Decomposition Hierarchy Structure.

4.3 Pairwise Comparison

At this stage the calculation of pairwise comparisons of criteria and sub-criteria is carried out.

Table 2. Pairwise Comparison.

	Cost	Quality	Delivery	Taste	Service
Cost	1,000	0,125	3,000	0,200	0,200
Quality	8,000	1,000	7,000	3,000	2,000
Delivery	0,333	0,143	1,000	0,333	0,200
Taste	5,000	0,333	3,000	1,000	0,500
Service	5,000	0,500	5,000	2,000	1,000
total	19,3	2,1	19,0	6,5	3,9

4.4 Matrix Normalization

Table 3. Matrix Normalization.

	Cost	Quality	Delivery	Taste	Service	P Vector	Weight	Eigen Value
Cost	0,052	0,059	0,158	0,031	0,051	0,351	0,070	0,357
Quality	0,414	0,476	0,368	0,459	0,513	2,230	0,446	2,387
Delivery	0,017	0,068	0,053	0,051	0,051	0,240	0,048	0,245
Taste	0,259	0,159	0,158	0,153	0,128	0,856	0,171	0,947
Service	0,259	0,238	0,263	0,306	0,256	1,322	0,264	1,421
total	1	1	1	1	1			5,357

$$CI = \frac{\lambda_{maks} - n}{n-1} \quad (3)$$

$$CI = \frac{5.289 - 5}{5-1} \quad (4)$$

$$CI = 0.723 \quad (5)$$

$$RI = 1.12 \quad (6)$$

$$CR = 0.723/1.12 \quad (7)$$

$$CR = 0.06 \quad (8)$$

So, based on the results of the CR value obtained, the analysis obtained and can be said to be consistent because it meets the specified limit, namely CR smaller than 0.1.

4.5 Order of Priority Weight between Criteria

Table 4. Criteria Priority Weight.

Criteria	Priority Weight	%	Ranking
Price	0,070	7%	4
Quality	0,446	45%	1
Shipping	0,048	5%	5
Taste	0,171	17%	3
Services	0,264	26%	2

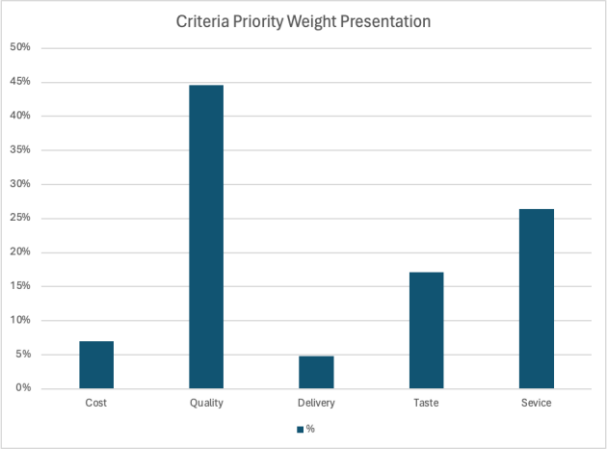

Fig. 4. Criteria Priority Weight Presentation.

The main criterion in evaluating suppliers of coffee raw materials at BadBear coffee shop is the Quality criterion with a value of 2.386. And the main subcriteria of the price criteria are the Goods Integrity subcriteria with a value of 2.131, followed by the Cleanliness subcriteria with a value of 0.913. When the position is fixity with a value of 0.619. And the fourth position is the durability subcriteria with a value of 0.515

The next criterion is the Service criterion with a value of 1.421 and the main sub-criteria of the Service criteria are the stock availability subcriteria with a value of 2.333, the second position is the flexibility supply subcriteria with a value of 1.138, the third position is the Proactive subcriteria (Problem solving) with a value of 0.434, and the last position is the subcriteria of responsiveness with a value of 0.205.

The third order of priority criteria is Taste with a value of 0.947 with the main sub-criteria, namely flavor consistency with a value of 1.5 and the second is the aroma subcriteria with a value of 0.5.

Table 5. Calculation of Priority for each Criterion and Subcriteria.

Priority Weight Calculation Results						
Criteria	**Priority**	**Sub Criteria**	**Local Priority**	**Global Priority**	**Supplier**	**Weight**
Cost	0,07	Affordability	0,205	0,014	Hear	0,366
					Sreg	0,089
					Coffee Moi	0,055
					Tatido	0,490
		Negotiation	0,09	0,006	Hear	0,501
					Sreg	0,082
					Coffee Moi	0,077
					Tatido	0,341
		Ease of Payment	0,341	0,024	Hear	0,474
					Sreg	0,129
					Coffee Moi	0,105
					Tatido	0,292
		Discounts/Promotion	0,364	0,026	Hear	0,572
					Sreg	0,093
					Coffee Moi	0,074
					Tatido	0,261
Quality	0,446	Resilience	0,126	0,056	Hear	0,301
					Sreg	0,110
					Coffee Moi	0,063
					Tatido	0,525
		Decree	0,146	0,065	Hear	0,269
					Sreg	0,105
					Coffee Moi	0,061
					Tatido	0,565
		Cleanliness	0,22	0,098	Hear	0,350
					Sreg	0,106
					Coffee Moi	0,051
					Tatido	0,493
		Integrity	0,508	0,226	Hear	0,273
					Sreg	0,115
					Coffee Moi	0,074
					Tatido	0,538
Delivery	0,048	Time of Delivery	0,446	0,021	Hear	0,493
					Sreg	0,106
					Coffee Moi	0,051
					Tatido	0,350
		Integrity of Delivery	0,106	0,005	Hear	0,461
					Sreg	0,136
					Coffee Moi	0,075
					Tatido	0,328
		Safetiness of Delivery	0,14	0,007	Hear	0,285
					Sreg	0,156
					Coffee Moi	0,119
					Tatido	0,440
		Delivery Cost	0,307	0,015	Hear	0,473
					Sreg	0,087
					Coffee Moi	0,142
					Tatido	0,298
Taste	0,171	Scent	0,25	0,043	Hear	0,246
					Sreg	0,092
					Coffee Moi	0,054
					Tatido	0,607
		Taste Consistency	0,75	0,128	Hear	0,319
					Sreg	0,087
					Coffee Moi	0,061
					Tatido	0,533
Service	0,264	Responsiveness	0,051	0,014	Hear	0,256
					Sreg	0,064
					Coffee Moi	0,193
					Tatido	0,487
		Stock availability	0,563	0,149	Hear	0,368
					Sreg	0,071
					Coffee Moi	0,044
					Tatido	0,516
		Flexibility Supply	0,278	0,073	Hear	0,274
					Sreg	0,096
					Coffee Moi	0,088
					Tatido	0,543
		Proactive (Problem Solving)	0,108	0,028	Hear	0,350
					Sreg	0,069
					Coffee Moi	0,112
					Tatido	0,469

The fourth order is the price criterion with a value of 0.357 and the discount / promotion subcriteria as the top priority subcriteria with a value of 1.476, the second position is ease of payment with a value of 1.385 and the third position is affordability with a value of 0.828 and the last position is negotiation with a value of 0.090.

The last order as a priority criterion is the delivery criterion with a value of 0.245 with the main subcriteria, namely Delivery Time and the next subcriteria is the Delivery Cost subcriteria with a value of 1.269, the next criterion position is delivery security with a value of 0.572 and the last is the Delivery Integrity subcriteria with a value of 0.438.

4.6 Supplier Performance Assessment

Table 6. Supplier Performance Assessment Weight.

Supplier Performance Assessment							
Supplier	**Criteria**					**Total**	**Rank**
	Cost	**Quality**	**Delivery**	**Taste**	**Service**		
Hear	1,913	1,193	1,712	0,566	1,247	6,631	2
Sreg	0,393	0,436	0,485	0,179	0,299	1,791	3
Coffee Moi	0,310	0,251	0,387	0,115	0,438	1,501	4
Tatido	1,383	2,121	1,416	1,141	2,015	8,077	1

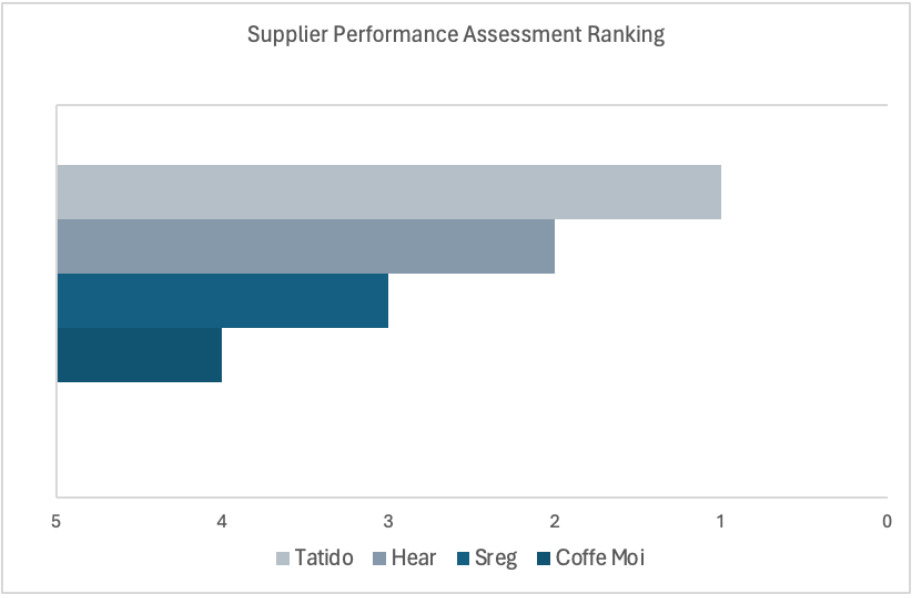

Fig. 5. Supplier Performance assessment Rangking.

Coffee Moi's assessment as a supplier of coffee raw materials at Coffee Shop Bad-Bear in each criterion and subcriteria has the smallest assessment compared to other suppliers. Coffee Shop BadBear also sees that Coffee Moi needs to fix its shortcomings and make Coffee Moi not one of the top priorities as a supplier for Coffee Bad-Bear. In the price criteria with sub-criteria of affordability, negotiation, ease of payment, discounts / promotions, quality criteria with sub-criteria of durability, fixity, cleanliness and integrity, delivery criteria with sub-criteria of delivery time, delivery integrity, delivery security, shipping costs, taste criteria with sub-criteria of aroma and consistent taste and finally the service criteria with sub-criteria of responsiveness, stock availability, flexibility of supply and problem solving. Almost all get the smallest assessment, and only two subcriteria, namely the responsiveness and proactivity (Problem Solving) Coffee Moi subcriteria get an assessment in third position, which means that the other two suppliers still outperform in the assessment of criteria and subcriteria.

Sreg as a supplier of coffee ingredients at Coffee Shop BadBear also has a low assessment in each criterion and subcriteria, the assessment obtained is also not too far from the supplier who has the lowest score, namely Coffee Moi. Two sub-criteria, namely responsiveness and and Proactivity (Problem Solving) are in the last position for the Sreg supplier assessment. his condition is indeed felt by Coffee Shop BadBear when compared to suppliers. This proves that Sreg as one of the suppliers at Coffee Shop BadBear to be able to improve every shortcoming.

Hear has a fairly good assessment as the second-best supplier. Hear is superior to Tatido in several sub-criteria, namely the Negotiation sub-criteria, Ease of Payment, Delivery Time, Delivery Integrity, Delivery Cost. However, in other criteria and sub-criteria, Hear lost the upper hand. In this case, Hear is always one of the best options for BadBear Coffee Shop and often places orders directly to Hear.

Tatido's assessment as a supplier of coffee raw materials at BadBear Coffee Shop is the most superior among other suppliers of coffee raw materials. However, Martido still has several assessments of criteria and sub-criteria that must be maximized. In several sub-criteria such as Negotiation, Ease of Payment, Discounts / Promotions, Delivery Time, Delivery Integrity, Shipping costs, it is inferior to Hear. No doubt, BadBear Coffee Shop considers Tatido to be one of the suppliers for Coffee Shop in Batam. All criteria and sub-criteria assessments carried out in this study against Tatido are true and BadBear Coffee Shop is always satisfied with all the criteria that Tatido has.

5 Conclusions

Based on the results of weighting using the Analytical Hierarchy Process method, it is known that the main criteria in the research of suppliers of coffee raw materials at BadBear Coffee Shop are quality criteria with a priority weight value of 0.446, based

on the analysis of the priority weight of the quality criteria presented about 45% of the supplier selection decision, then followed by service with a priority weight value of 0.264, which presented about 26% of the decision results, the third position is the taste criteria with a priority weight value of 0.171 presented 17 percent of the decision results, the fourth is the price criteria with a priority weight value of 0.070 presented 7 percent of the results of the supplier selection decision and the last is delivery with a priority weight value of 0.048 presented 5 percent of the results of the assessment of coffee raw material supplier selection decisions at Coffee Shop BadBear.

Then the results obtained for the main supplier from the assessment results carried out are Tatido with a total value of 8,077, in second place is Hear with a total value of 6,631, then followed by Sreg with a total value of 1,501, and the last is Coffee Moi with a total value of 1,791.

Based on the conclusions obtained from this study, an evaluation is obtained, namely that Coffee Moi and Sreg as the two suppliers with the lowest assessment must maximize performance based on all criteria and subcriteria assessed in order to be able to compete as fellow suppliers of coffee raw materials. Hear and Tatido as the top two suppliers in research using the Analytical Hierarchy Process method must also continue to maximize their performance in each criterion and subcriteria, especially in several criteria and subcriteria assessments that are still not optimal in order to continue to compete as suppliers of coffee raw materials.

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