

SELECTION OF THE BEST SOYBEAN SUPPLIER FOR TEMPE BALAP MSME USING THE ANALYTICAL HIERARCHY PROCESS (AHP) METHOD

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(artikel diterima: 03-05-2026, artikel disetujui: 20-08-2026)

Abstract

Tempe Balap MSME is a home-based tempe production business that depends on a stable supply of soybean raw materials. Late deliveries and uncertain stock availability can disrupt production, while supplier selection has not been supported by a systematic decision-making method. This study aims to determine the best soybean supplier for Tempe Balap MSME using the Analytical Hierarchy Process (AHP). Six criteria were evaluated: price, quality, delivery, supplier capability, service, and flexibility. Data were collected through interviews and pairwise comparison questionnaires. The results show that delivery had the highest criterion weight (0.394), followed by supplier capability (0.267), quality (0.140), price (0.092), service (0.064), and flexibility (0.042). Supplier I obtained the highest overall priority of 0.390, followed by supplier U at 0.294 and supplier C at 0.214. Therefore, supplier I is recommended as the preferred soybean supplier for Tempe Balap MSME.

Keywords: MSME, Soybean Supplier, AHP, Criteria, Decxion Making

1. INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play a crucial role in supporting the national economy. Although often viewed as a traditional business sector with relatively small sales volumes, both in terms of workforce, assets owned, sales revenue, and capital employed, MSMEs still make a significant contribution to Indonesia's economic growth. Furthermore, MSMEs also play a role in creating jobs, improving community welfare, and promoting regional economic equality in Indonesia (Sholeh and Hartono, 2022).

In the food industry, the availability of raw materials is a crucial factor in the food production process, particularly in relation to the selection of the right raw material supplier. One example is the tempeh production process, where soybeans are the raw material, so a smooth supply of soybeans from suppliers is a key determinant of smooth production. However, most tempeh MSMEs still experience several obstacles, particularly those related to soybean suppliers, such as late deliveries, inconsistent soybean quality, and relatively high soybean prices. These problems can hinder the smooth production process of tempeh and reduce business profits (Munawarah dkk., 2023).

Tempe Balap MSME is a home-based tempeh production business established in 2020 and capable of daily production with a daily requirement of approximately 3 sacks or ± 150 kg of soybeans. This can produce approximately 225 packages of tempeh in 1 kg sizes. A single soybean purchase typically involves 50 sacks or 2,500 kg of soybeans to meet the demand for approximately 17 working days. The soybeans currently used are sourced from a warehouse in Samarinda City under the Prama brand. Since its inception, Tempe Balap MSME has collaborated with approximately 4 different suppliers.

Interviews with owner of Tempe Balap MSME revealed that the biggest obstacle to procuring soybean raw materials is the supplier's inability to deliver soybeans as needed and the supplier's lack of soybean stock. Stock shortages can occur two to three times a month. This situation forces owner of Tempe Balap MSME to seek alternative suppliers, incurring additional operational costs. Furthermore, delays and shortages of raw materials also lead to labor losses due to production disruptions. Another threat is the frequent increase in soybean prices, which impacts production

costs. Furthermore, soybean supplier selection is still carried out in a simplistic manner, relying solely on experience, lower prices, and stock availability, without systematic calculations or analysis based on various important criteria.

The discrepancy between ideal conditions and actual practice indicates a gap. Ideally, supplier selection should be conducted systematically and structured, comparing criteria such as price, quality, delivery time, and the supplier's ability to maintain stock availability. However, in actual practice, supplier selection at the Tempe Balap MSME has not been conducted systematically and does not utilize a measurable decision-making method. This situation can lead to operational inefficiencies and the risk of future raw material shortages.

When selecting a soybean supplier, several criteria must be considered because the decision involves multiple factors. A multi-criteria decision-making approach can therefore be applied (Chai et al., 2023; Utomo and Asdi, 2025). Previous research has applied AHP to soybean supplier selection, including the study by Munawarah et al. (2023) at UD. PQRIS. However, the present study differs in its research object and decision framework: it focuses on Tempe Balap MSME and evaluates six criteria price, quality, delivery, supplier capability, service, and flexibility across three soybean suppliers (U, C, and I). This approach is intended to reflect the specific operational priorities of Tempe Balap MSME, particularly the need for reliable delivery and continuous raw material availability.

Therefore, to address these issues, a systematic and structured decision-making approach is required. One method that can be used is the Analytical Hierarchy Process (AHP) method, which is considered crucial for assisting Tempe Balap MSMEs in determining the best soybean supplier. This is because the Analytical Hierarchy Process (AHP) method is used in decision-making by structuring problems into several levels or hierarchies. Each level is then weighted based on its importance to determine the best decision for the problem at hand. (Spastika dkk., 2025). With this method, supplier selection can be done based on clear priority levels according to the needs of Tempe Balap MSMEs.

Based on the explanation above, this study aims to identify supplier selection criteria and determine the best supplier for Tempe Balap MSMEs using the Analytical Hierarchy Process (AHP) method. It is hoped that this research will be conducted more systematically and can determine the priority of soybean suppliers that best suit the needs of Tempe Balap MSMEs. This will improve operational efficiency, reduce the risk of stockouts, and maintain the sustainability of tempe production at Tempe Balap MSMEs.

2. RESEARCH METHOD

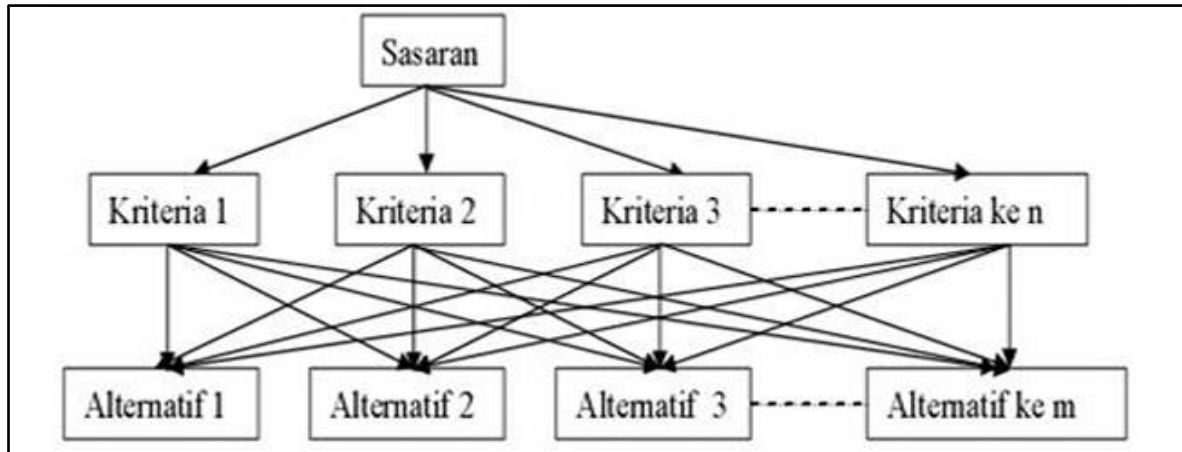
Analytical Hierarchy Process (AHP)

The Analytical Hierarchy Process (AHP) method was developed by Thomas L. Saaty, a mathematics professor at the University of Pittsburgh. The AHP method is used to solve complex, unstructured problems by breaking them down into hierarchically arranged elements, assigning subjective values to each variable. This method can determine which variables have the highest priority in determining decision outcomes (Ramaand and Firmansyah, 2023).

The strength of PHA or the strength of the AHP method lies in its own hierarchical structure which allows one to include all important factors, both tangible and intangible, and arrange them from top to bottom starting with the most important to the level containing alternatives, to choose the best one (Saaty, 1993).

According to (Darmanto dkk., 2014), The Analytical Hierarchy Process (AHP) is a method used to obtain a ratio scale through pairwise comparisons of districts or continuous variables. The AHP method breaks down a problem into multiple factors and then arranges them into a hierarchy. The following are the steps in developing the Analytical Hierarchy Process (AHP) method.

1. First, determine the problem to be solved and determine the alternative solutions to be considered in the decision-making process.
2. Create a hierarchical structure that begins with the general objective, then continues with the assessment criteria and continues with the alternatives to be compared.,



Picture 1. Hierarchical structure

3. Construct a pairwise comparison matrix to determine the contribution of each element to the objectives or criteria of the higher level. This comparison is based on the decision maker's choice by assessing the importance of one element over another.
4. Normalize the data, which means dividing the value of each element in the pairwise matrix by the total value of each column.
5. Calculate the eigenvector values and check their consistency. The eigenvector value is the maximum eigenvector value obtained.
6. Repeat steps 3, 4, and 5 for all levels of the hierarchy.
7. Calculate the eigenvectors for each pairwise matrix value. The eigenvector value is the weight value of each element.
8. Test the consistency of the hierarchy. If it does not meet the $CR < 0.1$, the assessment must be repeated.

Table 1. Paired comparison matrix rating scale

level of importance	Definition
1	Both elements are equally important
3	One element is slightly more important than the other element
5	One element is more important than the other element
7	One element is clearly more absolutely important than the other element
9	One element is absolutely important than the other element
2,4,6,8	Values between two adjacent consideration values
1/c	If an activity is one number compared to activity j, then j has the opposite value compared to i
(the opposite)	

(saidah dkk., 2024)

According to Munthafa and Mubarak (2017), A pairwise comparison matrix shows the level of contribution or influence of each element on the objective or criterion at the next level. The following is a table of pairwise comparison matrices.

Table 2. Matriks perbandingan berpasangan

	Kriteria-1	Kriteria-2	Kriteria-3	Kriteria-n
Kriteria-1	K11	K12	K13	K1n
Kriteria-2	K21	K22	K23	K2n
Kriteria-3	K31	K32	K33	K3n
Kriteria-m	Kn1	Kn2	Kn3	Kmn

According to Padmowati (2009), To assess the consistency of user responses, the Analytical Hierarchy Process (AHP) method requires a consistency index (CI) calculation by comparing the random consistency index corresponding to the elements used. The following is a table of random consistency indices.

Table 3. Random index value

n	1	2	3	4	5	6	7	8	9	10
RI	0,00	0,00	0,58	0,90	1,12	1,24	1,32	1,41	1,45	1,49

According to Azhar dkk., (2024) When using the AHP method, formulas must be used to calculate the consistency index and consistency ratio to obtain accurate results. The following are the formulas used for the consistency index and consistency ratio.

$$CI = \frac{\lambda_{maks} - n}{n - 1} \dots\dots\dots (2.1)$$

dengan: $\lambda_{maks} - n$ = eigen value maksimum
 $n - 1$ = ukuran matriks

$$CR = \frac{CI}{RI} \dots\dots\dots (2.2)$$

dengan: CR = rasio konsistensi
CI = matriks konsistensi
RI = indeks random

According to Sihombing dkk., (2024), After the weights for the criteria, subcriteria, and alternatives are obtained, the next step is to calculate the final value for each alternative. This calculation is done by adding the weights of the criteria and the weights of the alternatives.

$$\text{Nilai Alternatif} = \sum_{i=1}^n (\omega_{\text{Kriteria } i} \times \omega_{\text{Alternatif } i}) \dots\dots\dots (2.3)$$

3. RESULTS AND DISCUSSION

3.1 Research result

Determination of Criteria and Subcriteria

According to Tampubolon dkk., (2025), The selection of soybean raw materials is a strategic decision for tempeh-processing MSMEs because it directly impacts product quality, production efficiency, and cost efficiency. The following are the criteria and sub-criteria used in selecting the best soybean suppliers for MSMEs.

1. Price (H)

Price is the exchange rate of goods expressed in rupiah and is the primary consideration for MSMEs in determining production costs. The following are the sub-criteria of the established pricing criteria.

 - a. Discounts (H1)
 - b. Price-to-Quality Matching (H2)
2. Quality (K)

Quality indicates the quality of the soybeans used as raw materials. Good and stable quality will produce consistent tempeh products. The following are the sub-criteria of the established quality criteria.

 - a. Soybean Cleanliness (K1)
 - b. Bean Damage/Defect Level (K2)
3. Delivery (P)

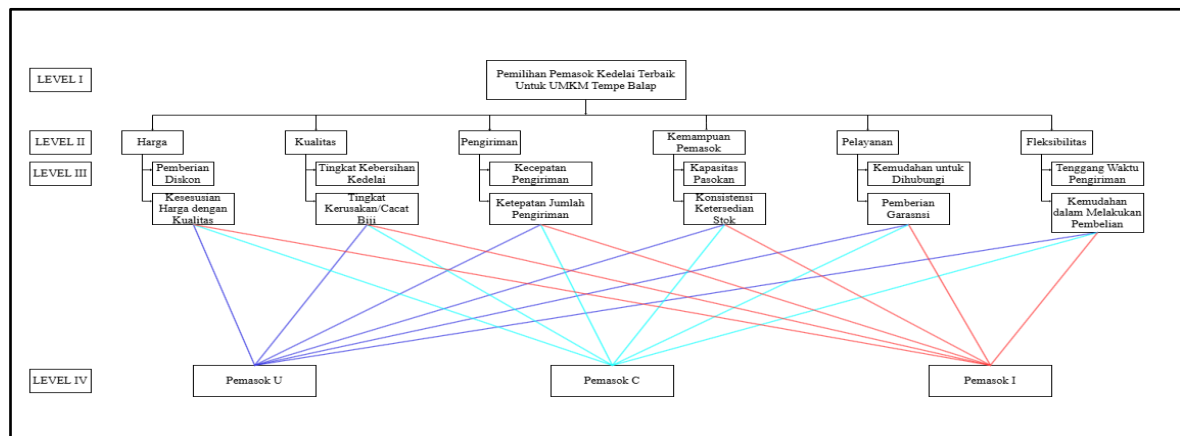
Delivery refers to the supplier's ability to distribute soybeans in a timely and safe manner. The following are the sub-criteria of the established delivery criteria.

 - a. Delivery Speed (P1)
 - b. Accuracy of Delivery Quantities (P2)

4. Supplier Capability (KM)
Supplier capability indicates the supplier's certainty in meeting the MSME's soybean needs sustainably. The following are the sub-criteria of the established supplier capability criteria.
 - a. Supply capacity (KM1)
 - b. Consistency of stock availability (KM2)
5. Service Criteria
Good service is an activity that increases customer satisfaction, while poor service will leave customers feeling disappointed and lost. The following are the sub-criteria of the service criteria:
 - a. Fast communication
 - b. Product guarantee
6. Flexibility Criteria
Flexibility is a criterion that indicates a supplier's ability to provide convenience and flexibility to buyers. The following are the sub-criteria of the flexibility criterion:
 - a. Payment grace period
 - b. Ease of purchase

Analytical Hierarchy Process (AHP)

After determining the criteria and sub-criteria, the next step is to create a decision hierarchy containing objectives, criteria, sub-criteria and alternatives.



Picture 2. Hierarchical structure of supplier selection

Pairwise Comparison Matrix and Consistency Test

Data were collected through interviews and pairwise comparison questionnaires covering the criteria, subcriteria, and alternatives. The questionnaire was completed by one respondent, namely the owner of Tempe Balap MSME, who is directly involved in soybean procurement and supplier selection. The resulting pairwise comparison values were entered into the comparison matrices and followed by normalization, priority-weight calculation, and consistency testing.

Table 4. Criteria pairwise comparison matrix

Criteria	H	K	P	KP	PL	F
Price	1	0,500	0,200	0,250	2	3
Quality	2	1	0,250	0,333	3	4
Delivery	5	4	1	2	5	6
Supplier Capability	4	3	0,500	1	4	5
Service	0,500	0,333	0,200	0,250	1	2
Flexibility	0,333	0,250	0,167	0,200	0,500	1
Amount	12,833	9,083	2,317	4,033	15,500	21,000

Table 5. Normalization and prioritization results

Criteria	H	K	P	KP	PL	F	Amount	Priority	Rangking
Price	0,078	0,055	0,086	0,062	0,129	0,143	0,553	0,092	4
Quality	0,156	0,110	0,108	0,083	0,194	0,190	0,841	0,140	3
Delivery	0,390	0,440	0,432	0,496	0,323	0,286	2,366	0,394	1
Supplier	0,312	0,330	0,216	0,248	0,258	0,238	1,602	0,267	2
Capability									
Service	0,039	0,037	0,086	0,062	0,065	0,095	0,384	0,064	5
Flexibility	0,026	0,028	0,072	0,050	0,032	0,048	0,255	0,042	6
Amount	1,000	1,000	1,000	1,000	1,000	1,000	6,000	1,000	4

Table 6. Pairwise comparison matrix of price subcriteria

Criteria	H1	H2
Discounting (H1)	1	0,200
Price-Quality Matching (H2)	5	1
Amount	6	1,200

Table 7. Normalization and prioritization results

Criteria	H1	H2	Amount	Priority	Rangking
Discounting (H1)	0,167	0,167	0,333	0,167	2
Price-Quality Matching (H2)	0,833	0,833	1,667	0,833	1
Amount	1,000	1,000	2,000	1,000	

Table 8. Pairwise comparison matrix of quality subcriteria

Criteria	K1	K2
Soybean Cleanliness (K1)	1	4
Bean Damage/Defect (K2)	0,250	1
Amount	1,250	5,000

Table 9. Normalization and prioritization results

Criteria	K1	K2	Amount	Priority	Rangking
Soybean Cleanliness (K1)	0,800	0,800	1,600	0,800	1
Bean Damage/Defect (K2)	0,200	0,200	0,400	0,200	2
Amount	1,000	1,000	2,000	1,000	

Table 10. Pairwise comparison matrix of delivery subcriteria

Criteria	P1	P2
Delivery Speed (P1)	1	7
Delivery Quantity Accuracy (P2)	0,143	1
Amount	1,143	8,000

Table 11. Normalization and prioritization results

Criteria	P1	P2	Amount	Priority	Rangking
Delivery Speed Criteria (P1)	0,875	0,875	1,750	0,875	1

Table 11. Normalization and prioritization results (continued)

Criteria	P1	P2	Amount	Priority	Rangking
Accuracy of Delivery	0,125	0,125	0,250	0,125	2
Quantity (P2)					
Amount	1,000	1,000	2,000	1,000	

Table 12. Pairwise comparison matrix of supplier capability subcriteria

Criteria	KP1	KP2
Supply Capacity (KP1)	1	3
Stock Availability Consistency (KP2)	0,333	1
Amount	1,333	4,000

Table 13. Normalization and prioritization results

Criteria	KP1	KP2	Amount	Priority	Rangking
Supply Capacity (KP1)	0,750	0,750	1,500	0,750	1
Stock Availability Consistency (KP2)	0,250	0,250	0,500	0,250	2
Amount	1,000	1,000	2,000	1,000	

Table 14. Pairwise comparison matrix of service subcriteria

Criteria	PL1	PL2
Fast Communication (PL1)	1	0,200
Product Guarantee (PL2)	5	1
Amount	6,000	1,200

Table 15. Normalization and prioritization results

Criteria	PL1	PL2	Amount	Priority	Rangking
Fast Communication (PL1)	0,167	0,167	0,333	0,167	2
Product Guarantee (PL2)	0,833	0,833	1,667	0,833	1
Amount	1,000	1,000	2,000	1,000	

Table 16. Flexibility subcriteria pairwise comparison matrix

Criteria	F1	F2
Payment Grace Period (F1)	1	4
Ease of Making Purchases (F2)	0,250	1
Amount	1,250	5,000

Table 17. Hasil normalisasi dan prioritas

Criteria	F1	F2	Amount	Priority	Rangking
Payment Grace Period (F1)	0,800	0,800	1,600	0,800	1
Ease of Making Purchases (F2)	0,200	0,200	0,400	0,200	2
Amount	1,000	1,000	2,000	1,000	

Table 18. Test overall consistency

Pairwise Comparison	CR	Description
Criteria (Level II)	0,053	Consistent
Price Subcriteria (H)	0,000	Consistent

Table 18. Overall consistency test (continued)

Pairwise Comparison	CR	Description
Quality Sub-Criteria (K)	0,000	Consistent
Delivery Sub-Criteria (P)	0,000	Consistent
Supplier Capability Sub-Criteria (KP)	0,000	Consistent
Service Sub-Criteria (PL)	0,000	Consistent
Flexibility Sub-Criteria (F)	0,000	Consistent
Alternatives to the Discount Sub-Criteria (H1)	0,061	Consistent
Alternatives to the Price-to-Quality Sub-Criteria (H2)	0,004	Consistent
Alternatives to the Soybean Cleanliness Sub-Criteria (K1)	0,020	Consistent
Alternatives to the Bean Damage/Defect Level Sub-Criteria (K2)	0,056	Consistent
Alternatives to the Delivery Speed Sub-Criteria (P1)	0,061	Consistent
Alternatives to the Delivery Quantity Accuracy Sub-Criteria (P2)	0,033	Consistent
Alternatives to the Supplier Capacity Sub-Criteria (KP1)	0,020	Consistent
Alternatives to the Stock Availability Consistency Sub-Criteria (KP2)	0,028	Consistent
Alternatives to the Prompt Communication Sub-Criteria (PL1)	0,028	Consistent
Alternatives to the Product Guarantee Sub-Criteria (PL2)	0,087	Consistent
Alternatives to the Payment Grace Period Sub-Criteria (F1)	0,048	Consistent
Alternatives to the Ease of Purchasing Sub-Criteria (F2)	0,087	Consistent

Based on Table 18 above, it is clear that all respondents' assessments were consistent, and no further pairwise comparisons were necessary. Therefore, these results can be used to assess the criteria, sub-criteria, and alternatives in selecting the best soybean supplier for the Tempe Balap MSME.

Next, determine the best soybean supplier for Tempe Balap MSME by calculating the global priority of all criteria, sub-criteria and alternative weights, which can be seen in Table 19 below.

Table 19. *Global priority* overall

Objectives (Level I)	Criteria (Level II)	Subcriteria (Level III)		Alternative (Level IV)		Global Priority
Selection of Soybean Suppliers for the Best Tempe Balap MSME	Price (H) (0.092)	Discounts (H1)	0,167	Supplier U	0,252	0,004
				Supplier C	0,159	0,002
				Supplier I	0,589	0,009
		Price-Quality Matching (H2)	0,833	Supplier U	0,110	0,008
				Supplier C	0,309	0,024
				Supplier I	0,581	0,045
	Quality (K) (0.140)	Soybean Cleanliness (K1)	0,800	Supplier U	0,123	0,014
				Supplier C	0,320	0,036
				Supplier I	0,557	0,062
		Bean Damage/Defect Level (K2)	0,200	Supplier U	0,142	0,004
				Supplier C	0,334	0,009
				Supplier I	0,525	0,015
	Delivery (P) (0.293)	Delivery Speed (P1)	0,875	Supplier U	0,556	0,143
				Supplier C	0,090	0,023
				Supplier I	0,354	0,091

Table 19. *Global priority overall (continued)*

Objectives (Level I)	Criteria (Level II)	Subcriteria (Level III)		Alternative (Level IV)		Global Priority
Selection of Soybean Suppliers for the Best Tempe Balap MSME		Accuracy of	0,125	Supplier U	0,681	0,025
		Delivery Quantities		Supplier C	0,118	0,004
		(P2)		Supplier I	0,201	0,007
	Supplier Capability (KP) (0.267)	Supplier Capacity	0,750	Supplier U	0,123	0,025
		(KP1)		Supplier C	0,320	0,064
				Supplier I	0,557	0,112
		Consistency of	0,250	Supplier U	0,098	0,007
		Stock Availability		Supplier C	0,334	0,022
		(KP2)		Supplier I	0,568	0,038
	Service (PL) (0.064)	Rapid	0,167	Supplier U	0,568	0,006
		Communication		Supplier C	0,334	0,004
		(PL2)		Supplier I	0,098	0,001
		Product Guarantee	0,833	Supplier U	0,608	0,032
		(F2)		Supplier C	0,272	0,015
				Supplier I	0,120	0,006
Flexibility (F) (0.042)	Payment Grace	0,800	Supplier U	0,633	0,021	
	Period (F1)		Supplier C	0,260	0,009	
			Supplier I	0,106	0,004	
	Ease of Purchasing	0,200	Supplier U	0,608	0,005	
	(F2)		Supplier C	0,272	0,002	
			Supplier I	0,120	0,001	

Based on the global priority calculations above, the overall weight for each alternative is obtained by adding up the global priority values for each supplier. The following are the results of the supplier global priority calculations.

Table 20. Overall alternative weight

Supplier	Price	Quality	Delivery	Supplier capability	Service	Flexibility	Total	Ranking
U	0,012	0,018	0,167	0,031	0,038	0,026	0,294	2
C	0,026	0,045	0,027	0,086	0,018	0,011	0,214	3
I	0,054	0,077	0,098	0,149	0,007	0,005	0,390	1

RankingThe decision-making stage is the final stage in the supplier selection process using the Analytical Hierarchy Process (AHP) method. The overall alternative weight shows the weighted value of each alternative that has been calculated. Based on the weighting results in Table 20, it can be seen that the highest alternative is supplier I with a value of 0.390. Next, followed by supplier U with a value of 0.294 and supplier C is in the last position with a value of 0.214. Therefore, supplier I is the best choice as a supplier of soybean raw materials for the Tempe Balap MSME.

3.2 Discussion

The next step, after all the data has been processed, is to analyze and discuss the results. The analysis and discussion consist of criteria, subcriteria, alternatives, and the best supplier analysis for the Tempe Balap MSME.

1. Criteria Weight Analysis

Based on the criteria weighting calculations in the weighting table, the most influential criterion in selecting the best supplier for Tempe Balap's MSMEs is the delivery criterion (P), with a priority weight of 0.394. The next criterion is the supplier capability criterion (KM), with a priority value of 0.267, followed by the quality criterion (K), with a priority value of 0.140, followed by the price criterion (H), with a priority value of 0.092, then the service criterion (PL), with a priority value of 0.064, and finally, the flexibility criterion, with a priority value of 0.042. This weighting order

indicates the priority level of the criteria considered in determining the best soybean supplier for Tempe Balap's MSMEs.

The selection of the delivery criterion as the top priority indicates that Tempe Balap's MSMEs urgently need suppliers with timely and accurate delivery of soybean raw materials. This is because delays in raw material delivery can impact tempe production and potentially lead to raw material shortages. With a supplier capable of delivering soybeans on time, the production process can run more smoothly and raw material needs can be met.

2. Subcriteria Weight Analysis

The sub-criteria of each criterion constitute Level III in the problem hierarchy structure. There are 12 sub-criteria that are weighted using pairwise comparisons. The results of the sub-criteria weighting analysis are as follows.

a. Discount Provision (H1)

The discount provision sub-criterion within the price criterion has a final priority weight of 0.167 and is the second priority within the price sub-criterion. This indicates that providing discounts or discounts from suppliers can help reduce raw material purchasing costs, although the reduction is not as significant as matching price to soybean quality.

b. Price-Quality Matching (H2)

The price-quality matching sub-criterion within the price criterion has a final priority weight of 0.833 and is the top priority within the price sub-criterion. This indicates that matching soybean price to quality is a crucial factor for Tempe Balap MSMEs, as quality raw materials at an appropriate price can increase production cost efficiency.

c. Soybean Cleanliness Level (K1)

The soybean cleanliness level sub-criterion within the quality criterion has a priority weight of 0.800 and is the top priority within the quality sub-criterion. This shows that soybean cleanliness is a crucial factor in supplier selection, as clean soybeans can produce high-quality tempeh.

d. Bean Damage/Defect Level (K2)

The bean damage/defect sub-criterion within the quality criterion has a priority value of 0.200 and is the second priority of the quality criteria. This demonstrates that the level of soybean damage remains a consideration in supplier selection, although its influence is not as significant as soybean cleanliness.

e. Delivery Speed (P1)

The delivery speed sub-criterion within the delivery criterion has a priority value of 0.875 and is the top priority of the delivery criterion. This indicates that the supplier's speed in delivering soybeans significantly impacts the smooth production process of the Tempe Balap MSME tempeh.

f. Accuracy of Delivery Quantity (P2)

The accuracy of delivery quantity sub-criterion within the delivery criterion has a priority value of 0.125 and is the second priority of the delivery criterion. This demonstrates that maintaining the appropriate quantity of soybeans delivered remains crucial to prevent shortages or excesses of raw materials.

g. Supply Capacity (KP1)

The supply capacity sub-criterion within the supplier capability criterion has a priority weight of 0.750 and is the first priority within the supplier capability criterion. This demonstrates that the supplier's ability to supply soybeans according to production needs is crucial to maintaining the smooth running of the tempeh production process.

h. Stock Availability Consistency (KP2)

The stock availability consistency sub-criterion within the supplier capability criterion has a priority weight of 0.250 and is the second priority within the supplier capability sub-criterion. This demonstrates that the stability of supplier stock availability is also a factor that must be considered for the sustainability of tempeh production.

i. Prompt Communication (PL1)

The prompt communication sub-criterion within the service criterion has a priority weight of 0.167 and is the second priority within the service criterion. This demonstrates that smooth

communication in soybean purchasing is crucial for maintaining the smooth running of the tempeh production process.

j. Product Assurance (PL2)

The product assurance sub-criterion within the service criterion has a priority weight of 0.833 and is the first priority within the service sub-criterion. This demonstrates that product assurance from suppliers is also a significant factor in maintaining consistent tempeh production.

k. Payment Grace Period (F1)

The payment grace period sub-criterion within the flexibility criterion has a priority weight of 0.800 and is the first priority within the flexibility criterion. This demonstrates that the payment grace period provided by suppliers is a crucial factor to ensure the smooth flow of tempeh production.

l. Ease of Purchasing (F2)

The ease of purchasing sub-criterion within the flexibility criterion has a priority weight of 0.200 and is the second-highest priority among the flexibility sub-criteria. This demonstrates that ease of purchasing is also a crucial factor to ensure the smooth running of soybean procurement.

3. Subcriteria Weight Analysis

The alternatives for each criterion constitute Level IV of the problem hierarchy structure. There are six criteria for which pairwise comparison weighting between alternatives is performed. The results of the alternative weighting analysis can be seen as follows.

a. Price Criteria (H)

In the price criterion (H) with the discount sub-criterion (H1), supplier I was deemed the best with a priority score of 0.589. This was followed by supplier U with a priority score of 0.252, and supplier C with a priority score of 0.159. This indicates that the soybeans supplied by supplier I were considered more affordable than those provided by other suppliers. In the price-to-quality sub-criterion (H2), supplier I was deemed the best with a priority score of 0.581. Furthermore, supplier C had a priority score of 0.309, and supplier U had a priority score of 0.110. This indicates that the price offered by supplier I was deemed most appropriate for the quality of the soybeans received by the Tempe Balap MSME.

b. Quality Criteria (K)

In the quality criterion (K) with the soybean hygiene sub-criterion (K1), supplier I was deemed the best with a priority score of 0.557. This was followed by supplier C with a priority score of 0.320, and supplier U with a priority score of 0.123. This indicates that the soybeans supplied by Supplier I are considered cleaner than those of other suppliers. In the sub-criterion of seed damage/defects (K2), Supplier I is considered the best with a priority score of 0.525. This is followed by Supplier C with a priority score of 0.334, and Supplier U with a priority score of 0.142. This indicates that Supplier I is considered capable of providing soybeans with a lower level of seed damage than other suppliers.

c. Delivery Criteria (P)

In the delivery criterion (P) with the sub-criterion of delivery speed (P1), Supplier U is considered the best with a priority score of 0.556. Furthermore, Supplier I has a priority score of 0.354, and Supplier C has a priority score of 0.090. This indicates that Supplier U is considered faster in delivering soybeans to the Tempe Balap MSME. In the sub-criterion of delivery quantity accuracy (P2), Supplier U is considered the best with a priority score of 0.681. Next, supplier I has a priority value of 0.201, and supplier C has a priority value of 0.118. This indicates that supplier U is considered capable of delivering soybeans according to the quantity required by the Tempe Balap MSME.

d. Supplier Capability Criteria (KP)

In the supplier capability (KP) criterion, with the supply capacity sub-criterion (KP1), supplier I was deemed the best with a priority score of 0.557. This was followed by supplier C with a priority score of 0.320, and supplier U with a priority score of 0.123. This indicates that supplier I is considered more capable of meeting the soybean supply needs of the Tempe Balap MSME. In the stock availability consistency sub-criterion (KP2), supplier I was deemed the

best with a priority score of 0.568. Furthermore, supplier C had a priority score of 0.334, and supplier U had a priority score of 0.098. This indicates that supplier I was deemed more consistent in maintaining soybean stock availability to meet the production needs of the Tempe Balap MSME.

e. Service Criteria (PL)

In the service criteria (PL) with the fast communication sub-criterion (PL1), supplier U was deemed the best with a priority score of 0.568. This was followed by supplier C with a priority score of 0.334, and supplier I with a priority score of 0.098. This indicates that supplier U is considered more capable of communicating quickly with the Tempe Balap MSME. In the product assurance sub-criterion (PL2), supplier U is considered superior with a priority score of 0.608. This is followed by supplier C with a priority score of 0.272, and supplier I with a priority score of 0.120. This indicates that supplier U is considered more consistent in ensuring the quality of soybean products to meet the production needs of the Tempe Balap MSME.

f. Flexibility Criteria (F)

In the flexibility criterion (F) with the payment grace period sub-criterion (F1), supplier U is considered superior with a priority score of 0.633. This is followed by supplier C with a priority score of 0.260, and supplier I with a priority score of 0.106. This indicates that supplier U is considered more capable of providing flexible payment grace periods to the Tempe Balap MSME. In the ease of purchasing sub-criterion (F2), supplier U is considered superior with a priority score of 0.608. Next, supplier C has a priority value of 0.272, and supplier I has a priority value of 0.120. This indicates that supplier U is considered easier to place orders for the Tempe Balap MSME.

4. Analysis of Determining the Best Soybean Supplier for Tempe Balap MSME

After the overall alternative weights were calculated, supplier I ranked first with a priority value of 0.390, followed by supplier U at 0.294 and supplier C at 0.214. Supplier I is the recommended supplier because its overall priority is highest across the evaluated criteria. For implementation, Tempe Balap MSME should maintain supplier I as the primary supplier while continuing to monitor delivery performance, stock availability, and quality. Supplier U and supplier C can be evaluated as backup suppliers when the primary supplier cannot meet procurement requirements.

These results provide a practical basis for supplier management at Tempe Balap MSME. The AHP ranking can be used as a reference for periodic supplier evaluation rather than as a one-time selection. In particular, delivery performance and supplier capability should receive continued attention because they are the two highest-weighted criteria.

4. CONCLUSION

Based on the AHP analysis, the study identified six criteria and twelve subcriteria for selecting the best soybean supplier for Tempe Balap UMKM. The criteria are price, quality, delivery, supplier capability, service, and flexibility, with two subcriteria under each criterion. The highest criterion weight was delivery (0.394), followed by supplier capability (0.267), quality (0.140), price (0.092), service (0.064), and flexibility (0.042).

1. The final supplier ranking shows that supplier I is the preferred supplier with an overall priority of 0.390, followed by supplier U at 0.294 and supplier C at 0.214. Supplier I is therefore recommended as the primary soybean supplier for Tempe Balap UMKM, while supplier U and supplier C can be considered alternative suppliers and evaluated periodically based on the same criteria.
2. Based on calculations using the Analytical Hierarchy Process (AHP) method, supplier I is the top priority in selecting soybean suppliers for the Tempe Balap UMKM because it has the highest priority weight value, 0.390, compared to other suppliers. Supplier U is second priority with a weight value of 0.294, while supplier C is third priority with the lowest weight value, 0.214. This indicates that supplier I is considered most capable of meeting the needs of the Tempe Balap UMKM in terms of price, soybean quality, delivery, and ability to provide a sustainable soybean supply.

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