

Selection Of Organic Fertilizer Supplier Using Analytical Hierarchy Process (Ahp) Method In Pt. Jmn Kabupaten Bandung

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Abstract:Suppliers are an important part of a company's business activities, because quality suppliers will provide quality raw materials as well. PT. JMN is a company engaged in the agro-tourism business in which it carries out the process of agricultural management. One of the needs of PT. JMN is how to determine the supplier of organic fertilizers in accordance with the standards applied by the company. To solve these problems, the solution is carried out using the Analytical Hierarchy Process (AHP) method. The determination of decision-making elements for the AHP method is carried out by means of a Focus Group Discussion (FGD) with the management team. The result is that there are 5 criteria expected by the company and 3 alternative suppliers. After processing the data, it was found that the highest criteria expected by the company was quality with an importance weight of 47.3% and the chosen alternative was supplier A with a weight of 41.6%.

Keywords: Suppliers, Analytical Hierarchy Process (AHP), hierarchy.

1. Introduction

Production activities are increasingly required to produce quality products. A quality final product will be produced by producing quality raw materials as well. According to Assauri (1975), every production process must be able to use sources within the company that are comparable to the materials and services that are processed into the final product. Thus the number of quality raw materials will determine how high the quality of the final product is. So that the determination or selection of the right raw materials will provide an advantage for the company to get quality raw materials according to the desired standards. So it requires a good procurement planning from the determination of the supplier and also the criteria for determining the supplier in accordance with the wishes of the company standards. According to Xu et al (2007) the application of evaluation tools and appropriate decisions must be considered at the conceptual design stage which involves many elements of complex decision making.

PT. JMN is a company engaged in agro-tourism which is engaged in agricultural tourism. Currently the company is managing an agro company in which there is management of agriculture and livestock. The aim of this company is to make agriculture sustainable and also make it a learning tour for agriculture. Meanwhile, SEARCA (1995) defines sustainable agriculture as a management of a holistic agricultural system that requires economically viable, ecological and friendly, socially just and acceptable, and culturally appropriate whose overall goal is to improve the quality of life.

The problems faced by PT. JMN is the determination of suppliers who can provide organic fertilizer products which will be used as a source of nutrition in the agricultural management process. Organic fertilizers are the most important part of the agricultural process at PT. JMN because quality fertilizers will increase the final product from agriculture. So that the right decision in determining a fertilizer supplier will determine the quality of the harvest. In addition, the accuracy of delivery from suppliers also determines the right time because it relates to the right time to apply fertilizer to plants. With these problems, the purpose of this study is to determine the planning in selecting organic fertilizer suppliers to support PT. JMN in the agricultural process.

2. Literature review

Definition of supplier

Suppliers are business entities or individuals whose business activities are to meet the needs of other parties in the form of products or services. According to Kotler (1987) is a company or individual that provides the resources needed by the company to produce certain goods or services. A good Supplier is that complies with consumer standards, so it is necessary to determine how the supplier is determined. In selecting suppliers that are used to meet the needs of raw materials for production, companies are trying to pursue improvements so that they are able to encourage their companies to become champions in meeting consumer needs.

Analytical Hierarchy Process (AHP)

According to Laksana (2016) AHP is a method that has been developed by Thomas L. Saaty who is a mathematician from the University of Pittsburg in the United States around 1970. AHP is a method that implies solving complex problems because of the many criteria used in making decisions according to Siti. (2016; Mokoena & Dhurup, 2019). In solving problems using the AHP method, there are several basic principles in its implementation according to Siti (2016), including:

1. Create a Hierarchy (Decomposition)

Solving the whole problem will then be divided into a hierarchical form that will determine the elements of the problem so that it will clarify the decision making.

2. Assessment Criteria and Alternatives (Comparative Judgment)

The assessment is carried out in pairs for each criterion and alternative. According to Saaty (1988) to assess the best scale in expressing opinions, Saaty comparison value is used. The scale is:

Table 1 Pairwise Comparison Scale

Nilai Skala	information
1	The two elements are equally important
3	One element is slightly more important than the other
5	One element is more important than the other
7	One element is clearly more absolutely essential than the other
9	One element is absolutely more important than the other elements
2,4,6,8	Value between adjacent considerations

3. Determinants of priority (Synthesis of priority)

Performed by using eigenvalues vector to gain relative to the elements of decision-making.

4. Logical Consistency

To measure consistency in assessing the elements of decision making. If the value is more than 0.1 or 10%, then the assessment is categorized as not good so it needs reassessment.

3. Research methods

The method used in this research is descriptive method with a quantitative method approach. The aim is to make descriptions, descriptions systematically, factual, and accurately of the problems faced and also the nature of the relationships between the phenomena under study.

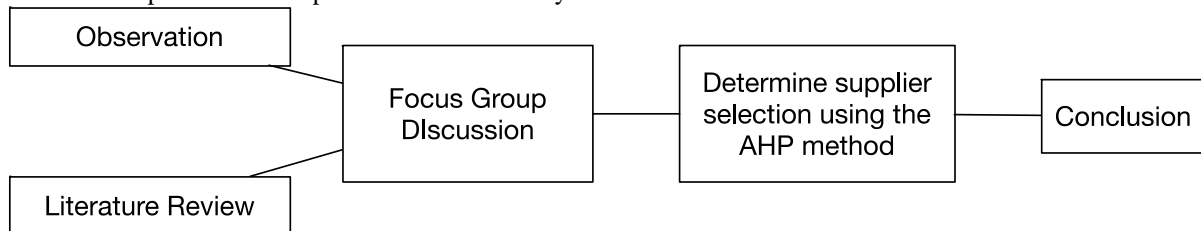


Figure 1 systematic research

Systematics in this research is to make observations to find out the real problem. From the results of these observations will provide a clear picture of the researcher in seeing the problem and the scope of the problem. Then to provide an overview in solving the problem, a literature review is carried out as a comparison between the real problem and the theory-based method. Then an FGD was conducted with top management to determine the views of the company. The results of the FGD are the basis for solving problems using AHP. The result is a solution to the problem the company is currently facing.

4. Results and discussion

The results of the observations that have been made are adjusted to the literature review and then the problem or problem of this research is defined. The data obtained is data generated from interviews and focus group discussions with management at PT JMN. Several interviews resulted in several criteria for selecting organic fertilizer suppliers.

1. Delivery Time
2. Product Prices

3. Warranty and Claims
4. Product Quality
5. Service

The criteria for selecting the fertilizer supplier that PT. JMN has been obtained. Then the step is to determine alternatives from organic fertilizer suppliers. After conducting interviews with management, it turned out that there were 3 suppliers that were selected, namely Supplier A, Supplier B and Supplier C. All suppliers come from the same city, namely Bandung Regency. The next step is to create a hierarchy between objectives, criteria and alternatives.

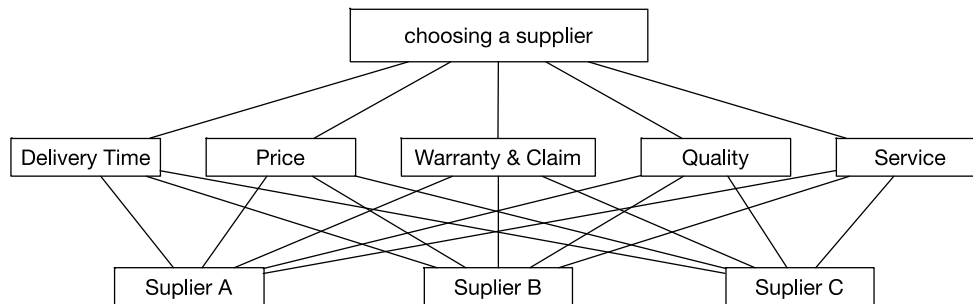


Figure 2 Hierarchy Model

To perform calculations, you will use Expert Choice 4.0 software. The process steps in the calculation using the application are as follows. The assessment in the matrix will use the Saaty scale.

a. Determine the hierarchy of problems

The first step is to enter the problem data into a hierarchy in the software. As shown in the picture.

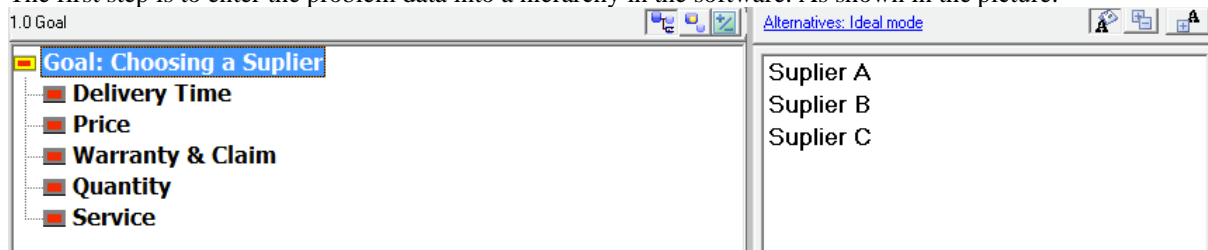


Figure 3 Hierarchy Model in expert choice

b. Perform a Pairwise assessment between the Criteria

The next step is to determine the assessment between the criteria to determine the weighting results of each criterion expected by PT. JMN. The results of the assessment can be seen in the picture

	Delivery Ti	Price	Warranty &	Quality	Service
Delivery Time		2.0	3.0	4.0	2.0
Price			2.0	3.0	2.0
Warranty & Claim				4.0	1.0
Quality					4.0
Service	Incon: 0.03				

Figure 4 Pairwise Comparison for Criteria

The results of the assessment for the criteria show an inconsistency value of 0.03 which indicates that this assessment is included in the consistent category.

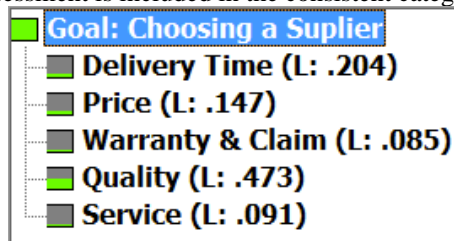


Figure 5 weight value for Criteria

The results of the weighting of the criteria show that the greatest weight of this assessment is the Quality criterion which is the priority expected by PT. JMN to choose an organic fertilizer supplier.

c. Conduct a Pairwise assessment of the Delivery Time criteria

The next step is to assess alternatives based on the Delivery time criteria.

	Supplier A	Supplier B	Supplier C
Supplier A		2.0	3.0
Supplier B			3.0
Supplier C	Incon: 0.05		

Figure 6 Pairwise Comparison for Delivery Time Criteria

The results of the assessment show an inconsistency value of 0.05 indicating that the assessment is in the consistent category.

Supplier A	.333
Supplier B	.528
Supplier C	.140

Figure 7 weight value for Delivery Time Criteria

The results of the alternative assessment based on the Delivery Time category show that Supplier B has the highest rating.

d. Conduct a Pairwise assessment of the Price criteria

The next step is to assess alternatives based on Price's criteria

	Supplier A	Supplier B	Supplier C
Supplier A		3.0	3.0
Supplier B			4.0
Supplier C	Incon: 0.07		

Figure 8 Pairwise Comparison for Price Criteria

The inconsistency value of the assessment is 0.07, indicating that the assessment is still consistent.

Supplier A	.268
Supplier B	.117
Supplier C	.614

Figure 9 weight value for Delivery Price Criteria

From the results of the weighting of this alternative assessment, the one with the greatest weight is supplier C.

e. Conduct a Pairwise assessment of the Warranty & Claim criteria

The next step is to assess alternatives based on the Warranty & Claim criteria.

	Supplier A	Supplier B	Supplier C
Supplier A		3.0	2.0
Supplier B			3.0
Supplier C	Incon: 0.05		

Figure 10 Pairwise Comparison for Warranty & Claim Criteria

The inconsistency value of the assessment that has been carried out is 0.05, which indicates that this assessment is still categorized as consistent.

Supplier A	.157
Supplier B	.594
Supplier C	.249

Figure 11 weight value for Warranty & Claim Criteria

The results of this alternative show that Supplier B is superior to the alternative.

f. Conduct a Pairwise assessment of Quality criteria

The next step is an alternative assessment based on Quality criteria.

	Supplier A	Supplier B	Supplier C
Supplier A		3.0	3.0
Supplier B			2.0
Supplier C	Incon: 0.05		

Figure 12 Pairwise Comparison for Quality Criteria

The inconsistency value of this assessment is 0.05, indicating that the assessment is still in the consistent category.



Figure 13 weight value for Quality Criteria

The results of the alternative assessment of this criterion were selected as Supplier A.

g. Conduct a Pairwise assessment of Service criteria

The next step is to assess alternatives based on the Service criteria.

	Suplier A	Suplier B	Suplier C
Suplier A		2.0	3.0
Suplier B			3.0
Suplier C	Incon: 0.05		

Figure 14 Pairwise Comparison for Service Criteria

The inconsistency value of this criterion assessment is 0.05, which indicates that the assessment is still in the consistent category.

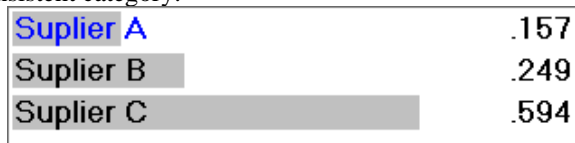


Figure 15 weight value for Service Criteria

The results of the assessment show that in the assessment of these criteria it shows that the alternative Supplier C is the most suitable.

h. Menentukan bobot total alternatif

Penilaian untuk kriteria dan alternatif telah dilakukan dan telah menghasilkan bobot setiap kriteria dan juga bobot untuk semua alternatif berdasarkan kriterianya. Hasilnya menunjukkan bahwa alternatif yang menjadi pilihan sesuai kriteria yang diharapkan adalah Suplier A dengan tingkat bobot adalah 0,416 atau 41,6% dengan nilai inconsistency totalnya adalah 0,04 yang menunjukkan nilai lebih kecil dari 0,1 sehingga semua penilaian masih dikategorikan konsisten.

Synthesis with respect to:
 Goal: Choosing a Suplier
 Overall Inconsistency = .04



Figure 16 Total Weight for alternatives

Level 1	Alts	Prty
Delivery Time (L: .204)	Suplier A	.068
	Suplier B	.108
	Suplier C	.029
Price (L: .147)	Suplier A	.040
	Suplier B	.017
	Suplier C	.090
Warranty & Claim (L: .085)	Suplier A	.013
	Suplier B	.050
	Suplier C	.021
Quality (L: .473)	Suplier A	.281
	Suplier B	.074
	Suplier C	.118
Service (L: .091)	Suplier A	.014
	Suplier B	.023
	Suplier C	.054

Figure 17 Detailed weights for alternatives

5. Conclusion

After conducting research on the need for problem solving PT. JMN regarding supplier selection. It can be seen that there are 5 criteria that are expected by PT. JMN in choosing suppliers, namely Delivery Time, Product Price, Claims Guarantee, Product Quality and Service. The results of the FGD in the implementation of AHP show

that the weight of the criteria is Quality (47.3%), Delivery Time (20.4%), Price (14.7%), Service (9.1%) and Claims Guarantee (8, 5%).

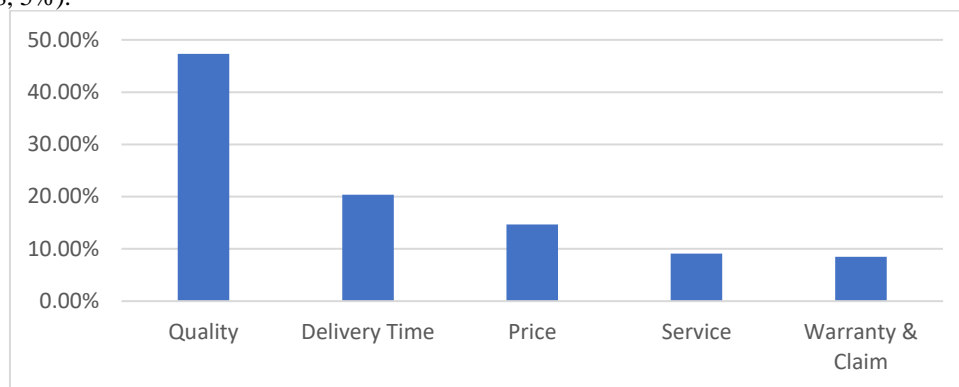


Figure 18 priority criteria

In addition to knowing the priority criteria, the results of AHP are determining alternatives to supplier selection problems. The supplier selected after conducting research using the AHP method is supplier A with a weight of 41.6% compared to supplier B and supplier C.

The results of this study have answered the needs of PT. JMN to be able to determine how to choose a supplier for the fulfillment of organic fertilizers that will be used in the agricultural processing process at PT. JMN.

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