



Selecting Green Supplier for Perishable Raw Materials using AHP Method at Nunia Boutique Villa Seminyak

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Abstract

Purpose: The aim of this research is to do the selection for green supplier for perishable raw material at Nunia Boutique Villa, Villa with 8 Units Villa located at Seminyak Badung Bali.

Research methods: One of the methods that used in this research is Analytical Hierarchy Process (AHP) method with Vendor Performance Index (VPI) is a Quality, Cost, Delivery, Flexibility, and Responsiveness (QCDFR) by adding the Environment Management criteria. This research used the AHP method with the expert choice software.

Findings: The final rating of relative importance's supplier selection criteria was found: the Quality criteria (0.472) was ranked first in the order of priority in the green supplier selection criteria.

Implication: The Cost criteria with 0.192, Environment Management criteria (0.102), Delivery criteria (0.091), Flexibility criteria (0.076) and the last criterion is Responsiveness (0.067).

Keyword: green supplier, analytical hierarchy process (AHP), QCDFR model, perishable

INTRODUCTION

Awareness of environmentally friendly practices has been carried out since 1990, awareness of these environmentally friendly practices is increasing in all sectors including the business sector. Environmental issues as a result of industrial activities can already be felt by the community. These environmental issues show the importance of companies to pay attention to the environment in carrying out industrial activities, where companies can help environmental issues if they involve environmental aspects in carrying out their operations.

Green Supply Chain Management (GSCM) or green supply chain management is one way that can be used to overcome the complexity of supply chain management as well as to face challenges related to environmental issues and regulations that companies must comply with. GSCM can be regarded as an attempt to include environmental issues in the context of supply chain management (Warisan, 2020). Srivastava (2007) in Green Supply Chain Management improves work operations by using solutions that take into account the environment. Ninlawan et al (2010) explained that there are several operational functions and activities in green supply chain management including: green procurement, green manufacturing, green distribution, reverse logistics.

Green suppliers are needed to achieve green supply chain management and be competitive within the company, as well as support in achieving environmental, efficient, green product design aspects. Selection of green suppliers as an activity to carry out procurement activities by paying attention to environmental aspects (Villanueva-Ponce et al., 2015).

In the tourism business sector, the application of green supply is in line with the development of accommodation which has begun to apply the principles of environmental conservation, education, ecology, community empowerment and the use of local products, and can minimize environmental damage in carrying out company operations (Astawa et al., 2020).

One part of supply chain management is a supplier or supplier. According to Pujawan & Mahendrawathi (2010), many companies choose to use a strategy of basic criteria such as maintaining the quality of goods, providing low prices, providing services in the form of timely delivery of goods to select suppliers within a company. The criteria for selecting green suppliers according to Hana & Nurcahyo (2019), there are 5 criteria in determining alternative green suppliers, namely quality, price, service which are traditional criteria, while environmental management and green technology are green procurement criteria. Companies can set other criteria to get suppliers according to the characteristics and provisions of the company.

In the hospitality business not only selling rooms to guests, but also providing Food and Beverage. The provision of perishable raw materials, especially quality meat, is one thing that must be considered starting from delivery to storage. Supplier selection is a very important aspect because it can affect the course of operations. Where in choosing a supplier, each hotel or villa has different criteria according to the hotel or villa policy itself, such as the price given is lower than the market price, environmentally friendly product packaging, timely delivery and others.

However, in operational activities at Nunia Boutique Villa Seminyak, there are still suppliers who use plastic in shipping goods, which means that the supplier is not implementing green supply chain management, while as we know that environmental issues are currently a concern for many people. In addition, the obstacles that are often faced are delays in delivery, the tenor given is not as desired, and the product provided is not in accordance with the specifications agreed upon at the beginning of the agreement.

RESEARCH METHODS

The types of data used in this research are qualitative data and quantitative data. Qualitative data is data that is described with words or a description of the object under study and is difficult to calculate. In this research activity, several things include information used to complete the research carried out, such as: General description of the hotel, organizational structure, and several documents obtained from the research location. Quantitative data is a type of data that can be measured or calculated directly, whose information or

explanation is expressed in numbers or in the form of numbers. In this study, the main data is quantitative data, namely data from questionnaires. The sources of data obtained in this study are primary data and secondary data. The primary data used in this study are the results of questionnaires and interviews. Secondary data is data obtained or collected by researchers from existing sources. This data is used to support primary information that has been obtained, namely from literature, previous research, websites, books, documents from the internet and other written data that is used as reference material. In this study, secondary data used is the general description of the villa and literature studies, company records or documents.

The data analysis method used in this research is the Analytical Hierarchy Process (AHP) method (Saaty, 1988). Calculations can be done manually using Microsoft excel or with the help of expert choice software. In determining the sample, this study used purposive sampling. Sampling in this case is limited to certain types of people who can provide the desired information, either because they are the only ones who have it or meet some criteria determined by the researcher (Sekaran, 2006). This is because the AHP method requires dependence on a group of experts according to the type of specialist involved in making decisions. In addition, the respondents involved must have sufficient knowledge and experience about the problem. Data collection techniques in this study consisted of 1) observation, 2) interview, 3) questionnaire, 4) document study.

FINDINGS

The criteria that influence the selection of green suppliers of perishable shoulder materials at Nunia Boutique Villa Seminyak are determined using the vendor performance index (VPI) which has a framework (QCDFR) namely quality, cost, delivery, flexibility, responsiveness (Li et al., 1997) and added environment management criteria .

Based on the results of a preliminary interview with Mrs. Keristina as chief accounting, Nunia Boutique Villa Seminyak as well as an expert or informant who knows about the selection of green suppliers, the QCDFR framework was approved by the informant. Identify the criteria by asking several questions contained in the interview guide so that 6 criteria are obtained in choosing green suppliers for meat raw materials at Nunia Boutique Villa Seminyak, namely quality, cost (price), delivery, flexibility, responsiveness, and environmental management.

After calculating the weight of each criterion and alternative, the weight is obtained globally (global priority). The results of the weighting of the criteria and alternatives can be seen in Table 1.

Table 1 Table of Global Priorities

Level 0	Level 1	Level 2	Weight	Alternative	Weight
	Quality (0.472)	Red and Fresh Flesh Color	0.628	Supplier X	0.604
				Supplier Y	0.311
				Supplier Z	0.085

Cost (0.192)	Odorless Meat	0.059	Supplier X	0.616
			Supplier Y	0.298
			Supplier Z	0.086
	Consistent Meat Taste	0.174	Supplier X	0.625
			Supplier Y	0.274
			Supplier Z	0.091
	Certificate Equipment	0.140	Supplier X	0.624
			Supplier Y	0.273
			Supplier Z	0.086
	Appropriateness of the price with the quality of the meat supplied	0.848	Supplier X	0.603
			Supplier Y	0.317
			Supplier Z	0.080
Delivery (0.091)	Payment Ease and Term	0.152	Supplier X	0.624
			Supplier Y	0.287
			Supplier Z	0.089
	Delivery Time	0.500	Supplier X	0.599
			Supplier Y	0.304
			Supplier Z	0.097
	Suitability of Type of Meat Sent	0.500	Supplier X	0.648
			Supplier Y	0.273
			Supplier Z	0.078
	Ease of adding or subtracting the number of orders	0.308	Supplier X	0.608
			Supplier Y	0.312
			Supplier Z	0.080
Flexibility (0.076)	Ease of changing delivery times	0.346	Supplier X	0.615
			Supplier Y	0.304
			Supplier Z	0.081
	Fulfilling Order Needs	0.346	Supplier X	0.647
			Supplier Y	0.266
			Supplier Z	0.087
	Speed In Responding To Customer Complaints	0.869	Supplier X	0.579
			Supplier Y	0.332
			Supplier Z	0.089
	Ease of Communicating	0.131	Supplier X	0.583
			Supplier Y	0.318
			Supplier Z	0.099
Responsiveness (0.067)	Conducting an Environmentally Friendly Production Process	0.646	Supplier X	0.645
			Supplier Y	0.265
			Supplier Z	0.090
	Have Environmental-Related Certificate	0.116	Supplier X	0.649
			Supplier Y	0.264
			Supplier Z	0.088
	Doing Waste Well	0.238	Supplier X	0.597
			Supplier Y	0.312
			Supplier Z	0.091
Environment Management (0.102)				

(Source: processed data, AHP 2022)

After getting *global priority*, the overall weight of each alternative can be calculated by adding up the weights for each supplier, the results are shown in the following table.

Table 2 Alternative Priority

Alternative	Weight	Rating
PT. Satria Pangan Sejati	0.615	1
PT. Aromaduta Rasaprima	0.300	2
PT. Ciomas Adisatwa Unit Bali	0.086	3

(Source: processed data, AHP 2022)

Based on the table above, it shows the order of priority in the selection of green suppliers at Nunia Boutique Villa Seminyak. PT. Satria Pangan Sejati is known to be ranked 1st in the priority order for selecting green suppliers with a weight of 0.615. Then in the 2nd order obtained by PT. Aromaduta Rasaprima with a weight of 0.300. Furthermore, in the last order obtained by PT. Ciomas Adisatwa Bali Unit with a weight of 0.086.

The selection of green suppliers based on each criterion can be seen in Table 3.

Table 3. Alternative Weights for Each Criterions

Criteria	Alternative		
	PT. Satria Pangan Sejati	PT. Aromaduta Rasaprima	PT. Ciomas Adisatwa Unit Bali
Quality	0,615	0,299	0,086
Cost	0,606	0,312	0,081
Delivery	0,624	0,288	0,088
Flexibility	0,624	0,293	0,083
Responsiveness	0,580	0,330	0,090
Environment Management	0,634	0,276	0,90

(Source: processed data, AHP 2022)

Table 3 shows PT. Satria Pangan Sejati excels in every Quality Criteria criteria at the supplier PT. Satria Pangan Sejati got a weight of 0.615. PT. Aromadura Rasaprima got a weight of 0.329 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.086. Cost criteria at supplier PT. Satria Pangan Sejati got a weight of 0.606. PT. Aromaduta Rasaprima got a weight of 0.312 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.081. Delivery Criteria at supplier PT. Satria Pangan Sejati got a weight of 0.624. PT. Aromaduta Rasaprima got a weight of 0.288 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.088. Flexibility criteria at supplier PT. Satria Pangan Sejati got a weight of 0.624. PT.

Aromaduta Rasaprima got a weight of 0.293 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.083. Responsiveness Criteria at supplier PT. Satria Pangan Sejati got a weight of 0.580. PT. Aromaduta Rasaprima got a weight of 0.330 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.090. Environment Management Criteria at supplier PT. Satria Pangan Sejati got a weight of 0.634. PT. Aromaduta Rasaprima got a weight of 0.276 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.090. With the AHP model that uses human perception as its input, inconsistency may occur because humans have limitations in expressing their perceptions consistently, especially if they have to compare many criteria. Based on this condition, humans can state that their perceptions will be consistent later or not. This consistency measurement is intended to see the inconsistency of the responses given by the respondents. If CR 0.1 then the pairwise comparison value in the given criteria matrix is consistent. If CR 0.1 then the value of pairwise comparisons in the given criteria matrix is inconsistent. If it is not consistent, then filling in the values in the paired matrix on the criteria and alternative elements must be repeated.

From the results of the AHP analysis above, the most influential criterion in the selection of green suppliers at Nunia Boutique Villa Seminyak is the Quality criterion with a weight of 0.472. The next influential criteria are Cost criteria with a weight of 0.192, Environment Management criteria with a weight of 0.102, Delivery criteria with a weight of 0.091, Flexibility criteria with a weight of 0.076, Responsiveness criteria with a weight of 0.067.

With the high value of Quality weight (weight value of 0.472) in the selection of suppliers, it shows that Nunia Boutique Villa Seminyak prioritizes high quality for the raw materials to be used. This is because good quality raw materials will have a good effect on the quality of the finished product. On the other hand, the use of low-quality raw materials will reduce the quality of the finished product. Quality criteria used in this study include four sub-criteria, namely Red and Fresh Meat Color, Odorless Meat, Consistent Meat Taste and Completeness of Certificates. Of the four sub-criteria, the sub-criteria for Red and Fresh Meat Color with a weight of 0.628 were considered the most important by respondents. Next is the Consistent Meat Taste sub-criteria with a weight of 0.174, then the Completeness Certificate sub-criteria with a weight of 0.140 and the last sub-criteria is the Odorless Meat sub-criteria 0.059.

In the sub-criteria for Red and Fresh Meat Color at the supplier PT. Satria Pangan Sejati got the highest weight with a weight of 0.604, then PT. Aromaduta Rasaprima who got a weight of 0.311 and the last one was PT. Ciomas Adisatwa Bali Unit received a weight of 0.085. PT. Satria Pangan Sejati is considered to have the best quality of meat, judging by the color of the meat that is fresh and still red. While PT. Aromduta Rasaprima and PT. Ciomas Adisatwa Unit Bali has meat quality under PT. Satria Pangan Sejati.

In the Odorless Meat sub-criteria at PT. Satria Pangan Sejati s get 0.616. Next PT. Aromaduta Rasaprima who got a weight of 0.298 and finally PT. Ciomas Adisatwa Bali Unit received a weight of 0.086.

In the sub-criteria of Consistent Meat Taste at PT. Satria Pangan Sejati s get 0.625. PT. Aromaduta Rasaprima got a weight of 0.274 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.091. PT. Satria Pangan Sejati is considered to have a more consistent taste compared to PT. Aromduta Rasaprima and PT. Ciomas Adisatwa Unit Bali.

In the sub-criteria for Completeness of Certificates at PT. Satria Pangan Sejati s get 0.624. PT. Aromaduta Rasaprima got a weight of 0.273 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.091. PT. Satria Pangan Sejati is considered to have a certificate that supports meat quality more than PT. Aromduta Rasaprima and PT. Ciomas Adisatwa Unit Bali.

In the overall assessment of PT. Satria Pangan Sejati excels in every Quality Criteria criteria at the supplier PT. Satria Pangan Sejati got a weight of 0.615. PT. Aromadura Rasaprima got a weight of 0.329 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.086. This shows that if the company wants to choose a supplier based on quality criteria, then the supplier selected is the supplier of PT. Satria Pangan Sejati because the supplier of PT. Satria Pangan Sejati is the most superior supplier on this criterion.

Cost criterion ranks second in the selection of green suppliers at Nunia Boutique Villa Seminyak with a weight of 0.192. The Cost criterion has an important role in choosing suppliers because the purchase of raw materials represents a sizeable portion of the sales value of the finished product. With lower raw material prices, the company is expected to be able to reduce raw material costs so as to increase profits. The cost criteria used in this study include two sub-criteria, namely the appropriateness of the price with the quality of the meat supplied and the ease and term of payment. The sub-criteria for price appropriateness with the quality of the meat supplied is known to get a higher score in the sub-criteria for selecting green suppliers with a weight of 0.848. Compared with the sub-criteria of Ease of Payment and Term of Payment with a weight of 0.152.

In the sub-criteria of appropriateness of price with quality of meat supplied by supplier PT. Satria Pangan Sejati is superior by getting a weight of 0.603 compared to the supplier PT. Aromaduta Rasaprima who got a weight of 0.317 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.080.

In the sub-criteria of Ease of Payment and Payment Period for suppliers, PT. Satria Pangan Sejati got a superior score with a weight of 0.624 compared to PT. Aromaduta Rasaprima got a weight of 0.287 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.089.

For the overall Cost Criteria, the best supplier is PT. Satria Pangan Sejati got a weight of 0.606. PT. Aromaduta Rasaprima got a weight of 0.312 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.081.

Environment Management criteria ranks third in the selection of green suppliers at Nunia Boutique Villa Seminyak with a weight of 0.102. Environment Management Criteria The research used in this study includes three sub-criteria, namely Conducting an Environmentally Friendly Production Process, which is

known to be ranked 1 in the priority order in the sub-criteria for selecting green suppliers with a weight of 0.646. Then in the second place, the sub-criteria for Doing Waste Well is obtained with a weight of 0.238. Furthermore, in the last order, the sub-criteria for Having Environmental Related Certificates obtained a weight of 0.116. For the overall Environment Management Criteria, the best suppliers are PT. Satria Pangan Sejati got a weight of 0.634. PT. Aromaduta Rasaprima got a weight of 0.276 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.090.

In the sub-criteria of carrying out an environmentally friendly production process, the supplier of PT. Satria Pangan Sejati s get 0.645. PT. Aromaduta Rasaprima got a weight of 0.265 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.090.

In the Sub-criteria of Doing Waste Well the supplier PT. Satria Pangan Sejati got a weight of 0.597. PT. Aromaduta Rasaprima got a weight of 0.312 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.091.

In the sub-criteria of having a certificate related to the environment, the supplier of PT. Satria Pangan Sejati s got 0.649. PT. Aromaduta Rasaprima got a weight of 0.264 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.088.

Delivery criteria ranks fourth in the selection of green suppliers at Nunia Boutique Villa Seminyak with a weight of 0.091. The Delivery Criteria used in this study include two sub-criteria, namely the Sub-criteria for Timeliness of Delivery and the Suitability of the Type of Meat Sent, which together have the same weight in order of priority in the sub-criteria for selecting green suppliers with the same weight, which is 0.500.

In the sub-criteria for the Punctuality of Delivery at the supplier PT. Satria Pangan Sejati received a weight of 0.599 PT. Aromaduta Rasaprima got a weight of 0.304 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.097.

In the sub-criteria for the suitability of the type of meat sent to the supplier, PT. Satria Pangan Sejati received a weight of 0.648. PT. Aromaduta Rasaprima got a weight of 0.273 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.078.

For the overall delivery criteria, the best supplier is PT. Satria Pangan Sejati who got a weight of 0.624. PT. Aromaduta Rasaprima got a weight of 0.288 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.088.

Flexibility criterion ranks fifth in the selection of green suppliers at Nunia Boutique Villa Seminyak with a weight of 0.076. The flexibility criteria used in this study include three sub-criteria, namely the Sub-criteria for Ease of Change in Delivery Time and Fulfilling Order Needs, both of which are known to be ranked 1st in the order of priority in the sub-criteria for selecting green suppliers with the same weight, which is 0.346. Then in the second place, the sub-criteria for Ease of Adding or Reducing the Number of Orders is obtained with a weight of 0.308.

Furthermore, in the sub-criteria of Ease of Change of Delivery Time at PT. Satria Pangan Sejati s get 0.615. PT. Aromaduta Rasaprima got a weight of 0.304 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.081.

In the sub-criteria of meeting the needs of orders at PT. Satria Pangan Sejati got a weight of 0.647. PT. Aromaduta Rasaprima got a weight of 0.266 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.087.

In the sub-criteria for the ease of adding or reducing the number of orders at PT. Satria Pangan Sejati s get 0.608. PT. Aromaduta Rasaprima got a weight of 0.312 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.080.

For the overall Flexibility Criteria, the best supplier is PT. Satria Pangan Sejati with a weight of 0.624. PT. Aromaduta Rasaprima got a weight of 0.293 and PT. Ciomas Adisatwa Bali Unit gets a weight of 0.083.

Responsiveness criteria ranks sixth in the selection of green suppliers at Nunia Boutique Villa Seminyak with a weight of 0.067. Responsiveness criteria used in this study include two sub-criteria, namely the Speed Sub-criteria in Responding to Customer Complaints, which is known to be ranked 1 in the priority order in the green supplier selection sub-criteria with a weight of 0.869. Then the 2nd order is obtained by the Ease of Communicating sub-criteria with a weight of 0.131.

On the sub-criteria for Speed in Responding to Customer Complaints at the supplier of PT. Satria Pangan Sejati received a weight of 0.579 PT. Aromaduta Rasaprima got a weight of 0.332 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.089.

Then on the sub-criteria of Ease of Communication at PT. Satria Pangan Sejati s get 0.583. PT. Aromaduta Rasaprima got a weight of 0.318 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.099.

overall Responsiveness criteria, the best supplier is PT. Satria Pangan Sejati got a weight of 0.580. PT. Aromaduta Rasaprima got a weight of 0.330 and PT. Ciomas Adisatwa Bali Unit received a weight of 0.090.

From the results of the overall calculation based on the criteria and priority sub-criteria in the selection of green suppliers at Nunia Boutique Villa Seminyak. PT. Satria Pangan Sejati is known to be ranked 1st in the priority order for selecting green suppliers with a weight of 0.615. Then in the 2nd order obtained by PT. Aromaduta Rasaprima with a weight of 0.300. Furthermore, in the last order obtained by PT. Ciomas Adisatwa Bali Unit with a weight of 0.086

CONCLUSION

The criteria in selecting green suppliers for perishable raw materials at Nunia Boutique Villa Seminyak are Quality, Cost (Price), Delivery, Flexibility, Responsiveness, and Environmental Management.

Based on the results of processing elements of the green supplier selection criteria at Nunia Boutique Villa Seminyak, it was found that the Quality criteria obtained a weighted value of (0.472) by looking at the Color of Red and Fresh Meat with Odorless Meat, Consistent Meat Taste, and Completeness of Certificates. Then the Cost criteria with a weighted value of (0.192) seen from the appropriateness of the price given by the supplier with the quality of the meat supplied and seen from the ease of payment and the time period given for

payment. Furthermore, the Environment Management criteria with a weighted value of (0.102) are seen from the Production Process that is Environmentally Friendly, Having Certificates Related to the Environment and Disposing of Waste Properly. Delivery criteria with a weighted value of 0.091. Judging from the Timeliness of Delivery and the Suitability of the Type of Meat Sent by the supplier. Flexibility criteria with a weighted value of 0.076 seen from the Ease of Adding or Subtracting the Number of Orders with Ease of Changing Delivery Time and Fulfilling Order Needs and Responsiveness criteria with a weighted value of (0.067) seen from the Speed in Responding to Customer Complaints with Ease of Communicating.

Based on the priority criteria and sub-criteria in the selection of green suppliers at Nunia Boutique Villa Seminyak, PT. Satria Pangan Sejati as the best supplier in the order of priority in selecting green suppliers with a weight of 0.615. The next priority PT. Aromaduta Rasaprima with a weight of 0.300 and the priority in the last order was obtained by PT. Ciomas Adisatwa Bali Unit with a weight of 0.086. This shows that overall the best green perishable raw material supplier for Nunia Boutique Villa Seminyak to serve as a long-term partner/partner is the supplier of PT. Satria Pangan Sejati because overall this green supplier has the highest value compared to the other two suppliers.

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