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The Analysis of Strategic Partnership to Supply Mandailing Arabica Coffee for Export Quality Markets

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Abstract. Coffee is a commodity that is essential to the international market. One of the best coffee from Indonesia is Mandailing coffee originating from North Sumatra. Simpang Banyak Mandailing Natal, North Sumatra Province is a centre of coffee agroindustry. It require best supplier in order to meet export market demand. Determination of required quality criteria in accordance with the standard of quality of coffee exports including the water content of 12%, a defective value below 4%, cherry seeds without mixture, cupping score is 85 and the uniform size of coffee beans. To meet the needs of the export market, the agroindustry also need a supply of coffee from the best coffee suppliers that have several criteria: Price, Quality, Production, and the accuracy of delivery by comparing these criteria at three suppliers chosen. A total of 10 experts were asked to choose an alternative based on the established criteria. Supplier selection weighting of data analysis in this study were calculated using analytical hierarchy process. The results showed that the most influential criteria to supplier selection criteria for Mandailing coffee is quality with a weight of 0.414 and a production with a weight of 0.277. Delivery accuracy weighting criteria is 0.245 and last criteria is the price of 0.065. While the best suppliers selected by the respondents is the Supplier Z with weights of 0.664 and supplier X (0.187) and last supplier is Y (0.176).

1. Introduction

Coffee is one of the important commodities in the International market [1]. Coffee is the most popular refreshment plants in the world and is consumed by millions of people every day. Coffee has become a lifestyle which is important for the main consuming countries especially in developed countries. Coffee is one of the commodities that may contribute to an important role for the development of agriculture in Indonesia. Coffee is also a commodity which is quite a role as an export commodity for the producer countries which are generally the developing countries so as to increase foreign exchange earnings [2].

Mandailings specialty Arabica coffee of the highest quality is one kind of specialty coffee that is preferred export market. Arabica coffee has a distinctive taste and has many varieties depend on the country, the climate, and land elevation [3]. Simpang Banyak Julu is one Mandailings coffee production center which is located in the district of Ulu Pungkut. Mandailing Natal. North Sumatra Province. Simpang Banyak Julu are subsistence farmers where coffee is the main commodity in addition to cinnamon and paddy fields. Arabica coffee produced from this village have a good quality. Simpang Banyak Julu has a agro-industries which have already marketed specialty Arabica coffee to export outlets. Although Simpang Banyak Julu is a centre of coffee production, it is not easy for the agro-industry in this village to meet market demand. The number of requests to exports market and local demand to make the agro-industry can not be fulfilled if only relying on land owned agro-industrial production. The main issues for coffee farmers to sell their coffee beans are the factors determining the

purchase price by the buyer or the container, which is generally a higher price and quick payment process preferred by the farmers to sell their coffee beans. While the main problems of coffee agro-industry in determining the purchase price is the quality of the coffee beans are assigned according to the agro-industry standards. The factors that influence the development of Mandailings coffee in undeveloped villages can be seen still low selling prices at the farm level if compared with the price of coffee beans at the level of exporters and can be seen from the level of welfare of coffee farmers of Mandailings are still low [4].

High export demand unfulfilled and low selling prices obtained by farmers level, buyers and collectors so as to encourage researchers to further determine the standard of suppliers based on supplier selection criteria in determining the quality of Mandailing coffee for export market. The coffee quality standards are applied as a reference to the farmers that are expected to improve the welfare of coffee farmers while also helping the agro-industry-coffee in facilitating the search for a coffee supplier with the best quality in order to help meet the increased production and agro-industries. Mandailings coffee as the main commodity is expected to be an alternative into improving the welfare of coffee farmers in Simpang Banyak Julu.. It must be realized that every company has the flexibility or discretion in determining supplier. It is necessary to identify what important factors that influence to the quality standards of export quality of Mandailings coffee using ISO standards and export standards so that we can design the supplier selection criteria for the quality of the coffee that involves not only the preferences of the company but also involves the association of Indonesian exporters and coffee experts. One of the methods that would be helpful for the supplier selection problem is Analytical Hierarchy Process (AHP).

2. Methods

Determination of the study area was done on purpose (purposive method). The selected study area is the District of Ulu Pungkut. Simpang Banyak Julu Mandailing Natal, North Sumatra province. Methods of processing and data analysis presented descriptively and analysed quantitatively as well as qualitatively. According to Ref. [5], descriptive analysis is focused on the field survey with interviews with respondents. Qualitative analysis is used to determine the internal environment, external and marketing mix and to support quantitative analysis using AHP. Strategy formulation process is done in three stages: input stage (internal and external environment analysis) and the stage of decision making using AHP.

The data collected in this research using interview and questionnaire method. The form of the questionnaire used in this study refers to the example of the questionnaire in [6]. While the items are compared in the questionnaire is the criteria, sub-criteria and alternatives (suppliers) that are used in supplier selection. The questionnaire was distributed to the respondents.

3. Results And Discussion

3.1. Analysis of AHP Method

Data Analysis Methods. AHP method involves certain steps:
- a) To identify the actor / actors and institutions involved in business of Mandailing coffee beans in Simpang Banyak Julu Mandailing Natal.
- b) On distribution and filling of questionnaires to experts and respondents.
- c) Conducted interviews to parties or experts concerning the quality of coffee beans Mandailings quality export markets.
- d) Is the determination of the criteria of the factors that affect the quality of the coffee Mandailings. The determination of these criteria is to determine the sub-criteria on the criteria of quality coffee, so you need to know what are the determinants of the quality of coffee beans Mandailings. This factor is based on ISO standards. Agro-industry standards, and standards of Indonesian Coffee Exports (AICE).
- e) Building the hierarchy of the decision problem.
- f) Creating a pairwise comparison matrix that describes the relative influence of each element contributing to each objective criteria level.

g) Calculating the weight / priority of each variable at level 1 (criterion).
h) Calculating the consistency index.
i) Calculate the ratio.
j) Calculating the weight / priority of each variable at level 2 (sub-criteria) of each criterion in supplier selection.
k) Calculating the weight / priority of each variable at level 3 (alternate).
l) After knowing the weight of each sub-criteria and weighting of each supplier is then determined the best supplier that can be chosen by an agro-industry as a supplier of raw materials for agroindustry through cooperation and contracts (carried out the most optimal supplier selection).

3.2. Respondent selection
The experts were consulted in this study were as many as 10 people. Specialists are those who are considered to have the skills, the appropriate background and in-depth knowledge relating to the object of study with coffee Mandailings quality supplier for the export market. The experts who are competent to give a decision has expertise based on experience and employment history, as well as practitioners associated with coffee Mandailings. Experts referred to in this study are from Supervisor Agroindustri Simpang Banyak Mandailings coffee, a coffee cooperative parties. Collector of (supplier), coffee growers, coffee entrepreneur and exporter of coffee.

3.3. Building the Hierarchy of the Decision Problem
Once the problem is defined, the next step is to break the problem into its elements intact. Troubleshooting is also made to the elements until no further possible solution to get accurate results. In AHP, the criteria usually arranged in the form of hierarchy and the framework (Figure 1 and 2). The criteria and sub-criteria in this study are the criteria and sub-criteria used by Agroindustry in selecting suppliers. Problems are arranged in a three-level hierarchy: Level 0 is the goal of selecting the best suppliers (optimal), the first level is a criterion in supplier selection, level 2 is sub-criteria which is a translation of the first level (criteria), while and level 3 is an alternative which the supplier should be selected. Selection criteria and sub-criteria in the Specialty Arabica coffee Supplier Mandailings.

1. Price
- Appropriateness price with the quality (A1)
- The ability to provide discounts (A2)
- Payment Method (A3)

2. Quality
- The water content of 12% (B1)
- Values below 4% disabled (B2)
- Picking seeds red (cherry) (B3)
- Results Cupping 85 (B4)
- Coffee beans of uniform size (B5)

3. Production
- A consistent supply of coffee (C1)
- The ability to provide consistent quality (C2)
- Ability to cope with the additional supply of coffee (C3)

4. Appropriateness of Delivery
- The ability to send goods according to the agreed date (D1)
- The accuracy of the amount requested by the agro-industry (D2)
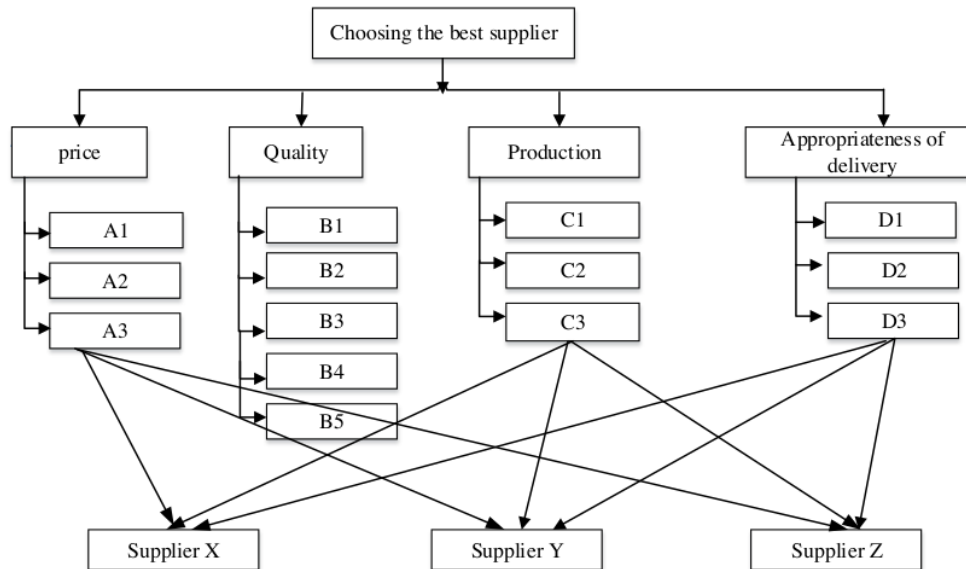- The ability in handling transportation system ((D3)

Figure 1. Structure Hierarchy of the Supplier Selection
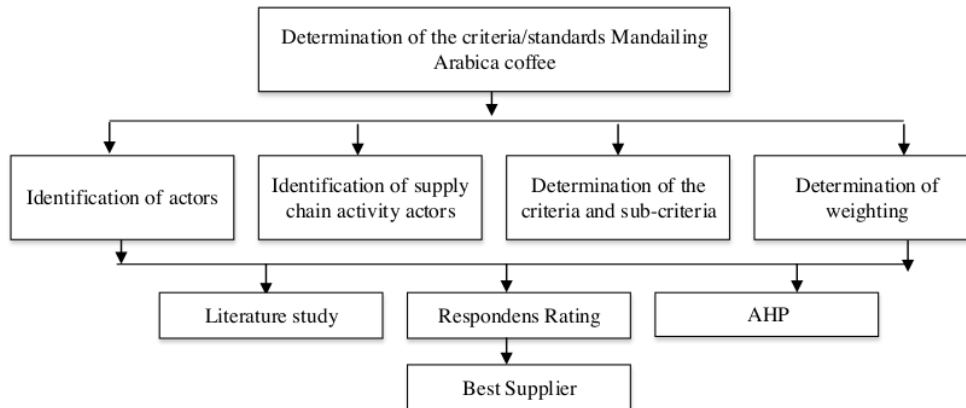
Figure 2. The Framework

Calculating the weight / priority of the interests of each variable at level 1 (criterion) that Price, Quality, Production and accuracy of delivery. Data for the measurement of importance of the criteria in supplier selection obtained through a questionnaire distributed to respondents amounted to 10 people. After assessment of 10 respondents obtained,   then the results are averaged using the geometric average (geometric mean). The results are shown in Table 1.

Table 1. Interest Priority Assessment Criteria in Supplier Selection

Criteria	Price	Quality	Production	Appropriateness of Delivery
Price	1	0.235	0.207	0.172
Quality	4.257	1	1.463	2.688
Production	4.829	0.683	1	1.116
Appropriateness of Delivery	5.814	0.372	0.896	1

From the calculation of pairwise comparisons between variables in choosing a supplier such as in Table 1, then the obtained weights is shown in Table 2.

Table 2. Priority Importance (Weighting Criteria in Supplier Selection)

Criteria	Weight	Priority
Price	0.065	IV
Quality	0.414	I
Production	0.277	II
Appropriateness of Delivery	0.245	III

Source: Results of Treatment AHP

Table 2 shows that in choosing a supplier for coffee beans Mandailings export quality key criteria that must be met by suppliers is quality criteria with weights 0.414, then the second priority is the production criteria that should be able to meet the supply needs of the agro-industrial and weighs 0.277, priority the next is the delivery accuracy criteria weighs 0.245 and last priority is the criteria of price and weighs 0.065.

3.4. Choosing the Optimal Supplier

After each of the criteria and alternatives available then synthesized to obtain an overall alternative weighting of criteria. Previous weight / local priorities (Local Priority) to look for the value of its global (Global priority) beforehand. To get the global priority by multiplying local priority with a priority level above (parent Criterion). In detail, the results of the weighting of criteria and alternatives can be seen in Table 3. Having acquired a global priority and then the weight of each alternative or each of the weights supplier (X. Y. Z) in total overall (global priority). The results can be seen in Table 4.

Table 4 shows that the supplier Z with a value of 0.664 is the first priority to be selected as the supplier for export quality coffee beans Mandailing. For the second priority is a supplier of X with a weight of 0.187, while for the last priority is the supplier Y weighs 0.176.

3.5. Consistency

With AHP models that use human perception as input, then inconsistencies may occur because humans have limitations in stating his perception of a problem or something, so that perception could be consistent or inconsistent. So with these limitations necessary to measure the inconsistency of respondents to the response given. So If CR <0.1 then the value of pairwise comparison matrices given criteria are consistent. But if CR> 0.1 then the value of the pairwise comparison matrix given criteria value is inconsistent. If the results obtained are inconsistent with the response given the respondent, then filling the values of matrix elements in pairs on the criteria and alternatives should be repeated as a whole to obtain consistent results. Table 5 show the value of consistency ratio (CR).

Table 3. Global Priority of AHP Treatment Result

Level 1 (Criterion)	Level 2 (sub-criteria)	Weight	Alternative	Weight
	A1	0.041	Supplier X	0.041
			Supplier Y	0.014
			Supplier Z	0.010
Price (0.065)	A2	0.014	Supplier X	0.002
			Supplier Y	0.003
			Supplier Z	0.009
	A3	0.010	Supplier X	0.001
			Supplier Y	0.002
			Supplier Z	0.006
	B1	0.107	Supplier X	0.018
			Supplier Y	0.020
			Supplier Z	0.069
	B2	0.098	Supplier X	0.015
			Supplier Y	0.013
			Supplier Z	0.070
Quality (0.414)	B3	0.096	Supplier X	0.014
			Supplier Y	0.015
			Supplier Z	0.067
	B4	0.061	Supplier X	0.009
			Supplier Y	0.012
			Supplier Z	0.040
	B5	0.052	Supplier X	0.008
			Supplier Y	0.010
			Supplier Z	0.034
	C1	0.035	Supplier X	0.006
			Supplier Y	0.005
			Supplier Z	0.024
Production (0.277)	C2	0.137	Supplier X	0.023
			Supplier Y	0.021
			Supplier Z	0.093
	C3	0.106	Supplier X	0.015
			Supplier Y	0.020
			Supplier Z	0.070
	D1	0.085	Supplier X	0.013
			Supplier Y	0.014
			Supplier Z	0.060
The accuracy of Shipping (0.245)	D2	0.131	Supplier X	0.018
			Supplier Y	0.021
			Supplier Z	0.091
	D3	0.029	Supplier X	0.004
			Supplier Y	0.005
			Supplier Z	0.021

Table 4. Alternative Weight in Overall

Alternative	Weight	Priority
Supplier X	0.187	II
Supplier Y	0.176	III
Supplier Z	0.664	I

Table 5. Consistency Ratio (CR) Ratings Respondents

Pairwise comparison	CR	Information
inter Criteria	0.058	Consistent
Inter sub-criteria Price	0.012	Consistent
Inter Sub-criteria Quality	0.095	Consistent
Inter sub-criteria Production	0.072	Consistent
Inter sub-criteria Accuracy Delivery	0.031	Consistent
Against Alternative inter sub-criteria (A1)	0.085	Consistent
Against Alternative inter sub-criteria (A2)	0.058	Consistent
Against Alternative inter sub-criteria (A3)	0.085	Consistent
Against Alternative inter sub-criteria (B1)	0.067	Consistent
Against Alternative inter sub-criteria (B2)	0.016	Consistent
Against Alternative inter sub-criteria (B3)	0.09	Consistent
Against Alternative inter sub-criteria (B4)	0.074	Consistent
Against Alternative inter sub-criteria (B5)	0.091	Consistent
Against Alternative inter sub-criteria (C1)	0.075	Consistent
Against Alternative inter sub-criteria (C2)	0.015	Consistent
Against Alternative inter sub-criteria (C3)	0.071	Consistent
Against Alternative inter sub-criteria (D1)	0.015	Consistent
Against Alternative inter sub-criteria (D2)	0.047	Consistent
Against Alternative inter sub-criteria (D3)	0.033	Consistent

From the analysis of data processing by using AHP the criteria of the most influential in the choice of suppliers for raw materials Mandailings coffee export quality are the quality criteria that weighs 0.065, production criteria and weighs 0.414, the criteria of timely delivery and weighs 0.277 and last criterion is the criterion of price to weight 0.245.

From the weight of quality is the criterion with the highest weight indicating that the quality is the criterion of the most prioritized by the agro-industry to Mandailing meet quality coffee bean supply export markets. Because if the quality is not good, then the green bean / coffee bean export market will not be accepted.

In the supplier selection order to meet the supply Agroindustry supplier selection is the most important criteria of quality criteria. This is consistent with the statement of ref. [7] who states that some criteria for supplier selection include the main thing is that the quality, price, service, and delivery. Where the quality criteria are also the most influential and occupy the first position in terms of determining the selection of suppliers based on rank order of importance according to [8]. It is closely linked to the quality of the finished product. If the quality of the raw material is good, then the final product also has a good quality value.

Quality criteria in this study include anything that becomes the most important criteria that can deliver coffee Mandailing accepted in the export market. Included in the criteria of quality is the water content of 12% (B1). Value defects below 4% (B2). Seeds quotation red (cherry) (B3). Results cupping 85 (B4) and the size of coffee beans uniform (B5). Of the five sub-criteria that are considered most important by respondents is sub-criteria moisture content of 12% (B1) with a weight of 0.258 then prioritized both considered important is the value marks under 4% (B2) with a weight of 0.206, then the sub-criteria seed picking red (cherry) (B3) with a weight of 0.232 and prioritized next is the result of cupping 85 (B4) with a weight of 0.148 and further prioritized the last of the coffee bean quality is uniform size (B5) with a weight of 0.125.

Absolute water content is more important for all criteria of market demand for exports. Because it takes a very long delivery and maximum water content of green beans can be kept during transportation old export is 12%. This is because it is such quality standards for export coffee beans. If you are picked perfectly ripe cherry in the form of seeds, the results obtained green bean is good, which it is also an impact on the value of disability decreases or disappears with the reduced defects in the green bean value will be obtained also cupping better results. For that process produces a good green bean specified start of the process of choosing the best seeds to grow until the harvest process that will determine whether or not the quality of specialty Arabica coffee beans. With a height of land which was also greatly affect the quality and taste. Usually this type of specialty coffee planted area up to 1700 meters above sea level altitude of 1200 so as to produce the highest quality coffee.

As for the sub-criteria of quality that are used in this study is the water content of 12% (B1). Value defects below 4% (B2), seed picking red / cherry (B3), the cupping 85 (B4) and the size of coffee beans uniform (B5). Maximum moisture content of coffee quality for export is 12% due to the shipping process. This is in accordance with the general provisions of the coffee quality requirements of point 3 the water content of 12.5% [9].

Total value of disability is below 4% where the total value of the maximum disability is 11 or that are in the first quality [9]. is also consistent with the statement of literature indicating that generally Arabica coffee beans exported from Indonesia are quality Grade 1 with a value of maximum flaw 11 while for 60% robusta coffee beans are exported in the form of quality 4 [10]. Quality is also determined from the harvesting process. It is associated with a defect that dominate the coffee beans in Indonesia, where the factors that causes black seeds, white – pale, broken seed, hollow seeds and others due to harvesting systems are less effective. So as to maintain the quality of the coffee beans must considered an effective harvesting process that is only just harvest the red fruit (cherry) [11].

Another aspect that greatly affect the marketability of the determination is the cupping process. Cupping score of   85 is a prerequisite for the determination of the quality particularly for specialty coffee [12], whio states that any transaction using cupping of coffee for coffee quality determination, particularly in the segment specialty. Some of the reasons to do with the process of cupping is to assess the coffee beans to be sold, for product quality control to develop test and evaluate new products and mix (blend) and also to ensure that the purchased materials quality as desired by the buyer.

As for the other aspects affecting the quality of the coffee beans are coffee beans the size and uniformity of size. the size of coffee beans are uniformly required that the results of the coffee roasting produces a good process that can not be found charred seeds or undercooked [13]. Uniformity of size of coffee beans is also necessary because preferred by the buyer, this is in accordance with the literature Ref. [14], who states that the seeds should be uniform in size, shape and colour. For example, larger size will be preferred by the buyer.

4. Conclusions
The most influential criteria in the selection of the supplier for Mandailing coffee export quality is the quality criteria with a weight that weighs 0.414 quality, the production criteria and weighs 0.277, the delivery accuracy criteria and weighs 0.245 and last criteria is the criteria of price with a weight of 0.065.

Based on the overall criteria and sub-criteria in supplier selection, the supplier Z is rated as the best supplier as an alternative supplier to the industry with a weight of 0.664. The second priority is a supplier of X with a weight of 0.187. And the last priority is the supplier Y weighs 0.176. From the ranking results, these priorities can be concluded that the supplier can be a partner or business associate

long term to meet the supply of quality coffee beans export for the agro-industry is the supplier Z. because the weights based on the overall criteria for supplier Z has a value higher weight than the weight of a supplier to another.

From the results of data processing using AHP The excess is the supplier that best meets the criteria in terms of price, quality, production and timely delivery. Supplier Z is able to provide quality green coffee beans with a good bean moisture content of 12% -12.5%. Supplier Z put quotation red beans because besides being a mediator. Supplier Z is also a coffee plantation owner who had often received counselling assisted maintenance of coffee from the local agriculture department .Supplier Z also is believed to collectors Simpang Banyak farmers in the village so that the supplier Z has a supply of coffee beans green bean more than any other supplier. That are expected to help the agro-industry in meeting the supply of coffee beans green bean Supplier Z also has another added value that besides having a large area for sunning red stringed beans, these suppliers have a dryer so that when the high rainfall intensity (sunlight less) can use the machine dryer. For sorting. Supplier Z also have workers who do the sorting to separate the seed green bean the appropriate size and separating the seeds burst and separate it from impurities. For storage, suppliers Z has a warehouse, where all coffee made with plastic packaging first and then inserted into the packaging bag. In terms of delivery of coffee beans green bean, the Agroindustry parties also need not worry, because the location is close to the Agro-industry of supplier Z. So some of those reasons with the added value that the supplier is able to make the supplier Z, superior supplier of X and Y. The results showed that while the actors involved in the supply chain in coffee research specialty Arabica Mandailing are composed of coffee farmers (perpetrator production) collecting small collecting a large agro-industries cooperatives wholesalers, traders, exporters, and finally commodity to the hands of consumers.

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