Managerial implications of North Sumatera coffee export risks using the failure mode and effect analysis method

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Abstract. Managing risk can be conducted starting with the process of identifying and measuring the magnitude of the risks occurred. The study of coffee export risk management research is based on the experience of experts in the coffee export business. Risk management is the most important element to protect companies from the risk of losses that may arise. The purpose of this study is to examine the types and sources of risk, as well as the magnitude of the risk. Then give a proposed strategy in the risk of North Sumatra coffee exports. The location of the research determined purposively. The research data are primary data obtained from interviews using questionnaire. The data analysis method used is Analytical Network Process (ANP) and Failure Mode and Effects Analysis (FMEA). The results showed that the biggest risk to coffee exports was in production activities (procurement of raw materials until it ready to be sent) while the lowest risk was at policy risk. The exporters need to give sustained guidance to farmers in yielding products in accordance with standards and be able to cooperate with the government in the continuity of export.

1. Introduction
Coffee is one of the agricultural commodities in Indonesia which has a strategic role in the Indonesian economy. From the sale of coffee in the world market, this agricultural commodity contributes a substantial foreign exchange to the Indonesian state along with other plantation products.

The export market is a complex place to be explored with various criteria of coffee. Various threats appear in coffee export because of various things, like volume and even price fluctuation, nevertheless the growth of world traders directly or indirectly involved. This has led to a various phenomenon including understanding of the best-selling strategies and satisfy international customers. The strategic position of a product in the minds of international customers can play an important role for marketers to compete on a global scale [1]. Coffee export activity is a great opportunity for Indonesia to sell coffee products that manufactured in Indonesia. Export is an activity of selling goods or services from a country with its prime products to various countries [2].

Indonesia has coffee export competitors from various countries. This should be a reminder that Indonesia should pay more attention to the quality of exported coffee because it allows for various risks to be arose in coffee export activities, it could be due to production, distribution, financial and exporters or importers regional policies. This process aims to gain profits and increase foreign exchange of manufacturer countries with foreign currencies used in the transactions [2]. Implementation of risk management and proper actions in dealing with risks are the main things that
must be implemented by every coffee exporter, in order to maintaining the risk in the company properly.

2. Materials and method
The location determination in this research was purposively. The location of the study was taken based on the criteria that have been determined. As for the criteria of the location is in the coffee exporter region in North Sumatera, the Indonesian Coffee Export Association of North Sumatra. The population in this study is whole coffee exporters. The number of respondents for this study were 30 respondents (exporters) coffee.

2.1. Analytical Network Process (ANP)
In this research, Superdecision software is used as a tool in completing ANP calculations. The values obtained from the results of the respondent's questionnaire in the form of opinions regarding the interdependence of the elements in each cluster were dismounted to a supermatrix. From the super matrix, we will get the final result which will show which element has greater contribution based on predetermined weights [3,4].

2.2. Failure Mode and Effect Analysis (FMEA)
The detailed process of conducting FMEA can be divided into the following steps;
1. All items of failure and problems that often occur during operational activities Determine the failure mode of each component and its impact. Give the value of severity / severity (S) of each mode.
2. Determine the cause of failure and estimate the chance of each failure occurring. Determine the rate of occurrence (O) of each failure mode in accordance with the chance of occurrence.
3. To get the priority level of risk that occurs in North Sumatra coffee exporters from risk sources using the calculation of the Risk Score Value (RSV) with the following formula:
   $$RSV = (Severity) \times (Occurrence)$$

From the RSV value obtained, the risk priority level of North Sumatra coffee exporters can be identified for risk prevention and resolution strategies [5].

3. Results and discussion
From the results of risk identification, starting from the coffee bean growers then collected to be distributed by exporters where the exporters who are responsible for the handling of coffee delivery documents up to the hands of buyers. So, it is known that there are several risks that can occur in this process, namely production risk (raw material procurement), distribution risk (travel), financial risk, and policy risk (export regulations) of the importing and exporting country.

3.1. Analytical Network Process (ANP)
In analysing using the ANP method, the following steps must be formulated, namely:
1. Determine risk criteria
2. Compare each risk criteria
3. Assess the importance of each criterion on a scale of 1-10
4. Determine the weight of risk
After evaluating the effect of each criterion and problem, the level of risk is obtained through a questionnaire that is processed using the ANP method with the application of superdecision [3,4].

The results obtained, shown that the biggest risk that is most influential in carrying out the first coffee export process is in terms of production, the second is policy, the third is financial, and the fourth is distribution.

Production risk factors have the highest risk value. This is related to the production / procurement of imported raw materials face lots of risk threat to the coffee quality and punctuality of distribution.
Experior must pay more attention to coffee bean flow from planting to coffee ready to send to match the request of the importing country. The need for efficiency in the procurement of raw materials so that North Sumatra coffee can be sold at high prices and able to compete in world markets [1, 6].

Policy risk factors are caused by constraints in limited international trade such as tariffs and complicated documentation procedures. The policy also covers contracts stipulated in the transaction process, in this case when the importing country wants high quality but exporters have difficulty meeting demand because of the lack of knowledge of farmers in realizing the desired quality of their coffee. Business ties and trust between the two parties are needed in the process of determining the contract and the transaction process. This policy risk factor can also be caused by the absence of the government’s role in assisting farmers and exporters in dealing with stiff competitors, hampering exporters from entering the world export market [1, 7].

Financial risk factors are caused by an increase in coffee prices due to crop failure, exporters have to pay more but not to raise high prices because they are afraid of not being able to compete on world markets because the prices are too expensive. Moreover, if world coffee production increases, the prices will decrease [1]. In addition, the exchange rate is also a special concern for exporters because the exchange rate affects the short-term fluctuations, but in the long run the exchange rate fluctuations do not have a large effect because they can cover losses due to the exchange rate in certain periods. Exchange rates, production costs, quality and technology are the causes of congestion in the export system. A proper export strategy is needed for export continuity [8].

The last ranking is distribution risk factors. Distribution is the most problematic type of risk after financial. Transportation problems caused by theft and problems with shipping difficulties are also problems that farmers directly express when coffee is ready to be sent [9].

3.2. Failure Mode and Effect Analysis (FMEA)

From the results of the identification of the sources of risk obtained from interviews with several exporters, then an assessment of the sources of risk using the FMEA method. It aims to facilitate decision making by knowing priority risks. Explanation of the sources of risk and the results of the assessment based on the FMEA method [5].

Based on Table 1. The top 10 priority risks are taken, the highest RSV value is caused by delays in coffee supply, coffee prices have risen, the value of the dollar has fallen (rupiah strengthened), not in accordance with export quality standards, coffee quality mismatches, insufficient coffee supply from farmers, contract transaction/misunderstanding (carelessly looking at the contract), contaminated by pests, and inappropriate storage room. The next is Figure 2 which shows the top 10 priority risk diagrams that can cause losses.
Table 1. Risk priority score & RSV value

| No | Code | Activities                          | Risk Variable          | S  | O  | RSV |
|----|------|------------------------------------|------------------------|----|----|-----|
| 1. | A    | Production Delay in coffee supply  | 7 6 42                 |    |    |     |
|    | B    | Inadequate supply of coffee from farmers | 4 7 28                |    |    |     |
|    | C    | Coffee quality mismatch            | 7 4 28                 |    |    |     |
|    | D    | Coffee Damage (defective)          | 8 5 40                 |    |    |     |
|    | E    | Storage room is not appropriate    | 6 4 24                 |    |    |     |
|    | F    | Pest contaminated                  | 6 4 24                 |    |    |     |
| 2. | A    | Distribution Broken Packaging      | 7 3 21                 |    |    |     |
|    | B    | Accident / theft on way            | 7 3 21                 |    |    |     |
|    | C    | Incomplete Export File             | 6 3 18                 |    |    |     |
|    | D    | Not in accordance with export quality standards | 8 4 32     |    |    |     |
| 3. | A    | Financial Dollar value goes down (Rupiah strengthens) | 7 5 35     |    |    |     |
|    | B    | Increasing Coffee prices           | 7 5 35                 |    |    |     |
|    | C    | Break the promise / default        | 9 2 18                 |    |    |     |
|    | D    | Poor financial report              | 4 3 12                 |    |    |     |
| 4. | A    | Policy Changes in export regulations | 6 2 12                |    |    |     |
|    | B    | Stunted exports due to domestic politics | 6 3 18              |    |    |     |
|    | C    | Misunderstanding of contracts / transactions (not looking carefully at the contract) | 9 3 27 |    |    |     |
|    | D    | Changes in importing country regulations | 7 2 14 |    |    |     |
|    | E    | Failed to send due to import country conflict | 8 2 16 |    |    |     |

From Figure 2 we get 10 risk priorities for North Sumatra coffee exporters. The highest RSV value is a risk priority with the highest handling strategy and watch out so that North Sumatra coffee exporters do not suffer losses.

3.3. Managerial implications
The control strategy in handling production risks must be carried out correctly in order to produce the products that buyers want, so that the sustainability of contracts between exporters and importers can continue. Exporters must pay attention to quality and improve efficiency, in terms of quantity, price,
time and place according to what is stated in the contract. This is done so that North Sumatra coffee can still compete and be accepted at high prices in importing countries [1]. The importance is to support Indonesian coffee farmers to prioritize local coffee beans. The increase in promotion is done by introducing the types of coffee from various regions in Indonesia. Training for farmers on market opportunity information in order to increase farmers' motivation to produce quality coffee beans and be able to compete in the ASEAN market (Association of Southeast Asian Nations) [6].

Exporters must comprehend the international trade. The existence of long-term vision to analyse the risks that will occur and can estimate risks. The use of protective devices such as insurance, and risk management options stated in the contract. Exporters must not only rely on profits in terms of domestic currency, but must be able to define the ratio and profitability and increase of the North Sumatra coffee market in the world in dollar [8]. The role of government in giving influence to overcome the exchange rate. The government must be able to motivate exporters to increase the volume of exports in order to maintain the value of exports amid the strengthening of the rupiah, the goal is that the trade balance remains surplus [10].

In controlling distribution risk, it is not only exporters who are expected to oversee the shipping process, but also the role of the government in improving the improvement of infrastructure and transportation facilities in coffee plantations. It also expects the government in terms of supervision and penalties for smuggling that occurs in the distribution process of export [6]. Punctuality of the transaction also needs to be considered; in this case the distribution process runs if the initial transaction has been carried out by the importing country.

Policy risk. Here the role of the government is more expected so that the export process can be sustainable. Creating bureaucratic regulations that are not complicated and do not require a long time in handling export licensing. Exporters play a role in selecting importers to create mutually beneficial cooperation for related parties [10]. Exporting companies must not merely seek profits for shareholders but also design larger schemes to achieve a variety of political objectives, and generally become organizations that serve more than the needs of their consumers [11].

4. Conclusions
From the two methods based on ANP and FMEA, there is a similarity in the level of risk of production/procurement of raw materials as the highest risk with a value of 0.388 for the ANP value and the risk priority value from the FMEA method using the RSV calculation of all production risk variables included in the 10 highest risk priority categories. So exporters must really pay real close attention to the process of production / procurement of raw materials because in this section, quality is maintained and quality control, storage warehouses, and pest protection lie in the production / procurement of raw materials in order to maintain quality starting from ready to send to importers. It is recommended to further researchers to keep on updating on export information from prices to quality. And to exporters to be motivated in fostering coffee farmer groups to plant in accordance with the SOP desired by buyers, and pay more attention to the improvement and consistency of agreements in the contract so that all agreements between exporters and importers to become clearer so that the North Sumatra coffee export business can be sustainable.

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