

# **Analytical Hierarchy Process at Supply Chain Management of Efficient Shallots (Case Study at Medan Main Market, North Sumatera)**

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## **ABSTRACT**

This research aims to identify and analyze roles, actors and alternative scenarios to form an efficient supply chain management of shallots in the Medan Main Market. The sample in this study were five respondents with judgment sampling method. The data taken in this research is primary data which is distributed directly to respondents. The results of baking data were analyzed using expert choice 11 software to identify and analyze roles, actors and alternative scenarios in forming efficient onion supply chain management in Medan City Main Market. The results of the analysis show that the product availability factor is the most determining factor in establishing efficient supply chain management of shallots. The actors who are considered to have the most role on the distributor side in the availability of products and achieving the goals of the producers' business sustainability are collectors. In achieving the objective of producing business sustainability, the alternative scenario chosen is government policy.

**Keyword:** supply chain management, analytical hierarchy process, shallots.

## **1. INTRODUCTION**

Shallots are a horticultural commodity that is classified as a spice vegetable. This spicy vegetable is much needed, especially as a complement to cooking spices to add flavor and enjoyment to food. In the current problem, Medan Main Market requires a supply of 100 tonnes of shallots/day to complement consumer needs. However, the amount of production in North Sumatra aimed at the Medan main market is not sufficient to meet this need. This can lead to scarcity and increase the price of shallots. Reported by Republika (2016) the price of shallots reaches Rp 40.000,00/kg in Medan City and the supply of shallots comes from Karo and Dairi.

Supply Chain Management is a series of approaches applied to efficiently integrate suppliers, entrepreneurs, warehouses and other storage areas. Products produced can be distributed with the right quantity, place, and time to minimize costs and satisfy customers. SCM aims to make the entire system efficient and effective, minimizing costs from transportation and distribution to inventory of raw materials, materials in process, and finished goods. There are several main players who have an interest in SCM, namely suppliers, processors (manufacturers), distributors (distributors), retailers (retailers) and customers (David et al., 2000 in Indrajit and Djokopranoto, 2005).

According to Marimin and Maghfiroh (2010), the supply chain structure of agricultural products is unique because it does not always follow the chain order above. Farmers can directly sell their agricultural products directly to the market as retail, thus breaking the chain of middleman, manufacturers and distributors.

Based on this understanding, one way to see efficient supply chain management is to use the Analytical Hierarchy Process (AHP) method. The Analytical Hierarchy Process (AHP) was developed by DR. Thomas L. Saaty from the Wharton School of Business in the 1970s for organizing information and judgments in selecting the most preferred alternative (Saaty, 1993).

AHP is a method used in decision making, as well as a tool to understand the conditions of a system and predict decision making in a process. AHP is very useful and very important for decision making in determining the priority of several factors or alternative strategies that exist and will be implemented.

## **2. RESEARCH METHODOLOGY**

This research was conducted in Medan Main Market, North Sumatera. The material used in this study was shallots. Method to analyze the efficient supply chain management of shallots using the Analytical Hierarchy Process (AHP). AHP is a method used in decision making, as well as a tool to understand the conditions of a system and predict decision-making in a process. AHP is very useful and very important for decision making in determining the priority of several factors or alternative strategies that exist and will be implemented.

Saaty (1993) sequences the problem-solving steps using AHP, which are as follows:

1. Define the problem and determine the desired solution.
2. Creating a hierarchical structure starting with the general goals, factors, actors, goals, and alternatives at the lowest level of the hierarchy.
3. Create a pairwise comparison matrix.
4. Calculating the overall weighting value of the hierarchy and determining the alternative ranking of the weights obtained.
5. Check the consistency of the assessment matrix.
6. Look for the weighted value of the entire hierarchy and determine an alternative ranking of the weights obtained.

And choose the highest alternative weighting value from the product.

To analyze the efficient supply chain management of shallots using the Analytical Hierarchy Process (AHP) by filling out a questionnaire, samples in this case are the Head of the

Facilities and Infrastructure Division of the North Sumatra Provincial Agriculture Office, Deputy Head of the Main Market for Medan City, Chair of the Karunia Rengas Farmer Group, Head of UPTD Simalungun, Head of UPTD Haranggaol Horison selected based on judgment sampling method. This method is carried out with the consideration of effectiveness, that based on the judgment of the researcher or expert, the sample concerned is the most suitable party, who has "information rich" and has an understanding of shallot supply chain management (Cooper and Emory, 1996). The five respondents were selected based on their capacity in making policies regarding shallot products.

### **3. RESULTS AND DISCUSSION**

#### **Questionnaires Result**

Based on the results of the interviews at the identification stage, it was found that the elements involved in the preparation of efficient supply chain management in the Medan Main Market. At this stage, each respondent determines the factor variables, actors, objectives and alternative scenarios based on priorities according to their expertise and knowledge. The results of the hierarchical determination questionnaire filled out by the respondents were collected into a hierarchy.

a) Factors that make an efficient supply chain management of shallots in Medan Main Market.

In determining the factors, there are two factors, namely price stability and product availability. All respondents agree that price stability is one of the factors because fluctuating prices will affect the supply and demand of shallots. A small demand will have an effect on the offers made by producers, collectors as well as distributors and traders. In addition, price stability also affects consumer interest who will switch to imported shallots. Because imported shallots are much cheaper.

The second factor is product availability. The availability of shallots is used as an important factor in forming supply chain management because products that are always available are the basis for supply chain management. Product availability is very influential because when the customer orders the onion and the shallot is not there, the possibility of the customer to re-order is very small. So that the product must always be available, in order to ensure the smooth supply to customers.

b) Actors involved in establishing efficient supply chain management in Medan Main Market.

In determining priority actors in supply chain management, there are four actors who receive recommendations, namely producers, collectors, distributors and traders. Producers are shallot farmers in the cities of Medan, Simalungun and Samosir, both of which make shallots

farming as a main or a side job. With land that is used for their own or lease and farmers who are members of the farmer group. Based on interviews with stakeholders, producers from these areas are producers (farmers) who supply about 85% of the need for shallots in the Medan Main Market.

Collecting traders in question are collecting traders in the village or district who are an extension of the distributor's arm.

Distributors are individuals or groups to sell shallots in large quantities. Distributors who are in this wholesale market are also a gathering place for shallots from various regions, so traders can easily get shallots according to demand. This distributor supplies shallots to traders in markets spread across Medan City, restaurants, catering even to shallot traders in the Siborong-borong area.

Traders are individuals who buy small or medium amounts of shallots. Usually these traders sell shallots to retailers, restaurants and catering which require small amounts of shallots to sell to household consumers.

c) The purpose of forming an efficient shallot supply chain management in Medan Main Market.

The objectives to be achieved in forming an efficient shallot supply chain management in Medan Main Market in the hierarchy arrangement, respondents recommended four objectives, namely increasing the welfare of producers, the sustainability of producer businesses, the sustainability of distributor businesses, and increasing product value.

d) Alternative scenarios to form an efficient shallot supply chain management in Medan Main Market.

There are 3 (three) alternative scenarios in forming an efficient shallots supply chain management in Medan Main Market, namely facilities and infrastructure for producers, access to information and technology and government policies.

Facilities and infrastructure for producers are an alternative scenario that forms an efficient supply chain management because to support the improvement of supply chain performance, the facilities and infrastructure needed by producers should be provided so that producers are not difficult if they need them, such as fertilizers, quality seeds, and pesticides. If everything is available, the producer can work optimally without having to think about the obstacles that will be faced.

Another alternative scenario is the development of access to information and technology. The development of access to information includes market and price information, so that producers and collecting traders are being faced by distributors, so that all parties can understand and understand each other.

The other alternative scenario is government policy, because government policy is very necessary, especially for the provision of facilities and infrastructure, eliminating shallot imports, and issuing base prices for producers, roof prices for distributors and collectors as well as a conducive business climate policy.

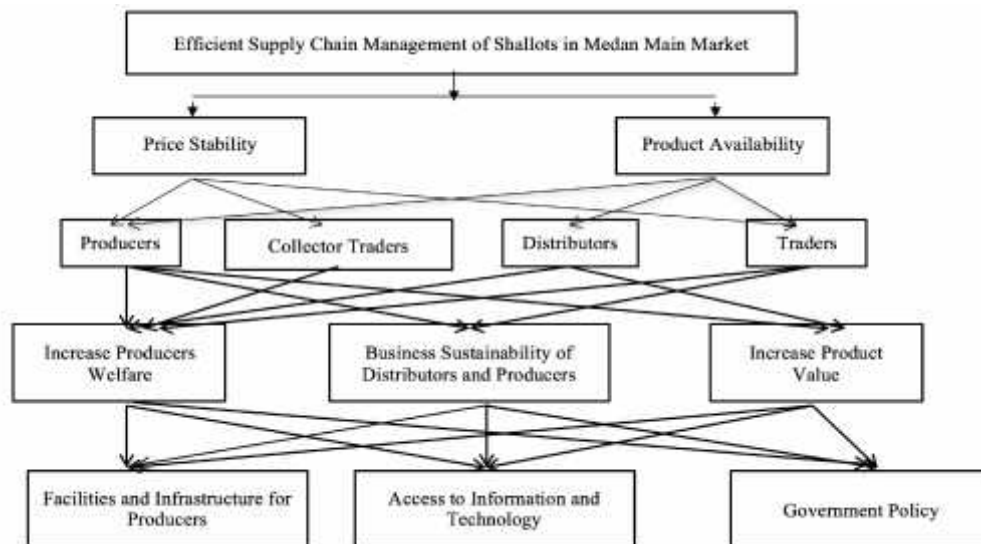


Figure 1. Analytical Hierarchy Process (AHP) Scheme for Efficient Supply Chain Management of Shallots in Medan Main Market

### Interpretation of Each Criteria

AHP has set a goal, namely to establish efficient supply chain management of shallots in the Medan Main Market. In achieving this, scenario priorities are obtained to achieve it, namely the government policy scenario (0.640), which means that by implementing this scenario, the goals will be achieved. Then following the second scenario is the facilities and infrastructure for producers (0.267), and access to information and technology (0.093), then the goal will be achieved.

Several factors that will support this scenario include the most important of which are product availability (0.667) and price stability (0.333). This means that according to policy makers (experts) the availability of products is a top priority in forming an efficient supply chain management of shallots, but still combined with other factors.

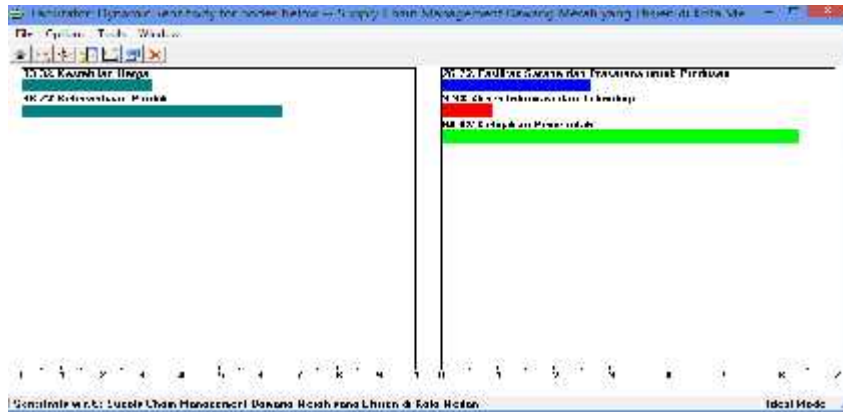


Figure 2. Graph of Sensitivity to Factors That Form Shallots Supply Chain Management

a) Product Availability (0.667)

The availability of products is fundamental and a very important factor in establishing efficient supply chain management of shallots. Red onions, which are always available throughout the year, make it a commodity that has the potential to be developed in business. If it is hampered, then price stability will greatly affect the availability of the product.

b) Price Stability (0.333)

Price stability is also an influence in efficient supply chain management. This has an effect because if the price fluctuates with high frequency, it will have a large effect on demand. The stable price will make it easier for actors to make their business plans in the shallot trade. However, it should also be remembered that price stability is inseparable from the availability of shallots in the supply chain members

**The Role of Actors and Their Proportions in Scenario**

In Figure 3, it can be seen that with the same priority scenarios, namely facilities and infrastructure for producers, collectors have a very important role. It can be seen from the priority value of 0.403, this value is higher than other actors, namely producers of 0.370, traders of 0.134 and distributors of 0.094. However, no matter how small the priority value is, all parties must work together to achieve the desired goals together.

Model Name: Analisis SCM Bawang Merah yang Efisien di Kota Medan

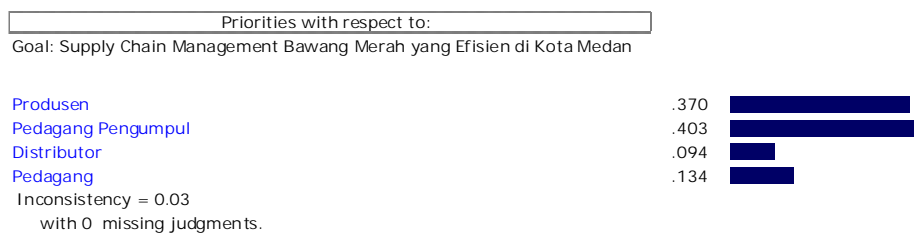


Figure 3. Graphs of Actors That Form Supply Chain Management of Shallots

a) Collector traders (0.403)

Collector traders have the most important role in forming an efficient supply chain management of shallots because of the role of the collecting traders in bridging the economic needs of producers and the needs of distributor supplies. As a middleman (intermediary), either an extension of the distributor or personally, the middleman also has a role to play in providing guidance to producers such as helping producers when their shallot plants are attacked by diseases and assisting producers in cultivating shallots. All this is done by collector traders to join strive to form an efficient supply chain management so that common prosperity can be achieved. Keep in mind, the existence of collecting traders is very profitable and necessary when viewed from the point of view of distributors and traders. If from the producer side, the existence of collector traders who make farmers only become price takers and do not get the power to determine the selling price of shallots themselves.

b) Producers (0.370)

Producers as the spearhead of the shallots supply chain need to be facilitated with supporting facilities and infrastructure to cultivate shallots. With the fulfillment of the producers needs, the producers can carry out cultivation activities properly. Producers no longer need difficulties in finding seeds or confusion to deal with their shallot plants which are attacked by diseases or pests. If the facilities and infrastructure are easily available, the producers will be more enthusiastic in cultivating shallots.

c) Traders (0.134)

The trader becomes the part that guarantees the marketing of the resulting product to the end consumer. Support from traders in the marketing aspect will affect the sustainability and success of the shallot business in establishing efficient supply chain management in Medan Main Market. With market guarantees, shallot products produced by producers have a definite market and producers do not need to be confused about selling their products.

d) Distributor (0.094)

Distributors are considered measly influence in establishing efficient supply chain management. The small value of the distributor, it is possible that the role of the distributor is considered insufficient in achieving goals. In fact, the distributor is a gathering place for shallots from withany area and is ready to distribute them to the traders below them. Distributors have the strength that can be a support to form an efficient supply chain management of shallots.

## The Role of Objectives and Proportions in Scenarios

From Figure 4 it can be seen that of the four objectives, two of them are in favor of the producers. Producer business sustainability has the highest priority value with 0.413, followed by an increase in producer welfare with 0.360, followed by an increase in product value 0.160 and distributor business sustainability with 0.106. Thus it can be interpreted that in each scenario that has been made, each of them can proportionally answer the objectives that all parties want to achieve in order to achieve a fair supply chain management that wants producers to get more attention.

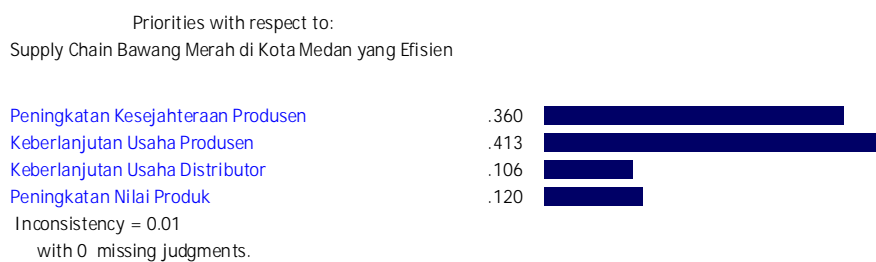


Figure 4. The Purpose Graph Forming Supply Chain Management of Shallots

### a) Producer Business Sustainability (0.360)

The sustainability of the producer business is the most important goal in establishing efficient supply chain management of shallots in Medan Main Market. Producers must be assisted in terms of facilities and infrastructure so that their business can continue. This assistance can be provided by collectors and distributors. And this relationship of assistance should be a relationship of mutual need between producers, collectors and distributors. The distributor's role in the sustainability of the producer business is to provide capital to collector traders or producers that will benefit all parties. Because if the producers business stops, the supply of shallots will also be hampered.

### b) Increase Producer Welfare (0.413)

Increasing the welfare of producers is the second priority because the level of welfare of shallot producers who supply the needs of the main market in Medan is still considered less attention. Producers want a prosperous life and can meet their needs more than their present life. They want an increase in the value of their harvested shallots. Many parties are trying to improve the welfare of producers who supply shallots in the main market of Medan, including middlemen and distributors as well as the government.

### c) Increase in Product Value (0.120)



The increase in product value is assessed by the increase in the quality of shallots, supply and accuracy in delivery. Sorting and grading are also actions that can be taken to increase product value. Another thing that is usually done to increase product value is to increase the technology of shallot production.

d) Distributor Business Sustainability (0.106)

Distributor business sustainability is the last thing to be taken into account in efficient supply chain management of shallots. This is because the distributor's business sustainability will always be able to run if the producers are still able to supply the shallots that the distributor wants. So it can be concluded that the sustainability of this distributor's business is closely related to the sustainability of the producers' business.

**Priority Scenarios in Achieving Goals**

In achieving goals, several strategic scenarios are formulated. The highest priority scenario is government policy (0.640) so that the focus on the intended strategy is considered effective to achieve efficient supply chain management of shallots. The next scenario is facilities and infrastructure (0.267), then access to information and technology (0.093).

Synthesis with respect to: Supply Chain Management Bawang Merah yang Efisien di Kota Medan

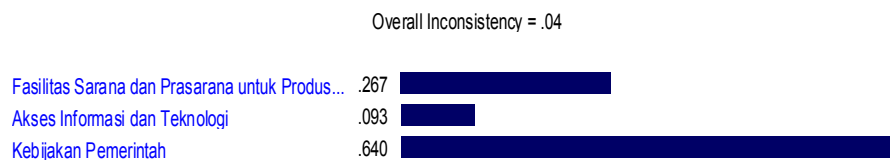


Figure 5. Graph of Scenario Priorities in Achieving Goals

a) Government Policy (0.640)

Government policy becomes the most priority alternative scenario. This is because government policies are needed, especially to provide capital for facilities and infrastructure, base price policies, roof price policies and so on. The priority value is very large because the role of government policy intervention so far is quite large. The information obtained, government policies have started to support shallot farmers in the city of Medan, especially in Medan Marelan. However, at the level of traders, collectors and distributors, the government's role is less visible. As facilitators, regulators and motivators who are very important in creating a conducive business climate, the role of government is needed in this scenario.

b) Facilities and Infrastructure for Producers (0.267)

Facilities and infrastructure for producers are an alternative to the second important scenario. This is because if the production facilities and infrastructure are fulfilled in sufficient

quantities, the appropriate types, good quality and affordable prices will greatly support the formation of efficient shallot supply chain management. Therefore, the availability of facilities consisting of seeds, fertilizers and pesticides as well as other supporting facilities, needs to be carried out in accordance with the needs and used at the right time and place.

c) Access to Information and Technology (0.093)

The development of access to information and technology has the smallest priority value. This is because of the sources of information received are not comprehensive. Access to information that needs to be developed in this case is at the producer level. It is expected that all parties can find out about market conditions and prices. With this knowledge, it is hoped that producers will have a good bargaining position in the supply chain. Actions that can be taken to improve access to information include frequent discussions among supply chain members. Technology development can be achieved through technology transfer from traders to producers. So that integrated technology can be used for the purpose of increasing product value and will also improve the welfare of producers.

#### **4. CONCLUSION**

To form an efficient supply chain management in the Medan Main Market, analyzed using the Analytical Hierarchy Process (AHP) method using expert choice 11 software, it was found that the product availability factor was the most determining factor in establishing an efficient shallots supply chain management. The actors who are considered to have the most role on the distributor side in the availability of products and achieve the goals of the producers' business sustainability are collectors. In achieving the objective of producing business sustainability, the alternative scenario chosen is government policy.

#### **SUGGESTION**

The recommendations proposed in order to form an efficient supply chain management need serious support from all supply chain actors in order to be implemented optimally. Especially capital assistance from the government for producers so that producers can become price makers and be prosperous.

By knowing the supply chain management of shallots in the Medan Main Market and knowing the factors, actors, objectives and alternative scenarios that form an efficient supply chain management, further research efforts are needed on supply chain management efforts through the study of product value added development and financial aspects. As well as a study of business ethics in partnership, both from the producer and distributor side.

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