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Assessment Supply Chain Performance and Risk of Agricultural Commodities in South of Sulawesi

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Abstract
The supply chain of agricultural commodities is very complex, because many actors and activities in the production process. The main actors of supply chain are farmers, then small collectors, large sellers, market traders, retailers and end-use consumers. This study aims to assess the performance and risk of supply chain agricultural commodities in South Sulawesi. The research method used is qualitative descriptive. The results showed that there are four supply chains in vegetable and fruit commodities in South Sulawesi. While the risk of supply chain using five assessments of price changes, shrinking value, market access, weather and infrastructure.

Keyword: Supply Chain, Agriculture Commodities, Farmer, Trader

1. Introduction

Indonesia consists of several agricultural sectors namely the subsector of small agriculture (food crops sub-sector), estate sub-sector, livestock sub-sector, forestry sub-sector and fishery sub-sector. Indonesia is an agricultural country where agriculture plays an important role in the national economy. To compensate for the rapid growth of the population of Indonesia, the advanced agricultural business should be encouraged agricultural areas of Indonesia. In an effort to build Indonesian agriculture so that the quality and quantity of agricultural products can be improved, it is necessary to play the role of government in terms of agricultural policy to achieve equality of food self-sufficiency. Development of agriculture sector is a priority sector related to the welfare of farmers.

Since the beginning of the emergence of supply chain management started from the management of supply and inventory. The results of supply chain research have been very diverse in manufacturing and agro-industry. The type of supply chain discussed also varies, from simple supply chains to complex networks. Various model completion techniques have also been applied ranging from operational research techniques to artificial intelligence. Production collaboration is often noticed based on some previous research results is cooperation with external suppliers (Meixell and Gargeya 2005) and model completion needs to consider the use of efficient techniques to obtain a good solution (Shen 2007). Optimization techniques continue to be a new approach in the field of supply chain management. The application of genetic algorithm has been done by Sha and Che (2006), Keskin and Üster (2007), Aliev et al. (2007), and Radhakrishnan et al. (2009). Fuzzy logic is specifically applied by Petrovic et al. (1999), while Rohde (2004) implements artificial neural networks in combination with analytic methods. Heuristic techniques are also frequently used such as Wouda et al. (2001), Kagnicioglu (2006), while heuristics by Sabri and Beamon (2000) and Aghezzaf (2005). Simulation techniques are still a concern as well as Vorst et al. (2000) and Zee and Vorst (2005) discussed the supply chain of horticultural commodities.

The supply chain needs to be well managed which is known as supply chain management. Vorst et al. (2007) defines supply chain management is the integration of planning, implementation, coordination and control of all business processes and activities to efficiently produce and deliver products to meet market needs. Pujawan (2005) defines it as a method, tool, or approach to supply chain management. Simchi-Levi et al. (2000) defines as a set of approaches utilized to efficiently integrate suppliers, manufacturing, warehousing and storage so that goods are produced and distributed in the right amounts, at the right

locations and at the right time in order to minimize overall system costs while meeting all needs at every level. Thomas and Griffin (1996) define it as the simultaneous management of material and information flows within and between facilities such as vendors, production, assembly and distribution.
Chapra and Meindi (2007) assert that the approach that is able to overcome obstacles, technical and non technical is supply chain management which covers aspects of material flow, information and money. Some literature studies on the supply chain of agricultural commodities, Van der vorst (2004), Marimin and Magfiroh (2010) suggest that the management of the agricultural supply chain is much more complicated than the supply chain of manufactured products. The complexity of supply chain management in fulfilling order and demand by m of raw material (x), at price (y), and delivery (z) can be met by S1, S2, ... Sn which of course has different value for m, as well as in other streams. In order to achieve system objectives, good governance management of materials, information and money is required.
Agricultural supply chain management is very complex, because there are many actors and activities in the production process. The main actors of the supply chain are farmers, then small collecting traders (villages), large collecting traders (sub-districts), agro-industries, exporters, distributors, retailers and end-use consumers. Activities include cultural, post-harvest, processing, packaging, storage, delivery and risk management aspects (Shafiro, 2001; Chopta, 2003; Van der varst, 2004; Chapra and Maindi, 2007; Saidisin and Ritchie, 2009; Saltini et al, 2012). Management needs include hard and soft applications, both conventional and advanced, such as artificial intelligence such as fuzzy logic, neural network and genetic algorithms that can improve the productivity of a managed supply chain system (Yu et al , 2006; Cakir and Canbolat, 2008; Wang and Hsu, 2010; Marimin et al., 2013).
Risk management in supply chain management does not differ greatly from general risk management. That is, the basic concept in risk management can be applied as usual. Implementation of the basic concept of risk management can be initiated by understanding the risk management cycle. Hallikasa et al. (2004) has formulated a risk management process consisting of (i) risk identification; (ii) risk assessment; (iii) decision making and implementation of risk management measures; (iv) risk monitoring. Basically, this process is a sequential and closed loop.
According to Hallikas et al. (2004) there are several types of risk management measures, namely risk transfer, risk taking, risk elimination, risk reduction and follow-up analysis of specific risks. Decision makers can apply one of these types based on the real state of the company. However, sometimes the mental strength of decision makers also exerts influence in the selection of risk management measures. This can happen if risk management measures are to be taken individually. Risk-taking type of decision makers will take extreme measures and vice versa, risk-averse type will take actions that will benefit personally. That is, the risk management process should involve collective decision-making so that actions taken can be monitored together.

2. Material and Method

The research was conducted in several districts in South Sulawesi, Indonesia including District of Gowa, District of Maros, District of Bantaeng and District of Enrekang. Agricultural commodities analyzed are agricultural commodities that are not durable vegetables and fruits. This research classifies respondents consisting of farmers traders, small collectors, large collectors, distributors, retailers and end users. Total respondents in this study as many as 100 people. The indicators of this study are Performance and Risk. This research method is qualitative descriptive, while data collection using interview and FGD (Focus Group Discussion).

3. Result and Discussion

Supply Chain Performance of agricultural commodities
Supply chain system is an organization that involves many companies. The progress or decline of supply chain performance will have the same impact on the performance of companies that are part of the supply chain. A supply chain consists of many activities and each activity requires continuous improvement. Each activity of the supply chain has involved the company as a member of the supply chain. This means that supply chain improvement will benefit the improvement of the company's performance.
Analysis of the supply chain of agricultural commodities in South Sulawesi is divided into 2, namely the supply chain of vegetables and fruits. The supply chain of vegetables consists of several ropes of supply; the first supply chain consists of farmers, small collectors, large collectors, wholesale market traders, retailers,

and consumers. This first supply chain sometimes does not run normally because in certain conditions large traders directly to farmers, especially farmers who have large-scale production. Similarly, the presence of small collecting merchants is also under certain conditions, bringing the goods directly to the parent market. This usually occurs when a significant price change occurs; In the second supply chain, starting from farmers, small collectors, large collectors to hotels, restaurants and supermarkets; In the third supply chain, farmers, small collectors, large merchants then go out to the outer islands; while in the fourth supply chain, farmers, small collectors, large merchants, and small and micro industries. Supply chains based on vegetable source areas are Gowa, Enrekang, Maros and Bantaeng .

Farmers as producers play a major role in vegetable production, while small collectors and large collectors contribute to the distribution of vegetables in South Sulawesi and some islands in Indonesia. Market traders and retailers play a role in the sale of vegetables in markets to consumers and small and micro-based vegetable industries. Small and micro industry actors are the actors who use vegetables as their raw materials and these actors buy vegetables in vegetable market centers in South Sulawesi. The capacity for selling between the actors is different, the largest capacity is large collecting traders with a maximum of 2-5 Ton of all vegetables, while the smallest selling capacity is retailers with a maximum of 30-50 Kg of all vegetables. Below is a depiction of a chain of vegetable actors in South Sulawesi.

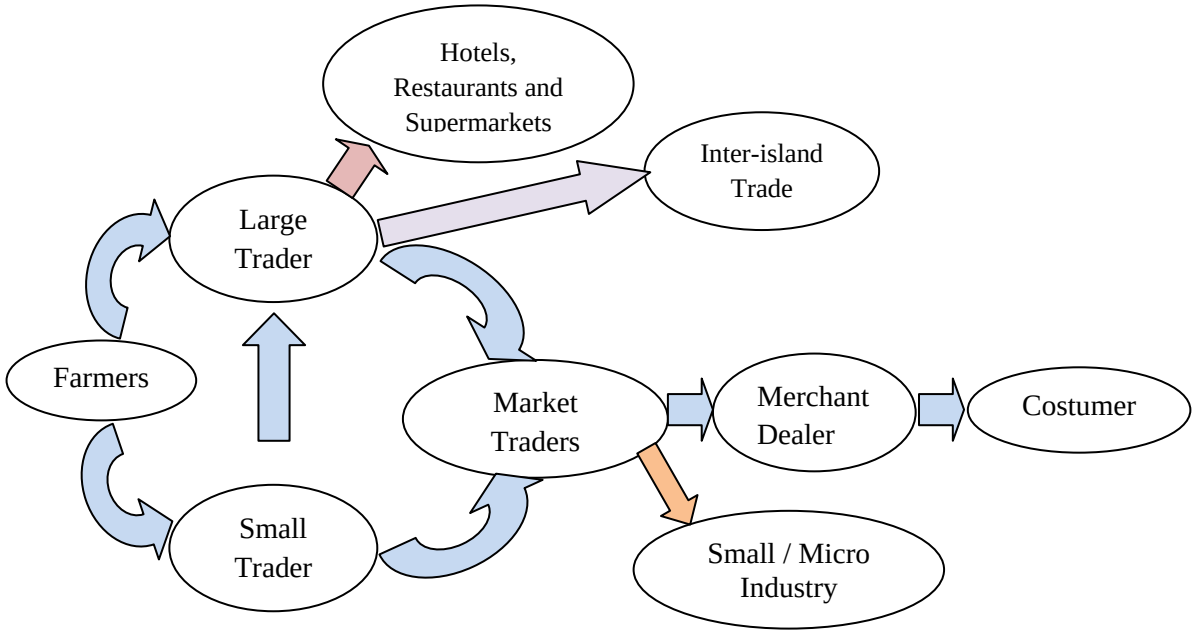

Figure 1. Agricultural Commodity Supply Chain Flow (Vegetables)

For fruits commodities, most of the local fruit sold by market traders in South Sulawesi are from fruit-producing centers such as Bantaeng, Gowa, Maros, Enrekang, Barru and Luwu and Polmas. The fruit is watermelon, papaya, banana from Gowa, Maros, Bantaeng, Enrekang and Barru. As for the Luwu area, the area is Luwu, palopo, masamba and polmas and Bulukumba which produce durian and langsat. As for imported fruit such as fuji apples, red apples, and pears originated from China and the United States. The supply chain for fruit traders also consists of several supply chains namely; the first supply chains are farmers, small merchant traders, big traders wholesalers, retailers and consumers. While the second supply chain is importers, large importer traders, large merchant traders, wholesale market traders, retailers and consumers; The third supply chain is farmers, small collectors, large collectors to hotels, restaurants and supermarkets; while the fourth supply chain is farmers, small collectors, large merchants, wholesale market traders to several islands in Indonesia.

According to Kulkarni and Khot (2012) an effective performance measurement system is to represent the whole system, able to influence the behavior of the entire system and provide information system performance for decision makers and stakeholders. Performance measurement is a glue that is capable of creating value for strategic planning and plays a major role in monitoring the implementation of that strategy.

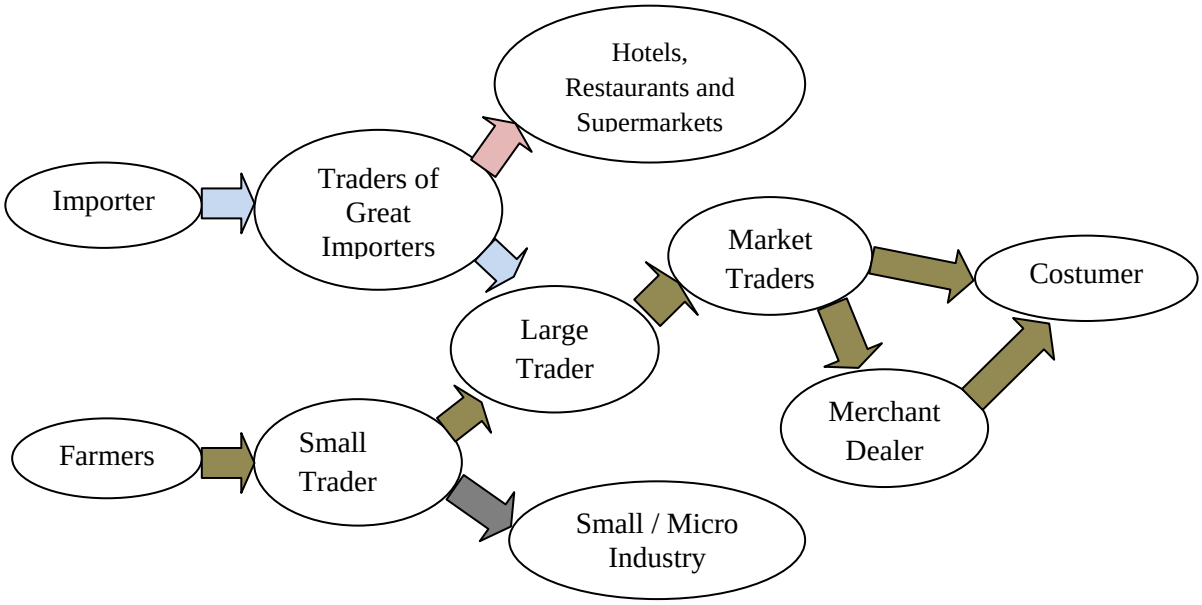

Figure 2. Flow Supply Chain Agricultural Commodities (Fruits)

Risk of Agricultural Commodity Supply Chain

Risk assessment is not just taking into account losses from a financial point of view such as cost. Non-financial losses should also be considered such as trust, learning ability and reputation, which are difficult to convert into monetary values, but which can cause financial losses in the long term. This risk assessment aims to gain a deeper understanding of the environment and to assist decision makers in expressing the need for further investigation. Less accurate risk assessment will result in poor quality decision making.

Table 1. Risk Assessment of Agricultural Commodity Supply Chain

	Type of Risk				
	Price	Shringk the	Market	Weather	Infrastructure
		Value	Accsess		
Vegetables	L	M	L	H	M
Fruit	L	H	M	M-H	L

L (*Low*), M (*Medium*), H (*High*)

Based on Table 1. The risk of fruit vegetables commodities is based on several indicators. The risk of price changes on vegetables is so small that price fluctuations occur only under certain conditions. As for the shrinking value range occurs. The use of technology for storage and packaging is still so traditional that the range of damage occurs, so the longer in the supply chain, the more impaired. Vegetables are one of the basic needs after rice, so these vegetables are very quickly sold. Vegetables are available at all levels of the market, making it very easy for consumers to find. The weather is also very influential on vegetable commodities. In dry weather vegetable crops are usually very difficult to grow, so, the supply chain is experiencing shortages caused by reduced farmer production. While the facilities / infrastructure also have an effect, especially on the distribution channel.

Tang and Tomlin (2008) have identified various sources of risk and classified them into six supply chain risks: supplier risk, process risk, demand risk, intellectual property risk, behavioral risk and socio-political risk. Supplier risk is an event occurring due to supplier performance that is not in accordance with established standards. For example the delay in delivery of materials that resulted in production activities to be shut down. The impact, among others, is not being able to meet the demand in accordance with the schedule that has been planned. The Company will bear the loss of a penalty fee from the customer.

The second risk is the process. This risk is sourced from internal operations consisting of in-bound and out-bound logistics. Risk triggers are usually sourced from production capacity and quality. Demand risk is another type of supply chain risk. In the era of globalization, many companies have developed business strategy by expanding the market to several countries. The goal is to increase revenue. The risk of intellectual property is the type of risk associated with operational efficiency.

4. Conclusions and Recommendations

Analysis supply chain of agricultural commodities in South Sulawesi is divided into 2, namely the supply chain of vegetables and fruits. The supply chain of vegetables consists of several supply chains; the first supply chain consists of farmers, small collectors, large collectors, wholesale market traders, retailers, and consumers. While the supply chain also consists of four supply chains. The risk of supply chain is divided into five, namely the risk of price change, the risk of shrinking, market access risk, the risk of weather, and the risk of infrastructure.

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