The supply chain of North Sumatera shallot

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Abstract. Shallot is one of the main food seasonings in Indonesia, which cannot be substituted with other ingredients. North Sumatera is one of the provinces producing shallot. Even it produces quite a large amount of production, there is still a large gap between the shallot production and consumption amount in North Sumatera due to its high consumption. Thus, the shallot supply chain in North Sumatera must always be maintained, so that the shallot can be well distributed to maintain price stability and meet consumer demand. In order to be managed properly, it is necessary to know the North Sumatera shallot supply chain. This study described the supply chain of North Sumatera shallot. The study was conducted by tracing the North Sumatera shallot supply chain starting from the production centre to the final destination regions, and then the supply chain was drawn in the Causal Loop Diagram. The results showed that the shallot production centres in North Sumatera Province consisted of six districts, namely Simalungun, Samosir, North Tapanuli, Dairi, Karo, and Toba Samosir. There were six final destination regions for shallot from those six districts, namely Medan, Padang Sidempuan, and Sibolga in North Sumatera, Kuta Cane in Aceh, West Sumatera, and Riau.

1. Introduction
Shallot is one of the important horticultural crops in Indonesia. Indonesian people usually use shallot as a mixture of food seasonings and traditional medicines. Almost all Indonesian recipes use shallot as one of the spices in their mix. It results, in addition to red chilli, shallot becomes an important commodity whose supply must be available at all times in the market because its scarcity and rising price can stimulate inflation [1,2].

North Sumatera is one of the regions with the highest consumption per capita of shallot in Indonesia [3]. Although shallot continues to be needed by the community with a relatively constant amount of consumption per capita, the community must continue to face fluctuation in the uncertain price of shallot. In fact, at the time of harvest, when supply increases, the price of shallot commonly rises [4]. Even shallot can be produced in almost all regions of Indonesia, national shallot production centres are mostly located on Java Island. Meanwhile, in North Sumatera itself, the amount of production and productivity of shallot is still relatively low, so that the available supply, both shallot originating from North Sumatera and from Java, are unable to meet the needs of shallot of the people in North Sumatera [1]. It indicates a problem in the North Sumatera shallot supply chain.

A supply chain that is too long to involve many intermediaries and speculators often becomes a problem in the distribution of important food commodities [5]. In fact, the amount of consumption per capita that tends to be constant is enough to help in calculating the need for shallot to plan the amount of production and supply of shallot, so that price can be stabilized. In order to contribute to gain the
stability of the shallot price in North Sumatera, this study aimed to describe the supply chain of the North Sumatera shallot.

2. Methods
Districts that were shallot-producing regions in North Sumatera were designated as research locations on a purposive basis (Purposive Method). The main producing districts of shallot in North Sumatera included Simalungun District, Samosir District, North Tapanuli District, Dairi District, Karo District, and Toba Samosir District [3]. Thus, in accordance with the objectives of the study, the study areas were determined in these districts.

The population in this study were all farmers and shallot traders in North Sumatera Province. The samples in this study were farmers, farmer groups, warehouse management, collector traders, wholesalers, and shallot retailers. The samples were determined using the Cluster Method and the Snowball method. Secondary data obtained from relevant agencies and primary data obtained by conducting interviews were analysed descriptively, then the shallot supply chain was described by a Causal Loop Diagram.

3. Results and discussion
Figure 1 showed the supply chain of the North Sumatera shallot, illustrated in the form of a Causal Loop Diagram.

![Figure 1. The supply chain of North Sumatera shallot](image-url)
Market was redistributed to Medan City and Riau Province, while excessive shallot from Kabanjahe Market was distributed again to Medan City. After fulfilling market needs, the excessive shallot from Dolok Pardamean Subdistrict and Girsang Sipangan Bolon Subdistrict was distributed to Pematang Siantar City, and then the further excessive was distributed again to Medan City and Riau Province.

Figure 2. The supply chain of Simalungun shallot

Figure 3. The supply chain of Samosir shallot

Samosir District had eight shallot-producing subdistricts (Figure 3), namely Simanindo Subdistrict, Pangururan Subdistrict, Sianjur Mulamula Subdistrict, Harian Subdistrict, Palipi Subdistrict, Sitirotio Subdistrict, Onan Runggu Subdistrict, and Nainggolan Subdistrict, then marketed to Medan City, Padang Sidempuan City, Sibolga City, West Sumatera Province, and Riau Province. After fulfilling market needs, excessive shallot from Simanindo Subdistrict, Pangururan Subdistrict, Sianjur Mulamula Subdistrict, and Harian Subdistrict was distributed to Haranggaol and Sidikalang. After fulfilling market needs, excessive shallot from the Haranggaol Market was distributed to Kabanjahe City and Saribudolok.
City, while excessive shallot from Sidikalang Market was distributed to Kabanjahe City and Pematang Siantar City. Furthermore, after fulfilling market needs, excessive shallot from Kabanjahe Market was redistributed to Medan City, excessive shallot from Pematang Siantar Market was redistributed to Medan City and Riau Province, while excessive shallot from Saribudolok Market was distributed again to Pematang Siantar City which ultimately had an excessive again then distributed to Medan City and Riau Province. After fulfilling market needs, excessive shallot from Balige Market was distributed to Pematang Siantar City and Tarutung City. Furthermore, after fulfilling market needs, excessive shallot from the Pematang Siantar Market was redistributed to Medan City and Riau Province, while excessive shallot from the Tarutung Market was distributed again to Sibolga City, Padang Sidempuan City, and West Sumatera Province.

North Tapanuli District only had one shallot-producing subdistrict (Figure 4), namely Muara Subdistrict, then marketed to Medan City, Padang Sidempuan City, Sibolga City, West Sumatera Province, and Riau Province. After fulfilling market needs, excessive shallot from Muara Subdistrict was distributed to Balige City and Tarutung City. After fulfilling market needs, excessive shallot from Balige Market was distributed to Tarutung City and Pematang Siantar City. Furthermore, after fulfilling market needs, excessive shallot from the Tarutung Market was distributed again to Padang Sidempuan City, Sibolga City, and West Sumatera Province, while excessive shallot from Pematang Siantar Market was distributed again to Medan City and Riau Province.

Figure 4. The supply chain of North Tapanuli (Tapanuli Utara) shallot

Dairi District only had one shallot-producing subdistrict (Figure 5), namely Silahisabungan Subdistrict, then marketed to Medan City and Riau Province. After fulfilling the market needs, the excessive shallot from Silahisabungan Subdistrict was distributed to Sidikalang City. After fulfilling the market needs, excessive shallot from Sidikalang Market was distributed to Kabanjahe City and Pematang Siantar City. Furthermore, after fulfilling market needs, excessive shallot from Kabanjahe

Figure 5. The supply chain of Dairi shallot
Market was distributed again to Medan City, while excessive shallot from Pematang Siantar Market was distributed again to Medan City and Riau Province.

Karo District had three shallot-producing subdistricts (Figure 6), namely Merek Subdistrict, Payung Subdistrict, and Tiganderket Subdistrict, then marketed to Medan City, Kuta Cane, and Riau. After fulfilling market needs, excessive shallot from Merek Subdistrict was distributed to Kabanjahe City and Pematang Siantar City, while excessive shallot from Payung Subdistrict and Tiganderket Subdistrict was distributed to Kabanjahe City and Kuta Cane City in Aceh Province. Furthermore, after fulfilling market needs, excessive shallot from Kabanjahe Market was distributed again to Medan City, while excessive shallot from Pematang Siantar Market was distributed again to Medan City and Riau Province.

![Figure 6. The supply chain of Karo shallot](image)

Toba Samosir District had eight shallot-producing subdistricts (Figure 7), namely Ajibata Subdistrict, Lumban Julu Subdistrict, Uluan Subdistrict, Tampahan Subdistrict, Balige Subdistrict, Laguboti Subdistrict, Sigumpar Subdistrict, and Siantar Narumonda Subdistrict, then marketed to Medan City, Padang Sidempuan City, Sibolga City, West Sumatera Province, and Riau Province. After fulfilling the market needs, the excessive shallot from the eight districts was distributed to Balige City and Pematang Siantar City. After fulfilling the market needs, the excess shallot from Balige Market was distributed to Pematang Siantar City and Tarutung City. Furthermore, after fulfilling market needs, excess shallot from Pematang Siantar Market was distributed again to Medan City and Riau Province, while excessive shallot from Tarutung Market was distributed again to Sibolga City, Padang Sidempuan City, and West Sumatera Province.

![Figure 7. The supply chain of Toba Samosir shallot](image)

All regions would only redistribute shallot to the next area if their own market needs had been fulfilled, or in other words, they will only distribute excessive shallot if the amount of shallot entering the market was more than the market needs. However, if the amount of shallot entering the market was
less or equal to market needs, the shallot would be spent to meet market needs and not be distributed again to the next area. For Medan City itself, at the time of this study, the market needs reached 100 tons/day. Due to the small amount of shallot production from producer areas, many shallot supply chains did not reach Medan City. When this research was conducted, the shallot produced in North Sumatera Province whose supply chain reached Medan City only came from Samosir District and Karo District areas. According to the closure of imported goods, to fulfill market needs, shallot in Medan City when this research was carried out had to be supplied from West Sumatera Province, namely from the Solok City area.

4. Conclusions
The shallot production centres in North Sumatera Province consisted of six districts, namely Simalungun District, Samosir District, North Tapanuli District, Dairi District, Karo District, and Toba Samosir District. There were six final destination regions for the distribution of shallot from the six districts, namely Medan City, Padang Sidempuan City, Sibolga City, Kuta Cane City in Aceh Province, West Sumatera Province, and Riau Province. All of the shallot production centre districts distributed their shallot to Medan City and Riau Province. Samosir District, Toba Samosir District, and North Tapanuli District also distributed their shallot to Padang Sidempuan City, Sibolga City, and West Sumatera Province, while Karo District also distributed shallot as far as Kuta Cane City in Aceh Province.

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