

# Supply Chain Model for Agro Products from Central Sulawesi Province to the Archipelago Capital

Syamsuddin<sup>1</sup>, Saharuddin<sup>2</sup>, Asngadi<sup>3</sup>, Sulaeman Miru<sup>4</sup>, Fatlina Z<sup>5</sup>

<sup>1,2,3,4,5</sup>: Faculty of Economics and Business, Tadulako University

Correspondence Email: syamsuddinsyam@untad.ac.id

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## ABSTRACT

The growth of the Morowali Industrial area and the Archipelago Capital in Kalimantan is the potential for the development of agro-products in Central Sulawesi Province, which is centered in the Napu Valley, Palolo and Biromaru areas which have also become leading horticultural centers. The purpose of this research is to examine the vegetable supply chain model from Napu and its surroundings to the Capital City of the Archipelago in supporting the new area and strengthening the economic order, especially for vegetable producing areas in Central Sulawesi Province. The findings of this study indicate that there are main activities in the agro industry, especially horticulture, namely inbound, conversion and outbound. It was also found that there are 4 supply chain models of horticultural products from the Napu Valley and its surroundings to the target market.

**Keywords:** Supply Chain, Agro and Vegetables, Capital of the Archipelago, Industrial Estate

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## 1. Introduction

Development patterns that lead to green economy and green ecology make urban development must pay attention to the carrying capacity and capacity of the environment to create a decent urban life (Kuncoro, 2016). This reality has become a consideration for the relocation of the Capital City of the Archipelago, which led to the determination on January 18, 2022. The determination is evident from the passing of the Draft Law on the Capital City of the Archipelago into Law by the House of Representatives of the Republic of Indonesia and the Government, which means that Indonesia will have a new capital city to replace Jakarta.

Efforts to develop the carrying capacity of the Capital City of the Archipelago have been made by several provinces, one of which is Central Sulawesi Province. Central Sulawesi Province as one of the food supporters of the Archipelago Capital has established the Archipelago Food Estate which is intended to produce food needs in the Archipelago Capital. The distribution of the Nusantara Food Estate in Central Sulawesi Province is located in Poso, Sigi, Donggala, Parigi Moutong and Toli-Toli districts.

Napu Valley as one of the agro-regions, especially vegetable and fruit production, which has been supplying the East Kalimantan region and the Morowali industrial area is expected to grow further, along with the growth of the Nusantara Capital Region in East Kalimantan (Asngadi & Mas'adah, 2018). For this reason, controlling the food supply chain system is urgent. This is because logistics structuring will have an impact on the efficiency and effectiveness of a logistics system that is sustainable in the long term.

According to Yusuf et al., (2021) Logistics management is clearly visible in trading, storage, and transportation systems, while supply chain performance is measured by the efficacy and efficiency of the supply chain. Meanwhile, according to (Anatan, 2010) Supply chain performance is strongly influenced by competitive advantages (price, quality, delivery, product innovation, time to market, reliability, responsiveness, flexibility, cost, and assets). While logistics infrastructure in Indonesia has improved, there are still challenges related to quality, connectivity, and accessibility that need attention (Sinaga et al., 2022). Logistics infrastructure includes

transportation networks (roads, toll roads, ports, airports, and railways), storage warehouses, logistics terminals, and integrated communication and information technology systems.

Proper control of raw material input, processing, and delivery of finished goods in accordance with consumer demand is known as logistics management (Prayitno & Fairus, 2022). Conceptually, logistics management is supply chain management that plans, implements and controls the transportation, storage and distribution of goods and related services and information efficiently and effectively to meet customer needs (Siahaya, 2015). The high poverty rate causes the population to have limited purchasing power and thus does not have the ability to market their agricultural products to the city (Asmara & Ichtiarto, 2021). The integration of rural logistics with the local economy is not only about the distribution of goods and services, but also creating a positive impact on economic growth in rural areas (Gunawan, 2020).

The logistics management function according to Prihantoro (2012) is explained as planning and requirements, budgeting, procurement, storage and distribution, elimination, and control. Logistics management aims to make the goods or materials needed for the production process or operational activities available in the required quantity, quality, time and place at the most efficient cost possible, through the application of the concepts of standardization (technical standards, storage standards, destruction, procurement), optimization (according to needs) and accuracy (Hasibuan et al., 2021). Through simplifying and accelerating the flow of goods and services, logistics systems can generate new added value and turn them into integrated services that can generate revenue (Rahmatullah *et al.*, 2020).

The development of the Nusantara Capital City, and the development of Morowali industry as a new growth area will encourage the growth of buffer food areas through the formation of a supply chain system for various needs such as vegetables and fruits, located in the Napu Valley and its surroundings. Demand for agro products, especially vegetables and fruits produced from the Napu Valley and surrounding areas, will certainly increase in the coming years. Efficient distribution route planning is crucial to overcome topographical barriers and distances that may be longer than in urban environments (Qin & Jin, 2022).

Thus, the growth of the Nusantara Capital City area will trigger the growth of new areas around it, and a logistics system that connects the Nusantara Capital City as a destination and Napu Valley as an origin point. This research has urgency in developing an efficient supply chain model, which allows for a smooth distribution process of vegetables from Central Sulawesi Province, especially from Napu Valley to the Capital City of the Archipelago in Kalimantan.

## 2. Literature Review

Logistics management, as an integral part of modern supply chain strategies, incorporates various aspects and functions to ensure the smooth flow of goods and information from suppliers to customers (Aharonovitz et al., 2018). These logistics activities include customer service, demand forecasting and planning, transportation, order processing, warehousing, inventory management, material handling and packaging, reverse logistics, and logistics communication (Badraoui et al., 2020). Logistics management is responsible for ensuring the availability of the right raw materials at the right time, optimizing storage processes, and ensuring accurate and timely delivery of products to customers (Stank et al., 2001).

Relationship dimensions in the context of rural logistics include aspects such as trust, commitment, respect, communication, and customer satisfaction (Badraoui et al., 2022). The ability to provide superior customer service, reduce product cycle time, and improve operational efficiency are key determinants of success in a changing business environment (C. R. Carter & Easton, 2011). For example, (J. R. Carter et al., 2010) found that, when selecting a third-party logistics service provider, buyers who focus more on operational capabilities place more emphasis on the transaction relationship.

To optimize the use of resources in a trusting and mutually beneficial environment, and to share information, risks, and rewards with the aim of achieving improved performance (Flynn et al., 2010). In addition, outsourcing of logistics operations has been widely practiced to reduce costs and improve service levels, using the expertise of logistics operators and service providers (Gammelgaard & Larson, 2001).

Hong et al., (2018) refer to dynamic capability theory in which firms seek to identify specific capabilities that can be a source of advantage through management capabilities, a hard-to-imitate combination of organizational, functional, and technological skills. Supply chain integration can assist companies in reorganizing their internal and external resources and capabilities to build a solid supply chain network (Huo et al., 2014).

In logistics collaboration, logistics activities involve joint planning and information sharing, with less focus on strategic planning (Jazairy et al., 2021). The frequency of meetings among partners is important to define goals and initiate the development of new projects (Kirono et al., 2019). A shared understanding of the importance of sharing data and insights into logistics operations can enhance collaboration (Kwon & Suh, 2004). In this digital era, information technology has a central role in logistics management (W. Liu et al., 2021).

The existence of the state is reflected in its membership in international organizations, diplomatic relations, and participation in international treaties and agreements (Nirad et al., 2023). The existence of the state is the basis for political stability, security, economic development, and people's welfare. Companies can jointly improve their business processes and develop organizational capabilities through mutual adjustment and knowledge transfer (Pfohl & Buse, 2000). The structural dimension refers to the structure or framework of social relationships within a network or community (Piboonrungraj et al., 2016).

A state is a political entity that has a certain territory, population, government, and sovereignty recognized by the international community. States have territories consisting of legally defined geographical boundaries (Susanto et al., 2021a). The state plays an important role in maintaining order, protecting human rights, providing public services, and promoting social welfare (Susanto et al., 2021b). The existence of the state also involves the responsibility to maintain territorial integrity, protect national interests, and advance the interests of its people.

Internal social capital acts as a resource that enhances supply chain resilience (Polyviou et al., 2019). Similarly, a firm's internal social capital in the form of internal integration positively influences SCRM capabilities in terms of warning and recovery (Polyviou et al., 2020a). This includes the presence of a connected network of suppliers, distributors, logistics agents and other related parties in the supply chain (Polyviou et al., 2020b). If the network structure allows for easier access and efficient distribution, then different parties are more likely to be willing to collaborate.

In terms of tactical collaboration, information sharing and technology can facilitate the exchange of real-time operation forecasting and scheduling data (Prajogo & Olhager, 2012), such as order cycles, delivery schedules, routes, and vehicle availability. In addition, successful collaboration is only possible if companies are interdependent, committed, and trustworthy. Logistics management should consider factors such as expected market growth, demand fluctuations, and potential risks in the supply chain. This strategy also includes working with business partners, suppliers, and distributors to create strong and mutually beneficial relationships (Samal, 2019).

Interpersonal collaboration is based on open communication and shared values, which increases trust and, in turn, directly affects commitment (Sandberg, 2007). The dimensions of collaboration have been studied extensively in the supply chain management literature (Simatupang & Sridharan, 2002) identifying the elements of supply chain collaboration and the main barriers to its implementation. Collaboration can be defined as a relationship characterized by openness and trust where risks, rewards and costs are shared by both parties (Simatupang & Sridharan, 2006).

Previous research conducted by Widodo et al., (2021) analyzed the performance of the logistics system on underdeveloped and very underdeveloped islands in Indonesia by taking the case of the Anambas Islands. Relational competencies of communication and cooperation are important for building supply chain resilience and robustness (Wieland & Wallenburg, 2013). Supplier selection is critical to building dynamic relationships with collaboration capabilities that achieve differential performance. These advantages can be in the form of good company profitability and good company environmental performance (Helfat et al., 2023). Some of the advantages that the company has can help the company compete with other companies.

Supply chain management information systems, real-time tracking, and technology-based inventory management software help improve efficiency and visibility in the supply chain (Meng, 2020). Thus, modern logistics management must be able to build systems that are responsive to dynamically changing market needs (Rushton et al., 2006).

Logistics has a role in the movement of both goods and people. The logistics function is responsible for enabling the real movement of goods from raw material suppliers to manufacturers, distributors, and end consumers (Laksono, 2012). The essence of logistics activities is to provide the system with the right product, in the right location, at the right time. Logistics is part of supply chain management in planning, implementing, and controlling the effective and efficient flow and storage of goods, information, and services from the point of origin

to the point of destination in accordance with consumer demand. Logistics bears the responsibility of ensuring that appropriate products are available at the right time, location, quality, and cost to satisfy customers (Hayati, 2014).

According to Chandra (2013) there are key activities in logistics including Customer Service; Demand Forecasting / planning; Inventory Management; Logistics Communications, Material Handling; Traffic and Transportation; Warehousing and Storage. In the National Logistics System, logistics is defined as part of the supply chain that handles the flow of goods, information, and money through procurement, warehousing, transportation, distribution, and delivery services.

In general, logistics activities consist of 2 (two) activities, namely movement activities (move) and storage activities (store), which are then translated into a logistics activity mix which includes 7 activities namely order processing, transportation, inventory, goods handling, facility structure and information and communication systems. The effectiveness of the success of the distribution system is influenced by several important factors, namely; Adequate transportation facilities and infrastructure; Certainty of the number of goods sent according to delivery orders; Preparedness of distribution centers (warehouses) and their supporting facilities (facility structure); Adequate material handling system; Suitability of information and communication systems according to needs (communication & information).

The object of logistics is not limited to the logistics of goods, but also includes passenger logistics, disaster logistics, and military logistics (defense and security) carried out by every business and industry player in both the primary, secondary, and tertiary sectors (Diawati *et al.*, 2022). Logistics activities also involve various stakeholders that can be categorized into five groups, among others:

1. Consumers, logistics users who need goods for use in the production process or for consumption.
2. Logistics actors, namely as owners and providers of goods needed by consumers.
3. Logistics Service Providers (logistics service providers) are service provider institutions in charge of delivering goods (transporters, freight forwarders, shipping liners, and so on).
4. Logistics Supporters, which are institutions that support the effectiveness and efficiency of logistics activities, including associations, consultants, education and training institutions and research institutions.
5. Government.

According to research Primiana (2012) logistics performance is a significant factor in improving competitiveness, especially national competitiveness. As an activity that builds competitiveness, logistics has several performance measures, namely quality (level of customer satisfaction, customer loyalty, delivery accuracy); time (total replenishment time, business cycle time); cost (total delivered cost); flexibility (quantity and specification).

A supply chain is a group of three or more entities, either organizations or individuals, that manage the movement of goods, services, financial matters, and/or information from suppliers to consumers directly from upstream to downstream, (Mentzer *et al.*, 2001). The implementation of a supply chain strategy only takes place effectively if the supply chain has a network with an appropriate configuration because the network configuration can determine whether a logistics distribution will be responsive or efficient. One area where expenses can be reduced through efficient management is distribution logistics (Wahyu *et al.*, 2023). Distribution logistics can involve upstream and downstream relationships, which create value for end users.

### 3. Method

To achieve the expected objectives, the research approach used is non-positive or qualitative padigma. The qualitative approach allows the discovery of phenomena that are the basis for the development of effective supply chains, especially agro-products of fruits and vegetables from Central Sulawesi Province to the Archipelago Capital Region and other industrial areas. The approach used in this research is phenomenology which raises the experiences of actors in the agro supply chain, especially fruits and vegetables in the Napu Valley and its surroundings.

As a qualitative research, data collection in this study was carried out in several ways:

#### a. Observation

Observation is data collection by visiting and reviewing Balikpapan, and Napu as the origin point of the vegetable supply chain of Central Sulawesi Province. Observation is also conducted to business actors in Napu and trade actors in Balikpapan City.

b. Documentation

Data collection through review of available documents, both at the association, the Central Bureau of Statistics and the documentation of the research team during this research.

c. Recording of Data Collection Results

This data is in the form of detailed notes from interviews with key informants that describe the reality and conditions of the field. Reflection notes containing impressions, opinions, ideas, suspicions, question marks, are also part of the data collected in this research.

As a qualitative research, the research instruments used in this study are:

- a. Research Implementation, Research implementation is the main instrument in this research. Researchers conducted in-depth direct interviews with key informants to obtain valid and relevant data.
- b. Interview Guide, The interview guide is used as a guidance in conducting dialog with informants.
- c. Data recorder, is a device used to record the results of interviews which are then used as the basis for making manuscripts.

#### 4. Result and Discussion

##### Agro-product Supply Chain Activities

##### a. Word Cloud with Nvivo

To be able to describe the supply chain in the agro industry from the Napu Valley and surrounding areas, all interview results were entered into Nvivo, to find meaningful words related to the supply chain of vegetables from the Napu Valley to the market. The results are realized in the form of a wordcloud as follows:



Furthermore, these words guide the subsequent analysis of the various supply chain models for vegetables and fruits from the Napu Valley to target markets. In the context of the supply chain, the end of this model is the market. The market referred to in this study based on the findings in the field refers more to the place where vegetables and fruits from the Napu Valley end up in the supply chain system.

##### b. Inbound Logistics

Based on the data and results of field analysis, it shows that the market, in the context of vegetable trade from the Napu Valley, is the market in the Balikpapan, Samarinda, Morowali, Sanagatta areas, which is the final destination for agro products before being distributed to end consumers through markets in various regions and industries in the target market area.

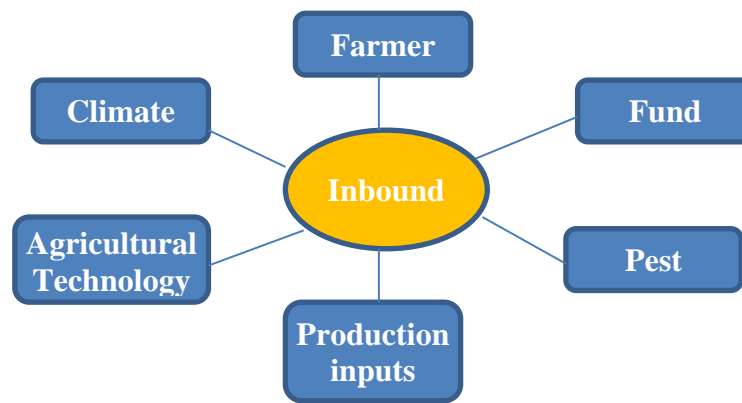


Figure 1 Items in Inbound Activities

In detail, the success of the agro-product supply chain in the Napu Valley from the inbound logistics side in the form of entities and activities, among others, are agro-farmers, sources of funds, pest control, availability of inputs, climate, agricultural technology.

### c. Conversion Process

In the agro industry in the Napu Valley, after the harvest period is carried out by farmers, it will then process in the next stage, namely the conversion stage. This stage is carried out to ensure that there is added value created from raw materials, namely the harvest of vegetables and fruits in the Napu Valley. The process includes:

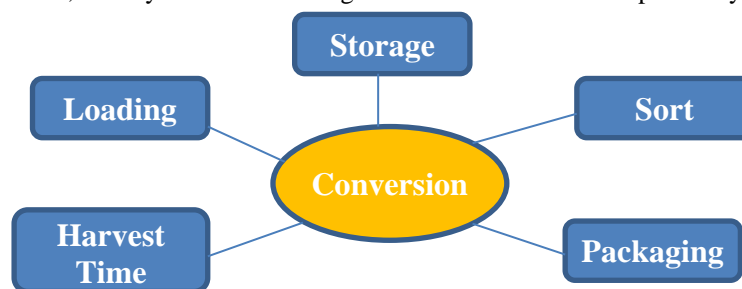


Figure 2 Conversion Process in Agro Logistics in Napu

From the chart above, the conversion process involves various activities including: determining the harvest period, product sorting, packaging, loading, storage. The whole process will take place continuously to ensure the quality of products to be sent to consumers, especially in industries in Morowali and the capital cities of the archipelago, including Samarinda and Balikpapan. Determination of the harvest period is carried out to ensure that the product is not damaged post-harvest by farmers before sorting. Sorting includes measuring (Sizing) and checking for product defects.

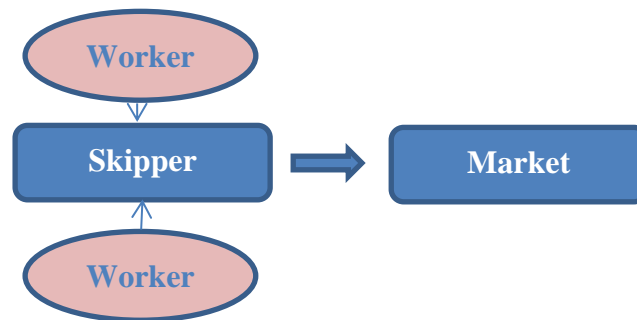
For this activity, the unloading process is carried out in the Morowali industrial area. While shipping via ship is carried out the loading and unloading process on the crossing ship. This was done early, because business actors have a cooperation bond with buyers in Kalimantan that the goods sent are received on the ship (FOB-free on board). With this pattern, the owner of the goods does not bear the cost of shipping the goods sent.

### Agro Industry Supply Chain Model Towards the Capital City of the Archipelago and Industrial Estates

The development of supply chains to the Capital City of the Archipelago and other industrial areas will provide great added value along the distribution channel from upstream to downstream. Various patterns of distribution channels indicate the existence of growing business opportunities between business actors. Based on the results of the analysis, it shows that there are various patterns of supply chains of agro business actors in the Napu Valley and its surroundings to the Capital City of the Archipelago and other industrial areas as follows:

#### Pattern 1: Skipper-Market

In this pattern, the Skipper is actually a large-scale farmer who has sufficient funds and a relatively large area of land. In this pattern, the Skipper acts as both the capital owner and the landowner. The supply chain pattern is as follows:



Pattern 1 shows that there is a pattern of direct interaction where the Skipper, who is a large-scale farmer, has direct contact with the market. However, there are not too many of them. In this pattern, the supply chain is relatively short, and the Skipper is the main risk bearer. This is because the Skipper is the one who employs the farmers, prepares all the inputs and interacts with the market directly. The risk of falling prices and crop failure are part of the risks faced by the Skipper. The Skipper like this pattern has relatively permanent workers, where the workers are active from land maturation, planting, fertilizing, spraying to harvesting. The tiered planting pattern means that workers in this pattern are relatively uninterrupted and remain partners with large farmers (Skipper).

#### Pattern 2: Farmer-Traders-Market

In the second pattern, the supply chain model is longer where the farmer stands as a separate entity. In this position, the farmer acts as one of the business units, which is usually micro-scale. The relationship pattern of the second pattern can be seen in the following chart:



In the second pattern, it appears that farmers can market their crops to traders, before the traders finally take them to market. In this relationship, traders usually act as financiers for farmers. The traders provide herbicides, basic fertilizers, growth fertilizers and mulch. This alternative places the risk on farmers and traders, this is due to crop failure, the payment of initial capital is also disrupted.

In this pattern traders usually set a price that is lower than the market price. However, if harvest prices decline, there is certainty that traders will still take the produce from farmers. The ties between farmers and traders means that the risk of the harvest not being sold due to abundant production does not occur.

#### Pattern 3: Farmers—Collectors—Traders—Market

In this pattern, there are village level collectors who have direct contact with farmers. In this pattern, farmers usually do not collaborate with traders, but rather village level collectors.



In the third pattern, large-scale traders usually take agricultural products from second hand, namely collectors at the village level. Traders like this usually get large orders from the market in Kalimantan so the quota they fulfill must be large.

This pattern is effective for large traders with large turnover, because through relationships with collectors at the village level, traders will obtain large volumes of goods.

#### Pattern 4: Farmers—Traders—Collectors—Market

The fourth pattern is almost similar to the third pattern where there are 4 entities in the agro product supply chain system from the Napu Valley and surrounding areas to the market. This can be described as follows:





In the fourth pattern, collectors gain a wide market network both in the capital city of the archipelago and Morowali and surrounding areas. Collectors, in an effort to fulfill goods, buy goods from traders who have bought from farmers. This pattern also occurs where traders only get a limited volume of goods, so they do not ship the goods to the port, but only transfer them to large collectors.

From the findings above, it appears that collaboration in production systems, both inbound, process conversion and outbound, will create a strong supply chain system, especially in the agro industry where products do not last long. In accordance with research from (Matakana *et al.*, 2023), one of the characteristics of agricultural commodities, especially agro crops, is their vulnerability to damage. Therefore, agricultural production is handled carefully so that it has added value and a long shelf life.

Throughout the supply chain there are various entities, including farmers, traders, collectors, and inter-island wholesalers who have different roles, and these activities create a value chain along the supply chain. According to (Akhmad Mahbubi, 2015) various entities surround the supply chain and often interact through standard interactions following predetermined patterns. The structure of the supply chain will be affected and its complexity will become more apparent the more entities there are in the supply chain. According to (Patronase, 2016), the interaction pattern between business actors is called "parent-owner" and "trading subsidiary" interaction. Apart from that, of course there is a relationship between buyers and sellers of agricultural products and entrepreneurs who act as providers of goods, which is only based on market mechanisms. On the one hand, the pattern of relationships between business actors is a benefit in mitigating the risk of loss in the agro industry, although the length of the supply chain will have an impact on product competitiveness due to the margins taken by business actors along the trade chain.

Huda *et al.*, (2014) Hedging is defined as a method or strategy to reduce risks caused or anticipated due to changes in financial market prices. Efforts to increase the competitiveness of the agro industry in the Napu Valley and its surroundings can be carried out at a macro level through a Hedging scheme where the government becomes a contractual mediator between the upstream industry (farmers) and the target market. This is because implementing a hedging scheme is one way to anticipate movements in the rupiah exchange rate that are needed to achieve exchange rate stability. The contractual scheme will make farmers focus on increasing production capacity with a guarantee of a continuous market.

The findings justify that the presence of the government as a stakeholder in the agro industry will mitigate farmers' risks, especially from price fluctuations that are often faced by agro business actors. According to (Setiyanto, 2013) to truly achieve regional development, large-scale and targeted resource mobilization is needed and the participation of stakeholders from the center to the regions, down to the smallest village or government unit.

According to Suryana (2014) farmers must have more access to food processing technology, both financially and physically. Increasing accessibility is also one pattern of increasing the competitiveness of agro areas, especially the designation of the Napu Valley as a supporter of the Archipelago Food Area, providing justification for the importance of this area as a supporter of sustainable food. Efforts to develop the agro-industry supply chain are in line with the government's efforts to realize Sustainable Development Goals (SDG's), which consider balanced development from social, economic and environmental aspects in a sustainable manner.

## 5. Conclusion

- a. There are various activities in the inbound, conversion process and outbound in the Napu Valley agro industry logistics system to the market.
- b. There are 3 main markets for agro products in general, namely the local market (Palu and surrounding areas), industrial areas (Morowali and surrounding areas) and the capital city of the archipelago (Samarinda, Sangatta, Balikpapan).
- c. There are 4 patterns of agro-industry supply chain models from the Napu Valley to target markets.

## 6. Recommendation

- a. Farmers' independence still needs to be increased, through the provision of cheap credit by financial institutions because much of the upstream sector funding depends on traders and collectors.



- b. There is a need for large-scale contracts between regional governments and markets, so that farmers and their entities can maximize production potential in the Napu Valley area.

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