

Received: 17.3.2023  
Revised: 31.5.2023  
Accepted: 1.6.2023  
Published: 6.6.2023

**Slovak Journal of  
Food Sciences**

*Potravinárstvo Slovak Journal of Food Sciences*  
vol. 17, 2023, p. 467-483  
<https://doi.org/10.5219/1873>  
ISSN: 1337-0960 online  
[www.potravinarstvo.com](http://www.potravinarstvo.com)  
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## Supply chain management analysis of avocado in south Sumatra province through the Food Supply Chain Network (FSCN) method

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### ABSTRACT

One of the agricultural sub-sectors that occupy a strategic position in agricultural development is the horticultural sub-sector, with one of its potential commodities being avocado. Avocado is one of the export-based commodities, especially in South OKU Regency, South Sumatra Province. This study aims to obtain an overview of the Avocado Agribusiness Supply Chain management in South OKU Regency. The study was conducted in Warkuk Selatan District, South OKU Regency in February 2022. The research method used was a qualitative descriptive method with a type of data using primary data and secondary data. The data analysis method uses the Food Supply Chain Network (FSCN) method, which illustrates South Oku Regency's avocado supply chain model. The results showed that the Avocado Management Supply Chain Management model with the FSCN framework consisted of four main components: the supply chain structure, the business chain process, supply chain management, and supply chain resources. Avocado supply chain targets are still dominated to meet the domestic market and products in the form of fresh avocados for consumption. Avocado supply chain management comprises election partners, contractual agreements, transaction systems, government support, and supply chain collaboration. The avocado supply chain structure in South OKU Regency consists of farmers, collecting traders, local and non-local traders, retailers, and consumers with respective roles in the supply chain structure. Business processes in avocado supply chain management consist of procurement, replenishment, and customer order cycles. Based on marketing margin analysis, the lowest total marketing margin is found in channel IV, with a margin value of Rp 1,500 per kg. The four avocado marketing channels in South Warkuk Ranau District have Farmer's Share  $\geq 40\%$ , so it is categorized as an efficient channel.

**Keywords:** horticulture, avocado, agribusiness, management, FSCN

### INTRODUCTION

Agriculture is still believed to be one of the roots of the Indonesian economy. The agricultural sector is one of the sectors which contribute to Indonesia's economy [1]. The horticultural sub-sector occupies a strategic position in agricultural development. The contribution of the horticultural subsector to agricultural development continues to increase, as seen in several indicators of economic growth, such as gross domestic product (GDP), export value, and employment.

One of the horticultural commodities that have prospects with growing market potential is the fruit commodity. Fruits are horticultural products that significantly impact Indonesian agriculture [2]. In other sectors, fruits also play a role in increasing farmers' income. Commodities that have the potential to be developed so that market needs can be met and benefit from farmers, namely avocados [3]. The fruit known as the avocado is sold worldwide and is renowned for providing various health benefits [4].

Avocado (*Persea americana Mill*) is a plant originating from the highlands of Central America and has many varieties that are spread throughout the world. The avocado is an evergreen tree, although the leaves have a

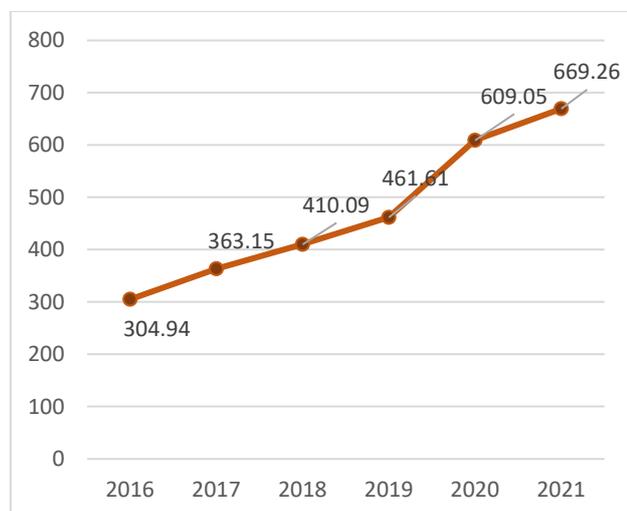
surprisingly short longevity of 12 months. It is characterized by rapid growth in height and spread, reaching heights up to 20 m, its roots are shallow and have poor water uptake and hydraulic conductance. The trees generate many blooms, but less than 0.1% of those flowers often turn into fruit [5]. The climacteric fruit avocado (*Persea americana*) is primarily consumed as a vegetable. Avocados, like olives, are abundant in oleic acid, a monounsaturated fatty acid, health-enhancing phytosterols, and phenolic antioxidants [6].

**Table 1** Top 10 avocado-producing countries in the world.

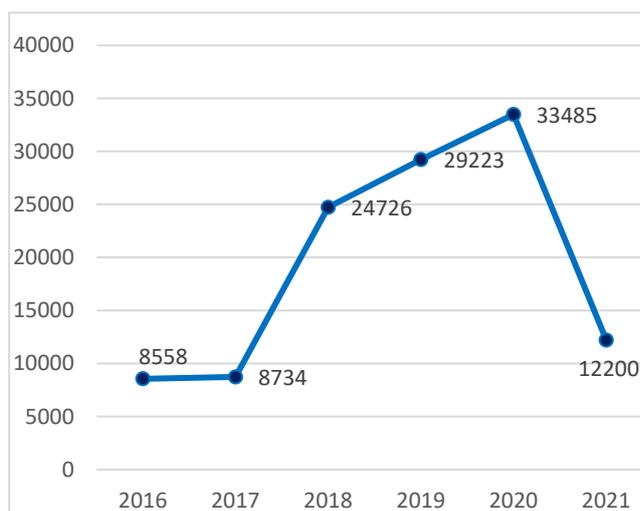
Nr.	Country	Production (Tons)
1	Mexico	2,442,944.64
2	Colombia	979,617.72
3	Peru	777,095.96
<b>4</b>	<b>Indonesia</b>	<b>669,260.46</b>
5	Dominican Republic	634,368.16
6	Kenya	416,802.72
7	Brazil	300,894.00
8	Haiti	248,135.12
9	Vietnam	212,977.00
10	Chile	169,031.26

Note: Source – Food and Agriculture Organization (FAO), 2021.

According to data from the Food and Agricultural Organization (FAO) in 2021, Mexico is the world's center of avocado production, accounting for the first position with a total production value of 2,442,944 tons, while Indonesia ranks fourth with a production value of 669,260 tons. Avocado is an agricultural commodity with a harvest time of approximately 6-7 months from when flowers bloom. If planted through the vegetative system will bear fruit after 5-8 years old, but several effective ways can make avocado plants bear fruit within 3 years, namely by graft and shooting shoots. Avocado-producing areas in Indonesia are West Java, East Java, South Sulawesi, and South Sumatra (Figure 1). In South Sumatra, one of the areas producing avocado is South OKU Regency, with the most production in South Warkuk Ranau (Figure 2).



**Figure 1** Avocado production in Indonesia.



**Figure 2** Avocado production in South Oku Regency.

Avocado Fruit Production in South Ogan Komering Ulu (OKU) Regency has increased from 2016-2018 with a very significant increase in 2018, avocados, including one of the commodities from the horticultural sector that is being developed, especially in South OKU Regency. In 2020 Indonesia was hit by the Covid-19 Pandemic which paralyzed the community's economy and required to stop some marketing supply chains that farmers usually do. The marketing supply chain is an important defence in fighting Covid-19. In the current competition, business actors are required to realize that competition that occurs is competition between supply chain networks [7]. As an avocado center area in the Province of South Sumatra, the development of agribusiness fruit applications experiences various problems ranging from upstream subsystem agribusiness, cultivation, downstream agribusiness, institutional, and marketing. Where all of them are interrelated to each other in a supply chain.

The Agricultural Quarantine Agency, working with the Center for Plant Quarantine and Biosafety, has developed an avocado phytosanitary certification system based on in-line inspection in the form of Avocado Phytosanitary Certification Guidelines to support the export of avocados. This directive will act as a reference for all parties in organizing the export of avocados from Indonesia so that the exported avocados meet the requirements of the destination country, the quality of the fruit is properly maintained, the fruit is safe for consumption, and the exported fruit has good traceability. The Agricultural Quarantine Agency believes that a guideline for avocado phytosanitary certification, which will be used as a reference for all parties in implementing avocado exports, is specifically required to assist the export of avocados. Indonesia as well as to guarantee that exported avocados are of high quality, suitable for human consumption, and match the standards of the destination nation. The following constitutes the legal justification for avocado certification [8]:

- i. Regulation of the Minister of Agriculture of the Republic of Indonesia Number: 44/Permentan/OT.140/10/2009 Concerning Guidelines for Post-Harvest Handling of Yields Agriculture of Good Plant Origin (Good Handling Practices).
- ii. Regulation of the Minister of Agriculture Number: 48/Permentan/OT.140/10/2009 concerning About Guidelines for Good Agriculture Practices for Fruit and Vegetables (Good Agriculture Practices For Fruit and vegetables).
- iii. Regulation of the Minister of Agriculture Number: 88/Permentan/PP.340/12/2011 concerning Food Safety Supervision on Importation and Exportation of Fresh Food Plant Origin.
- iv. Regulation of the Minister of Agriculture Number: 73/Permentan/OT.140/7/2013 concerning Guidelines for Harvesting, Postharvesting, and Management of Horticultural Postharvest Wards The good one.

According to the UNECE standard on avocados [9], based on their quality, Avocados are classified under three classes, as defined below:

1. Class "Extra"

This category only accepts avocados of the highest caliber. They have to be traits exclusive to the variety. They must be devoid of flaws, except minor surface flaws, so long as they don't damage the produce's overall appearance, quality, keeping quality, or presentation in the packaging. The stalk must be intact if it is there.

2. Class I

Avocados must be of high caliber to qualify. They have to be traits exclusive to the variety. However, suppose the following minor flaws don't damage the produce's overall appearance, quality, keeping quality, or presentation in the packaging. In that case, they may be tolerated: A minor shape flaw, a minor color flaw, a minor skin flaw (corkiness, healed lenticels), and a minor sunburn are all acceptable as long as they don't spread. The overall maximum area shouldn't be larger than 4 cm<sup>2</sup>.

3. Class II

Avocados that meet the minimal standards outlined above but do not meet the criteria for participation in the higher classes are included in this class. As long as the avocados maintain their fundamental qualities in terms of quality, keeping quality, and presentation, the following flaws are acceptable: Skin flaws (corkiness, healed lenticels, and sunburn, provided they are not progressing), faults in shape, and color, with a maximum total area of 6 cm<sup>2</sup>.

Relationship management is a key component of supply chain management, and each link in the chain is overseen separately. Managers from various corporate functions, including marketing, sales, finance, production, purchasing, logistics, and research and development, make up each process team [10]. The management of supplier and customer relationships upstream and downstream to increase value in the ultimate marketplace while incurring fewer costs for the supply chain as a whole is known as supply chain management [11].

Supply Chain Management is a concept or mechanism to increase the company's total productivity in the supply chain through optimization of time, location, and flow of material quantity. Supply chain administration Agriculture represents the overall control of the production process, from processing to distribution and marketing to getting the desired products into consumers' hands [12]. Supply chain management integrates management practices and information technology to optimize the flow of information and goods between processes and business partners in a supply chain, which is a network of business processes and relationships between businesses required to create, market, and deliver products to end customers [13].

The Supply Chain Network (SCN) is a network that depicts the movement of resources, capital, and information from the point at which raw materials enter the network to the point at which goods are in the hands of consumers. Typically, a network's beginning points are suppliers, manufacturers, distribution centers, and retail, and its ending points are consumers [14]. The supply chain is related to the flow and transformation of goods and services, starting from the stages of providing raw materials to the final product in the hands of consumers. Management of agricultural commodity supply chains is different from non -agricultural commodity

supply chain management because it is related to the nature of agricultural products that are easily damaged. The planting process, growth, and harvesting depend on the climate and season, and the harvest has a variety of shapes and sizes [15]. All of these variables must be considered for the supply chain management of agricultural commodities to be comprehensive, effective, efficient, responsive, and sustainable.

Supply chain management is needed to meet consumer demand for agrarian industry products for raw materials and fresh and halal products for directly consumed so that they can benefit from both farmers and consumers [16]. Based on the problem above, researchers are interested in conducting further studies regarding the analysis of avocado supply chain management in South OKU Regency by using one of the supply chain methods, namely *the food supply chain network* (FSCN) method. FSCN structure consists of multi-farmers, factories (processing), multi-distribution centers (DC), and multi-consumers (retail/customers). This study aims to obtain an overview/mapping of the Avocado Agribusiness Supply Management in the South OKU Regency.

## SCIENTIFIC HYPOTHESIS

The study had two hypothesis:

1. Avocado marketing margins are most efficient in the marketing channel with the shortest chain because it has the lowest marketing margin value.
2. The value of farmers' share in each avocado marketing channel in OKU Selatan is greater than 40%, with marketing channel IV having the highest value.

## MATERIAL AND METHODOLOGY

### Study Area

This research was conducted in South Warkuk Ranau, South OKU Regency (Figure 3). Location selection is made intentionally (*purposive*). This sub-district was chosen because the South Warkuk Ranau District was a pilot area for Avocado Cultivation with the largest area of cultivation and production compared to other regions in South OKU. The research was carried out in February 2022.



Figure 3 Map of research locations in Buay Madang East OKU District.

### Data Collection

Types of data use primary and secondary data. Primary data comes from survey results and direct interviews with farmers. The primary data collected is the area of farmer's land, production, farming costs, selling price, marketing of avocado fruit, and other related primary data. Researchers also interviewed collectors, local and non-local traders, and final buyers regarding buying and selling prices in avocado marketing activities. At the same time, secondary data are obtained through documentation studies through relevant literature/literature such as research location maps, previous research as references, and others related to research content.

## Samples

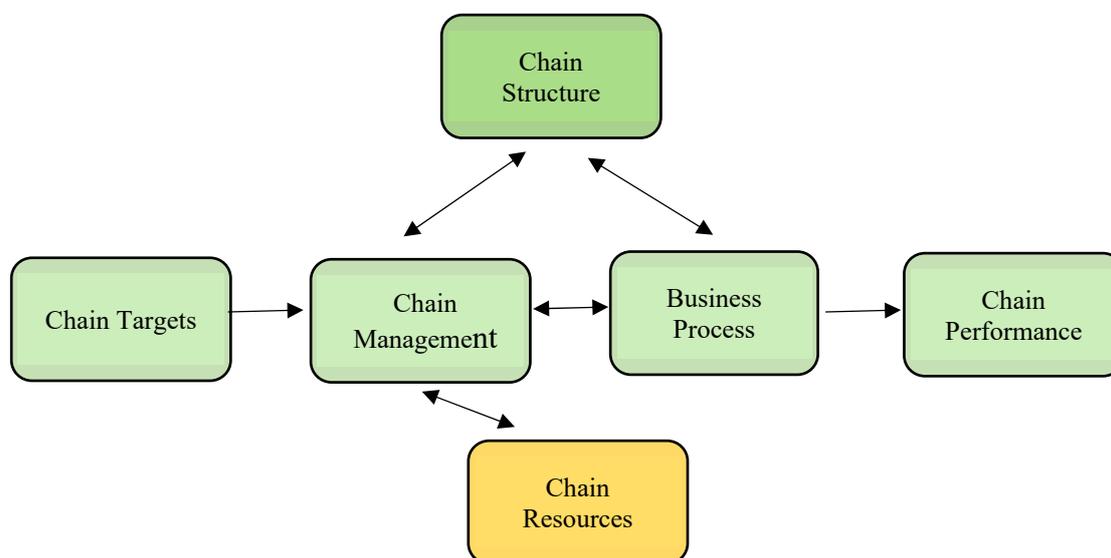
Determination of informants in this study were selected purposively and snowball sampling. The population of this study were farmers in Buay Madang, OKU Selatan. Samples were taken from 10 avocado farmer informants and information collection on other supply chain members use the technique of snowball sampling by following the flow of marketing to the final consumer, that is, with the number of informants consisting of 3 middlemen, 3 local traders, 3 non-local traders this is intended to make it easier for researchers to obtain data related to research objectives.

## Statistical Analysis

The data collected is in the form of primary data and secondary data. The data processing method is carried out by qualitative analysis by creating a Food Supply Chain Network (FSCN) model developed by Vorst (2006). Quantitative analysis through the calculation of marketing margin analysis and farmers' share analysis with a calculator and Microsoft Excel version 2019 by Microsoft Corporation.

## Model of FSCN

The research method used is a qualitative descriptive method. Research techniques known as qualitative descriptive methods (as opposed to experiments) are used to examine natural object circumstances. Triangulating (mixed) data gathering methods are used, inductive/qualitative data analysis is used, and the emphasis in qualitative research findings is on meaning rather than generalization [17].



**Figure 4** Frame Model of FSCN.

In the FSCN framework (Figure 4), several characteristics that are typical of the supply chain can be identified by distinguishing the following four elements that involve coordination in it and can be used to describe, analyze and/or develop supply chains, namely:

1. The supply chain structure describes the actors involved in the network and each role in the supply chain. The structure also describes the elements in the supply chain that can encourage business processes.
2. Structured supply chain business processes and measurable business activities are designed to produce certain outputs (physical types of products, services, and information) for certain customers or markets.
3. Supply chain management illustrates a form of coordination and management structure in the network that facilitates the decision-making process and the implementation of the process by members of the supply chain by utilizing the resources found in the supply chain to realize the purpose of the supply chain performance.
4. Supply chain resources are used to produce products and give them to customers (called resource transformation). Supply chain resources can be in the form of physical resources, technology, human resources, and capital.

The list of questions addressed to respondents is present in Table 2.

**Table 2** Transcript of the list of respondents' questions.

No.	Respondents	Questions
1.	Farmers	How much land for avocado cultivation do you have? What is the average production of avocados once harvest? What is the selling price of the avocado offered? Where are avocados sold or marketed? How to transport avocados to the market? what costs must be incurred in avocado cultivation? Is the income received enough to benefit farmers?
2.	Collectors Traders/Tengkulak	What is the purchase price offered to farmers? Are you involved in the capital of avocado farmer farming? What is the cost of transportation incurred? Where are the farmers' produce sold? What is the selling price offered to local or non-local traders?
3.	Local Traders	How much does it cost to buy an avocado from a collector? How much does it cost to transport avocados? What is the selling price offered to the buyer?
4.	Non-Local Traders	How much does it cost to buy an avocado from a collector? How much does it cost to transport avocados? What is the selling price offered to the buyer?
5.	Final Consumers	Where do you usually buy avocados? How much does it cost to buy an avocado in the market?

### Marketing Margin Analysis

Marketing margin is the price difference between the price paid by consumers and the price received by farmers, which can be systematically formulated as follows:

$$M = Pr - Pf$$

Where:

M = Marketing Margin; Pr = Prices at the consumer level; Pf = Prices at the Farmers level.

### Farmer's Share Analysis

One indicator of marketing efficiency is the Farmer's share which is analyzed to find out how much the farmer receives from the price paid by the final consumer. Farmer's share is mathematically formulated as follows:

$$Fs = \frac{Pf}{Pk} \times 100\%$$

Where:

Fs = Farmer's Share; Pf = Prices at the Farmers level (Rp/Kg); Pk = Price that consumers pay end (Rp/Kg).

## RESULTS AND DISCUSSION

### Avocado farm revenue analysis

Production costs are all costs that must be incurred in carrying out avocado farming, which consist of fixed costs and variable costs. Fixed costs on avocado farming in South Warkuk Ranau District are equipment costs and depreciation, including spray tanks, hoes, and machetes. As for variable costs consisting of seeds, fertilizers, pesticides, herbicides, and labor costs [18]. Fixed fees for depreciation and variable costs in the avocado farm result in total production costs, as presented in Table 3.

**Table 3** The Average Cost of Avocado Farmers' Production in South OKU Regency.

Description	Total Costs (Rp/Ha/Thn)
<b>Fixed Costs and Depreciation</b>	
Spray Tank	Rp 134,285
Hoes	Rp 30,428
Machetes	Rp 37,500
<b>Total Fixed Costs</b>	Rp 202,214
<b>Variable Costs</b>	
Seeds	Rp 7,464,286
Fertilizer	Rp 1,203,142
Pesticides	Rp 159,428
Herbicides	Rp 514,286
Labor	Rp 8,501,071
<b>Total Variable Costs</b>	Rp 17,842,213
<b>Total Production Costs</b>	Rp 18,044,427

The average total production cost in Avocado farming in South Warkuk Ranau District is Rp 18,044,427 ha/year. Where the cost of depreciation of the tool is the cost incurred from the initial cost minus the cost of residues and divided by the period of use (year). The average fixed cost/depreciation of tools consisting of spray tanks, hoes, and machetes is Rp 202,214 ha/year, and the average variable cost consisting of seeds, fertilizer, pesticides, herbicides, and labor is Rp 17,842,213 ha/year. Production is the result obtained by avocado farmers in each harvest season. The average production of avocado farming in West Warkuk Ranau District is 13,436 kg/ha/year. The average Avocado farm reception can be seen in Table 4 below:

**Table 4** Average Avocado Farmers in South Warkuk Ranau.

Description	Total (Rp/Ha/Year)
<b>Average production (Kg/Ha/Thn)</b>	13,436
<b>Price (Rp/Kg)</b>	Rp 8,000
<b>Revenue (Rp/Ha/Thn)</b>	Rp107,488,000

Table 5 shows that the average revenue in avocado farming in the South Warkuk Ranau District from an average production of 13,436 kg/ha/yr multiplied by the selling price of Rp8,000 is Rp107,488,000 ha/yr. Next is to see how much the income earned by avocado farmers is through farming income analysis. Income is the difference between the amount of revenue from avocado farming and costs incurred as production costs. Avocado farmers' average income can be seen in Tables 5 and 6 below:

**Table 5** The Average Revenue of Avocado Farmers in South Warkuk Ranau

Description	Total (Rp/Ha/year)
Revenue (Rp/Ha/Thn)	Rp 107,488,000
Total Production Costs (Rp/Ha/Thn)	Rp 18,044,427
<b>Income (Rp/Ha/Thn)</b>	Rp 89,443,573

**Table 6** Total Income of Avocado Farmers in South Warkuk Ranau

Description	Total (Rp/Ha/Thn)
Average Income (Rp/Ha/Thn)	Rp 89,443,573
Capital Loan (Rp/Thn)	Rp 10,528,571
Profit Sharing 1%	Rp 160,000
<b>Total Income (Rp/Ha/Thn)</b>	Rp 78,755,002

Based on the calculations in Table 5 above, the average revenue reduced the return of capital loan costs and profit sharing of 1% (Rp.10,000/harvest season) based on the cooperation agreement to obtain a total revenue of the farming of the cooperative partnership pattern in the South Warkuk Ranau District of Rp78,755.002 Ha/yr.

### Avocado Supply Chain Management

Avocado farmers in South Warkuk Ranau District, South OKU Regency, are still dealing with several problems; based on the explanation of the farmers, it is known that the problem of capital farming, marketing of avocado fruit production, and price fluctuations. Inadequate infrastructure or capital can limit smallholders' ability to meet high production standards [19].

The beginning of the discussion within the FSCN framework is the chain target (chain objectives) by identifying specific supply chain characteristics, integrating quality, and optimizing the chain. Furthermore, chain management emphasizes management between each process of selecting partners, intertwined contracts, the transaction system, the extent of government support, and the collaboration of the supply chain [20].

Furthermore, starting with discussing the chain structure to answer the question of who the members are in FSCN, their roles and the rules. In Figure 5, the following is the flow of the Food Supply Chain Network (FSCN) method in this study:

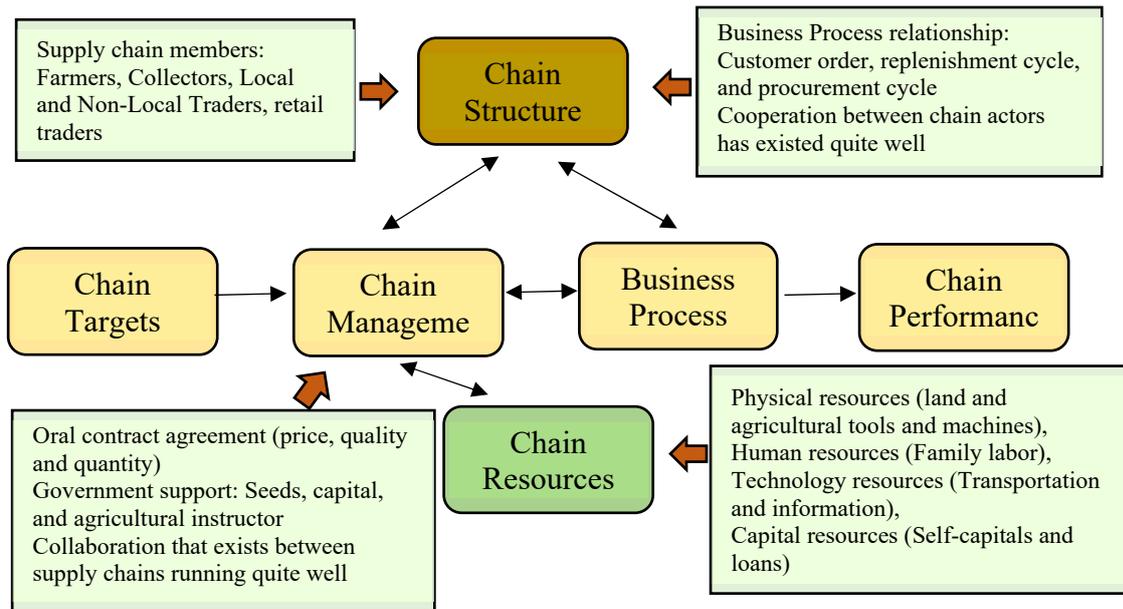


Figure 5 FSCN Method Flow in Avocado Supply Chain.

### Supply Chain Targets

Avocado supply chain targets in South Warkuk Ranau District include market targets in the region. Avocado market targets in South Warkuk Ranau District are still dominated to meet the domestic market and products in the form of fresh avocados for consumption. Many farmers sell directly to the collectors rather than selling directly to the local market in Ranau because some collectors have directly taken the harvest on farmers' land so farmers do not need to pay labour costs and costs for transportation and cleaning avocados. In addition, farmers have also partnered with collectors in capital loans for avocado cultivation activities. Avocados are sold to collecting traders who are valued at Rp. 8,000/kg, Rp. 10,000/kg, and Rp. 12,000/kg, depending on the quality of the avocado.

### Supply Chain Management

Some things discussed in Avocado Supply Chain Management are the selection of partners, the contractual system between the supply chain members, the transaction system, government support, and the coordination and collaboration between the chain members to determine the decision process of the supply chain management activities.

#### 1. Partner Selection

Avocado farmers in South Warkuk Ranau District will choose partners to spend their harvests to prospective partners based on price offers. Partners who have contracts with farmers during this study are collecting traders. Although it does not determine a certain quality, the collecting traders will set prices by considering the quality of the products that farmers have harvested. In addition, some avocado farmers also partner with cooperatives to advance with a profit-sharing system in each harvest season of 1%, namely Rp.10,000.00 for cooperatives. In this case, farmers who partner with cooperatives like to advance also get capital assistance and must deposit Rp. 50,000.00 of members/farmers who partner as agreed staples. But in reality, more farmers partner with collectors

than cooperatives directly. Smallholders' only flexible option for financing production is to borrow capital input (money) from the 'tengkulak' [21].

## 2. Contractual Agreement

The contractual agreement details the terms that the supply chain participants have agreed upon, such as the restrictions that must be adhered to by the partner and allows them to operate for the predetermined amount of time. Contracts are designed to share risks, share benefits and create incentive structures to encourage supply chain members to use optimal policies for all chain members [22].

The contractual agreement occurs as an informal contract between members of the Avocado Supply chain from the farmers, collectors, and traders in the form of price agreements and land area sold to the collector. The collector decides avocado prices by adjusting to prices in the market/quantity of commodities to prevent losses on the farmer's side.

## 3. Transaction System

The transaction system that occurs in all transactions between avocado supply chain members is a cash system and delay. Based on observations in the field, many collectors buy from farmers with delayed payment systems compared to cash systems. This is because the farmers already know and believe in the collecting traders. The deficiency in delayed payment transactions is that there are a lot of delays in the payment process so farmers get lacking profit.

## 4. Government Support

Policy support to improve Avocado supply chain management by the government, especially in the South Warkuk Ranau District, is currently not much done. The form of support carried out by the South Warkuk Ranau District government is in the form of Avocado Seed Assistance for as many as 200 seedlings in order GSMP (Gerakan Sumsel Mandiri Pangan) program. Capital assistance through KUR in partnership with government-owned regional banks and the support of agricultural extension workers in delivering avocado cultivation materials and post-harvest processing related to technology socialization to extend the fruit savings so as not to rot quickly.

## 5. Supply Chain Collaboration

The collaboration of supply chains is shown to the chain members involved in the Avocado Supply chain process regarding the disclosure of information between the existing supply chain [23]. Communication between avocado farmers and collecting traders in South Warkuk Ranau District has been well established. The collaboration process is related to the avocado harvesting process from the collecting traders to the farmers. The avocado collection process starts from the reconciliation of the land ready for the collecting traders, then the collector traders take the harvest using pick up and the workforce of the collecting traders. Farmers claim that this approach is simpler because it eliminates the need to arrange vehicles, allowing them to simply wait on their fields. Farmers sell their harvests to collecting traders for this reason as well.

## Supply Chain Structure

The trustworthiness of each link in the avocado supply chain in South Warkuk Ranau District, South OKU Regency, impacts the chain's structure. Farmers frequently go via supply chain chains to flow their products, hence these chains form. The avocado supply chain relationship structure can be seen in Figure 6 below:

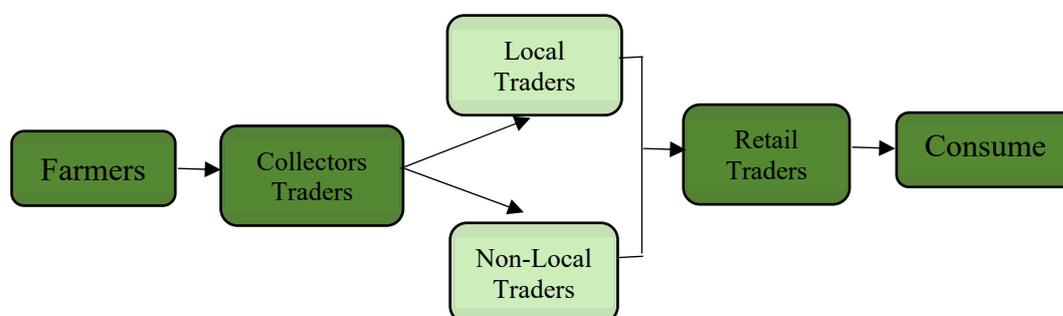


Figure 6 Supply Chain Structure of Avocado Agribusiness.

The supply chain structure involves the supply chain members. Each member performs marketing functions which can be seen in Figure 6. Members of the supply chain are the perpetrators who are incorporated and have a role in the Avocado Supply chain (Table 7).

**Table 7** The role of the Supply Chain Members of Avocado Agribusiness.

Level	Members	Process	Activity
<b>Producer</b>	Avocado Farmers	Purchase, cultivation, and sales	Purchase agricultural production facilities and seeds, cultivate avocados, sell avocados to collectors.
<b>Distributor</b>	Collectors Traders	Purchase, storage, and sales	Purchasing avocados from farmers, supplying large traders in the market and to traders outside the region (non-local).
	Local Traders	Purchase, storage, and sales	Purchase avocados from collectors, supply to the local market, and to the retailer.
	Non-local Traders	Purchase, storage, and sales	Purchase avocados from collectors, supply to the non-local market, and to the retailer outside the area.
<b>Retailer</b>	Retailer Traders	Purchase, storage, and sales	Purchase avocados from distributors and sell avocados to consumers.
<b>Consumers</b>	Final Consumer	Storage and consumption	Make avocado purchases from retailers.

### 1. Avocado Farmers

The average avocado farmer cultivates land with an area of 2.00 hectares. Avocado farmers have an important role because it determines the existing avocado's quantity, quality, and continuity. The number of harvests produced will determine the quantity of carrot availability. The average avocado farmer produces 3 tons per harvest season (every two weeks). There is a need for continuity to maintain the availability of avocados in South Warkuk Ranau District, South OKU Regency.

### 2. Collection Traders

Collecting traders sell harvests from farmers to local traders, with average sales ranging from 2 to 3 tons per one-time shipping that can be done in the afternoon or evening. Most farmers prefer to sell avocados through collecting traders rather than selling themselves to large traders. The selling price of collecting traders to local traders is between 10,000-13,000 per kg, depending on the quality of the avocado.

### 3. Local Traders

Local traders involved in Avocado Supply chain activities come from other regions in South OKU Regency. Local traders will sell avocados to non-local traders from outside South OKU to Palembang City, Lubuk Linggua City, and outside South Sumatra Provinces such as Lampung, Jakarta, and East Java. Avocado butter is a type of avocado that is exported outside the region. In addition, local traders will also sell avocado harvests to retailers

### 4. Retailer Traders

Avocado retailers will receive fresh avocados from local traders and sell them to end consumers in various markets in South OKU, such as Muaradua Market, Saka Selabung Market, and Simpang Sender Inpres Market with prices that also vary from 12,000-15,000 per kg.

## Business chain process

The business chain illustrates the entire process along the Avocado Supply chain in South Warkuk Ranau District, South OKU Regency.

### 1. Business process relationship

The process that occurs in the supply chain business has two aspects: *cycle view* dan *push or pull view* [24]. The *cycle view* on a supply chain consists of four process cycles. *Procurement cycle, manufacturing cycle, order cycle.* The cycle in an avocado supply chain consists of a cycle of procurement, replenishment, and Customer Order. Farmers serve as the primary supplier or producers for the procurement cycle, which is carried out by gathering traders who purchase avocados from them. Local retailers and traders complete the replenishment cycle by raising

the number of orders from the actual number of orders. The ultimate consumer, who has more power to influence the final pricing, completes the customer order cycle. In an economy that is becoming increasingly global, channel power has shifted even more in favor of the end user. Customers more often want price reductions and benefits upgrades for products and services [25].

In this case the final consumer by ordering and purchasing avocados directly to sales and booking locations through online media such as WhatsApp and Instagram, where avocado marketing is also done online on Instagram social media with account names @Alpukat Mentega Ranau. Digital-based promotions include simple information and ordering avocados to attract customers, which can increase the benefits of avocados themselves [26].

## 2. Distribution Pattern

The effective management of product and information flows is clearly a key aspect of Supply Chain Management [27]. The distribution pattern in the avocado supply chain in West Warkuk Ranau District illustrates the pattern of product flow, financial flow, and information flow that occurs between members of the avocado supply chain (Figure 7).

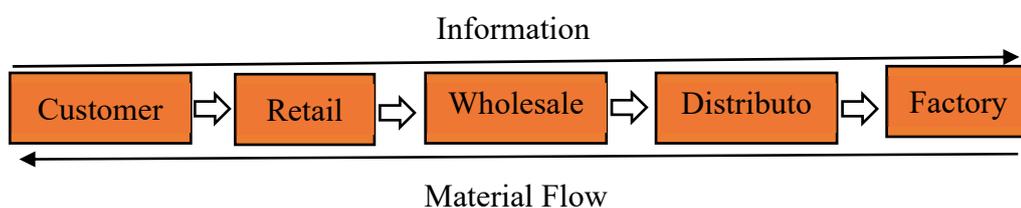


Figure 7 Flow of Goods and Information [28].

### 1. Product Flow

The product flow channeled in the supply chain is a fresh avocado harvested from farmers' land. The product flow starts with avocado farmers. Avocado farmers do plant until they are ready to harvest at the age of 180 days or at 6-7 months after planting. Some village collecting traders will go to avocado farmers' land to take yields then there is a process of determining the price of the collecting traders with the purchasing system per kg. Farmers, suppliers, and traders, the main actors in the agricultural product supply chain, play an important role in meeting the needs of consumers [29].

### 2. Financial Flow

The existence of money in a business is like the blood in a person, or it can be said that its existence is absolutely in the needs. The smooth flow of money or finances is very supportive of the achievement of an effective supply chain [30]. The financial flow in the Avocado Supply Chain in the South Warkuk Ranau District is in the form of payment money on products sold from farmers as the first supply chain actors to the next supply chain actors. Payment money is used as capital to return to cultivate avocado plants, thus forming a financial cycle. The financial flow starts from the final consumer to avocado farmers. For now, the selling price of fresh avocados received by farmers is Rp 10,000-15,000 per Kg.

### 3. Information Flow

The information flow in the South Warkuk Ranau District's avocado supply chain, including information on commodity prices, quantity, and quality. Unlike the product flow and financial flow, information flows reciprocally from avocado farmers to end consumers and vice versa [31], [32]. Information provided by avocado farmers to collecting traders is related to conditions in avocado farming land, such as land area, plant age, and estimated avocado harvest yields. At the same time, the information the gathering traders provides is in the form of a purchase price for the commodity.

## Supply Chain Resources

Supply chain resources are needed to support efforts in developing and making activities that take place in the Avocado Supply chain in South OKU Regency consist of four main resources: physical, human, technology, and capital [33].

### 1. Physical Resources

Physical resources owned by avocado farmers are land whose area is different from the total land area for avocado plants in South Warkuk Ranau District of 20,951.50 ha. Farmers are cultivated by avocado through the cone sari method. Equipment owned by farmers for cultivation to postharvest avocados in the form of hoes, pest spraying devices, flush tools, and sacks.

### 2. Human Resources

Compared to other resources like capital and technology, human resources make up the majority of an organization since people are in charge of them. For example, using mobile phones to improve communication within the supply chain. For example between farmers and collectors [34]. Human resources in the Avocado Supply chain in South Warkuk Ranau District involved labor in the family and workers outside the family. Work carried out by workers in the family, namely routine activities such as watering, maintenance using pest spraying, and fertilization. While the harvest of farmers is helped by family labor, other operations like land treatment and avocado land cleaning after harvest use daily workers from outside the family.

### 3. Technology Resources

Technology resources used by farmers in the avocado cultivation process still use traditional methods such as hoes for land treatment, and the harvesting process is carried out manually using human labor. Refer to research [35] weeding by hand is the most common practice in Nepal. Most farmers still manually remove weeds with small hand tools such as spades, various hand hoes (kuto, kodalo, kodali), and sickles. Farmers' use of information technology Farmers' use of information technology is only limited to mobile phones to facilitate communication between supply chain members. For example, between farmers and collectors.

### 4. Capital Resources

Based on the research results on business capital obtained by farmers come from their own capital and collectors. Own capital is obtained from the revenue of the harvesting period of plantation crops such as coffee and rubber. In addition, some farmers also chose to borrow capital from collectors or middlemen. Farmers with narrow lands who lack a strong capital base (proletarian) are used as opportunities for middlemen and trader farmers as capital owners (bourgeois) to be utilized or exploited by providing loans to farmers even without loan interest and the need for labor from farmers with narrow lands [36]. As a result, because they previously felt helped during the agricultural production process, these smallholder farmers sell their crops to middlemen or farmer-traders.



Figure 8 Avocado farmers and avocado fruit marketing.

### Supply Chain Performance

Supply chain performance is the performance of activities related to the flow of goods, information, and funds from suppliers to end consumers [37], [38]. To find out the performance of the supply chain in avocado agribusiness is carried out through marketing margin analysis and farmer's share analysis.

### Marketing Margin

Marketing margin is the price difference producers receive from the final consumer's cost of goods. Marketing margins are used to see receipts received by each component in the marketing channel. Each stage of the marketing

chain takes a percentage of the final weighted average selling price [39], [40]. The components in the marketing channel are farmers, collecting traders, local and non-local traders, retailers and consumers. Marketing margins on each supply chain can be seen in the following Table 8:

**Table 8** Marketing Margin and farmer's Share of Avocado in South OKU Regency.

Marketing Actors	Marketing Channel			
	Chanel I	Channel II	Channel III	Channel IV
<b>Producer (Farmers)</b>				
Selling Price (Rp/Kg)	8,000	8,000	9,000	10,000
Marketing Costs (Rp/Kg)	825	825	1,025	1,225
<b>Collector Traders</b>				
Buying Price (Rp/Kg)		8,000		
Marketing Margin		2,000		
Marketing Costs (Rp/Kg)		825		
Profits (Rp/Kg)		1,175		
Selling Price (Rp/Kg)		10,000		
<b>Local Traders</b>				
Buying Price (Rp/Kg)		10,000	10,000	
Marketing Margin		1,500	2,000	
Marketing Costs (Rp/Kg)		425	625	
Profits (Rp/Kg)		1,075	1,375	
Selling Price (Rp/Kg)		11,500	12,000	
<b>Non-Local Traders</b>				
Buying Price (Rp/Kg)		10,000		
Marketing Margin		2,500		
Marketing Costs (Rp/Kg)		1,025		
Profits (Rp/Kg)		1,475		
Selling Price (Rp/Kg)		12,500		
<b>Retailer Traders</b>				
Buying Price (Rp/Kg)	9,000	11,500	11,500	12,000
Marketing Margin	2,500	1,500	1,500	1,500
Marketing Costs (Rp/Kg)	925	425	425	225
Profits (Rp/Kg)	1,575	1,075	1,075	1,275
Selling Price (Rp/Kg)	11,500	13,000	13,000	13,500
<b>Consumer</b>				
Buying Price (Rp/Kg)	12,500	13,000	13,000	14,000
<b>Total Margin</b>	<b>2,500</b>	<b>7,500</b>	<b>3,500</b>	<b>1,500</b>
<b>Farmer's Share (%)</b>	<b>64,00</b>	<b>61,53</b>	<b>69,23</b>	<b>71,42</b>

The table above shows marketing margins for each component in the marketing channel. The marketing margin will differ in each marketing channel because each marketing actor has a different selling price. The lowest total marketing margin is found in channel IV with a margin value of Rp 1,500 per kg. Channel IV is the shortest supply chain because it only involves two marketing institutions, namely farmers and retailers. According to the research [41], [42], if the marketing margins are expended is equal to the use for which it was created. This indicates that the margins are equal.

### Farmer's Share

Farmer's Share is the distribution of prices received by farmers (Farmer Share) which is a price comparison of prices paid by farmers with prices at the consumer or retail level [43] can describe one indicator of marketing efficiency and marketing justice [44]. *Farmer's share* is an indicator that measures how many parts are received by avocado farmers as a service for contributions made to the final selling price of each marketing channel.

Based on the results of Farmer's Share in Table 8 show that Farmer's Share was obtained for channels I, Channel II, Channel III, and Channel IV respectively, namely 64.00%, 61.53%, 69.23 and 71.42%. Channel IV has the highest percentage of Farmer's Share which is 71.42% means that the part received by farmers is 71.42% of the price paid by the final consumer. *Farmer's share* with a value of  $\geq 40\%$  can be said as an efficient channel [45]. The four avocado marketing channels in South Warkuk Ranau District have a Farmer's Share  $\geq 40\%$  so it is categorized as an efficient channel.

## CONCLUSION

Avocado supply chain management in West Warkuk Ranau District, South Oku Regency based on Vorst's Food Supply Chain Network model, includes supply chain targets, supply chain structures, supply chain management, and network chain, supply chain resources, and supply chain business processes.

Avocado supply chain targets in South Warkuk Ranau District include market targets in the region. Avocado market targets in South Warkuk Ranau District are still dominated to meet the domestic market and products in the form of fresh avocados for consumption. Avocado Supply Chain Management includes partner selection, contract systems between supply chain members, transaction systems, government support, and coordination and collaboration. The supply chain structure involves the supply chain members of avocado agribusiness consist of producer (avocado farmer's), distributor (collectors traders, local traders, non-local traders), retailer (retailers traders), consumer (final consumer/final buyer). Supply chain resources to support activities avocado cultivated in South OKU Regency consist of four main resources: physical, human, technology, and capital.

Based on the results of marketing margin of avocado, marketing margin efficiency found in Channel IV because it is the lowest total marketing margin with a margin value of Rp 1,500 per kg. Channel IV is the shortest supply chain because it only involves two marketing institutions, namely farmers and retailers. The shorter a product's marketing chain, the lower the costs, allowing for greater marketing efficiency. Based on the results of Farmer's Share, the four avocado marketing channels in South Warkuk Ranau District have a Farmer's Share  $\geq 40\%$  so it is categorized as an efficient channel. Channel IV has the highest percentage of Farmer's Share, which is 71.42%, meaning that the part received by farmers is 71.42% of the price paid by the final consumer.

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### Acknowledgments:

This paper is one of the results of research in the LPPM (Research and Community Service Institute) program of Baturaja University which is located in South OKU Regency, South Sumatra, Indonesia. Thank are also extended to the farmers who participated in the survey and gave the data and information needed for the research to produce the desired results. Thanks also to the reviewers who provided helpful criticism for this paper.

### Conflict of Interest:

No potential conflict of interest was reported by the author(s).

### Ethical Statement:

This article does not contain any studies that would require an ethical statement

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