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# Cayenne pepper: structure and supply chain performance in Gorontalo Province, Indonesia

*by* Ria Indriani

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## Cayenne pepper: structure and supply chain performance in Gorontalo Province, Indonesia

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**Abstract.** The research aims to examine the structure and performance of the cayenne pepper supply chain. The study was conducted in Gorontalo from January to March 2019. The research was using the survey method. Data analysis was using descriptive and marketing efficiency analysis. The results showed 1) The structure of the cayenne pepper supply chain in Gorontalo Province consists of seven distribution channels. Sale of cayenne pepper by farmers through collectors (40 percent), wholesalers (26.67 percent), market traders (10 percent), and retailers (23.33 percent). The primary members of the cayenne supply chain consist of farmers, collectors, wholesalers, out-of-town traders, market traders, retailers, consumers, and agroindustries. The secondary members are farm shops, banks, transportation service providers, the Agriculture Service, and information media. 2) The most efficient distribution channel is channel six because the smallest marketing efficiency value is 3.17 percent. The cayenne pepper's market in Gorontalo runs inefficiently because it has a price transmission elasticity value of 1.11 ( $E_t > 1$ ). It means the rate of change in prices at the consumer level is greater than the rate of change in prices at the farmer's level.

### 1. Introduction

Gorontalo Province is the center of cayenne producing centers in Eastern Indonesia, with the harvested area of 1,928 ha, production of 11,942 tons, and productivity of 6.19 tons/hectare, in 2016 [1]. Cayenne pepper is the second leading commodity in Gorontalo province besides corn. Cayenne farming has a large prospect because it has a higher competitiveness than corn and rice [2]. Gorontalo people consume fresh cayenne pepper about 2,915 tons while Gorontalo production about 12,063 tons, so there is a surplus of 9,148 tons [3]. Cayenne pepper in Gorontalo has an LQ value of 1.15-1.83, which means that the area's production is a surplus of 1.15-1.83 times greater than its own needs [2], so that the marketing of cayenne is not only in within Gorontalo region but also sent to other regions [4].

In the last two years, cayenne pepper's price goes up and down in Gorontalo. The price of cayenne pepper in the traditional market is 60,000- 90,000 IDR a kg. The increase was due to the lack of supply of cayenne which was circulating in the market because it was disturbed by a number of things from the weather to the distribution process. Erratic weather factors can have implications for the uncertainty of the amount of production that will affect the supply of cayenne pepper, which results in uncertain selling prices of cayenne and generally follows the market mechanism [5].



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A supply chain is an approach that can be used to resolve cayenne commodity problems such as unpredictable chili supply, price fluctuations, uncertainty in production, extreme weather, distribution channels, and price stabilization. Supply chain success can be seen from the level of performance it has. Performance measurement is needed as an approach in order to optimize supply chain networks and determine the extent to which marketing activities are optimized by members of the supply chain. The objectives of the study are identifying the structure of cayenne supply chains and assessing the performance of cayenne supply chains in Gorontalo Province.

**2. Methodology**

The study was conducted in Gorontalo Province from January to March 2019. The sampling technique used the snowball sampling technique. The data used were primary data collected through interviews with farmers collectors, wholesalers, retailers using questionnaires. Secondary data were obtained from statistical offices. Data analyses were Descriptive Analysis and Marketing Efficiency Analysis. Analysis of marketing efficiency in the form of Marketing Efficiency and Price Transmission Elasticity.

$$Ep = \frac{TB}{TNP} \times 100 \%$$

Ep = Marketing efficiency (%)  
 TB = Total Cost (Rp)  
 TNP = Total Product Value (Rp)

The most efficient supply chain criteria can be seen from the comparison of the marketing efficiency (Ep) value of each channel, namely the smaller the efficiency value (Ep), the more efficient the marketing channel [6]. Price transmission elasticity is measured through simple regression analysis between two prices at two market levels, then the elasticity is calculated. Processing simple regression analysis with the help of software SPSS 16. Mathematically the transmission price elasticity (Et) can be written as follows:

$$Et = \frac{\left(\frac{\delta Pr}{Pr}\right)}{\left(\frac{\delta Pf}{Pf}\right)}$$

$$Et = \left(\frac{1}{b}\right) \times \frac{Pf}{Pr}$$

b = regression coefficient  
 Pf = prices at farmer level  
 Pr = prices at retailer level

The criteria for determining efficiency namely if Et = 1 means the rate of change in prices at the retailer level is the same as the rate of change in prices at the farmer level. A price change of 1% at the retailer level resulted in a 1% price change at the farmer level. The market runs efficiently. Et < 1 means the rate of change in prices at the consumer level is greater than the rate of change in prices at the producer level. A price change of 1% at the retailer level results in a price change of less than 1% at the farmer level. The market runs inefficiently. The market faced is an imperfectly competitive market. Et > 1 means the rate of change in prices at the retailer level is smaller than the rate of change in prices at the farmer level. A price change of 1% at the retailer level results in a price change greater than 1% at the farmer level. The market runs inefficiently. The market faced by market participants is that markets are not perfectly competitive.

3. Results and discussion

The supply chain structure of agricultural products does not always follow the chain sequence where farmers can directly sell their agricultural products directly to the market [7]. The supply chain structure of cayenne pepper in Gorontalo Province can be seen in figure 1.

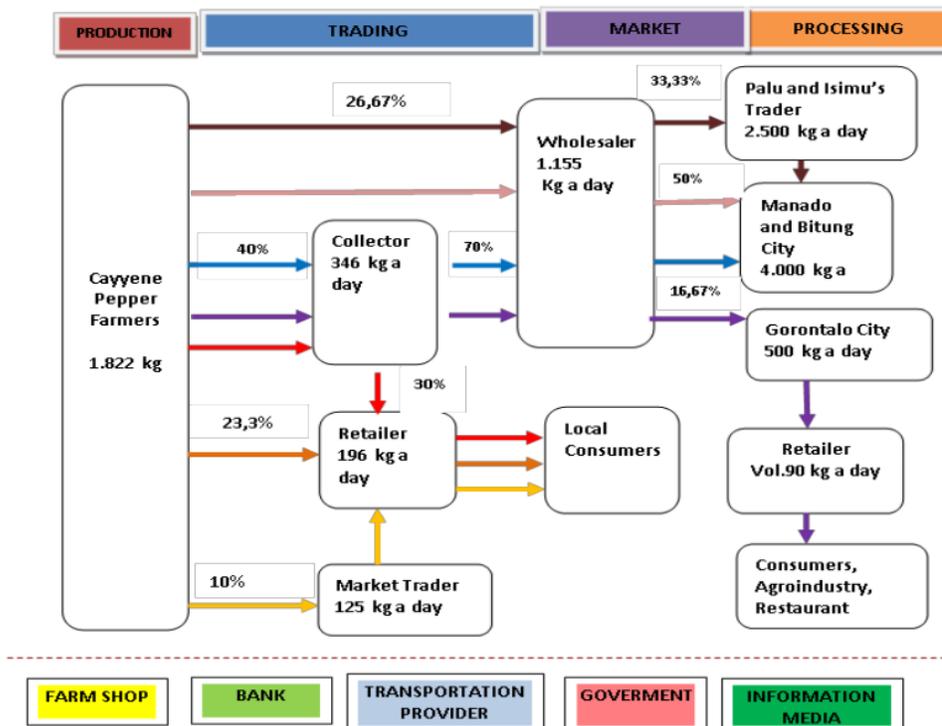


Figure 1. Structure of Cayenne Pepper Supply Chain Gorontalo Province, 2019.

Figure 1 shows the flow pattern of cayenne pepper supply chain from farmers is divided into 4 chains, namely 1) farmers sell through collectors by 40 percent (346 kg) (2) farmers sell through wholesalers by 26.67 percent (1.155 kg), 3) farmers sell-through market traders by 10 percent (125 kg), and 4) farmers sell directly to retailers by 23.33 percent (196 kg). It shows that most farmers are still dependent on collectors even though they have been supported by road and transportation infrastructure and wholesalers are already in the sub-district capital. It causes the proximity of the location to a collector, little harvest volume, and collectors pick up cayenne pepper to farmers directly so that farmers do not pay for transportation costs. In addition, farmers are bound by agreements with collectors, because some farmers often borrow money from collectors. It shows that most farmers choose to sell to village collectors because of the bond loans that farmers have received before harvest, a small volume of harvest, a closer distance to farmers and family relations [8] including marketing institutions [9].

The most dominant distribution channel is channel three, where 16.67 percent of farmers choose to sell cayenne pepper to 70 percent of the traders and then to 50 percent of wholesalers who send it to Manado and Bitung City. In addition, the flow pattern of the cayenne pepper supply chain from wholesalers is divided into three chains, namely 1) delivery to Palu and Isimu trader is 33.33 percent (2,500 kg a day), 2) delivery to Manado and Bitung by 50 percent (4,000 kg a day), and 3) delivery to Gorontalo City at 16.67 percent (500 kg a day). While the flow pattern of the cayenne pepper supply

chain from the collector is divided into two chains, namely 1) sales to wholesalers by 70 percent (2.293 kg a day) and 2) sales to retailers by 30 percent (350 kg/day).

At the farm level, there is a production stage where the supply of inputs, especially seedlings, comes from collecting traders (10 percent), other farmers (26.67 percent), farm shops (6.67 percent) and from the previous harvest seeds (56.67 percent). Fertilizers and pesticides were mostly bought by farmers at farm shops, while others were obtained from collectors. There were also farmers who received assistance from the Agriculture Service in the form of seeds and liquid fertilizer. At the production stage, it starts from land preparation, planting, maintenance, and harvesting. Then after harvest, farmers sell to cayenne traders. In the trading phase is processing and delivery of cayenne pepper to out of town's market by using transportation services in the form of pick-up cars, buses, and airplanes. Payment system from out-of-town merchants through transfers in bank accounts (Banking). The price information is available through information media such as radio and television. Processing of fresh cayenne pepper into sagela sauce is done at the agro-industry level.

Marketing efficiency is often used in assessing work performance marketing processes. Farmer's Share and Marketing Efficiency often used to determinant marketing efficiency [10]. Based on the value of marketing efficiency, channel 6 and channel 7 are efficient marketing channels because the smaller the value of marketing efficiency, the more efficient the marketing channel. This can be seen in table 1.

**Table 1.** Marketing Efficiency Value of Cayenne Peper Supply Chain in Gorontalo, 2019.

Marketing Channel	Prices at Farmer Level (IDR a Kg)	Prices at End Level (IDR a Kg)	Marketing Margin (IDR a Kg)	Marketing Cost (IDR a Kg)	Marketing Efficiency (%)
1	25.000	40.000	15.000	6.130	15,33
2	25.000	30.000	5.000	2.480	8,27
3	20.000	30.000	10.000	2.790	9,30
4	20.000	40.000	20.000	3.440	8,60
5	20.000	30.000	10.000	1.560	5,20
6	25.000	30.000	5.000	950	3,16
7	30.000	40.000	10.000	1.110	2,78

Table 1 shows the most efficient channels are channels six and seven because they have the lowest marketing efficiency value, namely 3.16 percent and 2,78 percent. 23.3 percent of farmers who chose channel six and 10 percent of farmers chose channel seven. This is because channels six and channel seven have small marketing margins and low marketing costs. Besides their marketing channels are quite short which involves only a few marketing institutions, namely channel 7 (farmers market trader retailers), and channel 6 (farmer retailers). The low marketing costs are caused by the close distribution distance between farmers and involving only one or two marketing institutions. Marketing efficiency is influenced by the length of the marketing chain and the size of marketing margins. The shorter the marketing chain and the smaller the marketing margin, the more efficient marketing activities [11].

Channels one, three, four and five are inefficient because they have a large marketing efficiency value and marketing margins, high marketing costs, and involving several marketing institutions such as wholesalers and out-of-town traders in the process of distributing cayenne pepper. Large marketing costs are due to high transportation costs for delivering cayenne pepper out of town. The handling of marketing functions that are less efficient can cause marketing costs to be higher because the purpose of marketing institutions is to seek profits, then the marketing costs are delegated to producers or consumers by reducing prices at the producer level and increasing prices at consumer level [11].

Price transmission elasticity is a comparison of relative changes in prices at the retail level with price changes at the farm level [12]. Price transmission elasticity is used to determine the response of agricultural commodity prices at the farm level because of changes in price changes at the consumer

level through price information [13]. By knowing the relationship, it is expected that the benefits of market information about the balance of supply and demand between farmers and traders can prevent excessive price fluctuations and the possibility of reducing production and marketing risks so as to reduce losses [12].

For analysis of price transmission elasticity, the price of cayenne pepper every month for three years (2016-2018) at the farm level and the retail level are processed using a simple regression approach. The result is value of  $b$  = regression coefficient = 0.536.  $P_f$  = average price of cayenne at farm level = 27,944.44 IDR a kg and  $P_r$  = average price at retail level = 47,138.89 IDR a kg. The price transmission elasticity ( $E_t$ ) is:  $E_t = 1/b \times P_f/P_r$

$$= 1/0,536 \times 27.944,44/47.138,89$$

$$= 1,11$$

The value of price transmission elasticity is 1.11, which means the market runs inefficiently because of  $E_t > 1$ . It means the rate of change in prices at the level of cayenne pepper retailers is smaller than farmers. The price change is 1% of cayenne pepper at the retailer level resulted in a change in the price by 1.11% at the farmer level. It shows the market is not perfectly competitive. Efficient marketing is a perfectly competitive market structure. But this rarely happens in the community. Marketing that often happens is the oligopoly competition market structure [14].

The results of simple regression analysis also illustrate the relationship of prices at the level of cayenne farmers with prices at the level of retailers. The value of the correlation coefficient ( $r$ ) of 0.865 which means the relationship between the price of cayenne pepper at the farm level and retailers is quite strong because the value is close to 1. In addition, the determinant coefficient ( $r^2$ ) is 0.748, which means the price variation at farm level 74.8% can be explained by price variations at the retailers level, and the remaining about 25.2% is caused by other factors. The regression coefficient value ( $b$ ) is 0.536, which means that each price of cayenne pepper at the retailer level of 1,000 IDR a kg will cause the price of cayenne pepper at the farm level to increase by 536 IDR a kg.

The level of marketing efficiency can be seen from the margin distribution of the marketing chain. Marketing efficiency is relative depending on which aspects of the actor see it. For farmers, marketing is said to be efficient if the price level received (farmer's share) is high and getting better. However, marketing efficiency occurs when margins are evenly distributed, meaning the transmission of prices from consumers to producers and producers to consumers can run well. Applicable otherwise if there is a build-up of margins there are market players who control the market and inhibit the transmission of prices [14]. Agricultural products usually have a price transmission elasticity value smaller than one. It means the volume and price of inputs are constant so the relative changes in prices at the retail level will not exceed the relative price changes at the farm level [16].

#### 4. Conclusion

The supply chain structure of cayenne pepper consists of primary and secondary members. Primary members consist of farmers as cayenne suppliers, collectors, wholesalers, retailers as customers, and agro-industry as a processor. Secondary members consist of farm shops, banks, transportation service providers, government, and information media. The flow pattern of cayenne pepper supply chain from farmers is divided into 4 chains, namely 1) farmers sell through traders (2) wholesalers, 3) market traders, and 4) farmers sell directly to a retailer. Besides, the supply chain consists of seven distribution channels. The most dominant distribution channel is channel three, where 16.67 percent of farmers choose to sell cayenne pepper to 70 percent collectors and 50 percent wholesalers who send it to Manado and Bitung City. Channels six and seven are the most efficient channel because it has a small marketing efficiency value of 3.16 percent and 2.78 percent, respectively. The value of the price transmission elasticity of cayenne pepper is 1.11, which means the market is running inefficiently. It shows the rate of change in prices at the cayenne retailer level is smaller than farmers. The market is not a perfectly competitive market.

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