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Muhammad Rafli Arfian*, Dwi Aulia Puspitaningrum, Heni Handri Utami
Departemen of Agribusiness, Faculty of Agriculture, Universitas Pembangunan Nasional "Veteran" Yogyakarta, SWK 104 (Lingkar Utara) Condongcatur, Yogyakarta, Indonesia, 55283.

*) *Correspondence email*: raffliarfian@gmail.com

Cayenne Peper (*Capsicum frutescens L.*) Supply Chain Performance Analysis in Dukun District, Magelang Regency, Central Java

ABSTRACT

The study is a quantitative descriptive study with purpose of evaluating the effectiveness of the cayenne pepper supply chain. In this method, non-probability sampling is used. Analyze the information using the Supply Chain Operation Reference (SCOR). The cayenne pepper supply chain's performance was evaluated using five different approaches; chain I and chain II produced the greatest results in terms of cayenne pepper delivery efficiency. According to criteria, the outcome is 97,20 percent on chain I and 98 percent on chain II, including superior. When compared to Chain I, Chain II must have an order fulfillment rate of 7,9 percent, placing it in the below parity category. If supply chain I is flexible for three days while supply chain II is flexible for one and a half days, it is highly profitable. Chain I in the superior category has a lead time of three days, whereas chain II has a lead time of just one day. While the Chain II cycle has a superior category of 1,6 days, the Chain I order fulfillment period is 3,3 days. Chain II for 0,53 days and Chain I for 0,0079 days are regarded as superior daily supplies. Chain-to-cash cash cycles of 1,079 days and chain II cycles of 2,53 days were among the better categories. The results of the study demonstrate that although the cayenne pepper supply chain performs admirably overall, order fulfillment is still fairly low.

Keywords: Cayenne pepper; Supply chain; Order fulfillment; Supply chain performance.

INTRODUCTION

Cayenne pepper is one of the various agricultural products that are sufficiently produced in Central Java. (Noorviana, Hartono, & Waluyati, 2018; Putra, Perwitasari, & Jamhari, 2021; Dessy, Toiba, & Fahriyah, 2022; Iskandar, 2022) Magelang Regency is Central Java's main cayenne pepper grower. Magelang Regency is one of the top 5 producers of cayenne pepper in the area, according to BPS data from Central Java Province in 2021. The top 5 districts for cayenne pepper output, according to BPS figures for the Magelang Regency in 2021, are as follows. The primary cayenne pepper-producing region in Magelang Regency is Dukun District, one of them.

A supply chain is a network of interconnections connecting different networks that cooperate to provide products from suppliers to end customers. As new networks be created, information on the amount, quality, and cost of the products flows between the networks. The implementation of supply chain management in a business is anticipated to raise customer satisfaction, sales, cut costs, and increase profits. If supply management actors in Dukun District are aware of sound supply-chain management procedures, they will be impacted and motivated to cooperate effectively. (Lazzarini, Olin, Chaddad, & Cook, 2021; Zhang, Wang, Nan, Luo, & Yi, 2022)

Having the ability to obtain the appropriate commodities in the appropriate amount of time is one advantage of adopting supply chain management. It might be argued that a supply chain's ability to satisfy consumer demand serves as a barometer for how effective it is. (Wang-Mlynek & Foerstl, 2020; Silva, Amancio, Tabak, 2021). To meet customer needs, it's critical to understand how each player in the supply management performs. The practice of supply chain goals, future policy planning, and work evaluation can all be aided by supply chain performance measurement.

The research as well as on observations revealed a number of problems, including the uneven dissemination of market information and the cayenne pepper growing method used by farms that weren't operating simultaneously. Farmers of

cayenne pepper are at risk because of inaccurate market info regarding sales and production. A non-asynchronous planting strategy may have an impact on the cayenne pepper supply, which must always be available to maintain stable cayenne pepper prices. For some cayenne pepper cultivars, it may also affect the seasons for planting and harvesting. The supplies of cayenne pepper will ultimately run out due to the significant risk of crop failure and possible risks to virus or disease in cayenne pepper plants. The cayenne pepper supply chain includes retailers, farmers, agribusiness sub-terminals, collectors, and farmers in The Dukun District.

Evaluating how efficiently each supply chain actor is operating in satisfying customer needs in terms of timing and quantity is the goal of monitoring supply chain performance. A effectiveness of cayenne pepper value chain through to the agricultural sub-terminal as the controlling of the supplies of agricultural commodity in the Dukun District may be measured, and this information is useful for attaining objectives, assessing performance, and formulating future policies. The goal of this study is to assess the effectiveness of the cayenne pepper supply chain in the Dukun District.

RESEARCH METHODS

As a result of the study's results being presented as numbers, it is argued that it belongs within in the topic of quantitative studies, a method utilized in academics studies to evaluate that certain sample or population (Sugiyono, 2019). The study's method is a case study (case research). In a case study, the circumstances or events of the study subject are examined or researched in connection to a typical or specific stage of their character as a whole (Nazir, 2017). This method is used to present an overview of the performance of the cayenne pepper supply chain in the Dukun District.

Description of Study Area

The location of this study was chosen based on the consideration that Dukun District is a chili producing area and has the most cayenne pepper land in Magelang Regency. Using a non-probability sampling technique, which denies population members

equal chances or opportunities to be selected as samples, the responses were determined. The non-probability probability sampling with quotas is a method for selecting an appropriate number of quotas from a sample of an entire population that has particular characteristics (Sugiyono, 2019).

Population and Sampling Methods

According to observations made, there were 4 farmers and village collector traders who sent cayenne pepper directly to the agribusiness sub-terminal in the Sewukan area, Dukuh District, Magelang. Four farmers deliver their produced cayenne pepper to each village collector dealer, making a total of 16 farmers who deliver their products to the villages.

Data collection Methods

Cayenne Pepper of Supply Chain Operation Reference (SCOR) is a model used to measure overall supply chain performance, by offering guidance on the types of indicators that can be used in the decision-making process. The parameters or indicators used in this SCOR model include inventory and asset management, delivery and demand fulfillment performance, guarantees, production flexibility, process costs, and a number of other indicators that have an impact on the evaluation or assessment of supply chain performance (Aramyan, Ondersteijn, van Kooten, & Lansink, 2006; Aramyan, Lansink, van der Vorst, & van Kooten, 2007).

Data Analysis Method

The supply chain performance is evaluated using the SCOR model technique. The SCOR analysis methodology may be used to assess the performance of the cayenne pepper supply chain from producers or farmers to final consumers through the use of the agribusiness sub-terminal in Sewukan, Dukun District, Magelang. The supply chain performance is calculated using the SCOR technique, weights are applied based on benchmark values, and conclusions are drawn (Nurmahdy, Machfud, & Syuaib, 2020).

The performance criteria are response time, flexibility, asset management, and dependability. Internal and external performance are the two types of criteria used to assess the cayenne pepper supply chain's performance in Dukun District. Internal

performance includes assets, whereas external performance also includes dependability, reactivity, and flexibility (Apriyani, Nurmalina, & Burhanuddin, 2018). For each performance attribute, the efficiency of the cayenne pepper supply chain in Dukun District is measured using the metrics listed below:

Reliability. Reliability is a gauge of a product's accuracy, position, package, value, and the quantity of products that are delivered on time and in accordance with client demand. (1). Delivery Performance. Percentage of the overall product that is delivered quickly and in line with client requests to the destination. Presented in percentage-based units. Mathematically, it can be formulated as follows: Delivery Performance = (Total products delivered on time)/(Total products) x 100%. (2). Standard Conformance. Standard compliance is the ability to fulfill customer requirements while upholding consumer norms. Mathematically, it can be formulated as follows: Standard Conformance = (Total conforming quality)/(Total product)x100%. (3). Request Fulfillment. The percentage of product needs that meet customer demand right away. Mathematically, it can be formulated as follows: Request Fulfillment = (Request without waiting)/(Total products shipped) x 100%

Flexibility. Flexibility is the amount of time it takes to respond to a change in the quantity of additions or decrease in demand without incurring penalty fees, which is measured in a matter of days. Flexibility = time to look for goods + time to pack goods + delivery time. **Responsiveness.** Responsiveness or reaction capacity is the term used to describe how quickly a product is manufactured. **Lead Time for Fulfillment of Requests**. Lead Time is the period of time between when a consumer puts an order and when they actually receive the product.

Demand Fulfillment Cycle. The demand fulfillment cycle is the period of time between a customer's request and delivery of the desired product. Mathematically, it can be formulated: Demand Fulfillment Cycle = planning time + time packaging + delivery time. **Asset** or Asset Management. **Cash to Cash Cycle Time**. The cash to cash cycle is the exchange of modest payments over a period of time, defined in days, from later members in the chain to early participants in the chain. Mathematically, it can be

described in the formula: Cash to cash cycle = daily inventory + time needed, Consumers pay to merchants – time what merchants need to pay to supplier. **Daily supplies**. Daily inventory, that is expressed in units of days, is indeed the amount of time that a product is available to satisfy different customer needs if consumers do not acquire more product supply. Mathematically, it is formulated as follows: Daily inventory = (Average inventory)/(Average need)

According Sari, Winandi, & Tinaprilla (2017) in Table 1, The supply chain performance matrix computation is compared to the Superior SCOR cd value, which acts as the industry benchmark for quantifying supply chain performance, as a benchmark value. A benchmark is a standard figure used to gauge how well a supply chain is doing. The benchmark value was built on the rules established by the Supply Chain Council. Three groups of benchmark values are distinguished: superior, advantageous, and parity. The supply-chain performance value equals the average value when there is parity. Effective supply chain performance is indicated by Advantage's rating, which ranges from parity to superior. Superior denotes an improvement over the supply chain's current performance.

Table 1. SCOR Benchmark Value

SCM Attributes	Performance Indicators	Benchmark		
		Parity	Advantage	Superior
External Performance				
Reliability	Delivery Performance (%)	85.00 - 89.00	90.00 - 94.00	≥ 95.00
	Standard Conformance (%)	80.00 - 84.00	85.00 - 89.00	≥ 90.00
	Request Fulfillment (%)	94.00 - 95.00	96.00 - 97.00	≥ 98.00
Flexibility	Supply Chain Flexibility (days)	42.00 – 27.00	26.00 – 11.00	≤ 10.00
Responsiveness	Lead Time (days)	7.00 – 6.00	5.00 – 4.00	≤ 3.00
	Request Fulfillment Cycle (days)	8.00 – 7.00	6.00 – 5.00	≤ 4.00
Internal Performance				
Asset	Daily Inventory (days)	27.00 – 14.00	13.00 – 0.01	= 0.00
	Cash to Cash Cycle (days)	45.00 – 34.00	33.00 – 21.00	≤ 20.00

Source: Bolstorf and Rosenbaum (2011) in Apriyani et al, (2018)

RESULTS AND DISCUSSIONS

Supply Chain Management in Dukun District

Based on the theory put forward by Marimin and Nurul (2011), supply chains for agricultural goods typically deviate from the established hierarchy. Farmers are able to sell their products directly to consumers without going via the supply chain. but direct to the consumer. This study's objective was to assess the efficiency of the cayenne pepper supply chain at the Sewukan Agribusiness Sub Terminal in Dukun, Magelang Regency. The Dukun District is one of the sub-districts in the Magelang Regency. On the slopes of Mount Merapi is where the Dukun District is located. The bulk of the population lives and works in the region on the mountain slopes because it has fertile soil that is suitable for growing vegetables, especially cayenne pepper, as well as fertile region circumstances. The supply chain is a structure or network of relationships that work together to create a certain item, in this case cayenne pepper. The cayenne pepper supply chain that occurs in Dukun District can be seen in Figure 1.

The cayenne pepper supply chain in the district involved farmers, village collectors, Sewukan Agribusiness Sub Terminals, and dealers from beyond the Dukun District. Chain I, which is colored black, depicts the cayenne pepper supply chain, from the farmers who grow it to the villagers who purchase it. The following step involves village collectors delivering cayenne pepper to the Sewukan Agribusiness Sub Terminal. A Sewukan Agribusiness Sub Terminal brings together local collectors in need of cayenne pepper and sellers from beyond the Dukun District.

Cayenne pepper's supply chain is depicted in Chain II in red, beginning with farmers who send the spice immediately following harvest to the Sewukan Agribusiness Sub Terminal. Farmers directly supply the Sewukan Agribusiness Sub Terminal with cayenne pepper in order to meet the demand of traders outside of the Dukun District. Farmers that grow and distribute their own cayenne pepper often have better financial standing and access to reliable transportation systems. The farmer is not restricted by a

capital loan with the local collectors, therefore he is free to send cayenne pepper according to his preferences. Additionally, the cost of cayenne pepper brought directly to the Sewukan Agribusiness Sub Terminal is higher than the cost for village collectors since there are fewer players in the supply chain and farmers have direct access to consumers.

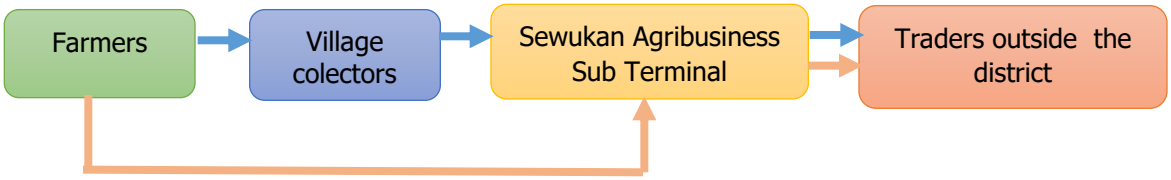

Figure 1. Product Flow in Cayenne Chili Supply Chain in Dukun District

Information:
: Product flow in the cayenne pepper supply chain I
: Product flow in the cayenne pepper supply chain II

Supply Chain Performance in Dukun District

Supply chain performance is defined as the chain's ability to meet consumer demands (Vorst, 2005). The supply chain for cayenne pepper in the Dukun District is assessed using the Supply Chain Operation Reference method. The results of the performance of the cayenne pepper supply chain in Dukun District are listed in Table 2.

Table 2. Supply Chain Performance of Cayenne Pepper in Dukun District

Metric Performance	The Calculation result			Average		Suppply Chain Performance Category	
	Chain I	Chain II		Chain I	Chain II	Chain I	Chain II
Delivery Performance (%)	100%	100 %	100%	100%	100%	Superior	Superior
Standard Conformance (%)	97,20%	98,85 %	98%	97,20%	98,42%	Superior	Superior
Order Fulfillment (%)	7,9%	54,73 %	52,77 %	7,9%	53,75%	Under Parity	Under Parity
Supply Chain Flexibility (days)	3 days	3 days	1,4 days	3 days	2,2 days	Superior	Superior
Lead Time (days)	3 days	3 days	1 days	3 days	2 days	Superior	Superior
Order Fulfillment Cycle (days)	3,3 days	3,3 days	1,6 days	3,3 days	2,45 days	Superior	Superior
Daily Inventory (days)	0,079	0,55	0,53 days	0,079 days	0,54 days	Advantage	advantage
Cash to Cash Cycle (days)	1,079	2,55	2,53 days	1,079 days	1,804 days	Superior	Superior

Source: Primary Data Analysis, 2022

Delivery performance is a ratio of the quantity of cayenne peppers that can be harvested in one harvest to the number of cayenne peppers that can be provided to the Sewukan Agribusiness Sub Terminal. According to table 2, the delivery performance of chain I is 100% classified as superior or excellent. The delivery performance category is already in a good position to handle supply chain management. Cayenne pepper is quickly transported to the Agribusiness Sub Terminal by farmers after being harvested in the fields. In terms of supply chain management, delivery performance in chain II, namely from farmer to local collector and villages collector at the Sewukan Agribusiness Sub Terminal at 100%, is rated as superior or very good. Farmers that cooperate with the village collectors bring for all the cayenne peppers to the collector once they are plucked from the fields. The Sewukan Agribusiness Sub Terminal receives the entire village's supply of cayenne pepper from collectors.

The percentage of all cayenne pepper collected that meets quality standards is known as the standard compliance rate. According to Table 2, the value of standard conformance in Chain I is 97.20%, falling into the superior or very good group. This result indicates that farmers are in a very excellent position and are able to meet consumer standards. Cayenne pepper is sorted by farmers before it is delivered to the Sewukan Agribusiness Sub Terminal. In chain II, 98.85% of farmers were suitable for traders from the Sewukan village government, and 98,0% of farmers were suitable for traders from the Sewukan Agribusiness Sub Terminal. This value, which falls within the category of superior or excellent, demonstrates that farmers are quite capable of meeting the requirements of village collector traders. Village collectors are in a fantastic position and can fulfill customer expectations.

Demand fulfillment measures how much cayenne pepper can be sent by chain participants in relation to how much is needed. According to table 2, the value of satisfying the demand in chain I is 7.9%, which is not very acceptable because it is extremely distant from the parity category. The Sewukan Agribusiness Sub Terminal's needs have not been adequately met by farmers. Only 7.9% of the needs of the Sewukan Agribusiness Sub Terminal can be met by farmers. Demand fulfillment for chain II is

fulfilled by farmers and village collectors to the tune of 54.73% and village collectors to the tune of 52.77%. This number is well below parity, which shows that chain II's ability to satisfy demands is not very good. The value of meeting the demand is low due to adverse seasonal conditions for cayenne pepper plants, which raise the danger of disease attack on many cayenne pepper plants and diminish cayenne pepper production.

The supply chain's flexibility refers to how rapidly it can respond to changes in demand or quantity without requiring additional spending. According to Table 2, the value of flexibility in Chain I for three days falls into the superior or exceptional category. The speed at which farmers respond to shifting demand will determine how effective the supply chain is. Dukun District cayenne pepper growers don't have an excess of the spice. Inventories kept by farmers are available after cayenne pepper has been harvested or picked. The chain II flexibility value, which includes farmers working with village collectors for three days and village collectors for one and a half days, is rated outstanding or very good. Farmers are slower than village collectors because they exclusively rely on their crops for cayenne pepper supplies. Village collectors should search for cayenne pepper alongside other members of the supply chain rather than exclusively relying on cayenne pepper from farmers in order to adapt to changes in demand.

Farmers must allow enough time to satisfy the needs of the Sewukan Agribusiness Sub Terminal, often known as lead time or waiting time. In accordance with table 2, the lead time value in chain I for 3.3 days falls under the superior or very good category. Cayenne pepper cannot be picked every day by farmers. After the cayenne pepper plant is prepared for harvest, picking takes place around every three days. Chain II, which consists of farmers and collectors for three days and village collectors for one day, has a lead time value that is rated as outstanding or very good. Farmers frequently run out of cayenne pepper, so the waiting time is longer there. Before growers can harvest cayenne pepper, three days must pass.

The demand fulfillment cycle is the length of time it takes for farmers to submit orders. Chain I's demand fulfillment cycle, as shown in table 2, has a value of 3.3 days. The 3.3-day demand fulfillment cycle value falls into the superior or very good range.

Chain II of the demand fulfillment cycle has a value of 1.6 days for village collectors and 3.3 days for farmers working with them. The value of the demand fulfillment cycle is in the excellent or very good range. Rapid demand fulfillment cycles will boost supply chain efficiency. Since family members are required for the cayenne pepper picking and packing jobs and there are only a limited number of them available, the demand fulfillment cycle is longer at the farmer level.

The daily inventory represents the quantity that, in the absence of new supplies, is sufficient to meet demand. Based on table 2, the benefit category or good is comprised of the daily inventory value in chain I for 0.079 days or fewer. The chain's daily inventory value I is farmers with village collectors for 0.55 and 0.53 days, or less than one day, and this value is categorized as either good or advantageous. In the event that the daily inventory value is close to zero, chain members do not carry out upcoming daily inventory plans. Since they anticipate that the cayenne pepper delivery revenues will soon be converted into cash to pay for their living expenses as well as capital for establishing or maintaining cayenne pepper plants, farmers do not have enough supplies for a long time.

The cash to cash cycle refers to the flow of funds from product payments to supplier payments to customer payments. To ascertain how quickly the supply chain can turn all of the inventory into cash, cycle from cash to cash. According to table 2, chain I's cash to cash cycle has a value of 1,079 days. This value falls within the superior or very good categories. It takes one day on average to receive payments from customers. Because of the worth of cash to cash, farmers are also very skilled at turning their produce into cash. Farmers with village collectors for 2.55 days and village collectors for 2.53 days make up the value of the cash-to-cash cycle in chain II. This value falls within the superior or very good category. Farmers and village collectors are highly adept at turning cayenne pepper products into cash.

Discussions

The average cayenne pepper supply chain performance in the Dukun District is good to very good. The fulfillment of the cayenne pepper demand in the Dukun District,

one performance measure, is not very satisfying. Regarding the supply chain's ability to meet the demand for cayenne pepper while improving quality by 7.9% and 53.75%. Weather conditions or unfavorable growth seasons are among the factors that may be to blame for the still-weak demand for cayenne pepper. Due to the plants' susceptibility to viruses and diseases, there is a limited cayenne pepper yield as a result. This situation is consistent with the research by Moazzam Akhtar, Garnevska, & Marr (2018), which demonstrates how agri-food supply chain managers can use our new analytical framework and the SCOR model to better understand the intricate performance measurement indicators used in their agri-food production systems and supply chains. this is important.

The chili supply chain in the cayenne pepper supply chain II performs better than the one in the cayenne pepper supply chain I. The second link in the supply chain for cayenne pepper includes village collectors who work with farmers who have superior capital. Daring village collectors provide funding for their associate farmers to plant cayenne pepper. The non-simultaneous harvesting of cayenne pepper by farmers ensures that the village collectors' stock of the spice is nearly always full. In order to meet fluctuating customer demand, village collectors do not have to rely only on the harvest of their linked farmers. Additionally, work done by village collector dealers owned by non-family members helps to cut down on wasting time so that cayenne pepper production may move more swiftly to keep up with consumer demand. The manpower issue should be resolved with the use of technology. According to the findings of studies by Syofya & Chatra (2022), Ramos, Coles, Chavez, & Hazen (2022), and Profita & Rahayu (2018), caution must be exercised when using increased processing technology because it can reduce time and labor requirements while impairing the efficiency of the agricultural supply chain.

The cayenne pepper supply chain I performs worse than the cayenne pepper supply chain II because fewer farmers directly transfer cayenne peppers to the Agribusiness Sub Terminal than partner farmers who are owned by village collectors. Farmers with access to transportation infrastructure and who send cayenne pepper to

the Sewukan Agribusiness Sub-Terminal are more powerful financially than those who depend on villagers as collectors and lack such access. The quantity of cayenne pepper in stock is limited because only one pick is made of the spice each year. Access to labor for farmers is still limited. To respond to shifts in the volume of consumer demands, farmers alone rely on the harvest they have. Farmers don't go elsewhere for supplies of cayenne pepper. According to studies by Barbaglia, Croux, & Wilms (2020) and Dinu (2016), farmers should think about prices in order to be prepared to use the optimal pricing strategy in order to handle this issue. Advertising, distribution, enhancing the standard and level of customer care, expanding the consumer base, and enlarging the marketing horizon may come next.

CONCLUSION

The analysis indicates that overall, the cayenne pepper supply chain has been performing at a very high level. The two performance criteria for this category are daily inventory and demand fulfillment. Daily inventory is still in the reasonable group and demand fulfillment is still in the very low range.

More research is needed to determine the cayenne pepper supply chain that operates in Dukun District, as it avoids the Sewukan Agribusiness Sub Terminal. The results showed that the daily supply value was still in the good category, the demand fulfillment remained in the very poor category and needed improvement, and the value of meeting consumer needs was still in the very poor category. Therefore, coordination and collaboration between farmers and village collectors were necessary to boost daily inventory and boost order fulfillment for cayenne pepper consumers in Dukun District.

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