Auction Market Dynamics and Chili Supply Chain Performance in Yogyakarta

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Abstract. This study delves into the supply chain intricacies of chili in Yogyakarta, a major determinant in recent inflation trends. Utilizing a quantitative approach, data were garnered from 53 key stakeholders encompassing farmers, traders, and auction market managers. The chili supply chain was delineated into four principal stages: farmers, assembly points, auction markets, and traders, underpinning three core flows - product, monetary transactions, and information dissemination. Noteworthy findings highlight an exemplary performance of the chili supply chain, marked by high responsiveness, agility, and commendable asset management efficiency. Interestingly, an intertwined price dynamic was observed: the Yogyakarta auction market's chili prices mirror those of the Jakarta market, and vice versa. The implications of these insights can be pivotal for devising strategies to ensure price stability and bolstering food security, emphasizing the potential role of auction markets as integral mechanisms in stabilizing commodity prices.

Keywords: Chili Supply Chain, Inflation Trends, Auction Markets, Price Dynamics, Food Security

1 Introduction

Chili is one of the largest contributors to inflation in Daerah Istimewa Yogyakarta (DIY), namely 2.13% from 9.57% in the second quarter of 2022 [1]. Chili gives farmers and traders higher profits, causing prices to fluctuate. Price fluctuations that occur in the commodity market greatly impact farmers and traders [2]. Farmers as producers will suffer losses because farmers do not have authority in the market price determination mechanism [3]. Empirically in the field, it is often found that producer farmers still often face price fluctuations, especially during harvest, and it is traders who have more access to higher prices [4]. Therefore, increasing chili production needs to be accompanied by
improvements to the supply chain system that can provide price information from producers and consumers transparently to maintain market balance and stable prices.

The supply chain is a series of processes that involve several actors in creating and delivering cheap, fast, and quality products. The supply chain process for each product is different, specifically for the food supply chain is more difficult to manage than other fields. There are quite a lot of actors involved and the price of agricultural products often fluctuates so this supply chain is complex and constantly changing [5]. The upstream and downstream sectors of agriculture start from production, post-harvest handling, processing, transportation, marketing, distribution, and retail.

Sleman Regency is one of the major locations of national Chili. This condition is the result of the formation of the Sleman Regency Chili Auction Market to maintain the stability of chili supply in the market so that farmers get a fair price. The Sleman Regency Government collaborates with the Puncak Merapi Horticultural Farmers Association (PPHPM) in forming a PPHPM cooperative with the aim of improving the welfare of farmers. The Sleman Regency Chili Auction Market was established in 2018 but so far chili prices are still fluctuating and there are still farmers who are reluctant to sell their crops to the auction market due to fierce price competition with middlemen. The auction market starts with chili farmers who deliver their crops to assembly points that have been provided in various regions. In the next stage, the auction market manager will transport chili from various assembly points to be moved to the centre point of the auction market. After all chilies from various regions are collected, an online auction will immediately be held using a mobile-based application, namely the Dipanen.id application. The transaction process in the auction market has become easier but the facilities and management of human resources are not adequate. The objective of this study is to identify the supply chain of chili in the Special Region of Yogyakarta, analyse the performance of the supply chain, and analyse the effectiveness of the chili auction market.

2 Methodology

Descriptive statistics was used and the proportionate stratified sampling was used to select the samples among farmers, auction market management, and chili traders. Both primary and secondary data were used in this study. Primary data was obtained from observations and direct interviews with farmers, the chairman of PPHPM, the chairman of PPHPM Cooperative, and chili traders. While the secondary data was obtained from the Department of Agriculture, Food and Fisheries of Sleman Regency. This research was carried out from May to June 2023 in the Special Region of Yogyakarta Province, particularly in Sleman Regency, one location of Indonesia's national chili centre. The data analysis method uses descriptive analysis and SCOR (Supply Chain Operations Reference). Descriptive analysis was used to describe a systematic picture of chili supply chain in Sleman Regency, DIY through the chili auction market. The chili supply chain starts from chili farmers, assembly point, auction market, and traders. The SCOR model was used to analyse the performance of the chili supply chain with five performance measurement attributes, namely reliability, responsiveness, agility, costs, and assets. All these attributes are measured using metrics so that the resulting value can compare with the Superior SCOR Card scoring criteria, as its benchmark value. Performance appraisal qualifications consist of three classifications of values, namely parity, advantage and superior. These qualification value shows the effectiveness of the performance of the chili supply chain in Sleman Regency, DIY.
3 Results and discussion

A supply chain is dynamic and involves the constant flow of information, product, and funds among different stages [6]. The food supply chain is more difficult to manage than other fields because most of the products can rot and require intensive management [5]. The food supply chain consists of four stages, namely crops/orchards, consolidation, processing/package, and distribution/retail. These supply chain actors are farmers, farmer organizations, cooperatives, start-ups holding companies, state-owned enterprises, private financial actors, and private foundations [7].

3.1 Supply chain of chili

Figure 1 below presents the stages of the chili supply chain in Sleman Regency. The results showed that the supply chain of chili consists of four (4) stages: post-harvest, consolidation, packaging, and distribution. The farmers will collect their crops at the nearest assembly point. The manager of the Chili Auction Market of PPHPM is in charge of transporting chili from the assembly point to the PPHPM Cooperative. Once there, the auction market manager will sort and grade before being sold through the auction process. Traders who want to buy chili must bid through the Dipanen.id application that starts from 19.30 to 20.00 WIB. Traders will distribute to markets in the city and outside the city, part of it is the Main Market of Jakarta. The delivery time needed is about 8-10 hours by using a box car.

The stages of the chili supply chain can be seen in Figure 1.

Fig. 1. The Stages of The Chili Supply Chain in Sleman Regency

The flow of products in the supply chain of chili starts from chili production by farmers in Sleman Regency. At the production stage at the farmer level, tillage, planting, maintenance, and harvesting are carried out. Farmers sell fresh chili by delivering it to the nearest assembly point using two-wheeled vehicles. Chili that has been cleaned by farmers will be transported in sacks as containers. After arriving at the assembly point, chili will be weighed and then transported to the PPHPM Cooperative for sorting and grading by the auction market manager. The trader who wins the auction process will buy the available chili peppers with a minimum purchase of 90% of the total inventory on that day.

The flow of money in the chili supply chain starts from merchants who make non-cash payments after the winner of the auction is determined. Traders will buy chili according to
the price offered in the Dipanen.id application accompanied by an administration fee adjusted to the price of chili on that day. Table 1 shows prices and total supply chain costs incurred. The deadline for payment from traders is 1x24 hours, as well as the deadline for payments to farmers. Payment from the manager of the auction market to farmers is made in cash starting from 20.00 WIB until the next day.

Table 1. Prices and total supply chain costs incurred

<table>
<thead>
<tr>
<th>Price (Rp/kg)</th>
<th>Operational (Rp/kg)</th>
<th>Service (Rp/kg)</th>
<th>Total (Rp/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; Rp 15.000,-</td>
<td>Rp 1.000,-</td>
<td>Rp 1.500,-</td>
<td>Rp 2.500,-</td>
</tr>
<tr>
<td>Rp 15.100 - 20.000,-</td>
<td>Rp 1.000,-</td>
<td>Rp 2.000,-</td>
<td>Rp 3.000,-</td>
</tr>
<tr>
<td>Rp 20.100 - 50.000,-</td>
<td>Rp 1.000,-</td>
<td>Rp 2.500,-</td>
<td>Rp 3.500,-</td>
</tr>
<tr>
<td>&gt; Rp 50.100,-</td>
<td>Rp 1.000,-</td>
<td>Rp 3.000,-</td>
<td>Rp 4.000,-</td>
</tr>
</tbody>
</table>

Source: The PPHPM Cooperative (2023)

The information needed by farmers is the price, quantity, and quality of the most up-to-date chili in the Chili Auction Market of PPHPM. The information needed by the manager of the auction market is the number of chili deposits per farmer, chili prices in the Association of Chili Farmers in Kediri, Muntilan, Magelang, and other regions as a basis for pricing, the latest news about chili cultivation and the development of chili prices nationally. Traders who follow the auction process need information on the price, quantity, and quality of chili available at the Chili Auction Market of PPHPM at that time.

3.2 Supply chain of chili

The supply chain performance of chili in Sleman Regency is measured using five attributes of SCOR (Supply Chain Operations Reference), namely reliability, responsiveness, agility, costs, and assets. All supply chain attributes are categorized as superior except the costs attribute. The total supply chain cost was IDR 3,500/kg so the average chili price in May 2023 was IDR 23,539/kg. It means that the percentage of total supply chain costs incurred is 13% of the chili price. The high costs caused the distribution process of the chili supply chain to get inefficient and the traders get more profit [8]. Table 2. presents the calculation results of chili supply chain performance in Sleman Regency.

Table 2. Supply Chain Performance of Chili in Sleman Regency

<table>
<thead>
<tr>
<th>Performance Attributes</th>
<th>Metric</th>
<th>Parity 94-95</th>
<th>Advantage 96-97</th>
<th>Superior ≥ 98</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability</td>
<td>POF (%)</td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Responsiveness</td>
<td>OFCT (day)</td>
<td>8-7</td>
<td>6-5</td>
<td>≤ 4</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Agility</td>
<td>SCF (day)</td>
<td>42-27</td>
<td>26-11</td>
<td>≤ 10</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Costs</td>
<td>TSCMC (%)</td>
<td>13-9</td>
<td>8-4</td>
<td>≤ 3</td>
<td>13</td>
</tr>
<tr>
<td>Asset</td>
<td>IDS (day)</td>
<td>27-14</td>
<td>13-1</td>
<td>= 0</td>
<td>0</td>
</tr>
</tbody>
</table>

3.3 The effectiveness of the chili auction market

The auction market is characterized by successfully its role of determining prices. It is because the price developments are in line with the price developments of chili in the national market [9]. If the price of chili in the Jakarta Market falls, the price in the auction market should not drop drastically so that it can be characterized as an effective auction market. Table 2 shows chili prices in Auction Market and Jakarta Market. Table 3 indicated
that the price at Jakarta fell by 0.33% followed by a decrease of 6% in the auction market meanwhile, the hike in price at Jakarta market by 32% will rise the price of the auction market by 57%.

Table 3. Supply Chain Performance of Chili in Sleman Regency

<table>
<thead>
<tr>
<th>Year</th>
<th>Auction Market Price (Rp/kg)</th>
<th>Market Price Jakarta (Rp/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Red Cayenne Chili</td>
<td>Curly Red Chili</td>
</tr>
<tr>
<td>2021</td>
<td>41.623</td>
<td>19.271</td>
</tr>
<tr>
<td>2022</td>
<td>39.128</td>
<td>30.218</td>
</tr>
</tbody>
</table>

4 Conclusions

The supply chain is divided into 4 stages (farmers, assembly points, auction markets, and traders) that consist of 3 flows: product, money, and information. The performance of Chili’s supply chain responsiveness and agility were categorized very well. The asset management efficiency was very good. Chili prices at the auction market followed the chili prices at the Jakarta market meanwhile, the price at Jakarta is followed by the Yogyakarta auction market.

References