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Analysis of Price Formation of Onion and Garlic Commodities: A Framework of Supply Chain Management

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Abstract: Despite the fact that the commodities of onion and garlic contributes to relatively high inflation in several areas in Indonesia including in ex-Surakarta Residency, these commodities are undeniable very essential. The dependency of onion and garlic supply and the length of the distribution channels have negative impact on the price determined by the brokers or traders as the distributors of the commodity to the consumers. The study aimed to analyze the pattern of price formation and distribution of onion and garlic in the adjacent area of ex-Surakarta Residency. The analysis framework used in the study was the supply chain management. The design of the study was mixed method, namely the quantitative survey and qualitative approach of in-depth interview. The population of the study is the entire parties involved in the supply chain of garlic and onion in ex-Surakarta Residency. The sampling methods were puRp.osive sampling and quota sampling. The analysis tools were data Envelopment Analysis (DEA), analysis of producer share, margin and margin profit ration, price correlation analysis and price transmission elasticity analysis. The study indicated the price fluctuation of onion is caused by the planting season and climate change, seed quality and seed market share, cartels on various levels and particular seasons of celebration. Meanwhile, the fluctuation price of garlic is primarily caused by the import dependency which reached 90%. Analysis of price transmission elasticity adduced the price pattern of onion and garlic at the level of the consumer is higher compared to the price change at the level of producer. Te market participants have to face imperfectly competitive market and inefficient marketing system. The most dominant price formation for onion was transportation costs while for the garlic was labor costs. Analysis on supply chain efficiency indicated the performance of the distributors in the supply chain of garlic and onion was inefficient. The inefficiency of onion supply chain took place in the farmer level where the allocation of fertilizer, seed and labor costs is inefficient yet. The efficiency of garlic supply chain was evidenced at the level of retailers and yet it endured non-optimal labor costs.

Key words: Supply chain, price fluctuation, businessmen, inflation, analysis, labor cost

INTRODUCTION

Price assessment is a crucial study in association with inflation, macroeconomic stabilization and commodity distribution aspect. Inamura *et al.* affirms the current commodity price change significantly affects the Consumer Price Index (CPI). Chen *et al.* also suggests that the commodity price has circuitous impact on currency exchange rate.

Garlic and onion are important commodities whose price fluctuation contributes the level in several regions in Indonesia. The area in ex-Surakarta Residency is among them which undergo the effect of this fluctuation of onion and garlic prices. Both of them are commodities significantly affecting the inflation rate in the adjacent area of ex-Surakarta Residency. By the inflation value of 0.41% for onion and 0.34% for garlic (data of Statistics Indonesia) with consumption value of 22,527 ton onion per year, a small increase on price of onion and garlic commodity will consequently bring about a considerate inflation value.

In 2012, the consumption of onion in ex-Surakarta Residency was to reach 22,527 ton while the production level was approximately 41,325 ton. The highest amount was derived from Boyolali district and respectively followed by Karanganyar and Sragen. However, onion available in the markets in ex-Surakarta Residency is averagely brought in from outside the area of ex-Surakarta Residency. Based on the information yang didapatkan oleh Representative office of BI (KPw BI) in Solo, the onion farmers in Boyolali for instance, have no access to enter the markets in ex-Surakarta Residency except it is preceded via. the distributors of East Java.

It implicitly adduces the demands of onion and garlic in the area of ex-Surakarta Residency are primarily relied on the import from other areas as well as foreign countries

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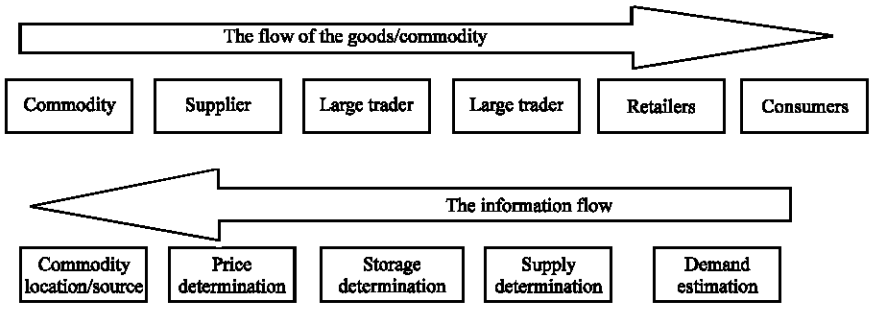

Fig. 1: The plot of supply chain management

even thought the production amount is suRp.lus. Thus, if there is any interference in the distribution of onion from other areas, it leads to the scarcity of the commodity and it consequences on the rise in price.

The dependency of onion and garlic supply from other areas and the length of distribution channel make up the negative impact that is the pricing is determined by the wholesalers or traders who distribute onion and garlic from the producers to the consumers produsen. Hence, the local farmers of Boyolali, Sragen and Karanganyar have no bargaining power towards the price determination of onion.

By this mechanism, the rise of onion price is obtained by the brokers (who are mostly called tengkulak). Since, the price from the farmers is regularly stabile and the brokers as well as the distributors are the actors playing the prices in the markets. In the case of the harvest occurs and onion price declines, the farmers must endure the immediate effects so that, they must be willing to offer their crop production at a relatively lower price.

The study aimed to analyze the pattern of price formation and distribution of onion and garlic in the area of ex-Surakarta Residency. The analysis framework used in the study was supply chain management. The objectives of the study are:

- To analyze and map the chain of onion and garlic distribution and marketing in ex-Surakarta Residency
- To analyze the price formation of onion and garlic commodity in ex-Surakarta Residency
- To formulate the policy recommendations to the local government and Bank Indonesia in order to control the prices of onion and garlic commodity on inflation as well as to protect the farmers of onion
- To analyze the supply availability is there any additional factor which influences the price fluctuation of onion and garlic

Literature review

Analysis framework of supply chain management: The analysis framework in the study was the supply chain management. Supply chain is the sequence of business processes and information that provides a product or service from suppliers through manufacturing and distribution to the ultimate consumer (Schroeder *et al*., 2002; Sahay and Mohan, 2003). Supply chain management is the series of processes that plans, designs, organizes and controls the flow of information and materials along the supply chain in order to meet customer requirements in an efficient manner (Schroeder *et al*., 2002).

A supply chain has four performance measures which are defined as cost efficiency, quality, flexibility and delivery. The success of a supply chain management system depends on time delivery performance of the products or services to the consumers with maintained quality at a reasonable price. In a supply chain system, the critical point is very crucial. The critical point is the most decisive component of the supply chain process in terms of time-cost efficiency and quality standard performance. Figure 1 illustrates the analysis framework of supply chain management.

The supply of agricultural products is also an economic system that distributes the benefits and risks among the participants. Hence, supply chains enforce internal mechanisms and develop chain wide incentives for assuring the timely performance of production and delivery commitments (Iyer and Bergen, 1997, Lambert and Cooper, 2000). To survive in intense competition circumstance, a unit of agricultural businesses should make an attempt to have an efficient supply chain, in order to eliminate the uncertainty factors as well as to improve the customer service. The suppliers, producers and marketers make up a given supply chain shall coordinate their respective values to create a cooperate activities, thus the accumulated value will be greater compared to in the case each component of the chain operates independently. In supply chain management of onion and garlic commodity which is risky due to its perishables of a relatively short period of time, so that, the duration of supply restriction and the flow of commodity will improve the efficiency in the supply chain.

Identification of supply chain members: The implementation of Supply Chain Management (SCM) includes the recognition of the members, the participants they have to deal with the processes they have to pass

through in association with each primary member and the incoRp.oration applied in the process of these relationships. The aim is to maximize the competition and the profit for the company and the entire members including the ultimate consumers. The members of supply chain include all the company and organization related to the primary company, both directly or indirectly, through the suppliers and the consumers from point of origin to point consumption. Primary members are the entire companies or strategic business units which genuinely conduct the operational and managerial activity in the business processes constructed to yield a certain output for the consumers or the market. Secondary members are the companies which provide resources, knowledge, utilities or assets for the primary members. The definition of primary and secondary members will result on the understanding of point of origin from supply chain in which the point is the absence of primary supplier. All suppliers are secondary members while the point consumption is the point where there is an absence of primary consumers. In the study, the primary members of supply chain are as follows:

- Importer the party who makes purchase of onion and garlic from abroad to be distributed to the consumers to meet the domestic demand
- Importer agent (function) individual or company as the representation of importer in a certain market whose duty is to provide the information of onion and garlic supply
- Farmer individuals who are responsible for cultivation processes of onion and garlic to generate a large amount of crop
- Wholesaler (Pengepul) (function) wholesaler is the party who puts the crop on sale or to collect the goods for the distributors or traders in the market. Wholesaler frequently looks for the farmers who harvest their farms and conducts the bargaining process
- Distributor distributor is the high capital trader who receive the crop from the farmers or the importers. With a high amount of capital, the distributor acquires onion and garlic from various areas in accordance to the demand
- Retailer trader who purchase the goods from the farmers or distributors to resell it to the ultimate consumers
- Business consumers individual or coRp.oration who is responsible for the commodity from production process to final products

Price policy: Daniel *et al.* (2002) mentions the price strategy is determined by several matters including the cost structure, competition, communication strategy with the consumers and general marketing strategy. Oligopoly market is capable in enforcing the disparity of profit share between intermediary agency and producer. The price at the consumer level might be diverse, since, there is an information disparity. The structure of oligopoly market can be beneficial for the parties with the information to make possible profit in a distribution channel.

In the context of agricultural commodity, Marks states that the political economic aspect play its role in the commodity price determination. The study was conducted by Marks with the background of prawn commodity trade in the USA which indicated the structure change in the fishermen association and prawn trader organization, demographic, technology shifting and government macro policy in the aquaculture and mechanism of prawn trade cause the price change at the level of fishermen and consumers.

A variety of price strategy results on the pattern of price determination is getting complicated. Price determination is assessed by a simple equation, namely the cost structure added by the marketer expectation on the profit level. Price determination is also measured by various aspects, i.e., the structure of market, the characteristic of consumers, the distribution pattern and the marketing strategy. The equilibrium price is formed by the supply-demand process in which the amount of the demand is similar to the supply:

- Demand→Qd = D (P, a) in which a is a parameter that influence the demand curve shifting such as the consumer's demand, the price of other products or preference changes
- Supply→Qs = S (P, β) in which β is a parameter of supply curve shifting consisting of the factors of input price, technical change or the prices of other products

The factors of price formation:

- Input variables and other production factors used in the production process to generate the output
- Non-production variables, consist of distribution costs, marketing costs and profit margin
- Market structure reflects the level of competition and capability in affecting the price

Economic agents gain their profit by passing through one of the three activities of additional economic value of a commodity. However, the distribution activities remain the central activity of all these activities, since, it relates directly to the ultimate consumers, after the commodity endures the production process and storage. For several types of agricultural commodities such as vegetables for instance they do not require a certain production process

or storage due to their characteristics of the commodity. In addition, the perishable nature of the commodity enforces distribution activities to deliver the commodity to consumers is significantly dominant.

Commodity prices formed at the ultimate level or ultimate consumers are very dependent on the efficiency of the distribution activity. The efficiency of commodity distribution activities or well-known as 'commerce' is strongly influenced by the length of distribution chain and the magnitude of profit margin set forth by each of the distribution chain. The shorter is the distribution chain and the smaller is the profit margin, the more efficient is the distribution activities. In addition, the efficiency of the commodity distribution is also affected by the condition of the transportation sector. Interference on the transportation sector leads to increased costs and delivery period which will have a negative impact on the distribution efficiency. It can be in the form of the armada scarcity, decline in the infrastructure quality, natural disaster such as floods and landslides. The efficiency of commodity distribution needs to be supported by the efficiency of the transportation sector.

Market structure and business strategy: Information on market power can be utilized to figure out the market structural condition as follows:

- Whether the companies with the market power have chance to make collusion or free competition
- Is there any domination by a company or several companies (dominant position)
- Is there any competitor to join the market

Effective competition based on a certain market structure will determine the competition level. Tingkat persaingan. The category of market competition in addition to the level of market power is usually based on the type of product and geographic range. In microeconomic theory, there are six market categories in accordance to the level of competition which is indicated by market share as follows:

- Pure monopoly: a single company controls 100% of a particular market
- Dominant firm: a single company controls 40-99% of a particular market
- Tight oligopoly: four companies control over 60% a particular market
- Loose oligopoly: four companies control 60% or less a particular market
- Monopolistic competition: numbers of company compete in a market with their respective market power
- Pure competition: numbers of company compete without any market power

Effective competition based on a certain market structure will determine the competition level. The activities of production, manufacture, storage and distribution have been performed, the economic agents set forth a profit margin. The amount of the profit margin is significantly influenced by the commodity market structure. The market structure is determined by several criteria, namely the number of company/agent/seller in the market; the prevailing constraints for the company/agent/seller to participate and resign from the market and the characteristics of the traded commodities. The market structure affects the strength of the agent/seller in determining the market price. Theoretically, the market structure may be in the form of a monopoly, duopoly, oligopoly, monopolistic competition and perfect competition.

The contribution of supply chain in the agricultural industry is reflected from the potency which is able to provide guidance/reference of resource allocation to optimize the production value and consumer satisfaction and to encourage the enhancement through the promotion of technology innovation and to extend the supply/demand. This potency is inseparable from the price level formed as the meeting point of the market participant's response toward the supply and demand. Basically, the price of a product is the sum information regarding with the availability of resources, the possibility of production and consumer preferences. Particularly for vegetables with its perishable nature, information and recognition of the situation, the characteristic and behavior of supply chain is required by all participants.

However, descriptive study conducted by Mahmud reaffirm a propensity on the obstacle faced by the farmers in selling their products directly to the wholesalers, large traders in the grocery give no chance for the others to carry out marketing activities in the same market and the bias against the farmers or large traders. Implicitly, this study adduced the need to improve the current supply chain. Lambert and Cooper (2000) proposes three alternatives for measuring the performance of a Supply Chain, consisting of resource-costs, output-profits and customer satisfaction and flexibility-flexibility in volume and delivery setting.

MATERIALS AND METHODS

The study design: The study used quantitative surveys and qualitative study of in-depth interview. Survey research designed to analyze the data on the cost structure, the profit and delivery time of each party in the supply chain. Qualitative design of in-depth interview used to analyze the behavior of intermediaries in the supply chain of garlic and onion.

Table 1: Cost structure and price of farmers and wholesaler

Farmer		Wholesaler	
Farmer cost structure	Price at the farmer level	Wholesaler cost structure	Price at the wholesaler level
Seed procurement costs	Profit expectancy	The wholesale price from the farmers	Profit expectancy
Land maintenance costs	The highest price (depends on the season)	Labor costs	The highest price
Fertilizer costs	The lowest price (depends on the season)	Transportation costs	The lowest price
Pesticide costs	The price at the intermediary level	Storage costs	The price at the trader level
Labor costs		Other expenses	
Transportation costs			
Storage costs			
Other expenses			

Table 2: Cost structure and price of distributor and retailer

Distributors		Retailers	
Distributor cost structure	Price at the large trader level	Retailer cost structure	Price at the retailer level
Wholesale price from the broker	Profit expectancy	Wholesale price from the large trader	Profit expectancy
Labor costs	The highest price	Labor costs	The highest level
Transportation costs	The lowest price	Transportation costs	The lowest price
Storage costs	The price at the retailer level	Storage costs	
	The price at the consumer level		
Other expenses		Other expenses	

Population and sample: The populations of the research are the parties involved in the supply chain of garlic and onion, consisting of farmers, brokers, cooperatives, wholesalers, modern and traditional retailers, business customers and ultimate consumers in the territory of ex-Surakarta Residency. The study applied a combination of puRp.osive random sampling and quota sampling for the survey. The specific characteristics of the respondent are the farmers, the traders, the distributors and business customers from the medium to large scale businesses. Quota sampling was associated with spatial circumstance of ex-Surakarta Residency with their diverse specified characteristics. As many as 30 respondents were taken from respective district/city (with total of seven district/city), therefore there were a total of 210 respondents. Determination of the respondents in the in-depth interview used snow ball sampling that is a key respondent provides information on the other key respondents in the plot of supply chain.

Variable and measurement: Variables measured in the study were as follows; Table 1 shows cost structure of farmer and wholesaler of onion and varieties of price. Those information related with how farmer and wholesaler define their profit. It shows that farmers have more complicated cost structure than other members of onion and garlic supply chain (Table 2).

Table 2 shows the cost structure of distributor and retailer. The cost structure and price level in those two buying organizations is similar. However, the characteristic of buyer and trading volume of distributors and retailers is different. In addition, several variables were analyzed in the in-depth interview as follows:

- Business characteristics (turnover, total employees, total sales)
- Function in the distribution chain
- Business Strategy (price policy, information of distribution channel, information on suppliers/groceries, delivery time, commodity supply policy, information on market situation)

The tools of analysis: The tools utilized in the study consist of as follows:

Data envelopment analysis (DEA): DEA is used in the study to examine the actor efficiency in the supply chain from the farers to the business consumers. Analysis of producer share, margin and margin profit ratio. Producer Share (PS) used to determine the earning of the producers

Analysis of price correlation: The correlation between the price earned by the farmer as the producer and the price paid by the ultimate consumer is a linear function and the value of the correlation (r) can depict the prevailing market structure. The coefficient of price correlation provides guidance on the integration level among the market level or to what extent the price formation of a commodity at an agency level is influenced by the price at of other agencies

Analysis of price transmission elasticity: Elasticity of price transmission is an analysis explicates the extent of the impact of price changes of a commodity in a given place or level to the price change in other places or levels. Price transmission is measured through simple regression between the two prices at two levels of market, then the elasticity is calculated.

RESULTS AND DISCUSSION

General condition of onion and garlic agriculture and trade

Description of respondents: Survey was conducted in the area of ex-Surakarta Residency comprising of 7 District/City. Respondents prepared for the survey were 210 respondents while in fact, 208 respondents had answered the questionnaire. Response rate in the study reached 99%.

In the study, the sample of surveyed respondents was determined as many as 208 samples deribed from 7 District/City in ex-Surakarta Residency. The composition was the farmer of 20.67%, the importers of 0.96%, the agents of 1.44%, the distributors of 20.67%, the retailers of 37.50% and the business consumer of 19.71%.

Analysis of producer share, margin and profit margin ratio

Garlic commodity: The commodity of garlic in this analysis is referred to the import garlic instead of the data collected from the local farmers, since, there is no garlic cultivation in the study.

Producer share: Produces share for the distributors is 81.538 while the producer share for the retailers is 97.67. Based on the analysis of producer share, the operational performance of the distributors and retailers indicated well-maintained management.

Marketing margin: Marketing margin for the distributed was recorded as much as Rp. 3,000 while the retailer was Rp. 378.20. It explicitly adduced the marketing margin of the distributors is higher than the retailers.

Marketing margin ratio: Marketing margin ratio from the distributor was 298.766 while from the retailers was 4.335. Similar to the marketing margin, the ratio of marketing margin of the distributors is significantly higher than the retailers

Onion: The commodity of onion in this analysis used the data retrieved directly from the farmers as onion is generally cultivated in Indonesia.

Producer share: Producer share for the distributors was 126.47 while for the retailers was 89.285 and for the farmers was 68. The analysis of short-term producer showed off the weakest performance is demonstrated by the farmers.

Marketing margin: marketing margin for the distributors was Rp. 4,000, the retailers was Rp. 1,500 while the farmers was Rp. 3,250. It indicated the highest marketing margin was on the distributors. Marketing margin of the farmers is also high. While the lowest marketing margin was on the retailers.

Marketing margin ratio: The ratio of marketing margin from the distributor was 6.80 from the retailers was 15.768 and from the farmers was 0.159. It indicated the ratio of marketing margin of the distributor and retailers is higher than the farmer's.

Analysis of supply chain of onion and garlic: Garlic distributed in the markets of ex-Surakarta Residency is mainly supplied by the importers from Surabaya. It is estimated that 90% of garlic supply imported from China. The central government merely open the entrance of the import garlic in Tanjung Perak Port in Surabaya and Belawan Port in Medan, North Sumatra. Import garlic is available in Indonesian throughout the year. There are two type of import garlic, i.e., Cating and Cincau. The importers in Surabaya distribute their goods to Pasar Legi in Surakarta which is subsequenlty dispersed them to several markets throughout the area of ex-Surakarta Residency. In addition, they are also distributed to the markets in Ungaran, Ambarawa and Salatiga. Maenwhile, in some areas such as Temanggung, Magelang and Tawang Mangu, several farmers cultivate local garlic in a small portion (Fig. 2).

Garlic commodity is available only in May as it is a seasonal crop. The incurred costs consisting of fertilizer, labor, seed, pesticide and transport costs are estimated per planting season (approximately 70-80 days). Local garlic is planted in smaller amount compared to the import one. The costs include the management costs for crop diversification, e.g., chili and vegetables. Local garlic is purchased by the wholesalers who are frequently the local community or neighbors and sell the crop to Pasar Ngargoyoso. Local garlic produced by the farmers in Magelang and Temanggung is put on the markets in Boyolali, while garlic from the farmers of Ngargoyoso, Kemuning and Tawang Mangu is distributed to Karang Anyar district and Pasar Bunder in Sragen (Fig. 3).

Description: Farmers in Cepogo area are preoccupied on cultivating onion. There are 3 categories of onion. Pricing is determined based on the wholesaler's decision, which ranges between Rp. 8,000-20,000. The operational costs include the cost of fertilizer, labor, seed procurement and transportation which are calculated in each planting season. The seed is valued by Rp.. 14,000 kg^{-1} (a kilogram seed produces 3 kg fresh onion).

In a year, the farmers have 3 planting seasons (70-80 days for each season). In addition to cultivate onion, the farmers combine it with other crops,

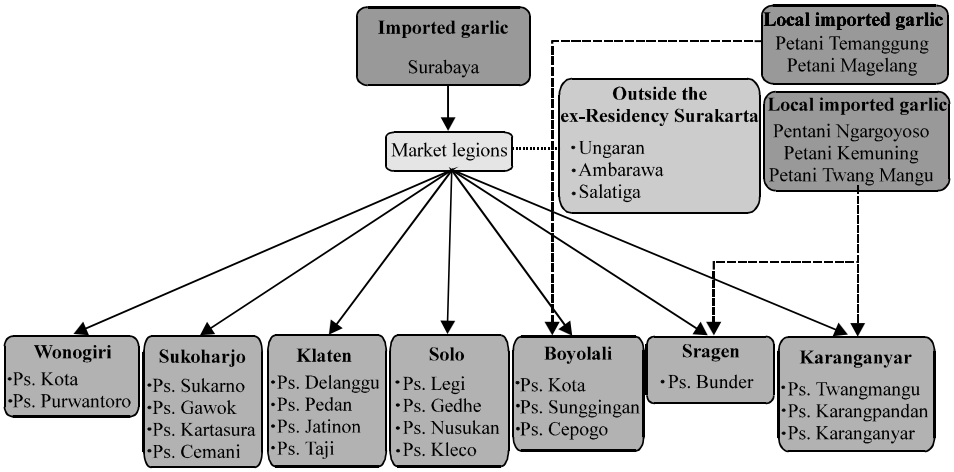

Fig. 2: Supply chain of import and local garlic in the area of ex-Surakarta Residency

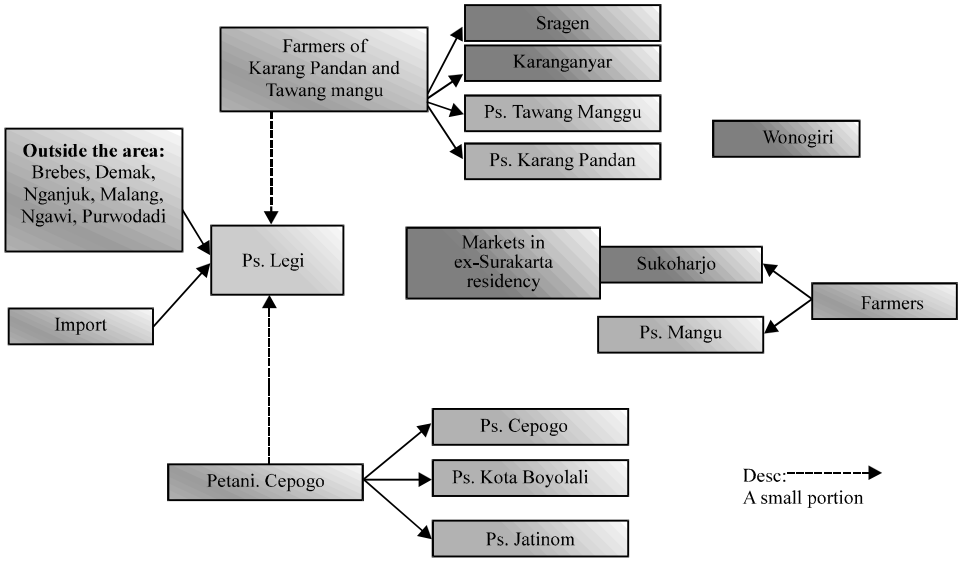

Fig. 3: Supply chain of import and local onion in the area of ex-Surakarta Residency

i.e., chili, tomato and tobacco. The majority of the farmers in Cepogo is smallholders or peasants. They own a plot or 2 plots and produce an average of 3-4 quintals in each planting season. The cost for each planting season is relatively small, the farmers utilize organic fertilizers from the manure and combine it with a small portion of non-organic fertilizer (ZA). Another precaution cost is pesticide cost. Pest becomes a problem when the fog comes down which is anticipated by the farmers by putting the tires in holes in adjacent to the plants and burning them. The wholesalers and farmers are in a business unit. The farmers in Cepogo directly put their crops to the markets in Cepogo and Boyolali area. There are several options to sale onion, the farmers can bring it to the market by themselves or the retailers who is responsible to bring it to the market.

A popular derivative product from Cepogo region is fried onion flakes. The wholesalers put onion in the form of frien onion flakes on the markets outside the area. The price is approximately Rp. 40,000 kg^{-1}. In the production process, it requires 3 kg fresh onion to produce a kilogram of fried onion flakes with the ratio of 1:3 (1 kg of fried onion flakes is generated from three kilograms fresh onion). In several occasions, the wholesalers have to supply onion to meet the demand of the farmers for seed and fried onion flakes from the area of Brebes and Malang with the transport costs as much as Rp. 600,000 for 5 tons onion. Cepogo's farmers allocate most of their production to Klaten and other areas such as Magelang and Salatiga while a small amount is distributed to Pasar Legi with the consideration their production is less desired by the local consumers in Surakarta.

From the local onion production centers in Karang Pandan and Tawang Mangu, onion is sold from Rp. 8,000-20,000 kg^{-1} while the price is determined by the market. It is the half-dried price. The respondents of onion farmer, particularly, explicated the mechanism that the post-harvested onion is collected by the retailers and it is paid-off after sold-out, thus it is able to save the transportation costs. The additional commodity of onion, i.e., the leaves and flowers can be sold to cover the production costs. A bunch of this derivative product is Rp. 8,000-10,000 in which a harvest period frequently yields 400 bunches. The average yield of 1000 m^2 is 600 kg. A kilogram of seed produces 6-8 kg of onion. The applied fertilizers consisted of organic and non-organic fertilizer. There is a business cartel led by the Head of the Village (Lurah) and the Head of the Sub-village (Kepala Dusun) in the mechanism of utilization of service land (tanah bengkok). Seed procurement is retrieved from the previous harvest yield. A high amount of onion generated by the farmers of Tawang mangu and Karang Pandan is distributed to Sragen, Karanganyar and Wonogiri and re-distributed to Pacitan and Ponorogo in East Java. Onion cultivated by the farmers in Mangu Colomadu is particularly dispersed to the sellers in Pasar Kartasura Sukoharjo and Pasar Mangu Colomadu since, it is produced in a small amount.

The supply of local onion in the area of ex-Surakarta Residency is derived from Brebes, Nganjuk, Malang, Purwodadi, Demak and Ngawi as well as imported onion. Import onion arrived in Tanjung Perak Port in Surabaya in January to March. While for import nion, local farmers productively cultivate this crop even though they have to compete with onion imported from Vietnam, Thailand, Phillipan and partly from India. In Pasar Legi traditional market of Surakarta, onion is subsequently distributed throughout markets in ex-Surakarta Residency.

Dea analysis of supply chain analysis of onion and garlic: Assessment of data envelopment analysis was determined to examine the efficiency degree of the economic actor in each supply chain level.

DEA analysis showed that in the supply chain of garlic in ex-Surakarta Residency, numbers of actors in the supply chain endured inefficient business processes. Efficiency is mainly caused by the disorganized allocation mechanism of transportation costs, storage costs and labor costs. The actor of supply chain with the most inefficient business processes is the retailers whose efficiency's value was <10%.

In fact, the distributors and importers had a dissimilar situation, although there was solely an importer and distributor successfully maintaining its function efficiently, the average efficiency of the importer and distributor had reached 75%. Regarding with this pattern, hence, the supply chain of garlic in ex-Surakarta Residency could be considered as severely inefficient. However, this supply chain of garlic had not analyzed the farmers' efficiency yet, since, 90% of garlic in the area ex-Surakarta Residency was imported from China as local farmers had no intention to cultivate garlic for supplying the demand in ex-Surakarta Residency.

In addition, analysis on the efficiency of the supply chain of onion was carried out. The result of DEA analysis of onion supply chain in ex-Surakarta Residency indicated that the distributors are the group whose business processes are maximal, the efficiency reaches 100%. The farmers and retailers were evidenced to undergo inefficient business processes.

The level of efficiency at the farmers' level was under 30%. This inefficiency was the result of the cost allocation of seeds, fertilizer and labor. The onion farmers in Tawang Mangu can make a profit because there are derivative of the onion, i.e., the leaves and flowers. These derivative products of leaf and flower are capable to cover the losses that would be suffered by onion farmers in Tawang Mangu, approximately of Rp. 4,000,000 in each planting season.

Inefficiency at the level of retailers occurs primarily due to the allocation of labor costs. Most of the retailers are the businessmen at micro level and small entrepreneurship, thus the majority of labor comes from the family or the owner. It results on non-optimal allocation of labors.

Price determination of onion: The prices of onion at the level of farmers range from Rp. 8,000-9,000 which are then distributed to the distributors from other regions. The distributors sell them to the retailers with the prices of Rp. 11,000-12,000 and to the business consumers with the prices of Rp. 16,000-18,000. The retailers subsequently put it to the market, mainly to the consumers with the prices of Rp. 13,000-14,000.

Onion price transmission elasticity in ex-Surakarta Residency achieved 4.938 or >1 that is price changes at the consumer level is greater than the change in the producer level, the market participants have to deal with imperfectly competitive market and the marketing system has been inefficient.

Price formation of onion was analyzed by regression analysis between the price of onion and the operational costs of distribution and onion cultivation process. The analysis of price formation of onion commodity adduced the transportation costs are the main cause of the price formation of onion.

Price determination of garlic: The prices of garlic from the importers range from Rp. 11,600-11,700 for kating garlic and Rp. 9,000-10,000 for cincau garlic which are subsequently distributed to the agents. The agents offer

it to the distributors from other areas with new prices of Rp. 11,700-11,800 for kating garlic and Rp. 10,110 or cincau garlic. They are sold to the retailers with the prices are determined by the distributors which are Rp. 12,000 for kating garlic and Rp. 12,000 for cincau garlic. Further more, the distributors put them to the sale for the business consumers with the price of Rp. 16,000 for kating garlic and Rp. 18,000 for cincau garlic.

An analysis of garlic price transmission elasticity was carried out by regression analysis between the prices at farmers level and consumers level (agents and distributors) and the result was b = 0.736.

Garlic price transmission elasticity in ex-Surakarta Residency reached 2.09811 or >1 that is price changes at the consumer level is greater than the change in the producer level, the market participants have to deal with imperfectly competitive market and the marketing system has been inefficient.

Price formation of garlic was scrutinized by conducting regression analysis between the selling price and the operational costs of garlic distribution and cultivation process. Based on the analysis of price formation of garlic commodity, hence labor cost was evidenced to be the most influential factor in garlic price formation.

CONCLUSION

The price fluctuation of onion and garlic is dominated by the factors of transportation costs and labor costs. Analysis on price elasticity indicated that in the price pattern of onion and garlic, price changes in the consumer level are higher compared to in the producer ones, the market participants encounter a kind of imperfectly competitive markets while the prevailing marketing systems are inefficient.

The price formation of onion is highly affected by the transportation costs, meanwhile the most dominant factor of garlic's price is the labor costs.

Analysis on the supply chain efficiency indicated that the distributors of onion and garlic had not efficiently managed their role in the supply chain. Inefficiencies in onion supply chain took place at the level of the farmer in which the allocation of the fertilizer costs, seed costs and labor costs have not been optimized. Efficiency in the supply chain of garlic succeeds at the level of retailers due to the labor cost can be reduced. Other factors affect the fluctuations of onion and garlic price are as follows:

Onion: Planting season and climate change. Seed quality and seedlings market share. Particular months of celebration.

Garlic: The demand for garlic is dependent on imports up to 90%. Limited importers (approximately 91 companies) Onion cartels in various levels. There are merely two import ports in Indonesia, i.e., Surabaya and Medan.

RECOMMENDATIONS

Government: Government's surveillance is conducted through the reporting mechanism of the amount of supply and distribution area to the Central Agriculture Agency. Government needs to improve the governance by empowering economic institutions at the village level to eliminate the cartel's power. Information on the price shifting and the amount of supply as well as the demand of onion and garlic will have an impact on policy making in maintaining the stability of price and supply. Government shall carry out an improvement as well as enhancement in the transportation sector through the relevant agencies. Garlic cultivation technology engineering is definitely required to reduce import dependency.

Bank Indonesia: It is suggested that the trading mechanism of these two commodities should be developed, particularly by implementing supply chain improvements, for instance by providing an information access about the prices and supply of both commodities. It is important for the farmers to diversify their products, such as processed onion which has high economic value, instead of merely supplying the fresh ones. For achieving the inflation target, Bank Indonesia should promote the participation as well as the coordination with the Regional Inflation Control Team (TPID). To provide guidance and reduce asymmetric information as well as to form public expectation, both sellers and consumers, dissemination of prices information is required by utilizing a variety of prevailing media.

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