

Evamping the Supply Chain of Fruit and Vegetable in East Java Province, Indonesia

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Abstract

Population growth and improved public awareness of health have resulted in an increase in the demand for fruits and vegetables from year to year, both in quality and quantity. Unfortunately, the increase in the demand for fruits and vegetables has not been supported by the availability or the supply of the products from production centers, thus resulting in an increase in imports of fruits and vegetables in order to meet the domestic demand. There are many factors that lead to the lack of products supply to market every year and this cycle occurs repeatedly, that is, harvest time – abundant products – price falls – unsold fruits and vegetables are rotting. Referring to the problem above, the argument commonly expressed by the government is that the problem is caused by bad trade system and limited innovation or technology. Trade system is still controlled by a handful of economic operators (wholesalers) that control the prices completely. At the same time, the information received by the farmers is very little. The products harvested cannot be distributed to other areas quickly due to the constraints in information, transportation and distribution networks. Furthermore, ignoring technology or product innovation makes most fruits and vegetables become perishable. Refrigeration or storage technology is urgently needed to extend the age of commodities (fruits and vegetables) so that the quantity of supply to the market can be regulated well and the prices would not be interfered. This problem, however, has not been handled well up to now, whereas the acceleration of commodity damage can be avoided if not all commodities are consumed in the form of raw materials. They should be processed first to achieve price stability and high added value.

Keywords

Supply Chain, Value Chain, Fruits and Vegetables, Logistics Infrastructure

I. Introduction

Horticulture development has a vital role in boosting economic growth as well as in increasing the income of producers of fruits and vegetables in East Java through the reception of the added value of advanced process on an ongoing basis, the creation of adequate employment opportunities in rural areas and the increase in non-oil exports. Horticulture development is expected to have a large opportunity, because it rests on a foundation of comparative advantage in producing fruits and vegetables as well as creating both domestic and foreign market opportunities.

Horticulture development needs to be placed not only as a new approach to plantation development in rural areas, but also as the main drivers of agricultural development as a whole, given that there are so many Indonesian typical horticultural products that are in demand by foreign consumers, such as mangosteen, watermelon, pineapple, zalacca, and pomelo. East Java has a bigger potential in agriculture and has become the main supplier of the needs of food crops, animal sources, and horticulture than many other areas in Indonesia. East Java has a more comparative advantage than other

areas because of the condition of its climate, soil and topography which is adaptive to the development of horticultural agribusiness. Horticultural production centers in East Java are quite large, such as Malang, Pacet, Pasuruan, Probolinggo, Kediri and Lumajang, in which the condition of the soil and climate in these areas is very suitable for the growth of horticulture

Table 1: Vegetable Production Centers in East Java (x ton)

| No | Commodity | Production Centers |
|----|-----------|---|
| 1 | Chili | Nganjuk, Probolinggo, Gresik, Tuban, Malang, Kediri, Sampang. |
| 2 | Onion | Nganjuk, Kediri, Probolinggo, Malang. |
| 3 | Garlic | Malang, Pasuruan, Probolinggo, Mojokerto |
| 4 | Tomato | Malang, Kediri, Blitar, Gresik Banyuwangi |
| 5 | Potato | Malang, Pasuruan, Probolinggo, Magetan |
| 6 | Cabbage | Malang, Pasuruan, Probolinggo, Magetan |
| 7 | Carrot | Malang, Pasuruan, Probolinggo, Magetan |

Source: Researchers, 2016

From marketing prospects, horticultural agribusiness has quite competitive advantages, that is, to meet the demand of local consumer (local market), consumer from other islands (inter-island market) and foreign consumer (export market). The local and inter-island market share is quite large considering the size of East Java's population (including consumers in major cities, such as Surabaya and Malang) as well as the surrounding areas (consumers outside of East Java). Similarly, export market is also quite prospective considering the diversity of products and the specifications of tropical fruits which are rarely produced by other countries.

Table 2: Fruit Production Centers in East Java

| No | Commodity | Production Centers |
|----|-----------|--|
| 1 | Mango | Pasuruan, Probolinggo, Situbondo, Gresik, Kediri, Madiun |
| 2 | Banana | Mojokerto, Banyuwangi, Malang, Jember, Lumajang, Bojonegoro, Bangkalan |
| 3 | Tangerine | Ponorogo, Pacitan, Malang |
| 4 | Pomelo | Magetan, Madiun |
| 5 | Papaya | Malang, Kediri, blitar, Lumajang, Tulungagung. |
| 6 | Zalacca | Jombang, Lumajang, Malang, Pasuruan, Bangkalan, Trenggalek. |

| | | |
|----|------------------------|--|
| 7 | Mangosteen | Trenggalek, Ponorogo, Blitar, Lumajang, Banyuwangi, Malang |
| 8 | Rambutan | Blitar, Jember, Kediri, Bangkalan, Ngawi. |
| 9 | Durian | Pasuruan, Jombang, Trenggalek, Ponorogo, Malang, Nganjuk. |
| 10 | Star fruit (carambola) | Blitar, Bojonegoro, Sidoarjo, Tuban |
| 11 | Apple | Malang, Pasuruan |
| 12 | Soursop | Mojokerto, Blitar, Malang, Pasuruan, Kediri. |
| 13 | Avocado | Malang, Probolinggo, Lumajang, Banyuwangi |
| 14 | Jackfruit | Malang, Lumajang, Bangkalan. |
| 15 | Pineapple | Blitar, Kediri, Tulungagung. |
| 16 | Water-apple | Sampan, Kediri, Banyuwangi |
| 17 | Sapodilla | Ponorogo, Kediri, Banyuwangi |
| 18 | Water melon | Malang, Bojonegoro |
| 19 | Melon | Ngawi, Malang, Madiun, Ponorogo |

Source: Researchers, 2016

The demand for fruits and vegetables tends to increase from year to year, both in quantity and quality. Such a condition is caused by population growth and an increase in prosperity of the people due to the increase in income and purchasing power of the society for horticultural products and the increased awareness of the importance of quality nutrition and health. Market opportunities on agricultural products, particularly the demand for horticultural products in domestic and global markets will continue to increase in line with the growth in world population from approximately 6 billion today to approximately 9 billion in 2025. Similarly, Indonesia's population will grow from 252 million people to 370 million people in the same period. Total demand will increase in line with the increase in demand of consumers from other countries, among others: United States, European Union, United Canada, Singapore, Hong Kong and Japan.

Unfortunately, the ability of farmers to produce fruits and vegetables has not been able to meet the large domestic and foreign markets due to limited land, the use of semi-traditional cultivation technology, difficulties in meeting quality standards, marketing to middleman and wholesaler in the form of wholesales without qualifying the quality of fruits and vegetables.

II. Literature Review

Supply chain involves continuous relationship concerning goods, money and information. Goods generally flow from upstream to downstream, money flows from downstream to upstream, while information flows both from upstream to downstream and from downstream to upstream. Viewed horizontally, there are five major components or actors in the supply chain: suppliers, goods-manufacturing factories, distributors, retailers and customers. Vertically, there are also five main components: makers, buyers, transporters, storage and sellers [6].

Basically, supply chain is an extension and development of the domain of logistics management concept. Logistics management deals with the flow of goods, including purchases, inventory level control, transportation, storage, and distribution within the company. Meanwhile, supply chain management deals with the same things but also includes inter-company related to the flow of goods, starting from raw materials to finished goods that are

purchased and used by customers.

Supply chain management is the further integration of the logistics management between the companies involved, with the aim to increase the flow of goods, improve the accuracy of estimated needs, improve the efficient use of space, vehicle, and other facilities, reduce the level of inventory, reduce costs, and increase other services required by end customers. Supply chain management is also related to product development, quality assurance of goods, ease of finance, after sales services, and information services [6].

In line with the development of supply chain, there will be additional tasks assigned to the purchasing function, such as management, cost, time, technology, and continuity of supply. Today, supply chain is the right concept in a very tight market competition to get the company's profit maximization, and is often termed as the supply network [6]. Basically, there is no company that can really fulfill its own needs. Every company relies on suppliers to meet the needs of different types of goods, services, and equipment. The Input management will influence the success or the failure of the output or the overall system.

The value chain of a company is a reflection of history, strategy, approach to the implementation of the strategy, and the economy underlying the company's activities. Value chain consists of margin and activity of value. Margin is the difference between overall value and collective cost of value activity, while value activity is basically the physically separated activities and the technologies applied by the company [1]. Fruits and vegetables producers are less aware of the importance of the role of logistics in enhancing the competitiveness of the companies, where as logistics management can be a competitive advantage through cost and service leader. Logistics is strongly associated with the movement of goods, from raw materials, auxiliary materials, to effective goods to meet the needs of customers with cost-efficient. Integrated logistics management appeals to farmers because there is an opportunity to reduce the costs that improve service for customers in order to get productivity advantage and value advantage [4].

III. Research Method

This research is a qualitative descriptive research which analyzes the existing condition of value chain of fruits and vegetables in East Java from the field of economics. This research is focused on the natural object condition in which the researcher is a key instrument. Data analysis is inductive with the emphasis on meaning rather than generalization. This qualitative research is intended to investigate and understand the phenomenon occurring in fruit and vegetable value chain in East Java, why and how it happens. The objective to be achieved is to make the fact easy to understand and, if possible, able to generate new hypotheses. This research seeks to interpret the phenomenon from the perspective of the doers based on their interpretation of the phenomenon. Thus, the presentation of the research results becomes complex, detailed and comprehensive according to the phenomenon occurring in the research setting.

The research team, in interviewing and observing the farmers and production centers, attempts to capture, record, interpret and present several information based on the data collection to generate in-depth and comprehensive analysis through data reduction and understanding related to the value chain of fruits and vegetables in East Java. Furthermore, it is expected that in the SWOT analysis and the basic value chain of fruits and vegetables can produce a strategy for farmers to obtain margin.

IV. Research Findings

Vegetable commodities zoning is found based on altitude and divided into 3 areas: highland, lowland and medium land. Highland vegetable crops such as potatoes, garlic and cabbage are developed in Pasuruan, Probolinggo, Malang and Magetan. Chili, onion, tomato and garlic (certain varieties) are developed in the lowlands which almost spread across East Java, while other commodities are developed locally in low to medium land in order to meet the need of diversification of vegetables for the community.

Table 3. Competitive Horticultural Commodities in East Java

| | |
|------------|---|
| Fruits | Mango, Orange, Banana, Durian, Rambutan, Zalacca, Soursop, Mangosteen, Apple, Star fruit, Pineapple, and Grape. |
| Vegetables | Chili, Onion, Garlic, Potato, Cabbage, and Tomato |

Source: Researchers, 2016

There are three areas of the development of prioritized fruit commodity: Northern area is for mango, Southern area is for orange, and Central area is for banana. The development of quality mango variety, such as “gadung 21” or “arumanis 143”, is mainly done in the Northern area of East Java which has a dry climate, ranging from Tuban, Lamongan, Gresik, Pasuruan, Probolinggo, Situbondo and Madura. The orange commodity developed is tangerine “pulung / batu” 55 in Madiun and Magetan. For the commodity of banana “Cavendish” is developed in Mojokerto, Banyuwangi, Malang and Jombang.

The increased production of chili and onion in East Java province is not only caused by the increased areas of plantation and harvest, but also caused by the increased productivity from 4.75 tons / hectare to 5.21 tons / hectare, or an increase of 14.02%, while onion rises from 7.98 tons / hectare to 8.79 tons / hectare, or an increase of 10.00%. Productivity value per unit area harvested from each type of vegetable (except chili) is still relatively low compared to its optimal potential. This is due to the absence of commodities zoning, an agro-ecological suitability factor of each region to produce a product with the high quality and quantity. In general, for the commodity of chili, the market transactions between producers and traders occur not only when the harvest comes, but also by / before the harvest, so the price at the level of farmers, as the producers, is relatively low. Such a condition is supported by the inability of farmers to access market information.

The flow of chili product is from the farmers, as the producers, to consumers through middleman who subsequently offer them to wholesalers. For wholesalers who do not have a strong capital, the product is offered to retailers in the local market and then to consumers. Meanwhile, for the wholesalers who have access to a strong market are able to market the product outside the region or even to the processing industry (factory). In addition, some farmers sell their crops directly to wholesalers and retailers before being enjoyed by consumers.

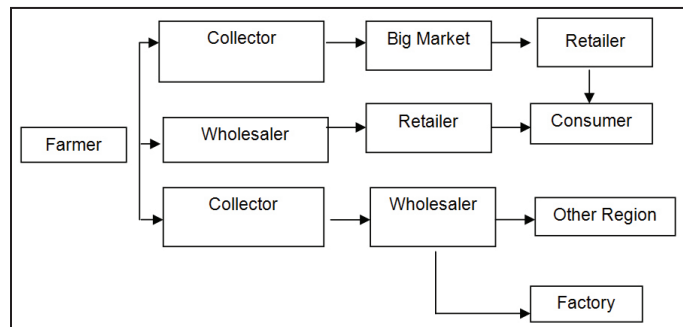


Fig. 1: Chili Commodity Distribution Network in East Java Province
Source: Researchers, 2016

The prices of red chili sold in a number of areas in 2016 and early 2017 were likely to move up and ranged between IDR 5,000 and IDR 100,000 / kg. The price increase has reached two to three times of the normal price due to the depletion of stockpiles, limited supplies from production centers, and the length of the chili commodity distribution network. The same thing also happened to onion and garlic commodities. Up to now chili trade system has not sided with the farmers and the supply chain from the merchant to the buyer must be through at least 6 middlemen. In fact, before the auction, the lowest chili price benchmark at farm level has been determined by the wholesalers in Jakarta. Representatives of farmers' groups can only get information from middlemen to establish the lowest selling price. As there is no chili price protection, anyone can fix the highest prices. Long supply chain and the absence of market management system may cause the price of chili to reach IDR 200,000 / kg. Other factors that also affect the high price of chili are extreme weather, distribution, and psychological conditions of the community. The price of chili reaching IDR 200,000 / kg can exceed the price of beef because farmers often fail to harvest, especially during the rainy season, considering that 90 percent of chili seeds planted by farmers is local seeds which cannot stand with extreme weather.

Meanwhile, the food industry usually uses fresh chili as the raw material to produce hot sauce, and the need for chili for industry is about 10 percent of national production. Dried chili is obtained from China and India at a cheaper price because both countries have large subtropical areas with cultivation system, and some are obtained from local product through a partnership with farmers and via the market, especially when the price of fresh chili is falling.

In addition to providing consumption and being marketed in the country, horticultural products are also exported to other countries that help encourage and contribute revenue and foreign exchange for the country. Commodities that make a significant contribution to the volume of export are cabbage, onion, apple, banana and jackfruit, in which each of them experiences positive growth every year. Export market for horticultural commodities from East Java has a good prospect. And, it is necessary to enhance other commodities that have not entered the export market because of the large competitors in horticultural products from other countries. The commodities are generally exported in small quantities so that the calculations are combined into one. The countries that become the export destination of East Java horticultural products are Malaysia, Singapore, Taiwan, Japan, Hong Kong and the Netherlands.

Horticultural commodities prove to have more market driven. Therefore, they need to be accelerated as the source of new growth of agricultural sector, especially in East Java. The horticultural

products that have advantages in the market are tropical fruits and vegetables that have potential to be developed, while the subtropical products, especially "temperate fruits", will be difficult to compete. In contrast to grain products, horticultural products are perishable so they require policy on handling and integrated services. The development of the domestic market is still very open although it will be related to the condition of purchasing power, preferences, social, culture, infrastructure, product development and so forth.

One of the potential domestic markets in East Java is Surabaya where the people are increasingly aware of the nutritional factors and health. The need for fruits and vegetables continues to increase in line with population growth, which is reflected in the magnitude of the flow of fruits and vegetables that go into Surabaya every

day from various districts in East Java, such as Malang, Pasuruan, Probolinggo, Bangkalan, Sampang, Pamekasan, Sumenep, and others. Even the delivery of fruits and vegetables also comes from different provinces, such as Bali, Central Java, West Java, and Lampung.

It is worth to note that the fruits and vegetables that go into Surabaya market are not only for the consumption of the people of Surabaya, but also for the consumption of the people of various areas, such as Sidoarjo, Gresik, Jombang, Banjarmasin, Balikpapan, Samarinda and Makassar. Fruits and vegetables trade may become evidence that Surabaya is the gateway to Eastern Indonesia. So the central government should focus on land, sea, and air infrastructures to support the rapid business world between regions and between islands.

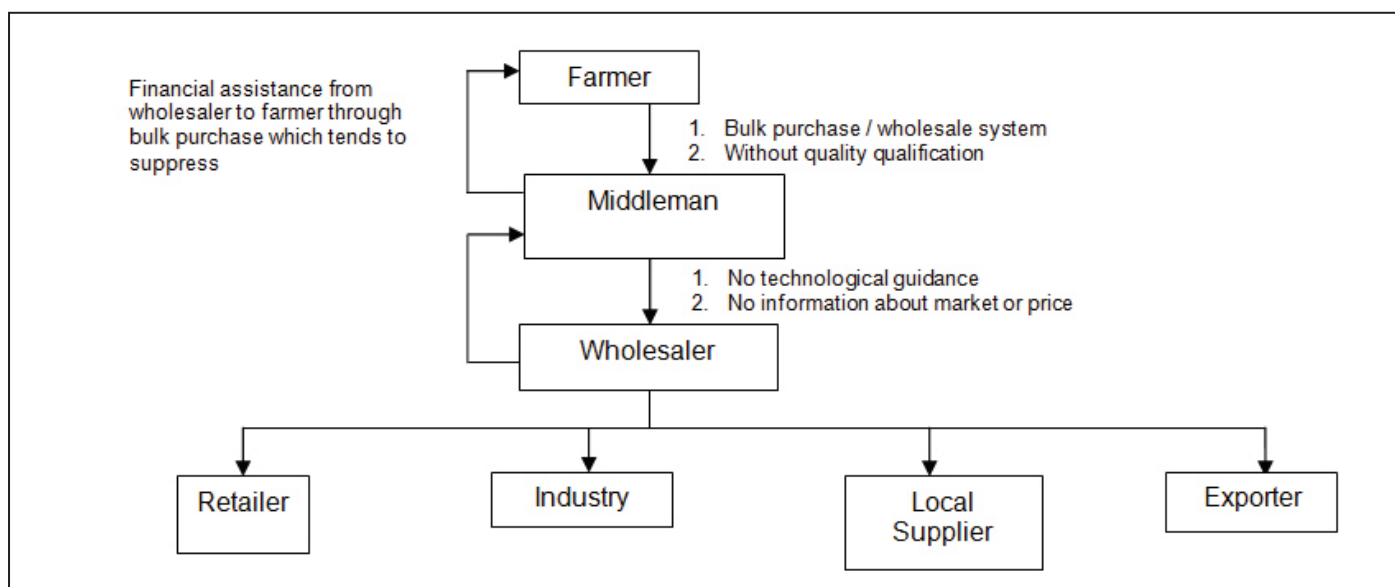


Fig. 2: Current Horticultural Trade System

Source: Researchers, 2016

From the interviews show that nearly 80% of farmers in the area of the study has willingness and ability to produce high quality products with high productivity level, and most farmers have already had cultivation technology. Factually, the farmers' most frequent question is related to the issue of the guarantees of sufficient market and pricing. This is the farmers' counterclaim to the government, given the businessmen or the exporters always demand quality results.

Horticultural commodities producers, particularly farmers, generally do not have business network and commodity distribution map, so the planting and harvest schedules are often the same in some regions and thus causing the prices to fall due to overabundance stock. Moreover, the farmers do not have a good bargaining position. Such condition makes them become helpless to face the markets. Another thing that also needs to get serious attention is related to the high cost of logistics in the trading activity of fruits and vegetables. Distribution flow of fruits and vegetables indeed needs to be organized and supported by improving inter-regional trade and inter-island infrastructure, including the density of vehicles on the state roads, like Madiun - Nganjuk - Jombang - Mojokerto - Surabaya; Malang - Sidoarjo - Surabaya; Pasuruan - Gempol - Surabaya; and Lamongan - Gresik - Surabaya which cause people to bear logistics high cost reaching 10 percent. The distribution costs include fuel, transportation and loading-unloading services, taxes, levies and extortion.

The mechanism of horticultural products distribution network in East Java is largely determined by the market behavior and marketing agencies involved. In general, small-scale farmers harvest their horticultural products gradually and sell them directly to wholesalers in big cities, which are subsequently forwarded to retailers. Based on the mechanism of horticultural marketing system in East Java, the farmers, as the horticultural producers, usually sell their products through middlemen, collectors, or wholesalers, and then the marketing will continue to the level of retailers (for domestic consumers). Various agencies or institutions that organize the distribution of horticultural products from producers to consumers are the marketing channels. Any kind of horticultural products from producers to consumers is a different marketing channel from one to another. Horticultural products marketing channels can change or be different, depending on local circumstances, time and technological progress.

Traffic congestion and natural factors such as flooding and bad weather at sea are also contributors to the rise in logistics costs. Traffic congestion consumes much time in transporting goods. Floods and bad weather make the transport of fruit and vegetables stop at one point waiting for condition to be better. Society still also has to bear the burden of other costs of production, such as the impact of inflation, the increase in electricity rates and fuel prices, the increase in the regional minimum wage, and the changes in interest rates. The amount can reach 20-30 percent of production

costs. This means that society has to bear 30-40 percent of the total cost of production. The government targets that the logistics costs can come down from 24 percent to 17 percent within one to two years ahead, through the improvement of bureaucracy, efficiency at the port, and the construction of highways and arterial roads. It is noteworthy that the logistics cost in other countries is much lower, such as in Singapore is 8 percent, in Malaysia is 13 percent, and in South Korea is 16.3 percent.

Slow but sure, there has been an increased public awareness to consume fresh and qualified fruits and vegetables. For example, the presence of local banana with international standard is one of the requirements for the local fruit to host in its own country. This means that it requires an innovation to produce fresh fruits with premium quality. Jepara cavendish banana comes from local banana seedlings, but in terms of performance, taste, and nutritional value, this banana can compete in international market.

Based on the experience of PT. Nusantara Tropical Farm, which has a garden area of 3,757 hectares in the village of Raja Basa, sub-District of Labuhan Ratu, East Lampung District, this company has been able to realize local fruits with international standards, in which the Cavendish banana produced can have three criteria: smooth skin with no black spots, 17 cm in length, and 3 cm - 4

cm in circumference handheld. It takes a long time to realize fresh banana in the market and through an ongoing process of trial. For example, it took about two years to be able to produce quality banana “sunpride”. The first year was spent to find superior seeds which were studied and selected from thousands of local seeds, and to ensure that the quality seeds had high productivity and resistant to fusarium virus. The next year was an effort to nurture the seeds into trees and produce international standard banana “Cavendish”.

It is important to note that superior seeds do not always bear fresh banana which corresponds to the three criteria. Therefore, in the first four months, greater attention should be paid to the growth of the banana. Fertilizing and regular watering from the water pipes buried in the ground are important factors to keep the growth of the trees. When the banana flower begins to appear, the candidate bananas should be covered with a kind of gold-colored cardboard which in turn will cover one bunch of bananas. The closure is meant to avoid the banana skin from sunburn which is marked by black dot so that the fruit produced will remain smooth and yellow.

Table 4: SWOT Analysis of Fruit and Vegetable in East Java

| | | |
|--|---|---|
| Internal Factor External Factor | Strength (S) <ul style="list-style-type: none"> • Availability of large area for fruits and vegetables • Availability of superior and regional typical fruits and vegetables | Weakness (W) <ul style="list-style-type: none"> • Less aggressive marketing system. • No guarantee of the continuity of fruit and vegetable supply. • High production cost per unit |
| | Opportunities (O) <ul style="list-style-type: none"> • Large alternatives for new markets • Many suppliers available in the market • High foreign demand. | S-O Strategy <ul style="list-style-type: none"> • Looking for new customers to increase sales volume • Marketing fruits and vegetables more aggressively |
| Threats (T) <ul style="list-style-type: none"> • Import of fruits and vegetables with good quality • Difficulty in obtaining price certainty • High cost of transportation due to traffic congestion | S-T Strategy <ul style="list-style-type: none"> • Improving the quality of fruits and vegetables in order to compete in the marketplace • Entering the local market with competitive price and quality | W-T Strategy <ul style="list-style-type: none"> • Utilizing more modern and environmentally friendly farming technology • Utilizing IT skills (online) • Eliminating the regulations that inhibit the production and administration |

Source: [3], Researchers, 2016.

At the harvest time, after being cut from its tree, the “Cavendish” banana may not touch the ground. To facilitate the farmers to bring the bananas to the packaging location, the company provides rail-like lines to hang and carry bunches of bananas. Each worker pulls 20 bunches of bananas from the plantations to the packaging center. The harvested “Cavendish” bananas cannot be enjoyed directly because they must be stored in a special room for ripening process prior to marketing them to some modern markets in Indonesia, as well as exported to a number of countries, such as China, the United Arab Emirates, Kuwait, and Saudi Arabia. In the early 1990s, the “Cavendish” bananas sold were about 10 thousand boxes, in which each box consisted of over 13 kg. In 2014 the number of “Cavendish” bananas sold reached 3.7 million boxes and in 2016 could reach 4.6 million boxes.

In addition to “Cavendish” bananas, at present, PT. Nusantara Tropical Farm is developing “honey” pineapple, “crystal” guava, dragon fruit and papaya to meet the demand for fresh fruit in domestic and overseas market. Based on the experience of PT. Nusantara Tropical Farm, fresh tropical fruits actually have a very large export market opportunity, but such an opportunity has not been put to good use because there has been no integrated management strategy from upstream to export. Each businessman tends to walk on his own way and is not concerned with the export destination. When there is a demand for fresh tropical fruits from other countries, the exporters get difficulties and even do not dare to make a commitment for fear of being unable to meet the demand according to the contract. Moreover, to meet export market requires quality standards and sustainable production and supply. It means that the main challenge of fresh fruit export is

how to be able to produce fruit all the time, with standard quality, post harvest handling, as well as packaging standard. Agricultural land areas in East Java that can be used for horticulture agribusiness are thousands of hectares and almost spread in 37 districts/cities. East Java has tropical climate lowlands and highlands, both wet and dry. One of the areas in East Java which has a huge potential to produce fruits and vegetables is Probolinggo district, with the products of mango, banana, avocado, durian,

rambutan, onion, cabbage, potato, carrot, chili and tomato. Farmers of fruits and vegetables in Probolinggo district generally sell their products to collectors or wholesalers, and do not have the ability to sell directly to the markets in Surabaya, such as traditional markets and modern markets. The price received by the farmers is very low, but the biggest advantage is enjoyed by intermediary traders (middlemen). The same case is also experienced by the farmers of fruits and vegetables in Pasuruan, Kediri, Blitar, and others.

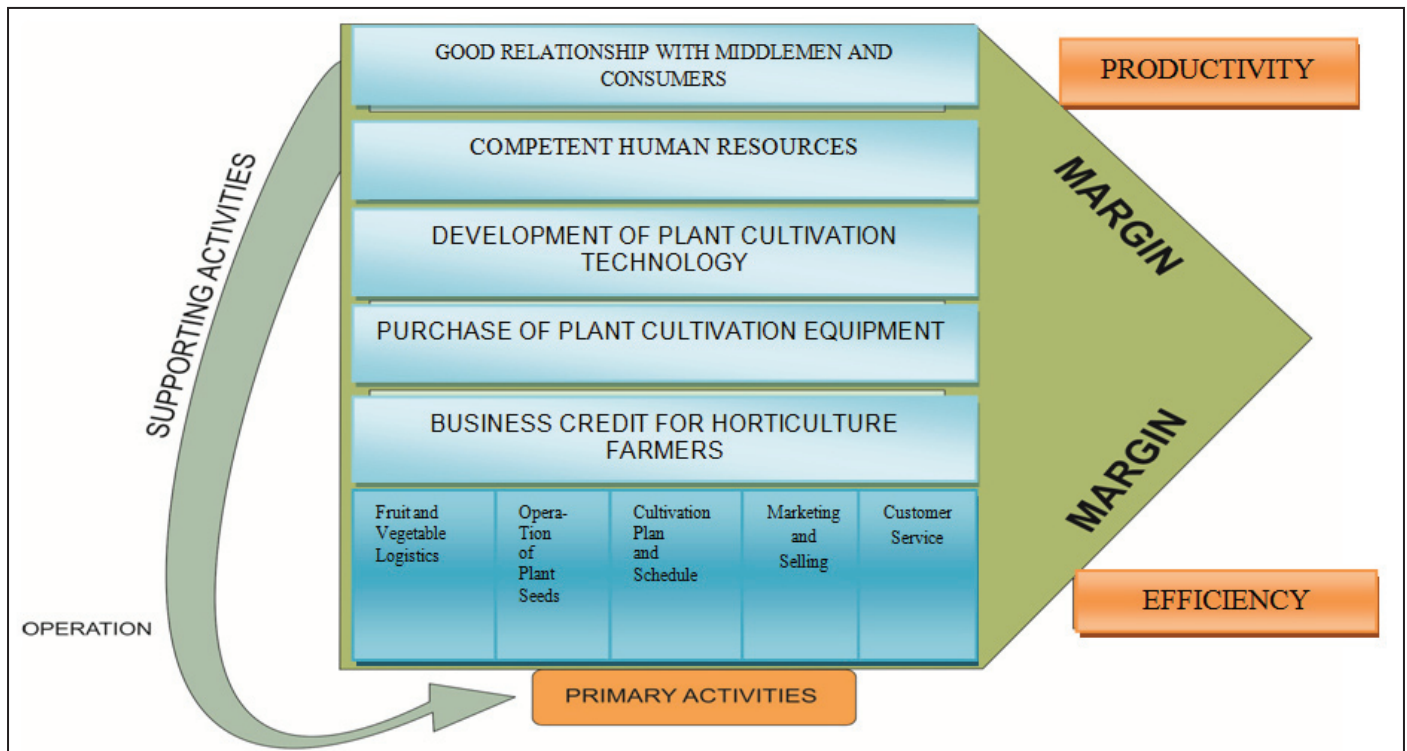


Fig. 3: Basic Value Chain of Fruits and Vegetables
Source: [5.7], Researchers, 2016

Factors of regional potential and agro-climate suitability for the main commodities need to be developed to meet the demands of domestic and export markets, such as industrial raw materials to substitute imported horticultural products that are often found on the market. Next, the development of superior commodities should be based on the suitability between the land resources and the superior commodity production requirements and with regard to economic value, market demand, competitive advantage value, marketing facilities, socio-economic conditions of farmers and regional spatial plan. Production areas in the form of commodity production centers in the region should be developed into agribusiness area which is expected to meet the economic scale, both for export and domestic marketing.

Supply chain of fruits and vegetables in East Java can be revamped when the central government and local government would earnestly increase the production and improve the quality, such as cutting the number of middlemen so that the farmers can directly sell to end consumers, eliminating various extortion in highway, and providing small loans with low interest rates to farmers of fruits and vegetables in order to eliminate bonded pattern. The local government needs to inform and distribute superior seeds with export quality. The farmers of fruits and vegetables really need the guarantee of the availability of superior seeds, considering that the seeds that have been distributed by the government to farmers are not good-quality seeds. Another thing that is needed by the farmers

of fruits and vegetables is an environmentally friendly, affordable, effective, and efficient technology. The technology serves as a tool to provide accurate, rapid, and adequate information that enables the farmers to identify, analyze, and make decisions more easily. The farmers need to adjust the cropping pattern of fruits and vegetables to avoid big losses due to crop failure during the rainy season. The farmers need to learn about the weather so that they can schedule the planting commodities each season with other types of horticulture.

East Java has great potential to produce fruits and vegetables and becomes a major supplier in the eastern region of Indonesia, western region of Indonesia, and the ASEAN region. The main problems are actually in the logistics, inappropriate production governance, and inadequate horticultural plantation land. Revamping the supply chain of fruits and vegetables in East Java is an urgent matter, considering that there are at least twelve superior local fruits, among others, durian, mango, pineapple, rambutan, Zallaca, banana, papaya, melon, watermelon, grapefruit and Bali tangerine. Truck and ship freight cost is one of the main factors that cause differences in commodity price, thereby reducing competitiveness in both domestic and international markets.

Singapore has succeeded in carrying out sky-greens program to produce vegetable using A-Go-Gro technology with hydraulic system and has been declared as a low-carbon system (Kompas January 24, 2017). The hydraulic system is unique because it is

driven by the water system that produces a unique gravity, in which to move the hydraulic system requires only one liter of water and can be obtained by collecting rainwater which is then supplied to the hydraulic system. Each tower plant has 22 to 26 levels rotated around aluminum frame with a hydraulic system. Shelf plant will rotate so that each plant can get sunlight, air flow, and irrigation evenly. The water that has been used will be recycled and filtered before returning to the plant, as well as organic waste will be reused into compost.

Sky greens system can help the plants avoid too much exposure to sunlight which may cause withering because at the same time the plants are obtaining the supply of nutrients from the water delivered. At present, the packet greens can produce up to 50 kinds of vegetables, herbs, and greenery that can be consumed. Sky greens pattern is suitable to apply in Indonesia, considering the whole cultivation of superior varieties of fruit and vegetables is still done in a household scale that generally only uses 0.5 - 2 hectares of land.

V. Conclusion

Horticultural commodities, such as fruits and vegetables, have positive and big prospects of development to diversify the menu for the nutrition quality improvement, to promote non-oil commodities, and to maintain the environmental beauty and sustainability. The development of vegetable crops is still largely financed using the farmer's own funds, especially in the areas of production centers. Highland vegetable crops such as potato, cabbage, carrot and garlic grow in Pasuruan, Probolinggo, Malang and Magetan. Chili, onion, tomato and garlic (certain varieties) are developed in the lowlands which almost spread across East Java, while other commodities are developed locally in low and moderate land to meet the need of diversification of vegetables for the community.

It is no time to think of selling fruit and vegetables from village to village or market to market. The farmers in East Java now have to think of how to sell the fruits and vegetables abroad, considering that Indonesia has been listed in the 20 countries in the world that dominate fruit production in the world trade. Indonesia has various types of native fruit. Some of them are demanded by world market, such as pineapple, mangosteen, avocado and banana. The government should remove the regulations that inhibit the production and horticultural marketing, including the provision of logistics infrastructure to facilitate the transport of fruit and vegetable commodities. Availability of sufficient refrigerator container and cold storage is needed by the traders to supply the fruit and vegetables throughout the year, so as not to focus on one season.

VI. Acknowledgements

The research was funded by University of Surabaya

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