Avocado fruit supply chain management in West Java

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Abstract. Avocado is one of the leading fruit commodities with high competitiveness and a source of growth for farmers’ welfare in rural areas in Indonesia. This paper aims to analyze the performance of avocado supply chain management in the Garut and Bandung Districts. The analysis focused on five components of supply chain management: planning source of avocado, procurement, processing, distribution, and receiving of products. Data collection is conducted through survey methods and focus group discussion (FGD) with actors on each supply chain node according to purpose and market segment. The results showed that the lack of variety, quantity, and continuity of supply is consistent with the dynamic of market demand and domestic and global consumer preferences. The performance of supply chain implementation for avocado at the planning level was at 45%–90%, product distribution performance was at a moderate level at 25%–80%, delivery of goods was at a good level at 70%–83%, and receiving product performance was at 0%–100%. Strategies to restrain the entry of imported fruit and penetrate the avocado fruit export market are required to improve product competitiveness, quality management, and integrated product chain management.

1. Introduction
Changes in the strategic environment in the form of economic globalisation, trade liberalisation, urbanisation and market segmentation, consumer preferences, and a flood of imported fruit, demand changes in the operation of business organizations and product supply chains. In a modern economy, the government has three central functions, namely (1) improving efficiency; (2) creating equality; and (3) spurring macroeconomic growth and maintaining stability [1]. Agriculture can be seen as a sector which has a special ability to produce quality growth [2]. The results of the study by Byerlee et al. [3] suggested that agriculture plays a role in spurring economic growth, reducing poverty, reducing incomes, improving food security, and providing environmental services. In addition, agriculture has an important role to play in improving trade balances through the development of export promotion commodities, such as avocados and other fruit products.

The results of a study show that there are still many weaknesses in supply chain management in India, which include high trading costs, decreased quality, and poor infrastructure facilities [4]. One of the developing countries that has been successful in implementing supply chain management systems on various fresh fruit commodities and has succeeded in supplying modern markets in India and other destination countries is Thailand [5]. The another results of a study found that the exchange of information and
expectations of avocado producers in Mexico on the sustainability of the relationship positively affected performance in seller-buyer transactions, while the expectation of continuity of the relationship leads to lower transaction costs and leads to efficiencies [6].

Krisnamurthi [7] demonstrated the important role of Indonesia's fruit sector in boosting the real sector and also found that (1) the rate of growth in the fruit sector was quite high, reaching 11% per year; (2) according to the 2003 agricultural census there were 4.4 million fruit-farming households, compared with 5.2 million households in the 2007 census; (3) Indonesia's fruit commodity export figures were quite high, reaching 14% per year in the study period (2001-2007); (4) fruit has an important role in Indonesian nutrition as a source of vitamins and minerals; (5) only 3% of fruit produced per year go toward raw materials for the new processing industry, which is underdeveloped; (6) fruit farming activities play an important role in providing environmental and aesthetic services; and (7) fruit development can be a 'brand' that helps to build the identity of the nation [7]. The development of industry and agriculture using imported fruit, such as avocados in Indonesia, can face difficulties in quantity, quality and continuity of supply due to technical and socioeconomic factors relating to fruit farmers. These problems include the small size and scattered distribution of the farmers’ land holdings, the farmers’ lack of capital, the fact that ‘slash’ and ‘ijon’ systems are often used to produce the fruit, and the fact that fruit is harvested before ripening. In general, the purpose of this research is to conduct an analysis of supply chain channels, margins of marketing (not trade), and the performance of supply chain management in the Indonesian avocado industry.

2. Materials and methods

The definition of supply chain management as a set of interrelated activities and decisions to efficiently integrate suppliers, manufacturers, warehouses, transportation services, retailers and consumers [8]. There are three stages in value chain analysis, namely (1) identifying the value chain activities that must be carried out, maybe the company is only involved in a single activity, part of the activity, or the whole activity; (2) identify the key success factors in each value-creating business activity that is the determinant in the value chain process; and (3) developing competitive advantage by upgrading, in the form of process up grading, functional up grading, and chain up grading [9].

This research focuses on production system performance and supply chain management (SCM) performance in order to formulate a competitive development strategy for the avocado industry. Indicators of the successful management of an agricultural commodity supply chain, include (a) an increase in margins and market knowledge among producers; (b) a decrease in loss of the product during deviation and transportation; (c) an improvement in product quality; (d) an increase in the amount of products with food safety guarantees; (e) a significant increase in sales volume; and (f) an increase in value-added products [10].

There are six principles of effective SCM management, namely (1) focus on customers and consumers, (2) produce quality products, (3) ensure effective logistics and distribution, (4) form effective information and communication strategies, (5) establish effective supply chain cooperation institutions, and (6) create value-added products and share value fairly among supply chain actors [11,12]. If careful attention is paid to these principles, then the potential of the supply chain system to function well can be improved. If SCM is well-run, at least four advantages can be obtained (1) addition of value by means of compliance with orders, provisions in distribution, and conformity in the loading of production costs; (2) reduction of transaction costs, which have an impact on the emergence of responses to markets that are more oriented to the interests of customers; (3) reduction of business risk in importing substitution fruit, namely by providing marketing guarantees, capital development, increased efficiency and the addition of value to the product; and (4) the transfer of technology from large companies to small-scale fruit farmers.
This study is limited to SCM in fresh avocado fruit, and includes the planning, procurement, and delivery of fresh fruit from seller to buyer, as well as receiving from buyers. The study areas for this research were Garut and Bandung regencies in West Java. Respondents to the study included manufacturers, fresh fruit traders, processing industries, and retailers. Both primary and secondary data were required for this study. Secondary data was collected from various relevant central, provincial or district agencies and from various scientific publications. Primary data was collected in the form of survey responses from farmers, farming organisations, PPL, commodity associations, STA/commodity auction markets, collecting traders, large traders, retailers, processing companies, partner/core companies, and exporters. Some of the intended sources and primary data are presented in Table 3. Data collection was conducted using a survey method and by focus group discussion (FGD). The survey method was intended for data collection from avocado farmers at the household level. The FGD was intended to explore data relating to the development of imported substitution fruits, and various institutional alternatives to supply chain management of imported commodity substitutions, with stakeholders and supply chain actors involved with imported substitution fruit commodities in each region.

3. Results and discussion

Indonesian-grown avocado fruit is competitive and can be promoted for the export market [13]. Indonesia is the fifth greatest avocado producer in the world, producing 304,938 tons of the fruit per year. Mexico produces the most avocados at 1,889,354 tons per year, followed by the Dominican Republic with a production of 601,349 tons per year, Peru at 455,394 tons per year and Colombia at 309,431 tons per year.

Indonesia has produced several varieties of avocado: Kementan (a variety of Ijo Bundar), Ijo Panjang, Merah Bundar, Merah Panjang, Mega Gagauan, Mega Murapi, Mega Paninggahan, and Vienna. In addition, it is preparing the release of kalibening avocado varieties that have great potential in terms of size, texture, color and taste. Information relating to developments in the harvest, production, and consumption of avocado is presented in Table 1.

Table 1. Trend of harvested area, production, productivity, consumption of Avocado, 2013-2019 [15].

| Year | Harvested area (Ha) | Production (ton) | Productivity (Ton/ha) | Consumption (kg/kapita/tahun) |
|------|---------------------|------------------|-----------------------|------------------------------|
| 2013 | 22.214              | 289.893          | 13.05                 | 0.417                        |
| 2014 | 24.200              | 307.318          | 12.70                 | 0.574                        |
| 2015 | 27.230              | 382.537          | 14.05                 | 0.575                        |
| 2016 | 20.508              | 304.932          | 14.87                 | 0.652                        |
| 2017 | 24.422              | 363.148          | 14.87                 | 0.730                        |
| 2018 | 34.190              | 410.084          | 11.99                 | 0.810                        |
| 2019 | 36.840              | 461.613          | 12.53                 | 0.880                        |
| Average | 23.455        | 329.566          | 14.08                 | 0.590                        |
| Trend (%/year) | 2.38              | 7.32             | 4.86                  | 15.79                        |

The development of Avocado Indonesia commodity export volume to ASEAN market tends to increase in the last five years. Starting in 2008, avocado export volume to ASEAN market is always more than 60,000 kg annually. On average Indonesia exports 20 percent of avocado’s total exports in the ASEAN market every year. Indonesia has exported Avocado fruit to Malaysia, Bahrain, Hongkong, Qatar, Oman and Singapore [15]. Avocado producing areas are West Java, East Java, parts of Sumatra, South Sulawesi and Nusa Tenggara [15]. Information related to the export and import development of Avocado commodities is presented in Table 2.
Table 2. Trend of export-import Avocado Commodity, 2013-2017 [16].

| Year | Export fresh (kg) | Import fresh (kg) |
|------|------------------|------------------|
| 2013 | 235.891          | 345              |
| 2014 | 61.103           | 1.655            |
| 2015 | 53.508           | 7.401            |
| 2016 | 108.250          | 8.774            |
| 2017 | 205.531          | 33.145           |
| Average | 132.857          | 10.264           |
| Trend (%/year) | 26.41 | 255.80 |

Development of avocado production is carried out through intensification programs which include (1) optimizing the utilization of yard and moor land for avocado plants; (2) providing supporting facilities to increase the production and productivity of avocado plants through seed assistance; (3) improving the ability of farmers to improve the quality of their avocado fruit through technical counseling in accordance with GAP; and 4) encouraging the entrepreneurial spirit of avocado farmers and avocado supply chain businesses. The expected output of this program is (1) the implementation of counseling to improve the capabilities of avocado growers as many as 25 people; (2) the implementation of avocado intensification counseling in four locations for 100 farmers; and (3) increasing the availability of Viennese avocado seeds as many as 640 stems.

3.1 Marketing channels

Avocado fruit marketing channels in West Java consist of farmers, village or inter-village collecting traders, large traders between regions, suppliers for supermarkets and hypermarkets, wholesalers and market retailers, roadside fruit outlets, production centers, and consumption centers. According to the Indonesian Avocado Planters’ Association (PPAI) the Indonesian market demands 200–300 tons of avocados daily. Information about avocado marketing channels from farmers to consumers is presented in Figure 1.
3.2 Marketing margin

The marketing margin of avocado commodities in West Java runs through only one line, namely from farmers to retailers. Table 3, presents in detail the costs incurred by each business actor as well as the profit margins of avocado traders. The greatest profit in rupiah achieved by retailers outside harvest time reached IDR 2,110 per kilogram, and the greatest profit achieved during harvest time was IDR 1,510 per kilogram. The results of this study are concluding that the largest commercial profit margin received by retailers was IDR 700 per kilogram. However, in terms of total profit, large traders and merchants dealing with village collectors achieved higher rates than retailers did because avocado sales turnover among these traders is much greater than it is among retailers.

| Commercial actor                | Component cost and price | Harvest price (IDR/kg) | (%) | Non-harvest price (IDR/kg) | (%) |
|--------------------------------|--------------------------|------------------------|-----|---------------------------|-----|
| Farmer                         | Selling price            | 8,192                  | 50.28 | 13,575                    | 59.54 |
| Village collecting merchants   | Trading cost             | 645                    | 3.96  | 645                       | 2.83  |
|                                | Profit margin            | 1,205                  | 7.40  | 1,280                     | 5.61  |
|                                | Selling price            | 10,042                 | 61.64 | 15,500                    | 67.98 |
| Inter-regional wholesaler       | Selling price            | 885                    | 5.43  | 885                       | 3.88  |
|                                | Profit margin            | 1,165                  | 7.15  | 1,365                     | 5.99  |
|                                | Selling price            | 12,092                 | 74.22 | 17,750                    | 77.85 |
| Wholesalers                    | Trading cost             | 735                    | 4.51  | 735                       | 3.22  |
|                                | Profit margin            | 1,265                  | 7.76  | 1,515                     | 6.64  |
|                                | Selling price            | 14,092                 | 86.50 | 20,000                    | 87.72 |
| Retailers                      | Trading cost             | 690                    | 4.24  | 690                       | 3.03  |
|                                | Profit margin            | 1,510                  | 9.27  | 2,110                     | 9.25  |
|                                | Selling price            | 16,292                 | 100   | 22,800                    | 100   |

3.3 Supply chain management analysis

A study of 125 North American manufacturing companies shows that (1) effective information sharing significantly improves efficient supply chain practices; (2) supply chain dynamics has a significant positive influence on effective information exchange and effective supply chain practices; and (3) effective supply chain practices become more important as the level of information sharing increases [14]. The results of a study by Coronado et al. [6] found that the exchange of information and expectations of avocado producers in Mexico on the sustainability of the relationship positively affected performance in seller-buyer transactions, while the expectation of continuity of the relationship leads to lower transaction costs and leads to efficiencies.

Each of the avocado commodity supply chain actors identified has to deal with five components of SCM, namely planning, sourcing of goods, processing, shipping, and receipt of goods. The performance of SCM implementation in terms of the planning component at the avocado farmer level in Garut District is described in Table 4.
Table 4. SCM performance among avocado farmers in Garut and Bandung, West Java, 2019.

| Management       | Indicator      | Implementation participation (%) | SCM performance indicators |
|------------------|----------------|----------------------------------|----------------------------|
|                  |                |                                  | Very good | Good | Middle | Bad | Very bad |
| Planning         | Finance        | 67.5                             | 5         | 30   | 55     | 5   | 5        |
|                  | Procurement    | 88                               | 5         | 15   | 65     | 10  | 5        |
|                  | Transportation | 76                               | 0         | 12.5 | 75     | 12.5| 0        |
|                  | Stock          | 85                               | 0         | 5    | 90     | 5   | 0        |
|                  | Sales          | 60                               | 5         | 10   | 65     | 20  | 0        |
| Procurement      | Supplier       | 71                               | 5         | 7.5  | 82.5   | 5   | 0        |
|                  | Selection      |                                  |           |      |        |     |          |
|                  | Pricing        | 82.5                             | 0         | 8    | 80     | 12  | 0        |
|                  | Delivery       | 85                               | 5         | 30   | 60     | 5   | 0        |
|                  | Payment        | 90                               | 5         | 55   | 35     | 5   | 0        |
| Delivery of fruit from seller to buyer | Transportation | 89                               | 5         | 10   | 75     | 10  | 0        |
|                  | On time delivery |                                  |           |      |        |     |          |
|                  | Handling       | 65                               | 0         | 10   | 80     | 10  | 0        |
| Receiving from buyer | Return of goods |                                  |           |      |        |     |          |
|                  | Reception service department |                            | 22.5 | 0 | 100 | 0 | 0 |
|                  | Replacement products |                                  | 0     | 0    | 0     | 0   | 0        |

Development of avocado SCM faces obstacles in terms of a lack of uniformity, quantity, quality, and continuity of supply, which conflict with market demand dynamics and the preferences of domestic and global consumers. Therefore, in developing techniques for avocado SCM that are competitive and sustainable, a strategy is needed as a reference to be used by farmers, business actors, the processing industry, import-export entrepreneurs, and the government. In this case the government acts as a regulator, facilitator and mediator in encouraging the growth and development of avocado SCM in an integrated, competitive, and sustainable way. This can be in the form of family farming, household industry, cooperatives, BUMDES, BUMD, SOEs, group businesses, small-medium enterprises, and large businesses engaged in each subsystem of agribusiness commodity substitution imports: upstream and downstream. Developing avocado SCM in an integrated manner is expected to increase efficiency, productivity and competitiveness in a sustainable manner through product alignment and the cohesiveness of businesses related to imported substitution fruit commodities.

Several important principles need to be considered when implementing SCM, such as (1) the centrality principle, which is useful for ensuring the success of government services and facilitation, especially in the construction, mentoring, and provision of supporting infrastructure; (2) the efficiency principle, which suggests that all business activities carried out by avocado supply chain businesses should lead to minimising production costs and/or maximising profits; (3) holistic and integration principles which indicate that the development of imported substitution fruit commodities should include all related activities, not separately but holistically and in an integrated fashion; and (4) the principle of environmental sustainability, which has recently received serious attention in line with the demand of the global consumer community for
imported substitution fruit products that are safe to consume and take environmental sustainability into account during the production process. Quality management of avocado commodities is a means of handling quality in the entire supply chain network aimed at satisfying customers and consumers. Some important functions of quality management in avocado fruit production are (1) providing tools to guarantee that imported substitute fruit products can be resold without loss of quality; (2) providing tools which can be used to maintain and improve productivity, identify problems in the supply chain, prevent errors and reduce inefficiencies; (3) helping farmers to access various market objectives and market segments; (4) increasing trust when building supply chain partnerships.

One of the main obstacles faced by farmers is the avocado harvest factor, in other words, the problem of meeting a continuous demand for a product when production is seasonal. Avocado fruit production is still intended for local, regional and inter-region or inter-island markets. However, market demand dynamics and consumer preferences tend to demand a continuous and sustainable supply. If seasonal influences are very dominant, it is necessary to take steps such as conducting stock management efforts within SCM with the support of cold storage and packing houses, or diversifying alternative fruit products covered by the contract so that substitution and complementary mechanisms can be carried out. The main weakness found in efforts to implement SCM for imported substitution fruit commodities is the lack of motivation among businesses to record various activities in the production of imported substitution fruits and to record marketing transactions. Data and information are the main inputs in the business process system. The development of a reliable information system in SCM is instrumental in facilitating the execution of an activity, and is the main determinant of the coordination system that must be applied when implementing SCM in an integrated, competitive, and sustainable manner.

Commodity marketing activities require components of marketing costs to be distributed at every level of the supply chain, as well as at each stage of marketing activities. These cost components are proportionally attached to each supply chain actor involved at each stage of marketing activities. If adequate control is not carried out, a cost component at a particular stage may become so much greater than the cost component at other stages, that it can threaten the sustainability of managing the supply chain of imported substitution fruit products as a whole. Gradually, the production process and supply chain actors dealing in imported substitute fruit products can be integrated so that the highest possible efficiency can be achieved.

4. Conclusion
The marketing margin of avocado commodities in West Java moves through only one channel, namely from farmers to retailers. The largest distribution of marketing margins is received by retailers. Measurement of the performance in the implementation of SCM in avocado products gives the following results: that planning performance is at a medium to good level, procurement performance is at a medium level, delivery of goods at a medium to good level, and performance on goods receipts is at a low level.

The problem facing the development of avocado SCM in Indonesia is unrealised variety, quantity, quality, and continuity of supply, which conflicts with market demand dynamics and the preferences of domestic and global consumers. This problem affects avocado products for modern market purposes, institutional consumers, and especially for export markets.

A five step strategy can be used to develop SCM for imported substitution fruit: (1) institutional management of the avocado product supply chain should be able to combine macro-economic policies and micro-economic activities and create synergy between large supply chain businesses (import export companies, processing companies, supermarkets/hypermarkets) and small businesses (small and medium-scale import substitution fruit farmers); (2) institutional management of the aqueous product supply chain should be able to explore sources of productivity growth by using superior seeds (including clone seeds), correct cultivation techniques using good agricultural practices (GAP) and integrated resource management
(PTT); (3) good handling practices (GHP) should be applied in post-harvest handling; (4) the efficiency of SCM should be improved through product process alignment and cohesion between businesses; (5) professional entrepreneurship and skilled labor should be encouraged, especially among young farmers from the millennial generation, so that new innovations can emerge in the farming, post-harvest handling, processing and marketing of imported substitution fruit products; and (5) SCM should be seen as a new source of growth which can achieve efficiency by promoting product process cohesion, integration between supply chain businesses, and the smooth flow of communication and information.

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