
Open Analysis Addressing Slavery in Supply Chains



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Supply Chain Series 1

**Agricultural Food Supply Chain: A journey from
food production to consumption**

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An ISA SIfA Production

1. Introduction

In our daily life we buy fresh fruits and vegetables and processed foods at food stores or supermarkets; we consume food at a restaurant or hotel where cooked foods are served. Food is a necessary daily product for human life. There is increasing customer concern over the transparency of food supply chains as people consider their health and the environment (AUSTRADE, 2020). There are many choices in the shops. When we buy a commodity we might consider who makes the product, where the product is made and in what working conditions. We could make a decision about the commodities we purchase from available information (Gardner et al., 2019). The information available usually includes size, shape, price, and whether or not the product is made by organic or non-organic farming methods, or by environmentally friendly or unsustainable farming practice. We also can find information linking consumers and producers, such as the location and name of the producers. Most of Australian fresh fruits and vegetables are produced in Australia with a high level of self-sufficiency (imported goods are approximately 18% to the total sales as of 2017-2018) (Fresh Intelligence Consulting, 2018; Spencer & Kneebone, 2012).

Fig.1 shows a simple supply chain of an agricultural commodity from production to consumption (Nguyen, Mobsby, & Goesch, 2016). A supply chain can be traced by examining a company's shipping records for a product. However, it is hard to see the details of a whole supply chain since supply chains are complex and intertwined with multiple layers (tiers) (Crawford, Bontinck, Stephan, Wiedmann, & Yu, 2018). Fig.2 illustrates the complexity of an actual supply chain. In order to produce a product a company contracts various suppliers who provide not only materials and machinery, but also electricity and financial services. For instance, if a company outsources cleaning of its factories, the cleaning company is one of the suppliers of the company. Furthermore, difficulty in maintaining the transparency of the supply chain lies not only in tracing all supply chains, but also in making sure that the suppliers follow the regulations and meet domestic or international standards. It can be especially difficult to obtain information like working and financial conditions in the production process. In this short report, we examine current problems and pressures in the upstream of a supply chain focusing on agricultural commodities.

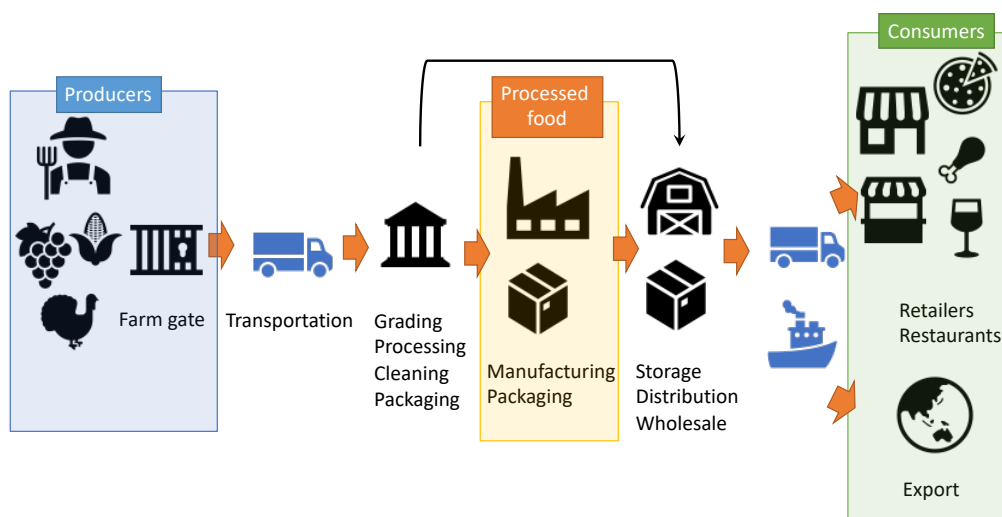


Fig.1 Australia Food Supply Chain

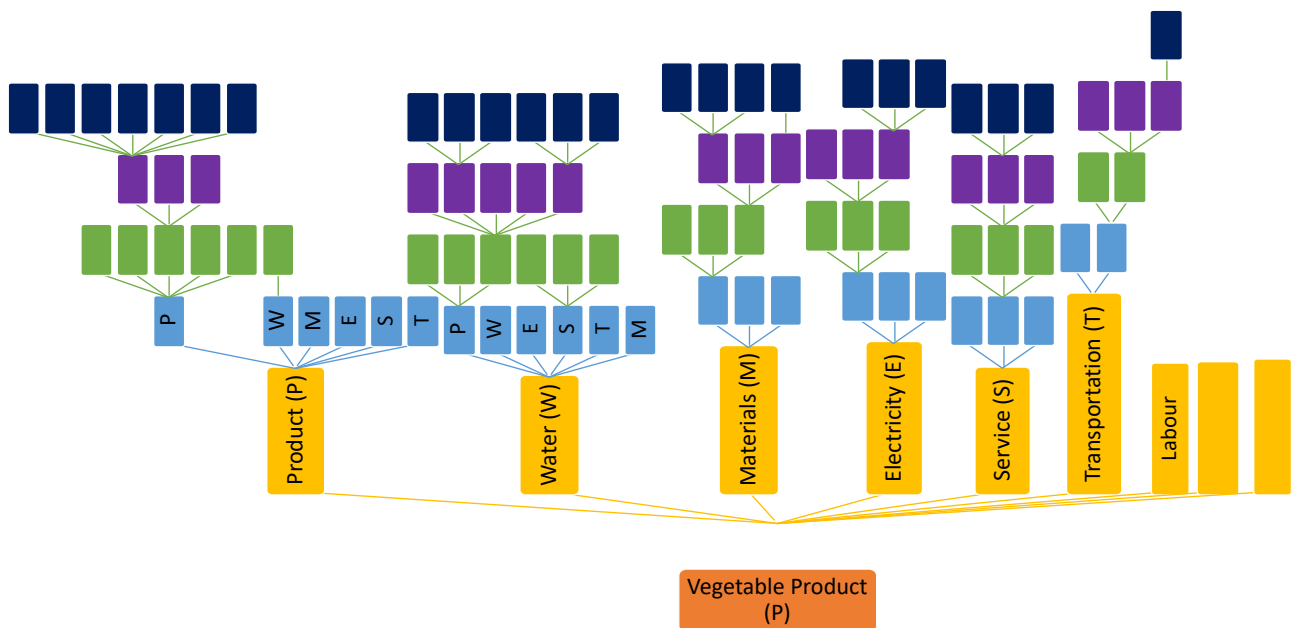


Fig.2. Complex structure of a whole supply chain

2. Supply chain and its pressures

2.1. Food supply chain in Australia

Here, we examine a supply chain of fresh vegetable productions. As shown in Fig.1, vegetables are cultivated and harvested at farmlands. After being harvested, they are stored and shipped. In this process the harvested commodities can be delivered to different destinations depending on the end use. If they are consumed as fresh vegetables there are a few ways to deliver to a market. As one option vegetables are delivered to packers (or vegetable and fruit sorting facilities) where the products are washed, cleaned and selected (Spencer, 2004). Then they are transported to a wholesale market through brokers. A broker is an agent who purchases fresh fruits and vegetables directly from producers and cooperatives and sells them to wholesalers or supermarkets. Then the commodities are delivered to retailers. As another option, vegetables are washed and selected by farmers and sold to brokers who sell to the wholesale market. In the case of a large supermarket such as Coles and Woolworth, the retailer makes a direct contract with the farmers and the commodities produced at the farm are delivered to a Regional Distribution Centre owned by the supermarket. Alternatively, vegetables are directly sold by farmers at a market such as farmers' market, co-operative, community supported agriculture, agritourism, pick-your-own enterprises, roadside stalls, online sales, direct sales to restaurants or a delivery service (AGRIC, 2018).

Different actors are involved through the process from production on a farm to delivery to a retailer (Kamilaris, Fonts, & Prenafeta-Boldú, 2019). In order to deliver food to a consumer various inputs are required in each step of the supply chain (Table.1). For example, at the upstream of a supply chain, a commodity is produced on a farm where farmers cultivate land and harvest crops. As shown in Table 1, for the production, labourers such as seasonal and casual workers as well as full time farmers are required. At the same time, when the land is cultivated using tractors or machinery as capital inputs farmers need to purchase that equipment, fuel and electricity. Water and fertilizers are also important inputs for farming. The fertilizers are produced with inputs such as labor, chemicals, machinery through other layers of supply chains. Thus, the supply chain tree evolves with many layers, and becomes more complex than we imagine.

	Human input	Resource input	Capital input
Farmers	Labor (full, casual, seasonal workers)	Fuel Electricity Fertilisers Pesticides Water Repairs	Tractor Machinery Greenhouse Irrigation system Equipment
Shipping company	Labor	Fuel (gasoline) Repairs	Freight vehicle
Brokers /marketer	Labor	Electricity (for office/electric devise) Repairs	Equipment
Cooperative	Labor	Electricity (for office/electric devise) Repairs	Office Equipment
Packer/Vegetables and fruit sorting facilities	Labor	Electricity Fuels Water Repairs	Machinery Facility (warehouse) Equipment
Distribution centre	Labor	Electricity Fuels Repairs	Machinery Facility (warehouse) Equipment
Wholesaler	Labor	Electricity Repairs	Machinery Facilities (warehouse) Equipment
Retailers	Labor	Electricity Repairs	Shop Equipment

Table.1. Inputs required in each step of a supply chain tree

In the case of processed food, there are more steps needed to deliver it to a market and to sell it to retailers and supermarkets. Before being delivered to wholesalers or distribution centers it is delivered to factories where vegetables and fruits are processed and manufactured to juice, frozen or canned food. In case of fruit juice production, fruits are consolidated from various farmers and selected by packers and washed, boiled, cooked and packed by processors (Spencer, 2004).

2.2. Pressure on farmers

Some consumers might seek cheaper products at a supermarket, compare the price in different stores and buy the product that is the cheapest. On the other hand, farmers face the price squeeze on the commodities they produce. There are globally increasing economic, environmental and social pressures on each step of a supply chain (Gereffi & Lee, 2016; Rajeev, Pati, Padhi, & Govindan, 2017; Sala et al., 2017). From an environmental perspective, global warming is now a key issue for national and global environmental plans. Many countries set up regulations to reduce CO₂ emissions, and each actor is required to take action to reduce greenhouse gas (GHG) emissions (UNEP, 2019; UNFCCC, 2016). Environmental problems such as GHG emissions and contaminated water are generated through each economic activity of a supply chain including production of agricultural commodities (Tidy, Wang, & Hall, 2016). Crops are cultivated using machinery that requires fuel or electricity. Through the consumption of fuel and electricity, CO₂ is emitted. From a social perspective, farmers need to provide secure working conditions for their employees and pay reasonable wages especially for casual and seasonal workers. These environmental and social considerations are ensured if there is enough economic profit to operate the farming activities.

(Hocquette et al., 2018; Nesheim, Oria, & Yih, 2015). If there is not enough profit, farmers will need to cut costs regardless of any increasing cost of farming inputs.

Depending on the costs of farming inputs such as fertilizers and fuels, the profit that farmers can earn changes (farmer's terms of trade: the ratio of index of prices received by farmers and index of prices paid by farmers) (ABS, 2019). For instance, in a year when the costs of fuel and fertilizer were increased, the ratio dropped compared to the base year of 2000-2001 (Fig.3) (ABS, 2019). On the other hand, production of agricultural commodities displays volatilities in the volume and quality each year. The production is influenced by weather and climate. Especially the price of perishable products, and shelf life of products is affected by the negotiability in a market (APPENDIX).

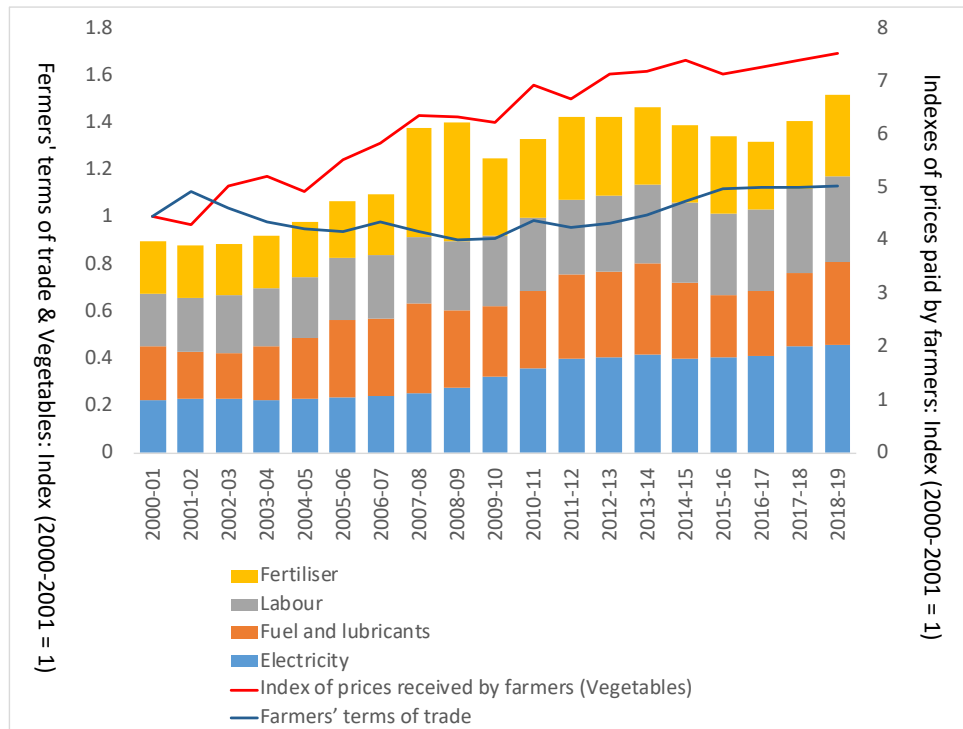


Figure 3. Price index of agricultural production (2000-2019): Price index of various agricultural inputs and farmers' terms of trade (base year of 2000).

Therefore, appropriate price setting of a commodity in a market is one of the key factors for farmers to ensure that environmental and social issues are addressed. There are various drivers that impact on price and costs in each step of a supply chain (APPENDIX). Price spread between local value (farmgate price) and gross value of agricultural commodities is not constant from year to year (Fig.4) (ABARES, 2019). The gross value includes payments for value-added services beyond the farmgate. The local price paid to the primary producer is based on the price set by the buyer at the factory or market location. Fig.4 indicates that as a recent trend, the spread has been widening. According to Nguyen, Mobsby and Goesch (2016), in perfect price transmission from farmgate price to retail price, the price spread should be vertical. "Change in price at one level of the supply chain is completely and instantaneously transmitted to prices at other levels of the supply chain" (Nguyen, Mobsby and Goesch, 2016; page8). However, in reality, the price is determined in competitive markets where prices respond to a change in supply and demand for a product, and the market power determines the price. In the case of vegetables, while the gross value of the commodities has increased, the local value has not increased at the same rate as that of the gross value. It could indicate that although the value of transportation and marketing cost has been increasing, the local value at the place of production has not been changed at the same rate.

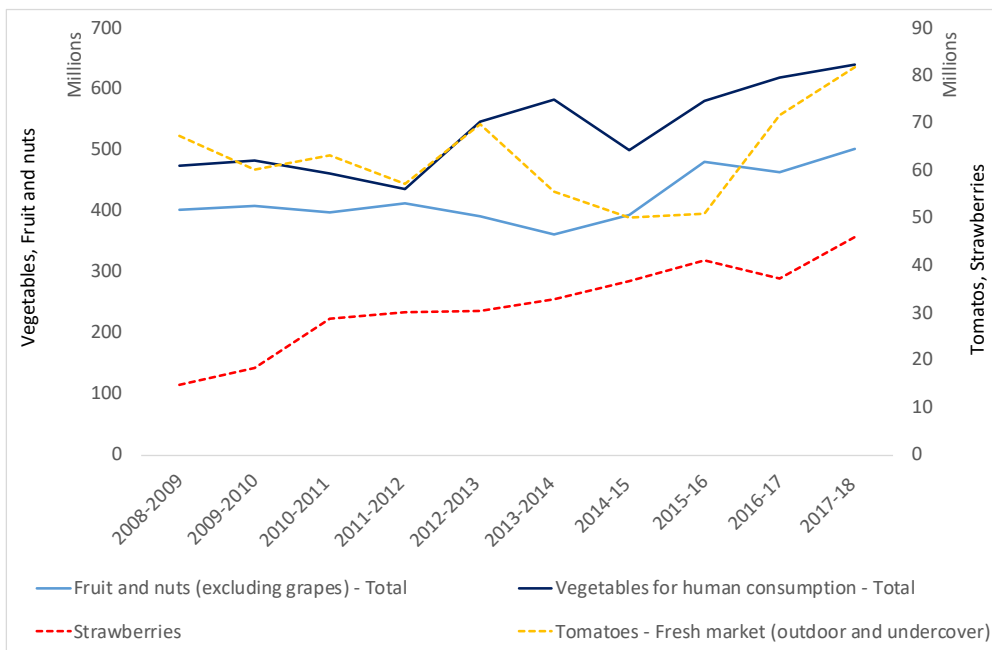


Figure 4. Price spread (2008-2018):

Price spread of different commodities (difference between the local value at the place of production including indirect taxes, and the gross value including transportation and marketing such as freight, cost of containers, commission, insurance, storage, handling and other charges necessarily incurred by the producer in delivering commodities to the market place).

3. Conclusion

We examined the Australian food supply chain in this report and found there are various pressures on suppliers, especially farmers. While costs of fertilizers and fuels have increased, the market power of farmgate prices is weak in marketplaces. A recent trend of market concentration in the retail or processing sectors could place pressure on farmers. Due to lack of market visibility and incomplete information, the market price may be able to be manipulated by the intermediary (ABARES, 2014). Consequently, a price squeeze occurs not only from the inputs that farmers need to purchase to produce crops, but also from the marketplace of supply chains. Moreover, climate change including extreme events and rainfall level affects the production level of commodities. The pressure could affect economic and social management of farms. Under such conditions, we need to enhance market visibility and transparency of the supply chains, and to consider how to secure price setting for the upstream of a supply chain.

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APPENDIX

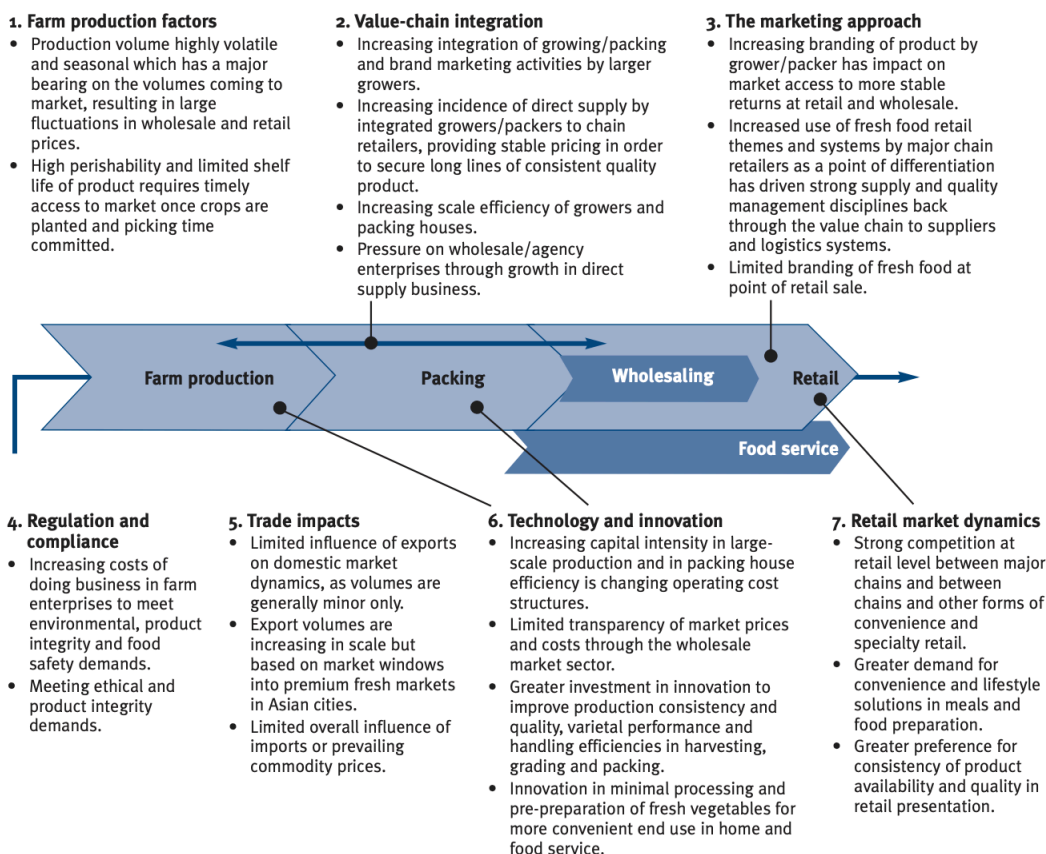


Figure. Fresh vegetables: Major drivers of prices and costs

Source: Spencer, 2004