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The Strawberry Value Chain in Jiangsu Province, China

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Abstract

Strawberries are regarded as a profitable crop in Jiangsu Province, and as one of the main regions for strawberry production in China, the province considers the strawberry industry to be important to increase the income of small-holders. However, the strawberry industry in Jiangsu Province is not competitive compared with other production regions due to limited varieties, and low quality and yield. Through analysing the performance of the strawberry value chain, it is shown that the constraints that cause this situation are low investment in the RD&E sector, few close connections in the value chain, poor infrastructure conditions, and unstable land property rights. However, these issues can be addressed by increasing investment in RD&E and in infrastructure, by establishing alliances and cooperatives in the value chain, and by changing the land property rights system.

Keywords: strawberries, value chain, Jiangsu Province, drivers, constraints

Introduction

The strawberry industry is becoming an important industry in China. Jiangsu Province is a coastal province in the east of China, and one of the top four strawberry production regions. Since 2000, strawberry production has grown substantially in Jiangsu, with the production of 550 tonnes in 2018 (Chang and Che, 2020). The strawberry industry also has played an important part in poverty alleviation in Jiangsu Province because of its high value.

The strawberry industry in Jiangsu needs to compete with other regions in China such as Liaoning Province, as well as other countries such as the United States and Chile. Therefore, it requires a well-coordinated value chain. In order to improve the strawberry value chain, many studies have focused on increasing the competitiveness of this value chain. However, most of these studies have simply proposed the concept of the strawberry value chain, or focused on brand promoting (Zhang, 2009), or quality control (Zhang and Li, 2016). Intensive and systematic research on the whole value chain is

still lacking, which is necessary for the development of the industry and raising the living standards of the poor who depend on income from strawberry production.

Australia now allows imports of fresh strawberries from a small number of countries, but China is not among them. China only exports frozen strawberries and other strawberry related products to Australia. In 2019, the volume of China's strawberry shipments to Australia was 3,040 tonnes, with a value of \$AU7.9m (CGAOC, 2020). Currently, the export price of China's fresh strawberries is \$AU 2.95/kg, while the Australian market price of fresh strawberries is over \$AU5/kg (Hort Innovation, 2020). Considering the low price of fresh strawberries, China, as a major exporter, and Jiangsu province, as an important exporter of strawberries in China, could be a potential strawberry exporter to Australia.

In this paper, the main participants throughout this value chain are described, and the drivers of value chain performance, are analysed (Chopra et al., 2013). Based on these analyses, the main constraints, such as lack of investment in RD&E, lack of close connections among the participants of the chain, poor infrastructure conditions, and unstable land property rights, are described and potential solutions are proposed to improve the performance of the chain.

The Strawberry Industry in China and in Jiangsu Province

Output and cultivation area

The strawberry industry is increasingly important in China, because it is regarded as a relatively profitable crop. The strawberry production regions are mainly in the eastern coastal provinces such as Shandong, Anhui, Liaoning, Jiangsu and Hebei (Figure 1).

Figure 1. Major strawberry production regions in China



Source: Carter, Chalfant and Goodhue (2005)

Since 2000, both cultivation area and output have increased, and currently, both China's output and exports rank No.1 in the world (FAO, 2020). In 2018, strawberry production was 2.96 million tonnes, three times that of 2000, from 111.13 thousand ha of cultivation area, about twice that of 2000, generating a yield of 266.73 tonnes/ha, 47 per cent higher than that in 2000 (Table 1). In Jiangsu in 2010, production was just 50,000 tonnes, from a cultivation area of 3,500 ha, but in 2018, it increased dramatically to roughly 550,000 tonnes and 19,000 ha. In 2018, Jiangsu was ranked as one of the top four producing regions in China (Chang and Che, 2020).

Table 1. Production and cultivation area of strawberry in China, 2000-2018

	2000	2010	2015	2016	2017	2018
Production ('000 Tonnes)	1186	1799	2812	2688	2860	2964
Area ('000 ha)	65.4	71.1	108.7	102.9	108.3	111.1
Yield (Tonnes/ha)	181.2	253.2	258.6	261.1	264.2	266.7

Source: FAO (2020)

Domestic and export market

China has the highest strawberry consumption in the world. With rapidly increasing incomes, and strong health perceptions, the demand for strawberries is growing, with total consumption of 2.902 million tonnes in 2017 (CGAOC, 2020)¹. Domestic consumption is dominated by fresh strawberries, accounting for 85 per cent of the total consumption volume (China Horticultural Society, 2020). Most of the strawberries are sold into population centres near production regions, so the strawberries from Jiangsu province are mainly sold to Southeast China, including Jiangsu, Shanghai and Zhejiang provinces. Due to the seasonality of strawberry production, the peak season of strawberries is from March to June, and consumers would like to buy strawberries in peak seasons or in traditional festivals, such as the Chinese New Year.

Exports of strawberries are growing rapidly, with an export volume of 62,000 tonnes, and a value of \$US134.79 million in 2019. Exported strawberries are generally frozen strawberries, accounting for 77 per cent of the total export volume (CGAOC, 2020). The top four destinations by volume were Japan, Russia, Thailand, and Germany, accounting for 13, 12, 9, and 8 per cent respectively (CGAOC, 2020). Most of the exported strawberries are processed in Shandong province and shipped via Qingdao port. However, Jiangsu is also an important export area in China. In 2019, the strawberry volume exported from Jiangsu to Japan and other regions was 5,720 tonnes, with a value of \$US16.47 million (CGAOC, 2020).

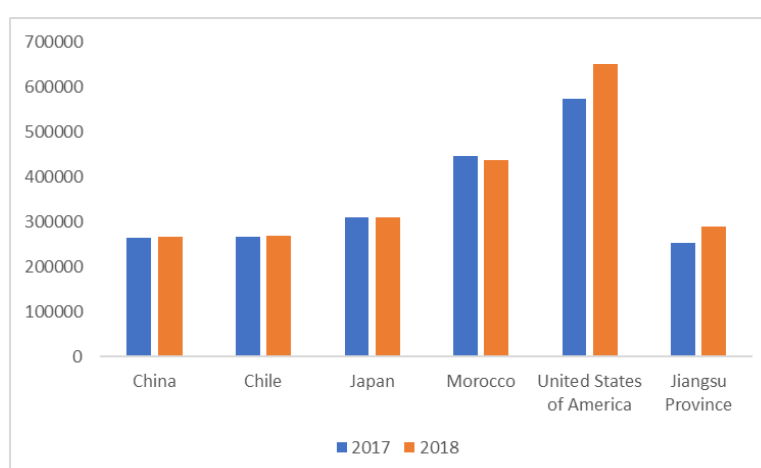
¹ Different sources provide different estimates of consumption. Here, consumption has been estimated using production data from FAO, and import data and export data from the National Customs Bureau to ensure consistency.

The importance of the strawberry value chain

The strawberry industry is an important part of the agriculture sector in Jiangsu. On the one hand, strawberries are very healthy and nutritious. They can be processed into frozen strawberry, strawberry juice, sauces, as well as used to make cake and ice cream. Strawberry-related experience tours such as strawberry picking have attracted increasing attention. Therefore, the development of the strawberry industry can boost many related industries, which can benefit the local economy. On the other hand, developing the strawberry industry is considered as an effective measure to help the small-holders, and alleviate poverty. Strawberries are a high-value crop. For strawberry producers, the average net profit of producing strawberries is \$AU40,000 per ha annually (Chang and Che, 2020), much more than other crops. Since greenhouse cultivation methods have been applied, farmers can grow strawberries in a variety of production modes and in many climates all year round. To sum up, researching and developing the strawberry value chain can provide huge economic benefits for the local small-holders.

However, currently, the strawberry industry is facing major challenges in Jiangsu Province. Compared to other strawberry production regions, the strawberry industry in Jiangsu still lacks competitiveness. Many links in the value chain need to be updated. For example, compared with California, where the supply chain of the strawberry industry is relatively mature, production in Jiangsu has not achieved standardized management and mechanized operations (Wu et al., 2016). Compared with other small-holder-based countries, such as Japan and South Korea, the breeding, production technology and product quality still need to be improved. In terms of the yield, although the strawberry output and area in Jiangsu province have grown significantly, the yield is much less than in other countries (Figure 2), even less than the average yield in China. In 2016, strawberry yield in Jiangsu was only 66 per cent of Shandong, 69 per cent of Liaoning, and 74 per cent of Hebei (Han et al., 2020).

Figure 2. Yield of strawberry by country of origin in 2017 and 2018 (kg/ha)



Source: countries' data source from FAO (2020); Jiangsu's data source from Liu, Chang and Han (2019)

Moreover, the export market is not performing well either. Jiangsu's share of strawberry export volume in the world's exports has fallen rapidly since 2012, and is less than 7 per cent currently. The

price of export strawberry from Jiangsu is also lower than the world's average export price (Han, Zhu, and Chang, 2019).

Mapping the Value Chain of Strawberry in Jiangsu Province

Due to the complex distribution and sale channels, there are multiple paths for the strawberry value chain in Jiangsu (Figure 3). The main actors in this value chain are input suppliers, producers, cooperatives, processors, wholesalers, retailers and consumers.

Inputs

Strawberry production inputs include seedlings, fertilizers, pesticides, bees, greenhouses, labour, land and other infrastructure like irrigation systems. There are two ways to source seedlings, which are self-breeding and purchasing from seed companies. In general, the cost of sourcing is higher than self-breeding. Strawberries cultivated in Jiangsu are mainly grown in plastic-covered greenhouses. Strawberries which are cultivated in the open field also need plastic protectors. For the land, most of the producers need to rent land from the collectives or rural residents², and the lease term is generally 3-5 years. Labour use depends on the scale of the farm. The small-scale farms only need seasonal labour, while larger farms need to hire permanent workers.

Production

There are two main cultivation methods in Jiangsu - open field cultivation and the greenhouse. These two methods mainly depend on varieties and seasons. Generally, open field strawberries, which account for less than 20 per cent of the total production, are produced mid-season (from March to June) when the weather is most favourable (Carter, Chalfant, and Goodhue, 2005). The varieties which are suitable to grow in the field include Honey, Darselect and Allstar. Greenhouse production accounts for more than 80 per cent of the total cultivation (Yu et al., 2017). It extends the season both earlier and later, and the main varieties are Toyonoka, Honeye, Camarosa, and Sweet Charlie.

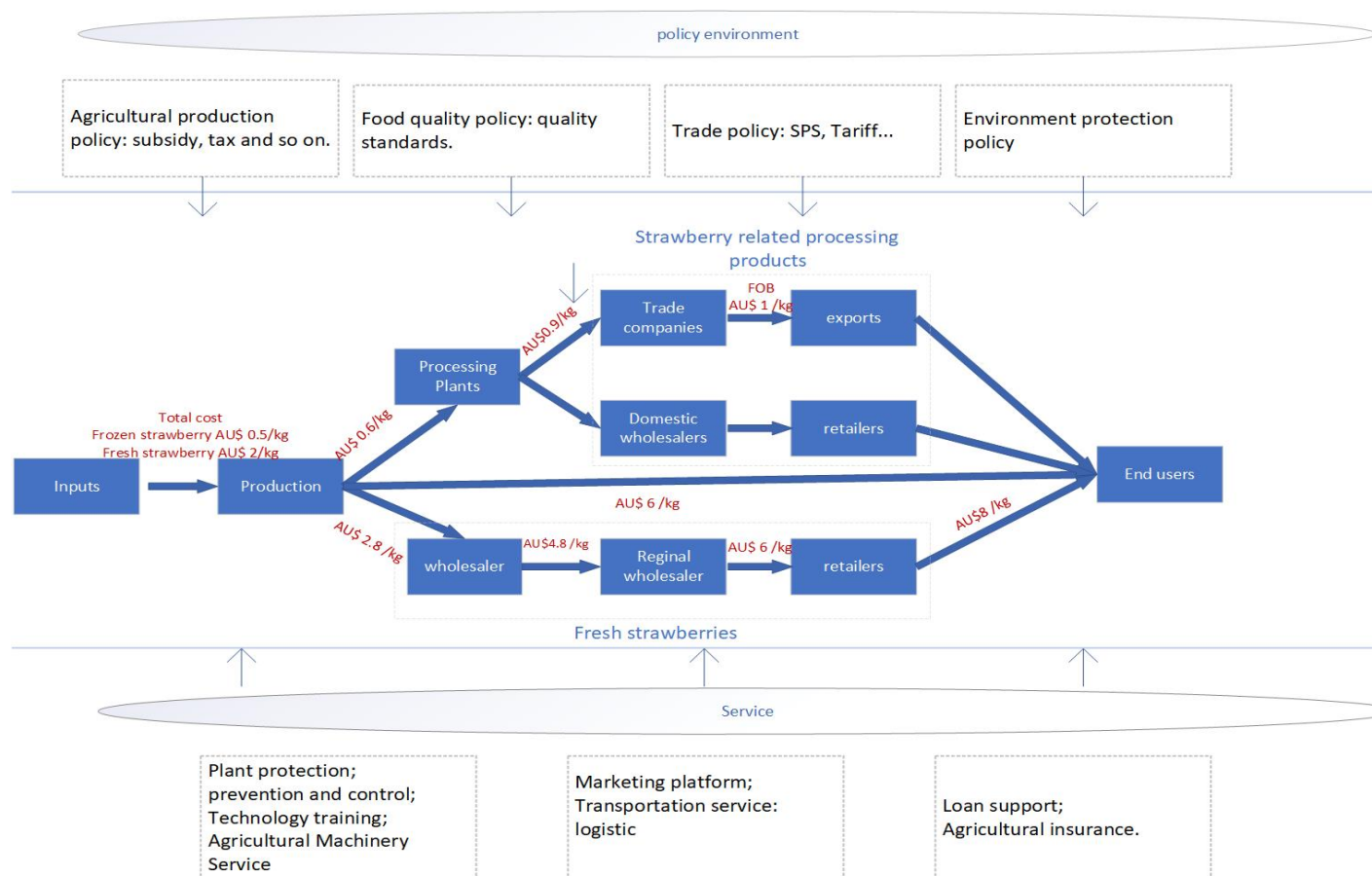
Generally, production is dominated by small-holders, with the average cultivation area just 0.5 ha. Small-scale (less than 0.33 ha) producers account for 54 per cent, medium-scale (less than 0.67 ha) producers account for 29 per cent while large-scale (more than 0.67 ha) producers account for 17 per cent (Chang and Che, 2020).

Processing

Domestically, most of the strawberries produced in Jiangsu are sold as fresh strawberries to cities near to the production region. The open field strawberries and a small number of low-quality berries are processed into frozen strawberry for exports, or other products such as strawberry juice, strawberry sauce, and so on (Carter, Chalfant and Goodhue, 2005). Most small-holders do not have processing

² In China, cultivated land is mainly owned by collectives. Agricultural registered permanent residents can obtain a plot (roughly 0.3 acres) from the collectives. Strawberry producers need to rent land from the local residents.

Figure 3. Product, value and information flows in the strawberry value chain in Jiangsu



Source: Author's investigation into five strawberry firms in Jiangsu. Note: The price of strawberry processed products varies greatly among different products.

facilities, so the preliminary processing, such as cleaning, grading and packaging, is done by cooperatives or processing plants. The strawberries that need to be further processed are sent to the production lines in specialised factories.

Wholesale

There are different types of wholesalers in the strawberry market. Strawberries produced in Jiangsu are mainly sold to south China, so some large-scale wholesalers, such as Nanjing Agricultural and Sideline Products Logistics Center, work as a hub and play an important part in the distribution system (NASPLC, 2020). Many regional wholesalers located in different cities purchase from these large-scale wholesalers.

Retail

The strawberry retailers include supermarkets, agricultural markets, fruit shops, street vendors, online shops, and so on. Fruit shops and street vendors are the most popular sales channels in China. These fruit shops are located in the communities, making it easy for consumers to buy on the way to and from work.

High-end consumers, who like high-quality or organic strawberries, are willing to purchase from boutiques or high-end supermarkets such as BHG and Ole'. For the younger generation, e-commerce, like JD, Taobao, is their favourite purchasing channel. Meanwhile, the market share of some online-to-offline (O2O) platforms, including Fresh Hema and Super Species, has increased rapidly in some big cities like Nanjing and Suzhou (Li, 2020).

Some of the producers are also strawberry retailers. With the emerging middle-class in urban areas, an increasing number of these families like to drive to farms located near the city to spend their weekends. The strawberry picking experience and other forms of agri-tourism can meet their entertainment needs. Generally, this direct-to-consumers (DTC) sales channel can save the transportation and processing cost, while the sales price is far more than that of selling to wholesalers (Figure 3).

Other related actors

Government. The government, especially agencies related to the agricultural sector, is one of the most important players in this value chain. Different levels of government provide different supports. For the national, province and city government, they usually formulate plans, as well as subsidies, taxes, and other policies, to support the development of the whole industry. The township government will implement the plans and policies. They also provide local farmers with advanced technology and knowledge.

Associations. Strawberry associations provide services for the whole value chain. In addition, there are other associations such as food quality associations and fruit associations, focusing on specific links

of this industry. For example, food quality associations can improve food quality by implementing quality standards. In China, the agricultural products generally can be divided into green food and organic food according to their quality.

Cooperatives. Cooperatives play an important role in strawberry production and marketing. On the one hand, they organize the local farmers, providing them with training and standardised varieties. On the other hand, because strawberry production is based on small-holders, it is very hard for the lead firms to establish long-term relationships with them individually, so cooperatives usually sign acquisition contracts with the firms on behalf of small-holders.

R&D sectors. R&D sectors that contribute to the strawberry industry are universities, institutions, and other private R&D departments. One of the most important types of R&D is the development of new varieties. Besides, robot companies and other agriculture-related technical companies are also involved in the value chain.

Other entities. Financial institutions, such as banks, Rural Credit Cooperatives, and agricultural insurance companies, participate in the value chain to provide financial services for the value chain.

Assessing the Performance of the Value Chain

There are several ways to examine the supply chain's performance with regard to responsiveness and efficiency. Compared to other measures of the value chain, such as Aramyan's framework (2007), analysing the details of each driver not only can provide insights to the strategic fit of the value chain, but it also can help improve the desired level of responsiveness at the lowest cost (Chopra et al., 2013).

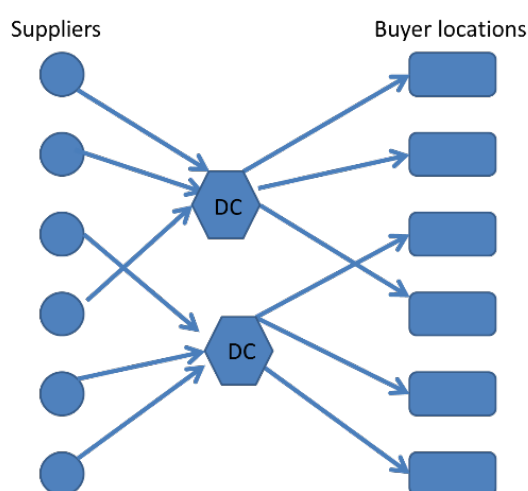
Logistical Drivers

Facilities. Since fresh strawberries are perishable, and do not retain freshness at room temperature, the most important facilities are the sterilization and storage equipment. Due to the high cost, generally, these facilities are near the production region, and only the lead firms have the resources to build them. Strawberries are delivered to sterilization production lines, and then stored in the cool rooms of the warehouse. The small-holders cannot afford to buy time in cold storage, so it is hard for them to guarantee the quality of the strawberry. For wholesalers and retailers, cold storage is quite important too. For instance, there are 13ha of service facilities, including cold storage, in the Nanjing Agricultural and Sideline Products Logistics Centre (NASPLC, 2020).

Inventory. It is quite difficult for this value chain to manage safety inventory. Firstly, strawberries need a quite particular storage environment, where the appropriate temperature is about -1°C, with a humidity rate of 90-95 per cent. Strawberries can be stored in this condition for up to 30 days (Wu et al., 2011). Secondly, the strawberry is a seasonal fruit, so the inventory management also puts pressure on the value chain, especially small-holders. Without good storage conditions and close cooperation with lead firms, the small-holders have to sell their strawberries in the peak seasons at a very low price.

Transportation. In the domestic market, truck and air are appropriate transportation modes, and the transportation network structure of this value chain is all shipments via some central distribution centres (DC) with some inventory storages (Figure 4). If the destination is far away from the production region, the strawberries need to be shipped to the logistic centre by truck, and then sent to the logistic centre in the destination province by air. For example, Lishui, which is a strawberry production region in Jiangsu, has sourcing agreements with a fruit chain store named Bai Guoyuan, so the strawberries in Lishui are delivered to Nanjing Lukou airport by refrigerated trucks and then sent to each logistic centre. For the destination near the production region, trucks are used throughout the delivery.

Figure 4. Transportation network of the strawberry value chain in Jiangsu, China



Source: Chopra et al. (2013)

However, some small-holders, who want to save costs to improve price competitiveness in the low-end market, use standard box trucks instead of refrigerated trucks, covered with plastic cloth for insulation.

In the export markets, most strawberries for export are frozen strawberries, which can be kept for up to one year, so generally, the most cost-effective way is shipping by sea. They are sold to processing plants from production regions, and then shipped to Japan and Korea and other destinations from the nearest ports.

Cross-functional drivers

Pricing. Due to the high perishability and seasonality, pricing has a significant impact on the value chain profitability. There are three pricing strategies in this value chain. Firstly, different prices exist in different channels. Fresh strawberries bought from retailers like street vendors and fruit stores, are much cheaper than those bought through high-end supermarkets such as BHG and Ole’.

Another strategy is grading. The most common way of differentiating strawberries is by variety. Some premium varieties, such as White Strawberry, can be sold for AU\$32/kg (Figure 5), while some other

varieties, like Sweet Charlie, are sold for AU\$4 /kg (Figure 6). In addition, quality standards can affect pricing too. In China, all agriculture products can be divided into Green Food, Organic Food, Geographical Indication and others. Organic food has the highest price.

Figure 5. White strawberry



Source: CNHNB (2020)

Figure 6. Sweet Charlie



Source: Nongnet (2020)

The third strategy is the seasonal price. The peak time for strawberries in Jiangsu is from March to June. At the initial time of the peak, especially during the Chinese New Year, the price is highest, about AU\$85.5/ kg, which is due to the short supply. From March to April, the average price falls to AU\$1.1-4/kg (Yu et al., 2017).

In the strawberry value chain, if a lead firm controls the production, and sells strawberries to the retailers who have agreements with it, price discrimination can work well because they can control the quality and the sales channels of the product. However, some small-farmers may sell the strawberries to wholesalers, which are then resold to small vendors, and fruit shops. Sometimes prices are reduced dramatically to attract consumers

Sourcing. Most of the resources required by the strawberry value chain are provided in-house. For some jobs, participants choose to outsource to reduce costs and improve efficiency. For example, some large farmers outsource plant protection requirements to agricultural service companies, because this saves costs and improves product quality compared to hiring technical personnel themselves.

Information. Information management in the strawberry value chain, such as customer and supplier relationship management, mostly focuses on the upper level of the chain. For example, a few lead firms, such as Golden Sunlight company, have supply agreements with producers and have established a complete control network, sharing market demand and inventory information in real time. Some of them provide inputs into the production process to ensure product quality. However, in most cases, there is little evidence that the whole value chain is sharing information in a timely manner.

Based on the above analysis, the Jiangsu Province strawberry value chain is dominated by efficiency considerations. Emphasis is placed on reducing the cost of storage, transportation, and sourcing, rather than on responsiveness. Although consumer demands can be predicted, there is little evidence to show that this value chain can respond effectively. For instance, the dominant varieties of strawberry are Camarosa, Sweet Charlie, and especially Honeye, taking up 73 per cent of cultivated area (Chang and Che, 2020). These varieties all have their peak season at a similar time, but current storage facilities cannot accommodate so many strawberries at the peak time. Consequently, competition is fierce at the peak season, while supply is short during the off-peak season. A typical example is that, as mentioned before, in Chinese New Year, which is usually in January or February, the demand for strawberries is strong but they are always in short supply. Furthermore, the information cannot be shared immediately across the value chain, which may cause the low quality, and over/short supply of the strawberries.

Constraints and Challenges in this Value Chain

Firstly, there is a lack of RD&E investment. Generally speaking, RD&E requires large investments and a long-term view. For the private sector, they also face the risks of freeriding and positive externalities, so most participants, even the lead firms are reluctant to invest too much in the RD&E sector. In Jiangsu province, currently, most of the investments, including the public funds, in the value chain are focussed on agricultural infrastructure, such as greenhouses, and less attention is paid to the R&D sectors. More than half of the lead firms invest less than 1 per cent of annual sales revenue in RD&E (Xu, Zhang, and Zheng, 2017).

The limited R&D investment leads to a weakness in innovation. For instance, the main varieties of strawberry such as Honeye and Sweet Charlie were introduced from Japan in the 1990s. Due to continual planting over many years, there have been problems of variety degradation such as weakened stress resistance and reduced quality (Zhao et al., 2012). Without the innovation in varieties through ongoing breeding programs, the problems of the concentrated peak period cannot be solved and the quality cannot be improved.

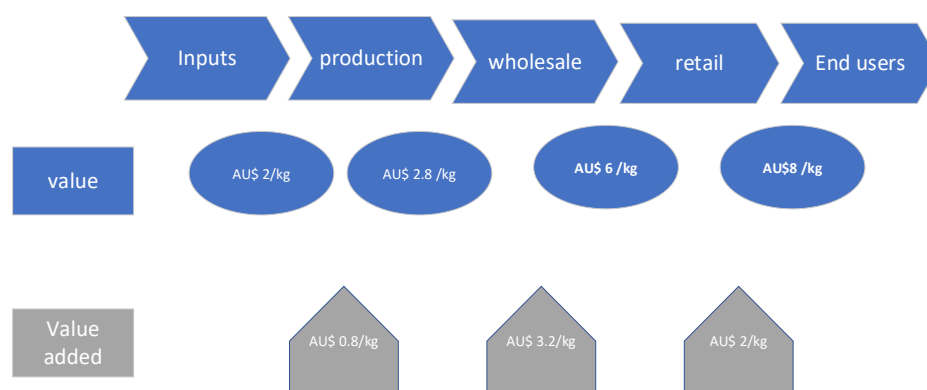
Secondly, there is a lack of a mechanism for collective action. Value chain participants are not organized closely. Although there are some alliances and cooperatives in the strawberry industry, these clubs only exist and serve a small number of participants. For the producers, the majority of strawberry growers in Jiangsu Province are small-scale family farmers who grow a variety of crops. Although the government encourages them to join the local industrial organizations to get sale or technical support, only 30 per cent of them have joined a cooperative or other alliance (Han et al., 2020). Without the technical support and standardized management provided by these alliances, producers only buy seedlings from other growers who breed and cultivate strawberries according to their experience. Therefore, the quality and yield of the strawberries cannot be guaranteed. Moreover, without a tightly connected alliance, the information cannot be shared throughout the chain effectively, which may cause inventory backlogs, or insufficient supplies.

Furthermore, without efficient collective actions, the small producers have little voice in the market.

As shown in Figure 7, the profits are not distributed throughout the value chain equally. The retailers take most of the profits while producers only get a small proportion.

Thirdly, facilities are insufficient. Producers, due to limited capital, cannot invest in cold storages. The fresh strawberries can only be stored at room temperature. In summer, strawberries are perishable. For transportation, box cars are mostly used, and the quality of the goods during transportation cannot be guaranteed. In some rural areas far away from cities, due to poor roads, the loss rate is as high as 25 per cent when reaching the destination (Zhang and Huang, 2013).

Figure 7. Value added at different links of the fresh strawberry value chain



Source: Author's investigation into five strawberry firms in Jiangsu.

Finally, property rights are unstable. In China, cultivated land is mainly owned by collectives. The agricultural registered permanent residents can obtain a plot (roughly 0.3 acres) from the local collectives for 30 years. Generally, the strawberry producers do not have land ownership, and they can only rent land from the local residents for 3-5 years. Due to the expensive rent and short lease term, producers are unwilling to cultivate sustainably, and they use continuous cropping and excessive amounts of fertilizer and pesticide. The resulting environmental problems are serious. These will cause the accumulation of pathogenic bacteria and nutritional imbalance, which lead to infectious diseases, or affect the yield and quality of strawberries. According to an investigation in Yancheng city in Jiangsu Province, the number of bacteria and actinomycetes in continuous cropping fields is 2-3 times higher than in other fields (Gao, Wang and Du, 2013). In addition, the short lease will also cause producers' reluctance to invest in advanced facilities and technology.

Potential Improvements

Increase the investment in the RD&E sector

Research is fundamental to the financial survival of value chains in that it is a major source of innovation and new product development within the chain. RD&E needs effort from both the chain and the government. Some RD&E projects should be done by chain participants, especially lead firms with RD&E capabilities, such as the information platform of the whole chain, and the extension of

planting regulations and plant protection technology. For RD&E projects that benefit the whole society, government investment is necessary to enhance the industrial competitiveness of the region. It can fund the professional research teams required to develop the new varieties which are suitable for natural conditions in Jiangsu Province, and develop effective fertilizers and pesticides, and so on.

Establish alliances to tighten connections among the participants

For the producers, the cooperatives are effective alliances to organize the local small-holders. The organizational structure and function could be modelled on Japan's Agricultural Cooperatives (Gherman et al., 2016). On the one hand, they can promote the speaking rights of small farmers in the value chain, and can fight for benefits for small-farmers when they take the collective action, distribute profits, and purchase the seedlings and input. On the other hand, cooperatives can improve the quality of strawberries. According to the quality standard, cooperatives can purchase high-quality seedlings, formulate production regulations, and control the use of chemical fertilizers and pesticides in production to ensure quality. Meanwhile, cooperatives can participate in the extension of new varieties and technologies through training.

For the different actors in a value chain, a vertical club can be established, such as strawberry supply chain alliances, where members are all participants in the value chain. These alliances can improve the connection of different links in a value chain and reduce costs. Compared to the traditional cooperation relationship, which is established only for purchase agreements, this alliance can focus on multiple products and activities in the value chain, sharing information, and increasing the overall chain surplus by collective action.

For the whole industry, horizontal clubs such as strawberry associations, can be established to enhance the competitiveness of strawberries produced in Jiangsu in national and overseas markets. For example, service and information sharing platforms can be established by the strawberry association, and information like consumer demand information can be shared, so that every individual chain in this industry can decide the varieties they wish to produce.

Invest in infrastructure to improve logistics and storage conditions

Although Jiangsu Province has increased investment in infrastructure such as highways, roads in rural areas are still not satisfactory. It is necessary to increase public funds for road construction to improve accessibility. In terms of storage and transportation, cooperatives can build a shared cold storage in a village for the small-holders, and purchase refrigerated transport vehicles and rent to members at a relatively low price. This can also improve the utilization of the cold chain.

Change the land use and lease system

Instead of current land use rights, in which only the rural agricultural registered permanent residents can get the arable land use right, with a modified system every producer could rent arable land from the village collective directly. Firstly, compared with leasing small plots from individual farmers, this

measure can make it easier for producers to obtain adjacent land plots and reduce the cost of land rent.

Secondly, it can provide producers with stable property rights. The initial investment in agriculture is large and the payback period is long. To achieve sustainable land use, the producers should have stable land use rights. However, for landlords, in order to reduce uncertainty and increase their rental income, generally, they are unwilling to sign long-term lease agreements with land producers. The village collective is a public organization, so it is much easier for the producers to negotiate the land lease period with them. In that case, the current general 3-5-year land lease period should be extended to more than 20 years, so that producers can reduce soil pathogen, and achieve the nutritional balance through fallow, and then improve the quality of the strawberry.

Moreover, if rental leases were made longer, producers would also be willing to increase investment, using advanced technology and equipment, such as building glass greenhouses to replace plastic-cover greenhouses, and establishing monitoring systems and other advanced technologies to improve the quality of strawberries and management efficiency.

Conclusion

The strawberry industry has become one of the most important industries in Jiangsu Province in China. Based on an analysis of the main drivers of the value chain, this chain is focused on efficiency. From the analysis of the constraints of the value chain, the lack of RD&E investment, infrastructure, lack of collective actions and land rights are the main factors which hamper the development of the chain.

As an efficient intervention in this value chain, more emphasis should be put on the RD&E sector, this needs cooperation between the chain and the government. The alliance should be established to improve the status of small-holders, increase the incentive for collective action and share the information in time in the value chain. Moreover, public funds are needed to support road construction to improve the accessibility in the value chain. Land use rights also need to be changed to increased sustainability and strawberry's quality.

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