

Regoverning Markets

Small-scale producers in modern agrifood markets

Innovative Practice

China

Case studies of Carrefour's quality lines

Dinghuan Hu and Xia Dandan

Institute of Agricultural Economics and
Development, Chinese Academy of
Agricultural Sciences

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Xia Dandan

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2007

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Regoverning Markets is a multi-partner collaborative research programme analysing the growing concentration in the processing and retail sectors of national and regional agrifood systems and its impacts on rural livelihoods and communities in middle- and low-income countries. The aim of the programme is to provide strategic advice and guidance to the public sector, agrifood chain actors, civil society organizations and development agencies on approaches that can anticipate and manage the impacts of the dynamic changes in local and regional markets.

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The case studies were coordinated by:

Julio Berdegue, RIMISP - Latin American Centre for Rural Development, Chile (contact: jberdegue@rimisp.org)

Lucian Peppelenbos, Royal Tropical Institute (KIT), Netherlands (contact l.peppelenbos@kit.nl)

Estelle Biénabe, Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), France (contact: estelle.bienabe@cirad.fr)

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The authors

Dr Dinghuan Hu and Ms Xia Dandan
Institute of Agricultural Economics and Development
Chinese Academy of Agricultural Sciences
Baishiqia Road 30
Beijing 100081
Corresponding author: Dr. Dinghuan Hu (E-mail:dhhu@163bj.com)

Acknowledgments

Funding for this work was provided by:
UK Department for International Development (DFID)
International Development Research Centre (IDRC), Ottawa, Canada
ICCO, Netherlands
Cordaid, Netherlands
Canadian International Development Agency (CIDA)
US Agency for International Development (USAID).

The views expressed in this paper are not necessarily those of the funding agencies.

Citation: (2007). Dinghuan Hu & Xia Dandan, 2007. *China: Case studies of Carrefour's quality lines*, Regoverning Markets Innovative Practice series, IIED, London.

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Published by:

Sustainable Markets Group
International Institute for Environment and Development (IIED)
3 Endsleigh Street
London WC1H 0DD
www.iied.org
Tel: +44(0)20 7388 2117, email: sustainablemarkets@iied.org

Cover design: smith+bell

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1. Introduction

In the 1980s structural reform and the adoption of a 'contracted responsibility' household-based system in Chinese rural areas redistributed land that had belonged to large farms, such as the people's commune and the production brigades. Farmer households received parcels of land based on the number of family members, and thus was established the widely adopted 'special small-scale farmers' production models'. The scale of production in China is very small. The average land area per household is less than 0.4ha. Just as there are many small-scale farmers in the agricultural production sector, there are an equally large number of small-scale dealers in the agrifood distribution sector (Hu, 2006). They are buying agrifood from small-scale farmers, transporting it, and are also engaged in wholesale, retail, etc. In the traditional agrifood supply chain, composed of a large number of small-scale farmers and small dealers, all the individuals are independent operators. There are no cooperatives and long-term stable supply-and-demand relationships among farmer households, among dealers, or between farmer households and dealers. They do not interfere in each other's work. The enthusiasm of the participants, combined with the so-called 'invisible hand' of the agrifood supply chain, can be very efficient in some stages, and thus the supply of agrifood in China has been stable and sustainable since the implementation of the reform policy that opened the market to the outside world. In the production domain, however, because of the shortage of funds and the lack of technical assistance, small-scale farmers find it difficult to take advantage of advanced planting and management technology (Ruofeng and Ying, 2000; Hu, 1998). As a result of the lack of an effective supervision system, small-scale farmers very often overuse pesticides and chemical fertilizers. Moreover, some of them even use highly poisonous and highly residual pesticides in order to improve the yield and appearance of agricultural products. The indiscriminate use of pesticides not only seriously damages agrifood safety, but also causes environmental pollution (Lijian et al, 2006). The agrifood supply chain from field to dining table has several relatively independent stages, and often there are no relationships between the actors in the different stages, except for a one-off buying or selling transaction. The agrifoods have been bought and sold several times before they reached the consumers, so may have been contaminated during the selling, loading, or unloading processes too. As the supply chain has no traceability, there are also opportunities for speculators to alter the food, for example by injecting water into pig carcasses (to increase the weight), or by introducing during food processing additives that impair consumers' health (Hu, 2004; 2005).

Since the mid-1990s, and particularly since 2000, changes have gradually taken place in consumers' demands for agrifood in China. Citizens' incomes have increased rapidly, along with the continuous rapid growth of GDP of the last 20 years. People's food demands have switched from quantity to quality, safety, and diversity.

The first supermarket was established in China in 1990, and they developed rapidly afterwards. Since the turn of the century the word 'supermarket' has been firmly established in the minds of most people in China. In many large and medium-sized cities supermarkets have become the main shopping outlet for both household necessities and food. According to research carried out by CCFA (the China Chain Store & Franchise Association) in 2004, supermarkets' average sales in 12 large cities in China accounted for 24.3 per cent of the total volume of retail sales (see Table 1).

Table 1. Supermarkets' share of total retail trade in 12 large cities in China (2004)

	Total retail sales (billion US\$)	Total supermarket sales (billion US\$)	Supermarket sales as % of total sales	Number of supermarkets
Shanghai	236.8	89.6	37.8	10,220
Beijing	211.2	61.6	29.2	5,000
Tianjin	101.6	24	23.6	0
Chongqing	92	20	21.7	3,000
Qingdao	58.4	16.8	28.8	3,785
Shenyang	77.6	20.8	26.8	4,000
Wuhan	92.8	24	25.9	2,350
Suzhou	60	9.6	16	1,093
Ningbo	57.6	13.6	23.6	0
Taiyuan	21.6	4.8	22.2	0
Hongzhou	68	12	17.6	1,222
Yantai	42.4	5.6	13.2	1,400
Herbing	68	3.2	4.7	253
Average			24.3	

Source: China Chain Store & Franchise Association (CCFA)

In 2006, Arief Goldman and colleagues from the Hebrew University surveyed 1,200 consumers in six large cities in China. The results showed that the proportion of agrifoods and food bought from the supermarkets by consumers are as follows: vegetables (22 per cent), poultry (35 per cent), fish and seafood (33 per cent), fruits

(37 per cent), meat (46 per cent), bread (55 per cent), manufactured and packaged foods (79 per cent), and non-food goods (94 per cent).

While the supermarkets developed rapidly in China, China's entry into the WTO began to open its retail market in general and in 2004 foreign businesses entered China's market one after another, thus increasing the competition among and between supermarkets and traditional retail stores. Chinese consumers traditionally buy raw and fresh agrifood every day, so the quality and availability of raw and fresh agrifood has become an important measurement of supermarkets' attractiveness to consumers. At present, because of the imperfect agrifood distribution system and infrastructure, the cost of the raw and fresh agrifoods sold in supermarkets is generally higher than that of vendors in the wet markets (Hu, 2006, Subject of the State's Ministry of Commerce). From the viewpoint of marketing strategies, therefore, many supermarkets position their sales of raw and fresh agrifood at the medium- and high-income market. Many supermarkets provide organic and green agrifoods in their stores too. In 2005 we studied more than 20 supermarkets in Beijing. We found that there were on average 48 varieties of vegetables sold by these supermarkets, and 26 of them were organic or green vegetables, which accounted for 52 per cent of the total vegetables (see Table 2).

Table 2. Organic and 'green' vegetables sales as a percentage of total vegetables sold by supermarkets in Beijing

No.	Name of supermarket	Varieties of vegetables	Varieties of organic and green vegetables	Sales share of organic and green food vegetables (%)
1	Huarun	20	15	75
2	Hualian	32	17	53
3	Huapu	20	20	100
4	Hua'an	18	10	56
5	Zhuangsheng	42	15	36
6	Auchan	87	46	53
7	Huaguang	87	47	54
8	Carrefour	92	30	33
9	Chaoshifa	35	29	83
10	New World	68	68	100
11	Jinkelong	18	0	0

12	Lotus	68	50	74
13	Meilianmei	67	34	51
14	Huaguan Shopping Centre	70	33	47
15	Taixingyuan	33	16	48
16	Yikelong	47	25	53
17	Wumart	20	9	45
18	Hengyuan	75	40	53
19	Lotus (Liuli Bridge)	30	14	47
20	Shuntianfu	72	30	42
	Average	48	26	52

Source: Author survey, 2005

It is claimed that some agrifood suppliers purchased ordinary agrifood from the wholesale market and then marked it with the symbols of organic or green foods and sold it to supermarkets.

Important questions to be answered are: How do organic and green agrifoods enter China's supermarkets? What methods have been used to produce organic and green agrifoods? What kinds of organizations and systems can guarantee that these agrifoods reach organic and green food standards? These problems are closely related to consumers' health and supermarkets' reputation, but nobody has studied them seriously in China until now. With these questions in mind, we have studied the raw and fresh agrifood quality line of Carrefour supermarket.

2. The development of the Carrefour brand

The Carrefour brand is widely known throughout the world. (The word 'carrefour' is French for crossroads.) The world's first department store opened in Paris, France in the 19th century. Department stores enable retailers to put all their goods in one large store for concentrated selling, thus meeting the requirements of consumers who want to purchase all their goods in one place. After World War II, were recovering from the war and the resulting privations, and their appetite for consumption was kindled. Carrefour emerged to fulfil this need. In 1959, the

Fournier and Defforey families created the Carrefour Company, opening their first store in 1960. At the very beginning, Carrefour was not attractive. In the summer of 1960, their first store opened (in a basement with an area of 650m²) in Annecy, Haute Savoie. Three years later they opened a much larger department store – a hypermarket – with an area of 2,500m² in Sainte-Genevieve-des-bois, a suburb of Paris. There were 12 cashier counters and a parking lot for 400 cars. This hypermarket combined the concentrated selling of goods practised by department stores with letting customers browse and collecting their goods off the shelves themselves. The hypermarket was well received by French consumers and has become one of the marketing models of retail commerce. This new concept of a ‘supermarket’ has brought consumers an amazing shopping experience. Consumers can buy everything they need in one store, and at an attractive price. Compared with traditional retail stores, Carrefour’s retail prices are 10–50 per cent lower. Just because of their low price, the annual sales of Carrefour increased by 50 per cent from 1965 to 1971.

The development of hypermarkets and supermarkets brought an unprecedented shock to small retail shops in France, and brought strong criticism and resentment from entrepreneurs of medium-sized and small enterprises. In order to protect the medium-sized and small retail enterprises and to raise the employment rate, the government restricted the growth of large domestic supermarkets. In 1972, France began to impose special taxes on retailers in supermarkets and the tax was used to fund the retirement pensions of small retailers who were put out of business. Carrefour’s annual tax bill accounts for 1.5 per cent of its annual volume of sales. Carrefour began its expansion to foreign countries in 1969, when the first hypermarket established abroad opened in Belgium (Guang, 2004).

In the mid-1970s Carrefour began to expand into the international market outside of Europe. The first store was established in Brazil, and the first supermarket was established in Argentina in 1982. Carrefour entered Asia in 1989 and the first supermarket was established in Taiwan. Carrefour opened the first Chinese supermarket in Beijing, the Chinese capital, in 1995.

Up to March 2006, Carrefour had established 6,987 chain stores. Of these stores 870 are hypermarkets, 191 of which are in France, 332 in Europe outside France, 103 in America, and 164 in Asia. Carrefour also has 1,426 ordinary supermarkets, 207 convenience stores, and 122 ‘cash and carry’ warehouses.

At the end of 2005, Carrefour’s global gross sales were 74.5 billion euros, an increase of 2.48 per cent over the 72.7 billion euros from the same period of 2004. Among the gross sales, hypermarkets were up 58.8 per cent; ordinary supermarkets up 17.8 per cent; discount stores up 8.6 per cent, and others up 14.8 per cent. Seen from the regional point of view, gross sales in France were 47.8 per cent of total sales, Europe (apart from France) was 37.7 per cent, Asia 7.7 per cent, and America 6.8 per cent.

Although Carrefour did not enter China's mainland market until 1995, the speed of its development in China has been faster than in any other country in the world. Up to June of 2006, Carrefour had established 78 chain stores in China, starting with the first store in Beijing. Carrefour arrived in Shanghai and Shenzhen in 1996 and into Tianjin in 1997. Carrefour established hypermarkets in Chongqing, Zhuhai, Wuhan, and Dongguan in 1998; 35 hypermarkets in more than 20 cities in 2002; and the 40th branch store in Hangzhou in 2003. The Champion brand supermarkets (owned by Carrefour) first opened a branch store in China in 2004, and the 60th branch opened in Chongqing in 2005. The growth of Carrefour chain stores carries on at a greatly accelerated pace in 2006. As of July 2006, Carrefour had 79 stores in China. Carrefour developed so rapidly in China because they offer very good economic benefits on the one hand, and on the other hand the development of Carrefour in China has realized economies of scale such as the establishment of distribution centres to reduce transport and distribution costs.

Table 3. Total sales in Carrefour supermarkets in China

Year	Sales (million US\$)	Number of stores
2002	1,243	35
2003	1,680	41
2004	2,030	62
2005	2,179	76

Source: CCFA

3. Food safety and the Carrefour quality line

3.1 Food safety problems in China

Food safety in China, especially that of raw and fresh agrifood, is not optimum. As for fruits, pesticide residue in apples from the apple-producing area of Shandong Province was tested by experts in 2000. Results showed that for the 12 kinds of pesticide tested, residue was found from nine of them, all except for parathion-methy, fenthion, and thiophanate-methy. The DDT and alkron residues are 10.91 per cent and 3.33 per cent respectively, higher than acceptable standards. Experts had checked the environment and apples of 45 orchards in eight cities (prefectures) in the main apple-producing areas in Shandong Province in 2000. The results showed that cadmium, lead, mercury, chromium, and arsenic were all present in both the soil and

the irrigation water. The levels of cadmium and mercury in the irrigation water were 4.4 per cent and 2.22 per cent higher than standards allow, and in the worst cases 24 per cent and 50 per cent higher than the standards. The tests showed chlorine and fluorine levels in the irrigation water of 8 per cent and 4 per cent, respectively. It also found lead, cadmium, and arsenic in 93 per cent of samples, and that copper, zinc, fluorine, mercury, and chromium were present in 100 per cent of samples, and that the levels of them in the irrigation water were 1.47 per cent, 11.29 per cent, and 18.06 per cent higher than permissible levels. The highest reached 25 per cent, 230 per cent, and 130 per cent higher than standards.

Pesticide residue is the main reason that vegetables are classified as 'unsafe'. The departments of agriculture carried out a second fixed-site monitoring of pesticide residue in vegetables in 37 provinces (cities) throughout the country in 2003. The results show that 18 kinds of vegetables contained pesticide residue 15 per cent higher than acceptable standards and four contained pesticide residue 13 per cent higher. There are other food safety problems too. The main problems in animal and poultry products are clenbuterol (a drug used to make animals gain more muscle than fat), BSE (bovine spongiform encephalopathy), avian influenza, Newcastle disease, etc. In fish and seafood products the problems include the misuse or overuse of drugs and additives, the diluting or poor packing of goods, and contamination from growing environmental pollution during the past 20 years. In 1999 the State Aquatic Products Quality Test Centre monitored drug residue in fish and found that the level of sulphonamides were higher than acceptable standards and there were residues of chloromycetin, furazodidone and other antibiotics, and stilboestrol residue was also found in a few of products. Chloromycetin residue was found repeatedly in frozen shelled fresh shrimps, and as a result in 2002 the European Community implemented a trade embargo on animal source products.

The problem of unsafe food runs right through the entire food supply chain. The main problems include that microbial pollution and pesticide and animal drugs residues are higher than acceptable standards; the production environment is not ideal, production methods are backward, food processing is not advanced, new technologies and new marketing models have risks, there are sham and shoddy commodities on the market, and other factors directly restricted the improvement of food safety in China.

The profiteering attitude of the producers is also one of the causes of unsafe food. On 12 April, 2006, there was a report in the newspaper *Nanfang Cities News* titled 'Growth regulator conceals the vegetables irrigated with polluted water'. There are 40mu of vegetable gardens in the village of Zhuhai in Guangzhou province, and the vegetables were irrigated with seriously polluted industrial wastewater. The vegetables look good, as the farmers had used growth regulator on them, so they

sold very well, to residents of two large and expensive housing districts and tens of thousands of people nearby.

3.2 Carrefour's quality line (TQL)

The aim of marketing raw and fresh foods is meeting the requirements of households of consumers for foods. Food accounts for about 70 per cent of the total sales of supermarkets, about 50 per cent of which is raw and fresh agrifood, raw and fresh agrifood is about 35 per cent of total supermarket sales. Along with economic development and the improvement in people's living standards, consumers attach more and more importance to the quality of raw and fresh agrifood, choice of varieties, and safety of raw and fresh agrifood. The increase in both choice and quantity will help to maintain long-term and stable relationship with consumers, who will get into the habit of shopping regularly in the same place. Experience has shown that establishing a good raw and fresh agrifood section in a supermarket increased the consumption by 15-50 per cent. Among the supermarkets in China, Carrefour is particularly known for selling raw and fresh agrifood. Carrefour classifies these products into five categories: fish, meat, fruit and vegetables, salads, and breads. Carrefour stocks between 3,000 and 5,000 products in these categories.

With consumers' growing awareness about food safety, the demand for high quality and safe agrifood has gradually increased. Carrefour therefore began to stock 'green' food, creating a self-branded line which is the subject of this case study.

There is a real story behind the creation of the Carrefour quality line. In the early 1990s a Carrefour director from the French headquarters took a tour to Africa with his wife. His wife was weak and fell ill when she ate polluted food during the tour. Unfortunately she died not very long after she returned to France. The director was distraught, but also became aware of the importance of food safety. He thinks that the creation of a guaranteed safe quality line can not only increase profits for the business, but also can create great social benefits. He patiently set about persuading the other directors and succeeded in creating an internal 'own-brand' quality line in Carrefour. The line was launched in France in 1990. The organic bread Quality Line was created by Carrefour in cooperation with the Boule Bio Company in 1993, and the Salmon Quality Line was created in cooperation with Norway in 1994. The Poitou Charente mutton Quality Line was created in 1995. Twelve more quality lines were created in 1996, and by 1997 the number available increased to 60. The first quality line for export was created in 1998, and by 2005 there were 353 quality lines worldwide (personal communication, Roland Vaxelaire, Quality, Responsibility & Risk Management Director of Carrefour Head Office).

China's first quality line was litchees, in 1999. The convention was that quality lines were only created after Carrefour had been in a country at least 10 years, but Carrefour's decision to go ahead in China after only four years of operation shows

the great importance attaches to the Chinese market. The litchee quality line was a success, and Carrefour went on to create the pomelo (a type of citrus fruit) and mandarin quality line in Xiamen and Zhangzhou in 2002. In 2003, Carrefour signed a contract with a French supplier for a salmon quality line and with the Shanghai Agriculture, Industry and Commerce Group for a pork quality line. Carrefour signed a contract with the Beijing Resource Meat Union Factory for a meat quality line, with a fruit supplier from Weifang of Shandong Province for an apple quality line in 2005, and with Xiaotangshan of Beijing for a vegetable quality line in 2006 (pers. comm. Wei Dai, Publish Affaires Director of Carrefour, China).

Although the proportion of raw and fresh agrifoods with quality lines in Carrefour is still very small, as special commodities with significant development potential Carrefour has paid great attention to them. The supermarkets have established special counters for the quality line goods. They have a clear brand logo and a description of the quality line above or on the counters. The products are specially packaged, not only with a quality line label, but also with supplier information on a traceable barcode. Consumers can find out which greenhouse grew their product, which farm produced their fruit or raised their pork, and which pesticides and fertilizers were used in the production process – all using the traceable barcode.

3.3 What is the Carrefour quality line?

The quality line is the control and supervision by Carrefour of raw and fresh agrifood throughout the supply chain, from planting and processing to distribution, in order to guarantee the quality and safety of products of their own-brand product. Carrefour defines the quality line as products that sit between non-polluting and organic, and on a par with 'green' food in terms of safety and quality. Organic food means that pesticides are not used at all during the production process, so there is no environmental pollution and also no chemical residue. With green food, not only is safety guaranteed, great attention has also been paid to protecting the environment during the production process, so pesticides and chemical fertilizers are used as little as possible. The aim of non-polluting agrifood is environmental protection.

The quality line have a number of key aims: (1) Maintain traceability throughout the entire supply chain, from planting to eating. (2) Produce agrifood with no pesticide residue. (3) Ensure that quality is consistent and reliable. (4) Use environment-friendly production and processing technologies. (5) Produce at a price acceptable to the majority of consumers. The production and marketing costs of the quality line need to be lower than truly organic food, because only a few consumers can afford organic food, even in developed countries.

Carrefour's quality lines aspire to the following five values:

(1) Taste. Quality line products taste better than ordinary produce, it terms of freshness and taste. Some foods have quantitative requirements, such as the sugar or

acid content, maturity grade, and freshness. These indexes are clearly defined in quality line manual of different agrifoods.

(2) Price. Besides the high and stable quality, the agrifoods of quality line still have moderate prices that are acceptable to consumers. At the same time, in order to guarantee that the products are processed according to the quality line requirements, Carrefour sells at higher than market price and some of the profits are returned to farmers.

(3) Food safety. The motto of the quality line is 'Contributing to people and consumer's health'. Quality line food products must have traceability and be chilled while being shipped. Quality line requires that the soil, water and air where the food is grown must meet the standards of green food. Pesticide and fertilizer use is also restricted and governed by standards.

(4) Sustainability. In order to protect society, the economy and the environment, pesticide use is restricted. Waste and packing materials are strictly managed, and genetically modified varieties are prohibited. The use of hormones and animal protein in feed are not allowed either.

(5) Reliability. They look for the best agrifood-producing areas and protect and develop the traditional agriculture there (pers. comm. Sylvia Wang, National Fresh Quality Line Developer, Carrefour, China, Merchandise Division).

3.4 The quality line development procedures

Carrefour's quality line products are developed one by one (the information in this section is from pers. comm. with Grelay Ye, National Fresh Quality Line Manager, China, Merchandise Division). First, the quality line department decides which products are in demand. Then they look for suppliers, usually through Carrefour's purchasing department, but they also follow up recommendations from agricultural universities and the Academy of Agricultural Sciences. First Carrefour selects several candidate suppliers, and quality line staff inspect the candidates individually. In the meantime, suppliers are asked to test and provide a report on the farm's soil, water and air. After choosing a supplier, Carrefour asks them to provide a test report on and samples of their products. At this time, staff from the quality line department will visit the suppliers several times and investigate the planting process, environment, and management. If necessary, Carrefour invites experts from colleges and universities to help train the suppliers. Once the products reach quality line standards, Carrefour signs a supply contract for a set period of time.

It takes a time for Carrefour and the suppliers to become familiar with each other, and some suppliers are eliminated because they are not able to adapt to the quality line purchasing model. However, Carrefour does its best to help suppliers meet its standards, and it pays a good price for them.

3.5 Quality line management

One of the characteristics of Carrefour is their management system, which puts supermarkets at the centre. The individual stores, the store managers, and the head of each department have a lot of operational power. The store manager and the department head decide what products they will stock and how much they will pay for them.

Within Carrefour, however, the agrifood quality lines are managed and controlled by a department based at the headquarters in France. This department is in charge of the quality line development plan, the selection of agrifoods and suppliers, negotiating, training suppliers, supervising suppliers and suppliers' contracted farms, compiling the manual for the quality line, how much goods are ordered and their price, etc. The department of raw and fresh agrifood quality line has special powers within Carrefour. The managers of the quality line department have close relationships with their suppliers. While a quality line is being established managers will inspect the suppliers' work at two-month intervals. Once established, there are two or three inspections each year. The principle is that the managers should be familiar with all the suppliers activities and work. When Hu Dinghuan interviewed the head of the quality line department, Ye Weilin, for this research, he said many times that 'We must be familiar with the faces of the farmers concerned'.

The raw and fresh agrifood quality line is supervised by a special committee at Carrefour headquarters. The members of the quality line examination and approval committee include the manager of the raw and fresh agrifood department of the supermarket, the manager of the supermarket, the regional manager, and the managers of the raw and fresh agrifood department at headquarters. This committee examines and approves the quality line programmes submitted for the raw and fresh agrifood quality line, discusses the purchase price with the managers of the quality line department, and participate in important negotiations (pers. comm. Jean Anthoine, General Manager, China-Central & West, China, Executive Board).

3.6 Transaction relationships and conditions

Carrefour has a variety of cooperative ways of working with agrifood suppliers in China. The most common ones are (1) outright purchase; and (2) joint operation. Outright purchase means that Carrefour directly purchases the agrifoods from the suppliers and sells them in Carrefour's stores. A joint operation is when Carrefour rents the counters to the suppliers, who sell their own agrifoods in supermarkets and pay Carrefour a 15-20 per cent management fee. The difference between the two methods and quality line is that Carrefour checks the quality and safety of agrifoods when it purchases them, but does not interfere in the production and distribution of these products.

Carrefour does oversee the general quality and safety management quality line suppliers. Carrefour has a contract with the suppliers, but in order to support them in the long-term they get preferential treatments, including: (1) Carrefour trains the quality line suppliers, inviting them to local training courses run by Carrefour and sending them to France to study. (2) Quality line suppliers get paid a better price to help their businesses do well. (3) Quality line suppliers are paid in only 30 days, while for other supplier it is 60 days.

Although Carrefour gives quality line suppliers preferential treatment in terms of a better purchasing price, they do not give them direct loans.

3.7 The aim of creating the Carrefour quality lines

Why does the Carrefour quality line manage the whole supply chain from field to dining table? According to Ye Weilin, the quality line manager in China, there are three reasons: (1) It guarantees food safety. Most of the food is produced by small-farmer households scattered throughout China. Some farmer households lack technical expertise and awareness about safe production, and overuse pesticides. This not only increases pesticide residue, but also causes environmental pollution. Without the supermarket's supervision and administration of production, processing, and distribution, it is difficult to guarantee the safety and quality of the agrifood that they buy. (2) It enables them to formulate standards for their products. (3) It helps to improve Carrefour's image. Consumer's confidence in and loyalty to Carrefour can be improved by publicizing the Carrefour quality line, which will increase its competitiveness compared to both wet markets and other supermarkets.

4. Creating the agrifood quality lines

In order to understand thoroughly the process of creating Carrefour quality lines, we present five case studies, each covering a different product: (1) litchees; (2) mandarins and pomelos; (3) bananas; (4) pork; and (5) vegetables.

4.1 The litchee quality line

The first raw and fresh agrifood quality line created by Carrefour in China was for litchees (the material for this case study is from an interview with Mr Su Jinrong, the manager of Guangdong Xinxing Wenjin Litchee Farm by author on June, 2006). The litchee has a special position in China, where it is considered 'the king of fruits'. The imperial concubine Yang (719–756 AD) was the favourite concubine of Tang Xuanzong Li Longji, the emperor of the Tang dynasty, and a famous beauty in Chinese history. The imperial concubine Yang liked eating litchee. In order to curry favour with this beauty and arouse her desire, Tangxuanzong ordered postmen to deliver fresh litchees to her by bringing them on horseback from Guangdong Province, more than 1000km away, to the capital Chang'an (now Xi'an city) without resting. A thousand years ago it was very difficult to keep litchees fresh because there was no refrigeration equipment and no rapid modern transport. Su Shi (1037–1101 AD), a great and famous Chinese poet, was banished by the Song emperor to Nanhai in Guangdong Province, which was at that time a desolate and uninhabited area. He was not depressed though, because this area produces the most delicious fruit, the litchee. He wrote verses then that have been handed down the generations and are still known today: 'I eat three hundreds litchee fruits every day, and I want to be a Lingnanese for ever'. (Lingnanese refers to someone from Guangdong Province.) These verses show just how fond the Chinese are of litchees.

Carrefour first decided to create the litchee quality line in 1999. Salinna was in charge of the quality line work at that time. She returned to France in 2003. An DonWen took over her work, and today Ye Weilin is in charge of this sector. Through a recommendation from a professor from South China Agricultural University, Salinna found Su Jinrong, a big litchee-growing household in Xinxing County, Guangdong Province, in August, 1999. Su Jinrong had more than 7ha of litchees and grew the good variety 'Feizixiao'. Su Jinrong's litchee farm is well-known in Guangdong Province, and many people visit his farm to learn from him how to grow the best litchees. The governor and deputy governor of Guangdong Province had both visited the farm, and government departments in Xinxing County buy litchees from Su's farm to give as gifts to higher authorities.

Salinna Xinhui County and Su's litchee farm. Salinna was satisfied with the quality and planting technology, and both sides agreed to work together. Carrefour had no standard yet for a litchee quality line, since France does not grow litchees. Carrefour asked Su to work towards a 'green food' certificate for his litchees, giving him two

years to reach the standard. In 2000 Su applied for and was granted the green food certification. He also submitted test reports on his farm's soil, air and water to Carrefour that year. At that time, five litchee farms had signed letters of intent with Carrefour, two in Gaozhou County, two in Xinhui County, and one in Shenzhen. Each farm has more than 2,500 litchee trees (40 per mu). Four other farms were considered but did not become suppliers to Carrefour's quality line, either because the quality of their litchees did not meet Carrefour's standards, or because they did not accept Carrefour's payment methods.

A cold spell in Guangdong in 1999 seriously affected to 2000 litchee output, so litchee was in great demand in the market in that year. Carrefour's quality line purchased 7 tonnes of litchees from Su that year, and sold more than 30 tonnes of litchees in 2001. In 2002, owing to the reduction of output of Su's litchee farm, Carrefour purchased more than 20 tonnes of litchees. Unfortunately because of the very hot climate in Guangdong Province, all the litchees transported to Shanghai by Su had gone bad and could not be sold, so both Carrefour and Su suffered heavy losses. Carrefour's quality line department realized that it would be difficult to guarantee a sustainable supply of litchees without good storage technology. Carrefour contacted the 'Hualong Fresh Fruit and Vegetable Co. Ltd', who have the technology to keep litchees fresh from Conghua City. Carrefour required Su's farm to work with the Hualong Company, who became a production base of the company. Su provides his litchees for the Hualong Company, who keep them fresh and then deliver them to Carrefour. Thus Carrefour has resolved the technical problems of storing and keeping the litchees fresh and long-distance transportation.

Carrefour's quality line purchased 50 tonnes of litchees from the Hualong Company in 2005. The heavy rainfalls of 2006 decreased output in the litchee-producing area of Xinxing County and also affected quality, so Carrefour's quality line only sold 36 tonnes of litchees this year.

Carrefour's quality line standards for litchees include: (1) Litchee quality. The litchee must be more than 30mm in diameter, with a saccharine degree of 15 degrees or more, and clean of pest damage. (2) Food safety standards. The soil, air and water in the litchee-producing area should meet the green food standards (according to test reports provided by the local agricultural department). The spraying of pesticides in litchee orchards is not permitted in the two months before the harvest, and samples should be submitted to the pesticide-residue test department and the results faxed to Carrefour headquarters to be checked. Only pesticides approved under green food standards are allowed. (3) Environmental protection and quality improvement. Carrefour stipulates that organic manure should account for 75 per cent of all fertilizers used, and growth hormones are not allowed. (4) Traceability. Farmers should keep agricultural records including for irrigation, weeding, and the names, quantity and application times of fertilizers and pesticides used throughout the

production period. To encourage litchee suppliers to improve their quality and output, Carrefour pays 30 per cent more than the market price.

The business arrangement between Carrefour and its litchee suppliers is 'order purchasing'. Carrefour's quality line team discusses the next year's litchee purchasing plan with suppliers in October of each year. The suppliers organize production according to this plan. The suppliers can produce the litchees themselves or purchase litchees from farmers whose products are approved by Carrefour's quality line. Carrefour sends the purchasing plan to suppliers again two weeks before delivery by suppliers. As the agrifood output is greatly influenced by environmental conditions, suppliers can adjust the delivery time according to the actual conditions. Two days before delivery, Carrefour will send the purchase order to suppliers again, informing them of the quantity required by each store. Then suppliers can deliver their goods to Carrefour according to these orders. Carrefour has a distribution centre in Songjiang, Shanghai and the litchee suppliers can transport their goods to the Carrefour distributing centre in Shanghai. Carrefour has no distribution centre in northern China, so suppliers have to deliver their goods through the fruit suppliers in the Beijing area.

Carrefour quality line suppliers enjoy perks such as no fees for store-entering, sales promotion, etc.

Carrefour published a standards manual for the litchee quality line in 2003.

4.2 The mandarin and pomelo quality line

After the successful creation of the litchee quality line, in 2002 Carrefour began working on a quality line for mandarin and pomelo (this case study is from an interview with Zhuang Zhanzhong, the manager of Fujian Zhangzhou Zhuangyi Agri-development Company by the author in July, 2006). Mandarin and pomelo are two special kinds of citrus fruit produced in Zhangzhou, Fujian Province. Carrefour's stores in Shanghai began marketing mandarin and pomelo in 1999 and these fruits sell well. When it was time to choose the next batch of quality line fruits, the manager of the eastern region purchasing department (Jiangsu, Zhejiang and other provinces around Shanghai) introduced the Zhuangyi Company to supply mandarin and pomelo and to the staff of the quality line. Through discussions and verification, the quality line department decided to create a new mandarin and pomelo quality line.

In 2001, Salinna, who was in charge of the quality line department, and her assistants visited Zhangzhou Zhuangyi Agricultural Development Co. Ltd (hereafter called Zhuangyi) in Fujian Province. Salinna inspected Zhuangyi's farms and processing facilities. Zhuangyi both produces and processes fruit, and has mandarin and pomelo farms of its own. Through discussions and negotiations to two companies reached agreement. Carrefour asked Zhuangyi to provide soil, air and water test

reports for the mandarin and pomelo farms, according to the standards spelled out in the quality line technical manual. These tests were finished in June, 2001 and Zhuangyi sent the test reports to Carrefour. The quality line department sent Ye Weilin to authenticate the results. Ye visited the mandarin and pomelo farms six times in 2001, during which time she aimed to learn about farmer household production and the harvesting and processing of the fruits. After three visits Ye designed a questionnaire, and planting households were asked to fill out production records including their use of pesticides and fertilizers. The packing workshop needed a full-time recorder to take notes on the sugar content and acidity of the mandarins and pomelos.

Zhuangyi Company supplied 300 tonnes of mandarins and 500 tonnes of pomelos to Carrefour in 2002. Demand increased for of Carrefour's quality line mandarin and pomelo, so in 2003 Carrefour proposed that Zhuangyi farms work with other farms and the Zhuangyi Company are asked to supervise and manage the production processes of other farms. The processing, packing, and transport of the fruits is still carried out by Zhuangyi. In 2003 Carrefour asked Zhuangyi to invite a lawyer to write purchasing contracts, and Zhuangyi signed supplying contracts with some large farmer households.

Managers the from quality line department visit Zhuangyi and their cooperative households regularly. In 2004, Carrefour invited a lecturer from the Xianzhengda Fruit Company to give lectures on basic pesticide use to Zhuangyi's managerial and technical personnel. The lectures included: (1) methods to identify different types of fake pesticides; (2) methods for effective pesticide use; (3) and how to protect the environment. That year, officials from the Zhangzhou Agricultural Bureau were also invited to give lectures in base areas. In 2005, Carrefour invited technician Huang Zhouyu to explain pruning techniques to pomelo farmer households.

Zhuangyi Company supplied 500 tonnes of mandarins to Carrefour quality line annually from 2003 to 2005. They exported pomelos to France with Carrefour's help, so Zhuangyi supplied 1,000 tonnes, 11 tonnes, and 4,000 tonnes of pomelo in 2003, 2004, and 2005, respectively.

4.3 The pork quality line

At the end of 2002, Carrefour learned from Shanghai's green food office about two relatively standardized pork slaughterhouses, the Shanghai Agricultural Industrial Commercial Group ('the Shanghai Group'), and the Shanghai Food Co., Ltd (this case study is from an interview with Grelay Ye, National Fresh Quality Line Management, by the author in July, 2006). Carrefour did not invite the Shanghai Food Co., Ltd to participate in quality line because Carrefour understood through the purchasing department of the northern region that although this company has very good slaughtering equipment, it does not have its own commercial pig farms,

just farms for breeding swine. All their pork hogs are purchased from small-scale farmers, and Carrefour did not think that the quality and safety of agrifood produced by small-scale farmers could be guaranteed. The quality line department concentrated its effort on collecting information related to agriculture, industry and commerce. They inspected the pig farms and the slaughterhouse at two-month intervals throughout the year and wrote summary reports on each visit. When they encountered problems that they did not understand, they made notes and asked about it at the next inspection. Mr Yan, the general vice-manager of Carrefour, participated in each inspection and provided Carrefour with all the related materials. The Shanghai Group gave a detailed presentation about what diseases are likely and what drugs were used on the animals.

In June, 2003, Carrefour internally approved the Shanghai Group as its quality line pork supplier. The examination and approval meeting proposed that two Carrefour chain stores be selected to trial- market the pork quality line. The trial began that month and lasted for one month. The quality lines manager trained the heads of the raw and fresh food departments and sections of Carrefour's Jinqiao store, along with the Shanghai Group's distributors. They learned the quality line requirements and that the aim is to let people know the difference in quality between the quality line pork and the ordinary pork sold by Carrefour. A six-month trial was conducted in these two Carrefour stores by the quality line staff, who were trained to advise the company if any problems were found. The examination and approval work for the pork quality line was completed in December 2003 and Carrefour signed a contract with the Shanghai Group.

Carrefour began to test-market and publicize the pork quality line in eastern cities apart from Shanghai in April 2004. Personnel from the stores in Hangzhou and Ningbo of Zhejiang Province and from Nanjing, Wuxi, and Suzhou of Jiangsu Province were individually trained by Carrefour. In October 2004, all of Carrefour's stores in the eastern cities began to sell Carrefour's quality line pork.

The Shanghai Group's pig farm is in Fengxian County and it belongs to the 4th May Farm. The farm operated according to the requirements of the Shanghai Agricultural Committee and is a 'safe pork' producer. Carrefour has their own special safety requirements for pork production, so the purchase price of the quality line pork is 10 per cent higher than that of ordinary pork.

The two parties had some disagreements while developing the of quality line standards, but through a great deal of harmonious work, a mutually acceptable programme was worked out. The first challenge was the traceability of the pork. This was accomplished after one year. Carrefour's traceability standards require that records include ancestry, and all feed and drugs used throughout the entire production process, from birth to slaughter. Each piece of packaged pork must be traceable back to the records of the individual pig so that if a problem occurs the

source can be traced quickly and accurately. This requirement not only added a great deal of work for Shanghai Group, but also created some technical difficulties, which angered some of the company's staff. Carrefour invested a great deal in explanations and instructions, and the traceability conditions were at last agreed by the two parties.

The second challenge was about the use of fish powder in the pig's feed. According to the French quality line standards, no animal-source protein or fish powder supplements are allowed in pig feed. The Shanghai Group claimed that fish powder had to be used in raising the pigs. There was no resolution to this disagreement for a long period of time. The controversy between the two parties was submitted to a French expert in the pork quality line. The expert proposed that if the problem of non-animal-source protein cannot be resolved by Chinese pig-keeping technology, then the use of animal-source protein could be allowed, but restricted to only a particular period of time. Finally, the two parties agreed that fish powder feed was allowed until the piglets reach 15kg.

The third challenge is the supplement streptomycin. The Shanghai Group continued to add a little streptomycin to their pig feed as it had been, and this will decrease the incidence of disease of pigs. But adding routine antibiotic supplements to feed is not allowed by Carrefour's quality line standards. After repeated discussion and dispute, the company finally agreed not to add the streptomycin supplement on the 2nd, 3rd, 4th, and 5th pig farms that supply the quality line pork, while the use of it on the other pig farms (seven altogether) was not restricted.

The fourth challenge is related to the length of drug prohibition. The quality line proposed that no drug should be used in the two months before the pigs are slaughtered, but the Shanghai Group production manager did not agree. Carrefour insisted on this point, so Shanghai Group agreed not to use any drugs during this period. Where drugs do have to be used, the pigs treated are not supplied to Carrefour's quality line.

The fifth challenge is the genetically modified (GM) feed. According to the stipulations of Carrefour's quality line, GM animal feed is not allowed. However, more than 95 per cent of the soybeans imported from North America for feed were GM, so this standard simply could not be achieved in China. As a result Carrefour's quality line pork does not advertise itself as being 'GM-free'.

The creation of the pork quality line in Beijing began in 2003. The Carrefour staff in the northern region recommended the Beijing Ziyuan Food Co., Ltd to the quality line team. (Ziyuan is Carrefour's pork supplier in the northern region.) This company has both a breeding farm and a commercial pig farm. Working together, the quality line team and Ziyuan Company created a quality line for pork in 2004 and Carrefour signed a contract with the company. Ziyuan company began

supplying quality line pork for Carrefour's supermarkets in October, 2004. In early 2005, the quality line pork extended to Tianjin and now all of Carrefour's supermarkets in Beijing and Tianjin sell quality line pork. A quality line for pork in Shenzhen was also established in 2006.

4.4 The banana quality line

Not all attempts to create agrifood quality lines are successful (This case study is from an interview with Grelay Ye, National Fresh Quality Line Management, by the author in July, 2006). The quality lines for litchee, mandarin, pomelo, pork, and others have succeeded, but the attempt to create a quality line for bananas failed, despite all the efforts that went into it.

Carrefour began creating the banana quality line in April 2002. In the search for suppliers, quality line staff from Carrefour in China and fruit and vegetable experts from Carrefour's headquarters in France together visited Zhongshan City and Leizhou City of Guangdong Province, Fujian Province, Hainan Province and Yunnan Province. They inspected all the banana-producing areas and wholesale markets in Beijing and Shanghai, and studied the difference between local and imported bananas.

In April 2003, through the recommendation of the Leizhou City government, Carrefour found the Datang Company, a supplier of bananas and tropical fruits. Datang Company has banana-growing estates in Haikou City (200ha) and Sanya City (150ha) of Hainan Province. During the attempted creation of the quality line a strong typhoon hit Hainan, in September, 2003, and the Datang company suffered heavy losses and saw its banana output fall by 40 per cent.

As typhoons and cold winds hit Hainan Province regularly, bananas cannot be reliably supplied year-round, and so cannot qualify as Carrefour's quality line of bananas. Datang Company rented 200ha of banana orchard in Jinping County of Yunnan Province. The person in charge of Carrefour's quality line made on-the-spot successful tests of this orchard in May and July of 2004. The banana-producing area also passed the soil, air, and water source tests. A trial sale of the quality line bananas was made in five of Carrefour's chain stores in Beijing in September 2004. The trial sale lasted only one-and-a-half months, then Carrefour stopped selling the quality line bananas on November 10th. The reason was that Datang Company used traditional techniques to accelerate banana ripening and the shelf-life of a banana is very short, and the stores suffered great losses. Carrefour decided to abandon the banana programme. From the failure of the banana quality line Carrefour learned that products cannot join the quality line of supermarkets without modern processing and preservation techniques, even if the product quality is good. China currently lacks the technology to keep raw and agrifood fresh. This lack of

investment in scientific research by the government has prevented many high-quality agrifoods from entering the modern market.

Ye Weilin, who is in charge of Carrefour's quality line, said to me: 'Although the banana programme was unsuccessful, I still entertain high hopes that it will be successful some day. Many agrifoods produced in China are good quality, but they cannot enter supermarkets as the processing and preservation techniques still need to be resolved'.

The aim of the Carrefour quality line is to help suppliers and cooperative farms to build their own production system of safe and high-quality agrifoods, according to Carrefour's standards and with their supervision. When the suppliers or farms have technology problems, Carrefour invites experts from China to help them to resolve these problems (in 2005, Carrefour invited experts from the Institute of Vegetables and Flowers, CAAS to help Xiaotangshan to solve the problem pollinating tomatoes grown in plastic film greenhouses). However, Carrefour itself does not have a scientific research fund and is unable to help the Datang Company to develop techniques to ripen their bananas effectively.

4.5 The apple quality line

China is the largest producer of apples in the world. It is also the greatest consumer, so the demand for apples is very large (This case study is from an interview with Feng Xiaoyan, manager of Shangdong Sanfeng Fruits Storage Limited Company, by the author in July, 2006). Carrefour decided to create an apple quality line in 2002. Before suppliers were selected, quality line staff did a great deal of research in Qixia City and other apple-producing areas of Shandong Province and visited many apple producers. In 2002, Carrefour selected a fruit company (who we will call Company P, because Carrefour does not want to publish their name) as the supplier of the quality line. Company P has apple estates in Weifang City, 150km from Qingdao City. These estates belongs to 10 contract-farmer households. The quality line monitored the estates for more than a year and inspected it at two-month intervals. When the various test reports from the estates reached the standards of the quality line, the two parties signed a contract for 100 tonnes of apples in 2003. In November 2003, Company P began supplying apples to Carrefour. However, in the month up to December, Company P only supplied 10 tonnes of apples – only 10 per cent of the contractually agreed amount. The main reason for the shortage was that the contract-farmers sold their apples to other companies instead, and so Company P could not purchase the apples that they had planned to buy. Company P asked Carrefour to give them another chance. This time Carrefour signed a contract with Company P for 500 tonnes of Grade I apples in 2004. However, Company P only supplied 300 tonnes of apples, and they were only grades II and III. The quality line team signed a contract with Company P for 800 tonnes of apples in 2005. However, when the apples needed to be transported before the 2006 spring festival, Company

P suddenly informed Carrefour that the apples could not be supplied to quality line because the roof of the cold frame was broken and the stored apples were affected. Carrefour was very disappointed at Company P's action, and had to stop working with them.

When Company P had been unable to supply the apples as contracted at the end of 2004, Carrefour's worldwide purchasing department recommended to the quality line department the Sanfeng Company of Laixi City, Shandong Province. Sanfeng Company was already exporting apples to Europe through Carrefour. After reaching a working agreement with Sanfeng, Carrefour checked and accepted that the estates followed the standards of quality line apples (which had been decided in 2004). The test reports on soil, water and air came out in April 2005, and they reached the quality line requirements. Carrefour signed a contract with Sanfeng to purchase 1,000 tonnes of apples. Quality line staff checked agricultural practice records and the pesticide use in Sanfeng Company's apple orchards at two-months intervals during that year. In 2005, Sanfeng Company supplied 1,000 tonnes of apples. From that time on, Sanfeng Company has been the sole supplier of Carrefour's quality line apples.

5. Case studies of quality line suppliers

In Section 4 of this paper, we studied five cases of new Carrefour quality lines. This section concentrates on the suppliers of quality line commodities. We investigated the process through which suppliers became Carrefour's contracted suppliers, the effect on the suppliers of working with Carrefour, and the production technology of these enterprises or suppliers. The suppliers themselves are producers of agrifood. Studies of Carrefour's quality line suppliers are beneficial to understand the way the market has changed, the development of supermarkets, and the effects on and roles of agrifood producers in China.

5.1 The Wenjin Litchee Farm of Xinxing County

Xinxing County Wenjin Litchi Farm was a private fruit farm, established in 1993 (this case study is from an interview with Mr Su Jinrong, the manager of Guangdong Xinxing Wenjin Litchee Farm by the author in June, 2006). The total area of the farm is 7ha, and the annual yield of litchee is about 35 tonnes. The farm began to work with Carrefour in 1999, and all the qualified (i.e. quality line approved) litchees produced by this farm have been purchased by Carrefour since then.

Mr Su Jinrong, the owner of Wenjin Litchee Farm of Xinxing County, Guangdong Province, was born in 1955 and is now 51 years old. He joined the army after he graduated from high school in 1972. He was demobilized in 1978 and became a forest worker in the Agro-forestry Department of Xinxing County. He worked for a government department promoting forestry technology in 1981, and was engaged in promoting technical improvements for fruit trees. He resigned from the government and started his own business selling of building materials such as cement, etc.

Su quit his building material business and started running fruit farms in 1990. He rented 2.5ha from Chegang Town in Xinxing County, and got a bank loan of Y170,000 to plant citrus. As the citrus market was weak at that time, Su lost Y330,000. He planted 400 litchee trees while he was planting the citrus trees, with the aim of 'supporting the long-term litchee project by using a fast-yielding citrus project'. He found that litchee sold well in 1992, and he made a profit of Y130,000 from the 400 litchee trees in 1993.

Su contracted more than 7ha of hill land in the suburbs of Xinhui County to plant litchee, and this is now the Wenjin Litchee Farm. This piece of land was covered with citrus and the original owner had gone bankrupt, so he sold the land to Su. The annual contracting fees were Y5,000, and the term of contract was 22 years. According to the contract, the rental price per ha in the first 15 years is Y1,500, and in years 16–22 that increases to Y1,800.

Su cut down all the citrus trees and planted litchee trees. The variety is called Feizixiao, and it is a good mid-season variety. He invested Y320,000 that year, and planted 2,100 litchee trees. Su hired nearby farmers to level the soil and plant the trees, and these works were not finished until April 1994. The litchee trees were planted in 1996 and achieved great sales in 1998, when their output was 1.5 tonnes. They were sold for US\$3/kg and the total revenue was \$45,000.

Before working with Carrefour, about a third of the litchee produced by Wenjin Litchee Farm were sold to local governmental departments and the owners of private enterprises, who mainly used the litchee as gifts or for guests. The remaining two-thirds were sold to a fruit wholesaler in the nearby Doumen shi fruit wholesale market who Su has worked with for a long time.

Through the recommendation of Wang Jianwu and Chen Houbin, professors from the South China Agricultural University, Su got in touch with Carrefour in August 1999. When Wenjin Litchee Farm was named a 'national sustainable agricultural demonstration project', Su met with the teachers from South China Agricultural University. There were only seven farms chosen as the national sustainable agricultural demonstration projects in the whole country, and Su's farm was the only one chosen in Xinxing County. Wenjin Litchee Farm also became a research subject of the South China Agricultural University, for the way he improved his sloping fields and produced litchees that qualified as 'green food'. When the farm became a national sustainable agricultural demonstration project it attracted many visitors, such as the governor, vice governor and cadres from other governmental departments of Guangdong Province.

On 5 December, 1999, 11 people from Carrefour, including the person in charge of world-wide quality line from France, inspected Wenjin Litchee Farm. The next day Su signed a letter of intent with Carrefour at the South China Agricultural University. At the same time, another five litchee farms signed a letter of intent with Carrefour, two each in Gaozhou and Xinxing, and one in Shenzhen. These farms are large, with each farm having more than 2,500 litchee plants.

Carrefour did have a standard manual for litchee production at that time, so Carrefour asked Su to apply for a green-food certification, and asked him to meet the green-food production standards within two years. Su applied for the green-food certification at the end of 1999, and the litchee are all produced according to the operational procedures of green food.

Owing to the economic depression in 2000, many supermarkets in Guangdong Province closed down and some of them refused to pay the suppliers what they were owed. Most litchee farms do not accept future payments. Professors Wang and Chen from South China Agricultural University led Carrefour's purchasing personnel to purchase litchee in cooperative farms in Gaozhou. But Carrefour never

purchases goods with cash and their purchasing staff did not have cash. Once the litchees were loaded onto the vehicles, the farmers were not willing to let them leave because the purchasing staff could not pay them with cash. Professor Wang has a friend in Gaozhou Shi government, and once guaranteed by the city government the farmers let the litchee vehicles go. Since then, Carrefour has not wanted to do business with Gaozhou farms again.

When the litchees were ripe on the Wenjin Litchee Farm, Carrefour's purchasing staff went there with \$10,000. Thanks to the high quality of the litchees from Wenjin farm, Carrefour signed a purchase contract for quality line litchees with Su and he delivered 1 tonne of litchees to Shanghai each day by road. The vehicle departs at 9:00am, so people are sent to pick litchee in the early morning. Wenjin Litchee Farm supplied 7 tonnes of litchees to Carrefour, which accounted for 44 per cent of his gross yield of 16 tonnes that year.

There was an interesting story that year.

Carrefour's purchase agent from the southern region went specially to Wenjin Litchee Farm that year and selected 60kg of first-class litchees from the farm, in which every litchee was selected carefully. The 60kg of litchees was transported to France from Guangzhou immediately, and given by Mr Shi Tongle, the director general of Carrefour in China, as a present to the mayor of Lyons, France. The mayor of Lyons entertained the visiting mayor of Guangzhou, 'the friendship city', with litchees.

Wenjin Litchee Farm supplied 35 tonnes of litchee to Carrefour in 2001, 30 per cent of which was produced by the cooperative farms of Wenjin Litchee Farm. Wenjin Litchee Farm is well known for supplying Carrefour's litchees, so the county government asked them to help other litchee farmers. The farmer of Wenjin Litchee Farm selected two litchee farms in the county and sent technicians to instruct them in production according to Carrefour's quality line standards. In the meantime, Carrefour also sent technicians to inspect these two farms and give them technical training and instruction.

Wenjin Litchee Farm produced more than 30 tonnes of litchees in 2003. Unfortunately, SARS (severe acute respiratory syndrome) happened that year, and the litchees had to be transported by air, rather than by road. All the litchees produced by Wenjin Litchee Farm were sold through Carrefour's quality line.

Carrefour asked Wenjin to deliver the litchees by itself from 2001, and to deliver the goods to Carrefour's stores in Shanghai and Beijing. Wenjin Farm selected Xiyang Materials Circulation and Delivery Company to deliver litchees for the farm.

Working with the Carrefour quality line, Wenjin Litchee Farm has a stable litchee market and the price offered by quality line is 30 per cent higher than the ordinary market price. It is a good opportunity for fruit farms.

There was a heat wave in 2004 and the relative humidity of the air was very high. The litchee fruits turned soft soon after being picked. The first batch was transported to Shanghai by air, but it took more than three hours to transport them to the Carrefour distributing centre in Shanghai because of traffic jams. By then the litchees had gone bad and had to be thrown away. The distribution centre refused to accept the litchees. After discussions with Carrefour, the supermarket deducted 18 per cent of the costs of litchee for Wenjin Farm (including air freight costs. Wenjin suffered heavy losses and Carrefour suffered some losses too.

Because of this occurrence, Carrefour asked Wenjin to work with the Conghua Shi Hualong Fresh Fruit and Vegetable Preservation Company. They have the technology to keep the litchees fresh. As a Hualong company's litchee production base area, the litchee fruit produced at Wenjin Farm is transported to Hualong Company, who then process it with cold storage techniques, and pack and transport it to Carrefour. Wenjin Farm sold 34 tonnes of litchees to Carrefour through the Hualong Company in 2005 and 50 tonnes in 2006.

The production standards of Carrefour's quality line of litchees were developed based on tests at Wenjin Farm. Since working with Carrefour, quality line staff visit Su's farm two or three times a year. They check the field records, pesticides, fertilizers, and the application times and amounts used in the records and the status of the orchard management in general.

Ten days before shipping the litchees to Carrefour, 5kg of samples are required to be submitted to Zhanjiang Agricultural Bureau for pesticide-residue tests which will be available seven days later. The report is sent to Carrefour and litchee delivery by Wenjin farm is approved only once the test report is considered acceptable.

One of the important indicators of Carrefour's quality line is traceability. The code number of the orchard and the picking date is printed on each box of litchees from Wenjin farm. Copies of the field records are faxed to the quality line department so that if any food safety problems occur, the source of problem and people who are responsible can be found.

As Wenjin Litchee Farm does not possess litchee cold storage technology, the farm has become the production base of the Hualong Company for direct supply to Carrefour's quality line. This shows that market changes also pose new challenges for agrifood processing, storage and transport technology.

5.2 The Hualong Fruit and Vegetable Fresh-keeping Co., Ltd

Guangzhou Conghua Hualong Fruit and Vegetable Fresh-keeping Co., Ltd is a cooperative enterprise (this case study is from an interview with Mr Ouyang Jianzhong, Guangzhou Conghua Hualong Fruit and Vegetable Fresh-keeping Co. Ltd., by the author in June, 2006). It undertakes to promote new and high-tech solutions in Guangdong Province, and is also a leading agri-business in Guangzhou City. The company was established in 1998. It is located in Chicao, Shengang Town, Conghuashi City, a main litchee-producing area, and has a fruit and vegetable production base, fresh-keeping and processing plant, cold chain storage and transportation equipment, and so on. It produces and processes a series of fresh-keeping fruits and vegetables. It has cold storage and processing capacity of 15,000 tonnes and an annual output value of \$26.25 million. Some 80 per cent of its products are exported. It exports to Europe, the USA, Japan, South-East Asia, among other areas. It is a litchee supplier for the Carrefour quality line.

Mr Ouyang Jianzhong is the Chairman of Guangdong Conghua Shi Huanlong Fruit and Vegetable Fresh-keeping Co., Ltd. Mr Ouyang loved to study from a very early age. He was admitted to the special agrifood processing and storage of horticulture department of South China Agricultural University in 1987. His graduation thesis was 'Conditions influencing litchee storage at low temperature'. He went to work for the 'Fruit and Vegetable Import and Export Corporation' after graduating and worked in fruit and vegetable export operations.

In 1997 the Guangdong Scientific and Technology Commission organized a China-wide public tender on the subject of the 'Development of Litchee Storage at Low Temperatures' and the South China Agricultural University won the bid. The project began in 1998 and Mr Ouyang worked on it. The project was completed at the end of 1999. The Guangdong provincial government was very concerned about this project, and in order to promote the results of the project and extend litchee fresh-keeping technology, the government provided a loan for the Conghua shi Company and the South China Agricultural University to establish a company, which they called the Hualong Fruit and Vegetable Fresh-keeping Company. As a representative of Vegetable and Fruit Import and Export Corporation, Mr Ouyang became general manager of the new company.

In 1999, after one year of operation, the Guangdong provincial science commission and government department released a new policy that companies like Hualong should not be state-owned assets, so a structural reform was carried out. The employees of the company purchased Huanlong Company for \$562,500. Ouyang contributed more than \$100,000, or 21 per cent of the total cost. He became chairman of the board of the company.

Hualong Company now covers an area of 14,000m² and has a cold storage capacity of 800 tonnes and a drying and processing workshop with an area of 3,000m². The company has rented 20ha of land in the suburbs of Conghua City; 15ha is vegetables and 5ha is litchee trees. The rent is \$81.25/mu. The company hired seven or eight workers for the orchards and more than 80 workers on the vegetable plots.

Hualong's main operation is exporting fruit and vegetables to England, the Netherlands, and France. Since 2000, the company has exported fruit and vegetables to South-east Asian countries such as Malaysia and Singapore too. Recently, the company has developed the North American market and exports to Canada and the USA. The total value of exports in 2005 was \$3.3 million.

Hualong began trading domestically in 2000, and supplies tropical and subtropical fruits and vegetables to Shanghai, Hangzhou, and other cities.

The occasion when Wenjin's litchees spoiled aroused the attention of Carrefour. Through a recommendation from the South China Agricultural University, Carrefour found out that the Hualong Company has litchee fresh-keeping technology. Staff from the Carrefour quality line department came to negotiate with Hualong Company to work together. The litchee quality line was already in place. The quality of the litchees was very good, but they were not treated with fresh-keeping techniques after harvest, so they easily rotted during long-distance transportation. The Hualong Company has a technique to treat the litchees to keep them fresh longer, which can prolong the shelf-life of treated litchees for one week. Through negotiation, the three parties of Carrefour, the Hualong Company and the Wenjin Litchee Farm began working together in 2005. The Wenjin Litchee Farm became Hualong's litchee production base. The litchees are still grown and managed according to Carrefour's quality line standards, then they are treated using the Hualong Company's techniques. Wenjin farm picks the litchees according to the schedule proposed by the Hualong Company technicians. After preliminary processing in the orchard, the litchees are transported to Hualong's processing workshop for treatment and then transported to the Carrefour stores in Beijing and Shanghai.

In 2005, the Hualong Company transported 50 tonnes of Carrefour litchees worth more than \$75,000. In 2006, abundant rainfall cut litchee yields in Xinxing County, so only 36 tonnes of litchees were transported, worth more than \$62,500.

Thanks to Hualong Company's fresh-keeping technology, losses from Carrefour's quality line decreased markedly. In 2005, a new cooperative litchee-producing base in Zhuhai was added to Hualong Company's portfolio. This was a state-owned grade A food base area, the orchard of the Zhuhai Institute of Pomology with more than 1000mu of litchee trees. Hualong and Carrefour had researched Zhuhai base area together. First of all, they asked Zhuhai to provide test reports on the soil, water

and air, along with records of farm management and agricultural activities. After in-depth inspections of the environmental conditions of the farm and the status of litchee tree growth, no abnormal phenomena were found. It was decided that this litchee orchard in Zhuhai would be Hualong's litchee production base area, and Carrefour's quality line litchee orchard.

As for the pricing of litchees the , Hualong Company purchases litchees from production base area and after processing they will be sold to Carrefour at a price that is 50 per cent higher than that year's market price. The price that the cooperative farm receives is determined by negotiation between the farm, Carrefour, and the Hualong Company, and is about 30 per cent higher than the market price for that year. This way the farm remains motivated to produce according to the quality line standards.

Along with the rapid development of Carrefour in China's market, the demand for quality line litchees increased continuously, so Hualong and Carrefour are looking for new cooperative base areas. For the sake of efficient management, only large-scale litchee farms with a productive capacity of more than 2.5 tonnes are being considered. Production from small-scale farms is difficult to control and they cannot easily meet the quality line standards.

In August 2006, Manager Ouyang of the Hualong Company got in touch with the Guangdong Yangxi County Litchee Association, and the two parties signed an agreement to produce quality line litchees in 2007. The Yangxi County Litchee Association has more than 200 members, 10 per cent of whom have large-scale litchee farms with more than 2,500 litchi trees, 30 per cent have medium-scale litchee farms with 1,000–2,500 litchi trees, and 60 per cent them have small-scale litchee farms with less 1,000 litchi trees. Hualong Company will manage the quality line standards and purchases litchees via the Yangxi County Litchee Association. First, Hualong trained the leading members of the association to familiarize them with the standards and demands of the Carrefour quality line and distributed the quality line safety standards manual. The association organizes the farmer households to produce the litchees. The first group has six farmer households and plants 1,000 litchi trees on average. These farmer households are medium-scale farmers. There are no small-scale farmers among the first group because Hualong worries that the quality and safety of the litchees produced by small-scale farmers cannot be easily controlled. In order to guarantee the quality and safety of the litchees, Hualong provides approved pesticides to the association and sent a long-term technician to Yangxi County. The technician provides guidance and supervision on the production of litchees for the Carrefour quality line.

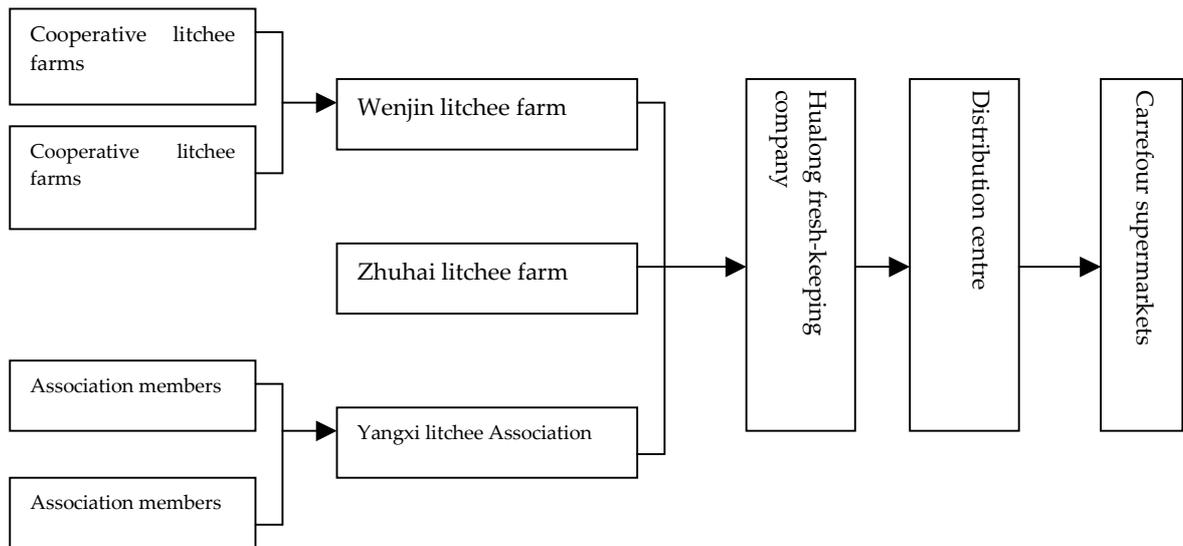


Figure 3. Carrefour's litchee supply chain

5.3 Mandarins from the Zhuangyi Agricultural Development Co., Ltd

Zhuangyi Agricultural Development Co. Ltd was established in 2000 (this case study is from an interview with Zhuang Zhanzhong, manager of the Fujian Zhangzhou Zhuangyi Agri-development Company by the author in July, 2006). It is a specialist fruit company mainly engaged in planting, processing (fresh-keeping), and marketing. It is a supplier of pomelos, mandarins, bananas and other high-quality fruit to Carrefour, Wal-Mart, Maelong and other large supermarkets. The company was elected as the province's leading enterprise in 2005. It sells 10,000 tonnes of fruit annually.

The mandarin is a type of citrus fruit and is a special local product of the Zhangzhou area of Fujian Province. Mandarin peel is an orangey-yellow colour, and it is juicy and delicious. Its solids content is about 15 per cent, and it is sweet and tasty. It is a good citrus variety, and the main variety in southern Fujian.

Carrefour started creating their mandarin quality line in 2002 and the main partner is Fujian Zhangzhou shi Zhuangyi Agricultural Development Co., Ltd (hereafter called Zhuangyi). The general manager of the corporation is Mr Zhuang Zhanzhong. Zhuangyi is a family-owned business, established by Mr Zhuang and his brothers. As his brothers have their own jobs, the corporation is mainly managed by Mr Zhuang Zhanzhong, who is from Zhangzhou. He was born in 1973 in a rural area.

His father is a teacher and his mother a peasant, and he himself quit school after graduating from middle school. He planted mandarin on his 5ha of hill land when he was 17 years old. In 1989, he rented 30ha of wasteland from Xiafeng village in Nanjing County. He employed the local farmers to cut down the trees on the wasteland and plant mandarin trees. In 1994, five years after reclaiming the land, he harvested the mandarins and sold all of them to small vendors.

In 1997, Zhuangyi rented more mountain land and his area of mandarin plantation increased to 86.6ha. With such a large plantation, his problems were the lack of a stable market for mandarins and price fluctuations. There were several years when the market price of mandarin was less than the cost of picking them, so the mandarins were left to rot on the trees. Transporting mandarins to the wholesale markets in Beijing and Shanghai was also a problem.

In 1999 Zhuang saw in the newspaper that Carrefour was looking for suppliers in Shanghai. He and one of his elder brothers went to Shanghai to negotiate with Carrefour. It went very smoothly and he began delivering mandarins to Carrefour's eastern region (including their supermarkets in Shanghai, Jiangsu and Zhejiang) in the autumn of 1999. A total of 300 tonnes of mandarins were sold to Carrefour in 1999 at a price of \$0.425-0.475/kg, which was about market price. Carrefour's principles for buying agrifood are: (1) original native products; (2) high-quality products; and (3) moderately priced products. The mandarins were transported to the Qingpu Materials Circulation and Distribution Centre established by Carrefour in the Shanghai suburbs. When working with Carrefour, Zhuangyi needs to pay a lot of extra charges, such as several hundreds dollars of 'products entry' costs. When there are sales promotions, Carrefour requires the suppliers to lower their prices. If there is a store change, service charges are collected. Zhuangyi sold 500 tonnes of mandarins to Carrefour in 2000.

Carrefour planned to create a mandarin quality line in 2002. They looked for suppliers who could guarantee high-quality products and Zhuangyi was selected. Salinna, who was in charge of quality products for Carrefour, and her assistants went to inspect Zhuangyi for three days in May 2002. The aim of the inspection was to understand the situation of the mandarin base area. They climbed up the hill land where the mandarin trees are grown and investigated the orchards carefully. They paid great attention to water quality, the use of pesticides and fertilizers, and the worker's living facilities. At that time, not only Zhuangyi had planted mandarin trees; there were also two cooperative farmer households with 7ha of orchards each. Salinna also inspected these farmers' orchards.

Through an on-the-spot investigation, Salinna recognized the potential for buying mandarins from Zhuangyi. She asked them to adopt the orchard management methods devised for the quality line, including the use of pesticides and fertilizers.

She also asked them to carry out the necessary tests on their water source, air, soil and products and to submit to her the test results.

Salinna went to Zhuangyi again in and Yan Keshi, Carrefour's head of office, and three people from the Fujian Green Food Office also went with her. Carrefour's quality line food safety standards were formulated according to the state's green food standards, so Carrefour invited their experts to come along, do some research, and make comments. Based on the experts comments, Carrefour formulated the mandarin quality line standards and compiled the technical manual for mandarin production. It took several years to complete the manual, which was finalized by Ye Weiling, Salinna's successor. Zhuangyi signed a contract with Carrefour in July 2002. The county secretary and vice secretary also signed the contract in Shanghai, along with the person in charge of Zhuangyi Company.

Zhuangyi enjoys some preferential treatment, for example they do not have to pay fees for things such as store entry, promotion, and sampling, which ordinary suppliers have to pay. Carrefour also pay 20 to 30 per cent more for the quality line fruit than for conventional products. In order to improve the quality of fruit, however, Zhuangyi did have to invest in improving their production and management. They have to record all agricultural activities such as spraying pesticides and using fertilizers, not only in their own mandarin-producing base area, but also on the other cooperative base areas. The quality line manual clearly stipulates which pesticides can and cannot be used and when. The quality manual also stipulates the levels of sugar and acid that the fruit need to have, and individual fruit weight and diameter.

In order to reach the quality line standards, Zhuangyi uses advanced pesticides, as the use of long-residual pesticides are not allowed. Once pests appear, physical control methods are used first, such as insect traps and lights, and shoot pruning (i.e. cutting off the shoots with insect pests on them). Quality line requires that 70 per cent or more of the fertilizers applied should be organic. Orchards used to be rain-fed, but now the fruit trees have to be irrigated with spring water. At harvest, the mandarins are graded according to the standards.

Carrefour's quality line staff inspect the Zhuangyi farm and cooperative base areas four times a year. They check pesticide use and the agricultural activity records. These routine inspections are conducted according to the quality line manual. In addition, Zhuangyi has to provide a test report on each batch of fruit. Carrefour has also given a third party, the SGS Group (a European testing company), the responsibility to test the quality and safety of Zhuangyi's products. SGS samples mandarins in Carrefour's stores and submits the test reports.

Carrefour negotiates the next year's mandarin purchasing plan with Zhuangyi every September. Carrefour tell Zhuangyi how many mandarins they need and where to

deliver them two weeks before delivery. Small adjustments are allowed. Zhuangyi delivers the goods to a delivery centre in Shanghai and to each of the other Carrefour supermarkets. Delivery methods include a third-party logistics company, the Zhuangyi company itself, and Carrefour's local fruit suppliers.

The Zhuangyi mandarins entered Carrefour's quality line in 2003, selling 300 tonnes in that year. Sales in both 2004 and 2005 were 500 tonnes.

The lands used by Zhuangyi are rented from adjacent small-farm households. The rent was \$18.75/ha in 1989, then increased to Y750/ha in 1995, to Y1,200/ha in 1997, and to Y2,400/ha currently. The term of the contract between the company and the households is 30 to 50 years. Once the contract is signed by the parties, the land rent will not change again.

Farmers whose lands have been rented to the company can work for the company if they wish. The wages of the regular workers are Y1,200/month, while temporary workers are paid Y35/day (men) and Y30/day (women).

5.4 Sweet pomelos from Zhuangyi Agricultural Development Co., Ltd

The sweet pomelo is a popular type of pomelo (this case study is from an interview with Zhuang Zhanzhong, manager of the Fujian Zhangzhou Zhuangyi Agricultural Development Company by the author in July, 2006). It is native to Pinghe County of Fujian Province and has been grown for more than 500 years. Sweet pomelo were given as gifts by the king in the Qianlong period of the Qing Dynasty. Wu Gengmin, a famous Chinese pomologist and professor at Zhejiang Agricultural University, describes the sweet pomelo like this: 'Its fruit is large and its peel is thin. The flesh is seedless, and a jade colour. It is very juicy and is soft, without residues, sweet, and slightly acidic in taste. Its taste lasts for a long time and it is the best pomelo'.

Like its mandarins, Carrefour's quality line sweet pomelos are also produced by the Fujian Zhangzhou Zhuangyi Agricultural Development Co., Ltd. The development process with Zhuangyi has been described in Section 5.3.

Zhuangyi has 50ha of sweet pomelo base area in adjacent Nanjing County. The creation of this base area began in 1995. The market for sweet pomelo at that time was good, so Zhuangyi rented 50ha of unused hill lands from several households, paying \$112.5/ha. Zhuangyi hired the local peasants to reclaim the wastelands and plant more than 8,000 sweet pomelo trees. At first Zhuangyi did not know how to plant sweet pomelo trees, so they invited local experienced peasants and technicians from the county forestry bureau to train them. They bought pomelo seedlings from the Pinghe County Agricultural Bureau, the county where sweet pomelo originates, at a price of Y12 /seedling.

The pomelo trees produced a few fruit in 1998; in 1998 the yield per plant was less than 25kg, but in 2000 it increased to 50kg.

The negotiations between Zhuangyi and Carrefour in 1999 included the sweet pomelo, and the company sold more than 200 tonnes of the fruit to Carrefour in 2000. These sweet pomelo were delivered to the Qingpu Materials Circulation and Distribution Centre in Shanghai.

The sweet pomelo quality line was created at the same time as the mandarin line. The Zhuangyi pomelo were improved during the creation of the quality line. The 2002 test reports showed that the fruit met the standards, so the products could then be sold under the quality line label. Table 4 shows the quantity of pomelos sold between 2002 and 2005.

Table 4. Quantities of quality line pomelo supplied by Zhuangyi Company

	2002	2003	2004	2005
Quantities (tonne)	500	1,000	1,100	4,000

Source: Author's research

In order to increase their yield of sweet pomelo, Zhuangyi started to work with other farms in 2002, and these farms were used as cooperative base areas. Zhuangyi selected base areas that had an area of planted pomelo of not less than 15ha, orchard management that conforms to required standards, and an agreement to follow the quality line standards.

In 2002, 12 farms were selected as base area, the largest one being the Zhongrun Agricultural Development Company, with 1200mu of land. Zhongrun is a state-owned farm, while the others selected are privately owned.

Not all of the farms were able to reach the technology and management requirements of Zhuangyi Company, so seven farms were eliminated the next year. In 2003 and 2004, four new farms were added, so there were eight farms altogether. Another farm has since been eliminated, and now Zhuangyi has seven cooperative farms.

One of the eliminated farms was Peasant Lu A'cheng's farm in Pinghe County, 15km from Zhuangyi Company. Lu has 20ha of pomelo orchard and he started to work with Zhuangyi in 2002. Lu had some farm management and funding difficulties, and his products did not meet the Carrefour quality line standards. Zhuangyi Company asked Lu to make improvements the next year. Lu was still unable to produce

pomelo according to Zhuangyi's standards the next year, however, so he was eliminated.

Zhuangyi Company considers the quality line management method to be advanced, so to implement the quality line standards it was necessary to change the farmers' traditional production methods and habits. The key problem is that the farmers will not change their ways before they see proven economic benefits. But in agriculture the input:output ratio is always negative in the short term, so it takes a while for results to become apparent. For instance, Carrefour advocates that organic manure should account for 70 per cent of fertilizers used. So the planting costs increase as the amount of organic manure used increases, but product yield does not increase proportionally. The farmers think that since the organic manure does not bring more benefits, why not use convenient chemical fertilizers?

Zhuangyi Company pay 10 per cent more than the market price for sweet pomelos from their base areas. The investment to bring production standards up to the quality line standards may be much more than 10 per cent in short term, so unless they have a long-term vision, the farmer households do not want to produce according to the quality line standards.

Another problem is that although Zhuangyi Company pays 10 per cent more than market price for the pomelos, the pomelos produced according to the quality line standards are very good, so other dealers are offering the farmers even higher prices for their high-quality products. Not surprisingly, the cooperative farmers sometimes sell their products to the other dealers. Most of the cooperative farmers were eliminated by Zhuangyi Company for this reason.

In order to supply sweet pomelo to Carrefour's quality line, Zhuangyi Company has had to:

- have a stable goods supply channel;
- provide technical support to cooperative farmer households;
- train cooperative farmer households more than twice a year;
- produce a monthly bulletin of agricultural activities and keep the cooperative farmer households informed of new information;
- send their two special technicians to train farmers and help if there are problems; and
- test for pesticides used by farmer households in the base areas (pesticides on the Chinese market are not currently standardized, and sometimes the contents do not match the description). award

The Zhuangyi Company was approved as a 'leading enterprise' of Fujian agricultural industrialization in 2005. It won the sweet pomelo processing and fresh-keeping project of the Fujian Province Science and Technology Bureau, and was granted a \$10,000 loan with discounted interest in 2005.

There is a story about the export of Zhuangyi sweet pomelo to France. In 2002, the manager of Carrefour's quality line at their headquarters in France went to visit the sweet pomelo farms. He thought that the quality of the Zhuangyi sweet pomelo was good enough to export to France. Following his and Carrefour's recommendations, Zhuangyi Company sent a refrigerated container of 18 tonnes of sweet pomelo to the Carrefour stores in France. There was no quarantine problem during export, and the sweet pomelo fruits sold very well in France. Sweet pomelo is one of the first Chinese fresh fruits to have been exported to Europe. Zhuangyi Company exported more than 600 tonnes of sweet pomelo to France in 2004, and these were sold in several dozen Carrefour supermarkets. The market demand for pomelo in France was high, so the Zhuangyi Company exported more than 1,000 tonnes to France in 2005 and plans to export 2,000 tonnes in 2006. Zhuangyi's estimated output of sweet pomelo in 2006 is 13,000 tonnes; 2,500 tonnes are to be sold through the quality line, 2,000 tonnes exported to France, and the rest will be sold to South-East Asian countries, Russia, and the domestic market. As Carrefour's quality line standards are very high, only 40 per cent of the fruit meets the quality line standards. Fruit with an irregular shape or with marks on the peel, or ones that are too large or too small, will be eliminated by the standards of the quality line.

5.5 The Zhongrun Agricultural Development Co., Ltd¹

Fujian Zhongrun Agricultural Development Co., Ltd, is situated in Pinghe County, Zhangzhou City. It is an agricultural development holding company established by the Zhongqingxin Company under the Ministry of Finance in March, 1997. Its main business is planting fruit trees. The company has developed into a leading enterprise of integrated intensive agricultural business, incorporating production, management, and marketing. The company has more than 80ha of fruit farms and an annual gross yield of pomelo of 4,200 tonnes.

In Section 5.4, we said that the Zhuangyi Agricultural Development Co., Ltd has seven sweet pomelo cooperative base areas, and these are:

- (1) Lu Huilong, whose farm is in Gulou village, Pinghe County. It is 33km from his home and he has more than 7,000 sweet pomelo trees and 18ha of orchards.

¹ The case is from interview with Mr. Huang Yuzhou, the manager of Fujian Pinghe Agricultural Development Co., Ltd By author on July, 2006.

- (2) Zhang Yiwei's farm is also in Pinghe County. He has an orchard of 18ha and 3,500 sweet pomelo trees.
- (3) Huang Zhouyu's farm is in Pinghe County, and he has an orchard of more than 80ha with more than 40,000 sweet pomelo trees.
- (4) Zhuang Liyuan, whose farm is in Nanjing County has an orchard of 22ha and 10,000 sweet pomelo trees.
- (5) Jian Haiquan's farm is in Nanjing County. He has an orchard of 20ha and more than 8,000 sweet pomelo trees.
- (6) Liu Shuhai's farm is in Pinghe County. He has an orchard of 18ha and more than 6,500 sweet pomelo trees.
- (7) Lu Guoyi's farm is in Pinghe County. He has an orchard of 24 ha and more than 12,000 sweet pomelo trees.

As we can see, the Zhuangyi Company's cooperators – the suppliers of Carrefour's quality line – are large-scale farmer households, unlike the great majority of farmers in China, who are small-scale households. To understand why this is the case, one cooperator selected from Zhuangyi's cooperators is described here.

Zhongrun Agricultural Development Co., Ltd is in Pinghe County, the origin of China's famous sweet pomelo. Huang Yuzhou is in charge of the farm and technology. Huang was born in 1947, and graduated from the crop cultivation specialty programme of Zhangzhou Agro-technical School in 1975. After graduation he worked in the Zhangzhou Institute of Agricultural Sciences doing research on fruit trees. One year later, he switched to the Pinghe County Agricultural Department and worked as a crop technician for eight years. He was elected a village leader, and held that post for 10 years.

In 1990, according to an agricultural policy, Xiazhai Town in Pinghe County reclaimed a mountain and planted 120ha of pomelo trees. The town government invested more than \$125,000 in pomelo orchards. The pomelo trees were planted in 1995 and the total output of sweet pomelo reached more than 400 tonnes in 1997. As the town government did not have enough money for continuing investment, they decided to sell the orchard for more than \$1 million. A company in Beijing under the Ministry of Finance became a large shareholder when the orchard was bought. The orchard is now a joint venture with four legal entities: the Beijing company, Zhangzhou City, Pinghe County, and the Xiazhai municipal government. The Beijing company has 64 per cent of the shares, and the other three parties have 12 per cent each.

The company was established in 1997 and it is called the Zhongrun Agricultural Development Co., Ltd (hereafter called Zhongrun). It has more than 80ha of orchard and 40,000 pomelo trees. The output of sweet pomelo in 1998 was 900 tonnes, which increased to 4,200 tonnes in 2005.

The farm has 30 permanent employees (including both managerial personnel and workers) and more than 100 temporary workers. Before it began to work with Zhuangyi Company, the sweet pomelo produced by Zhongrun were mainly transported by chartered wagons to wholesale markets in Shanghai, Beijing, Wuhan, Guiyang, and other cities. The main problem was that neither the market nor the price of the product was stable.

In 2003, Zhongrun began supplying the Zhuangyi Company with pomelos for Carrefour's quality line, and it has now become one of Zhuangyi's sweet pomelo producing base areas. Carrefour sent their quality line staff from Shanghai headquarters to Zhongrun and carried out a quality line inspection of the pomelo farms. The Zhongrun orchards had been approved as a green food base area by Fujian Province, but Carrefour still needed Zhongrun to test their soil, water and air. Zhongrun asked the Test Centre of the Zhangzhou City Agricultural Bureau to conduct the tests according to the requirements of Carrefour's quality line. All the results were within the standards. Carrefour also invited professors from the China Agricultural University to the base area to give technical demonstrations and training. Carrefour sends staff to inspect Zhongrun two or three times a year. The Zhuangyi Company technicians come regularly and give instructions and inspect the implementation of the quality line standards.

When it was decided that Zhongrun would be a base area for Carrefour's quality line, Zhuangyi began to purchase sweet pomelo from Zhongrun on behalf of Carrefour. Zhuangyi signs a purchasing contract and purchasing plan with Zhongrun in advance. During the harvest period, Zhongrun transports sweet pomelo to Zhuangyi's fruit packing and processing plant according to the plan, and it is then transported to Carrefour after processing. Once it has delivered the sweet pomelo to Zhuangyi Company, Zhongrun does not have to do anything else. Zhongrun sold 1,500 tonnes of pomelo to Zhuangyi Company in 2004, and 2,000 tonnes in 2005. Zhongrun feels that working with Zhuangyi is much more convenient than marketing and selling the pomelo itself. The market and price are stable, and sales value has increased. Working to Carrefour's very strict quality line standards created some management and technology difficulties in the company.

5.6 The Beijing Xiaotangshan special vegetables base area

The creation of a quality line for vegetables has special value to Carrefour (this case study is from an interview with Lin Yuan, Vice General Manager of Xiao Tang Shan Special Vegetable Farm of Beijing Agriculture Bureau). Compared with fruits,

consumers' demand for vegetables in China is much higher, because Chinese consumers usually buy fresh vegetables every day. However, as vegetables are easily infested with pests, the growing period of leafy vegetables is short, and the technology to control pesticide residue is expensive, vegetables quality line was not created until 2006. The first partner in Carrefour's vegetables quality line is the Beijing Xiaotangshan special vegetables base area (hereafter called Xiaotangshan).

Xiaotangshan vegetables base area was created in 1984, as a state-owned farm under the Beijing Agricultural Bureau. They started with 20ha of land rented from Xiaotangshan Town, Shunyi County, Beijing on a 70-year lease. Beijing Agricultural Bureau invested \$125,000, and the farm's fixed assets are now \$8.125 million. The creation of the vegetables base area was proposed by Deng Xiaoping, who although not the official head of state, was the de facto leader of China. Deng pointed out that policy reform and opening the country to the outside world would attract many foreigners to work in Beijing, and they would need to eat local vegetables. After Xiaotangshan was established many vegetables were introduced from foreign countries, and supplied to the Friendship Department Store and to large hotels. Xiaotangshan was named the special vegetables supply base area for the Beijing Municipal Party Committee and municipal government in 1995, and has become the special vegetables supply base area for the state council. The 'special supply base area' is the designated farm that supplies vegetables to higher ranking government leaders. In order to ensure the health of the leaders, only the most reliable farms can be designated 'special supply base areas'.

After the mid-1990s supermarkets in Beijing developed rapidly, and Xiaotangshan grasped this opportunity to develop its market share. In 1999, Xiaotangshan began supplying vegetables to Xidan Wanfang supermarket, the first supermarket in Beijing. It began supplying Xidan Department Store in the same year, and in 2000 added Itoiyakado, a Japanese-owned supermarket. By 2005 Xiaotangshan had special vegetable counters in more than 70 supermarkets. Xiaotangshan's original land was in Shunyi County, and its headquarters are still there. The first new base area was added in 1998 in Dasungezhuang, also in Shunyi County, and then they gradually expanded to Miyun and other parts of the Beijing suburbs. The first base area outside of Beijing was Zhangjiakou, Hebei Province, built in 1994. In 2000 three more base areas were established outside of Beijing, in Hainan, Guangxi, and Zhangjiakou. In 2005, 6 new base areas outside of Beijing were added, in Hebei Province (two), Inner Mongolia, Shandong, Guangxi, and Yunnan. Altogether, Beijing has eight base areas, one in Shunyi, two in Pinggu, four in Miyun and one in Yanqing. The grow more than 450 different types of vegetables.

Xiaotangshan's sales were Y3.7 million in 2000, more than Y5 million in 2001, more than Y9 million in 2002, more than Y12 million in 2003, more than Y18 million in 2004, and Y26 million in 2005. Estimated sales for 2006 are Y30 million.

The Xiaotangshan headquarters base area has 21ha of land, and the vegetables produced there are specially for the State Council, Beijing municipal government, and some hotels in Beijing. The 160ha of outlying base areas are in Shunyi, Pinggu, Miyun and Yanqing, and belong to about 1,000 small-scale farmers, although managed by Xiaotangshan's own staff. Xiaotangshan is responsible for managing production, training farmers in production processes, providing technical assistance, and supervising the use of pesticides and fertilizers. The company also invites experts to give regular technical training. The company's best staff inspect the management and production progress. The company's professional and technical trainings for people in the base areas covered more than 1,000 people in 2005.

The negotiations between Xiaotangshan and Carrefour on working together to create a Carrefour quality line began in April 2005. Carrefour's quality line staff investigated the base area, usually once a month but up to three times a month. The growing environment was the subject of most tests for quality line conditions, including water sources, and soil and air quality. They also investigated technical expertise, management and production methods, and the use of pesticides by farmers. They asked Xiaotangshan to provide a detailed written report on these items. Carrefour gave Xiaotangshan their technical manual for vegetable production and packing, which contains all the details and requirements from production, to processing and transportation. During negotiations, Carrefour explained that Xiaotangshan's production and management must follow the requirements of the manual. If Xiaotangshan had any difficulties in reaching these requirements, the two parties could discuss it further and revise the standards, before a final version is agreed by both parties.

On 10 September, 2005, the quality line vegetables produced by Xiaotangshan were first sold in Carrefour's Shuangjing supermarket in Beijing. There were seven kinds of vegetables in the first quality line: cucumber, cherry tomato, large tomato, cabbage, sweet pepper, carrot, and potato. In January 2006, Chinese radish was added to the quality line. With the success of the trial operations, which began on 25 September, 2005, Xiaotangshan's quality line vegetables began to be sold in six Carrefour chain stores.

Traceability is a key element of the quality line products. Each greenhouse has a code number and detailed records. Field production records include details about field operations: fertilizer application, pesticide spraying, irrigation, volume of harvest, and number of seedlings raised, etc. This code number appears on the label, so the accuracy of traceability right back to the greenhouse is very high. The code allocated to Xiaotangshan's vegetables is a 9-figure number; digits 1-2 are the base area, digits 3-5 are the greenhouse number, and digits 6-9 are the production date.

All Xiaotangshan products are tested before harvest and harvested only after tests for traces of pesticide and fertilizer are negative, and samples of the harvested

vegetables are tested again. The company keeps records for the latest three years' tests. Once packaged each boxes holds a different variety, with a code number and the names of the farmers printed on some boxes.

The company is now experimenting with reducing their waste. The waste leaves and stems from harvested plants are collected and composted. This experiment is still at an early stage of development.

Xiaotangshan's traceability system has the following characteristics: (1) All the plots have code numbers. (2) All the plots have field records. (3) All the farmers have code numbers. (4) Each box has a code number showing which farmer supplied it. (5) Each package has a traceability code number. The code numbers supply two pieces of important information: the producer and the accurate packing date. Through the packing code number the supermarket can find all these details when problems occurred. They have accurate production details, and if problems occur they have accurate and timely information at their fingertips.

There are also a few problems in the relationship between Xiaotangshan and Carrefour:

1. The use of hormones. Farmers use plastic film greenhouses to grow vegetables in China, but because of the temperature fluctuation inside the greenhouse – too low in winter and too high in summer – pollination is affected, so hormones must be used in winter and summer. According to Carrefour's standards, the use of hormones is not allowed, so the domestic growers cannot meet these requirements.
2. Carrefour demands that each farmer have a fertilizer pond, which cannot be achieved in China because farmers cannot afford it.
3. There are only a few varieties of pesticides in China, and sometimes the use of these pesticides cannot be controlled.

The difference between Carrefour's quality line products and domestic 'green foods' are as follows:

1. Carrefour's quality line products have traceability, while the domestic green foods do not.
2. Carrefour's quality line products are cheaper than domestic green agrifoods.
3. The quality requirements of Carrefour's quality line products are higher than that of the domestic green agrifoods.
4. Carrefour's quality line products need cold storage and transportation, while the domestic green agrifoods do not.

5. The production cost of Carrefour's quality line products is 20–30 per cent higher than domestic green agrifood production costs, but their sales price is 30 per cent lower, and the quality line profit margin is 2.7 per cent lower than Carrefour's normal profit margin.

6. Carrefour's quality line products follow a standard packing system, while the domestic green agrifoods do not.

5.7 The Xiaotangshan contract farm

Let us look at the Xiaotangshan cooperative base area. Some of the Xiaotangshan quality line vegetables are produced by a cooperative base area. One of the farmers there is Tong Liang, who lives in Pinggu County, Beijing. Mr Tong rented 5ha of land from the village government in 2002, invested Y0.86 million and constructed 17 plastic-film greenhouses. He hired 10 farmers from the adjacent villages to manage these greenhouses and grow vegetables. In 2006, when Xiaotangshan became a supplier of Carrefour's quality line, Mr Tong's farm was used as a cooperative base area. After an inspection from Carrefour's quality line staff, Xiaotangshan sent technicians to give Mr Tong some training. Mr Tong's farm supplies 300kg of tomatoes, 200kg of cucumbers, 200kg of autumn squash, and 50kg of tonka beans to Xiaotangshan every day. Some of the pesticides used by the farm are supplied by Xiaotangshan, while the rest are bought from the market by the farm according to the list provided by Xiaotangshan. Mr Tong's farm has implemented the traceability system according to the requirements of Carrefour and Xiaotangshan.

6. Summary and conclusions

This project studied a new type of purchasing system. The significance of the Carrefour quality line is that the supermarket, at the end of the supply chain, in fact manages the entire chain. Before Carrefour came along, Chinese agrifood supply chains were divided into several sections. The independent sections were linked together by governmental plans or by the invisible hand of market.

Since the implementation of reform policy in the 1980s, which opened China more to the outside world and instituted a system of contract production, the up-stream end of the agricultural supply chain consists of 200 million small-scale farmer households, and mid-stream is the thousands upon thousands of small retailers who distribute agricultural products. This kind of production and distribution model – based on small-scale retailers – is very efficient, but has had a negative and inhibitive effect on the planned increase in both production and the quality and safety of agrifoods. In recent years, the exports of agricultural products have been limited because pesticide residues or animal drug residues have repeatedly exceeded standards. There have been newspaper reports of food poisoning due to the high level of pesticide residues in vegetables purchased from the domestic market. All these events show us that if proper management measures are not adopted in the agricultural supply chain, the problems of quality and safety of agrifoods in China cannot be resolved once and for all.

Who, then, can play the leading role in such a divided supply chain? The traditional agricultural markets and distribution methods are changing gradually due to the development of supermarkets and the suppliers of agrifoods are developing simultaneously. So what measures should small-scale farmer households in China be taking to adapt to the changing market? The Carrefour quality line is just one part of the changing market. Market changes are like climate changes. To date humans have been unable to change the climate to suit their needs and can only adapt to it. Similarly, with market reform, it is impossible for us to make the market change in ways that are favourable to small-scale farmer households. It would be hugely expensive even for a powerful government to attempt this, and it would be unlikely to succeed. For instance, China launched the Great Leap Forward and the Peoples' Commune in the 1950s. Although the motives of the leaders who launched the movements were good, the results were that tens of thousands of people died of hunger due to food shortages. We think that the most wise action that scientific researchers could take would be to explain the laws of the changing market, identify the opportunities for farmers, and create the conditions to enable farmers to adapt to the changing market and increase their income.

The above case studies have explained the development of Carrefour's quality line in China. It is true that the aim of creating Carrefour's quality line is to serve the

Carrefour supermarket itself, and to make Carrefour more competitive than other supermarkets and the wet markets in China, but there is a far-reaching significance for Chinese farmers, agrifood processing enterprises, and consumers. The real significance of the quality lines introduced by Carrefour is innovation.

First, the quality lines have inspired innovation in the farmers' production methods. The originally independent farmer households have become an organic component of the quality line. The quality line gives farmer households training, supervision and management in the production process and this enables them to adopt more advanced food safety technology and to learn good management practice. Farmers are always greatly concerned about production outputs, such as yield and appearance. They do everything they can to maximize that goal, including using highly poisonous pesticides, over-using fertilizers, etc. The quality line makes the farmer households understand the importance of the entire agrifood production process. The establishment of traceability has not only made the entire production process thoroughly transparent, but also introduced the farmer households to the role of information technology in production.

Second, innovation has changed the traditional agrifood distribution chain in China, which used to be divided into many different sections, each with many individual employees. The upper and lower ends of the supply chain were connected by simple 'selling' and 'buying' (the invisible hand), and this needs little supervision or intervention. This kind of system is a breeding ground for contamination, and agrifood safety cannot be guaranteed. Carrefour's innovation is the direct management of both agrifood production and the processing at the end of the supply chain. The 'visible hands' (Chandler, 1977) of the enterprise are extended right to the beginning of the supply chain. The production standards and business plans can now be implemented effectively throughout the production chain. Most importantly, it has paved the way for the 'traceability' of agrifood. The supply chain adopted by Carrefour is one of the best in China for guaranteeing the quality and safety of agrifood.

Third, there is innovation in the production chain of safe agrifood. The current supply system for 'green food' and organic food commonly used in China is based on the relationship between suppliers and supermarkets. Supermarkets only supply a selling platform for the suppliers, but do not investigate how these suppliers produce or obtain their products. In a market full of 'opportunism', not only can the safety of agrifood not be guaranteed absolutely, but also consumers' faith will be undermined. By managing and controlling the entire agrifood supply chain, Carrefour's quality line produces its own-brand green agrifood, thus not only providing safe, high-quality food, but also strengthening the popularity of the Carrefour brand.

Fourth, innovation is also embodied in farmers' income. Along with economic development in China and the increase of consumers' income, the consumption patterns of agrifood have changed gradually from a demand for quantity to a demand for higher quality, safety, and an abundant variety of agrifood. Carrefour's quality line provides this. Carrefour pays more for safe, high-quality agrifood, and thus rewards participating farmer households with higher incomes.

Fifth, Carrefour's quality line helps to extend and popularize in China safe and high-quality agrifoods. In a market with fierce competition, once an innovation has brought economic benefits or competitive power to the innovator, many imitators will appear. Carrefour is the first supermarket to sell its own-brand, safe agrifood in China. Knowledge of Carrefour's quality line has spread far and wide among consumers, and more and more are attracted by it. Some large-scale supermarkets such as local supermarkets, agricultural, industrial and commercial enterprises, and foreign supermarkets such as Wal-Mart and Mide-long have also tried this model and produced their own-brand safe agrifoods. This trend is helpful to popularize and extend safe, high-quality agrifoods in China, and thus optimize agricultural production technology and the Chinese agrifood supply chain.

Sixth, although the cooperating farmers have until now been large-scale farmers, now that food safety and new production technology have been adopted by these large-scale farms they will play a demonstration role for nearby small-scale farmer households. As long as the innovation produces economic benefits, it will be disseminated rapidly and many imitators will appear. This is a Chinese characteristic. What matters is the existence of a market that is able to differentiate safe and high-quality agrifoods from common ones, and pay a better price for high quality. The development of supermarkets has created the conditions to enable this policy to happen.

We should not, however, ignore the problems that exist too. A safe agrifood line such as Carrefour's quality line needs to be supported by advanced planting and processing technology, as well as infrastructure. The case of the failure of Carrefour's quality line of bananas is evidence of this. The introduction of advanced technology and construction of infrastructure cannot be accomplished by only one supermarket. The creation of more safe food lines needs the participation of many scientific research units, scientists, and government departments. The current Chinese government attaches great importance to food safety. However, in addition to enhancing the tests for agrifood safety, more scientific research and infrastructure related to food safety need to be promoted.

The second problem is that up until now the farmers producing Carrefour's quality line are large-scale farmer households, not the small-scale farmer households that account for more than 90 per cent of the agricultural population in China. The average land area per small-scale farmer household is less than 0.4 ha. We

understand that Carrefour works only with large-scale farmers for management convenience. But the more important problem in China now is how to help small-scale farmer households begin producing a quality line that is similar to Carrefour's. We think that it is necessary to introduce a farmer cooperation association. Introducing a farmer cooperative to the Carrefour quality line will be a challenge.

Small-scale farmer households need to be organized to start producing for the Carrefour quality line if Carrefour plans to continue to expand its retail market share in China. As small-scale farmers are protected by macroeconomic policy, they not only account for a great majority of farmer households, but will also be around for a long time. As there are very many small-scale farmers and their individual ability to supply is small, the purchasing and management costs will increase if Carrefour does not adopt more effective purchasing and management models. Carrefour has to face this challenge.

Farmers' cooperatives have appeared again in China. With the support of the government, farmers' associations have been set up, one after another, in different regions. The associations' role is to organize the scattered farmer households together. They would then ensure internal management is good, and deal with supermarkets like Carrefour on behalf of the farmers, thus reducing Carrefour's purchasing and management costs, enabling them to deal with many small-scale farmer households.

The significance of these case studies is that the development of supermarkets is gradually changing agrifood production models and technology in China. Supermarkets are still not the main selling channel for raw and fresh agrifoods, but they have great potential and their role should not be ignored.

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CQL Requirements

□□□□□□□□□□

The following are the requirements for the vegetable quality line. The supplier does not need to meet them all at the beginning, but needs to be able to reach them eventually.

CULTIVATION PROCESS	
□□□□	
<i>Step</i> □□	<i>Requirements</i> □□
Lot identification □□□□□□	<ul style="list-style-type: none"> ➤ One lot = one number □□□□ = □□□□□ ➤ Clear identification on the field and greenhouse □□□□□□□□□□□□□□□□
Seed origin/certificate □□□□□□/ □□	<ul style="list-style-type: none"> ➤ Origin known □□□□□□□ ➤ Selected seeds (resistant to disease, good quality) □□□□□□□□□□□□□□ ➤ No GMO □□□□□□□□□□

<p>Soil □□□</p>	<ul style="list-style-type: none"> ➤ Analyse soil regularly □□□□□□□□□□□□ ➤ <i>The level of organic[material is checked and the fertilization plan must aim to increase this level.</i> □□□□□□□□□□□□□□□□□□□□□□ ➤ Heavy metals analysis □□□□□□
<p>Fertilization management □□□□□□</p>	<ul style="list-style-type: none"> ➤ Based on soil analysis □□□□□□□□□□□□ ➤ Keep traceability records □□□□□□□□ ➤ Focus on organic fertilizers □□□□□□□□□□ ➤ Don't keep manure outside □□□□□□□□□□
<p>Irrigation □□□□□</p>	<ul style="list-style-type: none"> ➤ Water analysis meets with regulation □□□□□□□□□□□□ ➤ Focus on irrigation system saving water □□□□□□□□□□□□□□
<p>Integrated cultivation process □□□□□□□□□□</p>	<ul style="list-style-type: none"> ➤ Focus on curative treatments □□□□□□ ➤ Reduce preventive treatments □□□□□□□□□□ ➤ Reduce quantity and frequency □□□□□□□□□□ ➤ Chemical class must meet international regulation □□□□□□□□□□□□□□□□ ➤ Enhance use of bio-treatments and natural enemies □□□□□□□□□□□□

<p>Chemical management</p> <p>□□□□</p>	<ul style="list-style-type: none"> ➤ Stop using chemicals as soon as possible during the cultivation process to reduce chemical residues in final products. <p>□□□□□□□□□□□□□□□□□□</p> <ul style="list-style-type: none"> ➤ Check chemical residues □□□□□□ ➤ Keep chemicals locked away. □□□□□□□□ ➤ No post-harvest treatment □□□□□□ ➤ Staff must be protected during chemical spraying □□□□□□□□□□□□□□□□
<p>Traceability</p> <p>□□□□</p>	<ul style="list-style-type: none"> ➤ Keep all records (delivery sheet, all inputs records) <p>□□□□□□□□□□□□□□□□□□</p> <ul style="list-style-type: none"> ➤ Cultivation book from seeds, through nursery house, to packing house. <p>□□□□□□□□□□□□□□□□□□</p> <ul style="list-style-type: none"> ➤ Register all treatments and activities on the fields in the cultivation book. <p>□□□□□□□□□□□□□□□□□□</p>
<p>Harvest</p> <p>□□</p>	<ul style="list-style-type: none"> ➤ Staff must be trained to harvest good-quality vegetables <p>□□□□□□□□□□□□</p> <ul style="list-style-type: none"> ➤ Frequency and trigger off must be checked by a specialist <p>□□□□□□□□□□□□□□</p> <ul style="list-style-type: none"> ➤ Harvesting equipment should be clean <p>□□□□□□□□</p> <ul style="list-style-type: none"> ➤ Try to reduce the time between harvest and packing house <p>□□□□□□□□□□□□</p>

Transportation to PH □□	➤ Good conditions for transport (low temperature, reduce shocks) □□□□□□□ □□□□ □□□□
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PACKING HOUSE	
□□□□	
<i>Steps</i> □□	<i>Requirements</i> □□
Traceability □□□□	➤ Different lot and different products = kept separate in the packing house □□□□□ □□□□□□□ =
Chemicals □□	➤ No post-harvest treatment □□□□□□
Water □	➤ Control water origin and quality □□□□□□□
Storage □□	➤ Cold room □□ ➤ Clear identification □□□□□
Overall cleanliness □□□□□□	➤ Clean surrounding area □□□□□□ ➤ Use disinfecting products to clean □□□□□□□□
Staff hygiene □□□□□□□□	➤ Toilets and washbowl for hand-cleaning □□□□□□□□□□ ➤ Clean uniform □□□□□□ ➤ Wash hands regularly □□□□

ENVIRONMENT	
□□	
Steps□□	Requirements□□
<p>Environment protection</p> <p>□□□□</p>	<ul style="list-style-type: none"> ➤ Plastic waste management <li style="margin-left: 20px;">□□□□□□□□ ➤ Good management of water resources <li style="margin-left: 20px;">□□□□□□□□ ➤ Keep chemical products locked away <li style="margin-left: 20px;">□□□□□□□□ ➤ Good management of chemicals and fertilizers <li style="margin-left: 20px;">□□□□□□□□

FINAL PRODUCT	
□□□□	
Steps□□	Requirements□□
<p>Freshness</p> <p>□□</p>	<ul style="list-style-type: none"> ➤ Reduce time between farm, packing house and storage <li style="margin-left: 20px;">□□□□□□□□□□□□□□□□ ➤ Good delivery conditions (cold truck) <li style="margin-left: 20px;">□□□□□□□□□□ ➤ Daily deliveries □□□□□□

<p>Healthy product</p> <p>□□□□</p>	<p>No chemical residues □□□□□□□□</p> <p>No post-harvest treatment □□□□□□□□</p> <p>Cold chain respected □□□□</p> <p>Reduce transportation time □□□□□□□□</p>
<p>Safe product</p> <p>□□□□</p>	<p>➤ Maintain traceability from farm to fork □□□□□□□□□□□□</p> <p>➤ Keep all records</p> <p>□□□□□□</p>
<p>Aspect</p> <p>□□</p>	<p>➤ Select best products / good-looking products □□□□□□□□ / □□□□□□</p>
<p>Best quality/price</p> <p>□□□□□□ / □□</p>	<p>➤ CQL vegetables must be well positioned on the market compared to common products</p> <p>□□□□□□□□□□□□□□□□□□□□</p>

Regoverning Markets

Regoverning Markets is a multi-partner collaborative research programme analysing the growing concentration in the processing and retail sectors of national and regional agrifood systems and its impacts on rural livelihoods and communities in middle- and low-income countries. The aim of the programme is to provide strategic advice and guidance to the public sector, agrifood chain actors, civil society organizations and development agencies on approaches that can anticipate and manage the impacts of the dynamic changes in local and regional markets. The programme is funded by the UK Department for International Development (DFID), the International Development Research Centre (IDRC), ICCO, Cordaid, the Canadian International Development Agency (CIDA), and the US Agency for International Development (USAID).

Innovative Practice

Innovative Practice is a series of case studies from the Regoverning Markets programme providing examples of specific innovation in connecting small-scale producers with dynamic markets at local or regional level. Based on significant fieldwork activities, the studies focus on four drivers of innovation: public policy principles, private business models, collective action strategies by small-scale farmers, and intervention strategies and methods of development agencies. The studies highlight policy lessons and suggest working methods to guide public and private actors.

The case studies were coordinated by:

Julio Berdegúe, RIMISP - Latin American Centre for Rural Development, Chile

Lucian Peppelenbos, Royal Tropical Institute (KIT), Netherlands

Estelle Biénabe, University of Pretoria, South Africa and Centre de Coopération

Internationale en Recherche Agronomique pour le Développement (CIRAD), France

