International Food and Agribusiness Management Review
Volume 12, Issue 3, 2009

Linking Small Scale Farmers in China with the International Markets: A Case of Apple Export Chains

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Abstract

This study describes how governance mechanisms were formed that link small-scale apple farmers in China with export markets. These institutional innovations have improved the efficiency of price transmission and generated higher profit margins for various actors in the supply chain, in particular for small-scale farmers. Chinese apple exports are highly coordinated through ongoing long term loyal network relationships and vertical integration. Relevant policy implications and further challenges are discussed in the conclusion.

Keywords: supply chain, price transmission, institutions, market integration.

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Introduction

In just two decades, China has made a remarkable leap from being a small apple producer to becoming the world's largest apple producer and exporter. In the early 1980s, China produced under three million tons of apples per year. By 2007, more than 42 percent of all apples produced in the world originated in China (FAO, 2008). Due to its rapid expansion of apple orchards in the late 1980s, notably in Shandong and Shaanxi provinces, China is now the leading player with a 13.5 percent share of the global apple exports by volume; ahead of other apple exporters such as Italy (10.4 percent), Chile (10.3 percent), France (9.2 percent) and the US (8.8 percent)(UN COMTRADE, 2007). But the value of China's exports ranked fourth behind Italy, France and the US, since China's apples sell at lower prices in international markets.

China has been able to connect millions of small-scale apple producers at one end with modern sophisticated western consumers at the other. Policy makers and agribusiness managers in economies where there are many small-scale agricultural producers might benefit from China's experiences. They show that small scale farmers can be integrated into a modern supply chain. This helps address the ongoing debate about whether small scale farmers can ever be and how they might be part of a modern supply chain. Prior research by Elizabeth, et al. (2000) and Dolan and Humphrey (2001) suggested that small farmers tended to be excluded from the modern marking chains. Other studies showed that the emergence of modern supply chains produced increased interaction between buyers and small farmers in developing countries (Dries, et al, 2004; Maertens and Swinnen, 2006; Huang et al, 2008). To mitigate the possible negative impacts of modern market development on small farmers, several recent studies showed that farmer cooperatives, that government interventions restraining purchasing powers, and that increased farm contact were all ways of improving small farmers' market involvement and bargaining powers (Gibbon, 2003; Gulati et al., 2006; Devesh and Thorat., 2008). For instance, Roy and Thorat (2008) showed using a unique success story, that of the Mahagrapes, how farmer cooperative partnerships could successfully combine collective action and public private / partnerships. They found that smallholder Mahagrapes farmers included in the process were able to consistently meet market standards and benefitted from significantly higher incomes. This implies that the model may be scaled up.

The paper focuses on the development of the apple export chain in Shandong province in general and on the vicinity of Qixia city in particular. The Shandong region accounted for half of China's total fresh apple exports and the area around Qixia provided most of the apples exported from the Shandong region.

The paper is organized as follows. Section 2 introduces the methodology and data used. Section 3 positions the apple industry in the broader context of a changing institutional environment in China. This is followed by section 4 in which a set of issues relevant to the apple industry are presented. In section 5 the apple export chains and their related institutional arrangements are mapped out. Section 6 follows with a description of the mechanism for governing the chain. The paper concludes with a set of policy implications and a description of the challenges ahead.

Methodology

Two qualitative research techniques were applied in this study: focus group discussions, and individual in-depth interviews. In the focus group discussions groups, five to 12 selected individuals discussed a range of topics with the conversation moderated by a facilitator. The individual in-depth interviews were 'an unstructured personal interview[s] which use[d] extensive probing to get a single respondent to talk freely and to express detailed beliefs and feeling on a topic' (Webb, 1995). Advantages and disadvantages of group versus individual interviews have been discussed extensively (Crabtree and Miller, 1993; Stokes and Bergin, 2006). While focus groups are more applicable to wide-ranging exploratory research, individual interviews allow probing the respondent for underlying motivations and feelings (Malhotra, 1999; Hennink, 2007). Thus using both techniques helps achieve a broad overview and detailed understanding of the issues discussed (Stokes and Bergin, 2006; Gellynck and Kűhne, 2008).

The combination of two research methods in this research let us gain substantive insights into the pattern of the apple chain from the perspective of the participants themselves. The focus group discussions were applied to apple growers while in-depth interviews were applied to other actors at different stages of the apple chain. Table 1 provides the profiles of the two research techniques used for this study.

Table 1. Description of participants in focus group discussions and in-depth interviews along the apple chain

Methods	Regions	Numbers of respondents	Chain actors
Focus group 1	Qixia, Shandong	8	Producers
Focus group 2	Qixia, Shandong	6	Producers
Focus group 3	Rongcheng, Shandong	12	Producers
In-depth interview	Netherlands	2	Importers
In-depth interview	Netherlands	1	packing equipment supplier
In-depth interview	Qixia, Rongcheng and Shandong	4	Exporters
In-depth interview	Qixia, Shandong	2	Collectors
In-depth interview	Qixia, Shandong	1	e-auctioneer
In-depth interview	Qixia, Shandong	2	Producers
In-depth interview	Qixia, Shandong	3	policy makers

The guidelines for focus group discussions and in-depth interviews were developed based on literature reviews of global commodity chains and the authors' extensive field experience in

China. The central topic for producers' group discussions was understanding how producers were linked with export chains. These discussions also sought clarification on the reasons producers participated in certain ways, what the external influencing factors were in making their choices, and what the consequences were for the producers' choices. The focus group interviews were carried out in July, 2008. All sessions were audio-taped and the researchers recorded notes. After each session, the data were verified among the research team and transcribed.

The in-depth interviews for other chain actors covered sector characteristics, changes and development along the chain, chain governance, etc. The questions asked were formulated based on reviews of global commodity chains and the authors' extensive field experience in China. They were then fine tuned based on consultations with several horticultural chain experts in China and in the Netherlands. The questions were then translated into Chinese. The interviews in the Netherlands were conducted in February and March, 2008. The data collection in China was carried out during July 2008.

The Enabling Environment

The Chinese economic reform started with an institutional change called the 'Household Responsibility System (HRS).' This started in the early 1980s. It tore down the commune based production system and restored individual household units as the primary production framework (Lin, J, Y., 1987 and 1988). The first impact of this reform was felt by the apple industry of Shandong in 1984. That year, collective apple orchards were distributed to individual households and each became responsible for its own apple production. In the same year, the marketing of apples was also liberalized. The government no longer imposed price control, and private traders were allowed to enter or leave the apple market without restriction or outside control. At the time apples were a luxury product in China with high prices and limited supply. Consequently farmers planted additional apple trees during that period. Qixia, the most famous apple growing region in China, doubled the size of apple orchards in 1984. This expansion was encouraged by the Chinese Ministry of Agriculture (MoA) which defined Qixia as one of the Quality Apple Production Bases, and provided 2 million yuan in subsidies for the purchase of young apple trees and additional incentives.

China's entry into the World Trade Organization (WTO) in 2001 was another significant event for the apple industry. By this time the apple trees planted in the middle of 1980s and early 1990s were in full production. Chinese apple markets were no longer in short supply and new markets were required to keep the price of apples up. The potential for increased trade provided an incentive opportunity for seeking out these markets.

Another change in 2001 that had a major impact on the apple industry was the introduction of the pollution-free Food Action Plan by the Chinese government. This was instituted to address the demand for safe food and quality that were increasingly required by both domestic and international markets. The main objective of this plan was to establish a sound food quality and safety standard system in China within ten years. To promote the apple quality, and particularly to reduce the pollution due to pesticide use, apple production in Qixia was now required to shift towards producing safe food by adopting pest lighting, by promoting the use of organic fertilizers, and by minimizing the use of chemical pesticides. Under the plan, the Ministry of

Agriculture (MOA) certified most apple production regions in Shandong as 'Pollution-free Apple Demonstration Base' . Qixia's achievement in environmental protection was recognized in 2002 when the National Bureau of Environmental Protection classified Qixia as a National Ecological Demonstration Zone . As an Ecological Demonstration Zone, apple farmers in this area were required to reduce substantially their use of chemical fertilizer and pesticides, and to increase the use of organic fertilizer and biological methods to control disease and insects. Apple farmers now had an incentive to join this action because they were able to obtain higher apple prices by labeling their apples as being produced within the "National Ecological Demonstration Zone." In 2005 the first export company in Qixia achieved EurepGAP certification, enabling it to export to the EU. Since then, more companies were certified, in part because of encouragement from 2006 onwards by the provincial department of Finance in Shandong which provided subsidies equal to 40 percent of the cost of EurepGAP --the total cost of certification was 20,000 yuan of the 50,000 yuan. Some county governments provided additional subsides to companies. By 2008 most export-oriented companies in Qixia had obtained EurepGAP certificates.

Farm Structure

Qixia, the leading apple export region in Shandong, China, will be used as a case to illustrate how small in their production scale the Chinese apple farmers are in this section and how innovative Qixia farmers are in the next section.

Apples have been produced in Qixia for more than a century. It produces top quality apples on its hilly and mountainous landscape complemented by its suitable soil and weather conditions. Prior to the market liberalization in 1983, Qixia had 7,360 hectares of orchards producing 99,200 tons of apples. By 2007, Qixia's apple orchards covered 43,300 hectares and produced 8 million tons of apples.

According to our interviews with the local government and farmers, most apple orchards of individual household in Qixia ranged in size from 0.15 to 0.65 hectares. The large scale farmers with plots larger than 0.65 hectares accounted for 20 percent of the total production. These farmers had increased their production by renting additional hilly land from their village committees, or sub-renting land from other farmers. The middle-scale farmers had with plots averaging 0.4 hectares and accounted for 60 percent of the total production. The small-scale farmers with plots of 0.15-0.2 hectares produce the remaining 20 percent. Even the so-called large orchards in China were less than one hectare, which was very small in scale in comparison with orchards in other apple producing regions around the world.

Apple cultivation was more profitable than wheat and maize production in Shandong. For example, in 2006, the net profit for producing wheat, maize and apples per hectare of land in Shandong was 2010 yuan, 2460 yuan, and 23670 yuan, respectively (NDRC, 2007). Hence, apple farmers invested heavily in apple production, including investments in transportation machinery (tractors) and irrigation and spraying equipment. They also endeavored to improve the soil quality by applying more organic matter such as soya cakes , believing that good soil improved both the taste of and the productivity of the apple trees. The government's recent program, 'to adapt fertilizer application to soil conditions' also encouraged soil improvement efforts.

Technology Innovation

Technology innovation played an important role in the development of apply industry in Shandong. This can be seen by noting that Qixia farmers were innovative in the adoption new apple varieties. In 1984, there were more than 60 apple varieties in Qixia, of which the most popular were Xiao Guo Guang (46 percent) and Green Banana (11.3 percent). Since then, the Fuji apples from Japan were introduced along with other shorter branch varieties. in the 1990's R&D researchers in Yantai (the region to which Qixia belongs) successfully introduced a series of Fuji-based varieties, such as Fuji2001, YanFu No. 1 and No. 3. These varieties were produced by cross-breeding Japanese Fuji with local varieties. By the end of 2007, the leading variety was Fuji series (80 percent), followed by Gala (11 percent) and New Red Star (6 percent).

Cultivation innovation is another success factor for Qixia's apple industry. In 1990, a special pruning technique aimed at stimulating flowering was adopted. This was later adapted in the rest of China. In 1993, experiments with the bagging of apples started. The paper bags greatly improved the quality, color, and surface shine of the apples, and reduced pesticide pollution content in the fruit. This labor intensive technology was formally adopted in 1996 in Qixia and has since reached an acceptance rate of 95 percent in Qixia.

In addition, improvement in storage facilities contributed substantially to providing high quality apples year-round. In 1984, there were only three cold storage facilities with total capacity of less than 10,000 tons. By 2006, there were more that 200 cold storage facilities with a total capacity of 360,000 tons. Some of these facilities used highly advanced atmosphere control systems.

International and Domestic Market

The main international markets for Chinese apples were South East Asia (Indonesia, Philippine, Singapore, Thailand) and the EU (Spain, France, NL and UK), where the EurepGAP certificate was required (recently renamed as GlobalGAP). In the UK the quality requirement (hardness and sugar contents) was higher than on the European continent. Chinese apples did not have access to the Japanese and the US markets due to phytosanitary restrictions. Chinese exporters indicated that the strictest apple export market in terms of phytosanitary requirements was Canada.

Chinese apple markets were influencing international apple market prices because it was such a large producer. Fewer apples entered international trade when supply was closer to domestic demand and more apples entered foreign markets when supply was larger than domestic demand. Consequently, international traders watched the Chinese markets closely.

Typically Chinese apples were cheaper than those of other countries. However, this was not the case in the harvest year 2007-2008 for several reasons: the appreciation of the Chinese yuan against the US dollar by 15 percent within a year, an increase apple procurement price at farm gate by 20-30 percent, plus a ten percent increase in packing material costs (such as paper and plastics). These led to Chinese apple prices almost equaling US prices in the South East Asian markets in 2007. Some Chinese exporters retreated from the EU markets as they lost price competitiveness. Meanwhile, they found that India was becoming a promising market for top

quality Chinese Fuji apples and consumers there were willing to pay premium prices for high quality apples.

Export-oriented traders started selling apples in the Chinese domestic market in 2007 after retreating from international markets. To their surprise, they discovered that domestic markets were quite profitable, particularly for quality apples. It seems that the domestic prices are more responsive to the product's quality than the EU markets. The main destinations in domestic markets are supermarket chains and wholesale markets in Guangdong, Fujian, Shanghai and Beijing.

Domestic markets for apples function similarly to other horticultural commodity markets in China. In the 1980s and 1990s, many small-scale vendors collected apples in villages. More recently, the collectors increased their scale and used larger transport trucks. Farmers started to choose collectors with good reputation, in particular those who paid on time. Most farmers were still engaged in spot markets.

Non-Tariff Measurements

The EU applied an eight percent tariff from August through May and no tariff from April through July. The EU also had numerous other requirements. All exporters had to register their companies and their production bases (the location of the apple orchard is one example). In addition there were specific package requirements. All wooden pallets had to be steamed for more than 45 minutes at a temperature higher than 60 degrees Celsius. Thus the local China Entry-Exit Inspection and Quarantine Services (CIQ) required all facilities packaging apples for export be registered and had have video cameras installed so that the local CIQ could monitor and check the steam process via the internet. And paper boxes had to be glued; not stapled. Apples that varied more that 10 percent from the apple shape were rejected.

Some Chinese exporters described customs problems entering markets in North and South America. One incident occurred in 2006 when Mexican customs did not allow three containers from Shandong to pass through because of alleged quality controls deviations. Shipping these apples back to China was economically unviable, so they were destroyed near the harbor. The Chinese exporter claimed to have received only a vague explanation about the quality problem.

In 2008 Chinese apples could not enter the US or Japan. China had been negotiating the entry of fresh apples into the US since 1998. The Animal and Plant Health Inspection Service of the US Department of Agriculture had sent a list of over 300 concerns to the quarantine inspection agency of the Chinese government in 2003 and the Chinese government responded the next year. In 2008, the negotiations were still taking place.

Price Formulation and Transmission

Price Formulation

In normal production years, the early harvest which began in October saw a peak price peak of around 6 RMB per kg. This was due to apple traders and storage owners purchasing the best

apples. The prices dropped to around 5.4 RMB per kg during the following few months until the second peak around the Chinese new year (end of January or beginning of February) when the price level increased to about 6.4 RMB per kg (apple demand increases substantially at this period). In the spring, the prices would fall slightly and then peak again in June/July at the level of 7 RMB per kg. The last price peak occurs when the apples stored in cold storages begin to diminish in supply (for physical reasons, apple in those facilities can not be stored any longer), and thus apples stored at high cost in air controlled system enter the market. Apple prices in China fluctuated considerably in recent years, however. Every farmer and trader in China remembered the "dark" year of 2005 when the procurement prices at farm gate reached its lowest point –1.20 RMB (US$ 0.15) per kg, as opposed to a good year like 2007 when the prices reached 5.6 RMB (US$ 0.74) per kg.

The cost composition of the prices at different stages of the apple chains are as follow. Table 2 shows the price and costs of apples at the farm level. Table 3 shows the price and costs of apples at collectors' level. And Table 4 and 5 shows the price and costs of apples at exporters' level.

Table 2. Apple prices and costs at the farmers' level in RMB per hectare in 2007

Items	Costs and Values *	Note
a. Fertilizer:	12,000 RMB	
b. Pesticides	9,000 RMB	
c. Bags:	15,000 RMB	
d. Irrigation:	3,000 RMB	
e. Labor cost:	42,000 RMB	of which 15,000 for hired labor
f. Total cost (a + b + c + d + e)	81,000 RMB	
g. Harvest:	3,000 kg, average 2.6 RMB per kg	
h. Total revenue: (g * 2.6)	117,000 RMB	
i. Profit per hectare (h – f)	36,000 RMB	

* I Euro equaled around 10 RMB in 2007.
Source: field interviews, July 2008.

Table 3. Apple prices and costs at the collectors' level in RMB per kilogram in 2007

Items	Costs and Values	Notes
a. Procurement price at farm gate	4.00 RMB	grade 2 and grade3 mixed
b. Costs of web netting, grading and uploading	0.40 RMB	if using paper carton, adding another 0.30 RMB
c. Costs of transportation to storage facilities	0.06 RMB	within 50 km
d. Storage cost	0.40 RMB	Until end of may next year
e. Total added costs (a +b + c + d)	4.86 RMB	
f. Sale Prices	5.4 RMB	
g. Profit margin (f – e)	0.54 RMB	

Source: Field interviews, July 2008.

Table 4. Apple costs at the exporter' level in percent in 2007

Items	Percentage
Apple procurement	75 %
Labor	4 %
Customs/inland transportation	3 %
Pack material	10 %
Overhead	8 %
Total	100 %

Source: Field Interviews, July 2008.

Table 5. Apple price formulation along the supply chain: Grade 2 Fuji apples from China to EU in 2007 (unit: kg)

Stages of the Chain	Added Value (RMB)	Market Functions	Price Formulation	Price Accumulation %
Farm	4	Production	4	20
Local collection	0,42	Sorting, grading, web netting, transportation	4,42	4
Storage	0,80	Cold storage, out sorting, loss	5,22	5,2
Export, leaving from Qingdao harbor	1,03	Inland transport, inspection, customs fee	6,25 (FOB price)	2
Arriving at Rotterdam harbor	0,45	Sea fare, insurance	6,7 (CIF price)	8,9
Import	1,77	Customs cleaning, tariff	9,47	4,9
Wholesale	0,98	Storage cost, profit margin	10,45 (wholesale price in EU)	47,75
Retailing	9,55	Transport, loss, profit margin	20	Total: 100

Source: Field interviews, July 2008.

The precise values for these items vary considerably across the growing seasons and regions. However, the data in the tables indicate the value distribution along the chain in addition to input-output analysis at the firm level. While China's apple market chain is very competitive, farmers have received much larger price margins (20 percent over what consumers pay at the supermarkets) compared with small farmers in other countries. For example, Doland, et al, (1999 and 2001) presented a detailed cost structure for African FFV export to the UK. Their results indicated that producer costs only account for 12 percent and 14 percent of the final prices for

Zimbabwe and Kenya, respectively. In keeping with their study, this research also found that the greatest margins in the final stages of the chain, or supermarkets.

Price Transmission

Compared to prices in five years ago, apple prices were transmitted incredibly quickly in Shandong. According to interviews, during the 2007 harvest season, Shandong farmers followed price changes at wholesale markets within their cities instantly using mobile phone and telephone. Price change information in the markets outside of their province, such as in Guangdong's wholesale markets nearly two thousand kilometers away from Qixia, were transmitted to apple farmers in Qixia within two days. Based on this price information and their own storage capacities, traders adjusted their procurement prices and quality requirements and informed local collectors of their prices (lower or higher) a day earlier. Local collectors also formulated their own judgments on price changes based on the degree of urgency from traders' buying orders.

Traders indicated that international price changes were transmitted immediately between China and international markets since most Chinese exporters had daily contact with their foreign importers. Even small traders in China knew of price changes in the international market within one week. This meant that Chinese exports were subject to volatility as exporters altered prices in order to stay competitive.

One's understanding of the volatility in prices is conditioned by one's exposure to the markets. Most apple farmers usually sell apples to traders/collectors within 40 days of harvest because they do not have storage facilities. This means they have a limited period in which they can respond to price signals. Only a small proportion of farmers rent storage facilities and so can market their apples throughout the year. In most cases, traders bear the market risks after the harvest season is over.

Their different perspectives meant that they had different understanding of events and hence what prices would be. In the 2006-2007 production year there was bad weather (frost) in some apple production regions in China, and traders were speculating that Chinese apple production would decrease in 2007. Hence, during the harvest season, traders and collectors were in competition to procure and store as many apples as possible. The prices traders paid farmers in 2007 were very high and farmers made large profits. Consequently in 2008 farmers expected good prices so attempted to improve both apple quality and quantity. However, traders had a different story. Their profits in 2008 were smaller because of the high prices they paid for apples in 2007 and the appreciation of RMB. Consequently they were looking at paying less for apples.

All farmers at the focus group discussions agreed that prices were not transmitted to them systematically. When the apple prices at the urban markets were higher, their farmgate prices were higher, but to a lesser extent. When the urban prices were lower, farmgate prices were much lower than the changes in the urban market. Farmers based this view of price on 40 days of price fluctuation following the harvest. After that period it was the traders who experienced the market price volatility. So, it was the exporters rather than the farmers who bore most of the price risks on the apple markets.

Consumer Preferences

Fuji apples had a sweet taste, but more importantly their charming red color was highly valued, particularly in Asian countries. In 2007 the Chinese consumed 80 percent of Grade 1 Fuji apples while most exported apples were grade 2 and grade 3. Although premium apples were more expensive, the increasing middle class in provinces such as Guangdong and Fujian were willing to pay for these apples.

Generally speaking, in northern China, consumers prefer big apples while in the southern part of China they like smaller apples, and Shanghai consumers often choose middle sized ones.

India is becoming one of the most important markets for Chinese apples as Indian consumers willing paid for top quality, heavy red Fuji apples even though the Indian tariff on imports was raised from 40 percent to 80 percent in 2006.

In the EU markets, Spanish and French consumers also relished Fuji apples. Chinese traders reported, however, that EU consumers chose grade 2 apples since they have the same taste as grade 1 though they were less appealing color-wise.

Mapping Supply Chains and Institutions

Mapping Supply Chains

Here again, we use Qixia as a case to illustrate the apple trade flow in Shandong. Qixia had 43,000 hectares of apple orchards in 2007 and produced 8 million tons of fresh apples (SBSP, 2008). Around 10 percent was exported to Southeast Asia, the EU and Russia, while the rest was earmarked for domestic consumption. The top quality apples went to big provincial cities, such as Guangzhou and Xiamen, while apples of lower quality went to cities in the counties. The Qixia apple flow chart and the percentages of the products marketed through different channels are shown in Fig. 1. It shows that the greatest tonnage of the apples (60 percent) is produced from the medium scale farms. A very small part of Qixia ‘s tonnage went to the processing industry. Although Qixia is the main apple exporting region in China, the largest portion of the tonnage of (90 percent) supplied the domestic markets.

There are various apple supply chains in Shandong. A supply chain picture of one Export Company actively involved in the EU market is illustrated in Fig. 2. The apple production in this chain was mainly carried out by its long term loyal farmers as well as by farmers connected through local collectors. These farmers were part of a cohesive area entity – their smallholdings were individually owned yet geographically connected to one another.

The marketing function of the packing station was sorting and grading. Packaging materials, such as boxes and pallets, were produced in its own packaging factory. Exporters extended their control over various stages of the chain by owning a nucleus farm, a packing station and a

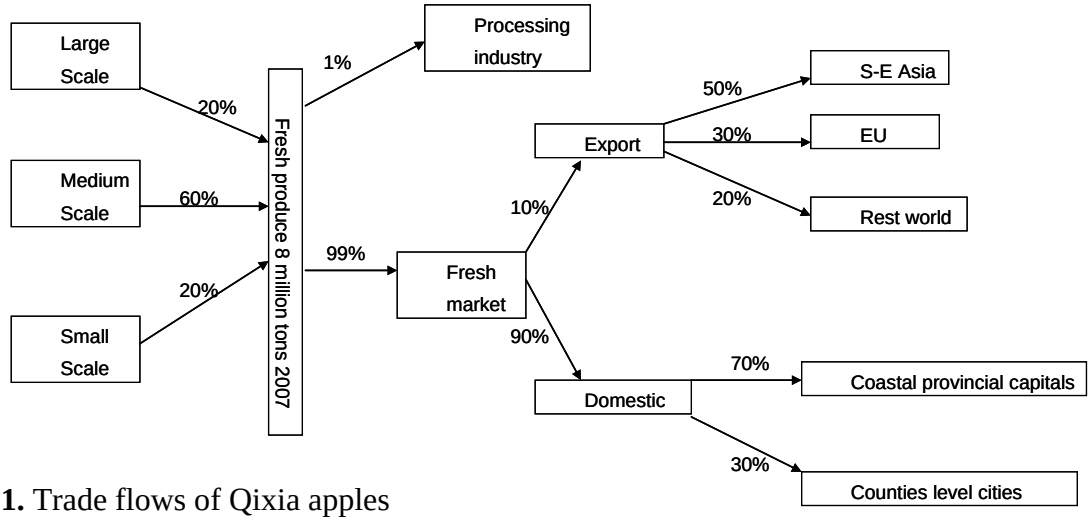

Figure1. Trade flows of Qixia apples

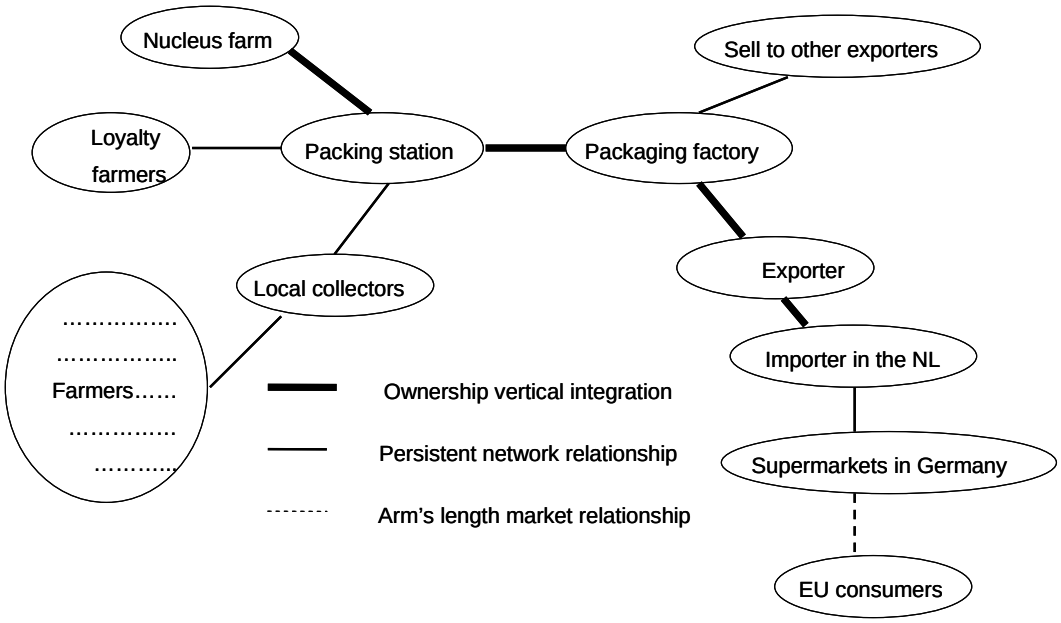

Figure 2. A case of Qixia apple Chain to EU markets

packing material factory. Since both Chinese government and EU regulations required that apple exporters register their orchards and packaging factories, it was efficient to centralize all of these processes. In addition to upward integration by the exporter, it also coordinated downward along the chain by setting up a joint venture with its long-term EU trading partner. This was a highly coordinated apple supply chain where all chain players were either vertically integrated or shared persistent network relationships, with the exception of consumers at the end of the chain, where a simple market relationship applied.

Mapping Institutions

A wide range of public and private institutions affected apple chains. Institutions which were critical to each phase of the apple export chains are identified in Table 6.

At the production stage, land tenure was the central issue. When collective land was equally distributed among villagers in the 1980's, land tenure was guaranteed for 30 years. Due to decent income from apple production and the exemption of governmental land taxes since 2003, capable farmers were requesting more land.

- Farmer cooperatives were allowed to be involved in apple production under the newly adopted Cooperative Laws
- The China Entry-Exit Inspection and Quarantine Services (CIQ) at local level frequently inspected fields and orchards.
- In some cases importing markets required that private institutions be involved in apple production, such as EurepGAP when apples were to enter the EU markets.
- Packaging materials was produced in factories certificated by the CIQ to guarantee food safety and meet phytosanitory requirements.
- Workers at the factories enjoyed certain welfare and working conditions according to new Labor Law requirements in China.
- Some traders were considering applying for certificates in corporate social responsibility as encouraged by importers.
- Quality control schemes, such as HACCP, were also prevalent.
- All export companies and their orchards were registered and checked by the local CIQ in China, except for those exporting to Canada. The companies were registered at provincial CIQ level, an indication of a more demanding requirement. When apples are ready for export, CIQ tested a sample of every shipment. Customs checked the consistence between the customs paperwork and the products.
- Both the EU and China had clear standards set for apple grades to ensure quality. Most traders had their own private standards which were stricter than compulsory standards.
- Food safety laws protected consumers' health.
- Preferences of consumers around the world varied and these differences were often difficult to address.

Table 6. Mapping institutions along the apple export chains

	Production	**Packaging**	**Trade**	**Consumption**
Public Institutions	Cooperative Law	Labor Law	Customs	Food Safety Laws
	Land Tenure	CIQ	CIQ	
	CIQ		WTO/ Bilateral agreement	
			Compulsory standards	
Private Institutions	EurepGAP/ GlobalGAP	Social Corporate Responsibility	Private standards	Cultural preference
		HACCP		

Chain Governance Mechanism

We use the term "chain governance" to denote the ways in which activities along the chain are coordinated, such as how the process is specified and how standards are enforced and monitored. Since the linkage between small-scale farmers and modern traders was the bottleneck for the apple chains, we were particularly interested in how small scale farmers were integrated in the apple export chain so we will describe this in greater detail than governance relationships in the rest of the chain.

Export companies were the leading firms in the apple export chain and used their power structure the apple chains. Five modes of relationships with farmers were identified using the interview data. Each is now described separately.

Mode 1: Multi Party Networks

Exporters signed agreements with village committees to support apple production in the village and purchase quality apples from village farmers. There were no prescribed agreements on apple prices and quantities. In order to help improve the apple quality exporters hired technical consultants from township extension stations to advise villagers with pesticide and chemical uses. About 5 to 10 times a year these consultants offered apple farmers field management courses. Exporters procured top quality apples by offering higher prices than the prices offered by other collectors. Exporters selected the villages based on the scale of the village orchards, purity of varieties, taste and quality of apple, and open transparent communication relationships with the village committees.

Mode 2: Preferred Farmers

Exporters developed long term relationships with preferred farmers by continual cooperation over time. Exporters could have hundreds of preferred farmers. These farmers were selected based on mutual trust as well as geographic location: higher altitude regions with tasty apples were preferred. Exporters required that these farmers use particular fertilizer and chemicals. In the end, exporters paid preferred farmers a higher price than the market price.

Mode 3: Nucleus Farm

Exporters often owned nucleus farms where they could demonstrate agronomic practices and provide training. A nucleus farm could be formed in several ways: (1) Export companies could lease collective orchard land from village committees where suitable soil and irrigation ensured quality apples; (2) The companies could acquire land from individual farmers by signing land tenure agreements with village committees. Exporters then employed village farmers to work on orchards (paid by salaries) and paid the village land rents annually (the village will then pay farmers); or (3) Exporters could lease land directly from farmers to establish their own orchards.

Mode 4: Cooperatives

Exporters would jointly register with farmers that they trusted as cooperatives. This was a step further than simply working with preferred farmers. The exporters joined the co-ops based on

the value of their cold storages and marketing capacity while the farmers join the co-ops based on their apple production. The farmers chosen had good reputations (that is, they were cooperative in terms of applying fertilizer and pesticide) and operated adjacent orchards. The farmers delivered their graded apples to exporters' cold storage without determining prices. The sale committees in consultation with farmers sold these apples in the markets. The exporters' storage and marketing costs were deducted from the apple revenues and the remaining funds were then distributed among farmers. The cooperatives also hired technicians to provide technological support to its farmers and help procure inputs so that the apple quality was constant.

Mode 5: Contracting for Special Markets

Written contracts were rarely used though informal contacts started when the exporter began advising farmers that they follow certain production practices. The survey only identified one case when a written contract was used. That time an importer had a special requirement for yellow-green Fuji apples rather than the normal red apples. The exporter signed detailed contracts with farmers one month before the harvest in which the quality, quantity, color and prices of apples was specified.

The governance relationships between apple farmers and their exporters under five modes are compared in Table 7. The comparison is in terms of their objectives, the co-ordination mechanism and the institutional environments. The first mode, the co-ordination of the multi party mode, was based on a wide network of exporters, village committees, farmers and extension staff. Through this network, exporters treated farmers' land as their 'orchards' and influenced farmers' production process in order to obtain a higher volume of top grade apples. The second mode, the preferred farmers scheme, was the result of mutual trust based relationships between farmers and exporters. The third mode, the exporters' owned nucleus farm served two purposes: to demonstrate practices to other farmers; and to satisfy export regulations which require orchard registration. The fourth mode, the formation of a cooperative by an exporter and farmers was done to maximize chain performance in both profitability and product quality. And the fifth mode, written contracts, was only used when the exporter desired a specific product. In the apple sourcing sector relational network based on trust and reputation was far more important than formal contracting.

Table 7. Comparison of Governance Mechanism between Farmers and Exporters

Modes	Objectives	Chain Co-ordinations	Institutional Environments
1. Multi party network	Getting more top grade product	network based	Land tenure
2. Preferred farmers	Stable quality suppliers	Persistent Relationship	Trust
3. Nucleus farm	Demonstration	Integration	Corporate law
4. Cooperatives	Efficient chain performance	Equity-based	Cooperative Law
5. Contracting	Specific demand	Specification contracts	Contracting Law

The dominant way in which exporters sourced their apples was through local collectors or agents. These delivered more than half of the exporters' apples. Some big exporters used up to 400 collectors. These collectors were entrepreneurial farmers as well as private businessmen. The relationships between collectors and farmers changed overtime. Five years ago farmers had to ask collectors to accept their apples. More recently, collectors encouraged farmers to deliver apples to them by providing more help and support to farmers as well as high prices. Farmers felt that it was getting easier to sell apples than few years ago. The main reason was a strong demand for quality apples.

Farmers were very conscious about collectors' reputation. They did not do business with collectors who have a poor reputation ('no heart' in the farmers' words). The main measures of reputations were quality requirements, fair pricing, honest weighting, and timely payment. Most farmers believed contracts were useless without trust because enforcing contracts through lawsuits was too costly. In addition, collectors and traders also thought that contracts without mutual trusts were useless because it was hard to sue collective, small farmers.

Conclusions and Policy Implications

This paper has analyzed the Chinese apple chain from a global supply chain perspective. Over the last 20 years, Chinese apple industry has made great progress in terms of both quantity and quality. China has emerged as one of the leading players in the global apple market over the last two decades. As described in this study, the Chinese apple export chains had become highly integrated within the international market. The efficient price transmissions between China and the world markets indicated a high degree of market integration. In addition, farmers were well integrated into apple chains and received a much higher profit margin compared with apple farmers in most other countries.

The success of the Chinese apple chain was attributed to factors, such as technology innovation and market liberalization. However, we would like to focus on two policy observations from our Chinese experiences. These observations may provide other transitional countries struggling with their global chain structure with ideas they may like to consider during the process of economic global integration,

The first observation is that globalization is beneficial to improving food safety and quality in China. When we review the development of apple industries in China over the last three decades, the process of domestic market liberalization and integration into world markets has had a substantial impact. In the 1980's, apple production started to take off as a result of domestic market liberalization. Towards the end of the 1990's apple markets were turned from supply driven to demand focused when food safety and quality became priorities due to well-off domestic consumers and pressures from trade partners. After China joined the WTO in 2001, Chinese apples quickly became significant in world markets because of their good quality and low prices. Meanwhile, domestic consumption increased as a result of the increasingly affluent middle class in China.

The development China of China's apple industry showed a clear path that began with increasing production then pursuing quality and safety, followed by entering international markets, and then

returning to domestic markets. During this process globalization was not the goal but was used as an instrument to improve the product's quality and safety. As the domestic markets mature, traders may alternate between domestic and international markets, dependent on profitability at the time. The question posed is 'Will this kind of development cycle be representative for other sectors in China as well?' Will the Chinese food industry need to first face up to the global markets to advance its interests before they head back to the domestic markets? "In fact, one should not be surprised to observe such shifting process between domestication and globalization given the great potential in China's domestic market. Affluent domestic consumers are the final beneficiaries in the apple case since they are ready to pay the premium prices for top quality products. If this development cycle holds for other agribusiness sectors in China, it likely has similar implications for other transitional countries such as India, which also enjoys a dynamic domestic market with increasing affluent middle class consumers.

The second observation is that China has a very reactive institutional mechanism that responds to the international demand for food safety in efficient ways. In the Chinese apple sector we did not see the public and private sectors join forces and act together to simply serve domestic interests. Rather, the international markets set the standard requirements while Chinese authorities adjusted their measures to help the apple industry's meet these requirements. It is irrelevant whether these requirements came from public institutions, such as EU's packaging treatment condition, or from private sectors, such as GlobalGAP. As long as it was necessary to export apples, the Chinese government saw these requirements in their responsibilities and met them, sometimes in creative ways such as video-camera monitoring of packaging treatment and through financial subsidies for GlobalGAP. Yet we recognize that in China there are separate procedures for food safety control for domestic and export markets. Having two separate systems where those for export are more rigorous may provide other transitional countries facing sector resource constraints with export markets while retaining smallholders in the modern chain.

Although China's apple industry has made great progress in the last 20 years, it still faces many challenges. The major problem lies in small-scale production. Small-scale production makes it difficult to produce homogeneous products. Imperfect land markets hamper the transfer of land use rights to other families. Small scale production is not attractive enough to keep young generations at the field. Lack of public investment in R & D is another weak point. Before 1995, the government financed horticultural extension stations in each town to carry out technology extension work. Since then horticultural stations were leased to private persons and became profit-oriented, rarely providing farmers with technology supervision. Alongside public extension, R & D investment in variety breeding is also urgently required. Fuji apples are currently the dominant variety. Although the markets welcome this variety, relying on a single variety is still precarious in volatile markets.

The chain analysis allows us to do more than just understanding the process. We must try to anticipate changes in the future (Vermeulen, et al. 2008). In order to facilitate policy discussion we identify two key factors which may influence the Chinese apple markets in the future and envisage four possible scenarios (Fig. 3). One factor is the future development of farmers' organization, and the other factor is the development of international and domestic apple markets. Will Chinese farmers remain as small scale and fragmented as they are now or will they be organized as cooperatives in order to enhance their market positions? Should the Chinese apple markets seek export business or domestic growth?

Although it is difficult to choose which scenario may be seen as the most favorable, Figure 3 shows clearly that the fragmented structure of growers is the major institutional obstacle for apple quality improvement as well as for long-term development in the apple sector. When compared to technical challenges, institutional obstacles may be seen as a more fundamental threat. Both farmers and traders have felt the urgent need to work together in order to succeed in the export market. They remain involved in the process of discovering an efficient cooperation and profit distribution mechanism.

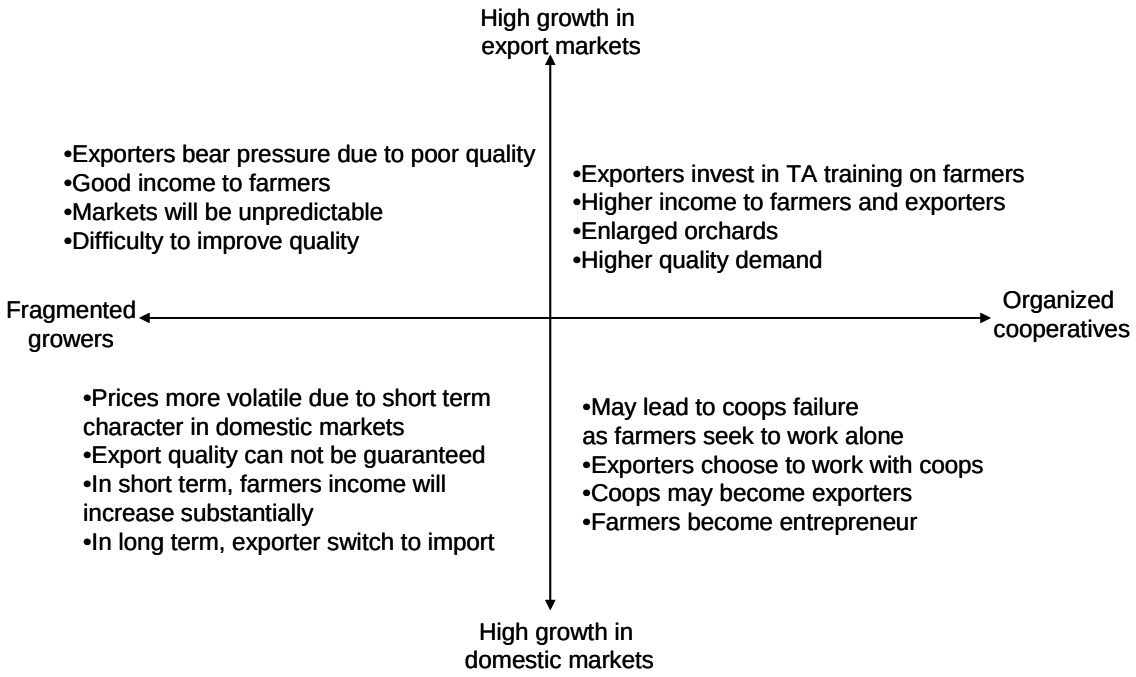

Figure 3. Scenarios for apple industry in China

Acknowledgements

The work described in this paper has been financially supported by European Union's 6th Framework Programme (Contract No. 044255) and National Natural Science Foundation of China (70603036).The authors wish to thank Jikun Huang, Marijke Kuiper and Ross Feehan for their comments and support. Our gratitude also goes to the apple farmers and other chain players who shared their information and views with us. Finally, we gratefully acknowledge that the comments from the IFAMR editors and two anonymous reviewers have contributed substantially to sharpening the paper.

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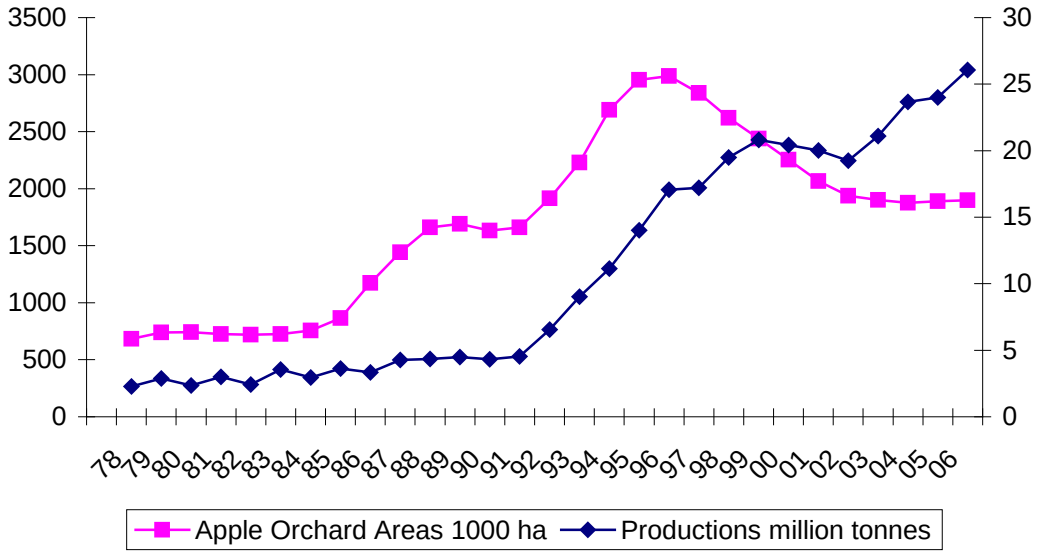
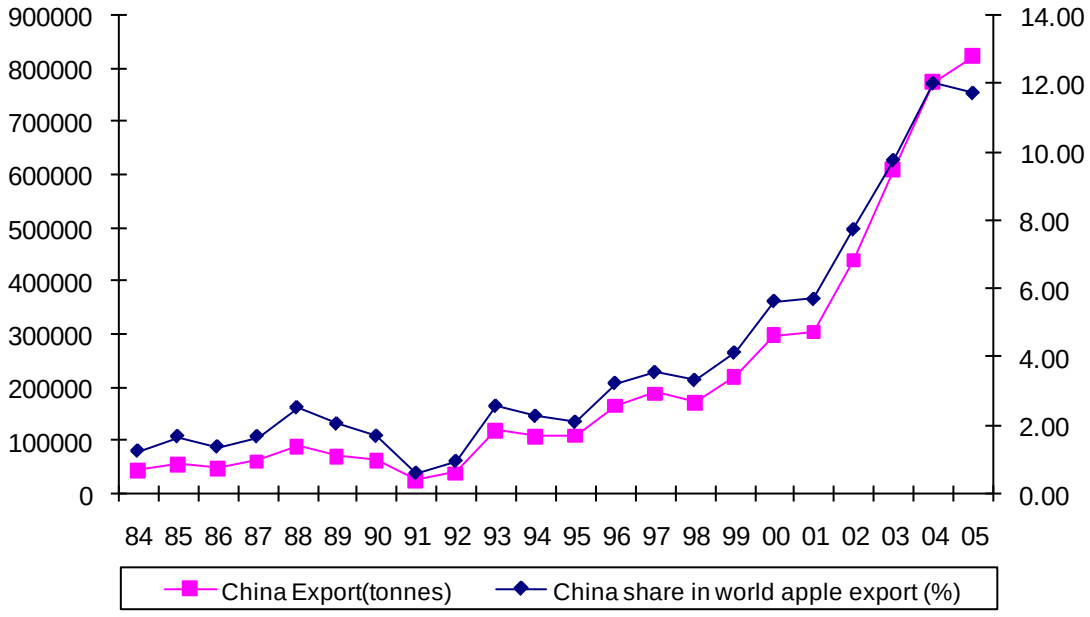
Appendix 1. Areas of apple orchards and apple production in China from 1978 to 2006.



Source: China Agricultural Statistics Yearbook, various years

Appendix 2. Quantity of Chinese apple export and its global export share from 1984 to 2005.



Source: FAO's Agricultural and Trade Data

