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

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Abstract

This study demonstrates that the Chinese apple export chains are highly coordinated through ongoing long term loyal network relationships and vertical integration. Various chain governance mechanisms were formed and link small-scale apple farmers in China with export markets. These institutional innovations have perfected chain performances by improving the efficiency of price transmission and generating higher profit margins for chain actors, in particular for small-scale farmers. Relevant policy implications and further challenges are discussed in the conclusion.

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

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1. Introduction

In just two decades, China has made a remarkable leap to become the world's largest apple producer and exporter. In the early 1980s, China practically did not participate in the global apple trade market and produced under 3 million tons of apples per year. In 2007, however, more than 42% of all apples produced in the world originated in China (FAO, 2008). Due to its rapid expansion of apple orchards in the late 1980s, most notably in Shandong and Shaanxi provinces, China is now becoming the leading player with an estimated 13.5% of the global apple market share in terms of export quantity (UN COMTRADE, 2007), ahead of other apple exporters such as Italy (10.4%), Chile (10.3%), France (9.2%) and the US (8.8%). Although China is leading in apple export quantity, its trade value is ranked fourth behind Italy, France and the US, an indication of China's lower prices for apples in international markets.

This paper describes the rapid development of the apple export chain in Shandong province in general and the vicinity of Qixia city in particular, with the Shandong region accounting for half of China's total fresh apple exports and Qixia being the leading apple exporter within the Shandong region. China's emergence in the global apple market has caused substantial concerns. There are still puzzles in understanding the organization and functioning of China's apple export chains. Apple chains in China connect millions of small-scale apple producers at one end with modern sophisticated western consumers at the other. How the industry made the transition from one extreme to the other in China and how to integrate small scale farmers in the modern supply chain are of paramount importance for policy makers and agribusiness industries.

Regarding the international debate on whether small scale farmers are excluded from the modern supply chain, the research results are controversial. For example, the study 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 show that the emergence of modern supply chains has resulted in 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 show that farmer cooperatives, government interventions that restrain purchasing powers, and increased farm contact are potential ways to improve small farmers' market involvement and bargaining powers (Gibbon, 2003; Gulati et al., 2006; Devesh and Thorat., 2008). For instance, Roy and Thorat (2008) studied one unique success story, Mahagrapes, to present how farmer cooperative partnerships can successfully combine collective action and public private / partnerships. The results of this study indicate that smallholders Mahagrapes farmers are also included in the process and benefit alongside large holders in a significantly higher income and are able to consistently meet standards. This implies that the model may be scaled up.

The paper is organized as follows. Section 2 introduces the methodology and data we 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 we map out the apple export chains and their related institutional arrangements. 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.

2. Methodology

Two qualitative research techniques, focus group discussions, and individual in-depth interviews were applied in this study. A focus group discussion refers to a group of 5 to 12 selected individuals that discussed openly a range of topics in a conversation moderated by a facilitator. An individual in-depth interview can be defined as 'an unstructured personal interview which uses 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 appear to probe the respondent for underlying motivations and feelings (Malhotra, 1999; Hennink, 2007). Thus a combination of using both techniques may achieve a broad overview and detailed understanding of the issues discussed (Stokes and Bergin, 2006; Gellynck and Kűhne, 2008).

In this research, the focus group discussion was 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. The combination of two research methods enables us to gain substantive insights into the pattern of the apple chain from the perspective of the participants themselves. Based on the authors' extensive field work experiences in China, along with literature reviews related to global commodity chains, the guidelines for focus group discussion and in-depth interviews were developed. The central topics for producers' group discussions attempted to understand how producers are 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 in-depth interviews for other chain actors covered sector characteristics, changes and development along the chain, chain governance, etc. After consultation with several other horticultural chain experts both in China and in the Netherlands, small adjustments were applied. The guides 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. All focus group sessions were audio-taped and researchers recorded notes. After each session the data were verified among the research team and transcribed.

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 and Rongcheng,	4	Exporters

	Shandong		
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

3. The Enabling Environment

The Chinese economic reform started with the institutional change named 'Household Responsibility System (HRS)' in the beginning of the 1980s, which tore down the commune based production system and restored individual household units as the primary production framework (Lin, J, Y., 1987 and 1988). 1984 was the first turning point for apple industry in Shandong. That year, the economic reform implemented through the Household Responsibility System (HRS) lead to the distribution of collective apple orchards to individual households. Every household then became responsible for their own apple production. In the same year, the marketing of apples was also liberalized, so that the government no longer imposed price control, and private traders were allowed to enter or leave the apple market without restriction or outside control. Since prices for apples were high, apples being a luxury product in China due limited supply, 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. Meanwhile, to support the apple industry in major apple production areas, the Chinese Ministry of Agriculture (MoA) defined Qixia as one of the Quality Apple Production Bases, and provided 2 million yuan in financial support for each production base, in the form of subsidies for the purchase of young apple trees and also introduced other additional incentives.

Another significant event for the apple industry was China's entry into the World Trade Organization (WTO) in 2001. By this time the apple trees planted in the middle of 1980s and early 1990s were in full production. The end result of these incentives was that the Chinese apple markets were no longer in short supply and new markets were required to keep the price of apples high. 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. The main objective of this plan was to establish within ten years a sound food quality and safety standard system in China. This was instituted to address the demand for safe food and quality that were increasingly required by both domestic and international markets. Under this plan, most apple production regions in Shandong were certified as 'Pollution-free Apple Demonstration Base' by the Ministry of Agriculture (MOA)'. 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, promoting the use of organic fertilizers, and by minimizing the use of chemical pesticides. 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[1]. As an Ecological Demonstration Zone, apple farmers in this area were now required to

[1] In order to promote the building of ecologically sound cities, starting from 1995, the Chinese Ministry of Environmental Protection had examined and approved the construction of 528 pilot sites and units of ecological demonstration zone in 9 batches, and the number of designated state level ecological demonstration zones had reached 233.

reduce substantially their chemical fertilizer and pesticide use, and increase the use of organic fertilizer and biological methods to control disease and insects. Apple farmers now had the incentive to join this action because they were now able to obtain higher apple prices by labeling their apples as being produced within the "National Ecological Demonstration Zone. In 2005 a first export company in Qixia achieved EurepGAP certification and was thus able to export to the EU. Since then, more companies have been certified, further encouraged (from 2006 onwards) by the provincial department of Finance in Shandong which has since provided subsidies equal to 40% of the cost of EurepGAP (20,000 yuan of the 50,000 yuan total costs for certification). Some county governments have provided additional subsides to companies. Currently most export oriented companies in Qixia have obtained EurepGAP certificates.

4. Apple Chain Analysis

4.1 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 vary in size from 0.15 to 0.65 hectares. The large scale farmers (above 0.65 ha) account for 20% of the total production. These farmers have increased their production by renting additional hilly land from their village committees, or sub-renting land from other farmers. The middle-scale farmers have orchards around 0.4 hectares in size and account for 60% of the total production. The small-scale farmers with little land plots of 0.15-0.2 hectares produce the remaining 20 percent. The so-called large orchards in China are still less than one hectare, which is very small in scale in comparison to orchards in other apple producing regions around the world.

Apple cultivation is more profitable than wheat and maize production in Shandong. As an 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 are investing heavily in apple production, including transportation machinery (tractors) and irrigation and spraying equipment. They have also endeavored to improve the soil quality by applying more organic matters such as soya cakes , believing that good soil improves both the taste of the and the productivity of the apple trees. The government's recent program 'To adapt fertilizer application to soil conditions' has also encouraged soil improvement efforts.

4.2 Technology Innovation

Technology innovation plays a very important role in the development of apply industry in Shandong. This can be seen by noting that Qixia farmers are 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%)* and *Green Banana (11.3%).* Since then, the Fuji apples from Japan have been introduced along with other shorter branch varieties. By cross-breeding Japanese Fuji with local varieties, R & D researchers in Yantai (the region to which Qixia belongs) successfully introduced in the 1990's a series of Fuji-based varieties, such as Fuji2001, YanFu No. 1 and No. 3. These new varieties are now successfully dominating apple markets. By the end of 2007, the leading variety was Fuji series (80%), followed by Gala (11%) and New Red Star (6%).

Cultivation innovation is another success factor for Qixia's apple industry. In 1990, new technology for pre-seasonal fruiting from young trees was adopted. This special trimming technique with the aim of stimulating flowering was later adapted in the rest of China. In 1993, experiments of bagged apples started. This labor intensive technology was formally adopted in 1996 in Qixia and has since reached an acceptance rate of 95% in Qixia. The paper bags greatly improve the quality, color, and surface shine of the apples, and reduced pesticide pollution content in the fruit.

In addition, improvement in storage facilities contributes substantially to the apple quality alongside the ability of a year-round apple supply on the market. In 1984, there were only three cold storage facilities with total capacity of less than 10,000 tons. By 2006, there was more that 200 cold storage facilities with a total capacity of 360,000 tons, which also include some facilities using highly advanced atmosphere control system. This enlarged storage ensures a year-round apple supply from Qixia.

4.3 International and Domestic market

The main international markets for Chinese apples are South East Asia (Indonesia, Philippine, Singapore, Thailand) and EU (Spain, France, NL and UK), where the EurepGAP certificate is required (recently renamed as GlobalGAP). In the EU markets, quality requirement (hardness and sugar contents) in the UK is higher than on the European continent. Chinese apples do not have access to neither the Japanese markets nor the US markets due to phytosanitary reasons. Chinese exporters indicate that the strictest apple export market in terms of phytosanitary requirements is Canada. A fairly substantial share of the Chinese apples transits through Carrefour's procurement center in Shanghai to reach stores in South-eastern Asia and Spain.

Conventionally, Chinese apples are cheaper than those of other countries. However, this was not the case in the harvest year 2007-2008. There were several reasons for this change: the appreciation of the Chinese yuan against the US dollar by 15% within a year, increase apple procurement price at farm gate by 20-30%, plus a10% increase in packing material costs (e.g. paper, plastics). These led to almost equal US-Chinese apple prices in the South East Asian markets in 2007. Some Chinese exporters are also retreating from the EU markets due to the loss of their price competitiveness. India is becoming a promising market for top quality Chinese Fuji apples and is willing to pay premium prices for high quality apples.

To a certain degree, Chinese apple markets are influencing international apple market prices. International apple traders are closely watching the Chinese markets. When there is good demand in Chinese domestic markets there is little competition in the export markets because traders can easily sell apples in domestic markets. When demand in the domestic markets decreases Chinese traders will turn to international markets and cause global market price volatility. However, due to their fragmented structure and severe intra-

competition, Chinese traders play a less significant role than then otherwise could in international markets.

Domestic apple markets in China function similarly to other horticultural commodity markets. In the 1980s and 1990s, there were many small-scale vendors collecting apples in villages. In recent years, the collectors have increased their scale and use larger transport trucks. Farmers have started to choose collectors with good reputation, in particular those who can pay on time. Most farmers still engage in spot markets.

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

4.4 Non-Tariff Measurements

Each year from April to July EU markets do not place tariffs on apple imports, but an 8% import tariff is levied during the rest of the year. The EU requires all exporters to register their companies and their production bases (the location of the apple orchard is one example). In the EU markets there are also specific package requirements. All wooden pallets need to be steamed for more than 45 minutes at a temperature higher than 60 degrees Celsius. Paper boxes can not be stapled but must be glued. If the variation of apple shape is more than 10%, the apples will be rejected. Thus the local China Entry-Exit Inspection and Quarantine Services (CIQ) require all shipment packaging factories to be registered and video cameras will be installed in their factories. In this way, local CIQ can monitor and check the steam process via the internet.

In 2006, Mexican customs destroyed three apple containers from Shandong. The Mexican customs office did not allow these containers to pass through because of alleged quality controls deviations. Since the cost to ship these apples back to China is economically unviable, they were destroyed near the harbor. The Chinese exporter only received vague information about the quality problem without receiving detailed explanation. Some exporters have also complained of customs problems in North and South American markets.

Currently, Chinese apples can neither enter the US nor Japanese markets. Negotiations between the US and China over whether its fresh apples can be brought into the US have been ongoing since 1998. The Animal and Plant Health Inspection Service in the US sent a list of over 300 insects and diseases of concerns to the quarantine inspection agency of the Chinese government in 2003. The Chinese government responded the next year. In 2008, the negotiations were still taking place.

4.5 Price Formulation and Transmission

4.5.1 Price formulation

Apple prices have fluctuated considerably in recent years. Every farmer and trader in China remembers 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. In normal production years, the early harvest season at the beginning of October is the first price peak, at around 6 RMB per kg. This is due to apple traders and storage owners purchasing the best apples. The prices drop 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 increases to about 6.4 RMB per kg (apple demand increases substantially at this period). In the spring, the prices will set back slightly with the last peak arriving in June/July at the level of 7 RMB per kg. The reason of the last price peak is due to the fact that at that time the apple 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. We list below the price formulation at different stages of the apple chains, namely at farm level (Table 2), collectors' level (Table 3) and exporters' levels (Table 4 and Table 5).

We realize that the precise values for these items vary considerably across the growing seasons and regions. However, this data did give us some indication regarding value distribution along the chain in addition to input-output analysis at the firm level. Our analysis shows that China's apple market chain is very competitive and that farmers have received much larger price margins (20 percent over what consumers pay) 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% and 14% of the final prices for Zimbabwe and Kenya, respectively. Our study also confirmed with their results that the greatest margins were at the end of the chain, or supermarkets.

Table 2 Apple price formulation at farmers' level per hectare in 2007 (Unit: RMB)

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

Source: field interviews, July 2008.

Table 3 Apple price formulation at collectors' level (unit: per kg)

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 price formulation at the exporters' level

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 chain: An example of 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 harbour	1,03	Inland transport, inspection, customs fee	6,25 (FOB price)	2
Arriving at Rotterdam harbour	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.				

4.5.2 Price transmission

Compared to prices 5 years ago, apple prices are transmitting incredibly faster nowadays in Shandong. According to our interviews, during the 2007 harvest season, Shandong farmers are updated regarding price changes at wholesale markets within their

cities instantly via mobile and telephone. Price change information in the markets outside of their province, such as in Guangdong's wholesale markets nearly 2 thousand kilometers away from Qixia, may be transmitted to apple farmers in Qixia within 2 days . Based on this price information and their own storage capacities, traders will adjust their procurement prices and quality requirement and will inform local collectors regarding their price strategy (lower or higher) a day earlier. Local collectors may also formulate their judgment regarding the price changes based on the degree of urgency from traders' procurement orders.

Traders indicate that international price changes are immediately transmitted between China and international import markets since most Chinese exporters have daily contact with their international importers. If the international market prices change, even small traders in China will know within one week. To understand whether or not apple prices are volatile in a future year, one should look at the apple production regions. In the 2006-2007 production year there was bad weather (frost) in some apple production regions in China, and traders were speculating apple production to decrease in China in 2007. Hence, during the harvest season, traders and collectors were in competition to procure and store as many apples as possible. This more than likely led to higher procurement prices in 2007.

Apple farmers respond to price changes differently than traders. Because most apple farmers don't have the storage facilities, they usually sell apples to traders/collectors within 40 days of harvest, so they can only respond to the price changes during that period. Only a marginal proportion of farmers rent storage facilities to market their apples throughout the year. In most cases, traders bear the market risks in the period after the harvest season. The procurement prices in 2007 were very high and farmers made large profits. In 2008 farmers attempted to improve both apple quality and quantity and hope for a good price this current year also (2009). However, traders have different stories. Due to the higher procurement prices in 2007 and the appreciation of RMB, their profits were not high in export markets in 2008, and it is expected that 2009 will bring lower procurement prices.

All farmers at the focus group discussions agreed that prices were not transmitted to them systematically. When the apple prices at the urban markets are high, their farmgate prices are also high, but to a lesser extent. When the urban prices are low, farmgate prices are much lower than the changes in the urban market. And yet we must however understand the apple price formulation mechanism in order to judge farmers' perception. Apple farmers have only 40 days from harvest to sell apples and experience price fluctuation. After that period it is the traders who experience the price changes. So, it is the exporters rather than the farmers who bear most of the price risks on the apple markets.

4.6 Consumer Preferences

Fuji apples not only have a sweet taste, but consumers also value their charming red color, particularly in Asian countries. In 2007 it was estimated that the Chinese consumed 80% of Grade 1 Fuji apples while most exported apples were grade 2 and grade 3. With an increasing middle class in China, Chinese consumers in provinces such as Guangdong and Fujian are willing to pay for premium quality 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.

The Indian market is becoming one of the most important markets for Chinese apples. Indian consumers relish top quality, heavy red Fuji apples and are willing to pay for the luxury, even though the import tariff was raised from 40% to 80% since 2006. In the EU

markets, Spanish and French consumers also relish Fuji apples. Chinese traders complain that EU consumers are unwilling to pay extra for more appealing color and they literally choose grade 2 apples since they have the same taste as grade 1 but are less appealing color-wise.

5. Mapping Supply Chains and Institutions

5.1 Mapping supply chains

Here again we use Qixia as a case to illustrate the apple trade flow in Shandong. Qixia had 43,000 ha of apple orchards in 2007 and produced 8 million tons of fresh apples (SBSP, 2008). Around 10% was exported to Southeast Asia, the EU and Russia, whilst the remaining bulk was earmarked for domestic consumption. The top quality apples go to big provincial cities, such as Guangzhou and Xiamen, whilst apples of lower quality go to county level cities. Fig. 1 presents the Qixia apple flow chart and the percentages of the products marketed through different channels. As we can see most of the apples (60%) are produced from the medium scale farms. A very small part of Qixia apples went to the processing industry. Although Qixia is the main apple exporting region in China, the majority of apples (90%) still supply the domestic markets.

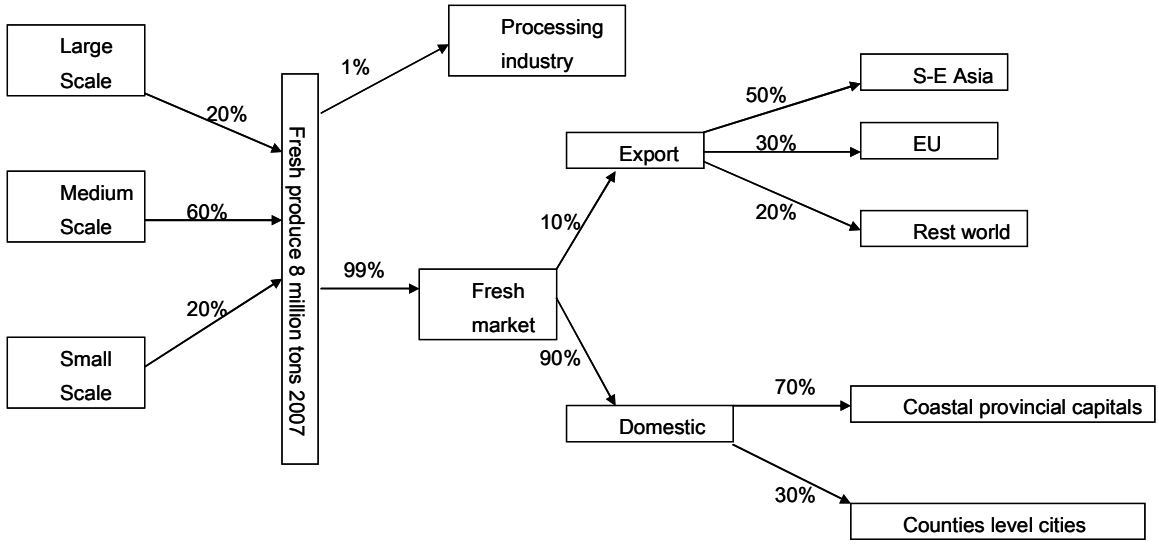


Figure1. Trade Flows of Qixia Apples

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

The marketing function of the packing station is sorting and grading. Packaging materials, such as boxes and pallets are produced in its own packaging factory. Exporters extend their control over various stages of the chain by owning a nucleus farm, a packing station and a packing material factory. Since both Chinese government and EU regulations require apple exporters to register their orchards and packaging factories, it is efficient to centralize all of these processes. In addition to the upward integration the exporter also goes downward along the chain and sets up a joint venture with its long-term EU trading partner.

This is a highly coordinated apple supply chain where all chain players are either vertically integrated or share persistent network relationships, with the exception of consumers at the end of the chain, where a simple market relationship applies.

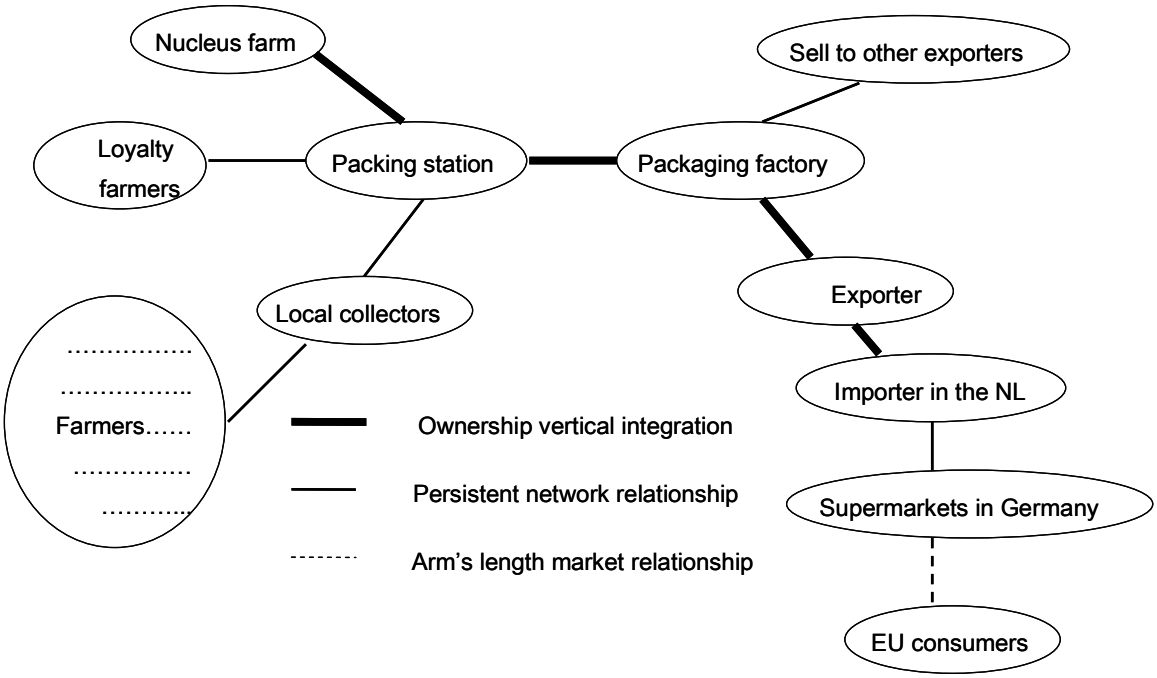


Figure 2. A case of Qixia apple Chain to EU markets

5.2 Mapping Institutions

A wide range of public and private institutions affect apple chains. We try to identify which institutions are critical to each phase of the apple export chains (Table 6). At the production stage, land tenure is 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 are requesting more land.

Other institutions involved in apple production include the newly adopted Cooperative Laws which allow farmers to organize themselves, and the China Entry-Exit Inspection and Quarantine Services (CIQ) at local level – a body that frequently inspects fields and orchards. Import destinations might require private institutions, in principle EurepGAP, to enter the EU markets.

Packaging materials must be produced in certificated factories by the CIQ to guarantee food safety and meet phytosanitory requirements. Workers at the factories must enjoy certain welfare and working conditions according to the new Labor Law requirements in China. In addition, some traders are considering applying for certificates in corporate social responsibility as encouraged by importers. Other quality control schemes, such as HACCP, are prevalent as well.

When the apples are ready for export, the CIQ will test a sample of every shipment. Customs will check the consistence between the customs paperwork and the products. All

export companies and their orchards have to be registered and checked by the local CIQ in China, except for those exporting to Canada. These companies must be registered at provincial CIQ level, an indication of a more demanding requirement. Both the EU and China have clear standard settings on apple grades. However, most traders have their own private standards which are stricter than these compulsory standards. Food safety laws aim to protect consumers' health. Besides food safety and quality, consumers around the world vary in terms of their cultures and preferences, points that are often more difficult to address.

Table 6 Mapping Institutions along the Apple Export Chains

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

6. 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 are at the bottleneck for the apple chains, we focus primarily on how small scale farmers are integrated in the apple export chain. The governance mechanism between farmers and its immediate chain actors (exporters) will form our research target, while the governance relationships in the rest of the chain will be examined to a lesser degree.

Export companies are the leading firms along the apple export chain since they are in a privileged position to structure the apple chains. Based on our interviews, five typologies of their relationships with farmers may be identified.

Mode 1: Multi Party Networks

Exporters sign agreements with village committees to support apple production in the village and purchase quality apples from village farmers. There are no prescribed agreements on apple prices and quantities. In order to help improve the apple quality exporters hire technical consultants from township extension stations to advise villagers with pesticide and chemical uses. About 5 to 10 times a year these consultants offer apple farmers Field Management courses. Exporters procure top quality apples offering higher prices than the prices provided by other collectors. Exporters select 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

Preferred farmer schemes are developed on the basis of long-term cooperation between exporters and individual farmers. Exporters may have hundreds of preferred farmers. Besides their mutual trust relationships these farmers are chosen on the basis of their geographic location: higher altitude regions with tasty apples are preferred. Exporters require these farmers to use particular fertilizer and chemicals. At the final stage, exporters pay preferred farmers a higher price than the market price.

Mode 3: Nucleus Farm

Traders often own nucleus farms for demonstration and training purposes for other farmers. There are various ways to form a nucleus farm: (1) Export companies may lease collective orchard land from village committees where suitable soil and irrigation ensure quality apples; (2) By signing land tenure agreements with village committees the companies acquire land from individual farmers. Exporters not only pay the village land rents annually (the village will then pay farmers), but they also have to employ village farmers to work on orchards (paid by salaries); (3) Exporters may also lease land directly from farmers to establish their own orchards.

Mode 4: Cooperatives

Normally, exporters have to deal with hundreds of small scale apple farmers. Over time, exporters and farmers cultivate trust between themselves. Sometimes they prefer to go a step further in their cooperation and jointly register as a cooperative. These cooperative chose farmers who have good reputations (e.g. able to cooperate in terms of applying fertilizer and pesticide) and who operate adjacent orchards. The farmers join the co-ops based on their apple production, while exporters join the co-ops based on the value of their cold storages and marketing capacity. Farmers deliver their graded apples to exporters' cold storage without determining prices. The sale committees in consultation with farmers will sell these apples in the markets. After deducting the storage and marketing costs the revenue is then distributed among farmers. The cooperatives also hire technicians to provide technology support to its member farmers and help input procurement in order to keep the apple quality constant.

Mode 5: Contracting for Special Markets

Written contracts are rarely used in the apple procurement chain. During the survey we only observed one contract case when an importer had a special requirement for yellow-green Fuji apples (normally Fuji apples are red). The exporter signs detailed procurement contracts with farmers one month before the harvest. The contracts describe quality, quantity, color and prices of apples. In fact informal contacts already start when the exporter begins advising farmers during the production period and then encourages them to follow certain processes.

We should point out that these five modes are not used exclusively. Table 7 compares the governance relationships between apple farmers and their exporters under five modes in terms of their objectives, co-ordination mechanism and institutional environments. The co-ordination of the multi party mode is based on a wide network of exporters, village committees, farmers and extension staff. Through this network, exporters treat farmers' land as their 'orchards' and influence farmers' production process in order to obtain a higher volume of top grade apples. The preferred farmers scheme is the result of mutual trust

based relationships between farmers and exporters. Exporters' owned nucleus farm serves two purposes: (1) demonstration in nature to other farmers; (2) to satisfy export regulations which require orchard registration. The joint effort between farmers and exporters to form a cooperative is to maximize chain performance in both profitability and product quality. Written contracts are only used when there is a specific demand for particular products. In the apple sourcing sector relational network based on trust and reputation is 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

Although there are several modes exporters can use to source their apples, local collectors or agents deliver more than half of their apples. Some big traders use up to 400 collectors. These collectors could be entrepreneurial farmers as well as private businessmen. The relationships between collectors and farmers are changing overtime. Five years ago farmers had to ask collectors to accept their apples. Nowadays, collectors have to ask farmers to deliver apples to them by providing more help and support to farmers in addition to high prices. Farmers feel that it is getting easier to sell apples than few years ago. The main reason is a strong demand for quality apples.

Farmers are very conscious about collectors' reputation. They do not do business with collectors who have a bad reputation ('no heart' in farmers' words). Quality requirement, fair pricing, honest weighting, and timely payment are the main measures for reputation. Most farmers believe contracts are useless without trust. Even though contracts are signed, it is difficult to implement them without trust because lawsuit costs are too costly. It is also interesting to note that, based on our interviews, collectors and traders also think contracts without mutual trusts are useless because it's hard to sue collective, small farmers.

7. 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 to become one of the leading players in the global apple market over the last two decades. As demonstrated in this study, the Chinese apple export chains were highly coordinated within the international market. The efficient price transmissions between China and the world markets indicate a high degree of market integration. In addition, farmers are well integrated into apple chains and receive a much higher profit margin compared with apple farmers in most other countries.

The success of the Chinese apple chain contributes to many 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 some ideas they may like to consider during the process of economic global integration,

The first observation is that globalization is beneficial as an instrument to improve food safety and quality in China. When we review the development of apple industries in China over the last three decades, we can trace strong marks from the process of domestic market liberalization and integration into world markets. 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 entered the world markets at full speed as a result of its improved quality and good value prices. Meanwhile, domestic consumption is picking up as a result of the increasingly affluent middle class in China.

The apple development in China showed a clear development cycle that begins with increasing production then pursues quality and safety, and then enters international markets, and then returns back again to domestic markets. During this process globalization is not the goal but in fact is used during the process as an instrument to improve the product's quality and safety. When the domestic markets mature, traders may alternate between domestic and international markets, dependent on profitability at each moment in 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. Domestic affluent 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 ground for other agribusiness sectors in China, it will have implication to other transitional countries such as India, who 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 typical public and private partnership where public and private sectors join forces and act together. Rather, the international markets set the standard requirement while Chinese authorities adjust their measures to help the apple industry's fulfillment. It is irrelevant whether these requirements are come from public institutions, such as EU's packaging treatment condition, or from private sectors, such as GlobalGAP. As long as it is a necessity for apple export the Chinese government will take on board these requirements in their responsibilities, such as video-camera monitoring for packaging treatment and financial subsidies for GlobalGAP. We recognize that there are separate procedures for domestic and export markets regarding food safety control in China. These special measures on food safety only apply to export oriented supply chains. This splitting system may provide some thoughts for other transitional countries also facing public sector resource constraints but striving to satisfy the export market demand for food safety while retaining smallholders in the modern chain.

Although China's apple industry has made great progress in the last 20 years, nevertheless many challenges still face the Chinese apple sector. 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 demand, relying on a single variety is still precarious in volatile markets.

The chain analysis should allow 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.

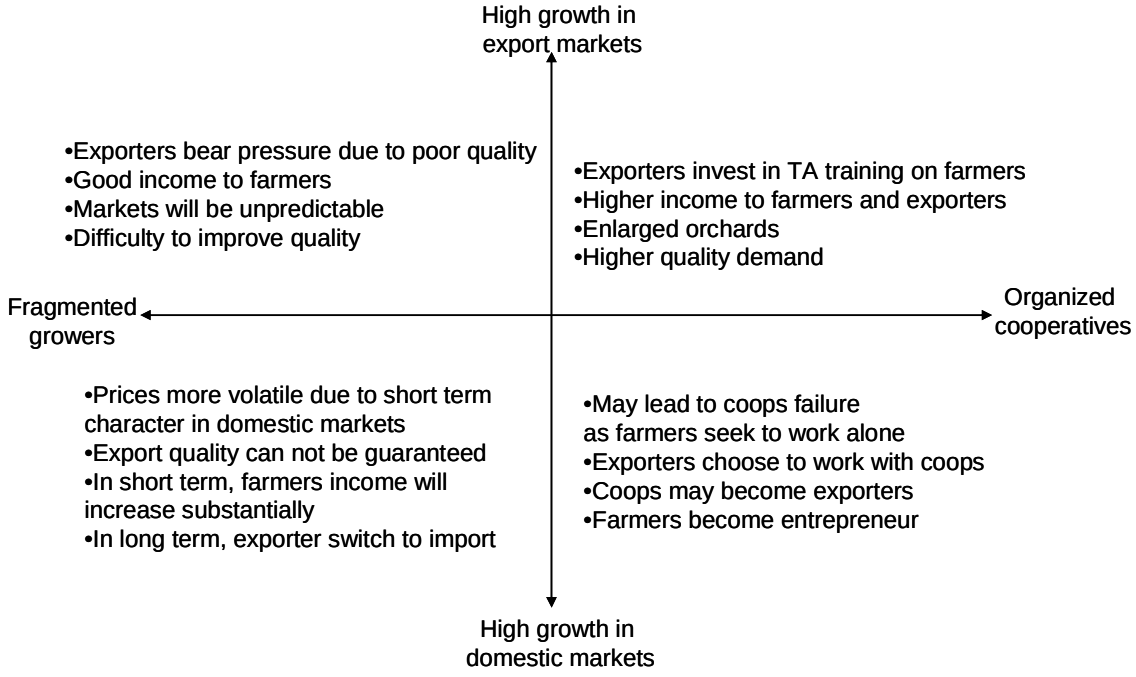


Figure 3. Scenarios for Apple Industry in China.

References:

China Agricultural Statistics Yearbook, 1979-2007.

Crabtree, B.F. and Miller, W. (1992), Doing Qualitative Research, Sage, Newbury Park, CA.

Dolan, C., and Humphrey, J. (2001). Governance and Trade in Fresh Vegetables: The Impact of UK Supermarkets on the African Horticulture Industry. Journal of Development Studies Vol.(37) No.2, pp: 147-176

Dolan, C., Humphrey, J., and Harris-Pascal, C., (1999). Horticulture Commodity Chains: The Impact of the UK Market on the African Fresh Vegetable Industry. Working Paper 96, Institute of Development Studies, University of Sussex.

Dries, L., T. Reardon, and J. Swinnen, (2004), The Rapid Rise of Supermarkets in Central and Eastern Europe: Implications for the Agrifood Sector and Rural Development, Development Policy Review, Vol. (22) No. 5, pp: 525-556.

Elizabeth, M., M. Farina,, and T. Reardon. (2000), Agrifood Grades and Standards in the Extended Mercosur: Their Role in the Changing Agrifood System, American Journal of Agricultural Economics, Vol.(82) No. 2, pp:1170-1176.

FAO [Food and Agriculture Organization of United States], (2008), FAOSTAT, available at: http://faostat.fao.org/

Gellynck, X., and Kűhne, B., 2008, Innovation and Collaboration in Traditional Food Chain Networks. Journal on Chain and Network Science 8(2):121-129.

Gibbon, P. (2003). Value-chain governance, Public Regulation and Entry Barriers in the Global Fresh Fruit and Vegetable Chain into the EU. Development Policy Review, 21 (5-6): 615-625.

Gulati, A., Minot, N., Delgado, C., and Bora, S. (2006). Growth in high-value agriculture in Asia and the emergence of vertical links with farmers. In J. F. M. Swinnen (Ed.), Global supply chains, standards and the poor. Oxford: CABI Publishing.

Hennink, M. M., 2007, International Focus Group Research: A Handbook for the Health and Social Sciences. Cambridge University Press.

Huang, J., Y. Wu, H. Zhi, and S. Rozelle, (2008), Small holder Incomes, Food Safety and Producing, and Marketing China's Fruit, Review of Agricultural Economics, Vol.(30), No. 3, pp: 469-479.

Lin, J.Y., (1987). The Household Responsibility System Reform in China: A Peasant's Institutional Choice. American Journal of Agricultural Economics, May, pp. 410-415.

Lin, J. Y., (1988). The Household Responsibility System Reform in China's Agricultural Reform: A Theoretical and Empirical Study. Economic Development and Culture Change 36, April, s119-s224.

Maertens, M., and J. Swinnen. (2006), Trade, Standards and Poverty: Evidence from Senegal, LICOS discussion paper No. 177, Leuven: LICOS.

Malhotra, N.K., 1999, Marketing Research- An Applied Orientation, Prentice Hall Inc, New Jersey, pp.150-160.

NDRC [National Development and Reform Commission]. (2007). National Agricultural Production Cost and Benefit Material. China Statistics Press, Beijing.

Roy, D., and Thorat, A., (2008), Success in High Value Horticultural Export Markets for the Small Farmers: The Case of Mahagrapes in India. World Development, Vol.36, No.10, pp: 1874-1890.

SBSP [Statistical Bureau of Shandong Province], (2008), Provincial Yearbook of Shandong, Shandong Statistics Press, Jinan, China.

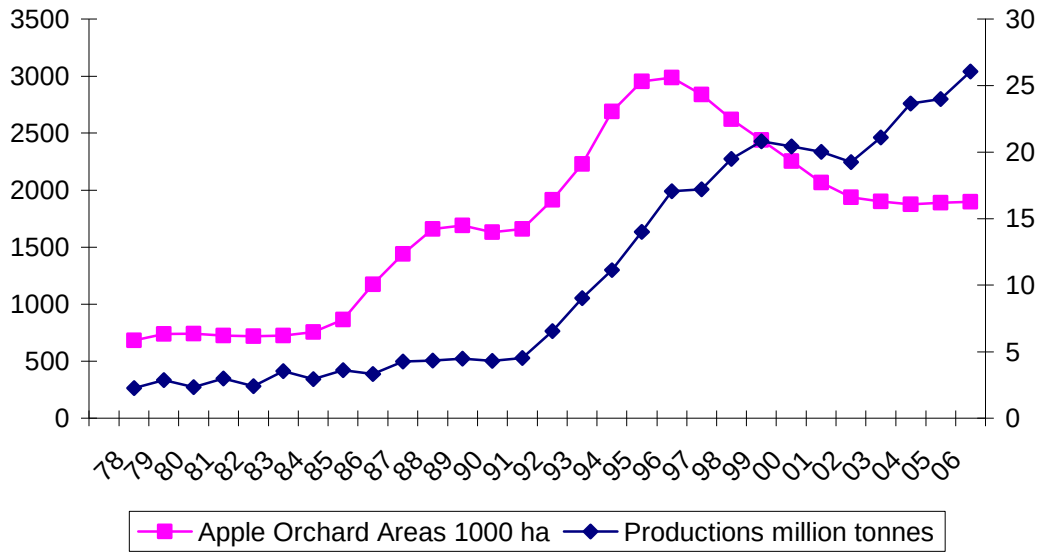
Stokes, D., and Bergin, R., 2006, Methodology or 'Methodolatry'? An Evaluation of Focus Groups and Depth Interviews. Qualitative Market Research: An International Journal, Vol. 9 No. 1, pp.26-37.

UN comtrade, (2007), United Nations Commodity Trade Statistics Database, available at: http://comtrade.un.org/

USDA, (2007). World Markets and Trade: World Apple Situation. Foreign Agricultural Service, May.

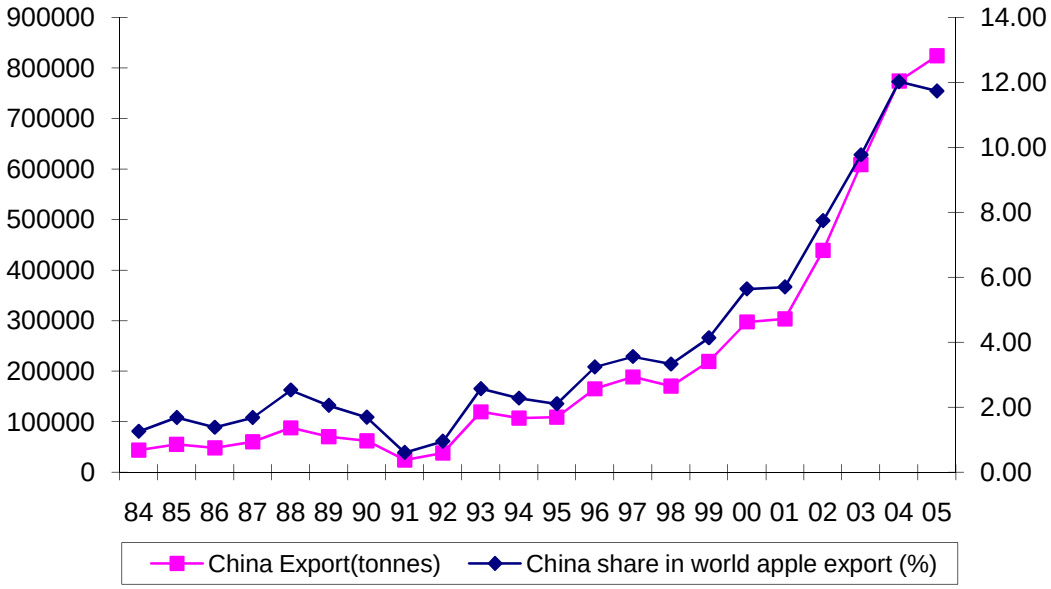
Vermeulen, S. Woodhill, J. Proctor, F. and Delnoye, R. (2008). Chain-wide Learning for Inclusive Agrifood Market Development: a guide to multi-stakeholder processes for linking small-scale producers with modern markets. International Institute for Environment and Development, London, UK, and Wageningen University and Research Centre, Wageningen, the Netherlands.

Webb, J.R. (1995), Understanding and Designing Marketing Research, The Dryden Press, London.



Source: China Agricultural Statistics Yearbook, various years.

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



Source: FAO's Agricultural and Trade Data.

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