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**PRODUCTION COSTS OF PEARS AND APPLES IN  
XINJIANG (CHINA)**

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## **PRODUCTION COST OF PEARS AND APPLES IN XINJIANG (CHINA)**

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and  
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### **Abstract**

China is the most important pear producing country in the world, and one of the most important as far as it concerns apples. Nevertheless, its international role is not so relevant: traded volume in relation to production is relatively small yet growing fast.

Xinjiang is a large and mainly deserted region in northwest China that covers one-sixth of China's land. However, thanks to abundant water resources, good lighting conditions and altitude, this area represents an ideal setting for pomefruit production, and has in fact a very long tradition. Unfortunately, due to a disadvantaged location and a poor economy this province do not attract enough capitals, passing unnoticed despite of its valuable resources. Economic analysis are therefore necessary to assess to which extent this market turns out to be approachable.

The aim of this paper is to describe in detail the situation of the fruit growing industry in Xinjiang, as far as it concerns two important pomefruit varieties: Xiang Li pear, a local and very appreciated variety, and Fuji apple. After locating the most vocated producing areas for both species and identifying the productive standards, we then proceed on counting up the production costs, using a well-established methodology adapted to the particular situation.

The target of the analysis are small and mid-size farms, since they represent the vast majority of the orchards of the area.

The costs aggregates are: base orchard management cost (BOMC), farm full cost (FFC) and total production cost (TPC). These aggregates group together costs related to similar productive factors.

The picture of the situation outlined by this survey is that of a marginal area, where however fruit growing, compared to other agricultural activities, grants a good income.

It also emerges that fruit growers in Xinjiang (and in China), are hardly coming out of a situation of general backwardness, striving to adapt to a larger business mainly through exportation to other provinces. Farms are however mainly familiar and small, and only a few big local enterprises seem to possess the right requirements to give local production the right impetus to reach successfully outside markets.

## 1. Introduction

After the opening to the world market the interest towards China, both as producer or as destination market, has grown rapidly, and it's likely that Italian and European companies are willing to investigate the possibility to build commercial relationships with this country. The coastal area still remains the principal centre for pomefruit production, and even if some internal areas also meet the right requirements to successfully attract capitals, they almost pass unnoticed. The aim of this paper is to fill this basic information lack about the potentials of two pomefruit varieties grown in Xinjiang and whose role as profitable exportable products might be greatly improved.

Xiang Li, also know as fragrant pear, is a typical Xinjiang pear, very appreciated in China but almost unknown abroad. Fuji is instead one of the most traded apple variety, but despite of the high quality level of Xinjiang' production, only a little percentage takes this way.

The main obstacle is the distance from the principal Chinese seaports, but nevertheless this area represents a worthwhile supply basin for traders interested in alternative markets.

The present paper aims at:

- locating the most vocated producing areas for both Fuji apple and Xiang Li pear in Xinjiang province;
- identifying productive standards;
- counting up production costs;

This survey is mainly focused on production costs and productive standards, and to have proof of the real productive situation a direct survey on the field was required. The main data has been therefore acquired through questionnaires to farmers and local technicians, while secondary information through bibliography and internet.

The areas of the survey are Aksu (for Fuji apple) and Kuorla (for Xiang li pear); they have been located under the guidance of the XJAU (Xinjiang Agricultural University), while the interviews have been carried out thanks to the support provided by local prefectures.

The paper is structured as follows:

- Chapter 1: Introduction. Brief outline on motivations and goals of the paper.
- Chapter 2: The situation of China. Overview of the overall economic background in China and specific issues concerning the pomefruit markets.
- Chapter 3: Materials and methods. Description of the procedure followed to process the data acquired in the survey;
- Results (chapter 4): analysis of the processed data and detailed description of productive standards and costs;
- Conclusions (chapter 5): interpretation of the results and glance on the future developments;

## 2. The situation in China

### 2.1. Economic background

#### 2.1.1. The farmer's situation <sup>1</sup>

Since the opening and reform in 1978, in the planned economy system, China's agriculture relied on Rural Household's Operation (RHO) as the typical operation mode. In

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<sup>1</sup> The information provided below mainly come from: Zhu, 2004, and Luo, 2004.

this period the rural households were restricted to the specific production chain in agriculture, and didn't enjoy any degree of autonomy. The land was equally divided among the farmers. The agricultural production, the processing and selling of the agricultural products, as well as the provision of the agricultural supply, were separated from each other, and the entire agriculture production was run by the government.

When the market economy slowly stepped in, the RHO began to appear based on the allocation of resources by the market, and gradually took control of some of the activities previously carried out by the government, such as taking charge of the state-owned land (which is rent for 30 years, and can be now subcontracted, transferred, swapped, leased etc.), purchasing the raw materials, inputting the labor, producing the agricultural goods and selling them. The replacement of centralized people's commune system by decentralized family contracting system let farmers to take choices on his own interest. Nevertheless, due to the long term-planned economy system, they didn't develop the necessary knowledge to enter competitively in the market. The outstanding problems in the development of contemporary agriculture are the following:

- high number of small and separate RHO. Chinese traditional agriculture has always been characterized by closed-door and self-development, and all activities were limited within villages separated from the rest of the world. The result is a considerable lack of knowledge of the marketing rules and techniques, and a scarce entrepreneurial initiative due to cultural factors, i.e. the passive way of thinking to which farmers were educated. However, the concentration of land in holdings to realize economies of scale has already begun, and although individual company efforts are critical, Chinese grower associations at provincial or local level, like Xinjiang "Fragrant" Pears and Yantai "Red Fuji Apples", have a good capacity to act as intermediaries between growers, government, and retailers. This makes easier for the fruit produce to reach domestic retailers, consumers, and even overseas markets. Even if some receive local government support, there is no formal support from both central and provincial government ;
- Inadequate rural infrastructures. The input in agriculture is too little, which prevents innovation. Agriculture investments have low profits and high risks, for production is uneven and hard to predict, and don't attract enough investments, thus resulting in decreasing productivity. Even if farmers are the largest social group in China (they represent about 70% of total population), they hold less than 30% of total financial assets, and capital investment into agriculture is lower than 10% of total investment;
- Slow technological transfer and low farmers' education level. 60% to 80% of the workforce used in modern agriculture comes from the development of science and technology, and in China this percentage is lower than 40%. Moreover, since the application of any advanced tool is highly constrained by educational level, the growth rate remains far below its potential;
- Agricultural productivity has greatly improved, but thanks to increasing harvests some of the rural products are now difficult to sell, thus witnessing the mismatch with the market demand;
- Slow rise in the farmers' income. Due to the labor surplus it's difficult to increase the income integration by non-agricultural job, and although farmer's income has increased remarkably and their living standards evidently improved, a huge gap between farmers' and city workers' wages still exists;

#### *2.1.2. The processing industry situation <sup>2</sup>*

The backwardness in the production system is however extended also to the processing industry, and compared to the abroad level the whole level of the Chinese

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<sup>2</sup> The information provided below mainly come from: Wang et al., 2003.

processing equipment is lagged behind 20-25 years (Dai, 2001). The main factors hindering the development are:

- The shortage of the most profitable agricultural product species,
- The poor integration among all the stages of the production chain and lack of a link between the processing industry and the raw materials provision;
- The agricultural product processing is inclined to the simple processing, while the deep processing is little;
- The agri-business enterprises in the processing industry are numerous but too small in scale;
- The low technological level of the equipments;

The inherent reasons why Chinese agriculture falls behind are either insufficient policy aids, since the market system can't spontaneously push enterprises to innovation on their own initiative, or knowledge innovation (above all in the after-production) in order to keep pace with the world developed countries. Which means that modern technology and new management solutions are the basic roads to realize the breakthrough and stride out the present transition period.

### 2.1.3. Market issues

With the policy objective of maintaining a stable growth, the central government has taken stabilization measures aiming at moderating investment growth. As a result of the tightening measures, the growth of real GDP slowed down in the second half of 2004, resulting in a 9.5% growth for the whole year. In the first half of 2005, the economy continued to grow by 9.5%, supported by both investment and consumption<sup>3</sup>. The main economic indicators are reported in Table 1.

**Table 1 – Major Economic indicators for China, 2005**

	2004		2005 (June)	
	Value	Growth %	Value	Growth %
Gross domestic Production (RMB bn)	13651.5	9.5	6742.2	9.5
Urban per capita disposable income (RMB)	9422	7.7	5374	9.5
Rural per capita disposable income (RMB)	2936	6.8	1586	12.5
Fixed-assets investments (RMB bn)	5862.0	27.6	3463.7	27.2
Exports (USD bn)	593.4	35.4	407.9	32.0
Imports (USD bn)	561.4	36.0	357.8	13.7

Source: National bureau of Statistics, Ministry of Commerce and General Administration of Customs.

Like many developing countries, China has been adopting a multiple foreign currency exchange rate regime in its attempt maintain control and order while liberalizing transactions in the sphere of trade and non-trade flows. From a very rigid regime in 1979, China has now advanced to a more flexible system under which the official rate, the swap rate, and the "free" market rate coexist. At the present time the Chinese government controls both the demand and supply of foreign currency, which means that the exchange rate is determined by the central bank. While the exchange rate remained stable at 8.30 RMB/ USD after 1994, domestic inflation fell steadily, reflecting that the domestic price level is bound to the exchange rate. On 21 July 2005 China reformed its exchange rate regime and re-valued the RMB exchange rate against the US dollar to 8.11.

The major worry about RMB appreciation is its negative effects on China's import and export trade. Nevertheless the past experience of 1988, where appreciation of RMB and export expansion coexisted, shows the potential benefits of more flexible prices.

<sup>3</sup> Hong Kong Trade Development Council, 2005

A further factor that can pose a threat to the trade relationship between China and Europe is represented by the opening of the EU to 10 new countries of the mid-eastern area (Czech, Slovakia, Hungary, Malta, Poland, Slovenia, Estonia, Latvia, Lithuania). The export structure of mid-eastern European countries is similar to that of China, thus China will face enormous competition from them in primary and low value-added industries, such as agriculture. Moreover, since the EU is investing more in the eastern Europe countries, it will reduce the investment in China. The mid-eastern European countries are likely to become an area of attraction to the investment more suitable than China, even because of the financial assistance provided by the EU to carry out reforms, infrastructure renewal and agricultural and rural development, thus resulting in a worsening of the economic relationships between the two blocks.

At the same time, in order to protect the weaker economy of the mid-eastern European countries, new trade protectionism, such as "trade technical barriers" or "environment protection clauses", may arise and the export of China to the EU will face more obstacles. The quality of product embodying the level of technology, and the system of authentication and certification are important deciding factors. The whole level of China has 2-3 decades of difference compared with developed countries, so the main obstacles in agriculture are represented by the presence of pesticide residues, the propagation quarantine criteria and by cleanness in the process production. Unfortunately at the moment no large capital is available to provide with "green allowance", so different countermeasures have to be found (Ma and Zhao, 2005).

## **2.2. Apples and pears situation**

### *2.2.1. Fruit production*

In 2002, the total production of fruit in China was 63.36 MT (over 9.2 MHa), accounting for 19% of world fruit production. The top 5 fruits produced in China are apples, citrus, pears, lychee and peaches.

According to government statistics, only 30% of China's total fruit production is of high quality, while 50% is considered ordinary quality and the remaining fruit does not meet quality requirements. The government has, and is still developing standards and regulations for some fruit in order to make quality and safety measures more uniform (Lu, 2004).

Provincial and City wholesale markets in China play a pivotal role in the distribution of locally produced fruit. Instead of passing through wholesale markets for nation-wide fruit distribution, fruits are transported from production area through Provincial and City wholesale markets to lower levels or domestic retailers and vendors locally (Lu, 2004).

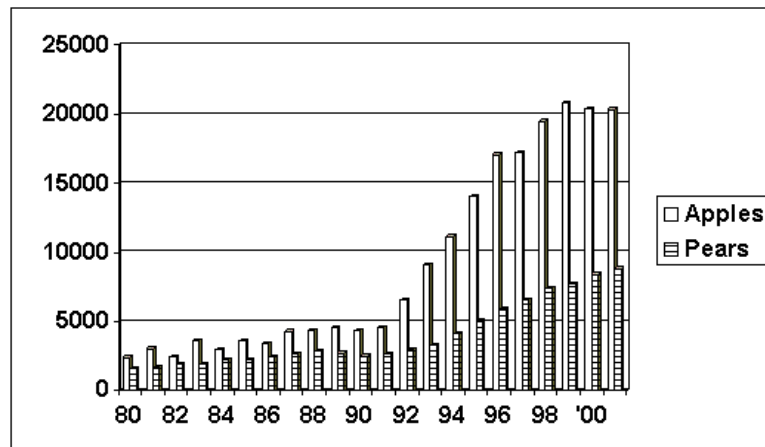
### *2.2.2. Production*

China has a long tradition in apples and pears growing. Even if official policy favours grain production, planted area and production of both apples and pears increased dramatically between 1960 and 1980. By 1980, China was the world's largest pear producer with 1.6 million metric tons (MMT) and among the largest apple producers (2.4 MMT). However, in the late 1970s Chinese farmers were allowed to take their decisions independently, and the role of the state was gradually reduced. Those farmers who could, turned heavily to higher-value fruits and vegetables. Furthermore, the central government called for reducing agricultural taxes and the speciality agricultural product tax in order to stimulate rural income growth.

The results of this policy change were astonishing. There were huge spurts in plantings of apples and pears in the early 1980s, and again in the early 1990s. A few years later, there were huge surges in production of apples and pears (Figure 1). Between 1989-91 and 1999, Chinese pear production increased by 230 % to 8.6 MMT, more than half of



**Figure 1 - Pears and apples increase in orchards number from 1980 to 2001 (1000 metric tons)**



Source: O'Rourke, 2002

the world total. Chinese apple production increased by 325 % to over 20 MMT, one third of the world total (O'Rourke, 2001).

China is now the world's largest producer and consumer of apples and pears, and accounts for 50% of world apple production and 65% of world pear production. Yet, traded volume in relation to production is relatively small but is growing. In 2003, China exported approximately 3% of its apples and pears (the United States exported 13% of its apples and 19% of its pears).

Thanks to higher consumer income, improved distribution, and increased production, urban and rural fruit consumption has grown dramatically over the past several years, reaching 56.52 kg per urban household in 2002, 37.5% more of the 1990 levels of 41.11 kg. Fresh fruits remain normal goods for Chinese consumers; even the lowest-income urban households consume an average 32 kg of fresh fruits annually while the more affluent households consume an average 75 kg/year. Per capita nationwide urban household expenditure on fresh fruits averaged RMB 168 amounting to 2.8% of living cost and 7.4% of food expenses.

### 2.2.3. Trade

China and other Asian nations have begun implementation of the "Early Harvest" program of their Free Trade Agreement, which slashed or eliminated tariffs on a variety of goods including fruit. Consequently China's exports of deciduous fruit and imports of many tropical fruits have risen rapidly. Most exported fresh fruits leave China from northern ports near production areas for neighboring countries like Russia or Southeast Asia, but access to new markets in Europe along with North and South America are being negotiated. Some Chinese exporters have partnerships with foreign investors.

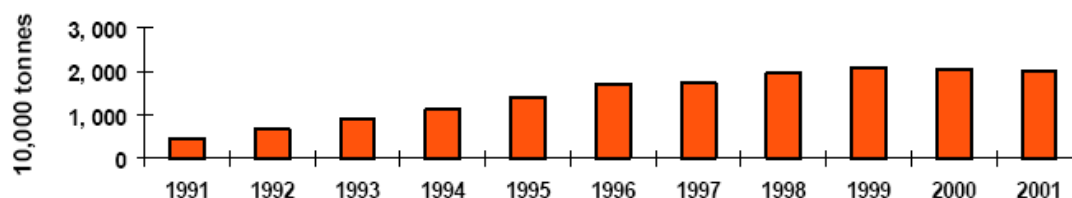
With China's accession into the World Trade Organization (WTO) in 2001, the export market shows much promise for Chinese farmers. Such positive development is undeniably necessary which will have a significant impact on the domestic market which will rapidly become much better organized and sophisticated in the coming years (Lu, 2004).

Nearly all imported deciduous fruit enter the country via ports in South China, much of it transhipped through Hong Kong. However, some traders express an interest in being able to import directly to northern ports, but they recognize it will depend on costs (Branson et al., 2004).

2.2.4. *China outlook for apples*

After a growth period after 1991, the apples production level tend to remain stable (Figure 2). According to China's National State Statistics Bureau, 2003 apple production was 21.1 MMT -20 MMT according to FAO estimates- on 1.9 million hectares (MHa).

**Figure 2 - Apples production in China, 1991-2001**



Source: China annual books, 2002

The Fuji apple is the most widely grown variety in China. During 2003, Red Fuji apples accounted for approximately 61% of the apple harvest. Apples are grown in most Chinese provinces, but the production is mainly concentrated in the northern provinces: Shandong, Shaanxi, Henan, Hebei, Shanxi, Liaoning and Gansu. These six provinces account for 86% of planted area and 90% of production. In 2003, Shaanxi apple planted area surpassed Shandong for the first time in China's modern history.

Xinjiang province ranks 9<sup>th</sup> in the list, and it accounts for 1% of the overall national apple production (Table 2).

**Table 2 - 1999-2003 China historical apple production table by province**

	1999		2000		2001		2002		2003		% var 99-03	
	1000 ha	1000 MT	1000 ha	1000 MT	1000 ha	1000 MT	1000 ha	1000 MT	1000 ha	1000 MT	1000 ha	1000 MT
Shandong	498	6433	444	6477	398	6164	369	5000	357	6119	-28,28	-4,88
Shaanxi	414	3993	395	3886	374	3913	369	3922	402	4618	-2,93	15,66
Henan	241	2428	207	2389	180	2524	168	2604	165	2510	-31,65	3,37
Hebei	341	1871	328	1806	317	1845	288	1966	276	2003	-18,98	7,03
Shanxi	188	1748	178	1630	165	1552	158	1724	154	1802	-17,90	3,06
Liaoning	209	1470	195	1231	162	1135	132	1005	115	1090	-44,93	-25,85
Gansu	195	629	168	691	166	724	164	776	168	830	-14,10	31,94
Jiangsu	64	680	50	695	48	680	47	615	39	495	-38,84	-27,22
Xinjiang	36	247	35	300	31	271	30	250	28	263	-23,20	6,72
Sichuan	29	187	29	202	27	194	26	207	27	225	-6,62	20,66
Anhui	25	309	24	302	21	260	18	297	17	221	-30,88	-28,27
Jilin	19	115	24	101	22	97	26	168	25	190	34,36	65,90
Others	182	694	178	722	156	657	143	708	128	636	-29,38	-8,27
Total	2439	20802	2254	20431	2066	20015	1938	19241	1901	21002	-22,08	0,96

Source: China agricultural yearbooks.

Apple yields are improving, but are still relatively low when compared to both the United States and the European Union. Based on information reported to the FAO, Chinese yields are currently some 60% lower than both the US and the EU on a per acre basis. As China implements more effective production methods, production of apples, even if on less acreage, should continue to rise.

The government allows market forces to determine both prices and production. Unlikely to arable crops, producers do not have to turn over a quota of their production to the government, but a production tax is imposed at the rate of 12 to 13% – collected at

the county level since the early 1990's. The free market policy in production has been in effect since 1984 and helped making China the main producer of apples in the world. Apple growers are able to earn higher incomes than Chinese farmers who focus on grains/oilseeds where domestic regulations apply (Skorburg, 2001).

China's apple industry plans to increase exports from current levels to 1.25 MMT by 2008, which would account for nearly one-fourth of global apple trade. There is no official list of approved export destinations for Chinese deciduous fruits available, but as export statistics show, China has been successful in its negotiations with other countries to gain new access or expanded varieties access.

Imports sales of apples from year 2003 to 2004 increased by value while fell by volume. The United States, Chile and New Zealand remain the primary apple suppliers to China (Table 3). Nearly 90% of China's apple imports enter the country through Shenzhen and Guangzhou ports (Guangdong Province).

**Table 3 - 2003 Import-export trade matrix for fresh apples in China**

Import	Metric Tons	Export	Metric Tons	Export	Metric Tons
U.S.	18.517	Russia	111.670	Kazakhstan	38.097
Chile	11.897	Philippines	72.640	Singapore	29.789
New Zealand	6.293	Indonesia	69.364	The Netherlands	29.396
Vietnam	112	Vietnam	67.476	Hong Kong	27.532
North Korea	19	Thailand	63.071	Others not listed	149.220
Japan	15	Malaysia	50.007		
Grand Total	36853			Grand Total	708.406

Source: Branson et al., 2004.

In the same period apple exports grew to nearly 250 million USD, up sharply from previous year exports of 173 million USD. China's apple export season is slowly expanding as changing fruit cultivars allow for an extended harvest season and improved cold storage and controlled atmosphere storage development allows for fruit to be better-maintained over a longer period. Although principal export destinations remain Southeast Asia and Russia, increased apple exports to the EU (the Netherlands, Spain, the United Kingdom, Italy, and France) appear to be taking hold. Although China produces many apple cultivars across a number of provinces, exports primarily depart China from Qingdao in Shandong province (in 2003/04 exports of 165 million USD). Traders indicate Fuji apples are the primary variety exported, but with more desirable cultivars and better infrastructure developing in the country, many expect to see exports increase from Liaoning and Shaanxi (Figure 3).

It's likely that the Netherlands import apples supplying others European countries.

Chinese domestic consumption has tripled over the past 20 years, keeping up with a 3-fold increase in per capita income. Fresh apples are the most widely consumed fruit in China. Fruit is eaten at most meals and also viewed as a popular snack – especially apples and grapes. China exports both fresh apples and apple juice concentrate, but these figures are dwarfed by domestic consumption.

#### 2.2.5. China outlook for Asian pears

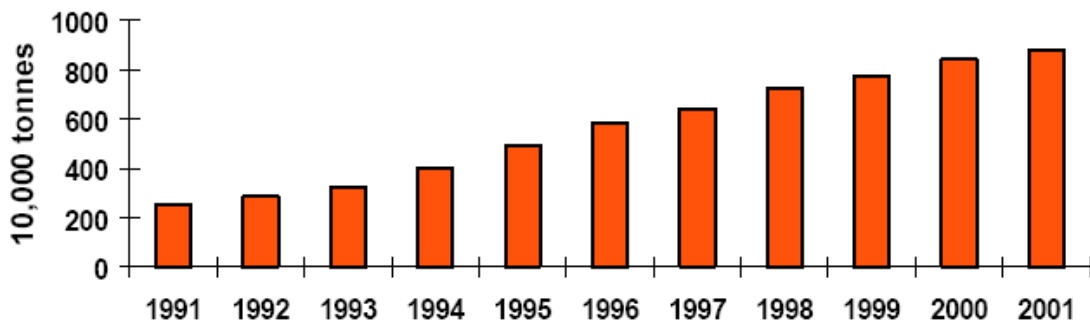
According to China's National State Statistics Bureau, starting from 1991 pear production level shows a steadily growing trend (Figure 4). In 2003, pear production was 9.8 MMT over 1.1 MHa. These statistics refer to both Asian (nashi) and non-Asian pears produced in China.

**Figure 3 - Import-export map for fresh apples in China**



Source: Branson et al., 2004.

**Figure 4 - Pear production in China, 1991-2001**



Source: China annual books, 2002

As for the 9.8 MMT 2003 pear harvest, Ya Pears amounted to 2.2 MMT (22% of total harvest) and Snow Pears amounted to 1.7 MMT (17% of total harvest). Also pear growers are turning their attention to quality graft trees. Other varieties of pears in China are Crystal pears, Crisp pears, Duck pears and, of course, Fragrant pears (Xiang li).

Pear production is mainly concentrated in Hebei and Shandong, accounting for nearly 30% of area and 40% of production.

Xinjiang province ranks 11<sup>th</sup>, and it accounts for 3% of the overall national production (Table 4).

**Table 4 - 1999-2003 China historical pear production table by province**

	1999		2000		2001		2002		2003		% var 99-03	
	1000 ha	1000 MT	1000 ha	1000 MT	1000 ha	1000 MT	1000 ha	1000 MT	1000 ha	1000 MT	1000 ha	1000 MT
Hebei	222	2510	219	2552	212	2446	212	2663	213	2821	-3,92	12,39
Shandong	74	858	60	911	63	961	64	830	74	983	0,82	14,54
Shaanxi	52	432	56	458	58	451	57	460	57	690	10,17	59,55
Anhui	31	493	34	616	35	672	37	767	37	583	17,17	18,39
Hubei	54	542	56	633	53	677	51	677	41	564	-24,43	4,07
Sichuan	34	272	48	344	52	395	62	470	71	548	108,19	101,32
Liaoning	83	425	86	455	88	510	86	413	86	516	3,64	21,50
Jiangsu	38	361	39	390	40	463	44	519	44	502	15,71	39,02
Henan	29	263	31	333	33	396	36	480	37	433	27,56	64,79
Gansu	57	222	55	246	52	266	51	266	51	286	-10,99	28,83
Xinjiang	29	198	34	195	43	227	46	309	48	250	66,78	25,93
Zhejiang	13	114	17	148	19	189	22	148	24	244	88,28	113,79
Others	262	1052	281	1130	280	1144	277	1307	279	1379	6,63	31,10
Total	977	7742	1015	8412	1026	8796	1042	9309	1062	9798	8,67	26,56

Source: China agricultural yearbooks.

**Table 5 - 2003 Import-export trade matrix for fresh pears in China**

Import	Metric Tons	Export	Metric Tons	Export	Metric Tons
New Zealand	498	Indonesia	42715	Thailand	19642
		Malaysia	42715	Singapore	15815
		Russia	36500	Philippines	10676
		Hong Kong	34069	Canada	8735
		Vietnam	28970	The Netherlands	8459
		U.S.	3730		
Grand Total	498	Others not listed	34652	Grand Total	303169

Source: Branson et al., 2004.

China imports small volumes of pears compared to its annual production of over 9 MMT. Pear imports entering China are almost all from New Zealand and enter the country via Guangzhou or Shenzhen in South China from January to June.

China's pear exports (Table 5) did not expand as quickly as apple exports during 2003/04, but remain an important and growing segment of China's fruit trading industry. The suspension of exports to the United States and other countries following the December 2004 detection of *Alternaria* fungus in Ya Pears contributed to the slow growth. In 2003/04 pear exports reached 85 million USD, up from 69 million USD in 2002/03.

Primary destination remains Southeast Asia. Ya and Fragrant Pear exports to Canada were strong, but stopped by a finding of *Alternaria*. The greatest export growth was to Indonesia; sales increased from 8 million to 17 million USD over the course of the year. A large portion of the export growth was in Fragrant Pears, and "Other" pears aside from Ya and Snow Flake Pears. Exports primarily leave China from the northern ports of Tianjin and Qingdao, but large increases from South China's port of Shenzhen appeared during the last year (Figure 5).

**Figure 5 - Import-export map for fresh pears in China**



Source: Branson et al., 2004.

**2.3. Interested areas**

Xinjiang lies in northwest China, bordering on Gansu and Qinghai provinces to the southeast and the Tibet Autonomous Region to the south, sharing a 5000 km border with 8 countries. With its typical continental climate, the annual average temperature of Xinjiang reaches 10.3°C and has an average rainfall of 156.1 mm. Xinjiang topography is quite particular: the Tianshan Mountains spread in the middle of Xinjiang, dividing the region into two parts and forming two enormous basins, the Tarim basin and the Junggar Basin.



The provinces interested by this survey are those of Korla (Kuerle) and Aksu.

Korla prefecture occupies an area of 478,700 km<sup>2</sup> in the southern part of Xinjiang. Situated on the northern fringe of the Tarim Basin, at the southern foot of the Tianshan Mountains, Korla lies at an average elevation of 933.2 m. The continental climate is dry and sunny, with light rainfall, a high evaporation rate and a great temperature range between day and night. The city of Korla has an

annual average temperature of 11.4 °C and an annual precipitation of 50 mm. The prefecture has 186,667 Ha of forested land. There are over 40 rivers, which have an annual runoff of 8.92 billion m<sup>3</sup>. Besides dried-up Lop Nur, there are natural lakes with a total water surface of 2210 km<sup>2</sup>.

Aksu is located in southwestern Xinjiang on the southern side of Tianshan Mountain and northern brim of Taklamakan Desert. The prefecture stretches for 132,500 km<sup>2</sup>. The abundant water resources provide the right basis for the development of agriculture. There are 4098 km<sup>2</sup> of glaciers, 215.4 billion m<sup>3</sup> of water reserves, 16 rivers of various sizes, over 60 springs, with a total annual runoff of 12.7 billion m<sup>3</sup> (including 4.8 billion m<sup>3</sup> of water from abroad). The underground water supply is abundant and easy to reach. The exploitable underground water resource in the plain area of the region is 5.126 billion m<sup>3</sup>.

### **3. Materials and methods**

#### ***3.1. Data collection***

The species examined are the Fuji apple and Xiang Li (fragrant pear).

The costing information here provided comes from a pool of 20 interviews: 10 carried out in the area of Kuorla (all concerning Xiang Li pear), 10 in the area of Aksu (1 for Xiang Li pear and 9 for Fuji apple).

Since this research aims at representing the average situation in the inspected areas as far as it concerns fruit production, targets of the interviews have been mainly small and mid-size farms, chosen randomly in the vicinity of the cities (up to 20 km).

Two more interviews have been directed to big local producers whose activity also includes international import-export, and one to the owner of a cold storage warehouse, but due to the reluctance to share costing information nothing but a faint outline about their activity has been sketched.

The survey has been carried out using a questionnaire basically divided into three parts: the first meant to acquire general information about the farm (orchard size, species grown, production, machines used etc.), the second concerning the problems farmers have to face (diseases, logistic etc.) and their role within the fruit supply chain (to whom they sell the product, when etc.), the third dealing with agronomic operations costing (irrigation, pruning, treatments etc.).

The data have been entered in Excel datasheets and then statistically processed.

#### ***3.2. Cost calculation technique***

The cost calculation has been carried out considering the most important cost headings, and all the information here displayed result from the data acquired through the questionnaires.

The only exception is represented by the heading "depreciation of the installations", which has been calculated according to the report of local technicians. The annual depreciation has been obtained adding the annual expenses for all the years preceding full production divided by 40 years for Xiang li pear, and 25 for Fuji apple (which are the expected durations of the orchards).

"Land operations" also include plant maintenance, since the answers given by the farmers didn't make possible to draw a distinction between the two headings.

Some information (like land operations) are identical for both species, since no significant variation has been reported in the farming technique.

Interests have been calculated considering a rate of 5% (the one in use in the areas).

### **3.3. Cost aggregates**

Costs have been aggregated in the following three headings:

- Base orchard management cost (direct cost) is what the farmer paid cash to produce that good (raw materials, labor etc.). This indicator is useful to compare different modes of production within the same production area;
- Farm full cost adds to the base tillage cost all the expenses that yet affecting the overall outcome cannot be attributed to a single operation (common costs), and the annual share of previously paid costs designed to last for more than a single productive cycle (depreciation). That is all the expenses that the farmer's enterprise have to pay for the fruit growing activity;
- Total production cost finally includes figurative costs, namely these expenses that do not appear in the registers for they refer to the productive factors provided by the farmer and his family members. These are called opportunity costs, to mean the costs of the opportunities foregone (and the benefits that could be received from these opportunities) by using these factors in that specific way.

All costs are expressed in RMB. The exchange rate is 1 EUR to 10.49 RMB (valid at the date of the end of survey, that is to say 05/06/2005).

## **4. Results**

### **4.1. General information**

The most common pathogens found in the inspected areas have been insects, especially caterpillars; however, one third of the farmers didn't report any problem of sort.

It also emerged from the interviews that products are often difficult to sell, but farmers do not complain about the selling price, nor they seem willing to change crop. On the other hand some grumbles concerns the backwardness of the technology used, and these remarks are supported by the low level of mechanization.

No farmer provides for the transportation, since all buyers fetch the product directly from the orchard. Most of the growers sell their fruit to local retail dealers, but a significant percentage (30%) sell to other province's traders. Only a single farmer, among those interviewed, tried to sell his products in another province by himself, but for three years in a row expenses overcame profits thus resulting in a net loss. It usually takes from 2 weeks to 1 month to sell off the fruit.

Packaging operations are not performed by farmers, and they take place within conditioning plants, and are all performed manually. The standard wage for manual labor is to 25 to 30 RMB per day, but for operations that require a certain skill (pruning) it can reach 45 -50 RMB.

### **4.2. Apple orchards technological level**

For the Fuji apple the range of possible scion is wide, and many species as "Guo guan", yellow and red "RMB shuai" can be equally found. "Gala", red "RMB shuai" and "Xing hong xing" are the most common pollinating species, and usually they represent 20% of the trees.

The tree shape is fuse.

Compared to pear orchards, apple orchards are bigger, and the average size is 2.9 hectares (43 Mu). The plantation thickness too is slightly higher (5 x 4.3 m, that is 450 plants every hectare).

A median value of 6 years are needed to achieve a satisfactory production, and the average orchard age in the inspected farms was 13.8 years.

The average production is about 40-45 tons per hectare.



Pruning is generally executed in winter and summertime, and only sometimes also in spring. No hard pruning to develop a precise structural framework is currently made.

It's likely that tractors and mechanical help is more widespread among apple growers rather than pear growers due to bigger size of the farms.

**4.3. Pear orchards technological level**

The most used graft for the fragrant pear is the "du" pear (it lends a good resistance to cold and keeps the vegetative growth down), while the pollinating species are principally the "dang shang" pear and "ba" pear (the ratio is from 1 to 10 to 1 to 12).

The most widespread tree shape is free palmette.

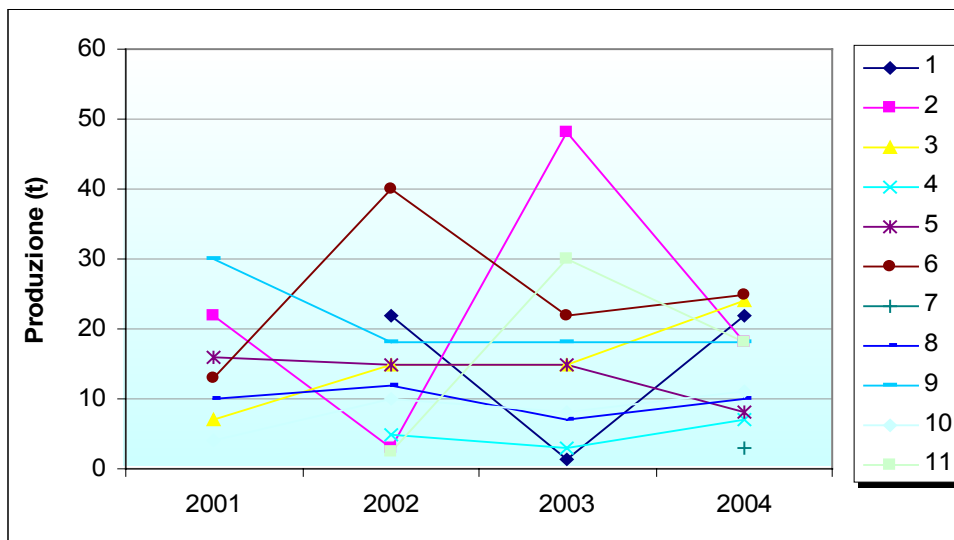
The average orchard size is of about 1 hectare (15 Mu), and the plantation thickness is rather low (5.6 x 4.2 m, that is 420 plants every hectare).

Usually 4 to 5 years are necessary to reach full production, and even if the average orchard age is under 20 years (18.6), trees can live and remain productive up to 90 years.

The production per hectare ranges from 14 to 17 tons, but once each 4-5 years it falls dramatically. Figure 1 displays the trend for 2001 to 2004.

Tree guards are often placed around the trunk to protect the trunk from vertebrate and to prevent insects from reaching the upper part of the plant.

**Figure 1 – Unsteadiness in pear production from 2001 to 2004**



Source: survey data. Each line shows the productive trend for one of the interviewed farms.

Another factor that affects the production level is the use of mechanization. Nearly one third of the farmers don't use any machine (either tractors or crop sprayers), and even among those who resort to mechanization the use of the machines, in terms of hours each year, is often very low.

**Table 1 – Pear and Apple orchards features**

Cultivar	Average surface area	Graft	Tree shape	Plants /ha	Average years to reach full production	Average orchard age
Xiang li pear	1.03 ha	Du li	Free palmette	424	6	18.6
Fuji apple	2.89 ha	Guo guan, yuan shuai	fuse	451	4-5	13.8

Source: survey data.

#### 4.4. Production costs

In the following table the average annual expenses (per hectare and Kg) for Xiang Li pear and Fuji apple are displayed.

**Table 2 – Xiang Li pear and Fuji apple production costs**

	XIANG LI PEAR			FUJI APPLE		
	RMB/ha	RMB/kg	%	RMB/ha	RMB/kg	%
1. Raw materials	11915	0.76	34.9%	12166	0.27	34.0%
fertilizers <sup>a</sup>	5463	0.35	16.0%	5463	0.12	15.3%
herbicides and pesticides	1470	0.09	4.3%	1470	0.03	4.1%
irrigation water <sup>b</sup>	4379	0.28	12.8%	4379	0.10	12.2%
energetic costs	604	0.04	1.8%	854	0.02	2.4%
2. External labor for:	11343	0.72	33.2%	12529	0.28	35.0%
land operations	3599	0.23	10.5%	3599	0.08	10.1%
thinning	554	0.04	1.6%	1490	0.03	4.2%
weed killing	198	0.01	0.6%	240	0.01	0.7%
fertilization	495	0.03	1.4%	1554	0.03	4.3%
irrigation	283	0.02	0.8%	117	0.00	0.3%
pruning	1086	0.07	3.2%	2178	0.05	6.1%
picking	4869	0.31	14.3%	3103	0.07	8.7%
plant protection	258	0.02	0.8%	250	0.01	0.7%
3. Insurance	0	0.00	0.0%	0	0.00	0.0%
4. land use cost <sup>c</sup>	360	0.02	1.1%	360	0.01	1.0%
<b>BASE ORCHARD MANAGEMENT COST (BOMC)</b>	<b>23619</b>	<b>1.50</b>	<b>69.2%</b>	<b>25055</b>	<b>0.56</b>	<b>70.1%</b>
5. Calculated costs	2406	0.15	7.1%	3359	0.08	9.4%
land capital maint. insurance	315	0.02	0.9%	315	0.01	0.9%
machines maint. depr. insurance	623	0.04	1.8%	535	0.01	1.5%
Depreciation of the orchard	1468	0.09	4.3%	2509	0.06	7.0%
<b>FARM FULL COST (FFC)</b>	<b>26025</b>	<b>1.65</b>	<b>76.3%</b>	<b>28414</b>	<b>0.64</b>	<b>79.4%</b>
6. Figurative costs:	8091	0.51	23.7%	7352	0.16	20.6%
family labor	4753	0.30	13.9%	3500	0.08	9.8%
management	210	0.01	0.6%	210	0.00	0.6%
interest on imprest capital	614	0.04	1.8%	690	0.02	1.9%
interests on fitting operations	2202	0.14	6.5%	2823	0.06	7.9%
interests on machine equipments	313	0.02	0.9%	129	0.00	0.4%
<b>TOTAL PRODUCTION COST (TPC)</b>	<b>34116</b>	<b>2.16</b>	<b>100.0%</b>	<b>35766</b>	<b>0.80</b>	<b>100.0%</b>

a Among growers who use both, the incidence of manure and chemical fertilizer on the whole cost is 65% and 35% respectively; however nearly 50% of the growers only use manure.

b The most common cost for water use is 15 RMB for each "Mu" (the Chinese surface unit, which is 1/15 of an hectare), that is 225 RMB for each hectare.

c The state owns the land. The lease has to be renewed after 30 years. Farmers have to pay a fixed sum for each "Mu". This sum used to be 32 RMB (480 RMB per hectare), but the policy-makers aim is to lower it to 16 RMB (240 RMB per hectare).

Source: authors' calculations on survey data

It immediately leaps off the figure that both land operations and, obviously, fruit picking are the more time-consuming operations. Yielding is performed manually and using ladders (trees are usually quite big, and no effort is made to keep their size down to facilitate this operation). Usually picker are divided in two groups, one that detaches the fruit, and the other placing it into 16 kg crates.

The heading “family labor” can be broken down into sub-headings. The following table shows its composition.

**Table 3 - Familiar labor composition**

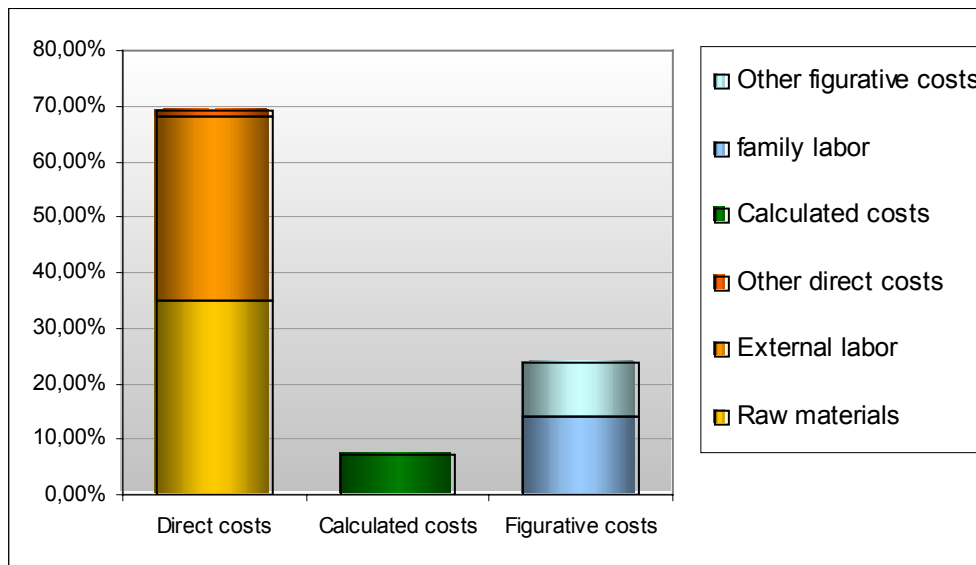
	XIANG LI PEAR			FUJI APPLE		
	RMB/ha	RMB/kg	%	RMB/ha	RMB/kg	%
land operations	825.83	0.05	17.4%	825.83	0.02	23.6%
thinning	730.39	0.05	15.4%	311.05	0.01	8.9%
weed killing	686.57	0.04	14.4%	117.08	0.00	3.3%
fertilization	418.76	0.03	8.8%	241.07	0.01	6.9%
irrigation	73.04	0.00	1.5%	95.04	0.00	2.7%
pruning	800.99	0.05	16.9%	1467.13	0.03	41.9%
plant protection	1217.31	0.08	25.6%	442.39	0.01	12.6%
<b>Total family labor</b>	<b>4753</b>	<b>0.30</b>	<b>100.0%</b>	<b>3500</b>	<b>0.08</b>	<b>100.0%</b>

Source: authors' calculations on survey data

Plant protection has a high incidence on the total for Xiang li pears (this operation is generally performed manually), immediately followed by land operations. For Fuji apple the most important heading is instead pruning, which suggests more attention to the development of the trunk and branches, and in consequence more awareness of the importance of a good structural growth on the future yield by apple growers.

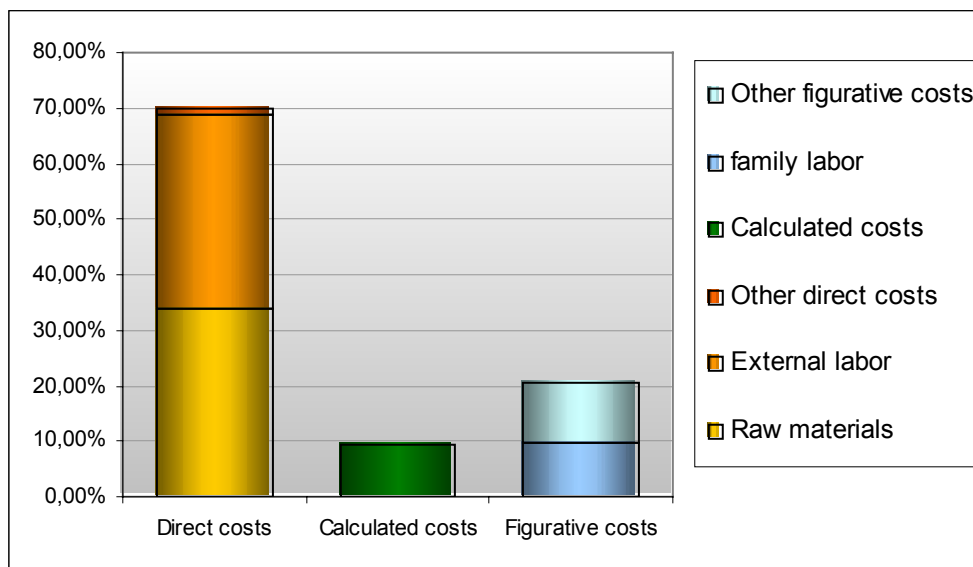
The following figures (Figure 2 and Figure 3) display direct costs (BOMC), calculated costs (FFC) and figurative costs (TPC) aggregates.

**Figure 2 – Breakdown of total cost for Xiang Li pear**



Source: authors' calculation on survey data.

**Figure 3 – Breakdown of total cost for Fuji apple**



Source: authors' calculation on survey data.

It clearly emerges that the incidence of the labor (both external and familiar) and raw materials on the overall cost is very high, about 70% for both species, while other direct costs represent an almost insignificant percentage of the total.

The main difference between pears and apples is the different impact of family labor on figurative costs. This shows how pear orchards are managed resorting to familiar labor more than apples, thus giving a first proof of the different extent of the business.

**5. Conclusions**

Chinese apple and pear production is going through a difficult time, since the continuous growth in volumes is leading to an internal market saturation, and neither foreign markets nor the processing industry are ready to absorb the surplus yet.

A lack of distribution infrastructure for fruit has made it difficult for farmers to reach markets in other areas. Farming re-organization is slowly leading to larger-scale farming using more automation in production, packaging and transportation. This will ultimately lead to the creation of significant fruit supply companies in China. While this process is still in its initial stages, it is now becoming a significant trend especially as more growers become actively involved in supplying the fast-growing large retail chains that are spreading out from China's largest cities. Once the agricultural industry reaches a more competitive stage of development, it is no doubt that we will see the emergence of leading suppliers of certain products using sophisticate branding and marketing to promote their goods. It is expected that transport infrastructure will improve to a level where inter-regional trade in fruit and vegetables becomes both possible and economically viable (Lu, 2004).

To reinforce its presence abroad, Chinese policy should moreover focus on guaranteeing the quality and safety of the products. Chinese agricultural officials are strongly encouraging growers to improve fruit quality (with respect to appearance, taste, and food safety aspects) and to choose more desirable and commercial cultivars demanded on the world market.

Growers appear to be following these encouragements: the trend for the past few years has been the growth of large scale, integrated commercial packinghouses and trading enterprises, some of which are foreign invested, that contract with growers to

produce certain cultivars and manage orchards and inputs so as to supply better quality and more desirable fruit. In the coming years, industry sources expect increasing sales to foreign markets with stringent food safety standards and more demanding consumers (Branson, 2004).

What emerges from this survey is that, despite of the many organization problems, the profit margin is still very high (Table 4), especially for the Fuji apple. This compensate Xinjiang farmers for the unevenness in the production as seen for Xiang Li pear.

**Table 4 – Production cost, selling price and profit margin**

Cultivar	Total production Cost	Selling Price	Profit (RMB/kg)	Profit %
Fuji apple RMB/ kg	0.80	1.5	0.7	47 %
Xiang Li pear RMB/ kg	2.16	2.8	0.64	23 %

Source : survey data.

The main reason why production costs incidence is much lower for Fuji apple than for Xiang Li pear is that orchards are larger, thus enabling farms to tap into economy of scale benefits.

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