

**ASSESSMENT OF FACTORS INFLUENCING UNSTABLE AND  
LOW PRICES FOR SMALL-SCALE FARMERS IN THE TOMATO  
VALUE CHAIN IN THE CHANGJI DISTRICT, CHINA**



**A Research Project Submitted to Larenstein University of  
Professional Education in Partial Fulfillment of the  
Requirements for the Degree of Masters in Agricultural  
Production Chain Management, specialization Post Harvest  
Technology and Logistics**

**By**

**Zhang Duoyu**

**September 2009**

**Wageningen**

**The Netherlands**

**© Copyright. Duoyu Zhang, 2009. All rights reserved**

## **Permission to use**

By presenting this research project in partial fulfilment of the requirements to obtain the masters degree, I agree that the library of this University may make it freely available for inspection. I further agree that permission for copying this research project total or partially for scholarly purposes may be granted by Larenstein Director of Research. It is understood that any copying or publication or use of this research project or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the University in any scholarly use which may be made of any material in my research project.

Requests for permission to copy or to make other use of material in this research project in whole or part should be addressed to:

Director of Research  
Larenstein University of Applied Sciences  
Part of Wageningen UR  
Director of Research  
P.O. Box 411  
6700 AK, Wageningen  
The Netherlands  
E-mail: [info@vanhall-larenstein.nl](mailto:info@vanhall-larenstein.nl)

## **Acknowledgements**

First, I wish to thank all the lecturers of Van Hall Larenstein and fellow students for their assistance and encouragement.

I wish to convey my gratitude to the entire staff of The Department of Agriculture with special thanks to Bai Jie, the District Agriculture Production Officer who supported my fieldwork & Cao Xinggang, the District Agriculture Production Director who willingly spared their limited time for the interviews.

I am highly indebted to a wide range of people who in one way or another have contributed towards this research work. Firstly, my special thanks go to my immediate supervisor Mr. Jos. Van Hal for his invaluable time put in this work. His critical, professional and fruitful comments throughout my research cycle and the thesis write up have finally resulted in output of this document.

My thanks also go to my Parents Mr. Zhang Xinfang, Mrs. Ma Yinlu and my relatives who encourage me and support me a lot during my overseas study. I would like to give my special thanks to my father who offered to drive me around during the data collection.

Finally, I also express my thanks to the thirty tomato growers for their valuable empirical data that formed the backbone of this research work. I also would like to thank my lovely girlfriend Li Dan who put the greatest effort to edit my thesis report. Last but not the least; I also want to give my great thanks to Ms. Laura who also put great effort to edit my report.

# Table of contents

Permission to use.....	i
Acknowledgements .....	ii
Table of contents .....	iii
List of tables .....	v
List of figures.....	vi
List of figures in annex .....	vii
Abbreviations.....	viii
Abstract.....	ix
<b>1 INTRODUCTION .....</b>	<b>1</b>
1.1 BACKGROUND OF THE RESEARCH .....	1
1.2 PROBLEM STATEMENT .....	2
1.3 SCOPE AND LIMITATION OF THE STUDY .....	3
1.4 RESEARCH OBJECTIVE .....	3
1.5 SIGNIFICANCE OF THE STUDY .....	4
<b>2 RESEARCH METHODOLOGY .....</b>	<b>5</b>
2.1 RESEARCH MATERIALS.....	5
2.2 DESK STUDY .....	5
2.3 FIELD SURVEY.....	5
2.4 CASE STUDY .....	6
2.5 DATA ANALYSIS .....	6
<b>3 LITERATURE REVIEW .....</b>	<b>7</b>
3.1 BACKGROUND INFORMATION OF THE XINJIANG PROVINCE AND THE CHANGJI DISTRICT .....	7
3.1.1 Profile of the Xinjiang province .....	7
3.1.2 Profile of the Changji district .....	8
3.1.3 Tomato cultivation in the Changji district, Xinjiang.....	10
3.1.4 Seasonality of tomatoes production .....	11
3.1.5 Infrastructure supporting the Changji district value chain .....	11
3.2 THE TREND OF TOMATO PRICE AND PRODUCTION IN THE CHANGJI DISTRICT.....	13
3.2.1 The trend of tomato yearly and seasonal price fluctuation.....	13
3.2.2 The trend of tomato production.....	18
3.3 TOMATO VALUE CHAIN IN THE CHANGJI DISTRICT.....	18
3.3.1 Input Suppliers .....	20
3.3.2 Producers .....	21
3.3.3 Processor .....	23
3.3.4 Wholesale market/Middleman.....	23
3.3.5 Exporter .....	25
3.3.6 Retailer.....	25
3.3.7 Consuming.....	26

3.4	CHAIN SUPPORTERS AND INFLUENCERS.....	26
3.5	QUALITY AND LOGISTICS MANAGEMENT IN THE CHAIN .....	28
<b>4</b>	<b>FIELD RESEARCH RESULTS.....</b>	<b>32</b>
4.1	THE GENERAL INFORMATION OF FARMERS .....	32
4.2	MARKETING, PRICE INFORMATION.....	32
4.3	QUALITY MANAGEMENT ASPECTS AND LOGISTICS .....	36
<b>5</b>	<b>DISCUSSION .....</b>	<b>42</b>
5.1	RESEARCH METHODS DISCUSSION .....	42
5.2	TOMATO CHAIN DISCUSSION BASED ON THE DESK AND THE FIELD RESEARCH RESULTS.....	42
5.2.1	<i>Background information of respondents .....</i>	<i>42</i>
5.2.2	<i>Tomato production .....</i>	<i>43</i>
5.2.3	<i>Tomato marketing supply and demand .....</i>	<i>43</i>
5.2.4	<i>Selling strategies for small-scale farmers .....</i>	<i>44</i>
5.2.5	<i>Comparison of gross margins in supply chain.....</i>	<i>45</i>
5.2.6	<i>Quality and logistics management in the chain.....</i>	<i>50</i>
5.2.7	<i>Chain supporters and influencer .....</i>	<i>52</i>
<b>6</b>	<b>CONCLUSIONS AND RECOMMENDATIONS .....</b>	<b>53</b>
6.1	CONCLUSIONS.....	53
6.2	RECOMMENDATIONS.....	54
6.2.1	<i>Recommendations for the small-scale farmers.....</i>	<i>55</i>
6.2.1.1	Farmers Association .....	55
6.2.1.2	Specific activities .....	55
6.2.2	<i>Recommendation for the Department of Agriculture (DOA) .....</i>	<i>58</i>
6.2.3	<i>Recommendation for the Changji local government.....</i>	<i>59</i>
	Reference .....	61
	Annex: .....	64
	Duties of farmer association .....	71
	Duties of the members .....	71
	Establishment .....	71
	Organizational structure.....	72
	Financial management .....	73
	Governmental supportive policies .....	74

## List of tables

Table3.1 Main Planting crops in the Xinjiang Province in 2008 .....	8
Table3.2 Seasonal tomato production in the Changji district .....	11
Table 3.3 Producers by category and yields .....	22
Table 4.1 The average selling prices and quantities to different buyers .....	33
Table 4.2 The reason of getting no adequate marketing information .....	34
Table 4.3 The way to get adequate marketing information .....	34
Table 4.4 The way of fertilization and the frequency of application .....	35
Table 4.5 The method of measuring the quantity of manure/compost/fertilizer and pesticides .....	37
Table 4.6 The way of sorting and grading .....	39
Table 5.1 Gross margin at small-scale farmer level .....	45
Table 5.2 Gross margin at Middleman level .....	45
Table 5.3 Gross margin at wholesaling level .....	46
Table 5.4 Gross margin at supermarket level .....	46
Table 5.5 Gross margin at retailer level .....	47
Table 5.6 Gross margin at processor level .....	47

## List of figures

Figure1.1 The trend of tomato production in Xinjiang province.....	2
Figure 3.1 Map of China showing Xinjiang Province (in red part).....	7
Figure3.2 Map of the Changji district.....	10
Figure3.3 The trend of yearly price fluctuation from 2004 to 2008 in wholesaler market .....	13
Figure3.4 The trend of seasonal price fluctuation from 2004 to 2008 in wholesale market.....	14
Figure3.5 The trend of yearly price fluctuation from 2004 to 2008 in supermarket .....	14
Figure3.6 The trend of seasonal price fluctuation from 2004 to 2008 in the supermarket .....	15
Figure 3.7 The trend of yearly price fluctuation from 2004 to 2008 in processors .....	16
Figure3.8 The trend of seasonal price fluctuation from 2004 to 2008 in processors .....	16
Figure 3.9 The total production yield trend small-scale farmers from the year of 2002 to 2008 .....	18
Figure 3.10 Tomato chain map .....	19
Figure 4.1 Surplus of tomato from small-scale farmers .....	31
Figure 4.2 Selling strategy when the price is lower than the pervious year .....	32
Figure 4.3 Selling strategy when the price is higher than the pervious year .....	33
Figure 4.4 The possibility of getting information on aspect of supply, demand and price .....	34
Figure 4.5 Frequency of pesticide application .....	36
Figure 4.6 The plant stage of starting spraying pesticides .....	37
Figure 4.7 Rejection from the buyers on the base of fertilizer/pesticides residue .....	38
Figure 4.8 The place of storing the harvested tomatoes .....	39

## List of figures in annex

Annex figure 1 Tomato yearly price in 2004.....	65
Annex figure 2 Tomato yearly price in 2005.....	65
Annex figure 3 Tomato yearly price in 2006.....	66
Annex figure 4 Tomato yearly price in 2007.....	66
Annex figure 5 Tomato yearly price in 2008.....	66

## **Abbreviations**

TDC	Tomato development Centre
GDP	Gross Domestic Product
Ha	Hectare (1Hectare=15mu)
DOA	The Department of Agriculture
BIBA	The Bureau of Industrial and Business Administration
RMB	10 RMB=1 Euro

## **Abstract**

The tomato cultivation is one of the most important agriculture activities in the Changji district, Xinjiang province. The tomato plantations have a long history in the region because of the preferable climatic and geographical conditions. The total tomato production yield makes up more than fifteen percent of the total tomato production in Xinjiang. Within this fifteen percent of production, ten percent of production is contributed by small-scale farmers. However, a great number of small-scale farmers stop growing tomato because of the unstable and low selling price in the market after 2002. Those tomato growers cannot cover their basic daily expenses from tomato cultivation. The theme of the study is to assess the potential factors influencing unstable and low prices for small-scale farmers in the tomato chain.

To meet this theme, the study mainly used the desk research combined with the field survey and the case study. Firstly, the value chain analysis was used as a tool to find out how the current chain is organized. Secondly, the field survey carried out among the small-scale tomato farmers that located in the Changji district, Xinjiang province. Thirdly, the case study was used by interviewing four different chain stakeholders. The aim of the case study was to deeply understand how the current chain is operated by different stakeholders, meanwhile to detect constrains which could cause unstable and low price in the market.

Based on the literature and field research, the findings underscore useful points. It is found that tomato is the primary source of income, followed by the traditional agronomical practices like fertilizer/pesticides management, harvest management, storage management and grading/sorting management. Farmers do not have adequate skills to handle crop management. The buyers always complained about the quality of the tomatoes and offered low price to farmers.

Because of the insufficient information flow between the actors in the chain, it is difficult for the small-scale farmers to get information on supply/demand and cultivation guidance. Farmers decide to grow tomatoes based on previous market situation and experience. Cultivation without sufficient guidance directly causes unstable and low tomatoes prices in the market year by year.

Promotion of improved production practise and harvest/post harvest techniques, standardization of cultivation practise and strengthening of marketing and cultivation information network and forming farmers' association are finally recommendations to encourage profitable tomato production and to inhibit unstable and low selling prices in the market.

# 1 Introduction

## 1.1 Background of the research

Tomatoes (*Lycopersicon esculentum L.var*) are the world's most commercially produced and used vegetable crops (Rajkumar, Kulanthaisami et al. 2006). The annual worldwide production of tomatoes has been estimated at 125 million tons in an area of about 4.2 million hectares. It is very important from an economic point of view and hence the global production of tomatoes (fresh and processed) has been increased by 300% in the last four decades (FAO 2005) being the countries of tropical and temperate regions the leading tomato producers. China is one of the most important tomato production bases contributing to more than 28% of the total production worldwide.

<http://faostat.fao.org>

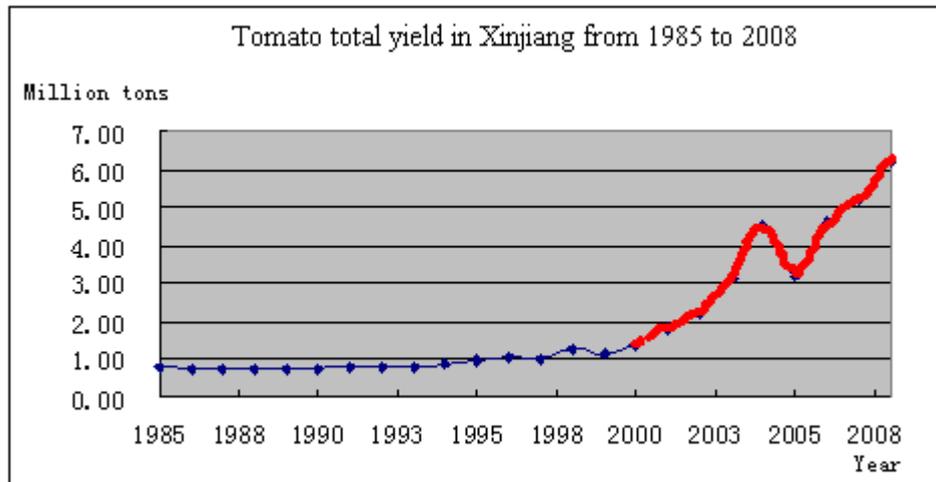
Tomato was introduced in China around 1630, but its popularization is a recent phenomenon. The tomato is an important vegetable in the People's Republic of China, both in northern and in southern parts. It is extremely popular in the Chinese dishes or in desserts. It is planted around the whole region of China. Nowadays it is possible to cultivate tomatoes whole year around with using greenhouse.

<http://www.kepu.net.cn/english/banna/folk/fo1109.html>

In China, tomato cultivation started since 1950 in the coastal provinces. The main cultivation provinces were Guangdong, Fujian, and Jiangsu. Most of the fresh tomatoes were exported to the Middle East, Korea, and Russia at this moment. Due to unsuitable cultivation conditions, most of the coastal provinces stopped planting tomatoes after 1980. Nowadays, fresh tomatoes are produced in most of the provinces, mainly in Xinjiang, Shandong, Hebei and Henan province, where production is about 55% of China's total output. Production is all-year of which 50% is field grown, 40% under glass and 10% in low level tunnels. The production area and total amount are increasing. China's fresh tomato production is forecasted to reach a massive 34 million tones during 2009/2010, an increase of 4.6% in comparison to the previous season.

The tomato cultivation is one of the most important agriculture sectors in Xinjiang Province. The tomato plantation had a long history in this province because of the suitable climatic and geographical conditions. Tomato cultivation started from 1978 in Xinjiang province. It is currently placed among the leading areas on the tomato world market. The production developed smoothly from 1985 to 1999. After 1990s, the Chinese government implemented a series of policies and political activities to promote economy development in the whole country, such like reforming and opening to the outside world, Development of Western Regions, accession to WTO, etc.

Chinese people were encouraged thinking and running business. More people, living in Xinjiang, started growing and selling tomatoes as revenue source. From figure 1.1 we can find that the total production yield rose dramatically from 1.5 million tons in 2000 to approximate 7 million tons in 2008.



**Figure1.1 The trend of tomato production in Xinjiang province**

<http://www.foodqs.com/news/gnspzs01/2009423131814149.htm>

The Changji district is located in the middle of Xinjiang. This area has dry and warm weather conditions and it is considered as one of the warmest regions of Xinjiang with more than 300 days of sunshine annually and the lowest rainfall in China. The average annual temperature is around 17°C. Due to the favorable climate conditions, the tomato cultivation is becoming one of the most important farming activities in the Changji district. The total tomato yield makes up for more than 15% of the total tomato production in the Xinjiang province. In the Changji district, the tomato sub-sector contributes over 20% of the Gross Domestic Production (GDP). 72 percent of the population in rural areas depends directly on tomato cultivation.

There are three types of producers namely large-scales farmers, small-scales farmers and large tomato production manufactories (see literature review) that grow and harvest tomatoes in the Changji district. There are approximately 4,500 producers involved in fresh tomato production. More than 3,500 farmers are small-scale farmers which contribute 70% of the total tomato production. Most of the tomatoes are sold to the Urumqi City and tomato manufactories. Small-scale farmers are the core actors in the chain which determine the production yield in the Changji district.

## 1.2 Problem statement

Tomato marketing in the Changji district is well established. However, since 2002, a great number of small-scale farmers are suffering from the unstable and low

marketing price. As the major tomato suppliers in the chain, small-scale farmers are not able to benefit from selling tomatoes to the Urumqi City and tomato processing manufactories, most of them not being able to get a stable income from tomato cultivation. The seasonal and yearly price variations make small-scale farmers less motivated. So far there are more than 400 small-scale farmers that shut down their tomato productions in the Changji district. During the research, the focus will be on diagnosing the causes of unstable and low prices and providing sound recommendations.

### **1.3 Scope and limitation of the study**

This study was conducted during July to September 2009. The geographical scope of this study involved the western region of China. The researcher mainly focused on 30 small-scale tomato producers who were involved in the tomato production in the Changji district.

Limited time and resources to undertake the research was noted by the researcher as a constraint.

Meanwhile, a civil war explored in Urumqi, Xinjiang province on 5th July 2009 and made quite a lot of problems on that region afterwards, such as transportation, network connections, national conflict and personal safety. Collecting the primary data from Changji district became dangerous and unsafe.

### **1.4 Research Objective**

The objective of this study is to assess factors influencing unstable and low prices for small-scale farmers in the tomato value chain in the Changji district in order to formulate strategies to encourage profitable tomato production.

#### **Main research question**

1. How is the fresh tomato value chain organized in the Changji district?
  - i. Which actors, supporters and influencers involve in tomato supply chain?
  - ii. What are the roles of actors, supporters and influencers in the chain?
  - iii. What quality demands are required by the tomato buyers?
  - iv. What are the logistics aspects in the chain?
  - v. What is the margin share for each of the actors in the tomato value chain?
  
2. Which are the causes of unstable and low prices for small-scale tomato farmers in the chain?
  - i. What has been the trend of tomato prices and production in the Changji district?

- ii. Which strategies do farmers use in selling tomatoes?
  - iii. How does the quality management and logistics influence price of tomatoes?
  - iv. How do the government activities influence the prices of tomatoes?
  - v. How does the different farmer organization and institutions influence the price building of tomatoes?
3. What aspects need to be improved in the fresh tomato value chain in order to encourage farmers' production?
- i. What should different actors in the tomato chain perform to be able to encourage farmers' production and provide a stable income?
  - ii. What should different supporters and influencers in the tomato chain perform to be able to encourage farmers' production and provide a stable income?

## **1.5 Significance of the study**

Small-scale farmers are important producers that can contribute most to the tomato production in the Changji district. The commitment of the researcher is to understand the position of small-scale farmers in the entire supply chain. The tomato productions can not continue without small-scale farmers. There is no solution if the district is only depending on large-scale production. Because some cities will be confronted with huge problems like massive migration of rural population to the cities and all drawbacks related to that.

Therefore, the origin of the idea for the research is to find out which factors are in the influence of small-scale farmers and which of this are not, while simultaneously, to formulate strategies to encourage profitable tomato production and provide a stable income for the small-scale farmers.

## **2 Research Methodology**

### **2.1 Research materials**

The materials used in this study were questionnaires to survey small-scale tomato farmers. Computer and programs (SPSS and Excel) are used for data analysis and the different publications like reports, journals, books and internet sites relevant to the study were used and reviewed.

### **2.2 Desk study**

First, value chain analysis was used as a tool to analyze how the value chain was organized and which actors were involved in the chain and the function of each actor.

Second, yearly vegetable price reports and statistics reports were used to analyze the seasonal and yearly tomato price and production trend in the Changji district.

Third, A lot of annual governmental reports and journals of the Xinjiang University alike on tomato production, trading, and consumption in the Changji district were studied to find out how the governmental and organisational activities and policies influence the price of tomatoes.

#### *Purpose of the desk study*

The desk study's result is helpful for understand how the current tomato cultivation in the Changji district is organized; what the constraints in the sectors are and which main factors lead to price fluxion.

### **2.3 Field survey**

The field research was undertaken using a quantitative approach and based on empirical data obtained during the field visit to the Changji district, Xinjiang province.

The primary data was collected through a field survey using structured questionnaires whereby 30 respondents were interviewed. The questionnaires for the survey were prepared based on the objective of the study relevant to small-scale farmers in the chain. Seven interviewees were pre-tested before they participated in the research area. The used survey method included the filling in of the questionnaires to get the required data. The questionnaires were filled in by the author himself during his field visit in the Changji district. The survey questionnaires are given in annex. The survey was conducted during July and August 2009. Moreover, the author also made field observations and noted all relevant information related to the issues explored in the study.

Thirty tomato farmers were selected through random sampling from the total number of tomato farmers operating in the Changji district. The sampling was carried out by using the farmers' register held by the local authorities associated with agriculture departments. However, the job was more time consuming than expected. Some small villages were only accessible by foot. It also took a long time to transfer from one farmer to another, especially in the hilly villages.

## **2.4 Case study**

A case study was organized and focused on marketing information and support to small-scale farmers. It comprised four interviews; one processor, one wholesale market, one supermarket and in the ministry of agriculture in the Changji district.

The case study also addressed the issues related to the role of different chain actors, constraints in the value chains, prices and quality requirement, coordination and governance of the chains. The interviews were conducted by telephone and personal communication.

## **2.5 Data analysis**

1. Value chain analysis was used to identify the functions of each actor in the chain.
2. Data, collected from the survey, was systematically organized, processed and analyzed in quantitative ways by using statistical tools.

Excel and SPSS programmes were used to analyze the data from the questionnaires. Excel was used to generate figures and charts. Meanwhile, SPSS was mainly used for finding the different correlations between questions.

## 3 Literature review

### 3.1 Background information of the Xinjiang province and the Changji district

#### 3.1.1 Profile of the Xinjiang province

##### General

Xinjiang is an autonomous region (Xinjiang Uyghur Autonomous Region) of the People's Republic of China, located in the western part of the country. It is a large, sparsely populated area (spanning over 1.6 million sq. km) which takes up about one sixth of the country's territory. Xinjiang borders the Tibet Autonomous Region to the south and Qinghai and Gansu provinces to the southeast, Mongolia to the east, Russia to the north, and Kazakhstan, Kyrgyzstan, Tajikistan, Afghanistan, Pakistan and India to the west. "Xinjiang" or "Ice Jecen" in Manchu, literally means "New Frontier", a name given during the Manchu Qing Dynasty in China. It is home to a number of different ethnic groups, many of them Turkic, the largest of which is the Uyghur people.

<http://www.xinjiangseek.com/info.htm>



Figure 3.1 Map of China showing Xinjiang Province (in red part)

Sources: <http://map.mapbar.com/>

Xinjiang boasts unique resources of water, soil, light and heat. With advantages such as long sunshine time, high cumulative temperatures, large day-night temperature difference and long frost-free period, Xinjiang is only second to Tibet in total solar

radiation, which is favourable to the growth of different crops. Xinjiang climate and growing conditions are favourable for a wide variety of fruits, and vegetables. The major fruits are grapes, apples, melons, watermelons, peaches, and pears while vegetables include tomatoes, potatoes, paprika, and eggplants. Tomato is a major crop in the Xinjiang province, accounting for 20% of the total production in China. The total production area will reach to 76,000ha in 2009.

<http://www.baidu.com/s?wd=%D0%C2%BD%AE%B7%AC%C7%D1%D6%D6%D6%B2%C3%E6%BB%FD>

### Land Holding Size

Average size of farm holding 4 mu (0.27ha) per capita

### Land use pattern (ha)

a) Cultivated land	68,000,000
b) Cultivable land	9,330,000
c) Forest	4,840,000
d) Pasture	48,000,000

**GDP** 415,000,000,000 RMB (61,029,411,764 US dollar)

a) Agriculture sector 145,250,000,000 RMB (35%)

b) Non-Agriculture sector 269,750,000,000 RMB (75%)

**Table3.1 Main Planting crops in the Xinjiang Province in 2008 (MOA, 2009)**

	Cotton	Corn	Wheat	Tomato
Area (×1000ha)	1268.6	521.2	728	76
Production (10,000ton)	218.9	376.4	401.4	700
Yield(kg/ha)	1725	7222	5514	92100

<http://www.agri.gov.cn/>

[http://www.ppi-ppic.org/ppiweb/nwchina.nsf/\\$webindex/79A4A73CE08FC240482573A800C22C9?opendocument&navigator=home+page](http://www.ppi-ppic.org/ppiweb/nwchina.nsf/$webindex/79A4A73CE08FC240482573A800C22C9?opendocument&navigator=home+page)

### 3.1.2 Profile of the Changji district

#### General

The Changji district is located in the middle of the Xinjiang province. In ancient times, it was an important place of the famous “Silk Road” northwards to Middle Asia and Europe. It was established in 1954 and Hui, Han, Uygur, Kazakh and some other nationalities live here nowadays. Among them, Hui Nationality is a main part among the nationalities in the autonomous region. The population of the prefecture is 15,888 million including 36 nationalities.

The topography of the Changji district is high in the south and low in the north, since the Tianshan Mountains lie on the southern edge of the district, and it has an average elevation of 2,500 meters. Situated deep in the interior of the Xinjiang province and not penetrated by the air currents from the oceans, the Changji district has conspicuous continental climate, with highly changeable temperatures, great differences in temperature between day and night, abundant sunshine (more than 300 days) and intense evaporation. The mean annual temperature in the Changji district is 17°C -- the hottest months, July and August, averaging about 26°C and the coldest month, January, -10°C in the north and -5°C in the south. Changji has an annual rainfall of 183-200mm and on average, 2,833 hours of annual sunshine, suitable for growing wheat, corn, beets, beans, sunflowers, tomatoes, and many other vegetables.

### **Land Holding Size**

Average size of farm holding 7mu (0.47 ha) per capita

### **Land use pattern**

The Changji district combines large-scale agriculture with animal husbandry, and has more than 266,667 hectares of arable land. Wheat, corn, rice and tomato are the main crops, but cash crops grown in the area include cotton, oil-bearing crops, beans and peas, sugar beet, hops, rugosa roses, melons and other fruits and vegetables.

**GDP** 35.9 billion RMB (US dollar 4.8 billion)

### **GDP composition**

Primary industry (Agriculture)	38.7%
Secondary industry (Industry and construction)	40.5%

Tertiary industry (Services)	20.8%
------------------------------	-------

<http://torchrelay.beijing2008.cn/en/journey/changji/news/n214333924.shtml>

<http://www.accci.com.au/keycity/xinjiang.htm>



**Figure 3.2 Map of the Changji district**

Source:

<http://image.baidu.com/i?tn=baiduimage&ct=201326592&lm=-1&cl=2&fm=ps&word=%B2%FD%BC%AA%B5%D8%CD%BC>

### 3.1.3 Tomato cultivation in the Changji district, Xinjiang

As Turpan district is known by its grapes and Hami district is famous for its melons, Changji is mostly famed for its ripe, red tomatoes. The administrators of the Changji District realized very early that a resource dependent economy such as fossil fuels is ultimately not sustainable so they took advantage of Changji's natural conditions, and have cultivated the tomato trade, or what they call the "Red Industry." It stands with the area's "White Industry" (cotton) and "Black Industry" (oil and coal)

The history of tomato cultivation in the Changji dates back to more than 50 years, when people used to cultivate them in their garden mainly for the daily consumption. After 1985, due to the increase of demand and price, tomato became one of the most important crops in the Changji district. Most of the farmers grow tomatoes in the open fields and in tunnels. It is a commercially important crop for fresh market and processing industries. There are many tomato varieties that are grown in this district. The major varieties are beefsteak tomato, plum tomato, paste tomatoes, cherry tomato and dual-purpose tomato.

Tomato paste is consumed in central Asian countries, some of which neighbour Xinjiang and make the region a big export market for the tomato paste. In 2007, Changji's tomato exports - mainly in form of tomato paste - reached 700,000 tons,

worth \$451,500,000million, which accounted for 14% of Xinjiang's tomato exports. Changji tomato products are also sold to over 78 countries and regions, mainly to EU countries, Russia and Japan.

The Changji tomato industry started from 1978 with 50,000mu farmland and 134 farmers. Until now, the total production reaches to 210,000mu. The total output of the tomato production exceeds 1,400,000 tons a year, which accounts for 20% of Xinjiang province total output and more than 4,500 farmers grow different varieties of tomatoes. Tomato as one of the important cash crop in the Changji District makes most of farmers highly dependent on tomato production for their household income. However, the recent unstable and low tomato prices have created severe hardships for small-scale farmers in the Changji district. These unstable and low prices mean that farmers cannot cover their basic costs of producing tomatoes, so they are operating at a loss. Many farmers are suffering from drastically reduced incomes.

### 3.1.4 Seasonality of tomatoes production

Tomato production in the Changji district is from February to October. Every three months tomato are flowering and fruits are ripe one and a half month later. The first production season is from February to June. The second period is from July to October. From December to May, is regard as a period of tomato scarcity.

**Table3.2 Seasonal tomato production in the Changji district**

	Jan.	Feb.	Marc.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov	Dec.	
production		45% total production					55% total production						
First production season		Planting stage				Harvesting stage							
Second production season							Planting stage				Harvesting stage		

### 3.1.5 Infrastructure supporting the Changji district value chain

An adequate and efficient infrastructure is vitally important for the functioning and development of the tomato industry throughout the Changji district. The most important elements are namely; roads, water system, electricity and communication.

**Road situation**

The Changji district is easily accessible to Urumchi city, Kuitun city, Shihezi city and the rest of the regions by the road system. The road network is relatively good despite the fact that some of the roads are not easily passable during the winter. In the Changji district, all weather passable roads account for 60% of the total infrastructure with 55% of the road infrastructure consisting of dirt roads, 30% of gravel and 10% of asphalt, 5% of cement. (Cao Xinggang 2007).

**Water**

The Changji government invested nearly 100 million Yuan last year to build 28 drinking water projects and 18 water supply facilities. These projects will provide safe drinking and irrigation water to 643,400 local farmers.

**Electricity**

More than 70 power-generating units are in operation at the wind power centre in the Changji district. The generating capacity of the centre makes up one-third of the total installed wind power capacity in the Xinjiang province. These power-generating units can support the power throughout the year.

**Telecommunications**

The telecommunication function is provided by Xinjiang Telecommunication Ltd. Landlines that connect all districts in Xinjiang and mobile phone systems (China mobile, Xinjiang mobile) cover all districts within the Changji. Coverage is being progressively extended over the whole district. Internet services, postal and fax are also available at Changji. Television broadcasts from Urumqi and satellite-based systems can be accessed in the whole region.

Sources: <http://www.cnki.com.cn/Article/CJFD2005-NONG200508007.htm>

## 3.2 The trend of tomato price and production in the Changji district

### 3.2.1 The trend of tomato yearly and seasonal price fluctuation

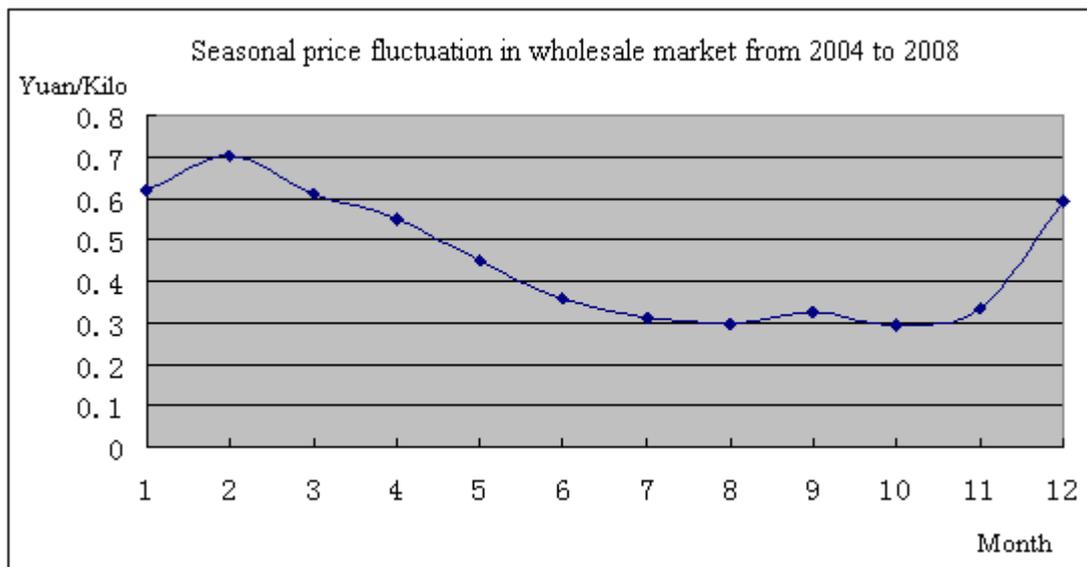
#### Selling to the wholesale market



**Figure 3.3 The trend of yearly price fluctuation from 2004 to 2008 in wholesaler market**

Source: Department of Agriculture, 2008, digital library

The figure 3.3 shows the changes in the average price in wholesaler market in the 5 years spanning from 2004 to 2008. It fluctuated a lot from year to year. The figure peaked at 0.49 Yuan/kilo in the year of 2005 and bottomed out at 0.42 Yuan/kilo in 2007. The average yearly price decreased by 14% from 2005-2007. It indicates that the average yearly price rose to 0.44 Yuan/kilo in 2008 which increased by 5% as the previous year.

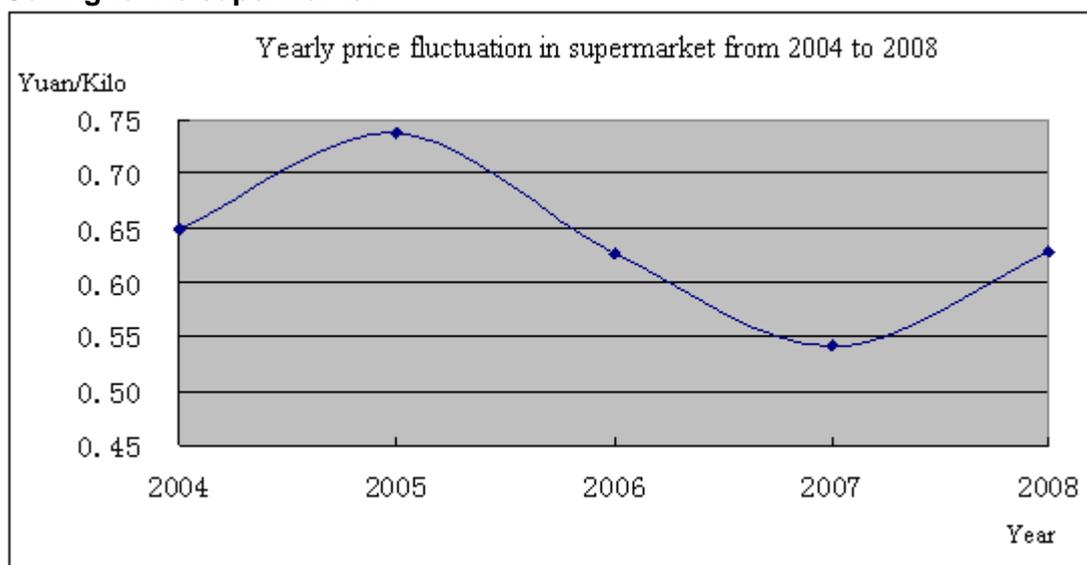


**Figure3.4 The trend of seasonal price fluctuation from 2004 to 2008 in wholesale market**

Sources: Own sketch based on yearly price trend (2004-2008), see annex, Department of Agriculture digital library

Seasonal fluctuation shows significant differences in figure 3.4. That is, in these years, the tomato price followed a particular trend: the tomato price is high in January and reaches the highest level in February, then it begins to fall in the end of February and down to the lowest in July, after then, it keeps increasing and reach the second peak in December.

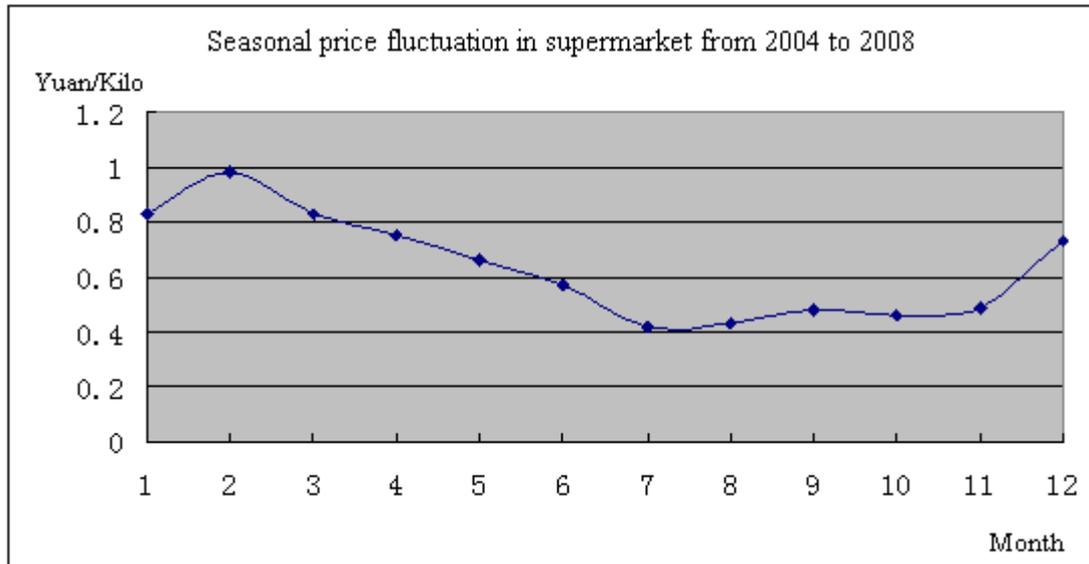
### Selling to the supermarket



**Figure3.5 The trend of yearly price fluctuation from 2004 to 2008 in supermarket**

Source: Department of Agriculture, 2008, digital library

The trend of yearly price fluctuation from 2004 to 2008 in supermarket was similar as it was in the wholesaler market. The average price of each year in supermarket was a bit higher than it was in the wholesaler market. The peak point was at 0.74 Yuan/kilo in 2005 and bottomed at 0.54 Yuan/kilo in 2007 as well.

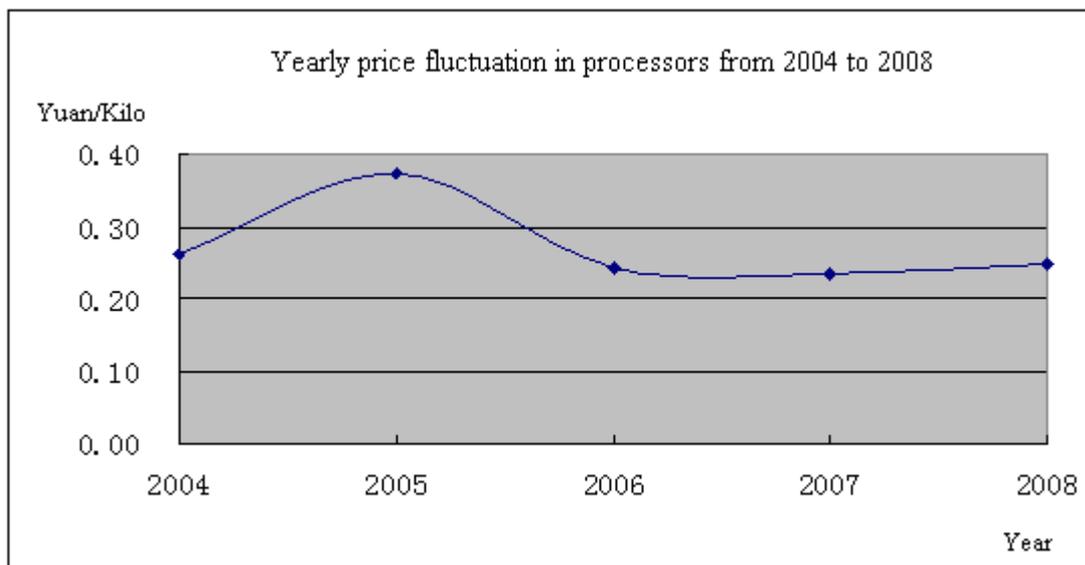


**Figure3.6 The trend of seasonal price fluctuation from 2004 to 2008 in the supermarket**

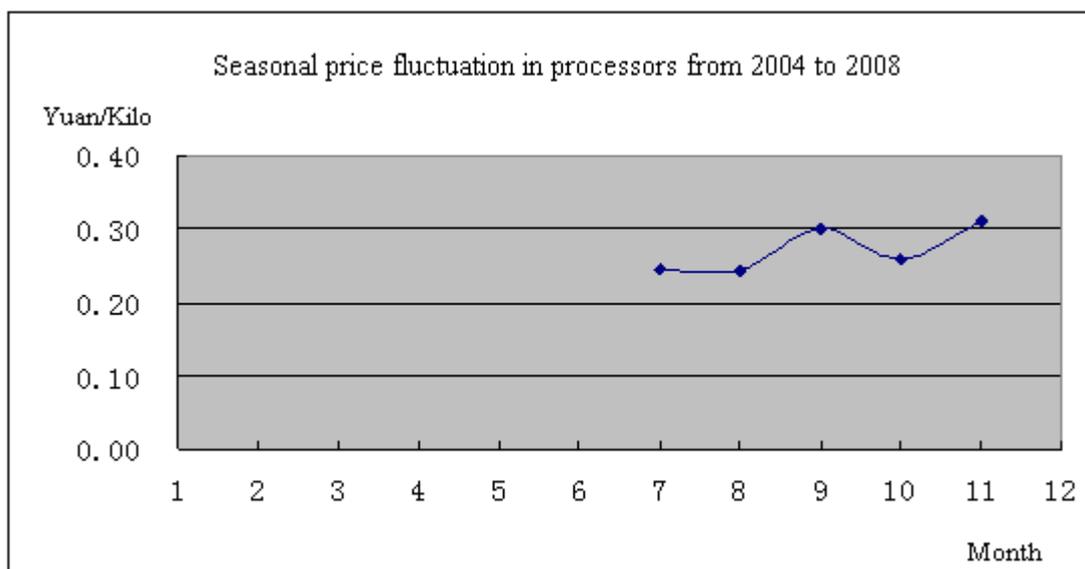
Sources: Own sketch based on yearly price trend (2004-2008), see annex, Department of Agriculture digital library

The seasonal price fluctuation follows the same trend, it is the same trend as in the supermarket and in the wholesaler market. The price fluctuated due to the relationship of supply and demand during the different seasons.

### Selling to the tomato processors



**Figure 3.7 The trend of yearly price fluctuation from 2004 to 2008 in processors**  
Source: Department of Agriculture, 2008, digital library



**Figure3.8 The trend of seasonal price fluctuation from 2004 to 2008 in processors**  
Sources: Own sketch based on yearly price trend (2004-2008), see annex, Department of Agriculture digital library

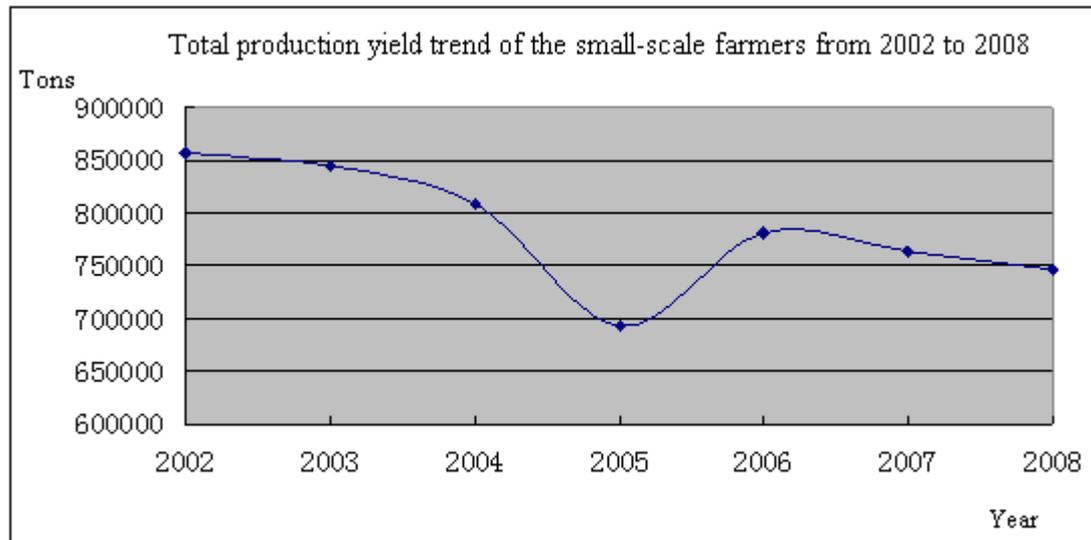
Big amounts of tomatoes were sold to the owners of the tomato processing industry. Processors are interested in low prices but they are requiring food safety as well. They normally purchase tomatoes during the period from July to November, in which there are more tomatoes available.

**Price trend analysis:**

There is no doubt that the price of any commodity in the market is based on the principle of demand and supply. Generally speaking, the tomato prices are low during June and November (high supply), but in other months (low supply), by contrast, it becomes relatively high. In both wholesaler market and the supermarket, the trend of prices was quite similar, but the price was higher in supermarket than in the wholesaler market in the same period. For instance, in the wholesaler market, the seasonal price of tomatoes for farmers was approximately 0.30Yuan/kilo (0.03 Euro/kilo) in July compared to 0.70 Yuan/kilo (0.07 Euro/kilo) in February, which was about 2.5 times the difference. In supermarket, it was about 0.40 Yuan/kilo (0.04 Euro/kilo) in July compared to 1.00 Yuan/kilo (0.10 Euro/kilo) in February, which was about 2.5 times difference. The tomato prices for selling to the processors were quite lower than either the wholesaler market or supermarket. The processors only need tomatoes during harvesting time, from July to November, when it can produce more yield and cost lowly. The selling price is low to sell to processors, however, the advantage and importance is high efficient and easy to get a way out for big amount of tomatoes.

Due to a high supply of tomatoes compared to the low demand following the harvest period, the prices are quite low and farmers often suffer losses. It is hard to get adequate marketing information from the government or from the agricultural office. The farmers could not make a proper decision to cultivate tomatoes. Furthermore, the education level of farmers in this area is low as well. They are rarely concerned about supply and demand of information. Furthermore, the farmers sometimes suffer from the queasy international market. In 2007, the indenters recalled many orders because they said there is some quality problem. Therefore, the processors who export tomatoes have reduced the purchase quantity or cancelled the purchase planning. The farmers can only watch the big amount of tomatoes rotten in the farm.

### 3.2.2 The trend of tomato production



**Figure 3.9 The total production yield trend small-scale farmers from the year of 2002 to 2008**

Figure 3.9 shows the small-scale farmers' tomato production trend during the whole year from 2002 to 2008 in the Changji district. From the figure, we can find that there are irregular fluctuations. This indicates that unexpected events or contingency shocks occurred in these periods. Take the latest two shocks as an example. In the early 2001, the tomato farmers (especially small-scale farmers) felt that they could not get enough income of tomato cultivation due to the insufficient support by the government and unstable selling price in the market. Some farmers started to grow cotton instead of tomato, so we can see that the tomato production had a decreasing trend year by year. In 2005, it had a lowest point around 700,000 tons which was a big difference compared with in the other years. It was due to the disastrous weather (drought) in that year. A number of crops failed because of the drought, so that the supply of tomatoes could not satisfy the demand of market, consequently the price became increased. Because of the high selling price in 2005, a number of farmers restarted to produce tomatoes in 2006. However, the market price did not reach the high levels expected by farmers in 2006. Those farmers still cannot get stable price from selling tomatoes and the production trend continually decreased afterwards.

### 3.3 Tomato value chain in the Changji district

The research in this sub-chapter is based on the value chain analysis. Value chain analysis broad conception has its roots in world systems theory that emerged from the Washington consensus in the 1970s and 1980s (Wallerstein, 2000) but since than been developed and applied in the development field. Value chain analysis helps to

identify key bottlenecks to price fluctuation in the market and views each chain actors in terms of these key bottlenecks.

According to the Literature review and the case study, the author map the value chain map of tomatoes in the Changji district as shown in figure 3.10 below. The value chain shows the current organization of the value chain and the different stakeholders therein.

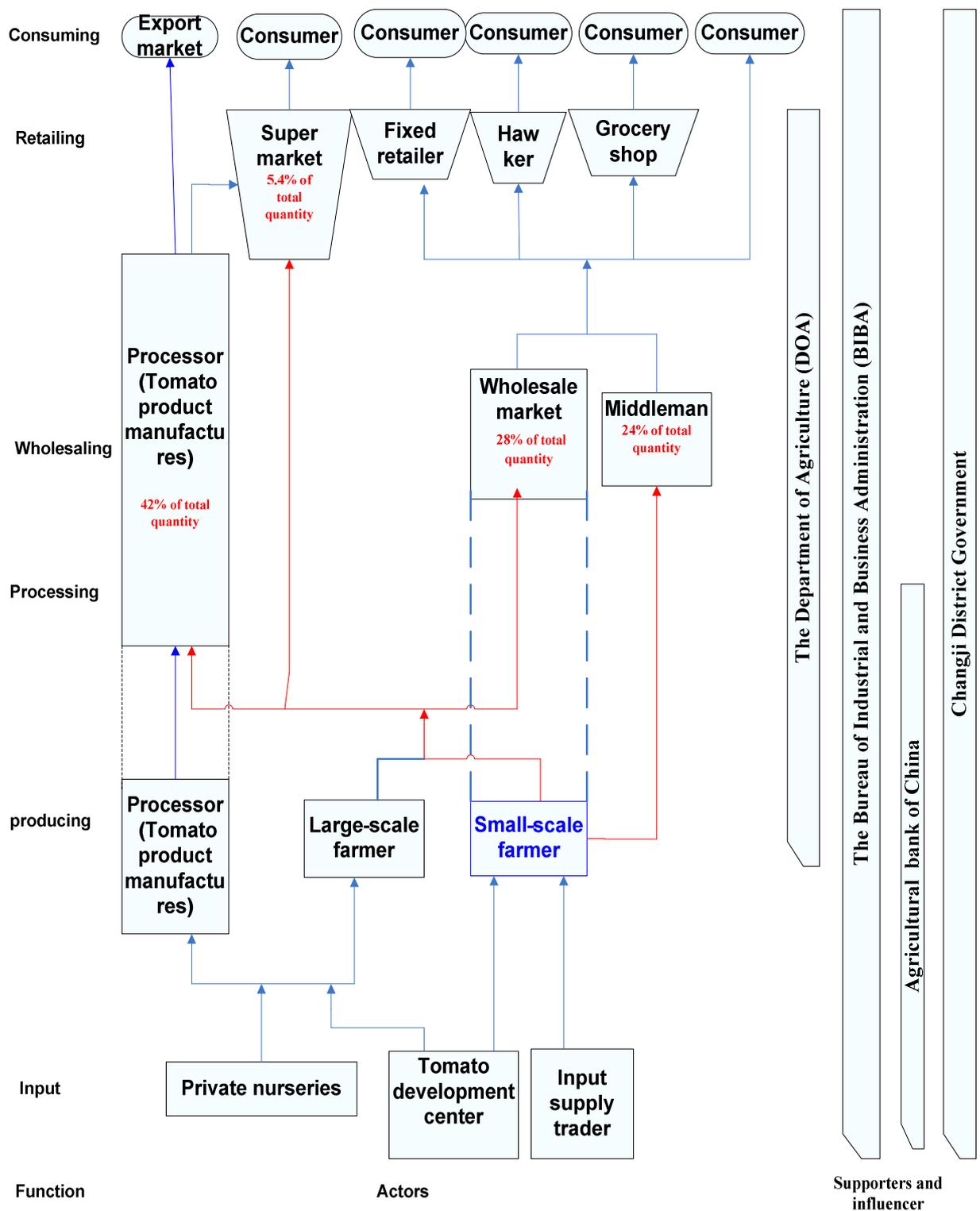


Figure 3.10 Tomato chain map

### 3.3.1 Input Suppliers

There are three types of input supply in the chain.

### **Tomato Development Center (TDC)**

The Tomato Development Center (TDC) is responsible for providing tomato seeds, seedlings, poles, fertilizers, and chemicals to the small-scale farmers, large-scale farmers, and tomato enterprises. Ninety-five per cent of the small-scale farmers buy the plant materials and agriculture products from either TDC or traders. Large-scale farmers and tomato enterprises buy fertilizer and chemicals only from TDC.

The TDC is the only operational Agro input supply shop in the Changji district which is under the administration of the district. This situation is due to the fact that a number of several Agro shops ceased to operate years ago due to lack of financial support. The TDC was initially supported by the Ministry of Agriculture in the Xinjiang province, and it was financed by the Changji Local Government. Nowadays, the Changji district plans to establish four extra Agro shops in different areas before 2011.

### **Private nursery**

Seventy per cent of the large farmers and tomato enterprises obtain seeds and seedlings from their own nurseries or buy from the TDC.

### **Input supply trader**

The input supply traders sell agro inputs (e.g. seed, seedling, fertilizer, pesticides, and fungicides etc.) to the small producers and small shops in the remote towns and villages.

## **3.3.2 Producers**

In the Changji district, tomato farmers are categorized into three groups namely, small-scale farmers, large-scale farmers and tomato enterprises.

In the Changji district, there are about 3,500 small-scale farmers with average cultivation areas about 30mu. They grow dual purpose tomato and the yield is approximately 7 ton per mu. The family members are the main labour on the farm. The total tomato production yield from small-scale farmers reaches 857,500 tons. According to a case study carried out by Bai Jie (2007), *most of the small-scale farmers surveyed in the Changji district sold their tomatoes to tomato enterprises, and the wholesale market/middleman. Only few of them sell to the supermarket, because the quality of tomatoes can not reach the required standard.*

The majority of the small-scale farmers recently are based on individual plantation models. They are not able to carry out standardization of agricultural production. It is more difficult for them to adapt to the competition of the domestic and the international markets. Considering the introduction of new varieties, new technology application, and product sale, the small-scale farmers are slow in adapting and produce and manage blindly, because their lack of information, technology practice, agricultural

stuff supplies, and effective marketing service, etc. Selling the tomatoes is the emergent problem when the majority of products matured. The products cannot be sold at a profitable price because the quality is not unified and lacks organization. The farmers lose their confidence to produce tomatoes due to their low competitive strength in the tomato market. That influences quite a lot the rural economy and social development.

According to the Changji district tomato production annual report (2007), there is no organized tomato associations to assist the small-scale farmers. Farmers need to increase their current returns from tomato production through effective farmer association or organization. This association/organization will make smallholder farmers to benefit through operating a tomato collection system, grading/sorting tomato based on market requirements, and providing sufficient market information for the farmers. It is reported that a great number of small-scale farmers would like to have their own farm association/organization to service them.

The large-scale farmers own more than 50mu to cultivate tomatoes. They have contract labour. Ten per cent of the large-scale farmers have more than 80mu arable land. The large-scale farmers produced 378,000 tons of tomatoes a year. They use improved inputs (i.e. seedlings, fertilizer, or pesticides) which have more yield than the small-scale farmers. They buy their inputs from the TDC and sell directly to the tomato enterprises, supermarket by yearly contracts. The large-scale farmers sometimes also deliver tomatoes to the wholesale market because of surplus products or low purchase price from tomato enterprises. A number of farmers have their own agents to sell products to other provinces.

There are 30 tomato enterprises growing tomatoes in the Changji district. The tomato enterprises have their own process factories and tomatoes can be processed after harvesting. The total cultivation areas are 30,000mu and produce more than 200,000 tons of fresh tomato every year.

In the Changji district, there are more than 4,500 producers with a total of 1,400,000 tons tomato each year. (Table 3.3)

**Table 3.3 Producers by category and yields**

Farmer type	Number of producers	Area(mu)	Production(ton) year	Market share%
Large-scales farmer	More than 850	63,000	378,000	26.3
Small-scales farmer	About 3500	122,500	857,500	59.7
Tomato enterprises	More than 30	30,000	200,000	13.9

Source: RADO(2008)

### **3.3.3 Processor**

The tomato processing industry in the Changji district is in a developing phase. Thirty-one processing factories are currently in this district. In the tomato chain, most of the tomato enterprises are the vertical integrations. The tomato enterprises play a multiplex role in the chain.

Firstly, they are the most important producer in the chain. Most of them have own tomato seeds, seedlings and laboratories. They produce fresh tomatoes and process them afterwards. Around 900,000 tons tomatoes are used for tomato catsup, canned tomato, tomato juice, dry tomato and fresh tomato export.

Secondly, the tomato enterprises act as the wholesaler in the chain. They purchase large amounts of tomatoes in various places from both small-scale farmers and large-scale farmers. The total fresh tomato export volume is around 140,000 tons per year.

Thirdly, the tomato enterprises are the exporters in the chain. Eighty-seven per cent of processed products are exported to the EU, America, Japan, South Korea and the Middle East.

### **3.3.4 Wholesale market/Middleman**

#### **Wholesale market**

In tomato production chain, there are two types of wholesalers involved in the chain. These tomato enterprises are the main processed tomato wholesalers, who sell ten per cent of the processed product to the domestic markets (supermarkets, shops)

Usually large-scale farmers and small-scale farmers would like to sell tomatoes to the tomato enterprise directly. They could sell enormous quantities of tomatoes at one

time. In most cases, they cannot sell all of their tomato to the enterprises due to the high quality requirement (hygiene and food safety) by the processing enterprises and their lack of marketing information, so that they could also sell tomato to the wholesale markets as well.

Those wholesale markets were established after 1990, under direct government instruction and support. Ministries and provincial government jointly founded them and the distribution ranges are at national or regional level. There are standardised marketing regulations and operational mechanisms. The main function of the wholesale market is to provide a transaction platform for farmers so that they will be able to sell tomatoes to different retailers and consumers in time. Most of small-scale farmers do not have their own transportation vehicles so they need to hire trucks to transport tomatoes to wholesale markets and selling tomatoes to the fixed retailer at the market (open air vegetable markets), hawker, local shops and consumers.

Because of the high demand of tomatoes, adequate selling price and an appropriate transportation distance between the Changji district and Urumqi city (40-50 kilometres), most of the small-scale farmers try to sell tomatoes to Fruit and Vegetable Wholesale Markets located in Urumqi city (the capital city of Xinjiang). However, the problem is that due to the high perishable state of tomatoes and lack of appropriate logistic facilities, there are high quality and quantity losses of tomatoes during the transportation by small-scale farmers. On the other hand, the market is supplied beyond its demand because of hundreds of farmers providing a huge amount of tomatoes at the same time in the wholesale markets. These factors prevented small-scale farmers from achieving good selling prices in the wholesale markets.

### **Middleman**

The middleman is a tomato broker in the villages and districts. They buy products from a farm at relatively low prices to ensure a profitable margin and avoid paying brokerage fee. This informal selling channel is mostly used among the small-scale farmers who are in the remote villages or who do not have channel to sell tomatoes. The middleman drives to the farm by transport vehicles and buys the tomatoes in the harvesting season. Normally, the middleman comes to the farm and hire pickers in the village to harvest based on their own quality standard. The pickers use baskets to collect and empty the tomatoes beside the middleman's vehicle.

Most of the small-scale farmers lack the technical skills and information to produce, sort and grade tomatoes in a proper way. A few farmers understand the tomato market, but do not hold the bargaining power. Middleman could pay early if farmer needs cash urgently, but the middlemen are able to dictate the terms and price. This kind of selling is mostly unfair.

### **3.3.5 Exporter**

In the Changji district, only the large tomato manufactories have export business. They buy fresh tomatoes from the large-scale farms and small-scale farmers and process them for the export. The tomato manufactories often work as exporters and sell products directly to the international market. The main export countries are Japan, Russia, European countries, Africa and the Middle East.

### **3.3.6 Retailer**

There are four types of retailers in the tomato chain. They buy tomatoes through farmers and wholesale markets.

#### **Supermarket**

Supermarkets have contracts with large-scale farmers. A few small-scale farmers can have contracts with supermarket to supply tomatoes. The consumer group in the supermarket is much richer than in the wholesale and the open market. The tomatoes in supermarkets are of good quality, unique size and colour and good looking. The small-scale farmers are not able to provide tomatoes that meet supermarket's standards. Supermarkets doubt about the tomato quality from small-scale farmer because they sometimes would face problems, like inhomogeneous size or colour, or pesticide residues, which make them more difficult to sell to the consumers in the supermarket.

#### **Fixed retailer**

Fixed retailer is another type of retailer in the chain. They sell tomatoes in small quantity. They are in the Central Market (in the Urumqi city) or in small wholesale markets.

#### **Hawker**

Hawkers buy tomatoes from wholesale market, put their product on barrows and walk around different markets or residential areas. Normally they buy only 50-100kg each day.

#### **Grocery shops**

There are many grocery shops, which sell commodity as well as fruits and vegetables in the city. The shop owner buys different fruits and vegetables from wholesale market every day.

### **3.3.7 Consuming**

There are at least five options for different consumers to buy fresh tomatoes. Supermarkets could provide different varieties of tomato with super quality. People with high living standard and the white-collars are the main consumption group.

People living near the wholesale market and senior citizens prefer to buy tomatoes in the wholesale market because of the cheap prices. However, most of the citizens would like to buy tomatoes from fixed retailers, hawkers and shops, which are near to the residential area.

## **3.4 Chain supporters and influencers**

### **The Department of Agriculture (DOA)**

*The Department of Agriculture* in the Changji district is officially responsible for tomato production at the district level. The DOA nowasays is responsible for strategic planning and implementation of district agriculture development especially in the tomato sub-sector. The DOA makes policies on tax reduction and providing subsidies to farmers. The major activities are:

1. Providing extension services to tomato farmers
2. Coordinating extension services among the stakeholders
3. Formulating and implementing policy guidelines in the tomato sub sector
4. Marketing research, technology transfer, and technical demonstration
5. Providing cultivation technical support and marketing information
6. According to the market requirement, the DOA is responsible for issuing information on tomato plantation and market guiding price etc.
7. Promoting the adoption of new tomato varieties and high technology extension and working closely with academic institutes and organization

### **Current problems of the DOA and the ideas for future work**

It is important to realize that a good job in agricultural information services is the objective requirement of economic development and the strategic adjustment of agricultural structure to guide the urgent needs. In the Changji district, the agricultural information work is still in its initial and exploratory phase. Information projects are not compatible and do not fit properly economic development. There are three outstanding issues. Firstly, agricultural information system and local network platform has not yet been established in the Changji district. It is not possible to make a perfect connection with other places, like Urumqi city, where the big consumption is, to get efficient information. Secondly, the serious shortage of funds and unadvanced agricultural infrastructure are the factors holding economic development back. Thirdly, services for agricultural information resources have not been effectively integrated.

For existing problems in the Changji district, it is better to focus on five solutions mentioned below:

1. Optimizing the network platform links to cities, counties, towns and villages
2. Improving the quality of governmental officers to provide efficient agricultural information
3. Popularizing the network among the farmers
4. Improving agricultural service quality and level to provide farmers with sufficient agricultural information and knowledge before the cultivation, during the cultivation and after the cultivation
5. Standardized management.

<http://www.ww8899.com/dzzw/html/index.asp?CoId=1&PrId=32&ArId=70&CiId=71&Id=105074>

### **The Bureau of Industrial and Business Administration (BIBA)**

The Bureau of Industrial and Business Administration (BIBA) used to be a state agency specialised in the registration administration of enterprises, such as issuing licences, collecting all kinds of management fees, setting market orders and so on. With the economic development and market liberalisation during the last two decades, BIBA has enhanced the fulfilment of marketing function and become more market focused. They currently act as state agencies in organising market functions. All tomato inputs, processed tomatoes and fresh tomatoes should be checked by the BIBA. All tomato processing enterprises, wholesale markets, and retail markets have the BIBA branches or offices. The main objective are to manage and regulate the millions of active markets scattered around urban and rural areas. The present tasks of the BIBA can be summarised as managing and inspecting markets, seizing fake products in the markets and stopping the appearance of unhealthy competition behaviour. The BIBA also collects market data, such as tomato transaction price and volumes in different markets. However, these data are mainly for administrative purposes, e.g. exchange information with other markets or reports to governmental agencies, and not for commercial usage.

### **Agricultural Bank of China**

The main function of the bank is to provide a loan for input suppliers, large producers, tomato enterprise who have credit facilities to purchase fertilizer, seedlings, land, machine etc. A few small-scale farmers could get a loan from the bank because the small-scale farmers could not pay back in time. Enforcement of the legal procedures in remote locations leaves much to be desired. Although there is the Agriculture Credit Act, which criminalizes defaulting on loan and repayments, defaulting small-scale farmers to go without punishment, banks and other lending institutions suffer untold monetary losses as a result of failure to recover collateral from defaulting farmers. (CIAD, 2005)

### **Government of the Changji district**

In the past, the government was the main player in the tomato marketing game. Since the transition, the government has gradually retreated from direct involvement in the market. The new task of the government should be to define the rules of the game and facilitate other actors in the chain on playing it. Following the traditional classification about market functions of exchange (physical and facilitating), marketing information is one of the central facilitating functions to which the government should pay more attention, particularly in collecting and making market data available to producers and consumers. Although government related public sectors dominated in the agricultural extension system, the traditional agriculture expansion in China focused on technology related delivery, while market information was hardly provided. A well-established communication network should be a basis for ensuring an efficient dissemination of market intelligence and smooth the information flow at different levels. (CIAD, 2005)

## **3.5 Quality and logistics management in the chain**

### **Quality Management:**

Food quality has become a very important aspect for competition in the domestic and global market. To obtain a good product, quality standards are checked along the whole food chain from the supplier of the raw materials to consumption. (P.A. Luning, W.J. Marcelis, W.M.F. Jongen 2002.)

The quality of the fresh and processed tomatoes products marketed by the sub-sector is below the standards and the chemical residue is high. Governmental quality assurance systems are in place but weak since they lack marketing inspection and cooperation with chain actors. On the other hand, most of growers have inadequate cultivation knowledge and little grasp of quality concepts.

### **Production:**

In the Changji district, the cultivated tomato variety is recommended by the DOA according to market requirements and production skills by small-scale farmers. They grow dual-purpose tomatoes (processing and fresh eating) to different markets. Most of small-scale farmers would like to arrange production quantity of tomatoes based on the market price of the previous year. Due to the insufficient tomato variety innovation and lack of field management, the tomatoes mature together in a certain short period. In the mature period, there is a surplus of tomatoes. As a consequence, small-scale farmers suffer from the difficulty of selling tomatoes.

**Chemical use:** The absence of appropriate knowledge and information sources on pest and disease control has been reported as one of the critical problems faced by the small-scale farmers in the Changji district. The DOA is supposed to be the primary supplier of this knowledge; however, due to limited personal and resources the

dissemination process is not at all functional. Most of the small-scale farmers only get this information from the input supply traders. On the other hand, the quality of information is poor and the remote farmers even get little access to this information, because of those local dealers also lack of knowledge on pesticide application. The farmers who purchase pesticides or fertilizers directly from The Tomato Development Center (TDC) reported that they get improved information from there. It was reported that about 30% – 65% of the tomatoes produced by small-scale farmers is completely rejected because of the high chemical residue.

There is no soil testing services available among small-scale farmers. As a result, the farmers either use an excessive amount of fertilizer or inappropriate fertilizers to simply increase tomato production. This significantly influences the quality of the tomatoes and meanwhile it can lead to short tomato shelf life and high costs.

On the other hand, most of the small-scale farmers did not use any manure in the tomato field. It is reported that crop residues and leaf litters on the surface soil serve as manure for the subsequent crops.

**Harvesting and Post harvesting:** During the harvesting and post harvesting stage, quality controls are almost non-existent. High harvest and post harvest losses (25-50%) are one of the major problems on small-scale farmers. The price of tomato decreases in addition to the hidden quality losses. These losses bring low return to farmers. The tomato quality starts deteriorating right after harvest. There are some primary factors that lead to harvest losses.

1. Poor pre-harvest measures, such as adoption of low production techniques (old varieties with short shelf-life, non-balanced use of chemicals)
2. Unadvanced technical harvesting practice, like non-application of pre-harvest recommended treatments/practices, harvesting at improper stages, and improper care during harvesting
3. Post-harvest problems, like dumping tomato from containers to the vehicle, moisture condensation causing pathogen infestation, packaging in different containers without sorting and grading, improper transportation and storage. (Syed Tamjid ur Rahman and Mahmud Hossain, 2005)

A large number of small-scale farmers do not pack and control the temperature during transportation. Enterprises complain that the tomato quality is not uniform. Farmers often mix unqualified tomato together with good tomato.

Quality is of key importance in the specialty (deliver to processing enterprises) tomato trade. If the small-scale farmers want to keep their place in the tomato supply chain, it is important to provide a top quality product to reinforce competition in the chain.

**Storage:** Because of the perishability of tomatoes, storage has always been problematic. The most common diseases of tomatoes are 'soft rotten' in temperature

above 15°C and 'frozen injury' in temperature below 7°C. In most cases, farmers only pick up the tomato and store in their house, living room or stacking tomatoes in the field with simple covering. Farmers also can store their products in the wholesale markets when they cannot sell all tomatoes at once. However, this is a huge expense for small-scale farmers, only a few of them doing this.

Farmers prefer to sell tomatoes to the tomato enterprises. However, farmers are scared to deliver tomatoes to them because of the insufficient cooling spaces. Farmers have to wait outside in front of the factories and tomatoes get worse without any protection.

### **Logistics management:**

**Information flow:** The small-scale farmers are often unaware of prices of tomatoes and opportunities in other markets. The agricultural market information centre of The Department of Agriculture is responsible for publishing a monthly market bulletin that reports the wholesale market and retail prices of different crops and inputs, including tomatoes in most of the district and cities. Some of the district government offices also publish their own agricultural market information bulletins. These bulletins are released through government offices and major wholesale markets to farmers and different buyers. This information is also broadcasted by radio every month, but does not spread to all farmers, in particular the small-scale farmers. On the other hand, most of this information is about current tomato prices; however, there is less information on quality requirements, cultivation guidance, and market analysis (forecasting) for farmers. Numerous farmers just grow tomato blindly. The major source of information for the small-scale farmers is through discussions with other farmers in the area.

Tomato enterprises are the major buyers of tomatoes in the chain. Few growers are informed about the purchase price before growing or harvesting. There is no unified basic purchase price to protect tomato farmers ever since long time ago. The tomato enterprises set purchase prices fluctuating in response to the market condition. The prices varied in the different years. The purchase price was higher if the processed product had a better sale and vice versa. Furthermore, it is not possible to check out if the order is fulfilled according to the contracts' quality and quantity. Some farmers did not fulfil the contract. They signed contracts with many enterprises in the beginning of the year and then sold tomatoes to the one that bid the highest price during the harvesting time. As a result, the idea of cultivation with order and contract promoted for quite a long time but performed practically without a function. Either farmers or enterprises have no protection in this disordered business.

### **Transportation:**

Bai Jie, (2006), described that: *'The adequate state of the Changji district road network is facilitating the physical movement of goods. Most of the roads can be used for all weather condition. The main roads are covered with asphalt, which are suitable for most of the cars, except the heavy tractor. About 80% of the Changji district roads were judged to be in a good condition, until 2005.'*

Small-scale farmers often hire trucks from their neighbours or use their own tractors to deliver tomato to the Urumqi wholesale market and tomato factory. Ten per cent of tomatoes are damaged during the transportation because of the poor protection and knowledge, poor transportation vehicles and overload.

Usually, small-scale farmers should deliver tomatoes to the tomato enterprises by themselves. Farmers have quite a lot of complaints concerning the delivering time. Farmers are really scared of queuing outside to deliver tomatoes to enterprises during the harvesting period. They have to wait in line. Waiting time is normally two to four days. The farmers suffer from the hot weather. To make matters worse, the tomatoes turn rotten after long distance transportation and long time waiting. When keeping tomatoes longer than 24 hours in the transport vehicle, they become rotten and ten per cent quality is lost every day. The tomato enterprises do not accept low quality for the reason of keeping their company quality. As a result, farmers lose their planting initiative and creativity which leads to low production or low quality.

## 4 Field Research Results

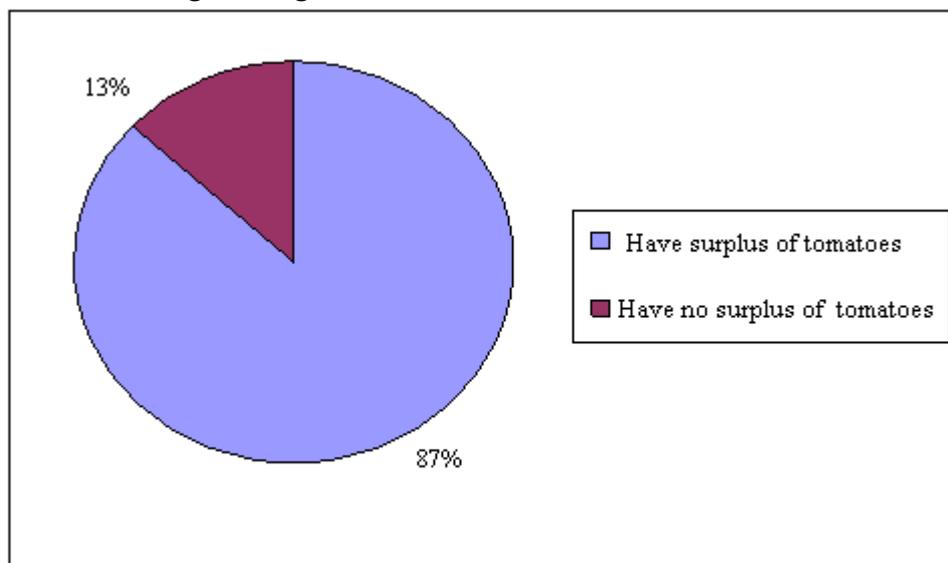
The major objective of this chapter is to elaborate and describe the potential factors influencing low and unstable prices for small-scale farmers in the Changji district based on the findings of the study. The result is organized through information obtained from small-scale farmers' interviews. There were 30 questionnaires delivered and answered by 30 small-scale farmers there.

### 4.1 The General information of farmers

The years of experience on tomato farming of the respondents ranged from 3 to 12 years, almost all the respondents have kept tomatoes for many years and have rich experience in traditional tomato production. 13% of the respondents hold land size less than 20mu, 40 % of respondents' cultivated land size is 20 to 30mu, 30 % is between 30 and 40mu, and 17 % is bigger than 40mu. Until 2008, 72 % of respondent harvest was around 7 tons per mu. Ten percent of the respondent seven had a productivity of 8 tons per mu.

### 4.2 Marketing, price information

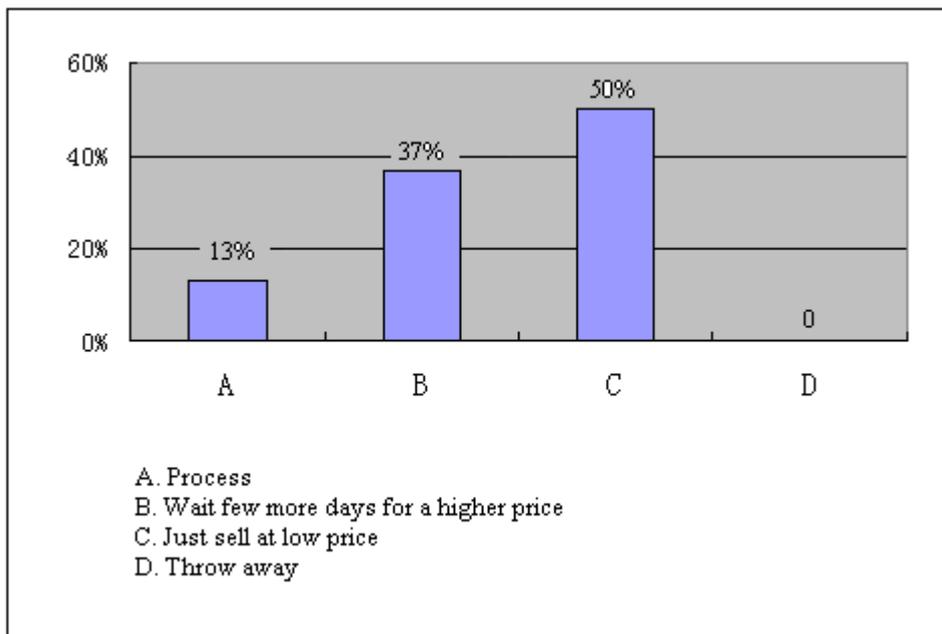
#### *Farmer selling strategies*



**Figure 4.1 Surplus of tomato from small-scale farmers**

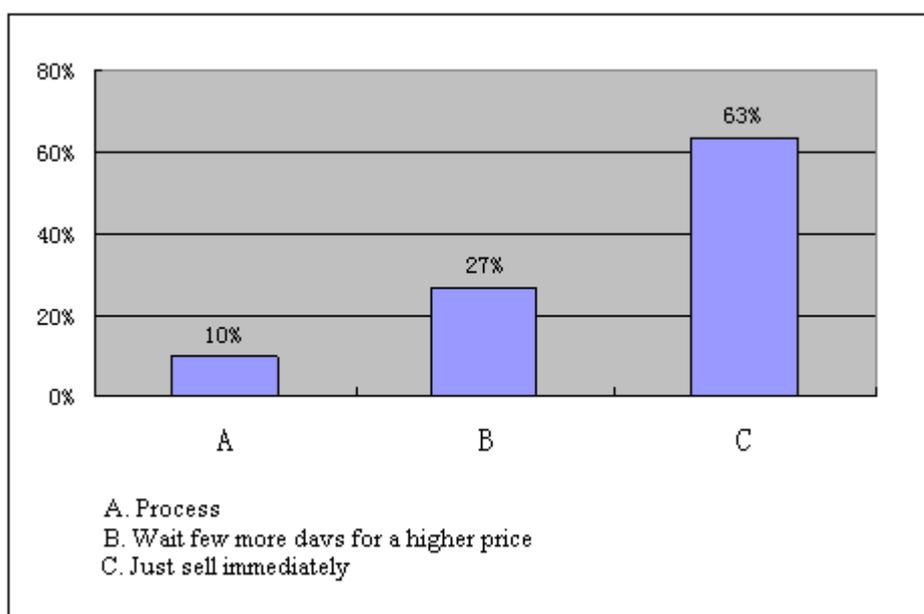
As can be seen from figure 4.1, 87% (26 out of 30) of tomato farmers have surplus of tomatoes during the harvest period. All tomatoes are mature in the same period., which leads to a supply exceed demand. Most of the tomato farmers reach high yields, but cannot manage to sell everything to the market. Only 13% (4) of tomato farmers

can sell the whole amount of tomatoes to the market. Three are holding the land sizes larger than 40mu, which is approaching the cultivation size of big-scale farmers. The other one only has 15mu.



**Figure 4.2 Selling strategy when the price is lower than the pervious year**

From figure 4.2, it can be seen that 50% (15) of the respondents answered that they just accepted the current price, 37% (11) of the respondents said that they were willing to wait for one or two days for expecting the price to be increased, and 13% (4) of respondents would make processed products to get added value.



**Figure 4.3 Selling strategies when the price is higher than the previous year**

Figure 4.3 shows that 63% (19) of the respondents mentioned that they sold immediately, 27% (8) of the respondents said that they were willing to wait for one or two days for even higher price, and 10% (3) of the respondents would process the tomatoes.

**Table 4.1 The average selling prices and quantities to different buyers.**

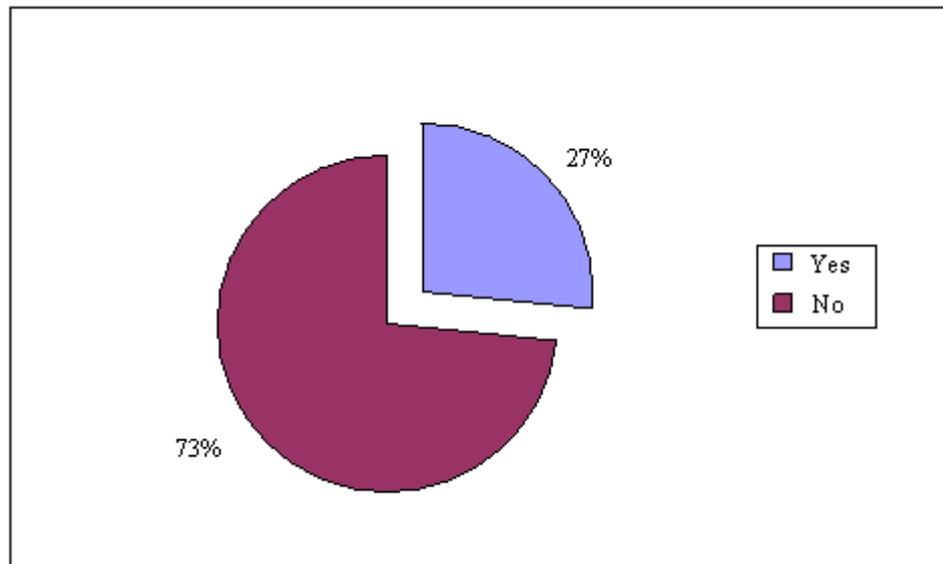
Buyers	The average summer price (Yuan/kg)	The average quantity (kg)	The average winter price	The average quantity
Processors (tomato enterprises)	0.25	44300	/	/
Wholesale market	0.29	29800	/	/
Middleman	0.20	25600	/	/
Supermarket	0.49	5700	/	/

According to the survey results we can find that farmers sell a large quantity of tomatoes to the processors. On the contrary, they sell really small amount tomato to the supermarkets. During the survey, it can be found that there is nobody was found to be growing tomatoes in the winter.

Table 4.1 shows that they sold 42% of the total tomatoes to the tomato enterprises, although the selling price was not high compared with other markets. Farmers complained about the low selling price and quantity to the tomato enterprises. Some

of them mentioned that they could sell even 0.45-0.6 Yuan/kg and 60,000-80,000kg few years before. Most of the farmers wanted to sell tomatoes to the supermarkets for a high selling price. However, because of the high quality requirements, the average selling quantities by small farmers were the lowest. Farmers did not want to sell tomatoes to middleman because of the extremely farm gate prices. In some case, farmers have to sell to the middleman when they have surplus tomato.

**Market information access**



**Figure 4.4 The possibility of getting information on aspect of supply, demand and price**

**Table 4.2 The reason of getting no adequate marketing information**

Reason	number of respondents
a. illiterate	4
b. do not know how and where to get	10
c. the information is not upgraded	8

**Table 4.3 The way to get adequate marketing information**

The way to get information	number of farmers
a. media (TV, newspaper, radio, etc.)	5
b. article from Department of Agriculture	3
c. both of a and b	2

Figure 4.4 represents the possibility of small-scale farmers to get information on supply, demand and selling price. 73% (22) of the farmers said they could not access the adequate marketing information. From table 4.2, it can be seen that four respondents are illiterates. It is hard for them to read words on paper, 10 respondents did not know how and where they could get the adequate information to guide their business, and eight respondents answered that the information was not updated. 27%

(8) of the farmers thought they could get some pieces of marketing information. They got information from news on TV or newspaper, or some article on magazine issued by the Department of Agriculture. The statistics in the table 4.3 shows that five respondents got information from media, such as TV, newspaper, radio, etc. Three of them access adequate marketing information from the articles, which were reported by the Department of Agriculture. Two respondents got marketing information from both media and the Department of Agriculture.

### 4.3 Quality management aspects and logistics

#### *Fertilization & Pesticide application*

**Table 4.4 The way of fertilization and the frequency of application**

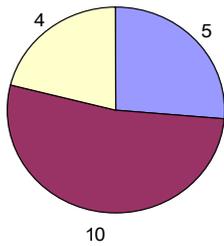
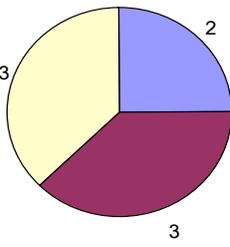
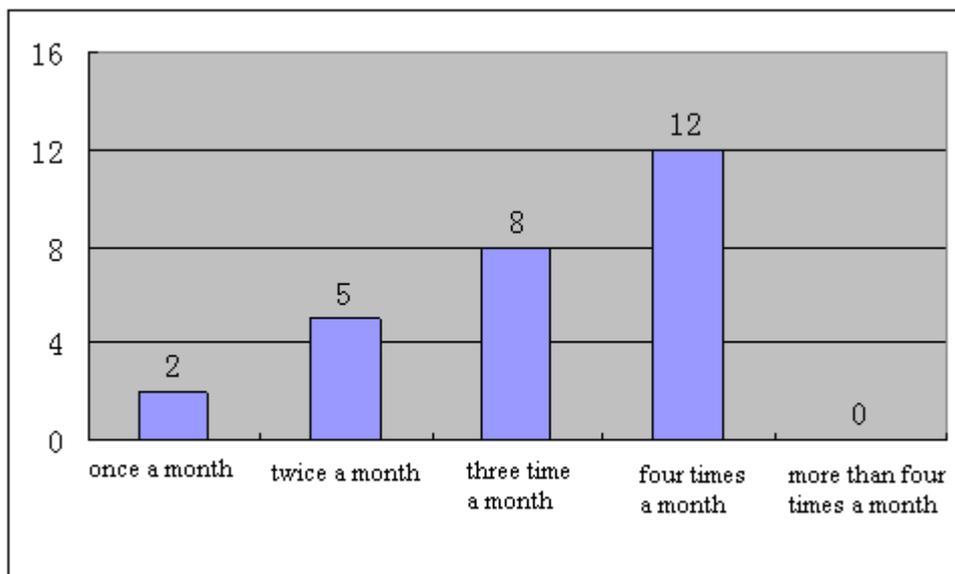
	Number of respondents	Times of manure/compost/fertilizer application during one cultivation			
Manure/compost	10%(3)	Three times			
Chemical fertilizer	63% (19)	 <table border="1" data-bbox="1157 1025 1481 1205"> <tr> <td>■ three times</td> </tr> <tr> <td>■ four times</td> </tr> <tr> <td>■ more than four times</td> </tr> </table>	■ three times	■ four times	■ more than four times
■ three times					
■ four times					
■ more than four times					
Both manure/compost and chemical fertilizer	27%(8)	 <table border="1" data-bbox="1168 1321 1481 1489"> <tr> <td>■ three times</td> </tr> <tr> <td>■ four times</td> </tr> <tr> <td>■ more than four times</td> </tr> </table>	■ three times	■ four times	■ more than four times
■ three times					
■ four times					
■ more than four times					
Total	30				

Table 4.4 shows the way of fertilization of the 30 respondents. 63% (19) of respondents said they only use chemical fertilizer. Five out of 19 gave plants fertilizer three times during the whole cultivation, ten respondents gave four times in total and four respondents gave more than four times. 27% (8) of respondents mentioned that they used both manure/compost and chemical fertilizer. Two out of the eight respondents applied three times during the whole cultivation, three respondents applied four time and three respondents applied more than four times. There were only 10% (3) of the total respondents used manure/compost as the main way of fertilization. They applied three times in one cultivated period. Those three farmers

have a small size of land, fourteen, seventeen and fifteen, respectively. They fed livestock that can supply quite enough manure/compost to the plants.

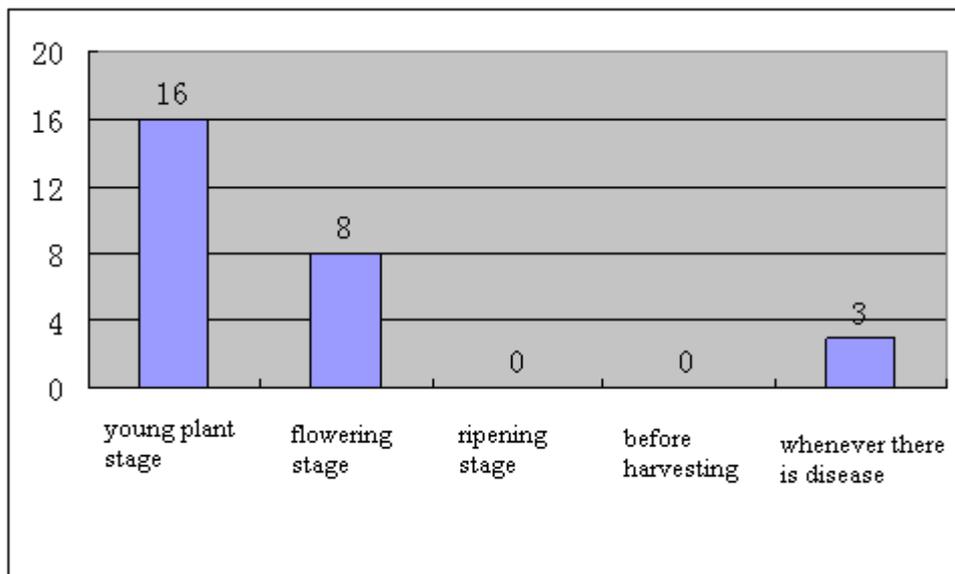
Manure/compost is not available easily for the farmers in Changji District, where farmers are depending on agriculture and not on animal husbandry. On the other hand, the small-scale farmers are not aware of the benefits of manure/compost for the plant and environment as well. They only care about high yields and believe to have obtained a good result by using chemical fertilizer.



**Figure 4.5 Frequency of pesticide application**

27 respondents reported that they used pesticides during the cultivation while three respondents did not use any pesticides because they had a contract with supermarket to provide 'green food' (pesticides free product).

According to figure 4.5, it shows that 12 respondents sprayed pesticides four times per month and eight respondents sprayed three times a month. Five said they sprayed every other week while two respondents mentioned they applied pesticides once a month.



**Figure 4.6 The plant stage of starting spraying pesticides**

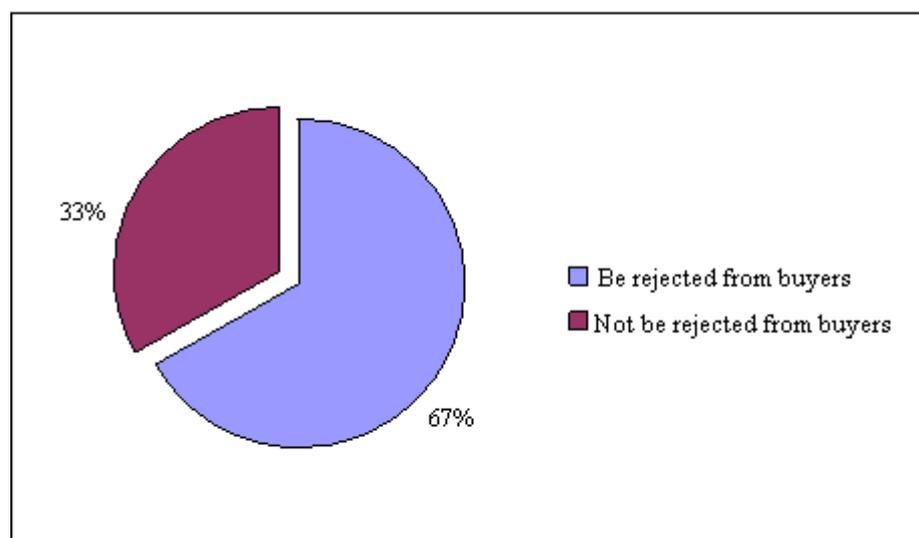
As is indicated in the Figure 4.6, 16 respondents mentioned that they started spraying pesticides from the young plant stage, while eight respondents started from the flowering stage. Three respondents only used pesticides when a disease occurred.

**Table 4.5 The method of measuring the quantity of manure/compost/fertilizer and pesticides**

	Manure/compost/fertilizer	pesticides
By experience	18	15
Calculating the area and measured quantity	3	2
Followed instruction given by supplier	6	7
The combination of above method	3	3
Total	30	27

According to table 4.5, it can be seen that 18 respondents fertilized based on their experience, and 15 respondents applied pesticides in the same way. They thought that they knew the application quantity by heart. Three farmers have the ability to calculate the area and measure the quantity of manure/compost/fertilizer and two calculate for pesticides application. Six respondents applied compost/fertilizer followed by instruction whereas seven respondents follow instruction to spray pesticides. Three respondents said they considered their experience and other information to fertilize or to spray. From the survey, 70% respondents mentioned that they never get guidance about how to apply fertilization or pesticides from

organization or association. Only 30% of them got a little guidance from experts who occasionally visited in the field.

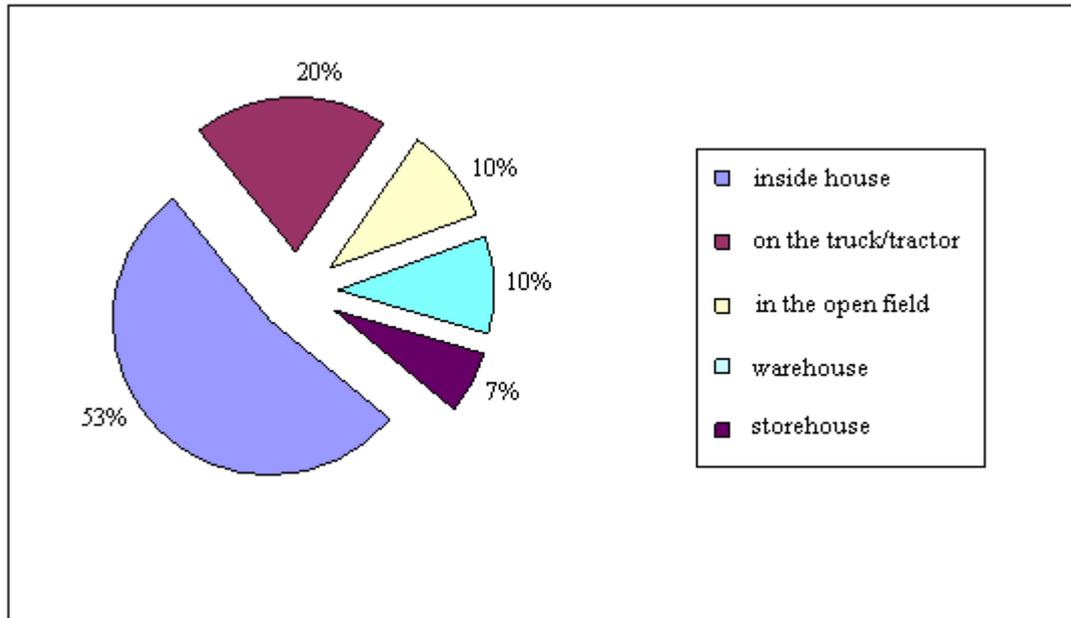


**Figure 4.7 Rejection from the buyers on the base of fertilizer/pesticides residue**

Figure 4.7 shows that 67% (20) of the respondents have been rejected by the buyers on the base of fertilizer or pesticides residues. Most of them have been rejected from buyers at least 2 times a year.

### ***Harvesting and post harvesting***

All farmers used their experience to harvest. Red colour was used as an indicator for fresh tomato harvesting. Picking individual ripe tomatoes were manually. Ripe tomatoes were picked by hand and collected in all kinds of containers that can contain tomatoes, such as wooden barrel, metal pail, plastic cask, bamboo basket, carton, and gunnysack, etc. They said that harvesting was a time consuming job and people sometimes pick up unripe fruits or miss ripe fruits in the plants. Family members participate in tomato harvesting, but farmers also need to hire temporary workers to harvest tomatoes. The temporary workers come from different regions. They work for farmers on different crops wherever the people need them. Farmers believe that those temporary workers know how to harvest tomatoes. If the worker does not know how, farm owner would guide them or ask a skilled employee to guide. The harvested tomatoes were stored in a certain place until they were sold to the market. According to the figure 4.8, 53% (16) of respondents stored tomatoes in their house, such as in the living room. 20% (6) of the total respondents put on the truck or tractor. The tomatoes were transported to the market or processed in a factory during the next day. 10% (3) stored in the open field, such like in the yard, or a big space near the farm. Tomatoes were protected by covering with straw. 10% (3) stored tomatoes in a warehouse. Two of the farmers rent warehouse in wholesale market in Urumqi. The other one stored in the warehouse of his brother. The rest, 7% (2) of respondents stored their tomatoes in the storehouse that was cooler than in the living room.



**Figure 4.8 The place of storing the harvested tomatoes**

**Sorting and grading**

**Table 4.6 The way of sorting and grading**

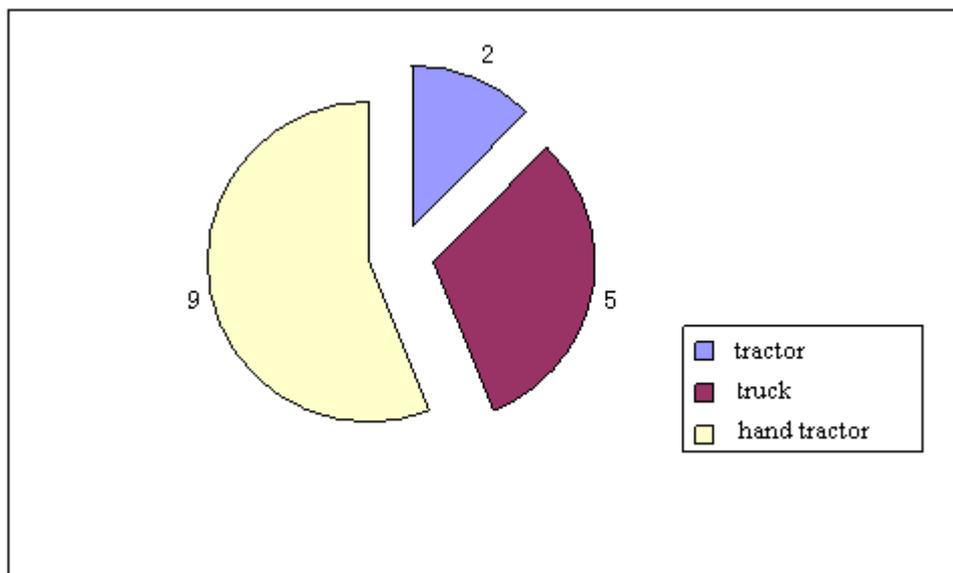
	Number of respondents	How to sort and grade								
No sorting and grading	18									
Sorting and grading	12	<table border="1"> <caption>Data for Figure 4.6: Parameters of sorting and grading</caption> <thead> <tr> <th>Parameter</th> <th>Number of respondents</th> </tr> </thead> <tbody> <tr> <td>Ripeness by hand feeling and experience</td> <td>5</td> </tr> <tr> <td>Colour</td> <td>3</td> </tr> <tr> <td>Ripeness and colour parameters of sorting and grading</td> <td>4</td> </tr> </tbody> </table>	Parameter	Number of respondents	Ripeness by hand feeling and experience	5	Colour	3	Ripeness and colour parameters of sorting and grading	4
Parameter	Number of respondents									
Ripeness by hand feeling and experience	5									
Colour	3									
Ripeness and colour parameters of sorting and grading	4									
Total	30									

Table 4.6 shows that twelve respondents reported that they sort and grade tomatoes before selling them to the supermarket and this would only be necessary to do for the supermarket. The other said they never consider about sorting and grading. Within twelve respondents who sort and grade tomatoes, five of them explained that they

sort and grade according to the ripeness by their hand feeling and experience. Three responded that sorting and grading is based on the colour of tomato. Four respondents stated that they consider both ripeness and colour as the parameters to sort and grade tomatoes.

When asking the interviewees if have were rejected by buyers on base of sorting and grading, all answered with a yes. They sold tomatoes to the supermarket and were told that the tomatoes were not qualified. The main reasons of rejection were inhomogeneous size and colour. Over ripen tomatoes were sometimes the reason for complaints. The respondents said that they could be rejected three or four times every year on average.

### **Logistics**



**Figure 4.9 Transport vehicles**

Sixteen respondents reported that they had their own transport medium to transport tomatoes to the buyers. Nine of them had hand tractors, (Annex 2) five had trucks and two used tractors. The other fourteen respondents said they did not have their own transportation. Sometimes they have to rent vehicle from other farmers or wait for middleman coming to the farm to take tomatoes by middlemen themselves.

There is no special protection during the transportation. Some farmers put straw under the containers and cover with a plastic sheet or cloth. They think the road condition is good and no quality loss is suffered by road condition.

## **5 Discussion**

In this chapter, the research methods, the results from desk study and survey will be discussed on factors that influence unstable and low price for small-scale farmers.

### **5.1 Research methods discussion**

This study attempted to assess the potential factors influencing unstable and low prices for the small-scale farmers in the tomato value chain. In the beginning, the value chain analysis was used as a tool to discover how the current tomato chain was organized in order to find out constrains which could lead to low and unstable prices for the small-scale farmers. Then, the author started the field survey on the small-scale farmers. The extent of this survey includes, selling strategies, quality management, logistic, and government or institutions' facilitating function for the small-scale farmers in the chain. The purpose of this survey was to find which factors could influence unstable and low price and which factors could not.

In order to be able to use the data statistically, 3-5% of the total samples are normally required to ensure a quantitative analysis significant at the 95% level. However, because of the time limitation, the author only took 30 samples at random. The author strongly recommends taking more than 105 (3%) samples to do the research in the future.

### **5.2 Tomato chain discussion based on the desk and the field research results**

#### **5.2.1 Background information of respondents**

Based on the literature review and field survey, tomatoes have been cultivated by the respondent small-scale farmers for at least 3 years in the Changji district. Most of them have experience on traditional tomato cultivation. Although the average yield can reach to 7-8 tons per mu, most of them still suffer from poverty due to the unstable and low selling price in the market.

## 5.2.2 Tomato production

### Varieties:

All the respondents mentioned that they grow the variety of 'Fen Hong D-80'. This variety was bred by Xinjiang Seed Research Centre and popular in the whole province. It can be used as Dual-purpose (The Dual Purpose Tomato is round fruit weighing 80 to 85gms and suitable for both fresh and processing market). The reason is that the small-scale farmers do not have the skills to grow other types of tomatoes and it is difficult to find markets for other types. Firstly, the small-scale farmers do not have enough capital and advanced technical support from any vegetable organization, associations or governments. Compared with other type of tomatoes, like the beef tomato, cherry tomatoes, dual-purpose tomato has a low cultivation technical requirement (e.g. all the plant are grow on the ground, farmers do not need to rope them in different stage.) and a low cost price. Secondly, farmers selected the dual-purpose tomato because it is easy to sell. Farmers can sell to either the processors or fresh markets. In addition, large-scale farmers usually grow other types of tomatoes for the niche markets. (E.g. Supermarkets, Restaurants, Hotels etc.) The large farmers had the absolute monopoly of market of other types of tomatoes.

### Feasibility of growing winter tomato

It is reported that the small-scale farmers can only grow tomatoes from late spring (February-March) to late summer (July-August). Because of low temperature in the winter, none of the small-scale farmers have the ability to grow tomatoes from October until the coming spring. However, in the wintertime, the tomato demands are high from the fresh market; small farmer could not produce because of insufficient organization and low technical support. The small-scale farmers normally have surplus tomatoes in summer and unstable or low selling prices. The small-farmers need to be organized by local government to grow winter tomatoes in order to be competitive in the market.

## 5.2.3 Tomato marketing supply and demand

### The trend of yearly price fluctuation in different market

From the sub-chapter 3.2 we can see that the yearly price fluctuations in different markets follow the similar trends. Three of the markets had the low purchase prices in year 2004. However, the purchase prices have dramatically increased in different markets in 2005. This is due to low production caused by natural disaster (continually high temperature without raining), and the tomato supply cannot reach market demands. After the natural disaster impact, most of farmers restart to grow tomatoes and the total supply enormously exceeds the total demand in 2007, so each market offers the low price to farmers again.

From the survey we can conclude that most of the small-scale farmers could not get sufficient market guidance information about supply and demand. A great number of farmers were experientialist; they rely on the previous situation to grow tomatoes. Within the thirty farmers, there were only two farmers could get market information from media and the Department of Agriculture. However, they also said, the information from the media was not good enough and detailed. It was just a general description mentioning that the demand would increase or decrease during the coming year, but without precise figures or information about purchasers.

Tomato and cotton are both main cash crops in the Changji district, with a great flexibility in Changing of planting areas. It depends often on the previous year in comparison of incomes in these two crops. The relatively good cotton price in the previous year, will probably affect the enthusiasm of farmers planting tomatoes. This is also the factor, which can influence the unstable tomato supply and demand in the market. (Li Tan, 2007)

#### *The trend of seasonal price fluctuation*

Figure 3.4, 3.6, and 3.8 show the trend of seasonal tomato price fluctuation. It is easy to be observed that the price in summer period ( June, July, August, September, October) are extremely low in different markets. This is because of surplus tomato supplied by farmers during the summer time. Compared with the summer time, the tomato price is very high in the winter, because only large farmers and a few small-scale farmers have the opportunity to grow tomatoes in winter. The large-scale farmers have a monopoly position and supply most of tomatoes to the market in winter. If the small-scale farmers also can produce tomatoes in winter, they will balance the market supply and demand; meanwhile they also can get adequate income.

The climate conditions in the Changji district are not too bad to hinder tomato cultivation in the wintertime. Some farmers already practise growing tomato in winter in plastic greenhouses or plastic tunnel as observed during the field research. However, there is no specialist farmer's association or organization, which is organized by farmers or the government to guide small-scale farmer to grow winter tomatoes. A number of small-scale farmers do not have the ability to set up plastic tunnels and manage winter tomatoes.

#### **5.2.4 Selling strategies for small-scale farmers**

About eighty-seven percent of the small-scale farmers have surplus tomatoes. Only four farmers mentioned that they could sell 95% the tomatoes to the market, meanwhile all of these four farmers mainly sell tomatoes to the supermarkets and tomato enterprises by contract.

As farmers mentioned, whenever the market price is higher or lower than the previous year, most of them just want to sell tomato immediately instead of waiting one or two days. It is evident from the field interviews that individual farmers have little bargain power to control the prices. If they could not sell tomato on time, the market price could even be worse in the coming days. During the field survey, the author found that only a few farmers processed tomatoes to 'tomato chunks puree' when they have surplus tomatoes. The rest of them never think about processing tomatoes and lack of processing skills and experiences. Based on the interview with the director of the Department of Agriculture and farmer interview, it was possible for the small-scale farmer to produce tomato chunks puree and sell tomato jam in Urumqi and Changji, because there is a huge quantity of tomato chunks puree consumption in both areas during the winter. It is a great opportunity and strategy for the farmers to sell tomatoes and can add value to the products.

### **5.2.5 Comparison of gross margins in supply chain**

Tomatoes are used as fresh fruits and for processing as well. The tomato value chain in the Changji district involves farmers, middleman, wholesalers, processors, supermarket and other retailers such as fixed retailers, hawkers, and grocery shops. The tables below show the gross margin analysis at different level of the chain actors about 1 kg tomato.

#### ***Data collection and calculation methods at small-scale farmer level:***

The gross margin at farmer level can be calculated by considering a small farmer with a production of 7 tons of tomato per mu (Table 5.1). According to the interview with the officer of the Department of agriculture and Statistic data study, we got the different costs of planting 1mu tomato. Therefore, we knew the

**Total cost per Kg= Total cost per mu/ Production per mu.** From the table we can find that the labour costs are most significant to the farmers and the fee accounts for large part of their cost as revealed in table 5.1.

**Farmer selling price/kg (revenue):** According to the chain analysis and field research result (chapter 4, table 4.1), farmers could sell tomato to different buyers by different prices. In this case, we use 'weighted average price' to calculate the selling price.

**Gross income= Revenue-variable costs**

**Gross margin= Gross income\*100/ Revenue**

**Table 5.1 Gross margin at small-scale farmer level**

Description	Price (RMB)	Price (Euro)
<b>Cost</b>		
Seed input (per mu)	67	6.7
Plant support (per mu)	70	7
Fertilizer (per mu)	160	16
Pesticides (per mu)	130	13
Irrigation (per mu)	55	5.5
Machinery (per mu)	27	2.7
Labour (per mu)	710	71
Transportation (per mu)	40	4
Total cost (per mu)	1259	125.9
Production 7,000 kg/mu		
<b>Total cost per kg</b>	<b>0.18</b>	<b>0.018</b>
Selling price per kg	0.26	0.026
<b>Total revenue per kg</b>	<b>0.26</b>	<b>0.026</b>
<b>Gross income</b>	<b>0.08</b>	<b>0.008</b>
<b>Gross margin</b>	<b>30%</b>	

(Note: 1euro=10 RMB, 1ha=15mu, 1mu=667m<sup>2</sup>)

***Data collection and calculation methods at Middleman level:***

In most cases, small-scale farmers have surplus tomatoes, which they cannot sell by themselves. They have to sell to the middlemen by a low price. Those middlemen buy tomato at 0.20RMB and sell to different retailers at 0.41RMB.

According to the Statistic data on tomato marketing analysis in Changji district (Bai Jiang 2008), we got the middlemen's costs and selling price data.

**Table 5.2 Gross margin at middleman level**

Description	Price (RMB)	Price (Euro)
<b>Cost (per kg)</b>		
Tomato	0.20	0.02
Transportation	0.03	0.003
Labour	0.04	0.004
<b>Total cost (per kg)</b>	<b>0.27</b>	<b>0.027</b>
Selling price (per kg)	0.41	0.041
<b>Total revenue (per kg)</b>	<b>0.41</b>	<b>0.041</b>
<b>Gross income</b>	<b>0.14</b>	<b>0.014</b>
<b>Gross margin</b>	<b>34%</b>	

***Data collection and calculation methods at wholesaling level:***

According to the Statistic data on tomato marketing analysis in Changji district (Bai Jiang 2008), we got the costs and selling price data.

**Table 5.3 Gross margin at wholesaling level**

Description	Price (RMB)	Price (Euro)
<b>Cost (per kg)</b>		
Tomato	0.19	0.019
Transportation	0.05	0.005
Labour	0.03	0.003
Market stall fee	0.03	0.003
<b>Total cost (per kg)</b>	<b>0.30</b>	<b>0.03</b>
Selling price (per kg)	0.45	0.045
<b>Total revenue (per kg)</b>	<b>0.45</b>	<b>0.045</b>
<b>Gross income</b>	<b>0.15</b>	<b>0.015</b>
<b>Gross margin</b>	<b>33%</b>	

***Data collection and calculation methods at supermarket level:***

According to the Statistic data on tomato marketing analysis in Changji district (Bai Jiang 2008) and interview the general managers of different supermarket, we got the costs and selling price data. In this case, supermarkets directly buy tomato from small-scale farmers. They give high purchase price to farmers and sell at 1RMB per Kg to consumer.

**Table 5.4 Gross margin at supermarket level**

Description	Price (RMB)	Price (Euro)
<b>Cost (per kg)</b>		
Tomato	0.49	0.049
Labour	0.04	0.005
Grading & sorting	0.03	0.003
<b>Total cost (per kg)</b>	<b>0.56</b>	<b>0.056</b>
Selling price (per kg)	1.00	0.1
<b>Total revenue (per kg)</b>	<b>1.00</b>	<b>0.1</b>
<b>Gross income</b>	<b>0.44</b>	<b>0.044</b>
<b>Gross margin</b>	<b>44%</b>	

***Data collection and calculation methods at other retailer level:***

According to the Statistic data on tomato marketing analysis in Changji district (Bai

Jiang 2008) and interviewed different retailers, we got the costs and selling price data. From table 5.5 we can find that the retailers buy tomatoes from the wholesale market at 0.45 RMB and sell at 0.70 RMB per Kg.

**Table 5.5 Gross margin at other retailer level**

Description	Price (RMB)	Price (Euro)
<b>Cost (per kg)</b>		
Tomato	0.45	0.045
Labour	0.05	0.005
<b>Total cost (per kg)</b>	<b>0.50</b>	<b>0.050</b>
Selling price (per kg)	0.70	0.07
<b>Total revenue (per kg)</b>	<b>0.70</b>	<b>0.07</b>
<b>Gross income</b>	<b>0.20</b>	<b>0.02</b>
<b>Gross margin</b>	<b>29%</b>	

***Data collection and calculation methods at Processor level:***

According to the Statistic data on tomato marketing analysis in Changji district (Bai Jiang 2008) and interviewed two managers of tomato enterprises, we got the costs and selling price data. Tomato enterprise (processor) directly buys tomato from small-scale farmers at 0.25/Kg and sells it (tomato paste) at 0.45/kg.

**Table 5.6 Gross margin at processor level**

Description	Price (RMB)	Price (Euro)
<b>Cost (per kg)</b>		
Tomato	0.25	0.025
Labour	0.05	0.005
Processing	0.03	0.003
<b>Total cost (per kg)</b>	<b>0.33</b>	<b>0.033</b>
Selling price (per kg)	0.45	0.045
<b>Total revenue (per kg)</b>	<b>0.45</b>	<b>0.045</b>
<b>Gross income</b>	<b>0.12</b>	<b>0.012</b>
<b>Gross margin</b>	<b>27%</b>	

(The gross margin for processor is considered about the domestic market.)

The above tables showed the cost, revenue, gross income, and gross margin of tomato, which were bought and sold by the participants of the marketing channel. The small-scale farmers could only earn 0.08 RMB/Kg, however the supermarket earned 0.44 RMB/Kg. This analysis confirmed that the supermarket gets the highest gross income and gross margin, followed by the Middleman, wholesaler market, small-scale farmers, retailer, and processor. This gives the reason why farmers always prefer to sell their tomato to the supermarket rather than sell to other buyers, because, the supermarket buy their tomato at high price.

As mentioned in the literature review and field research, we found that there were only a few small-scale farmers could sell their tomato to the supermarket. Most of

supermarket refused to purchase tomatoes from the small-scale farmers because of the quality. If the small-scale farmers want to directly sell tomato to supermarket and get adequate income, it is necessary to improve the quality of the products.

### **5.2.6 Quality and logistics management in the chain**

#### Fertilizer application

Technologically, chemical fertilizer and compost/manure should alternant be used two- three times during the whole tomato planting stage. However, based on the author's field research, 63% of small-scale farmers only use chemical fertilizers in the field and most of them apply these more than four times to increase the production. There are only 27% of them combining chemical fertilizers and compost/manure together and most of them use fertilizer more than four times.

Incorrect and excessive fertilizer application on the tomato could cause short storage period in the field, short shelf life in the supermarkets and bad taste. That is why many supermarkets and processor do not want to buy tomatoes from the small-scale farmers.

#### Pesticide application

Due to low extension services by the Department of Agriculture (DOA) and pesticides suppliers, small-scale farmers just use pesticides based on their own experience or learn from their neighbours. A great number of farmers lack of knowledge of appropriate application and dosage of pesticides use, what increases pesticides residues resulting in poor profit.

Theoretically, we need to spray pesticides whenever there are pests and diseases bursting in the field. It was reported that 40% of them just spray pesticides four times a month to prevent pest and diseases. Sometimes farmers often ignore the prescribed number and frequency of spraying.

During the interview, only three farmers followed the chemical application procedures. This high frequency and inappropriate pesticide application must cause high level of chemical residue and low/ unstable selling price in the market.

#### Harvesting and post-harvesting handling

Harvesting and post-harvesting losses are the major issues, which are faced by small-scale farmers. There are two types of losses namely quantity losses and quality losses.

**Quantity losses:** The farmers do not pay much more attention during the harvesting. Most of them just dump the tomato from different containers to the vehicle without grading and sorting. In order to reduce transportation time and save money, farmers would like to over loading tomato to the truck with tomatoes. During the transportation,

some tomato will be destroyed and pathogens will infect other tomatoes in the truck. These are typical quantity losses faced by small-scale farmers.

On the other hand, the small-scale farms sell a great number of tomatoes to the tomato enterprises. The problem is that the tomato enterprises cannot buy huge quantity of tomatoes from different farmers in one time, so farmers have to wait two or three days to deliver tomatoes. In many cases, farmers suffer huge losses because of long distance transport tomato and inefficiency purchase tomatoes by tomato enterprises.

**Quality losses:** For quality losses, it can be concluded:

1. Lack of pre-harvest recommended treatments/practices, harvesting at improper stages, and improper care during harvesting
2. Weak storage facilities and disunity harvesting containers
3. Wrong storage temperature and the absence of any plant protections after harvesting
4. Most of farmers do not grad and sort tomatoes
5. It is reported that most of small-scale farmers do not follow grading and sorting practices. The reported reasons behind this are due to lack of adequate knowledge of grading and sorting.

#### Logistics management

**Information flow:** According to the literature research and field research the author concluded that there is no efficiency and effectiveness of the information flow in the chain. The department of Agriculture only publishes market information based on current retail price in different markets without publishing the quality requirements in different market and market forecasting based on the supply and demand. Those insufficient information lead to farmers growing too many tomatoes that is over the demands.

As we know, the tomato enterprises are the big buyers of the fresh tomatoes in the chain. The farmers are willing to sell the tomatoes to them as much as possible. However, these enterprises do not give purchase price before growing. They just set up the purchase price base on the total supply of the tomatoes. If the supply is higher than last year, they just demand a low price and vice versa. In many cases, although farmer and enterprises sign the contract, farmers still sell tomatoes to someone else who can offer higher prices. There is no formal supply and demand information flow in the chain, meanwhile this bad chain relation directly influences the tomato price in the market.

**Transportation:** half of the small-scale farmers mentioned that transportation is not a big problems since they either can hire trucks to transport tomatoes or use their own transportation tools to deliver tomatoes to the market. Most of the farmers only use

simple material to protect tomatoes during the transportation. This might be influence the final quality of tomato.

### **5.2.7 Chain supporters and influencer**

The DOA is mainly responsible for providing extension services for farmers, publishing market information, and providing technical support to farmers. Following the analysis the tomato value chain and field research, it is found that the market information flow was not doing well to the small-scale farmers and farmers do not get adequate plantation guidance and information as well. For example, from the field research we found that twenty-one of the respondents never got guidance about the way of using fertilizers and pesticides. They mostly groped the way of fertilization or pesticides application by communication with neighbour or asking advice from input traders. They complained that it was difficult for them to calculate the concentration from instruction. They could not understand the calculation information of the instruction. Sometimes, the plants were damaged by high concentrated solution. They are eager to have some right guidance from the professional people or the DOA.

The role of the Changji district Government are facilitating and supporting different actors in the chain, defining the agricultural rules and collecting and making market data available to farmers and different buyers. After the initial institutional reforms and marketing liberalisation (2002), the government sought new waves of policies to push the growth of the agricultural economy to a higher level. When the central government advocated the development of agribusiness as a new pivot to encourage production for tomato enterprises, the Changji district government began to pay even more attention to the tomato-processing enterprises. Given the popularity of tomato processing activities at enterprise level, the Changji government adopted a series of policies aimed at encouraging tomato processing business. During this period, processing scales have increased and a number of private agribusiness is emerging (Lin, 2002), meanwhile the high quantity tomato materials were required by different tomato enterprises. Without proper guidance/supervision and government intervention, a great quantity of surplus tomatoes was produced by farmers every year which lead to low selling prices in the summer. Farmers faced an extremely impact of this low selling price.

## 6 Conclusions and recommendations

### 6.1 Conclusions

The potential factors, which influence the unstable and low price for the small-scale farmers in the chain in the Changji district, coming from the literature research and field research were discussed in the previous chapter. It is found that some points are more important than the others are. The conclusions are based on the major influencing factors. The following three clusters are the most important to be looked into and they lead to the recommendations.

#### **Production/supply and demand**

In the Changji District, the small-scale farmers grow Dual-purpose tomato as the major income year by year. The study found out that most of the tomato growers did not properly follow the production practices. They did by traditional method of cultivation, harvesting, and storage. The traditional skills and the knowledge of the tomato growers in production and marketing were not adequate for the changed situation and the market. Farmers lack knowledge and experiences on fertilizer/pesticides management, storage practice and harvest/post-harvest management. These poor production practices directly lead to low quality of tomatoes and low market prices.

The small-scale farmers did not have the ability to grow tomatoes in winter, even when the tomato price and demand in winter was high. In many cases, we have surplus and low price tomatoes in summer or vice versa in winter. On the other hand, the small-scale farmers could not get sufficient market information on supply and demand. They will increase tomato production if the price was high in the previous year (Supply > Demand). If the marketing price was low in the previous year, they just grew cotton instead of tomato (Supply < Demand). This unstable supply and demand caused unstable tomato price in the markets.

Due to the insufficient water conservancy and weak agricultural policy supported by the Changji government, the small-scale farmers cannot resist to natural disaster (high temperature) by themselves. Sixty percent of tomatoes were wilting due to a lack of water. A number of farmers suffered high quantity of tomato losses in 2005. This disaster strongly influenced the tomato market price, supply and demand.

### **Tomato Quality management**

The tomato supply chain in the Changji district was not properly co-ordinated and focussed more on the quantity than on the quality. Stakeholders operated individually and independently resulting in a poor flow information especially to the small-scale farmers. The situation was that most of the small-scale farmers have experienced rejection by their buyers because of the unqualified tomato quality. The major complaints by different buyers were short tomato shelf life which caused by oversupply fertilizer, pesticide residue and insufficient grading and sorting.

Form the field research, we found more than half of the small-scale farmers applied fertilizers/pesticides by old experiences without knowing the proper way of using them, and moreover, the farmers did not have adequate skills or abilities to handle harvesting and post harvesting. For example, farmers picked up tomato only base on red colour without thinking from marketing side. During the harvesting, farmers picked up the tomatoes and collected in any containers. After the harvesting, most of them put a huge quantity of tomato in the room, in trucks, or on open fields without proper protection. The insufficient quality management could not satisfy buyer so that farmers faced low and unstable purchasing price.

### **Information flow**

There was no adequate flow of information among the chain in the Changji district. The small-scale farmers often lack any information about supply, demand and quality aspect of the production. The information flow on technologies and marketing (quality requirement by different buyers, cultivation skills training, marketing forecasting etc) generated from the local government and Department of Agriculture to the farmers was poorly disseminated. The research-extension workers linkages were weak in the district hence the research findings remain locked up on the shelves without being disseminated along the chain to different actors, especially to producers. Farmers complained that they could not get useful marketing or cultivation information from any farm association or some other organizations. Because of this inadequate information, farmers always produced unqualified tomato and surplus tomato to the market. This is one of the factors, which lead to unstable and low prices for the small-scale producers.

## **6.2 Recommendations**

Three categories of recommendations were found to be relevant to encourage profitable tomato production by the small-scale farmers in the Changji district. Based on the conclusions drawn as discussed in the previous section, following recommendations were made to make the small-scale farmers more competitive by specializing each actor and influences' roles in the chain.

## **6.2.1 Recommendations for the small-scale farmers**

In the Changji district, the small-scale farmers are engaged solely in the production of dual-purpose tomato year by year without changing tomato varieties. The majority of the farmers, especially the farmers in the remote areas, are highly disintegrated having only production facilities without any processing ability and bargain power on marketing.

### **6.2.1.1 Farmers Association**

It is evident from the description of the chain that the farmers have very little or no influence on the price of their own tomatoes. From the farm to the consumer market, there is a large room in the price but the farmers have no power to control the price. According to the interviews of farmers and experts, establishing a farmer association is strongly suggested. Farmer association could help farmers to organise their business in a group instead of individually. One key component of this Tomato Associations is that they should be privately owned rather than governmentally controlled to ensure autonomy in decision-making. If the farmers are organized by groups, it would increase the small-scale farmers' current position in the chain. The small-scale farmers would have one language and bargain power in the market.

The farmers' association establishment should be based on 'the Law of the People's republic of China on Specialized Farmers Cooperatives'. This Law is enacted for the purpose of supporting and guiding the development of specialized farmers cooperatives, regulating their organization and behavior and protecting their lawful rights and interests and those of their members', and promoting the development of agriculture and of the economy of rural areas. (details in annex)

### **6.2.1.2 Specific activities**

The association is to try to represent to individual farmers collectively, moreover, their operations should more marketing oriented than production oriented. The task of the association is at strengthening individual small-scale farmers' marketing power, providing marketing service, and providing quality products to the clients. The specific activities are:

1. Cultivation guidance

Cultivation requires professional training. Farmers are interested in improving their tomato quality but there is insufficient training available. Most farmers learn how to cultivate tomatoes from each other. Training on quality

improvement is essential. Association can do the job with R&D team (Research and development team), for instance organizing demonstration courses on how to influence quality in different growth stages.

2. Fertilizer application guidance

The farmer association can organize to show the advantage of soil test based fertilization to the farmers and offer related courses on integrated soil fertility management, policy, and environmental issues related to the production, marketing, and use of agricultural inputs. The knowledge showed the improvement in yield and quality of vegetables through balanced and adequate fertilization is extraordinary useful for the small farmers.

3. Pesticides application guidance

Pesticide application training helps reduce the harmful effects of improper pesticide use. Pesticide application certification is a legal requirement for persons using restricted-use pesticides in any situation, as well as for those individuals who apply general-use products in a commercial situation and are required to be licensed by both state and federal regulations. The association should conduct courses of training for private pesticide applicators wishing to obtain certification and educate them to be licensed applicators to protect farmers themselves and environment.

4. To provide input supply

The costs of inputs are always the major expenses of tomato production. When the farmer association become a big buyer and buys a big quantity of inputs from suppliers, the unit price will goes down. To be able to achieve this goal, the farmer association needs to have an 'input department' to connect and negotiate with different suppliers.

Farmers who wish to buy inputs remit money into the farmer association bank account. The 'input department' then negotiates with different input suppliers for a quantity of inputs. The 'input department' need to hire lorries and pick up the inputs from different suppliers. They bring it to the association in the district, where farmers can pick up the different inputs they have ordered using their walking tractors. The farmer association's success at sourcing fertilizers directly has brought several benefits for its members.

-- Bulk buying and distribution mean farmers can buy inputs at lower prices comparing with individual purchase.

-- Low production costs mean farmers can have high gross margin.

5. To assist the small-scale farmers to grow winter tomato

The farmer association offers knowledge of growing tomatoes in winter and gives demonstrative course. They can jointly do the job with DOA

(Department of Agriculture) to provide the information of cultivars which are suitable to grow in winter. The association also should offer planting materials and construction fertilities to support winter cultivation, for instance, they can get together to buy wholesale fertilities of building the greenhouse or tunnels in case of reducing the material cost and transportation cost as well.

6. Grading and sorting guidance training

Grading and sorting will be a common and popular issue in the consumer market. High quality markets, for instance, the supermarket in China, offer a higher purchase price and set a higher purchase quality standard as well. The small farmers did not aware the importance of grading and sorting based on the different marketing requirements. Association should make them know why to sort and grade and how to do it. Technical support and skill guidance should be considered as a key point by the association.

The farmers bring their tomatoes to the collection centre, where the tomato are graded and sorted by members who have been trained to do this. The tomato are then weighted, and the farmer is given a sheet listing the quantity of tomatoes received and their grades. The tomatoes from different farmers are then bulk into crates, sack and sell to different clients. When the farmer delivers tomatoes to the collection centre, members of the monitoring committee are able to give him/her an estimate of the price the tomato will fetch. Farmers who are not satisfied can try to sell their products elsewhere.

7. Marketing information collection

Since the information flow plays an important role in the marketing system and individual farmers have difficulty in collecting marketing information, the farmer association could process market intelligence from both national and regional agencies, as well as disseminate this information to the members.

8. Marketing service

Since individual farmers hold weak bargaining positions in the markets, association can act as farmers' marketing agencies and vertically integrate farmers into the food marketing channels. Generic promotion for product can be done by association. An individual grower does not have the ability, and it is also not sufficiently worthwhile for them to promote their product individually. The association can assure a market for the product so as to minimize the unsaleable risk.

### **6.2.2 Recommendation for the Department of Agriculture (DOA)**

- 1) Updated marketing information channels or networks should be developed. A strong mechanism should be developed to provide the marketing information such as supply, demand and quality requirement by different buyers. The DOA should take initiatives in this matter.
- 2) Promotion of chemical using standards and harvesting techniques: Priority should be given to develop and disseminate the technology on chemical use standards, harvesting and post harvesting. Efforts should be made to improve the quality of tomatoes. These techniques should be tailored with needs of the farmers. The DOA and its concerned agencies should take the lead in promoting these activities. Different training should be provided to the farmers on the mentioned aspects of tomato production.
- 3) The Department of Agriculture should assist farmer association to work together to improve tomato quality based on a reduction of chemical residue, correct grading and sorting methods etc.

### **6.2.3 Recommendation for the Changji local government**

#### *Complete agricultural insurance system:*

There is little or no protection given to farmers against natural disasters. Since there is no effective governmental mechanism for supporting stricken farmers. This situation is made worse by the fact that the small-scale farmers have no capital to follow up the coming year's cultivation when they suffer natural disaster. If farmers have the ability to access agricultural insurance, they can reduce losses to some extent. The government needs to complete an agricultural insurance system and serve to the small-scale farmers.

First of all, the government should propagandize the function of agricultural insurance at district level. Those drumbeatings should be based on the insurance expenses, the types of insurance and insurance range. The purpose is to create an awareness of the importance of agricultural insurance. Secondly, the district government office should harmonize the working procedures with financial institution and insurance institution to insure the premium flow in a harmonious manner. Thirdly, the agricultural insurance institution should rigorous and rapid execute the compensation without delay. Insured farmers need to get compensation before the next cultivation stage. In order to facilitate agricultural insurance spreading out in the remote areas, the district government and insurance institution need to set some service agencies to serve remote farmers.

#### *Farmer association support:*

The government should provide an enabling environment for operation of privately managed farmer association through favourable policies. Those support policies should include:

- 1) The association registration fee should be reduced. The local government should facilitate farmers to build up a farmer association by giving subsidies. The subsidies should used for staff training, purchase of agricultural machinery, infrastructure construction, and agricultural inputs etc.
- 2) The government should facilitate the personnel training by means of the farmer association. The training includes association management skills, association rules and regulations, financial management skills etc.
- 3) The government should encourage farmer association to establish an own brand and guide farmers to get quality certification

#### *Extension services:*

Although government related public sectors dominated in the agricultural extension system, the traditional agricultural extension in the Changji district mainly focused on

technology related delivery, while market information was hardly supplied. (Zhang Xiaoning, 2009) The governmental extension officers and other extension providers should offer information or knowledge to the small-scale farmers after assessing their needs.

The government should put more emphasis on marketing R&D, marketing price monitor and publish the information to different chain actors in time. For example, the governmental information department should publish detailed information on different markets instead of general price information description. All the important information should pass by the small-scale farmers in remote areas.

The government should reinforce tomato sector supports, including financial/policy support on agricultural infrastructure to prevent natural disasters. For instance, implementing water conservancy and setting up pest and disease prevention and farmland protection system etc.

## Reference

Bai Jie, 2007, 'Transaction Channels Analysis of tomato in the Changji district.' Monographs, University of Xinjiang

Bai Jie, (2006). "Overcoming transaction cost barriers to participation of small-scale farmers in Xinjiang Province of China." PhD thesis, Xinjiang University, China.

Bai Jiang (2008) Tomato Marketing Analysis Report in Changji District, Department of Agriculture.

Changji district tomato production annual report (2007), Ministry of Agricultural development, Changji district, Xinjiang Province.

China fresh tomato sector analysis

<http://www.foodqs.com/news/gnspzs01/2009423131814149.htm> (accessed 8<sup>th</sup> July 2009)

China Agriculture Yearbook 2008

<http://www.agri.gov.cn/> (accessed 13th July)

Cao Xinggang 2001. A study report on tomato marketing in the Changji district Agriculture Research Station, Changji, Xinjiang

CIAD, (1995). Social and Economic Assessment of the Small-scale, Tomato Production System in the Changji district, Xinjiang Province. China Agricultural University, Beijing, China.

Farmers Cooperatives Law, translated and editing by Bai Jie, Zhang Duoyu. Copyright Department of Agriculture, 2009

<http://www.agri.gov.cn/xxgkqzdt/P020080429670661663933.doc> (accessed 10th Sep 2009)

Introduction to Changji

<http://torchrelay.beijing2008.cn/en/journey/changji/news/n214333924.shtml>

<http://www.accci.com.au/keycity/xinjiang.htm> (accessed 10th Sep 2009)

[http://www.ppi-ppic.org/ppiweb/nwchina.nsf/\\$webindex/79A4A73CE08FC240482573A8000C22C9?opendocument&navigator=home+page](http://www.ppi-ppic.org/ppiweb/nwchina.nsf/$webindex/79A4A73CE08FC240482573A8000C22C9?opendocument&navigator=home+page) (accessed 14th July)

Lin, J. Y. (2002). ' Rural Reforms and Agricultural Growth in China.' China Economic Review, 82 (March): 34-51.

Li Tan (2007) A case study of cotton industry in Xinjiang province. University of Xinjiang, China.

Map of China showing Xinjiang Province (in red part)

<http://map.mapbar.com/>

P.A. Luning, W.J. Marcelis, W.M.F. Jongen 2002. Introduction: Food Quality Management. (Chapter 1) P<sub>5</sub>. Food Quality Management. Wageningen Academic Publisher. The Netherlands.

Rajkumar, P., S. Kulanthaisami, et al. (2006). Vacuum Assisted Solar Drying Of Tomatoes Slices. ASABE Annual International Meeting, Portland, Oregon.

RADO,2007. Rural and Agriculture Development Office, Annual Report

Science Museums of China. Rubies in a World of Green Plants

- Tomato (*Lycopersicum esculentum Mill*)

<http://www.kepu.net.cn/english/banna/folk/fol109.html> (accessed 8th July 2009)

Syed Tamjid ur Rahman and Mahmud Hossain, 2005. Tomato Value Chain Analysis-Enhancing Farmer's Profitability through Value Addition

The map of Changji district.

<http://image.baidu.com/i?tn=baiduimage&ct=201326592&lm=-1&cl=2&fm=ps&word=%B2%FD%BC%AA%B5%D8%CD%BC>(accessed 10th Sep 2009)

The Department of Agriculture (DOA)

<http://www.ww8899.com/dzzw/html/index.asp?Cold=1&PrId=32&ArId=70&Cild=71&Id=105074> (accessed 31st July)

Tomato Cultivation in Changji district.

<http://www.cnki.com.cn/Article/CJFD2005-NONG200508007.htm>

The trend of tomato price and production in the Changji district

Department of Agriculture, 2008, digital library (no website available, internal using)

Wallerstein, I. , 2000. Globalization or the Age of Transition? A Long-Term View of the Trajectory of the World System. International Sociology 15(2):249.

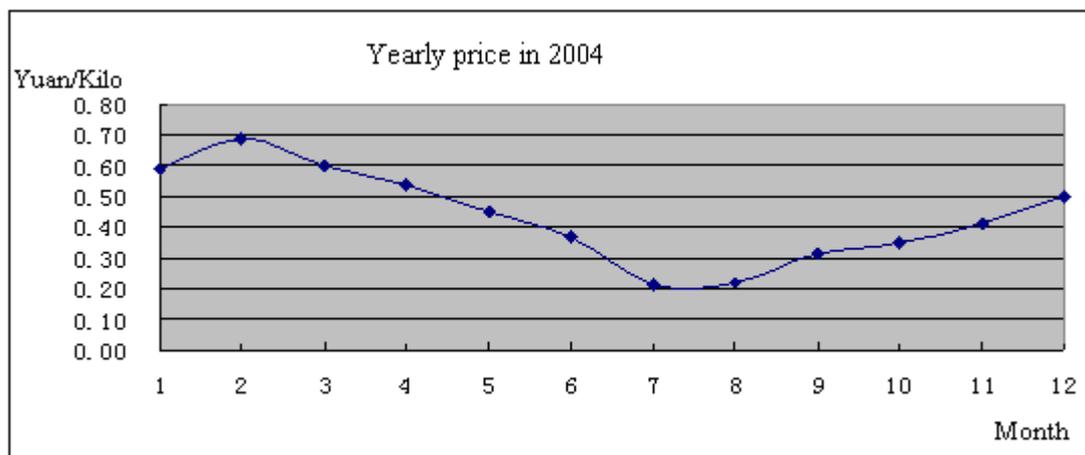
Xinjiang tomato industry introduction

<http://www.baidu.com/s?wd=%D0%C2%BD%AE%B7%AC%C7%D1%D6%D6%D6%B2%C3%E6%BB%FD> (accessed 13th July)

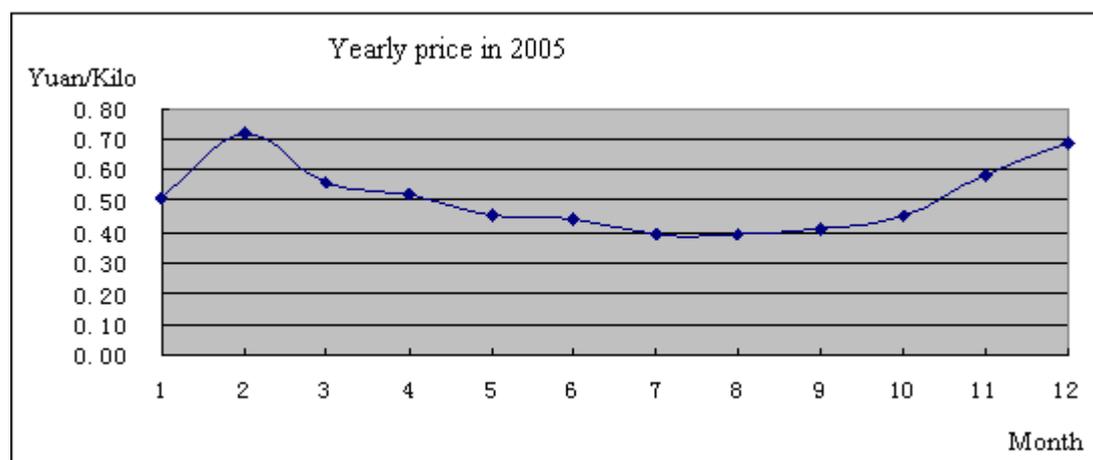
Zhang Xiaoning, 2009. ' Reform and Rural Market Integration in China: a case study of tomato.' Economic Research Journal. July P<sub>23-29</sub>.

## Annex:

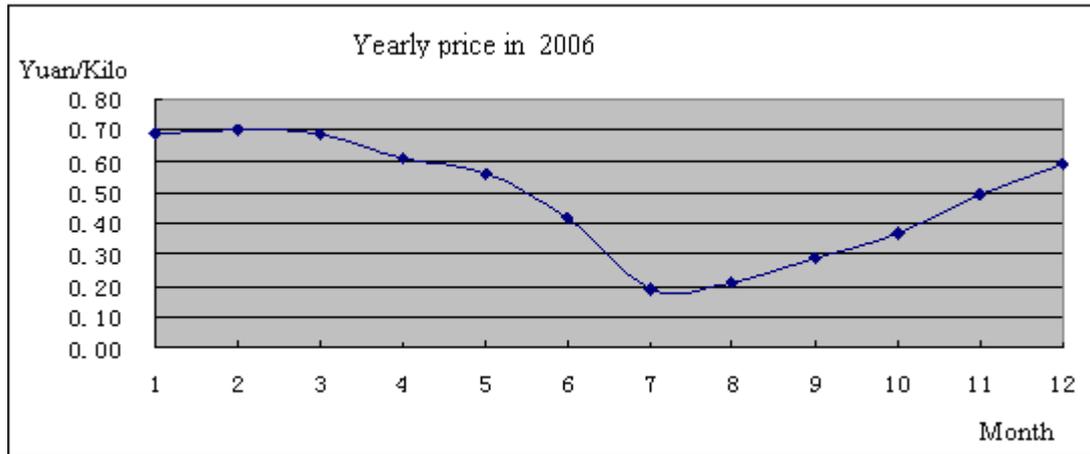
### Annex1 Tomato price in every year.



Annex figure 1 Tomato yearly price in 2004 in the Changji district



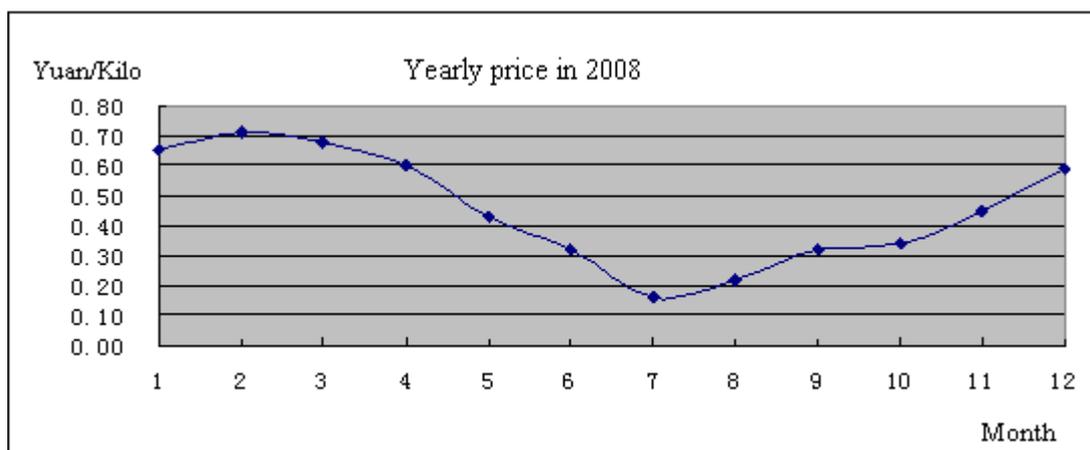
Annex figure 2 Tomato yearly price in 2005 in the Changji district



**Annex figure 3 Tomato yearly price in 2006 in the Changji district**



**Annex figure 4 Tomato yearly price in 2007 in Changji district**



**Annex figure 5 Tomato yearly price in 2008 in Changji district**

## Annex 2 Walking tractor



### Annex 3 Questionnaire for small-scale tomato farmers

#### PART 1: General Information:

1. Name of the farmer	
2. How long have you been planting tomato	
3. Land holding size	
4. What is the tomato yield in 1mu.	
5. What is your income from selling fresh tomatoes in 1mu.	

#### PART 2. Marketing, Pricing Information

6. Do you sometimes have surplus of tomatoes?

A. Yes      B. No.

7. What alternatives do you have when the price is low compare with previous year?

A. process      B. wait few more days for high price C. Just sell at low price D. throw away.

8. What alternatives do you have when the price is high compared with previous year?

A. process      B. wait few more days for even high price      C. Just sell immediately

9. What is your selling price to different buyers? (RMB) (Supply and demand, who can offer the high price in the chain)

Buyers	Summer Price/ kg	quantity (kg) in summer	Winter Price/ kg	quantity (kg) in winter
Wholesale market				
Middleman				
Supermarket				
Processors				

10. Can you access adequate marketing information on supply, demand and price?

A. Yes      how do you get it?

a. media (TV, newspaper, radio, etc.) b. article from Department of Agriculture  
c. both of a and b

B. No      why not?

a. illiterate      b. do not know how and where to get      c. the information is not upgraded



20. Is there any pesticides-using standard and guidance given by any organization or association?

21. If yes. How often could you get guidance? Where do you get it?

A. Once a year      B. Two times a year      C. Three times a year      D. Others (be specific answer)

22. Have you ever had reject from your buyers on the bases of fertilizer or pesticides residue?

A. Yes  
B. No,

23. Do you have other ways of producing tomatoes without using fertilizers and pesticides?

If yes, what methods do you usually use?

A. Organic farming      B. Biological farming      C. IPM farming      D. Others\_\_\_\_\_

### **3.2 Harvesting and Post harvesting**

#### ***harvesting***

24. How do you decide to harvest the tomato?

A. By color      B. By experience (by hand feeling)      C. By the buyer's requirements  
D. Others\_\_\_\_\_

25. Who will harvest on your farm?

A. Family members      B. long-term employees      C. temporary labours  
D. Students      E. Neighbours      F. Others, please specify \_\_\_\_\_

26. How about harvesting experience of your workers?

A. All have experience.      B. Most of them have experience      C. A few of them have experience  
D. no experience

27. If the workers do not have harvesting experience, can you training them to maintain the quality of picking tomatoes?

A. Yes      B. No

28. How do you collect the tomatoes during the harvesting?

A. Plastic box (volume, type)      B. In the basket (volume, type)      C. Sacks (volume, type)  
D. Others please specify\_\_\_\_\_

29. Do you have place to store your tomatoes?

A. Yes      B. No

30. If yes, where do you store the tomatoes?  
A. In the open area      B. In your house      C. Warehouse (whose warehouse, please specify)      D. Others please specify

**Sorting and grading**

31. Do you sort and grade tomatoes after harvesting?  
A. Yes      B. No
32. If you sort and grade tomato, on what parameters do you use  
A. Size of the tomato    B. Ripeness of tomato by hand feeling and experience    C. color of tomato    D. Others please specify \_\_\_\_\_
33. Have you ever had reject from your buyers on the bases of sorting and grading?  
A. Yes  
B. No
34. if yes could tell me why?  
A. Too large    B. Too small    C. Inhomogeneity size    D. Inhomogeneity colour  
E. Rotten    F. Overweight    G. Underweight    H. Others \_\_\_\_\_
35. How often do you suffer from rejection by your buyers?  
A. Per week    B. Per month    C. Per year    D. Others \_\_\_\_\_

**Logistics**

36. Do you transport your tomatoes yourself with your own transport medium to your buyers?  
A. Yes    B. No.
37. If yes, What means do you use to transport tomatoes to buyers?  
A. Tractor    B. Truck, C. Hand tractor    D, Others \_\_\_\_\_
38. Do you protect tomato during the transportation? ( base on shaking, cover etc.)  
  
If yes how do you do that?  
\_\_\_\_\_ ,
39. Do you think tomatoes suffer quality losses because of the road condition?  
A. Yes    B. No

## **ANNEX 4. Law of the People's Republic of China on Specialized Farmers**

### **Cooperatives ( A part of law)**

#### **Duties of farmer association**

Farmer association is mutual-help economic organizations joined voluntarily and managed in a democratic manner by the producers and operators of the similar farm products or by the providers or users of services for the same kind of agricultural production and operation.

Farmer association mainly serves their members, offering such services as purchasing the means of agricultural production, transporting and storing farm products, marketing, and providing technologies and information related to agricultural production and operation.

Farmer association shall observe the following principles:

- 1) The members are mainly farmers.
- 2) They aim to serve their members, working for the common interests of all the members.
- 3) The members join the cooperatives voluntarily and are free to withdraw from them.
- 4) The members are equal in status and democratic management is practiced.
- 5) Profits are to be distributed mainly in proportion on the volume of the transactions effected between the cooperatives and their members.

#### **Duties of the members**

- 1) to execute the resolutions of the membership assembly, the conference of members' representatives and the board of directors
- 2) to make capital contributions as stipulated within the association
- 3) to effect transactions with the association as stipulated
- 4) to share losses as stipulated within the association

#### **Establishment**

For establishment of the farmer association, the following conditions shall be met:

- 1) having five or more members who meet the requirements as below:
  - a Citizen who have the capacity for civil conduct and enterprises, public institutions and organizations that are engaged in production and operation which are directly related to the business of a farmer association may become members of the cooperative, provided that they can make use of the services offered by the cooperative, recognizes and abides by the charter of

the cooperative and complete the formalities for joining the cooperative as prescribed in the charter. However, a unit that exercises the function of administering public affairs shall not join such cooperative.

- b Farmers shall account for at least 80 percent of the membership of the farmer association. If the total number of members of the association is 20 or less, there may be one enterprise, public institution or organization as its member; if the number exceeds 20, the number of enterprises, public institutions or organizations shall not exceed five percent of the total number.
- 2) having a name and a domicile which is in conformity with the provisions of relevant laws and administrative regulations
  - 3) having capital contributions made by members who meet the requirements as are specified in the charter

### **Organizational structure**

- 1) When the farmer association holds its membership assembly, the number of persons present shall be two-thirds or more of its membership. It is the organ of power of the association and shall exercise the following functions and powers:
  - a to modify the charter
  - b to elect and remove the director-general, directors, the executive supervisor or members of the board of supervisors
  - c to decide on disposition of major assets, external investment, providing guarantee to entities and individuals outside the cooperative, and other major issues in respect of production and operation
  - d to grant approval of the annual business report, and the plans for distribution of profits and for disposition of losses
  - e to make a resolution on merger, division, dissolution or liquidation of the cooperative
  - f to decide on the number of managers for business operation and technicians to be employed and their qualifications and terms of office;
  - g to hear reports on the change of membership delivered by the director-general or board of directors
- 2) In the farmer association there shall be a director-general, and a board of directors may be set up. The director-general shall be the legal representative of the cooperative.

In the farmer association there may be an executive supervisor or a board of supervisors. The director-general, director, manager, the book-keeper or accountant shall not concurrently hold the office of the supervisor.

The director-general, director, the executive supervisor or members of the board of supervisors shall be elected at the membership assembly from among the members of the cooperative, and they shall exercise their functions and powers according to the provisions prescribed in this Law and the charter and shall be accountable to the membership assembly.

The system of “one person, one vote” shall be applied to voting at the meetings of the board of directors and the board of supervisors.

### **Financial management**

- 1) The department of finance under the State Council shall establish a financial and accounting system for the specialized farmers cooperatives in accordance with relevant laws and administrative regulations of the State. The specialized farmers cooperatives shall carry out their accounting according to the said financial and accounting system.
- 2) The farmer association may draw common reserve funds from the profits of the year in accordance with the stipulations in the charter or the decision made by the membership assembly. The common reserve funds shall be used for making up for losses, expanding production and operation or be converted into members' capital contributions.
- 3) The farmer association shall start an account for each member, in which shall mainly be recorded the following:
  - a the amount of capital contributions of the member;
  - b the quantified common reserve funds as shares of the member; and
  - c the volume of transactions effected between the member and the cooperative
- 4) The profits of the year left after the losses are made up for and the common reserve funds are drawn shall be the distributable profits of the farmer association.

The distributable profits shall be returned or distributed to the members according to the following provisions, and the specific measures for distribution shall be decided according to the stipulations in the charter or the resolution of the membership assembly:

- a to return the profits in proportion to the volume of the transactions effected between the members and the cooperative, and the total amount returned shall not be less than 60 percent of the distributable profits
  - b to distribute pro rata to the members of the cooperative the rest of the profits left after the return according to the provisions in the preceding subparagraph, on the basis of the capital contributions and shares of common reserve funds recorded in the members' accounts and the members' average quantified shares of the assets accumulated from subsidies directly given by the government and donations made by other persons to the cooperative
- 5) Where there is an executive supervisor or a board of supervisors in the farmer association, the executive supervisor or the board of supervisors shall be responsible for the internal financial auditing of the cooperative and shall report the auditing results to the membership assembly.

The membership assembly may also entrust an auditing body with the financial auditing of the cooperative.

### **Governmental supportive policies**

- 1) The Central and local governments shall respectively allot funds to support the specialized farmers cooperatives in providing services in respect of information, training, quality standards for farm products and their authentication, construction of infrastructure for agricultural production, marketing, technology dissemination, etc. Priority shall be given to the specialized farmers cooperatives in ethnic areas, outlying areas and poverty-stricken areas and to the ones engaging in the production of major farm products which are urgently needed by the State and the society.
- 2) The policy-oriented financial institutions of the State shall adopt diversified means to provide funds through various channels in support of the specialized farmers cooperatives. The specific supportive policies shall be formulated by the State Council. The State encourages the commercial financial institutions to provide financial services to the specialized farmers cooperatives by diversified means.
- 3) The specialized farmers cooperatives shall enjoy preferential treatment in taxation prescribed by the State in respect of agricultural production, processing, circulation and services and other economic activities involving agriculture.

Sources: Farmers Cooperatives Law, translated and editing by Bai Jie, Zhang Duoyu. Copyright Department of Agriculture, 2009

<http://www.agri.gov.cn/xxgkgzdt/P020080429670661663933.doc>