

The Draft Final Report

Licorice Industry in China: Implications for Licorice Producers in Uzbekistan

Beijing Office

International Food Policy Research Institute (IFPRI)

January 13, 2014

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Acronyms and Abbreviations

CAAS	Chinese Academy of Agricultural Sciences
CCCMHPIE	China Chamber of Commerce for Import& Export of Medicine& Health Products
CFDA	China Food and Drug Administration
CIAT	International Center for Tropical Agriculture
GAP	Good Agricultural Practice
GMP	Good Manufacturing Practice
GSP	Good Supply Practice
MOA	Ministry of Agricultural of the People's Republic of China
MOFCOM	Ministry of Commerce of the People's Republic of China
MOFTEC	Ministry of Foreign Trade and Economic Cooperation (Former MOFCOM)
MOST	Ministry of Science and Technology of the People's Republic of China
MOU	Memorandum of Understanding
NDRC	National Development and Reform Commission
NHFPC	National Health and Family Planning Commission of the People's Republic of China

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Acknowledgement

This report is based on research supported under the CGIAR Challenge Research Program – Policy, Institute, and Market: Linking Licorice Smallholders in Uzbekistan with Rapidly Rising Market in China: Environment-friendly Cross Boarder Value Chain Development. The research team consists of Kevin Chen (project leader), Hu Song (food value chain specialist), and Chen Ruyu (Research intern). We would like to thank Karen Brooks for her guidance and support throughout the whole period of research. We also wish to thank the following persons whom we meet in the filed visits:

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Executive Summary

Licorice is a perennial plant that grows in southern Europe, Asia, and the Mediterranean. The leaves, roots and stems of the plant have been used as livestock fodder, human food and herbal medicine by many countries including China, for thousands of years. In the past a few decades, extracts of licorice are widely applied as additives by the food and beverage, cosmetics, and tobacco industries. In addition, licorice brings environmental benefit by growing in marginal land such as dry land and Saline-alkali soil resulting in ecological restoration. Both China and Uzbekistan are major licorice producers in the region but with China as a major importer and Uzbekistan as a major exporter. In particular there is an interest from both donors and the government of Uzbekistan to develop Uzbekistan licorice industry for benefiting smallholders and environment. China could be a major potential market for Uzbekistan licorice. However, developing an effective investment plan requires better understanding of Chinese licorice market and its implications for Uzbekistan. This report attempts to provide an overview of licorice industry in China by mapping out the key actors, the interactions among them, as well as the enabling environment. A special focus is placed on cultivated licorice in China. Based on the analysis of the current licorice trade between China and Uzbekistan, the potential of linking licorice producers in Uzbekistan with Chinese market is assessed preliminarily. Recommendations to improve the licorice value chain development ultimately benefiting the participants of the chain as well as ecological environment are provided.

The review of global and Chinese licorice markets is limited by lack of existing data. Apparently there is little systematic effort to collect and disseminate the information on production, consumption, and trade of licorice both globally and in China. The existing literature and media reports makes possible to outline general trends of licorice sector development. The demand for licorice continues to grow in both domestic and international market in the recent years. In addition to the traditional use by the pharmaceutical industry, the increasing demand mainly comes from other sectors such as tobacco, food and cosmetic industries. With research findings with new applications of licorice in combating air pollution and others, the demand for licorice will likely to rise in the next decades. China's demand for licorice has grown in a much faster rate in the recent years. In the recent years, The licorice value chain in China has been globalized and integrated vertically. China's entry in WTO in 2001 has boosted its trade with other countries, including licorice. With a rapid decrease of its natural licorice reserve, China has become the net importer of licorice since 2006 due to the reduction of wild licorice reserve. This was a significant development as China used to be the largest exporter of licorice roots accounting for about 90% of the world supply. The rising Chinese demand for licorice is largely fueled by the shift towards value added processing recently. This

also creates a great potential for licorice producers from China and suppliers from other countries.

The cultivation of licorice has also been growing to fill the shortage of wild licorice supply in China. The cultivated areas for licorice have gone up fast since 2007 after the price of licorice jumped by almost 30% in 2006 comparing with previous year and its upward trend continues. According to MOFCOM, there were 1,881,122 Mu (or 125,408 hectare) licorice planted in 2011¹. However, the use of cultivated licorice by the extracts and Licorice ammonium salt processors is rather limited due to the poor quality compared to the wild one. While most cultivated licorice of 2-3 years can meet the national standard on the content of Glycyrrhizin acid (>2%), it is much lower than that of the wild licorice. The contents of other elements such as liquiritin and total flavonoids for the cultivated licorice are also much lower than these of wild licorice (Feng Wei, 2007). Most cultivated licorice is used as slice for traditional medicine as well as herbal drinks while the wild licorice is processed for other value added products such as Glycyrrhizic acid. On the other hand, the licorice cultivation farmers are facing two major challenges. First, the production cycle takes minimum 2-3 years which implies to larger investment than regular crops in terms of fertilizers, weeding, pesticides and irrigation. It is difficult to predict the market price in such long period and thus the profitability becomes uncertain. Second, the supply of seeds is inconsistent in terms of quality and quantity as the seeds are all collected from the wild and there is no third party supervision on the distribution of seeds. The inadequate supply of seeds is a bottleneck to scale up the licorice cultivation in China.

The Chinese processors intend to stabilize the licorice supply in China and other countries through establishment of corporate managed licorice farm or contracting local licorice producers or cooperatives. The vertical integration is accelerated by a number of government policies, such as the Advice on Supporting the Dragon Head Enterprises for Agricultural Industrialization issued by the State Council in 2000. The policy encourages the specialization, standardization, formalization and intensification led by the large agribusiness firms. Small growers and processors are expected to be included in the value chain by establishing various partnerships with large firms. The licorice processing industry in China is being reshaped to be more domestic market focused, more desired for consistent supply either from contracted licorice farm or imported from other countries, and compliant to GMP standards. Mainly because of the export restriction and growing demand in China, the licorice processors are paying more efforts to develop domestic markets. A lot of previous-export-oriented processors have started establishing long-term relationship with large customers in China. The reduced supply of wild licorice reserve in China makes the processors outsourcing the supply to other countries. Some processors have started to build corporate managed licorice farms or contract local

¹Analysis of Distribution for Some Chinese herbal Plants in 2011, MOFCOM

licorice farmers in order to secure the domestic supply. As quality control measure, GMP compliance has become compulsory for licorice processors by CFDA since 1999. Many small processors are closed down due to failure passing the GMP evaluation. It is reported that only 597 drug substance manufacturers of the total 4669 are granted GMP certification by November 2012². As a result, there are less but bigger processors left in the industry.

The research and extension are backbones to the licorice value chain development. Private sector is playing bigger role in the research activities. The NDRC and MOST jointly conducted a policy to promote the establishment of research facility at private enterprise (29 August 2011). Under the policy, the public research institutions are encouraged to work closely with private sector to address the immediate needs of technology. In the past, there is lack of continuous investment on market oriented research on licorice. Most Chinese researches funded by the government focused on the medical value of licorice, little attentions on the values of licorice applied by other sectors, such as tobacco, cosmetic, and food. Moreover, there was little participation of private business in the research activities. For example, there is limited publication on the cultivation technology of licorice seeds and processing technologies of cultivated licorice, which are challenges faced by the licorice growers and processors.

The distribution system of licorice has being changed dramatically in the past 10 years. The major change is that many small traders are disappearing with less supply of wild licorice and more contract farming by the processors. Traditionally, the licorice collected from the field will go through many traders normally at four levels from village, township and county to municipality before reaching the gate of processors or exporters, as showed. Traders have played critical role to secure the supply of wild licorice for the processors. However, the shrinking of wild licorice reserve and contract farming between licorice cultivators and processors has pushed many small traders out of business. Some of them have turned to become licorice cultivating farmers. More recently, the enforcement of Good Supply Practice (GSP) for Drug Distributors effective in June 2013 will likely push more small distributors out of business. In spite of fewer small traders, larger traders with financial capability are playing important role of credibility to bridge the licorice cultivating farmers and processors. The farmers prefer to be paid cash up in front while the processors normally pay suppliers on credit.

The government of China has implemented a number of policies to rationalize the licorice value chain development in China since 1990's. Given the reduction of natural reserve as well as concerning the ecological environment protection, the export of licorice roots and extracts is limited through a quota system, and the collection of wild licorice is restricted by the permit system. Due to the shortage of domestic supply, the

²http://www.fujiiepharm.com/cgi/search-cn.cgi?f=news_cn_1_&id=116605&t=news_cn_1_

government encourages the import of licorice through a duty free policy. Meanwhile, the government promotes the cultivation of licorice as alternative to the wild licorice through an agriculture policy portfolio including the supports to the farmer's cooperative, dragon head (flagship) agribusiness, standardized farming, farming mechanization, green for grain, agricultural products safety and quality, agri-food branding, specialized agriculture, etc. The government supports are often referred to reward or subsidy, low interest bank loan, less or free taxation and land transfer. Moreover, the government has implemented a number of quality assurance regulations to guard the medical material supply chain, such as GAP for the producers, GMP for the processors and GSP for the distributors of herbal medicine including licorice. Generally speaking, the policy environment plays a role to encourage the licorice value chain development toward environmental friendly and economical efficiently production, value added processing, and natural products consumption.

Uzbekistan has the potential to increase the supply of licorice to China. Firstly, the demand in China steadily grows in past decades and predicted to continue in the next decade. Second, both farmers and government in Uzbekistan are keen to develop licorice production not just as a means for cash income but the ecological benefit to reclaim the degraded land. Despite of the promising opportunities of linking licorice producers in Uzbekistan with growing Chinese market, there are numerous constraints to be addressed by the government and international donors, such as research and extension, trade policies, and financing.

1 Introduction

1.1 Background

Licorice is a perennial plant that grows in southern Europe, Asia, and the Mediterranean. The leaves, roots and stems of the plant have been used as livestock fodder, human food and herbal medicine by many countries including China for thousands of years. In the past a few decades, extracts of licorice are widely applied as additives by the food and chemical industry, including cosmetics, tobacco, and beverage. In addition, licorice brings environmental benefit by growing in marginal land such as dry land and Saline-alkali soil resulting in ecological restoration³.

China is a leading producer and user of licorice in the world. The annual demand for licorice is estimated around 300,000 tons⁴ in fresh for both domestic consumption and export market. Of that, about 1/3 are used by the licorice extracting industry while the rest 2/3 for other sectors such as herbal slice⁵. About 80% of licorice comes from the wild while the rest is cultivated⁶. The above data is the best guess we can make based on the experts and industry people during the interview as the official statistics are not available. However, natural licorice reserves have sharply dropped to 1 million hectares in 2000's from 3.2 million hectares in 1950's due to unregulated and over-harvesting (Zhou, 2008). Such over-harvesting not only causes depletion of wild licorice reserve but also environmental degradation. In order to protect the natural resource, the government of China has started limiting the harvest and export of licorice since 2001. The tightened regulation has reduced the domestic supplies of licorice. As an alternative, China has started to import more and more licorice since 2001. The import continues to grow every year since then. In 2011, China imported 10,659 tons of licorice roots, 123% increase over 2010. Of which, about 80% comes from Central Asia⁷. Uzbekistan is one of major licorice exporters in the region. For instance, Uzbekistan exported 2281.05 tons licorice roots in fresh or dry to China, accounting for 47.74% of the China total import, ranked the first place of exporters to China in 2010 (No.3, Vol.13, Mar 2011, Modern Chinese Medicine). Over 70% of licorice grown and processed in the country is exported abroad⁸. However, the percentage of its licorice export goes to Chinese market in recent years is unknown during the reporting period.

³<http://www.xzbu.com/2/view-4179848.htm>

⁴China Producing Area Information Platform, March 9, 2012. <http://www.chandi.cn/chandi/detail/2088.html>

⁵Interviewed with Zhang Zhonglin, the chairman of Xinjiang Zhonglin Bio-tech Ltd, and Dr. Zhou Chengming, the general manager of Beijing Shizhen Chinese Herbal Medicine Technology Ltd, 8 November 2013

⁶<http://www.mofcom.gov.cn/article/wtojiben/t/200406/20040600241330.shtml>

⁷<http://news.pharmnet.com.cn/news/2012/06/21/361448.html>

⁸http://www.uzbekistan.or.kr/bbs/board.php?bo_table=news&wr_id=1365

Licorice harvested in Uzbekistan is all wild up to present. The lands growing licorice are typically owned by small farmers who collect and sell licorice or lease out. With a strong recent demand for licorice, it could become an issue whether or not the current practices are sustainable. Like in China, there has been a growing interest on the cultivation of licorice in Uzbekistan. CIAT, for example, has successfully cultivated licorice on a pilot base at NUKUS Karakalpakstan, Uzbekistan (Nobel and Zafar 2013). The World Bank and the Government of Uzbekistan are exploring a possible loan program to support development of cultivated licorice sector. To have a commercially viable licorice sector, it is critical that markets (both international and domestic) are there to support increasing licorice production. Given apparent importance of Chinese market, it is critical to have a good understanding of the licorice sector in China and to assess the opportunities to develop China-Uzbekistan licorice value chains.

1.2 Licorice: Definition, Varieties, and Utilization

Liquorice or licorice is the root of *Glycyrrhiza glabra* from which a somewhat sweet flavor can be extracted. The liquorice plant is a legume that is native to southern Europe and parts of Asia. Licorice grows best in deep valleys, well-drained soils, with full sun, and is harvested in the autumn, two to three years after planting. It is grown to 1 m in height, with pinnate leaves about 7-15 cm (3-6 inches) long, with 9-17 leaflets. The flowers are 0.8-1.2 cm ($\frac{1}{2}$ – $\frac{1}{3}$ inch) long, purple to pale whitish blue, and produced in a loose inflorescence. The fruit is an oblong pod, 2-3 cm (1 inch) long, containing several seeds. The roots are stoloniferous⁹. The most common varieties in China include three kinds of *G. uralensis*, *G. glabra* and *G. inflata* that are approved by the Chinese Pharmacopoeia¹⁰. The Licorice contains phytochemical compounds that have biological and physiological effects on most mammals. These components can be classified to a) flavonoids and iso-flavonoids, b) terpenoids and saponins, c) vitamins, d) volatile oils, e) minerals, f) coumarins, and g) others¹¹.

Licorice cultivation started in early 1500's, but commercial cultivation did not start until 1950's in many countries including China. However, the licorice processing industry prefers to use wild licorice due to higher content of effective elements such as Glycyrrhizic acid and liquiritin. The majority of licorice traded in market today is still collected from the wild. Given the fact that wild licorice resource is becoming less and less, cultivation has been given a growing attention to address the shortage of licorice supply. The quality of cultivated licorice needs to be improved significantly in order to be able to compete with that of wild licorice.

⁹<http://en.wikipedia.org/wiki/Liquorice>

¹⁰Chinese Pharmacopoeia (a), China Pharmacopoeia Commission, Beijing: Science Press, 1977:3

¹¹[http://www.uobabylon.edu.iq/uobcoleges/files/share/articles/Licorice or Liquorice.pdf](http://www.uobabylon.edu.iq/uobcoleges/files/share/articles/Licorice%20or%20Liquorice.pdf)

The licorice is primarily used by the tobacco, food, pharmaceutical, and cosmetic industries. Licorice provides tobacco products with a natural sweetness and a distinctive flavor, also making it easier to inhale the smoke by creating bronchodilators. Licorice flavor is found in a wide variety of licorice candies, sweets, soft drinks where it provides a sweet aftertaste. Chinese cuisine uses licorice as a culinary spice for savory foods where consumers can find licorice at the supermarkets today. It is often employed to flavor broths and foods simmered in soy sauce. For example it is used extensively in the production of bacons. Licorice has a long history of medicinal use in both Chinese and Western systems of medicine. It is used as medical remedy for bronchitis, peptic ulcers, eczema, dyspepsia, upper respiratory infections and weight loss. Licorice extracts and many glycyrrhizin derivatives are widely used in the preparation of cosmetics owing to their skin-whitening, anti-sensitizing, and anti-inflammatory properties (Yokota et al. 1998). Various utilization of licorice is provided in Annex 5.

China is the major licorice producer, growing 18 of the 29 major varieties in the world. Different countries include different varieties in its pharmacopeia. For example, Chinese pharmacopeia only approves three varieties including *G. uralensis*, *G. glabra* and *G. inflata* as shown in Table-2. American and European pharmacopeias use *G. uralensis* and *G. glabra*. Japanese pharmacopeias only accepts *G. glabra*.

1.3 End markets for licorice

Licorice is widely used in pharmaceutical, tobacco, food, cosmetic and other industries. The root of licorice is the most common ingredient of traditional Chinese medicine. As a medicinal herb, licorice is known as “the king of Chinese medicine” providing therapeutic effect to asthma, cough, inflammation, rheumatism, gastritis, peptic ulceration, and arthritis (Gao, Wang, and Wei 2009). Moreover, its extract is much more widely used in modern medicine with functions of antiviral, anti-allergic, anti-tumor and immune regulation.. More recently, it has also used in anti-cancer formula due to the recently discovered cancer treatment effect (Liu, 2010). It is estimated the pharmaceutical industry in China accounts for 50% of the national licorice use.

In addition to the medical purpose, the chemical constituents of licorice have been extensively studied with regard to isolation of glycyrrhizin as well as many triterpene saponins and flavonoids (Nomura and Fukai 1998). The flavonoids extracted from licorice are also used in the preparation of cosmetics with functions of anti-inflammation, skin-whitening and anti-sensitizing. Glycyrrhizin and other licorice extracts are used as food flavoring additives and sweeteners in a variety of foods, such as snacks, instant noodles, sauces, ice creams, sherbets. The tobacco manufactures also use it as flavor improvement and reduction of tar and nicotine contained in cigarettes. The major international companies representing various industries are listed in Table A1.

1.4 Objectives

This project intends to assess the opportunity to link licorice smallholders in Uzbekistan to growing Chinese market through value chain development. There are six specific objectives:

- i. To examine the changes taking place in the functioning and organization of China's licorice industry and to identify challenges.
- ii. To identify patterns of licorice imports and exports in China.
- iii. To examine evolution of licorice cultivation relative to wild licorice in China
- iv. To identify business practices for linking licorice producers with markets in China.
- v. To identify how the government and international organizations can facilitate the development of licorice industry in China, with due attention paid to smallholders.
- vi. To identify lessons from experience to date in China for the design and implementation of licorice value chain development in Uzbekistan.

1.5 Method and Approaches

The major challenge for the project is that there is little systematic, reliable data available for licorice industry globally and in China. This study is a qualitative appraisal comprised of desktop review and field visits. The desktop review scanned the literatures and publications available in scientific journals, internet and bookstores. The field visits included meetings with various stakeholders of Chinese licorice value chains, including government officials, scientists, business associations, producers, traders, processors, and importers/exporters. The research team also paid visits to the licorice production and processing sites in Beijing, Jiangsu, and Xinjiang. Persons met and their affiliations are listed in the Acknowledgement.

The interview is guided by the following basic questions:

- i. What's the scope of licorice industry in China?
- ii. What roles China and Uzbekistan play in global licorice value chain?
- iii. Who are the stakeholders and key players of the licorice value chain in China? And how they interact with each other?
- iv. What are the driving force for the change of demand and supply?
- v. What role does the government play to develop the licorice value chain?
- vi. What are the motivations for China to import licorice from Uzbekistan? And how that can be sustained?
- vii. What are the opportunities and challenges to link the licorice smallholders in Uzbekistan with Chinese market?

2 Overview of licorice market globally and in China

2.1 Global market

2.1.1 World demand

The world demand for licorice roots and extracts had been reported to steadily risen in the past decades. However, the reliable estimate of the world demand for licorice is rarely available. One source¹², for example, reported that the global consumption of dried licorice roots has been ranged from 250,000 tons to 280,000 tons per year during the recent four years from 2009 to 2012 (Qi 2012). Since data on world demand of licorice is not available, this project relies on the world import data from UN statistics to partially reflect the world demand. Comparing with that of 1988, the import of licorice roots was tripled in 2004¹³, and the import of licorice extract was increased by nine times in 2011 (Figures 1 and 2). There appears a strong and continuous demand for licorice roots in global market. For example, China has dramatically increased its import of licorice roots to 13,960 tons in 2011 from 1,008 tons in 2004 according to data from China Customs. The increased import in China is mainly driven by: 1) the significant shortage of domestic supply of wild licorice due to over harvesting, 2) duty free policy for imported licorice since 2008, 3) rising price of licorice in both domestic and international markets since 2003 because of the growing demand by the new products (i.e. anti-cancer medication) using licorice as ingredient. The major importing countries for licorice roots and extracts include United States of America (USA), Japan, South Korea, China, Egypt, EU-27, France, Germany, Denmark, Netherlands, Indonesia, India, Malaysia, and Israel (Figures 2 and 4). Of those countries, USA, EU, Japan and Korea are leading importers for licorice roots. During 1998 and 2012, EU and USA are leading importers of licorice extract according to the accumulated import value (Figure 5). Netherlands and China have substantially increased their import of licorice extract since 2010.

2.1.2 World Supply

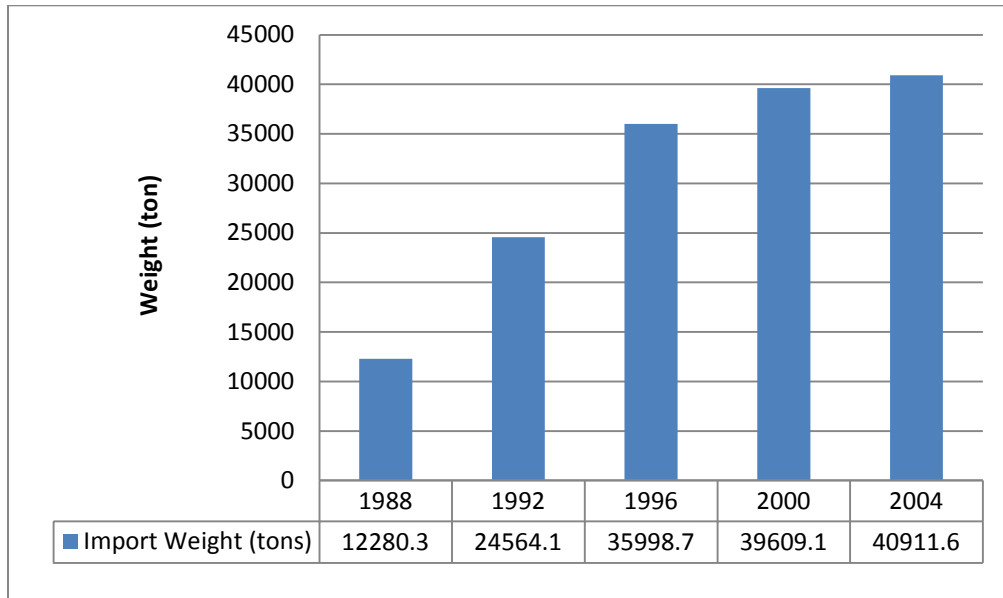
Licorice has mainly grown in China, Central Asia, Mid-East, and Eastern Europe for thousands years. Licorice was largely self consumed with national boundaries. With rapid development of licorice processing industry in recent decades and changing endowment of natural licorice reserve, the export of licorice became common. Originally, the licorice supply all comes from the wild and mainly traded in the form of fresh or dried licorice roots. Due to the decline of wild resource similar to Chinese situation observed today, many countries in Europe started licorice cultivation. For example, France, Italy and Spain started cultivating licorice as early as 1800's. However,

¹²<http://www.chandi.cn/chandi/detail/2088.html>

¹³The import figures for licorice roots are available only until 2004 with the United Nation Statistics as these after 2006 are either incomplete or unavailable for most years.

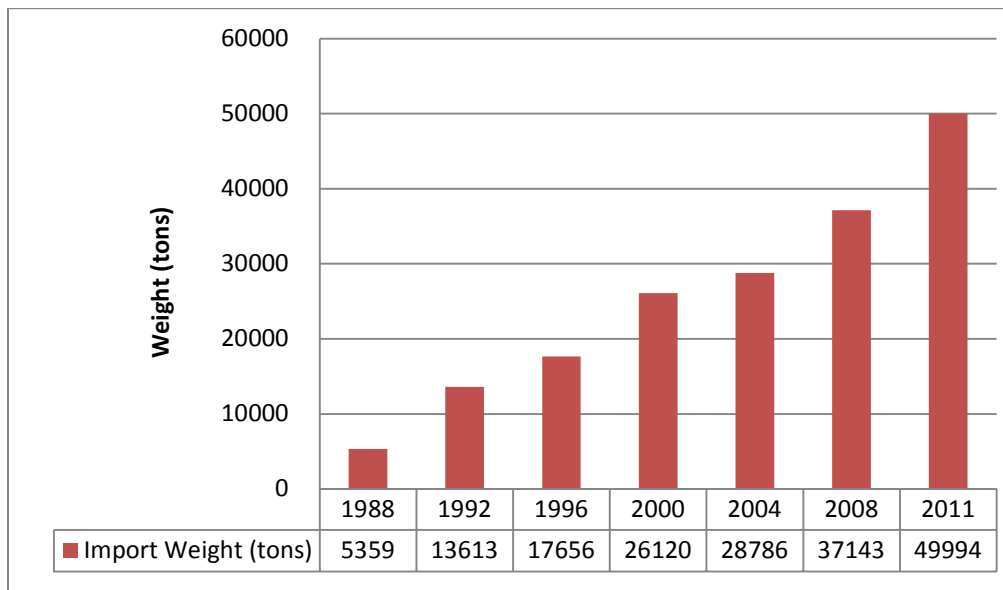
cultivation continued until the 19th century, when it finally phased out because of the competition from cheaper sourcing countries such as China and Central Asia.

Figure 1. World Import of Licorice Roots (1988-2004)



Source: UN Comtrade Statistics

Figure 2. World Import of Licorice Extracts (1988-2011)

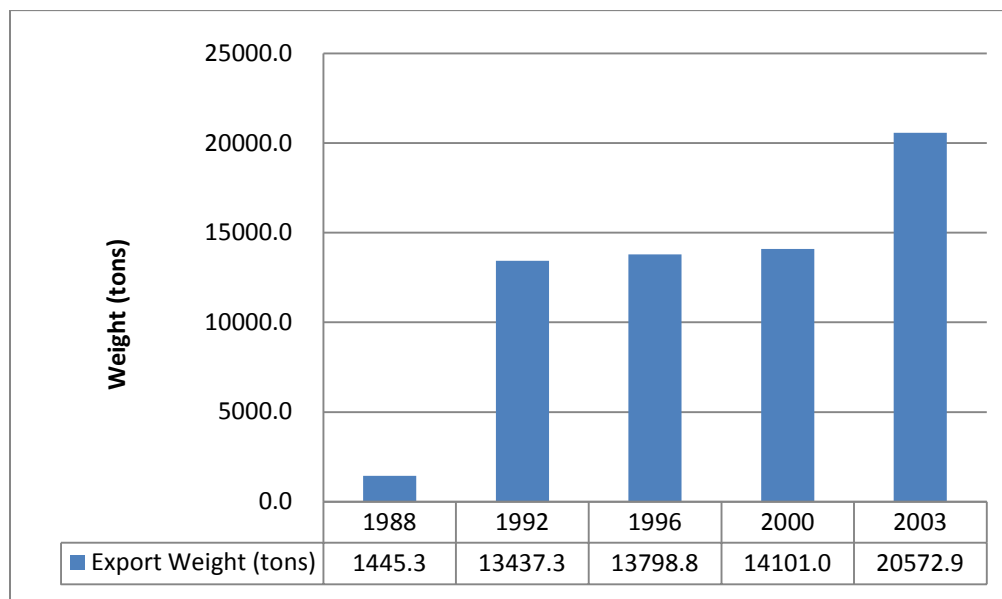


Source: UN Comtrade Statistics

Similar to the world demand situation, the data of licorice supply by countries is not available during the reporting period. As such the report uses the export data to partially reflect the world supply. The world export of licorice roots had increased by fourteen times in the past 15 years. By 2003, the export volume of the root exceeded over 20,000 tons per year. There was a big jump observed between 1988 and 1992, as showed in the trend every 5 years since 1988 (Figure3). The export volume of licorice roots was increased 9 times within 5 years, which was largely driven by the high price of roots in international market. The price reached the peak around 1993 (Figure 5). During the period of 1998-2006, the top 12 exporting countries for licorice roots include China, Hong Kong (China), Azerbaijan, Pakistan, Iran, Germany, France, EU-27, Indonesia, Syria, Turkey, and Kazakhstan (Figure A5). More recently after 2006, Afghanistan, India, Kyrgyzstan, Turkmenistan and Uzbekistan have increased their exports to the world market, mainly to China.

The export of licorice extracts was also dramatically increased during 1988 and 2011. There was also a big jump between 1988 and 1992, increased by 9 times (Figure4). The price of extract climbed from 1989 and reached the peak in 1991, then up and down in the next decade (Figure 5). The top ten exporting countries are USA, Iran, China, Hong Kong (China), Germany, France, Japan, Belgium, Netherlands and Israel (Figure A6).

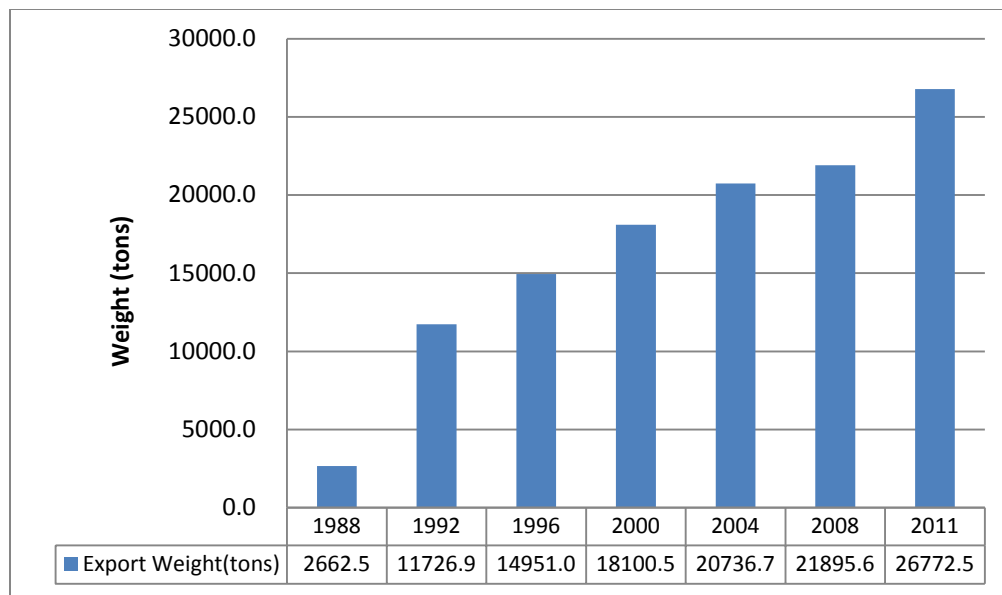
Figure 3. World Exports of Licorice Roots (1988-2003¹⁴)



Source: UN Comtrade Statistics

¹⁴The export figures for licorice roots are available only until 2003 with the United Nation Statistics as these after 2006 are either incomplete or unavailable for most years.

Figure 4. World Export of Licorice Extracts (1988-2011)



Source: UN Comtrade Statistics

2.1.3 World Price

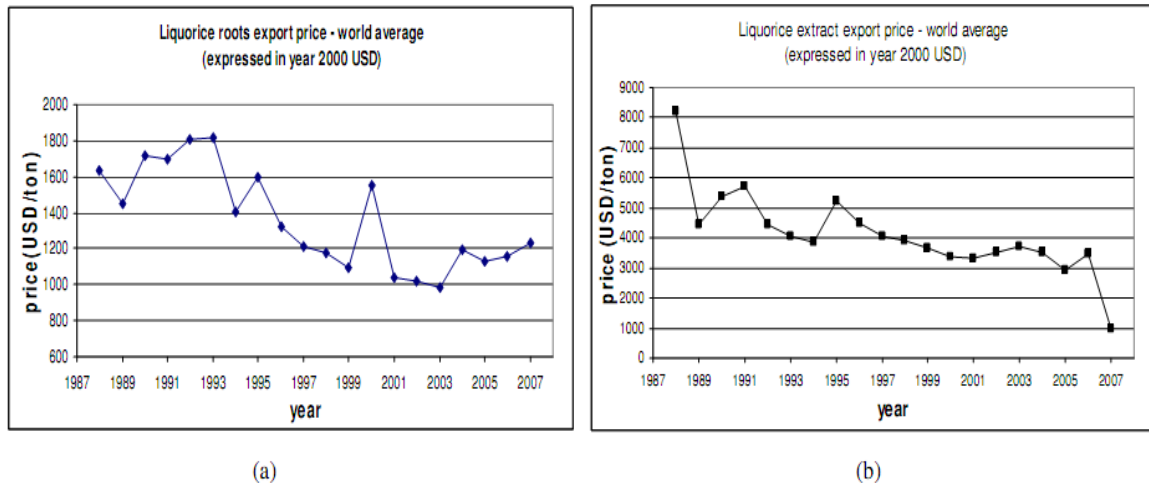
The interaction between unstable global demand and supply makes the price of licorice roots and extracts in the world market fluctuated greatly in the past decades, mainly affected by the government policy and market fundamentals. Since the actual prices of licorice in different countries and international market are not available during the reporting period, the report computed unit price based on the trade value and amount published on the website of UN Statistic Division during 1987-2007 (Liu and Sawson2009). The unit price had changes significantly over the period from 1993 to 2007. The unit price of licorice roots soared in the early 1990's when the United States began importing large quantities, recorded 16,083 tons in 1991 ¹⁵). After reaching its peak in 1993, the price began declining largely because China increased the production and export in 1994 (Figure 9). Following several fluctuations in the mid and late 1990's, the unit price has steadily risen since 2000 after China restricted the collection of wild licorice and export, signaling the shortage of the worldwide licorice supply relative to the increasing demand (Sawson 2009).

In contrast, the unit price of licorice extracts has kept dropping from the peak in early 1990's, mainly because of the increased supply. The private sector had invested significantly on licorice extracts processing plants especially in China. According to the UN trade data, the world export of licorice extract had increased eight times between 1988 and 2008 (Figure 4). After touching the bottom, the extract price has started picking

¹⁵UN Comtrade Database: comtrade.un.org/db/

up after 2008, mainly because China, Japan and Republic of Korea increased import of licorice from central Asia and other countries, thus pushed up the price of extracts. For example, the price of extracts was jumped to Euro 4.98/kg in 2011 from Euro 3.25/kg in 2008¹⁶.

Figure 5. World price changes of licorice roots and extracts (1987-2007)



Data source: Statistics are constructed from trade value and trade amount information that are public on the website of Trade Statistics Branch (TSB) of United Nations Statistics Division (<http://unstats.un.org/UNSD/trade/default.htm>).

2.2 China market

China has been the major country for licorice production and consumption for centuries. Licorice is traditionally used as herbal medicine in China. In the recent decades, the extracts from licorice have been widely used by food, cosmetic, tobacco and other industries. With the growing demand for licorice in domestic and international markets, China has emerged to play significant roles in global licorice value chain as major consumer, producer, and also trader. It is estimated that China produced 23,106 tons, imported 10,659 tons and exported 3,300 tons of licorice roots as well as 1,000 tons glycyrrhizic acid in 2011¹⁷. In 2012, the domestic extract production is about 2500 tons.¹⁸

2.2.1 Market demand

The demand of licorice in Chinese market was stable and trended up over the past decades. Traditionally, licorice is sliced as preparation for Chinese herbal medicine or cooking spice. With the development of plant extracting technologies, the active components of licorice are wildly used by other sectors such as tobacco, food and cosmetics. Majority of licorice roots (65%) are processed into extracts (Figure 6). The

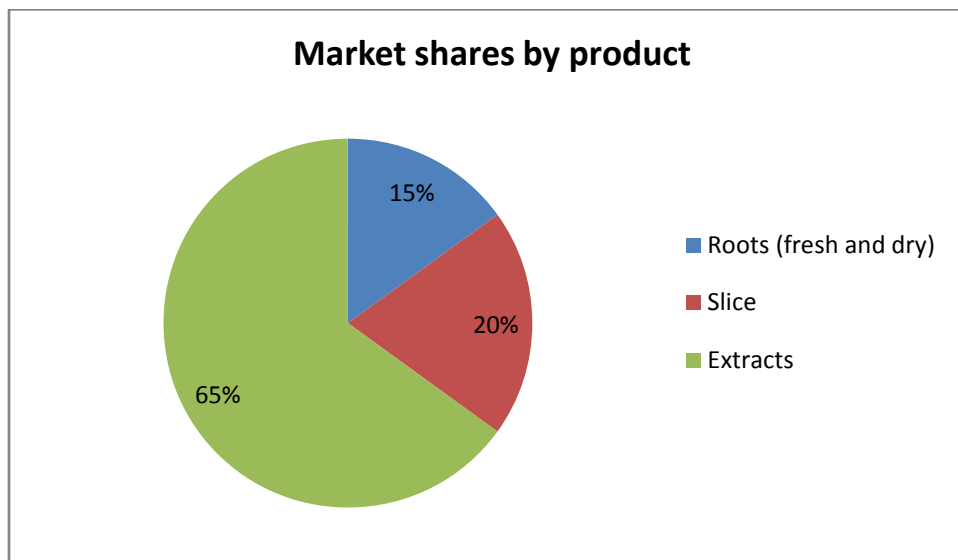
¹⁶<http://www.cnfood.cn/npage/shownews.php?pno=2&id=12725>

¹⁷http://web.yyjib.com:8080/html/2012-12/05/content_181492.htm

¹⁸Personal interview with Fanzhi president

new demand pushes up the price. For example, the price of dried wild licorice (ungraded) went up to 12 RMB/kg in 2013¹⁹ from 0.3 RMB/kg in 1988²⁰. However, there is no official data to estimate the actual demand for various licorice products. The number differs largely from 60,000 tons to 800,000 tons based on different sources. For example, one anonymous report estimates the annual demand for licorice in China as about 60,000 tons²¹, but there is no supporting reference to show how the data is estimated. Moreover, according to our various interviews with licorice farmers, processors and traders, the number of 60,000 tons is far below the real demand. For example, the annual demand for dry licorice roots was about 25000 tons in Fanzhi Company, one of the large scale licorice processors in China.²² Another report estimates the domestic and export (excluding processing) demand for dry licorice as 400,000 tons²³. By reducing the export quantity according to the export quota, the domestic demand for dry licorice roots is about 300,000tons. This data is corresponding with the first hand data collected from interviews with licorice farmers, processors and traders in Xinjiang. Therefore, the research team decides to use the 300,000 tons as the domestic market demand. It is said Xinjiang processes about 80% of the national licorice extracts while about 30% of the Xinjiang volume come from Korla area. Of that, about 125,000 tons are used by licorice extracting industry and the rest is used by other sectors.

Figure 6. Structure of licorice products in China 2008



Source: C & G Consulting Ltd., according to National Statistics Bureau

¹⁹Interviewed with Wang Haiting, licorice farmer in Bole of Xinjiang, Nov 6, 2013

²⁰P52, Licorice Cultivation, Zhou C.M

²¹<http://www.3156.cn/news/201203/91128.shtml>

²²Personal interview with Jin Chun, president of Gansu Fanzhi Biology Tech. Ltd.,

²³Zhao Huabi, lecture in China Licorice Website Congress, November 11, 2011.

<http://www.zhgc.net/a/jishujiaoliu/20111113/17.html>

2.2.2 Market supply

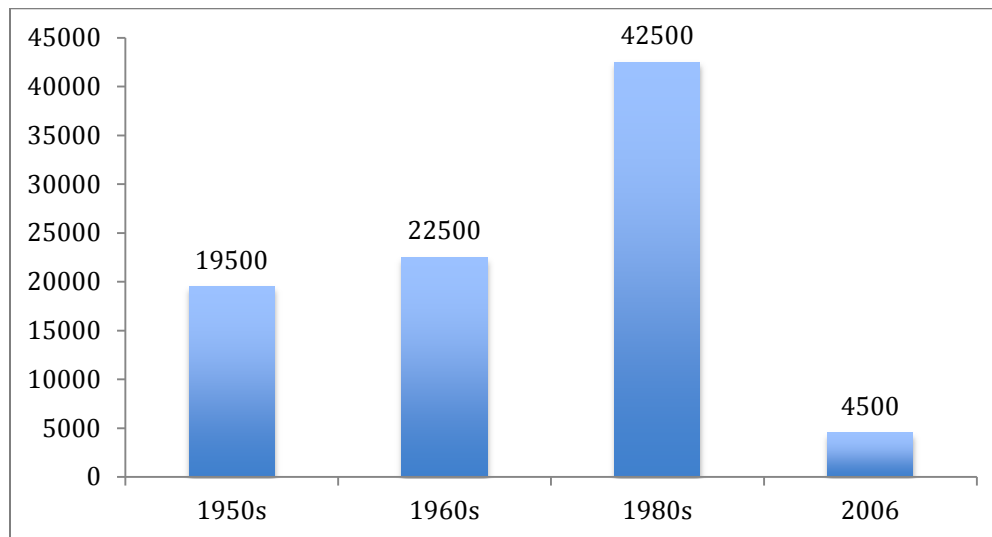
The supply of licorice in China is relying on three sources, wild, cultivation and import. China used to have abundant domestic endowment of wild licorice, estimated to be 3.2-3.5 million hectares or 4-5 million tons of wild licorice root reserves in 1950's²⁴.. However, the unregulated harvesting, land reclamation and change of weather sharply reduced the growing areas of wild licorice in the past 50 years (Figure 7), less than 1 million hectares in 2004 (Zhou 2008). As a result, the yield of wild licorice is dramatically dropped from 1950 to 2006. During the period of 1950's and 1960's, the annual yield of wild licorice is between 19,500 tons and 22,500 tons. In 1980's, the yield is largely increased to 42,500 tons due to the over-digging. Since then, the natural reserve of wild licorice started declining. In 2006, it is reported 4,500 tons a year. Besides the reduction of growing areas in wild, another important factor causing the drop of yield is the degradation of environment. For example, some rivers are drying out and the licorice grown along the river bank disappeared too. It is estimated to be much less now. However, there is no reliable survey data. The variables of different information sources are big. For example, the local government reported 200,000 *mu* licorices while the farmer/trader said only about 60,000 *mu* during the interview in Korla City of Xinjiang on 7 November 2013. Nevertheless, the reduction of wild licorice is obvious.

As supply potential substitute for wild licorice, licorice cultivation has been promoted after the policy was introduced to restrict the collection of wild licorice in 2000. However, the production of cultivated licorice is limited by lack of quality licorice seeds. The licorice seeds are all collected from the wild and cannot produce by specific seed cultivation. The quality is inconsistent as there is lack of quality regulation and standard governing the wild licorice seeds. Although there is no national standard for the licorice seeds quality, but there are local and corporate standards in place.(Table) For example, the Gansu government developed local standard for licorice seed (DB 62/T-2010). Shizhen Chinese Herbal Medicine Technology Ltd develops corporate standard (QB), as showed in annex: case 2.The main quality traits are purity, cleanness, germination rate and moisture. Meanwhile, the quantity of wild licorice seeds is in short of supply due to the reduction of wild licorice reserve and increasing demand by cultivation. It is estimated that the annual supply of licorice seeds is only about 200-400 tons, mostly coming from Inner Mongolia (IMAR), Ningxia and northern areas of Xinjiang. Most cultivated variety is *G. Uralensis* which is commonly used as Chinese herbal medicine slice while the extracting industry hesitates to use it due to concern of quality. Those seeds can meet the demand for planting about 300,000-500,000 *mu* every year, meeting about 20-30% of the annual demand 400,000 tons dried roots or 900,000 tons fresh roots

²⁴China conducted three census on endowment of Chinese herb medicine in 1960-62, 1969-73, and 1983-87, respectively. However these figures are not publicly available yet.

for both domestic and export markets. The gap has to rely on the importation from other countries (Zhao 2007).

Figure 7. Production of dried wild licorice in China (tons), 1950-2006



Data source: Pharmacoeconomics Report, 2012-12-10. <http://www.cinic.org.cn/site951/yypd/2012-12-10/611049.shtml>

2.2.3 Import market

China started importing licorice from other countries since late 1990's due to the shortage of domestic supply (Figures 8 and 9) and restrictive policy over collection of wild licorice. In 2000, the State Council's Notice on Prohibiting the Collection and Sale of Hair-Like Seaweed, and Restrictions on Excessive Digging of Licorice and Ephedrine was implemented. In 2001, the State Economic and Trade Commission enforced a permitting policy²⁵ governing the harvesting, purchasing, and transportation of licorice. Those policies widened the gap of domestic demand and supply. During 2003-2008, the annual demand went over 50,000 tons while the domestic supply is not much improved and hovered around 20,000 tons (Figure 13). The shortage is over 30,000 tons per year which has to rely on importation over years. The import volume for licorice roots and extracts has gone up since late 1990's and reached peak in 2011. The duty free policy for imported licorice effective in 2008 might be one of the factors for the increase. However, the increased import adds up the supply and subsequently pushed down the price. For example, the import price for roots and extracts started declining after hitting the peak around 1998. During the period, China imported licorice from many more countries. Central Asia is the major source of licorice export to China, accounting for 80% of China total import (China Customs 2011). The major exporters are Uzbekistan, Turkmenistan,

²⁵Notice on the Protecting Medicinal Resources of Licorice and MaHuangCao, Organizing and Implementing the Management System of Permit and Specialized Operation

Azerbaijan, Kazakhstan, Afghanistan, Tajikistan, and Pakistan. The import of licorice extracts from Uzbekistan to China was increased by sixty-five times in terms of value, thirty times in volume between 2007 and 2011 (Figure 21).

Figure 8. Import and price of licorice roots by China²⁶

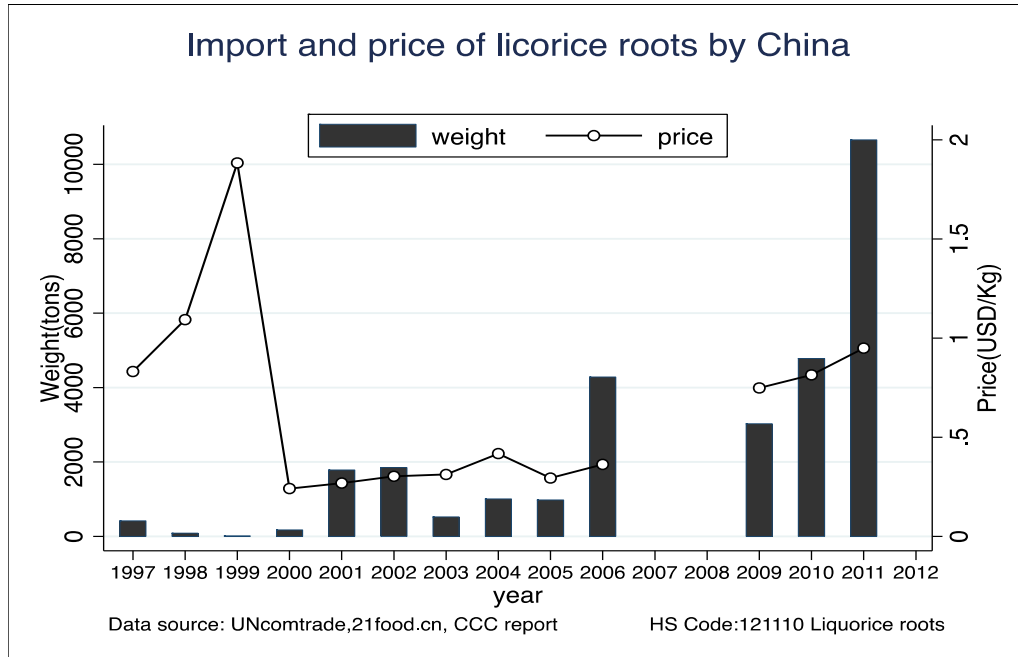
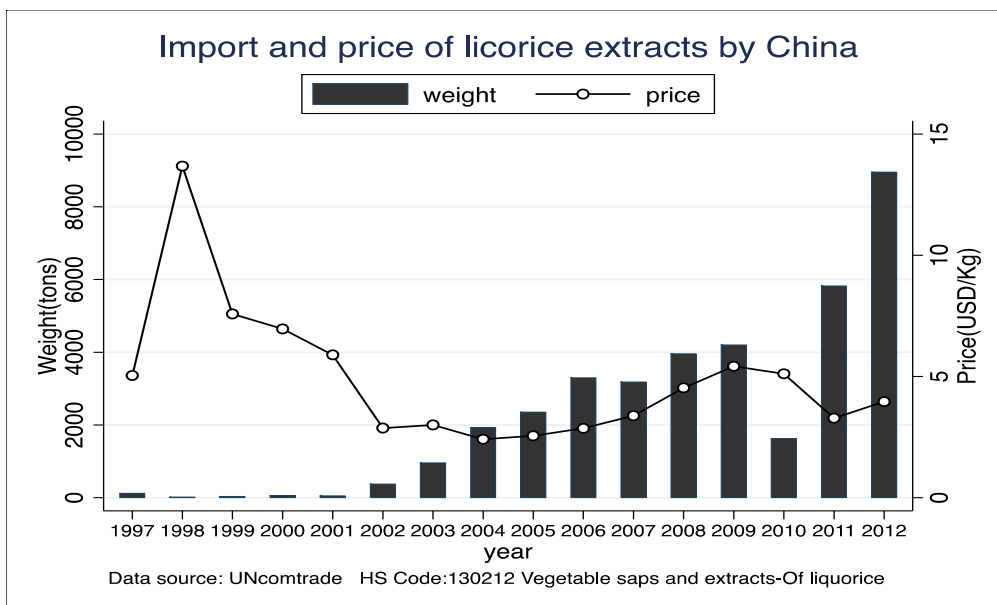


Figure 9. Import and price of licorice extracts by China

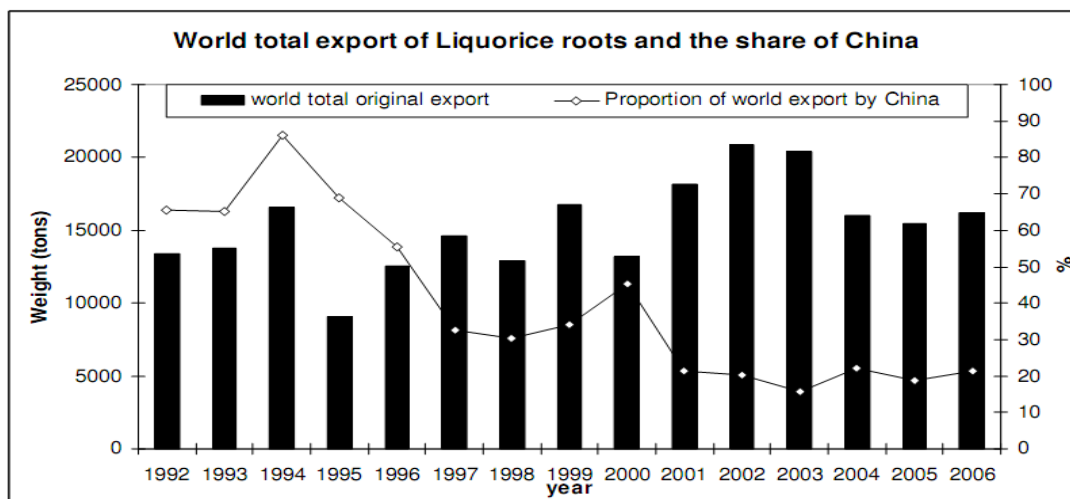


2.2.4 Export market

²⁶ Note: The data is combined from the UN Comtrade Statistic (1988-2006), 21food.cn (2009), and the CCC (2010-2011). The import quantity in 2007 and 2008 is inaccessible.

China has been one of the major exporters of licorice roots and extract in the international trade for centuries. Export of licorice from China dated back to Qing Dynasty in 1600's, significantly increased to meet the growing demand from America and Europe in early 1990's. However, the export from China has started declining since 1994. According to data from United Nations Statistics Division, China's share in the world's export market was more than half in 1990's but was only around one third in 2000's on average (Figure 10). After reach the peak in 1994, the export from China has kept declining (Figure 11). The drop in licorice export has been largely because China started export permit system for licorice in 1994. The quota policy intends to limit the export of licorice in order to assure the supply to the domestic pharmaceutical industry as a priority. Given the severe shortage of supply in domestic market, other non-pharmaceutical sectors such as food, beverage, and tobacco are restricted to use wild licorice²⁷. After that, the export volume is up and down but fluctuates around 4,000 tons for dried licorice roots, 2,000 tons for saps/extracts, and 1,000 tons for Glycyrrhizic Acid Powder and its derivatives during 1995-2013 (Figures 10, 11 and 12). Figure 11 is particularly interesting as it indicates China has become a net exporter of dried licorice roots in 2006 and also the fact China is still quite large players in both importing and exporting. Also unit prices for imports and exports appeared to change dramatically. For example, earlier on import prices are much higher than export prices, crossed, and then move to the opposite direction in the more recent years. Much higher import prices are likely due to the fact that there are very small quantity to be imported in the earlier period. In the recent year after 2006, much cheap licorice from Central Asia are imported.

Figure 10 . China share in world total export 1992-2006²⁸

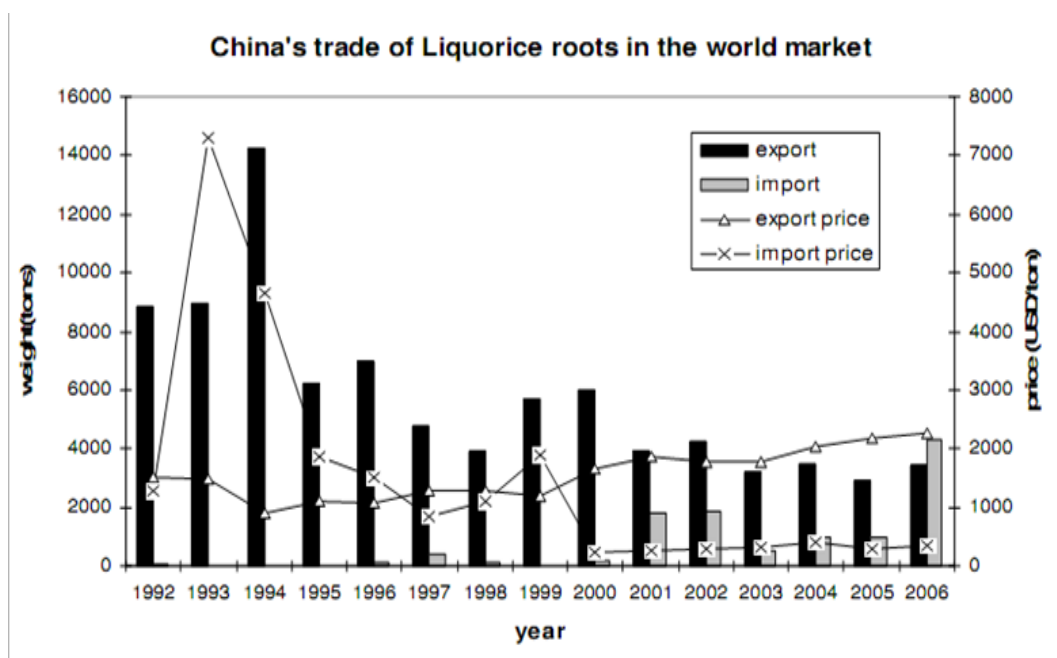


Data source: Ibid.

²⁷ <http://www.sxmw.net/sxgy/open7.asp?id=441>

²⁸ The data of licorice roots from UN statistic is only available till 2006

Figure 11. China's trade of licorice roots in the world market



2.2.5 Projection of Licorice Demand and Supply in China

Various sources of information indicate the demand for licorice will increase steadily in the future²⁹. The increased demand mostly comes from the new markers, such as new drugs(i.e. anti-cancer), healthy food and drinks³⁰, tobacco³¹, etc. However, there is no data on the overall demand by various sub-sectors of licorice industry. According to the CCCMHPiE,³² both demand and supply of licorice slice will steadily grow in the period of 2012-2016 (Figure 23). The licorice supply looks growing faster than the demand. The main reason is that cultivation is expanding fast. In the recent years, several provinces including Xinjiang, Inner Mongolia, Ningxia and Gansu have been promoting licorice cultivation as alternative cash crop to increase farmer's income as well as beneficial plant for ecological restoration. For example, the recent survey by the MOFCOM reported that the total planting area for licorice (mainly *G.uralensis*) reached about 1.9 million *mu* and the total yield of fresh licorice was 120,700 tons in 2011³³. The survey covers 29 key Chinese herbal plants including licorice with an intension to guide the production and distribution in order to balance the demand and supply. The gap of demand and supply is

²⁹<http://info.zyc.hc360.com/2012/04/05161245.shtml>

³⁰<http://www.wlj.com.cn/sunview.aspx?tid=132&id=3853>

³¹<http://www.yltryy.com/cpzx/gxcp/269506.shtml>

³²China Chamber of Commerce for Import & Export of Medicine & Health Products is the leading and most influential national trade association in China with a mission to promote the international trade and cooperation in medicinal and health products. (<http://www.cccmhpie.org.cn/English/EShowListAll.aspx>)

³³Analytical Report on Distribution of Key Chinese Herbal Plants 2011, MOFCOM

predicted to be narrowed by 2016.

The trend of licorice import is predicted growing stably according to the historic data as showed in Figures 13. This is backed up by a report that is done by the Xinjiang Customs³⁴. The licorice import has been encouraged by the government. For example, duty free policy for imported licorice was introduced in 2008. Meanwhile, the export quota is tied up with the import. For example, a licorice exporter can add 5% of the annual import of licorice on the bidding volume for export market according to the Bidding Committee for Export Quota of Commodities. As a result, the importation from Central Asia such as Uzbekistan, Iran, Afghanistan, and Ukraine have significantly increased since 2011. According to Xinjiang Customs, China imported 26,000 tons licorice roots (dried or fresh) in 2012, increased by 1.5 times than that of 2011. Of which, the import value of dried roots from Uzbekistan is US \$ 9.9 million, increased by 2.7 times than that of 2011.

The export of licorice originated from China is limited due to the binding export quota. In the future, the export quota of licorice roots might be increased if the domestic supply either from the wild or cultivated is increased. In terms of the export of licorice saps and extracts as well as other deep processed products, the current quota system will continue to limit the export volume of those using wild licorice produced in China as ingredients. However, the wild licorice imported from other countries and processed in China for re-export purpose is not included in the quota system. This is why the processing tradeoff licorice has increased significantly in recent years. For example, the value of processing trade through Xinjiang port reached US \$ 11.6 million during January to August 2013, increased by 1.2 times than the same period of last year³⁵.

As showed in Figure 12, the export quota for licorice roots has kept dropping since 2005, until reached the bottom in 2009. The export quota has been stable around 3,600 tons per year during the period from 2008 and 2012, but increased significantly in 2013. The latter was partially because of the increased yield of licorice production in 2013. Regarding the export quota for saps and extracts, it has continued to decline since 2005. The export quota for glycyrrhizic powder and others is up and down around 900 tons per year slightly.

According to interview with an undefined processor in Korla of Xinjiang (Nov 8, 2013), licorice processors prefer to use wild licorice to make saps, extracts and glycyrrhizic acid salt and its derivatives. This is because that the cultivated licorice cannot meet the same quality standards of wild licorice yet. The quota system is supposed to reduce the

³⁴<http://www1.customs.gov.cn/wulumuqi/tabid/61971/InfoID/418860/ftid/61950/Default.aspx>

³⁵<http://www.askci.com/news/201311/04/04155740144327.shtml>

collection of wild licorice thus protect the vulnerable environment in China, though, to our knowledge, no evaluation has been done for it.

Figure 12, China Export Quota 2005-2013

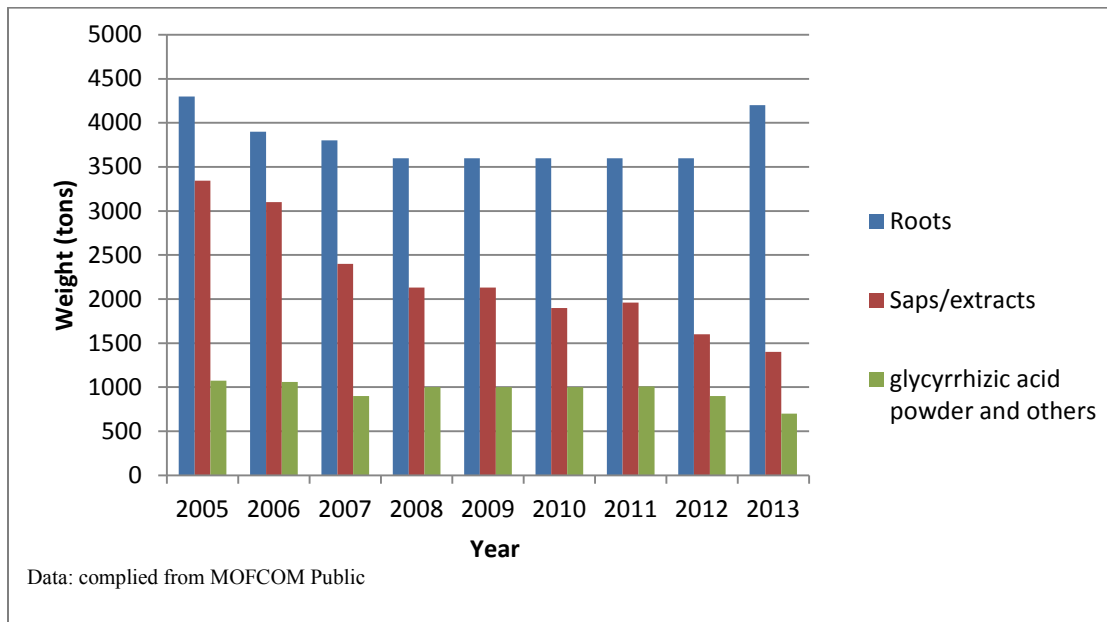
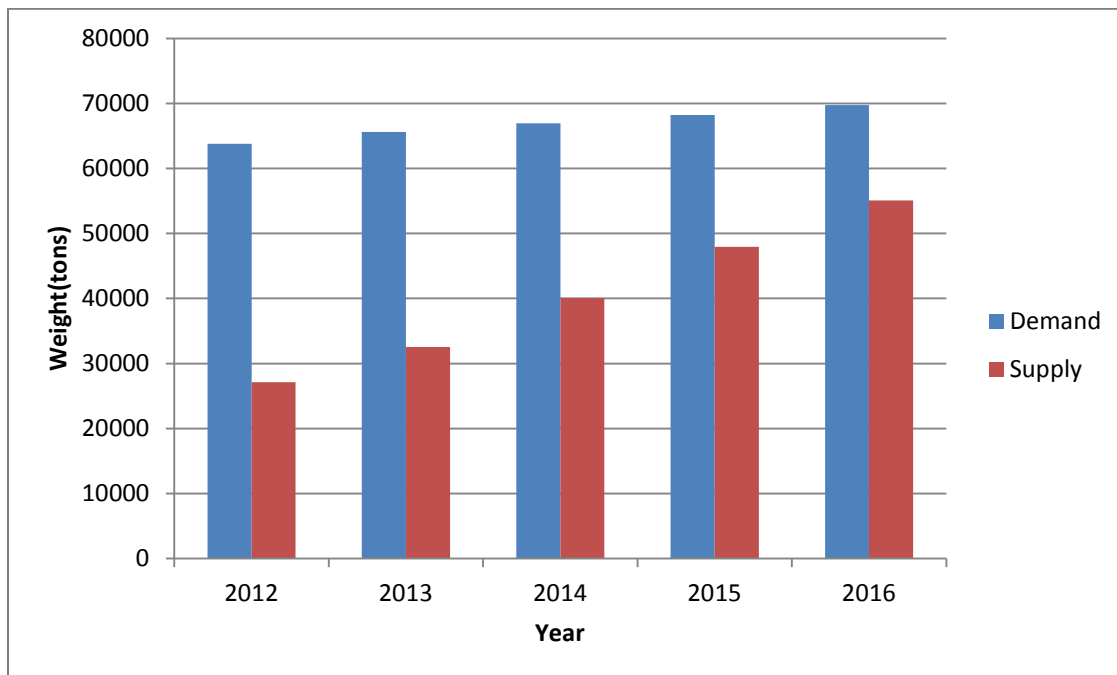


Figure 13. Projection of demand and supply of licorice in China 2012-2016



3 Mapping Chinese licorice value chain

The licorice value chain in China is developed with various values adding stages. The leaves of licorice are normally used as livestock feeders. The roots are processed into different types of product, commonly categorized as licorice slice, extracts/saps, Glycyrrhizic acid ammonium salt and its derivatives. The slice is mainly sold as ingredient to make formulated Chinese herbal drinks or Chinese patent medicine or cooking spice. The extracted products are widely used as ingredient or additives by pharmaceutical, food, cosmetic, and tobacco industries. The licorice roots come from two sources: either imported from other countries or produced locally in China. The majority of traded licorice roots is mainly collected from the wild in both China and other countries. The cultivated licorice has not fully replaced the wild one. The value chains for three different products are briefly described in Figure 14-16.

3.1 Licorice production

3.1.1 Wild Licorice

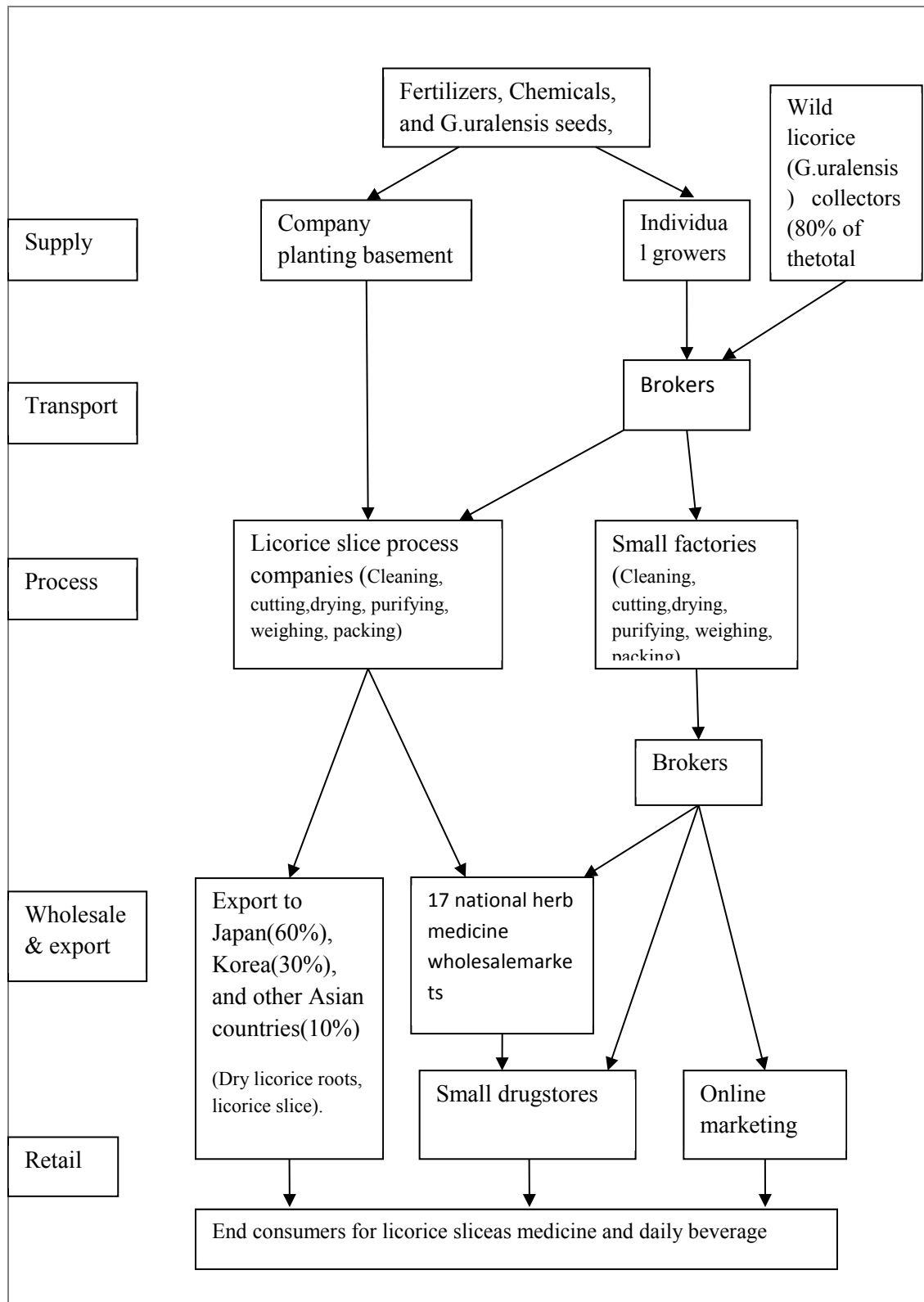
Licorice root is mainly produced in Inner Mongolia, Gansu, Ningxia, Hebei, Shanxi, Qinghai, Xinjiang, and western region of Northeast China, as showed in Figure A12. Of which, *G.uralensis* is the most popular one in China in terms of growing areas.

3.1.2 Licorice cultivation

Before regulations protecting environment and natural resources were introduced in 2001, the licorice was collected freely by individual farmers or traders or companies. Such practices were resulting in reduction of the natural reserves and desertification of the habitats of licorice. Since 2001, the Chinese government enforced restrictions on the collection of wild licorice, leading to a shortage of licorice in the marketplace. The shortage of licorice supply has induced the development of cultivated licorice in China.

Licorice cultivation can be done through underground stems or sowing seed. Stems based cultivation is more labor intensive comparing with seeding as mechanic planting cannot be applied, thus not favored by large scale operation. Seeds should be pre-soaked in water and sown in the autumn. In late spring, plants can be planted out in the open, but care should be taken to protect the new shoots from slugs. Alkaline, sandy but moist soil is preferable. Plant growth is initially slow, but once established the species can become weedy and difficult to remove if not kept under control by regular harvesting. In commercial situations, the whole plant is dug up after three to five years to harvest the rhizomes, which are cleaned, trimmed, sorted and dried before being pressed into bales for shipping. Increasingly licorice is harvested with machine which is designed to collect the tuberous herbal plants, such as licorice roots, the root of straight ladybell, *Scutellaria baicalensis*, etc. The roots harvesting machine is pulled by the tractor in the

Figure 14. Flow Chart of Traditional Herb (Licorice Slice) Distribution System



**Figure 15. Flow Chart of Licorice Extract Distribution System --Industrial Material for Food
Food/beverage, Tobacco, Cosmetics, and Medicine**

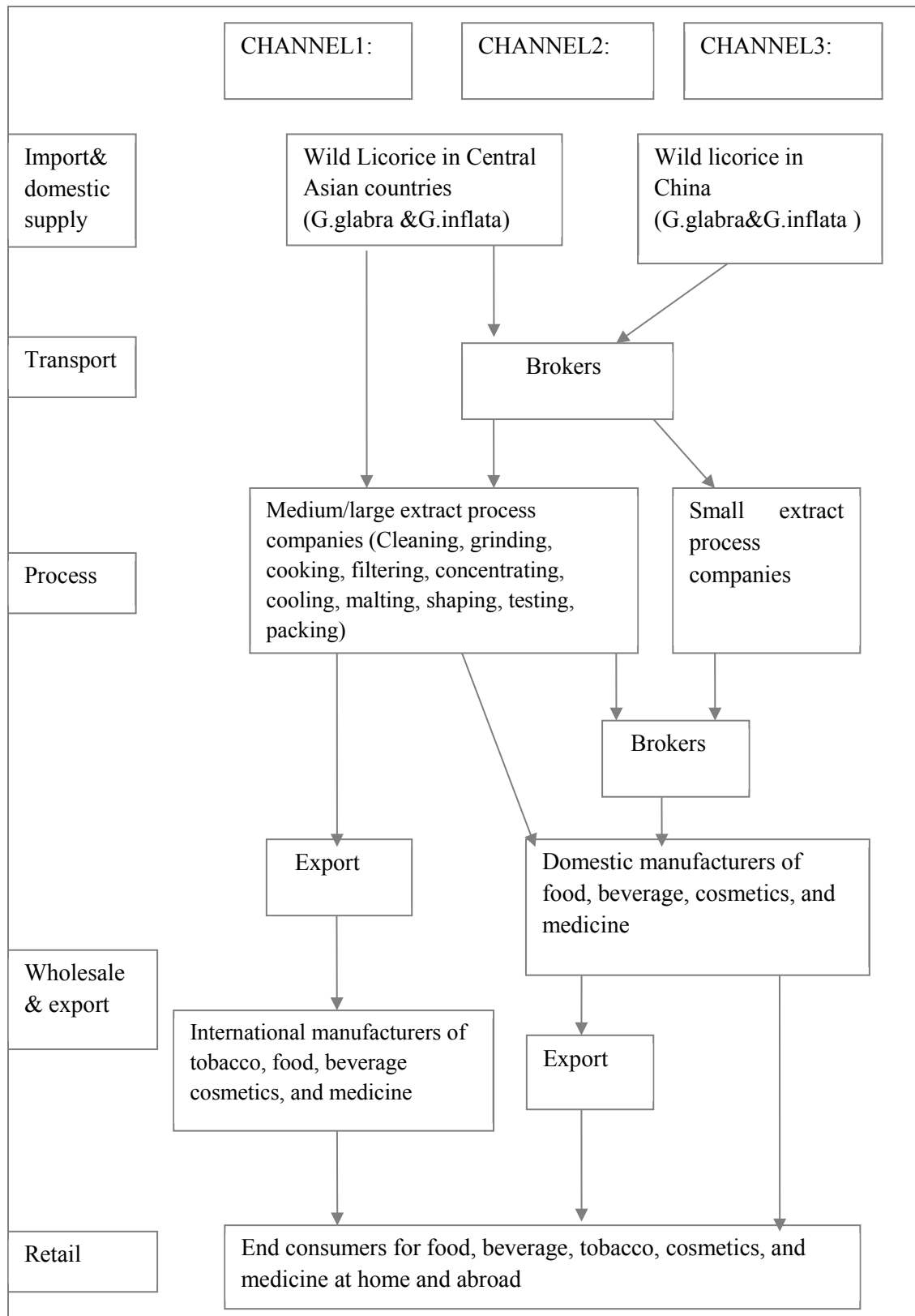
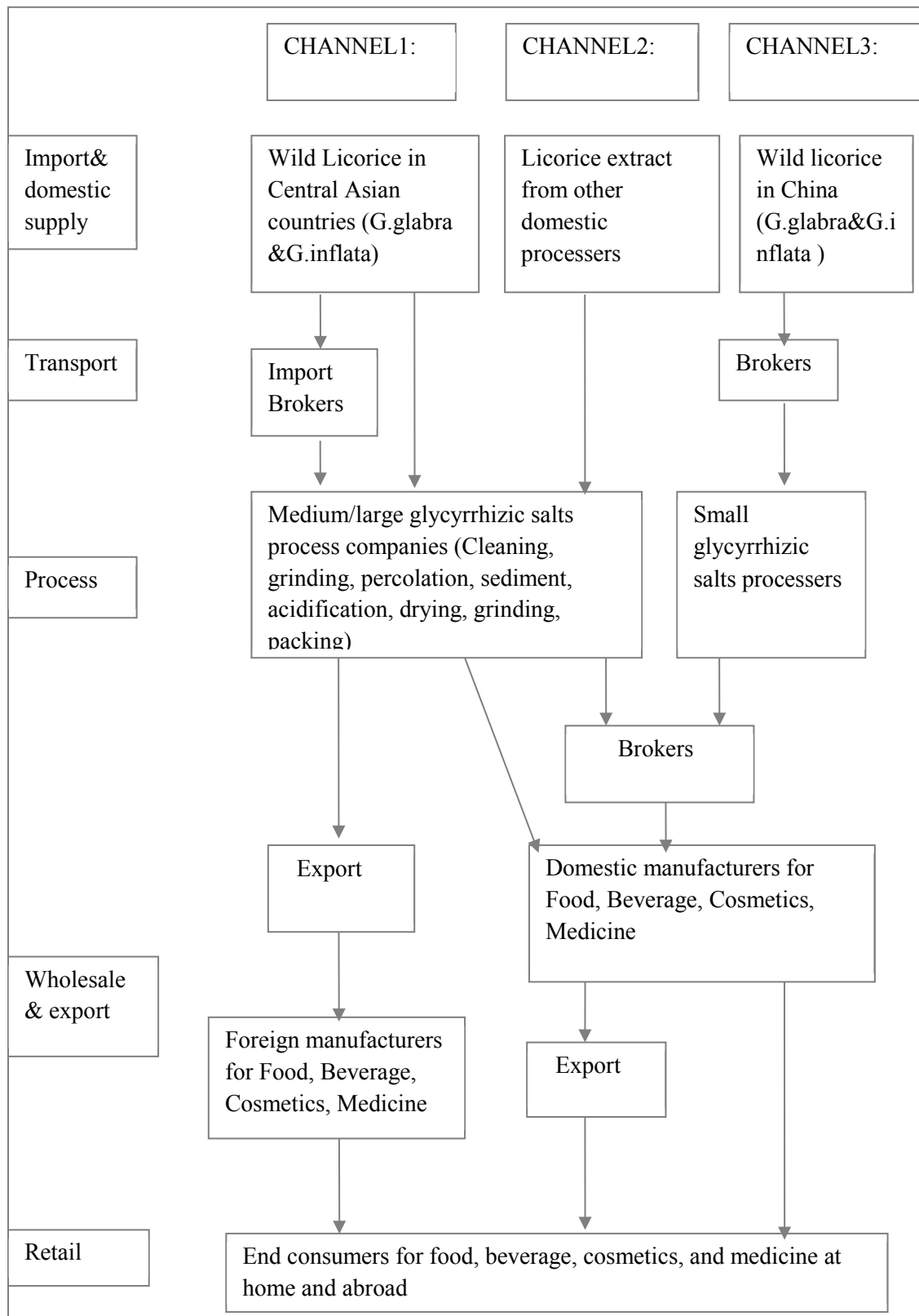


Figure 16. Flow Chart of Glycyrrhizic salts Distribution System - Industrial Material for Food/beverage, Cosmetics, and Medicine



front. The working depth is 65 CM, width from 0.7 to 1.4 meters, harvesting 0.6-2 *mu* per hour, using Dilong branded machine as an example³⁶.

Licorice cultivation has been promoted to compensate the reduction of wild licorice in China. In 2001, the size of newly planted licorice was 6,700 hectares, far more than previous years. In 2004, the newly planted size was dropped to 3,300 hectares due to introduction of direct subsidies to grain producers.(Zhou 2008) During the period from 2005 to 2006, licorice market took a better turn and the price was higher, making growing licorice more profitable. Better profitability stimulated more licorice planting among farmers or licorice companies. Many companies joined in this upsurge and set up their own planting farms in Northeast provinces of China. During the period from 2006 to 2008, about 7,500 hectares of licorice is planted in each year. Nowadays, Xinjiang, Ningxia, IMAR and Gansu are the major licorice planting areas in China, estimated 150,000-300,000 *Mu* in total³⁷. Xinjiang covers about 60% of the total planting in China. However, the development of licorice cultivation is constrained by technical and economic factors. At present, about 80% of the licorice in market is still collected from the wild in China or other counties³⁸.

There are three major types of licorice cultivating farms in China observed. The first type is called corporate farm. The farm lands are leased from the small farmers or village for licorice farming purpose by the corporate. The size of farm is at an average of 10,000-100,000 *mu*. The rent is around 400 *yuan per mu* per year depending on the location and soil quality. The tenancy is normally for 30 years as allowed by government. The abandoned land can be cheaper subject to negotiation. The inputs such as seeds, fertilizers, herbicides and irrigations are provided by the corporate. The planting and harvesting are operated by machine. Farmers in the village might be hired as seasonal workers. The entire production is managed by the corporate. Xinjiang Kanglong Agro-tech Development Ltd is an example³⁹. The Company is a vertical integrator of agricultural products value chain including licorice. There are about 100,000 *mu* farm land designated for both herbal plants and crops such as corn, cotton, pepper and sunflower, etc. The licorice roots are processed into slice and extracts. The second type is called cooperative farm. The licorice farm land is managed by individual members of the cooperative. However, the cooperative coordinates the purchase of inputs, training, and sharing the cost of mechanical planting and harvesting. The marketing of licorice is optional, either done by individual farmer or through the cooperative. In many cases, the leader of cooperative is also trader or processor who has better access to markets. The licorice processors prefer to contract the cooperative instead of individual farmers. The

³⁶http://xxfljx.15877.cn/picshow_8_99.html

³⁷Personal interview with Wang Haiting, president of BKY Licorice Farmer Cooperative, interviewed Nov 6, 2013

³⁸<http://health.sohu.com/20080514/n256840880.shtml>

³⁹<http://www.xjklny.com/about.asp>

average size of the cooperative farm is ranged from 1,000-10,000 *mu*. The Case 3 included in appendix of this report provides more details of this type of farming. The third type is called household farm. The licorice is planted and managed by individual farm household. The size of farm land varies around 10-100 *mu*. The land is either owned by the household or rented from others. The smaller scale farmer will likely follow the practice of larger scale farmers in terms of inputs supply and farming technology. It is also being observed that some licorice farmer households join the contract farming with the processors or traders.

Box 1. Licorice cooperative farm- BKY Licorice Farmers' Cooperative

The Baikangyuan (BKY) Licorice Farmers' Cooperative is located in Jinghe County at Bole Prefecture of Xinjiang Autonomous Region with 159 members. The Cooperative owns about 8,000 *mu* (equivalent to 533 hectares) farmland specialized in licorice (*G.uralensis*) cultivation, while the initial land is about 300 *mu* at the starting year 2009. The cooperative has successfully overcome a series of constraints from farming technology to finance access. Now they accounts for 80% of the total planting areas of licorice in Bole Prefecture. The cooperative is also actively involved in the processing (slicing) and marketing of licorice.

For details please refer to Case 3 in Annex 1.

Cultivating licorice faces two technical constraints. Firstly, the content of Glycyrrhiza acid in cultivated licorice is much lower than the wild one, as showed in Table 1 below. The variation may be caused by the grown time as the cultivate licorice is normally harvested less than 3 years to make it economical while the wild licorice is grown much longer. However, cultivated licorice can normally meet the minimum standard 2% of Glycyrrhizin acid as required by the Chinese pharmacopeia. Nevertheless, the processing industry still prefers to the wild licorice due to the higher content of Glycyrrhizin. Secondly, the seeds for cultivation is all collected from the wild mainly in IMAR due to better quality in terms of variety consistency (all are *G. uralensis* in red skin) and size. In contrast, Xinjiang produces mixed seeds with *G. uralensis* in red skin, *G. glabra* in black skin, and *G. Infaltain* yellow skin, which leads to inconsistent licorice roots with different color, size and shape leading to low market price. With the reduction of wild licorice reserve, the seeds supply also falls behind the seed demand. For example, it is estimated that China needs seeds in the amount of 12 million kg annually, while the supply is only about 200,000-400,000 kg on annual basis⁴⁰. On the other hand, the current technology does not enable production of seeds under cultivation. There are also no professional licorice seeds reproducers in China yet. This might be a potential area for investment but commercial feasibility needs further investigation.

⁴⁰Zhao Huabi speech at the Licorice Network Meeting In Lanzhou, September 12-15, 2007

Box 2. Licorice seeds and cultivation technology provider- Beijing Shizhen Chinese Herbal Medicine Technology Ltd

Beijing Shizhen Chinese Herbal Medicine Technology Ltd was registered as a private company in Daxing District, Beijing in 2005. The Company is actively involved in the planting technology research and extension of Chinese herbal plants including licorice. In recent years, Shizhen has spent great efforts developing the licorice (*G. Uralensis*) value chain through the quality control of licorice seeds and cultivation technology services, benefiting thousands farmers in Xinjiang, Inner Mongolia and Gansu provinces.

Shizhen sells about 50 tons seeds (*G. uralensis*) on annual basis, accounting for 10% of the national sales. The current price of seeds is about 200 RMB per kg, dramatically increased from 120 RMB per kg in 2011.

For details please refer to Case 2 in Annex 1.

The economic constraint is about the comparative benefits of licorice against other cash crops and grains. As showed in Table 2 below, growing licorice requires larger and longer investment. Since it takes at least 2 years to harvest the licorice, the farmers have to invest time and money for two years before seeing any revenue from the harvest and sales of licorice. The investment *per mu* for licorice is about 3.5 times higher than corn in the same period. As a result, the net profit from growing licorice is less than corn on annual basis. Although the comparative benefits between licorice and corn or other crops might be changed depending on the market price, but it is still a challenge for licorice farmers to predict the price of market in such long period. In addition, the licorice price is affected by the quality grades which are normally graded 7 levels in terms of length, head diameter, end diameter and moisture⁴¹.

Table 1. Glycyrrhiza acid content between the wild and cultivate licorice

Samples	Grown time	Source of sample	Glycyrrhiza acid (%)
Cultivated licorice	2 years	Daxing, Beijing	2.035
		Baotou, IMAR	2.112
		Houma, Shanxi	2.189
		Chengde, Hebei	1.973
		Binxiang, Heilongjiang	1.852
	3 years	Nong'an, Jilin	1.878
		Daxing, Beijing	2.683
Wild licorice	Perennial	Baotou, IMAR	3.819
		Houma, Shanxi	4.312
		Chengde, Hebei	2.988
		Binxiang, Heilongjiang	2.246
		Nong'an, Jilin	2.940
		Chifeng, IMAR	6.149

⁴¹Table 5-4, quality standard of planting *G. uralensis*, *Licorice*, Zhou Chengming, etc. 2010

	Yuanping, Shanxi	6.149
	Yanchi, Ningxia	4.325
	Kuerle, Xinjiang	3.948

Source: table 3-40, page 197, *Licorice*, Zhou Chengming and Gong Xiaojie, first edition by China Agricultural Press, January 1, 2010

Table 2.Comparison of economic benefits between licorice and corn, 2005

Licorice		Corn	
Item	Value (RMB/kg)	Item	Value (RMB/kg)
Land rental for 2 years	200	Land rental for 1 year	100
Seeds	600	Seeds	100
Water use for 2 year	100	Water use for 1 year	50
Fertilizer for 2 years	200	Fertilizer for 1 year	100
Machinery for 2 years	300	Machinery for 1 year	30
Labor for planting	50	Labor for planting	20
Management fee for 2 years	100	Management fee for 1 year	50
Weeding labor for 2 years	200	Weeding labor for 1 year	50
Harvesting labor for 2 years	200	Harvesting labor for 1 year	50
Total investment	1950	Total investment	550
Yield with 2 years (kg)	1000	Annual yield average (kg)	800
Unit price (RMB/kg)	2.8	Unit price (RMB/kg)	1.5
Total Revenue (RMB)	2800	Total Revenue (RMB)	1200
Net profit/year (RMB)	450	Net profit/year (RMB)	650

Data source: producers in Hetao plain of IMAR, Zhao Huabi's presentation in Lanzhou, September 2007

3.2 Licorice processing

There are three types of processors in the licorice industry. The first one is called slice processor which is a primary processing. The processing technology and equipment are simple. The second one is called extracts processor which involves both physical and chemical processes. Liquorice extract is obtained from the roots by grinding them (physical process), after which they are cooked in water at over 85°C, followed by evaporation, separation, sediment and crystallization (chemical process), etc. Ethyl alcohol and sulfuric acid are used as chemical reagents. The third one is called glycyrrhizic acid processor which includes more complicated chemical reaction. Both extracts and glycyrrhizic acid processing are considered deep processing.. There is no available data to show the number of processors by different products. Based on the field visits and interviews, there could be thousands of small processors for licorice slicing, hundreds for saps/extracts processing and a few key ones for licorice ammonium salt and

its derivative processing. The higher value processing requires larger investment on technology and facilities as well as license. Most processors particular those using *G.glabra* as ingredient are located in Xinjiang. It has a few advantages including (i) Xinjiang is the only *G.glabra* production area in China, (ii)Xinjiang customs is the entry point of imported licorice from central Asia and (iii)The cost of land and labor is relatively lower than that of other provinces.

According to the Chinese Drug Administration Law effective in 2001, the processors for Chinese herbal extracts must have Pharmaceutical Production License issued by CFDA. In reality, many small processors without Pharmaceutical Production License have to work with large processors which have the license on entrusted basis. To improve the quality control, CFDA implemented another regulation called the Management Measures of Quality Control Certification for the Drug Manufacturers issued in 2005 and revised in 2011. This regulation essentially requires drug processors to meet GMP standards developed by CFDA. The criteria of GMP assessment was developed in 1999 and revised in 2008.

Box 3. Exploring New Usage of Licorice in Cosmetic Industry - Nanjing Zelang Medical Technology Ltd

Nanjing Zelang Medicial Technology Ltd. is a private company established in 2004, it focused in production and wholesale of natural plant extracts. The main licorice product is Glabridin, a highly processed extracts from *G.glabra*. It is either white or yellow powder and is used in high-end cosmetic product as cream, paste, water solution and emulsion. The price of *G.glabra* of 90% purity is about 150 thousand RMB per kg. Over 95% products are exported to America, Europe, Japan and Korea.

For details please refer to Case 4 in Annex 1.

3.3 Licorice wholesalers and retailers

The licorice and its derived products are distributed through different channels. Traders including both wholesalers and retailers play important role of distribution, as illustrated in Figure 14-16.

There are 17 national wholesale markets for Chinese herbal medicine approved by the government in China, located in various provinces mostly in the south. The wholesale market provides services to the dealers in the market through banking, quality testing, storage, e-commerce and logistics. There are three types of dealers in the market, including household based small dealer with one or two booths, the medium size dealer and large corporate (Zhou 2008).The small dealer normally sells locally produced medicinal materials and the distribution network is limited to local area. The medium and

large wholesaler, especially those glycyrrhizic acid/salt wholesalers, have national distribution network, outsourcing the ingredients from various production sites through local trader at village/township/county levels and wholesale to the manufacturers or users across the country.

All the distributors no matter for wholesale or retail business must be certified by GSP (Good Supply Practice) according to the Drug Management Measures for the Certification of Quality Control Standards issued by CFDA in 2003.

3.4 Licorice imports and exports

3.4.1 China's import

Due to the shortage of domestic supply and duty free policy effective in 2008, there are noticed increases of importing licorice products from other countries. In 2010, there are 14 enterprises importing fresh or dried licorice with a total amount of 4,778 tons worth US \$ 3,891,200. Almost 100% of imported licorice roots come from Asian countries. Of that, Uzbekistan accounts for almost 48% as showed in Figure 18. 16 enterprises imported saps/extracts with a total 1,627 tons valued at US \$ 8,326,100. However, about 98% of that is for re-export after further processing. 67 enterprises imported Glycyrrhizic acid salts and its derivatives with 511 tons valued at US \$6,551,330. Almost all of that is for re-export market after further processing.⁴² The major importers of licorice from Central Asia are listed in Table 5 below.

Table 3. Major importers of licorice roots/extracts from Central Asian countries.

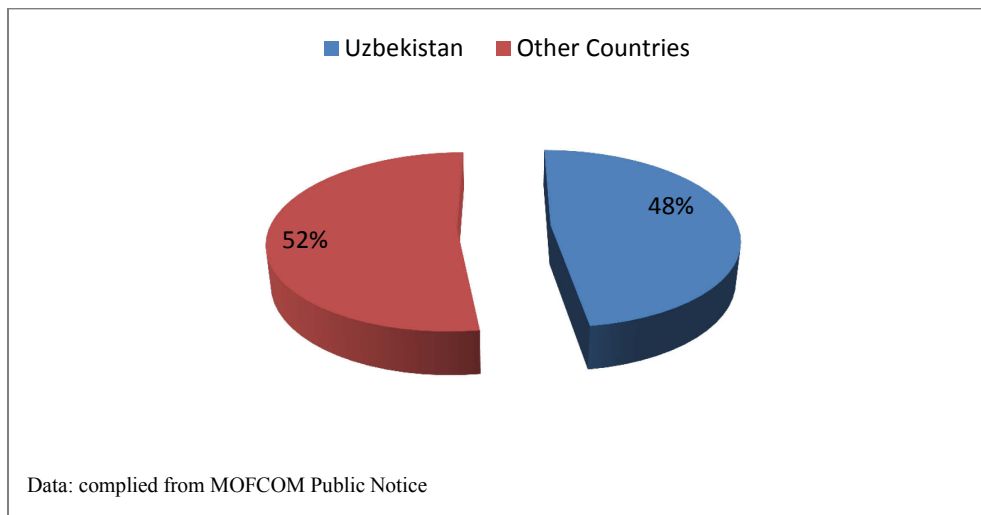
Name of Company	Province
China Meheco Corporation (under the central administration)	Beijing
Beijing Gingko Group Biological Technology Co., Ltd.	Beijing
Hebei Shenglun International Industry Group Co., Ltd.	Hebei
ZFTZ Mafco Biotech Co., Ltd.	Jiangsu
Zhejiang Medicines & Health Products Imp. & Exp. Co., Ltd.	Zhejiang
Northern International Group Tianjin Medicines and Health Products Imp & Exp	Tianjin
Gansu Fanzhi Biotechnology Co., Ltd	Gansu
Xinjiang Alar Xinnong Licorice Industry Co., Ltd.	Xinjiang
Yuli County Jinxing Licorice Products Co., Ltd	Xinjiang
Xinjiang Tianshan Pharmacy Industry Co., Ltd.	Xinjiang

The Chinese importers must provide two key documents when importing licorice from other countries at the border. The first one is the Drug Import Customs Clearance issued

⁴²<http://health.people.com.cn/GB/200501/14063431.html>

by the China Food and Drug Administration. It covers the products of traditional Chinese medicine, slice for Chinese herbal drinks, and Chinese patent medicine listed in the Catalogue of Imported Drugs⁴³. However, the drugs for bonded warehouse, bonded zone and processing for re-export are free of the formalities for import records keeping and port inspection. The second one is the Customs Clearance of Entry Commodities issued by the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ). The imported licorice must be compliant with the Catalogue of Inspection and Quarantine Law. Among the various licorice products, the fresh/dried licorice, sap/extract, and Glycyrrhizic acid salts are included in the Catalogue while Glycyrrhizic acid powder and Glycyrrhetic acid and its derivatives are not on the list⁴⁴. Besides the quarantine inspection on weeds and pests, the residues of pesticides and heavy metals will also be inspected. Noncompliance will be returned. Risk assessment is required for the first importation of fresh or dried licorice (HS 1211903600) originated from Azerbaijan, Kazakhstan, Uzbekistan, Pakistan, Afghanistan, the United Arab Emirates, Kyrgyzstan, Turkmenistan, Tajikistan, Russia and Iran⁴⁵.

Figure 16. Uzbekistan Shares Exporting Licorice Roots to China (2010)



3.4.2 China's export

The licorice products are exported to different countries. Asia is still the major destination of fresh and dried licorice products as well as Glycyrrhizic acid salts and its derivatives. Europe is the major importer of sap and extracts, according to an analysis by China Customs in 2010⁴⁶.

⁴³ Appendix 4, No.9 Public Notice by China Food and Drug Administration and the General Administration of Customs.

⁴⁴ <http://www.17025.org/hs.php?srchtxt=%B8%CA%B2%DD>

⁴⁵ http://www.xmciq.gov.cn/zfxgk/xxgkml/dzwjyjg/jysp/201307/t20130726_101357.htm

⁴⁶ http://web.vyjb.com:8080/html/2011-03/23/content_138111.htm

The fresh and dried licorice roots from China are exported to 13 countries and regions. Of that, Asian countries are the main markets, accounting for 81.95%, followed by EU with 15.51% and North America 2.54%.

In terms of saps and extracts, 18 countries and regions were identified as the destination, with EU as the majority of importation as much as 54.26%, followed by Asia as the second largest market with 34.33%, North America with 8.59% and 2.37% from the others.

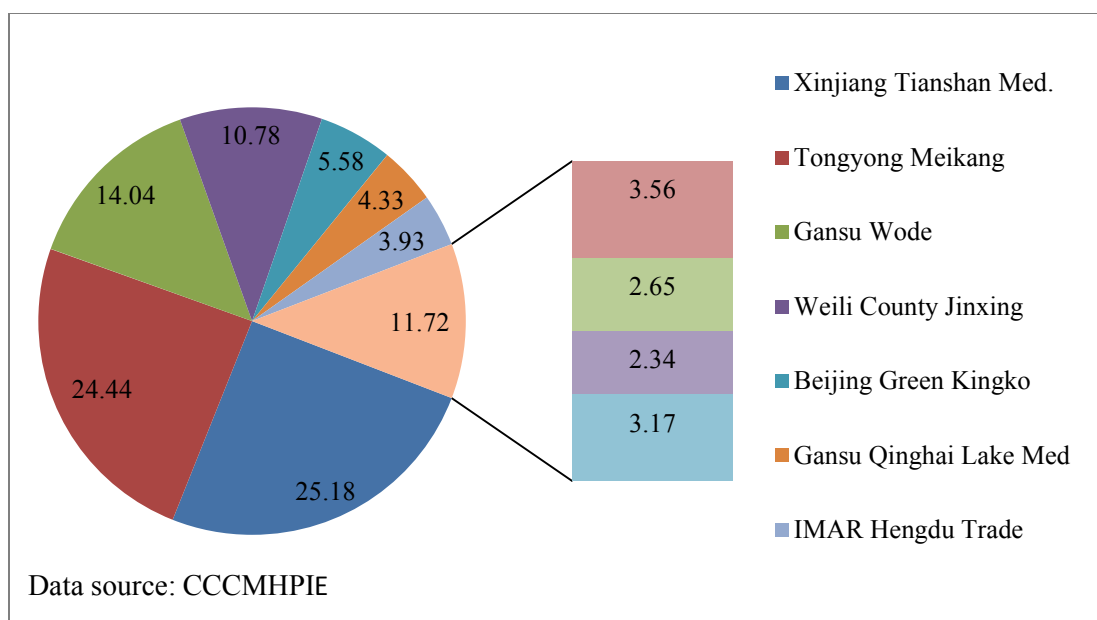
Regarding Glycyrrhizic acid salts and its derivatives, Asia still dominates the import of Chinese products as 88%, followed by 9% for Europe and 2% for North America. The top 10 Chinese exporters for licorice in 2011 are listed in Table 6 below. Figure19 shows the top ten Chinese exporters for saps/extracts in 2009, which accounts for 97% of the total export.

Table 4. Top ten Chinese exporters of licorice 2011

Ranking	Name of Company	Province
1	China Medicine and Health Products Co.,Ltd	Beijing
2	Jilin Lincun Chinese Medicine Development Ltd	Jilin
3	Xi'an Miaoxiangyuan Medical Ltd	Shaanxi
4	Anhui Xiehecheng Medical Drinking Slice Ltd	Anhui
5	Ningxia HeAnyuan Import and Export Ltd	Ningxia
6	Hangzhou Huiyuan Industrial Ltd	Zhejiang
7	Tianjin Yuansheng Medical Ltd	Tianjin
8	IMAR Dadihong Trade Ltd	IMAR
9	Tianjin Ruixin International Trade Ltd	Tianjin
10	Anhui Tianhe Chinese Medical Materials Development Ltd	Anhui

Note: ranking is based on the trade value from high to low. Data source: CCCMHPIE, Licorice Import Analysis report

Figure 17. Top ten Chinese exporters of saps/extracts 2009



Box 4. International licorice manufacturer- ZFTZ MAFCO BIOTECH CO., LED.

MAFCO Worldwide in the United States has been the world leader in quality licorice products since 1850. The Company specializes in manufacturing licorice extract and other derivatives for use as flavoring in various consumer products, including candies, pharmaceuticals and tobacco products. ZFTZ MAFCO is a branch of Mafco worldwide established in 1985 in the bonded area of Zhangjiagang, Suzhou, Jiangsu. With the advantage of export in bonded area and the cheap cost in China, ZFTZ focus on processing and export. The licorice value chain is highly vertical integrated in MAFCO. They have established a stable international value chain of sourcing material in Central Asia, processing in China, and marketing in Europe and America. For details please refer to Case 1 in Annex 1.

3.5 Enabling environment

3.5.1 Policy and regulations

China has enforced a number of regulations to protect the natural reserve and assure the quality supply of licorice. In 1994, the Ministry of Foreign Trade and Economic Cooperation (now called MOFCOM) carried out the Bidding Guide for Export Quota including the Implementation Details of Bidding on Export Quota for Ginseng/Licorice Products. As a result, the number of exporting companies is reduced to around 40 from over 1,000 (CCCMHPIE). Later on in 2000, the State Council issued the Regulations on the Prohibition of the Collection and Selling of Hairy Grass and Unregulated Collection

of Licorice Roots and Chinese Ephedra. In 2001, the Ministry of Agriculture implemented the Administrative Regulations on the Collection of Licorice and Chinese Ephedra, as well as MOFTEC developed the Detailed Rules of Bidding for Export Quota of Industrial Products. China Drug Administration Law was effective in 2001, governing the medical purpose of licorice. In 2004, the China Seeds Law was implemented to regulate the seeds production and distribution including the cultivation of wild licorice seeds. Furthermore, the MOFCOM conducted the Measures for the Administration of Licenses for the Export of Goods in 2008. For those exporters to USA, they also have to meet the GMP Standards for Health Food as ingredients supplier required by FDA effective in 2007. To promote the import of licorice, the government of China has reduced the tariff from 6% to zero since 2008. In June 2013, CFDA published the new version of Good Supply Practice for Drug Trading Enterprises (revised from version 2000). All the drug trading enterprises must be certified by GSP in order to assure the safety and quality of medical ingredients.

Of above regulations, it is the most challenging one to implement the Administrative Regulations on the Collection of Licorice and Chinese Ephedra. The regulation requires any individual (farmers or other individuals or firms) who intends to dig and collect licorice roots need to apply for the collection permit from local Grassland Administration Station under the Provincial Animal Husbandry Bureau. The permit specifies the name of collector, quantity of collection, location of licorice, variety of licorice and agreement of the land contractor. The permit is issued once a year and not tradable. A 5-10% of the resource values are charged by the Grassland Administration as resource fees. The application goes to county level Grassland Monitoring and Supervision Station (GMSS, hereafter) first and finally approved by the Provincial Department of Animal Husbandry. Despite the strict design of the permit approval system, the implementation faces the challenges of monitoring and enforcement. No-permit-collection, out-of-quota collection and cross-border collection are commonly reported during the interview.

Besides the restrictive policies for wild licorice collection, the government also encourages the cultivation of licorice. However, the national supporting policies are normally not licorice-specific, but cover all the traditional Chinese medicinal materials. At local government level, licorice cultivation is usually promoted as additional income source for the poor, or beneficial plant for environmental protection. The licorice cultivators may enjoy a policy portfolio including the supports to farmers cooperative, standardized farming, grain for green, national key leading enterprise (Dragon Head), agriculture mechanization, etc. The major policies related to licorice industry are summarized Table 5.

Table 5. List of Chinese Regulations and Policies for Licorice Industry

Name of Regulation/policy	Responsible Authority	Effective Date
Bidding Guide for Export Quota	MOFTEC(MOFCOM)	1994
The Implementation Details of Bidding on Export Quota for Ginseng/Licorice Products	MOFTEC (MOFCOM)	1994
Regulations on the Prohibition of the Collection and Selling of Hairy Grass and Unregulated Collection of Licorice Roots and Chinese Ephedra	State Council	2000
Grain for Green Project	State Council	2000
The Drug Administration Law of the PRC	CFDA	2001
Administrative Regulations on the Collection of Licorice and Chinese Ephedra	MOA	2001
The Adjusting of Administrative Regulations on the Collection of Licorice and Chinese Ephedra	NDRC	2004
Detailed Rules of Bidding for Export Quota of Industrial Products	MOFTEC(MOFCOM)	2001
Notification about the Income Taxation on National Key Leading Enterprises for Agriculture Industrialization		2001
China Seeds Law	MOA	2004 (revised 2013)
Subsidies to the Purchase of Agricultural Machinery	MOF & MOA	2004
The Amendment of Administrative Regulations on the Collection of Licorice and Chinese Ephedra	NDRC	2004
Management Measures for Demonstration Area of National Agriculture Standardization	SAC& MOA	2007
China Farmers Cooperative Law	MOA	2006
Measures for the Administration of Licenses for the Export of Goods	MOFCOM	2008
Duty Free for Imported Licorice Products	China Customs	2008
Good Supply Practice for Drug Trading Enterprises	CFDA	2013 (revised from version 2000)
Support Farmer Cooperative Development and Promote Innovation of Agricultural Production and Operation System	MOF	2013
Good Manufacture Practice	NHFPC	2013 (revised from version 1995)

3.5.2 Quality Standards

There are four types of quality standards applied by the licorice industry, namely national standards (GB), industry standards (HB), enterprise standards (QB) and export standards

required by different destination counties. The national standard is the minimum compulsory standard. For example, the content of Glycyrrhizic acid must exceed 2% otherwise it cannot be used as medical ingredient. This standard applies to *G.uralensis*, *G.glabra* and *G.inflata*. The industry and enterprise standards could be higher than the national standard. The export standard varies among different countries. For instance, the Japanese Pharmacopeia requires minimum 2.5% glycyrrhizin for medicinal licorice to be included in Kampo medicines. Kampo is the Japanese herbal medical system and diagnosis adapted from traditional Chinese medicine⁴⁷.

Table 6. Quality Standards for Licorice

Parameters	National standards(GB)	Industry standards(HB)	Enterprise standards (QB)	Export standards
Reference	Chinese pharmacopeia (2005)	Industry standards for licorice medicine as	Quality standards of planting <i>G.uralensis</i> by (Shizhen co.)	Standards of long and diagonal slice of <i>G.uralensis</i> for export to Korea (Shizhen co.)
Length	25-100cm	20-50cm	≥20cm	A: 8-10cm B: 6-7cm C: 4-5cm D: 3-4cm
Diameter	0.6-3.5cm	A: >1.8cm B: 1.2-1.8cm C: 0.9-1.2cm D: 0.5-0.9cm	A: 1.5cm B: 1.3cm C: 1.1cm D: 0.9cm	A: 1.5cm B: 1.2-1.5cm C: 0.9-1.2cm D: 0.5-0.9cm
Bottom diameter		A: ≥1.2cm B: ≥0.9cm C: ≥0.5cm D: ≥0.3 cm	A: 1.3cm B: 1.1cm C: 0.9cm D: 0.7cm	
Moisture	≤12%	≤12%	≤14%	≤14%
Ash	≤7%	≤7%		
Acid-insoluble ash	≤2%	≤2%		
Glycyrrhizic acid	≥2%	≥2.5%	≥2%	≥2%
Liquiritin	≥1%			
Pesticide residue	BHC≤200mg/g DDT≤200mg/g PCNB≤100/g	BHC≤20mg/g DDT≤5mg/g	BHC≤200mg/g DDT≤200mg/g	
Harmful	Pb≤500mg/g	Pb≤50mg/g		

⁴⁷ <http://en.wikipedia.org/wiki/Kampo>

elements	Cd≤300mg/g As≤2000mg/g Hg≤200mg/g Au≤2000mg/g	Cd≤20mg/g As≤30mg/g Hg≤100mg/g		
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3.5.3 Research and Development

Research on licorice cultivation has started in early 1960's, there are some successes on trial basis but the commercial success didn't emerge until late 1990's. The research is focused on analysis of chemical components, extraction technique, medical functions, and artificial planting methodology.

The research funding comes from both public and private sector. The universities and research institutes have conducted some research in the past decade, such as the research on the varieties of licorice by the Grassland Research Institute, synthesis and antitumor activity of Glycyrrhetic acid derivatives by the Wuhan University, the Effects of Drought Stress on Glycyrrhizic Acid Accumulation Systems by the Beijing University. More recently, research with DNA technology aiming to improve production and clone has been initiated since 2008.

The private sector is active in the applied research. For example, Beijing Shizhen Chinese Herbal Medicine Technology Ltd has done extensive research on the cultivation technology and achieved some success on commercial scale. One of its customers reported high yield at 1,300 kg per *mu* in Bole City of Xinjiang during the field visit. Another example is that the Beijing Gingo Group which is a large processor and exporter based in Beijing developed more efficient and environmental friendly technique to extract saps from licorice roots in September 2013.

Internationally research has been done by foreign universities and multinational companies as well. For instance, MAFCO the world leading licorice processor has developed various techniques to enhance productivity, though most of the results are kept within the company. Moreover, Japanese researchers successfully cultivated 4-year-old licorice with glycyrrhizin levels conformed to the Japanese Pharmacopeia standard (not less than 2.5%) - (Yamamoto et al. 2003, Yamamoto and Tani 2005). The DNA sequences of the enzymes involved in glycyrrhizin biosynthesis have been reported. The possibility of using bio-engineering technology to generate glycyrrhizin-producing plants or microorganisms seems promising in future (Hayashi et al. 2001, Seki et al. 2008). In 2006, the CASS and Japan Jincun Joint-stock Corporation conducted a joint research on medical utilization of licorice plant resources in Xinjiang, aiming to improve the quality of cultivated licorice through DNA sequencing technology.

To address the technical constraints faced by licorice farmers, both public and private sectors are providing extension services to the licorice farmers. From the public sector,

the Ministry of Agriculture and the Ministry of Science and Technology as well as their provincial branches are the key funding agencies and service providers. Various training and demonstration program are organized by multiple government departments in licorice production regions. Meanwhile, the private sector such as the licorice seeds and processing companies provide technical training and consultation to the licorice farmers. Since 2000, there are many technical materials published by various institutions available for sale on internet and book stores as showed in below box. This reflects the increasing interest in licorice cultivation technologies.

Box 5. List of Major Chinese Publications for Licorice Production

- i. *The Chinese Licorice (English version)*, authored by Fu Yujie, published by the Science Press, ISBN9787030125477
- ii. *Licorice*, authored by Zhao Yonghua, published by the Beijing Kehai Press, 2001-01-01, ISBN: 9787899990193
- iii. *Chinese Licorice*, authored by Qiao Shiyong, Cheng Shuchun, and Wang Zhiben, published by China's Agricultural Science & Technology Press, 2004.
- iv. *Standardized Production Technologies for Licorice*, authored by An Wenzhi& Lin Haiming, published by Jindun Press, 2008, ISBN: 9787508250465
- v. *Licorice Research*, authored by Jiang Qi and Wang Yinghua, published by the Ningxia People Press, 2009-05-01, ISBN: 9787227040354
- vi. *Licorice*, authored by Zhou Chengming& Gong Xiaojie, published by the China Agriculture Press, 2010, ISBN: 9787109138766
- vii. *Cultivation Methods for Licorice*, authored by the Training and Education Centre of Technologies for Farmers at the Ministry of Agriculture, published by the Agricultural Education Audio and Video Publishing House, 2011, ISBN: 978-7-88098-123-0
- viii. *Practical Technologies to Increase Licorice Productivity*, authored by Wang Wenquan, published by the China Forestry Publishing House, 2011-04-01, ISBN: 9787503860966
- ix. *Licorice Cultivation and Processing*, authored by the Training and Education Centre of Technologies for Farmers at the Ministry of Agriculture, 2012, ISBN9783507017108

3.6 Chain integration, cooperation and coordination

The licorice industry in China has being globalized with increasing vertical coordination in place since 2000. The Chinese licorice processors have to outsource the supply from other countries mainly central Asia due to the shortage of domestic supply staring in late

1990's. China has become the net importer of licorice since 2006. The import value continued to rise in past 10 years. The list of countries as licorice suppliers to China is still expanding. For example, Ukraine, Iran and Afghanistan have become the new licorice supplying countries since 2011.

To stabilize the supply, the processors start building processing facilities near the production areas. Besides Chinese buyers, the processors in USA, Japan and South Korea which used to import licorice from China have also started outsourcing licorice from central Asia. Due to the competition for the resource, the price of licorice from central Asia has been pushed higher year after year. To secure the supply, some Chinese companies initiated cooperation with local producers in licorice exporting countries. For example, the Chinese Holley Company signed cooperation with the Uzbek Pharmaceutical Company to establish licorice processing facility in Uzbekistan in January 2013⁴⁸.

Contract farming is still limited in China but getting some momentum in certain sectors such as poultry. However, there are some failures noticed during the research. The problem is mainly associated with the credibility and integrity. For example, it is reported that some seeds distributors sign purchase contract of licorice with farmers who are asked to buy seeds from the distributor. Once the seeds are sold and planted, the distributors of seeds run away. Farmers will not be able to find out the quality of seeds after 2-3 years.

Farmer's cooperative plays important intermediate role between the farmers and processors. The research team was told that individual farmer do not want to deal with processors directly as the processor will not pay cash to the farmers at delivery as a normal practice. The farmers do not feel comfortable to sell on credit. On the other hand, the processors do not want to deal with individual farmer either because of the high transaction cost. Therefore, farmer cooperative is deemed mutually trusted third party with responsibilities. Besides the liability, the farmer cooperative also plays roles of training coordinator, technical and marketing information disseminators, and financing.

Government sometimes plays a role of value chain initiator. For example, the China Medicine and Health Products Co., Ltd (CMHP) signed a joint venture MOU with Bachu County of Xinjiang in October 2013, to build licorice processing plant and farm with 40,000 Mu for licorice cultivation in Bachu County. Under the agreement, the Bachu Government designates exclusivity to the CMHP in terms of collection of wild licorice and cultivated licorice in the region⁴⁹. Moreover, the government also provides favorable policiesto this cooperation in terms of land and taxation accession.

⁴⁸<http://guba.eastmoney.com/news.000607.63133105.html>

⁴⁹http://money.finance.sina.com.cn/corp/view/vCB_AllBulletinDetail.php?stockid=600056&id=1223680

3.7 Constraints and opportunities faced by Chinese licorice industry

The growing Chinese licorice industry will need to address a number of constraints related to the quality of cultivated licorice, adequate seeds supply, financing for commercial cultivation, and consistent supply from overseas.

Insufficient research has been done to improve the quality of cultivated licorice. Currently, the content of glycyrrhizic acid extracted from the cultivated licorice roots can only meet the minimum standard of Chinese Pharmacopeia. Meanwhile, there are some other chemical elements from cultivated licorice are not as good as wild licorice. For instance, the content of glycyrrhizic acid in wild licorice (sourced from Xinjiang) is 4.03% while the cultivated licorice (grown in IMAR for 2 years) is 2.78%⁵⁰. Therefore, the cultivated licorice is mostly used as slice for the Chinese herbal drinks. The processors are not ready yet to use the cultivated licorice to replace the wild one. Before solving this quality issue, the demand for cultivated licorice will be limited.

The seeds for cultivation are all collected from the wild so far. There are inadequate efforts to select and cultivate the seeds to meet the demand of commercial cultivation. The seeds supply cannot meet the demand from the increasing cultivation. On the other hand, the quality of seeds is not effectively supervised by the government. Many individuals and firms collect seeds from the wild licorice and sell to other farmers who have no guarantee of the quality resulting in poor production performance.

The cultivation of licorice needs larger investment than traditional grains and cash crops, mainly because of the long production cycle (3-5 years). The banks typically hesitate to lend money to the licorice growers due to the uncertainty of market in such long production period. The bank normally lends the money on yearly basis. However, the licorice growers need to invest on the farm every year in terms of fertilization, weeding and watering, etc.

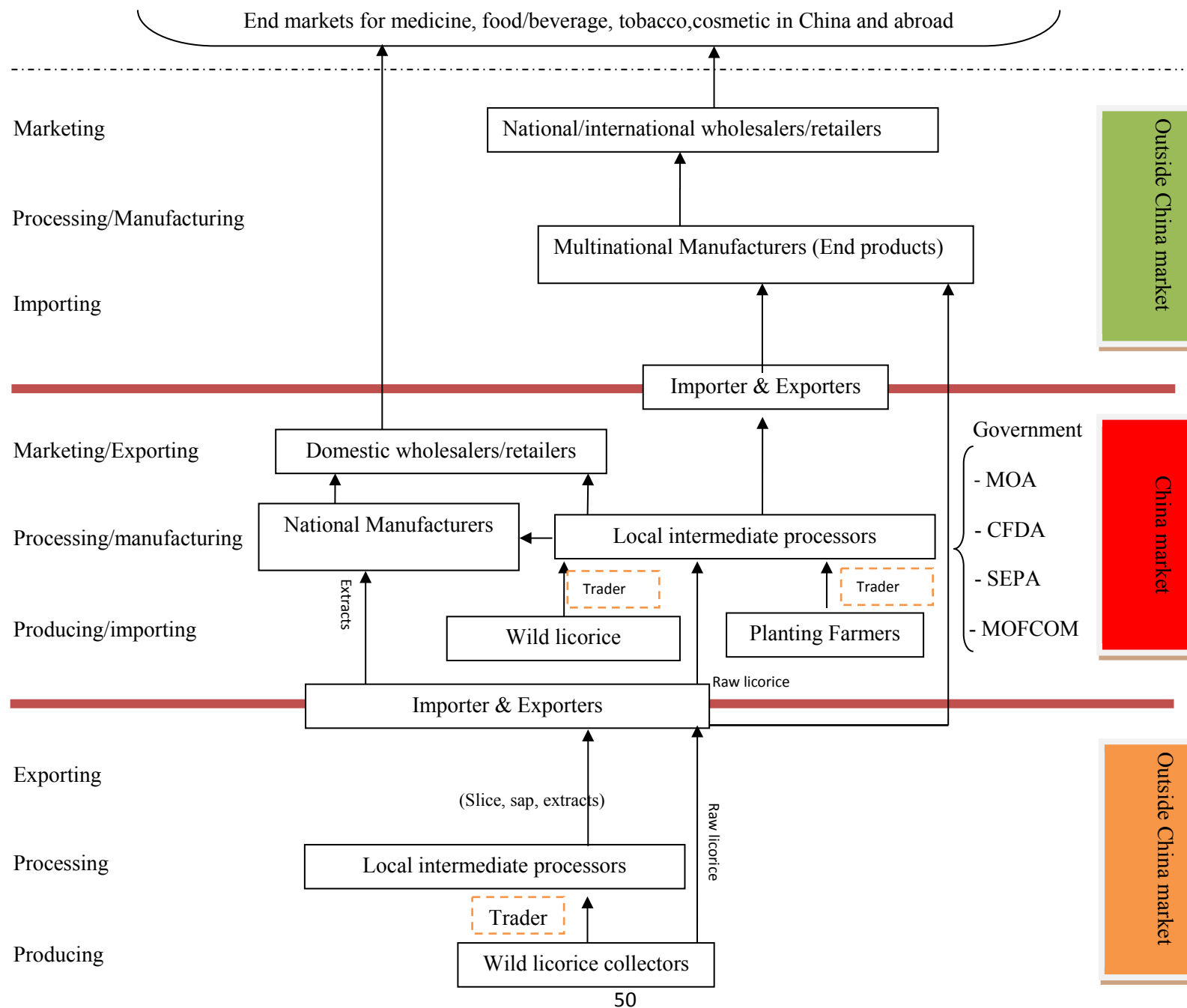
Although importation of licorice from central Asia is a good alternative to cover the shortage of domestic supply, China however has to compete with buyers from USA, Japan, Korea and EU which used to import licorice from China. The trade data shows those countries have increased importation from central Asia as well in the past decade. Their intension is to reduce the reliance on the supply from China. As a result of increasing competition, the price of licorice from other countries will likely go up. For example, the field interview with traders in Xinjiang indicates that the Chinese importers of licorice sometimes lose the shipment by failing the quotation which is not competitive with the Korean buyer in Central Asia markets (Lei Zhong, 7 Nov 2013).

⁵⁰Page 197, table 3-39, *Licorice*, Zhou Chengming, Gong Xiaojie, 2009.6, China Agricultural Press

Despite of the constraints, China also has opportunities to upgrade its licorice value chain by enhancing the role of licorice processors. At present, many Chinese licorice processors play a role of intermediate supplier to the end products manufacturers which have much higher value. The licorice processing industry need to spend more efforts on the research and development of new value added products using licorice roots or extracts as ingredients. Instead of being export-oriented, the licorice processors could pay more attention on the domestic market which has huge potential of market development.

Figure 20 presents a licorice value chain in China describing the various functions of the licorice value chain, key actors performing those functions and their dynamic inter-relationships.

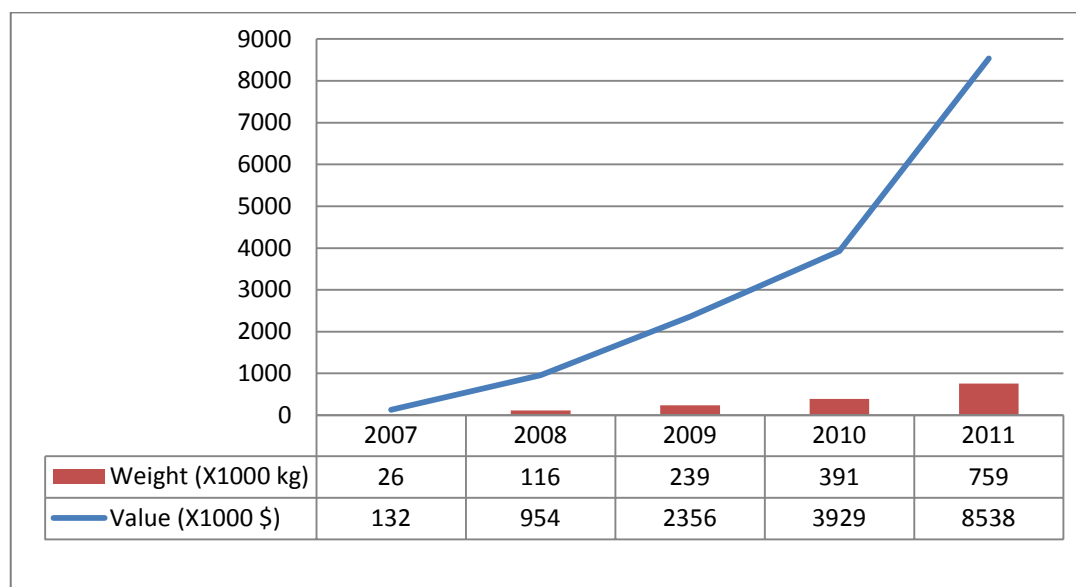
Figure 18. Mapping Licorice Value Chain in China



4 Prospects for developing Uzbekistan-China licorice value chain

China's demand for licorice will continue to grow. The domestic supply from either the wild or cultivated will be unlikely to meet increasing demand in the short run. China will have to rely on the importation of licorice from other countries. As indicated earlier in the report, Uzbekistan is the leading exporter of licorice to China. In 2012, China imported licorice from Uzbekistan at a total value of US \$ 9.9 million, which represents 2.7 times increase to that in 2011.

Figure 19. Import of licorice extract from Uzbekistan to China, 2007-2011



Data source: compiled from China Customs Data

There are a number of favorable conditions for licorice growing, processing and exporting in Uzbekistan.. First, the natural conditions including weather and soil are ideal for licorice growth. Small-scale experiments have proved that Uzbekistan soil condition is not only suitable for *G.glabra* which is currently popular, but also suitable for *G.uralensis* that is mainly used as herbal medicine in China. Second, the production cost in Uzbekistan is competitive against China. For instance, the labor cost in Uzbekistan is about 15 RMB per day while it is over 150 RMB per day in China⁵¹. Third, Chinese government promotes the importation of licorice from other countries including Uzbekistan through import duty free policy. In addition, the re-export of processed licorice from other country is not restricted by the Chinese quota system. Four, the research by IWMI indicates growing licorice can be a good alternative cash crop and a low-cost reclamation crop to the farmers in Uzbekistan. The farmer interviewed indicated

⁵¹http://blog.sina.com.cn/s/blog_5df509910100zpwj.html

that he makes a profit of between \$250-300 per ton (Andrew Noble and Zafar, 3 October 2013). There is clearly strong interest and enthusiasm for licorice in the region, particularly on the abandoned land caused by soil salinization and alkalization. Five, the government of Uzbekistan is also supportive of the licorice production and processing. In March 2013, the government of Uzbekistan implemented a new policy Measures to Improve the Licorice Processing⁵². It implies that Uzbekistan is not limited to grow and export raw licorice but also value added products to the international market including China.

Box 6. Increasing Foreign Direct Investment in Uzbekistan for Licorice Production

According to the Chamber of Commerce and Industry of Uzbekistan, more than 30 companies and enterprises with different types of ownership are engaged in procurement and processing of licorice across the country. Most of them are focused mainly on the foreign market. Over 70% of licorice grown and processed in the country is exported abroad.

China plays an active role among the foreign investors in Uzbekistan. In 2006, an Uzbek-Chinese joint venture Lanekstrakt, which specializes in processing and selling of licorice extract, was created in Chimbay district of Karakalpakstan. In the first year Lanekstrakt exported 64 tons of specialized flour worth \$347.4 thousand to overseas customers. By the end of 2010 exports exceeded 317 tons, as reported by UT News Agency. During this research, a few enterprises interviewed have initiated investment in Uzbekistan, either for licorice cultivation or processing, such as Beijing Shizhen Chinese Medicine Technology Ltd, and Xinjiang Zhonglin Bio-tech Ltd.

The government of Uzbekistan recently issued an order to Improve and Support the Licorice Processing Enterprises in March 2013. The order intends to improve the business environment for licorice processing business by simplifying the approval procedures to set up processing facility. Under the new Order, no government approval is required if the purchase and sale contract is signed between the local licorice processing plant and the natural person or legal person. Otherwise, permission must be granted by the National Environmental Protection Committee. The permit is charged at US \$ 225 per ton for licorice raw materials, and US \$ 100 per ton for processed licorice products. The Uzbekistan Customs will inspect such permit for exported licorice at the border. It is anticipated that more foreign investment, particularly those from China, will increase to establish licorice production base for export market in the next decade.

Source: Report UT News Agency, http://old.ut.uz/eng/business/uzbek_licorice_conquers_market.mgr

There have been a number of reported investments from China in Uzbekistan to collect licorice roots and also further processing. The cultivation remains at pilot in Uzbekistan.

⁵²<http://www.agronet.com.cn/News/832546.html>

Chinese experience on cultivating licorice can offer valuable lessons for Uzbekistan. There are challenging issues to cultivate the licorice in Uzbekistan including business environment, economic feasibility versus the wild, access to financing, technical supports, seeds supply, processing facilities, etc. Further studies are required to address some knowledge gaps in Uzbekistan. Even though the government is promoting FDI in licorice processing but we heard a number of complaints on the business environment in Uzbekistan. The investors have difficulties to get the earned money out of the country. Moreover, is there economic advantage to grow licorice against wild licorice or other crops? How much land even abandoned land is available for licorice cultivation? Is the agriculture service available to support the licorice production? Or is it accessible to Chinese agriculture service through cooperation program between the two countries? Is there any government scheme to promote licorice production? Is the cost of licorice production in Uzbekistan competitive against other central Asian countries? Can Uzbekistan grow special variety of licorice to meet Chinese market demand, such as *Glycyrrhiza uralensis*?

5 Summary, knowledge gaps and recommendations

5.1 Summary

The demand for natural plant oriented products including licorice is growing strongly in both China and the international market. The domestic supply of licorice has been in short for a while in China due to the reduction of wild licorice reserves and export restriction by the government of China. The shortfall is compensated by the cultivation and importation from other countries.

Licorice cultivation is expanding in China, driven by the government policy and increasing demand from the market. However, there are a number of constraints to limit the numbers of farmers to cultivate licorice: 1) the quality of cultivated licorice is not as good as wild licorice which limits the use by extracting industry, 2) the limited supply of seeds in both quality and quantity as the seeds are all collected from the wild without uncertain quality, 3) inadequate technical supports to cover the entire production stages from the selection of land, seeding, sprouting, seedling, fertilization, weeding, etc, 4) poor financing service to support the long production cycle which requires more investment than regular crops, at least 2900 RMB per *mu* even on large scale (over 3,000 *mu*) as showed in the example of case 3. The large investment will limit the participation of small farmers in the licorice cultivation business which is relatively more costly and risky. Farmer cooperative might be an option to the small farmers who want to be involved in this licorice cultivation. 5) The cultivation sites are limited by weather, soil, water access, etc.

Central Asia has replaced China to become the major supplier of wild licorice to international market. The importation of licorice is encouraged by the Chinese government as a means to protect the degraded environment caused by the over digging in past decades. Uzbekistan has become one of the major licorice exporters to Chinese market. Some Chinese companies have started investing in Uzbekistan in collaboration with local partners to cultivate and process licorice for Chinese market.

5.2 Knowledge gaps

Further studies are required to evaluate the concept of linking licorice smallholders in Uzbekistan to rising Chinese market, including 1) what's the natural reserve capacity of licorice in Uzbekistan, and how much of that is available for international market including China? 2) Is there any restriction or limitation of collecting wild licorice by the Uzbekistan government? 3) Does the government of Uzbekistan support the cultivation of licorice as a means to protect the natural reserve? 4) Is the cultivated licorice competitive with other cash crops in Uzbekistan? 5) Is Uzbekistan licorice grower competitive with those in other Asian countries in terms of quality and price? 6) Is the financing service available to support the cultivation which requires significant investment given the fact of long production cycle (2-3 years)? 7) How can the small farmers in Uzbekistan benefit from this licorice value chain development?

5.3 Recommendations

The trade linkage of licorice between China and Uzbekistan has been established by the private sector since late 1990's. Uzbekistan has become an important supplier of licorice to Chinese market. However, the current trade is based on the wild licorice which is limited in China but temporarily available and cheaper in Uzbekistan. The concept of linking licorice smallholders in Uzbekistan to the rising market in China is prosperous. There are a number of challenging issues to be addressed:

- i. Efforts should be paid to improve the seeds supply. The seeds are currently collected from the wild, both quality and quantity cannot meet the demand of market, which is becoming a bottleneck to expand the licorice cultivation. The poor quality seeds will cause problems of sprouting and seedling resulting in low yield.
- ii. Technical supports should be provided to the licorice farmers. Given the fact of significant investment, it is critical to assure every steps of licorice cultivation is done properly at farm level, such as the selection of proper land, sowing, seedling, fertilization, irrigation, pests and weed control, harvesting, etc.
- iii. Financing service must be available to support the licorice cultivation. Since it takes at least 2-3 years to harvest the licorice, the licorice farmers will have to

continue the investment on the farm on annual basis in terms of fertilizers, watering and weeding before harvesting. Considering above factors, the production scale must be over certain size (i.e. 1,000 Mu) otherwise the unit cost will be too high affecting the profitability. Without access to financing, the cultivation will hardly be expanded.

- iv. Farmer cooperative should be introduced as a practical option to include small farmers in the licorice value chain. As mentioned above, growing licorice needs significant financial inputs. Individual small farmer does not likely have the financial capability to grow licorice on economic scale. The farmer cooperative can help the small farmer as a member to reduce the production cost through group purchasing of inputs for a lower price, sharing cost of machinery (i.e. sowing and harvesting machine) and technical services. Moreover, the Cooperative may provide better market access through contract with large processors or establishing primary processing facility to add more values.
- v. Ecological benefit of licorice should be considered other than the economic benefit during the licorice production. It is proven that licorice can prevent sand and soil erosion in the dry and arid areas. In past decades, improper exploitation of wild licorice has led to land erosion and desertification in China. This can be avoided by good practices including but not limited to better harvesting method by leaving some stems in the soil for new sprouting, zoning and digging on rotation, etc. On the other hand, licorice can be cultivated in saline-alkali and alkali soils which will benefit reclaiming the soil through root nodule photosynthesis resulting in bacteria nitrogen.
- vi. Further studies are required to find out whether Uzbekistan can remain as a competitive supplier of licorice to international market including China in terms of quality and price in the future. Presently, the licorice from Uzbekistan is all collected from the wild. Cultivation of licorice has not been commercialized yet. Given the limited natural reserve of licorice in Uzbekistan, it is not sustainable to continue exporting the wild licorice. However, this search was not able to assess the comparative advantages of growing licorice in Uzbekistan against China and other countries due to lack of data in those countries except for China.

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Annex

Annex 1 List of Tables and Figures

Tables

Table A 1. List of Major Customers of Chinese Licorice Extracts

Corporate Name/brand	Products/Industry
Bayer	Medicine
Roche	Medicine
Novartis	Medicine
DSM	Medicine, Health Care, Chemicals
USP	Medicine
Basilea	Medicine
Yunnan Baiyao	Medicine
TASLY PHARM.	Medicine
Este lauder	Cosmetic
COGI	Cosmetic
JALA	Cosmetic
Shanghai Jahwa	Cosmetic
UNI-President	Food
Amway	Dietary supplement
TIENS	Dietary supplement
Nongfu Spring	Beverage
Coca Cola	Beverage
Rohm Haas	Fine Chemicals
SAFIC	Chemicals
S&D	Chemicals
Naturex	Chemicals
Sinochem	Chemicals

Table A 2. Major varieties of licorice and their production region

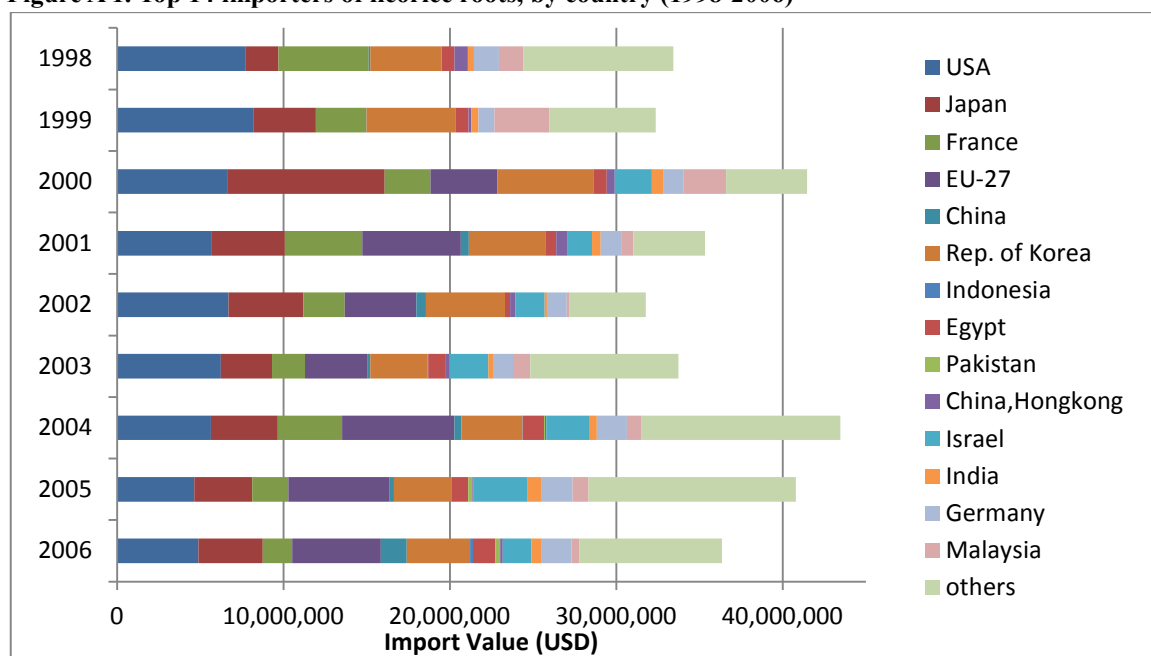
Variety	Production area in the world	Production area in China
Glycyrrhiza uralensis (a),	Southern Europe, Central Europe, Russian Siberia,	Xinjiang, Gansu, Ningxia, IMAR, Qinghai, Shaanxi, Shanxi, Liaoning,

(b), (d)	North Africa, China	Heilongjiang (wild and domestic) Hebei, Shandong, Beijing (domestic)
Glycyrrhiza glabra(a), (b), (c), (d)	Central Asia, Siberia, China, Central Europe (Spain, France, Italy, Turkey)	Xinjiang
Glycyrrhiza inflata Batal (a)		Xinjiang

Note: a - Chinese pharmacopeia (ChP2010), b - American pharmacopeia (USP34), c - Japanese pharmacopeia (JP16), and d -European pharmacopeia (EP7)

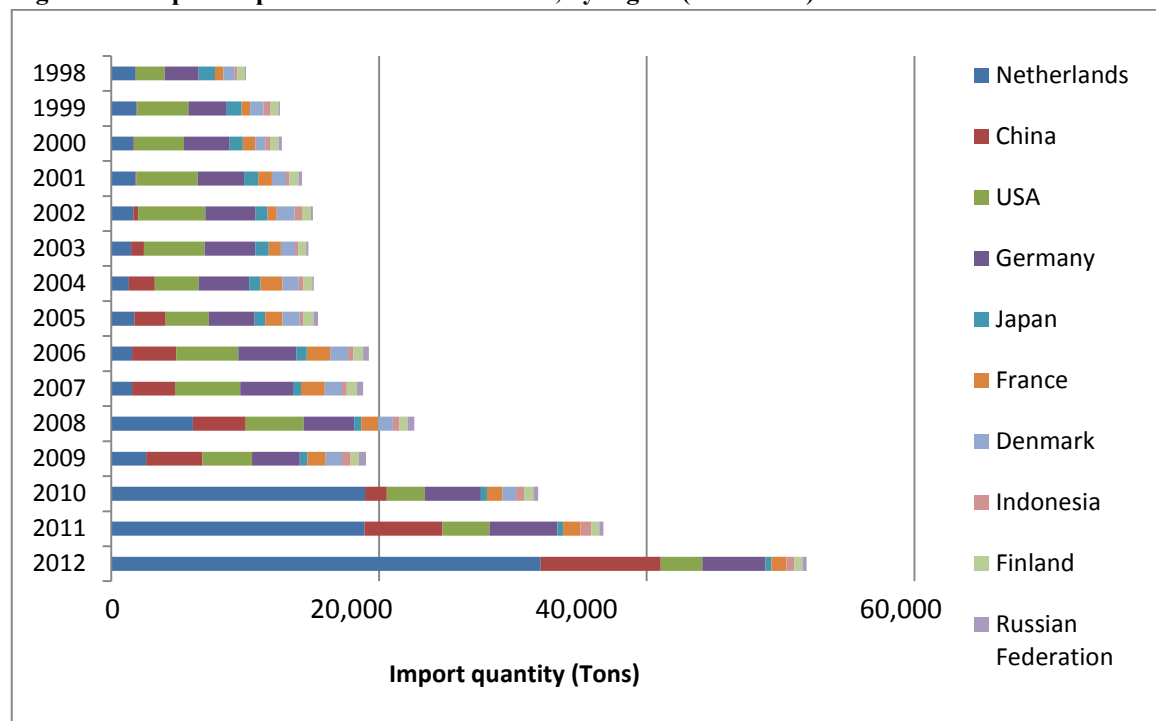
Figures

Figure A 1. Top 14 importers of licorice roots, by country (1998-2006)



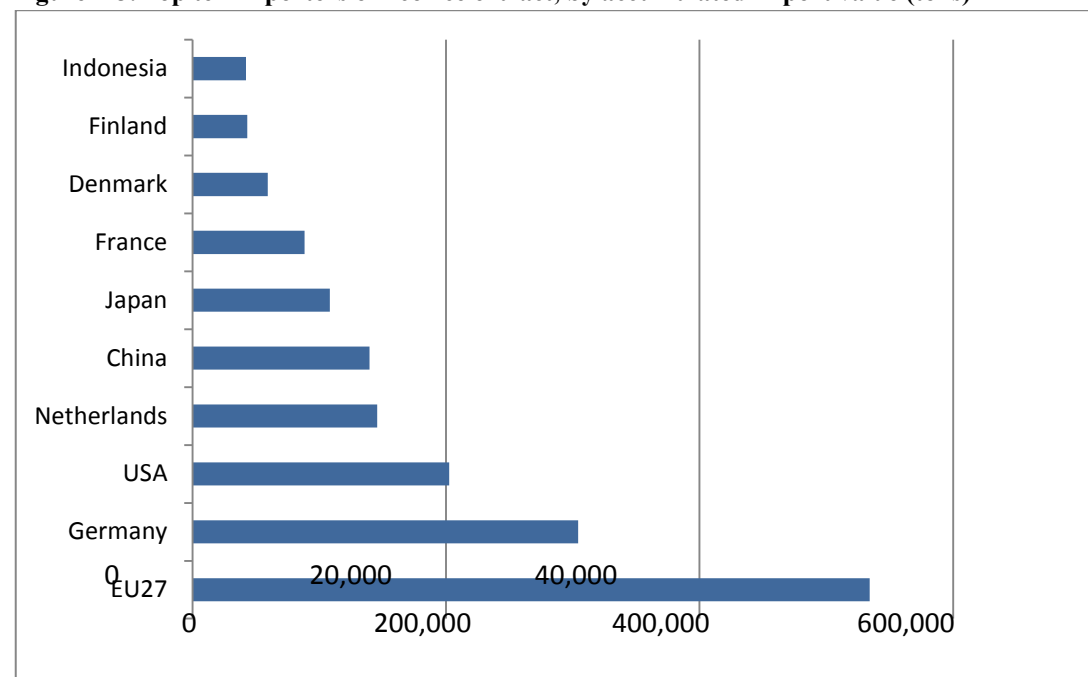
Data source: UN Comtrade Statistics

Figure A 2. Top 10 importers of licorice extracts, by region (1998-2012)



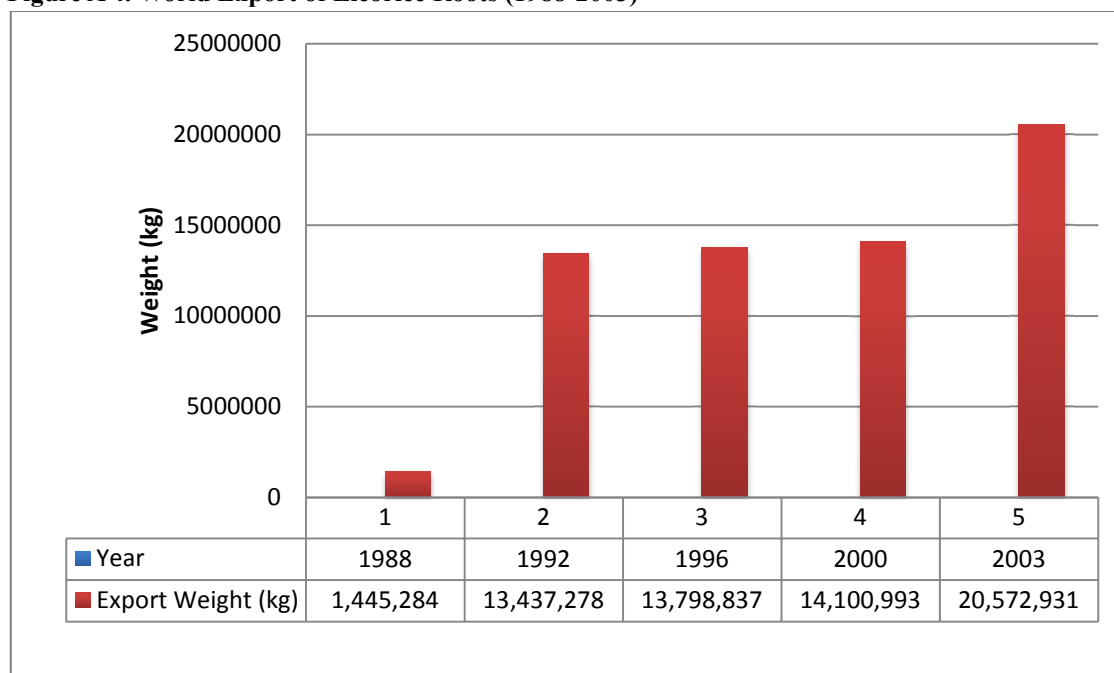
Data source: UN ComtradeStatistics

Figure A 3. Top ten importers of licorice extract, by accumulated import value (tons)



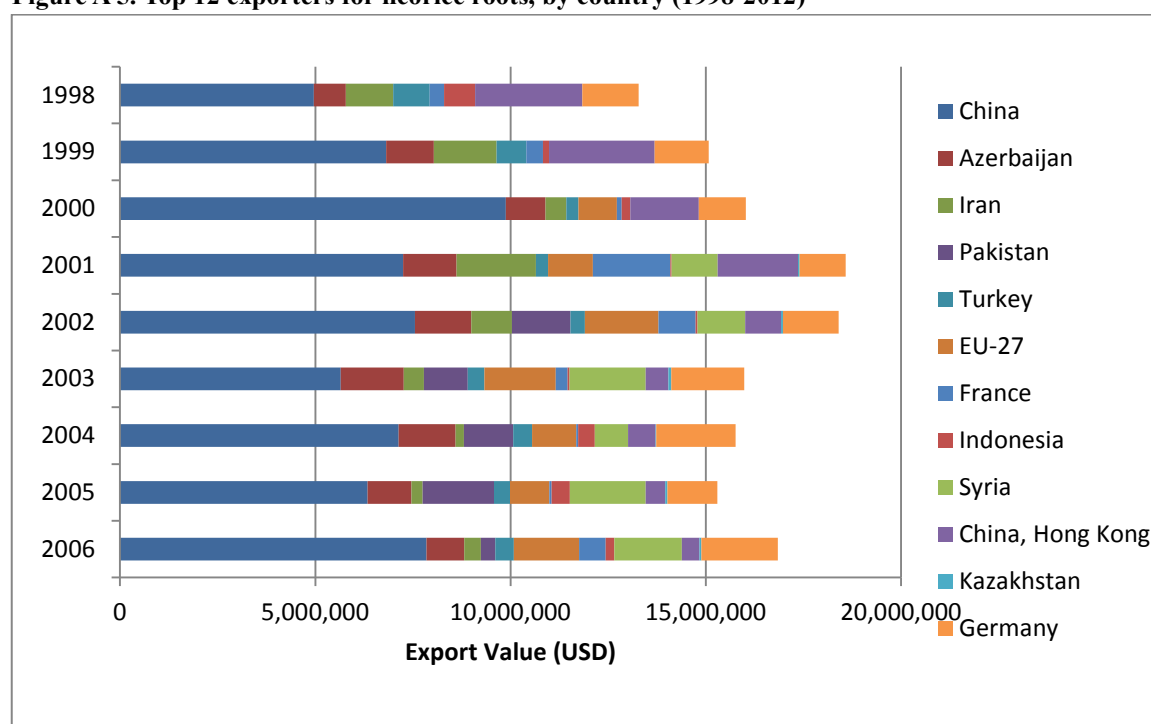
Data source: UN Comtrade Statistics

Figure A 4. World Export of Licorice Roots (1988-2003)



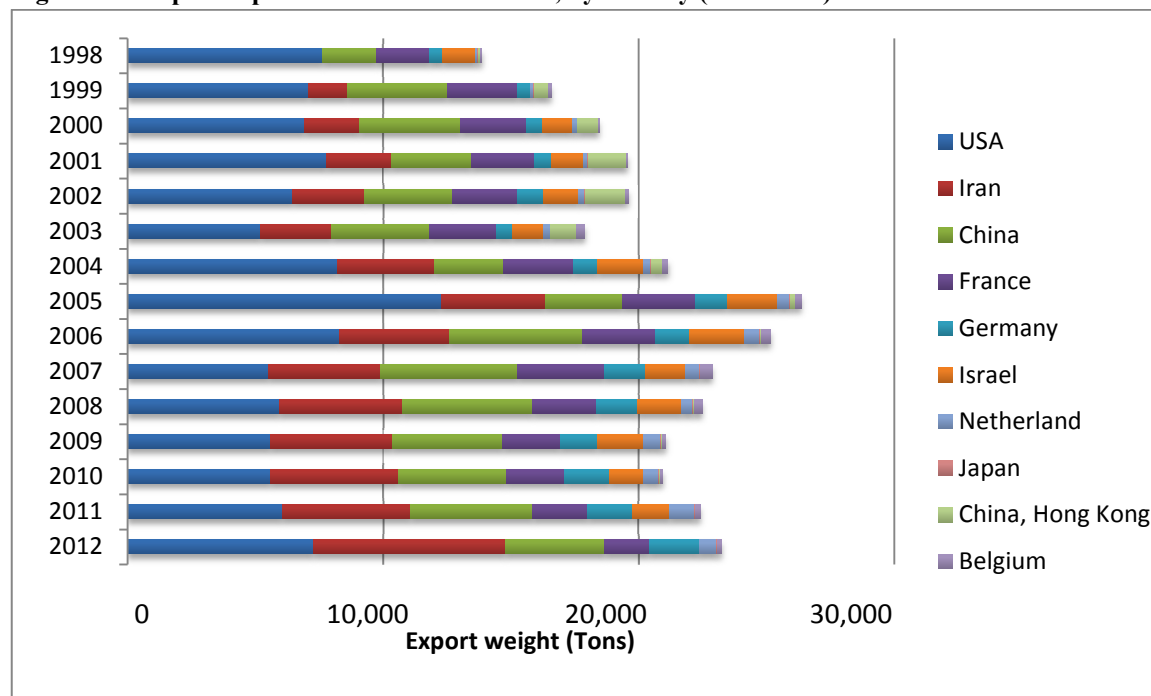
Data source: UN Comtrade Statistics

Figure A 5. Top 12 exporters for licorice roots, by country (1998-2012)



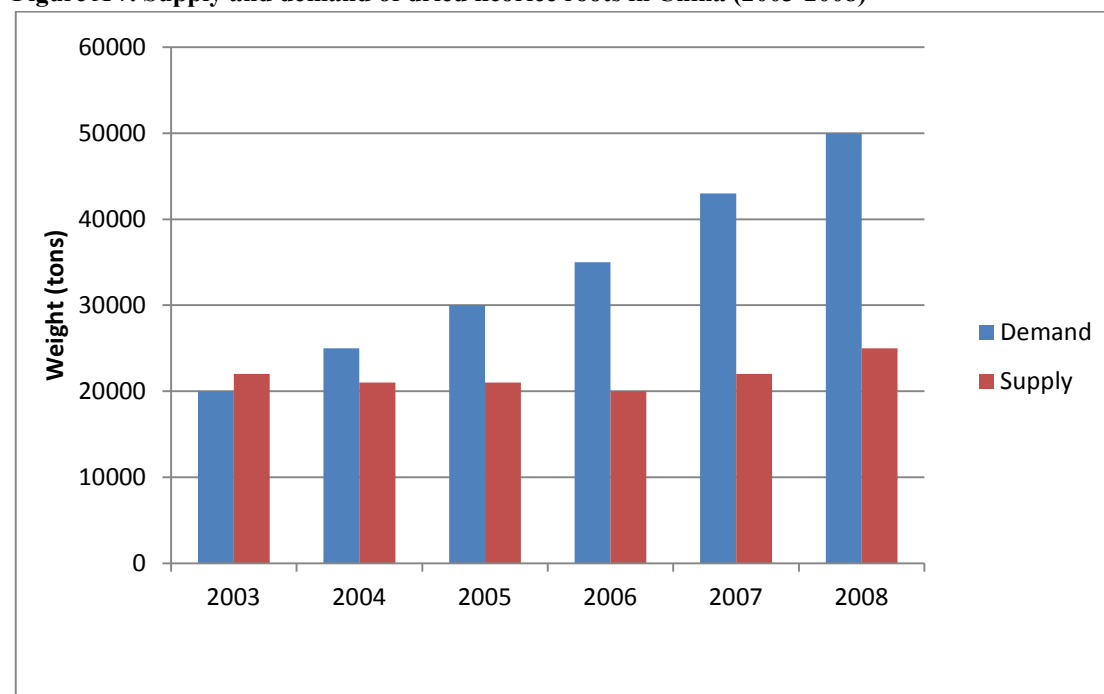
Data source: UN Comtrade Statistics

Figure A 6. Top 10 exporters for licoriceextracts, by country (1998-2012)



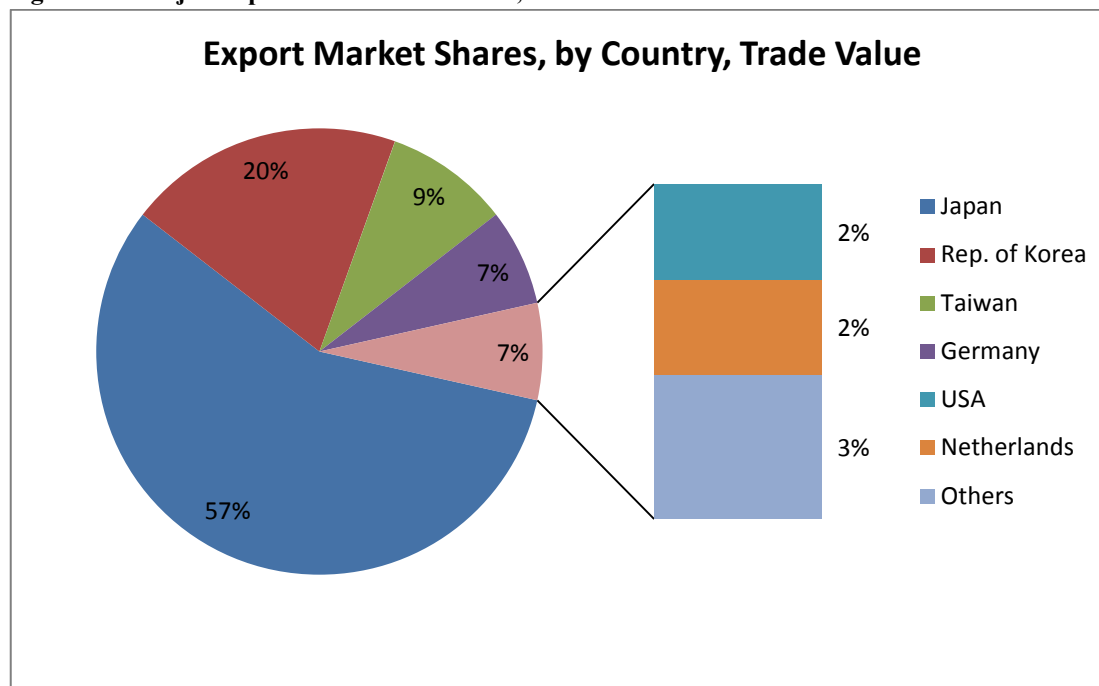
Data source: UN Comtrade Statistics

Figure A 7. Supply and demand of dried licorice roots in China (2003-2008)



Data source: China Medical Ingredients Market Report

Figure A 8. Major Export Markets for China, 2011



Data source: UN Comtrade Statistic

Figure A 9. Export and price of licorice roots by China

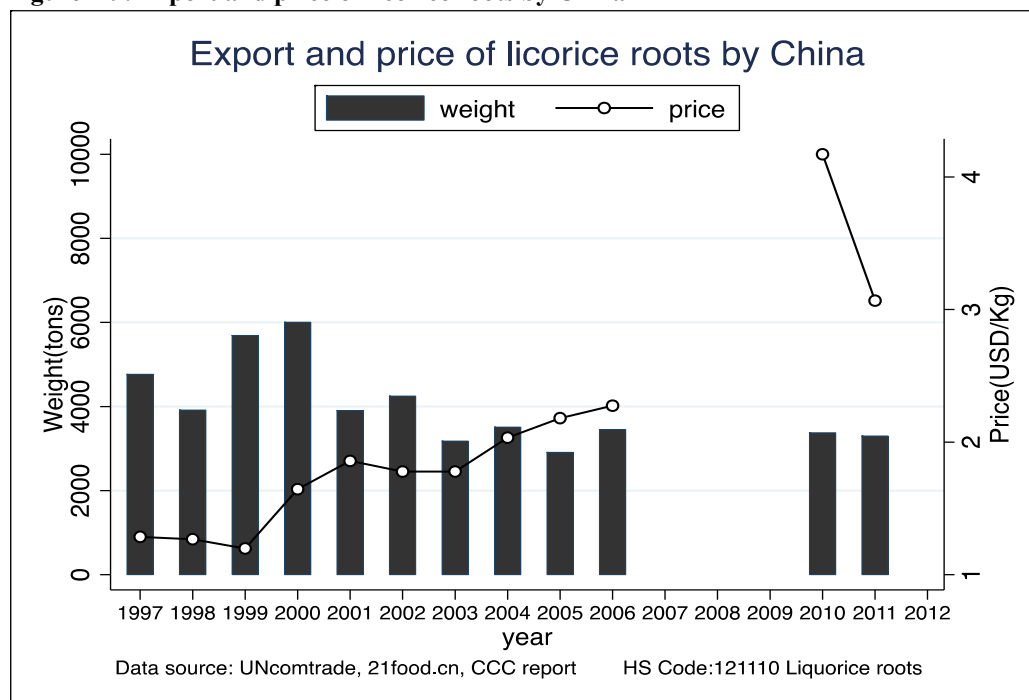


Figure A 10. Export and price of licorice extracts by China

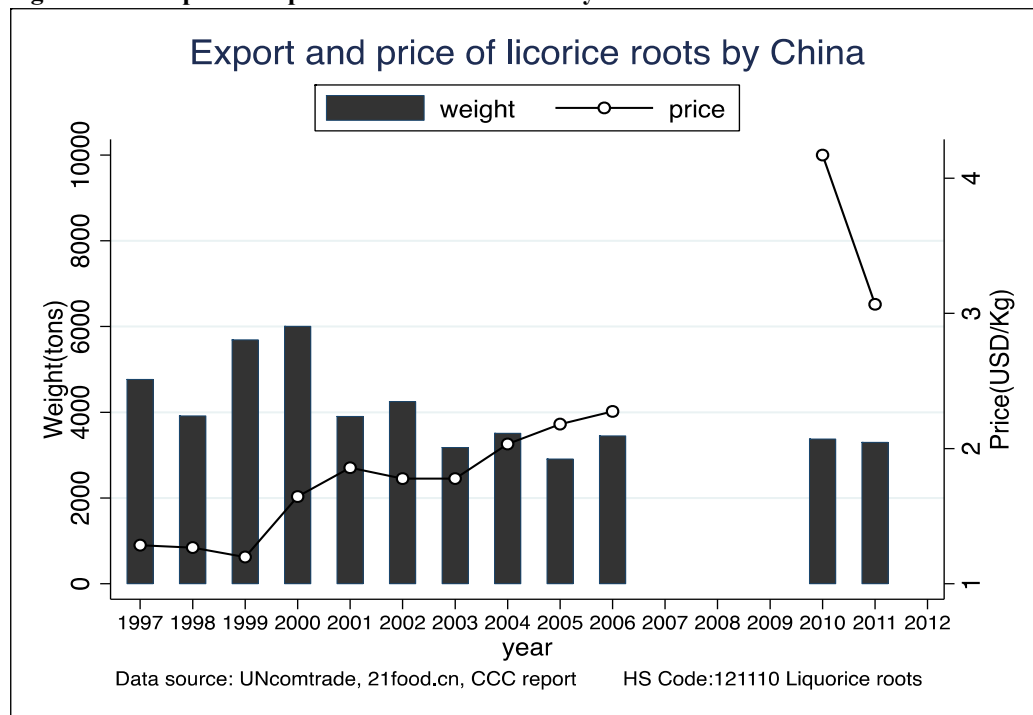


Figure A 11. Projection of import and export by China 2012-2016

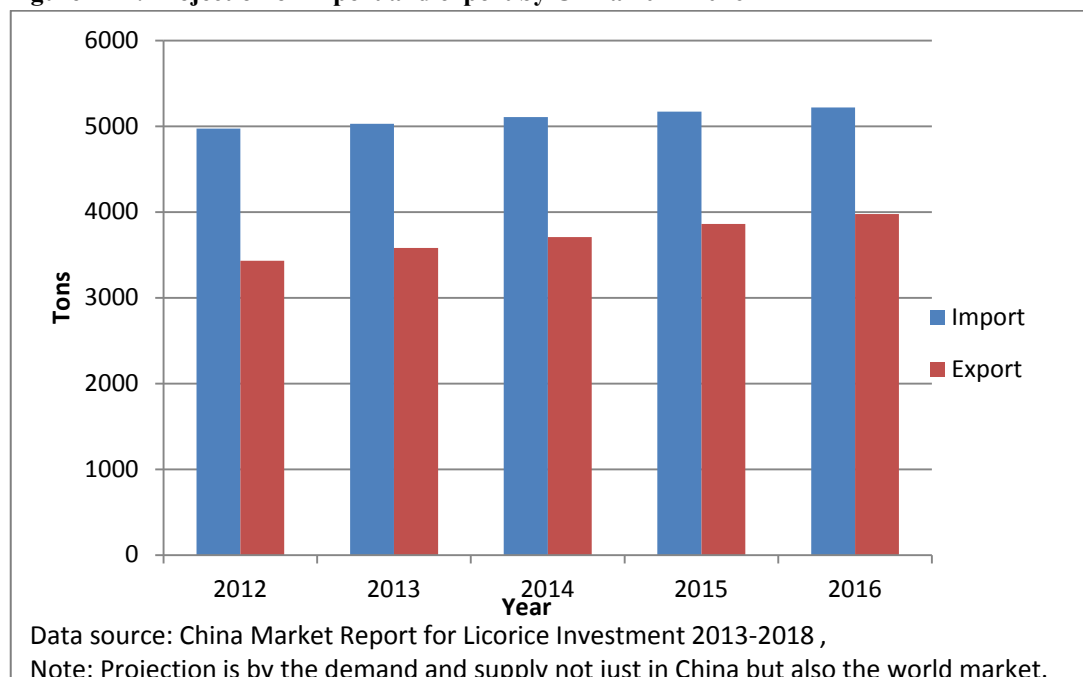


Figure A 12. Major production areas of wild licorice in China

Distribution of Wild Licorice in China (by province)

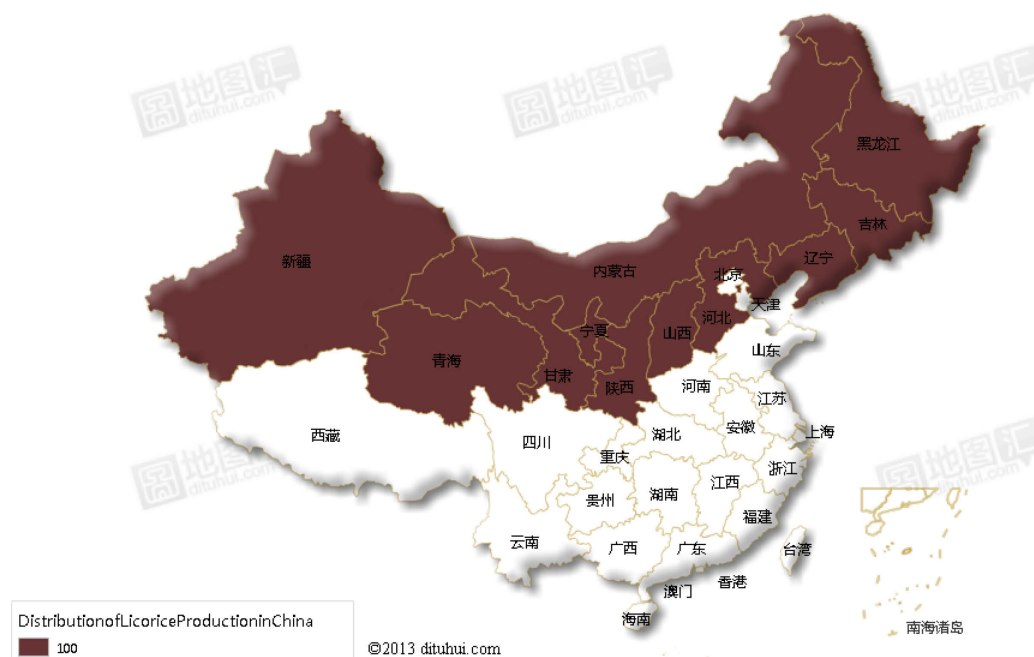


Figure A 13. Location of Major Wholesale Markets for Chinese Medicinal Materials

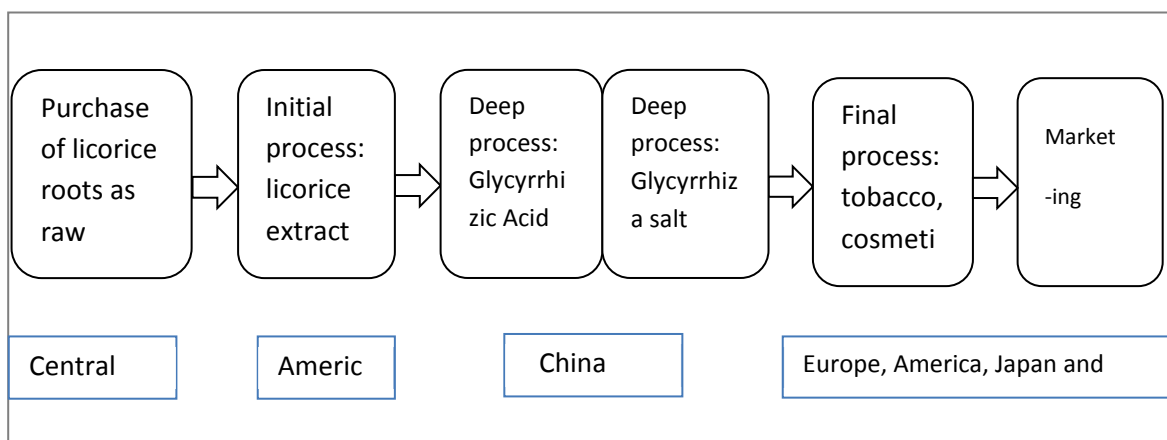


Annex 2 Case Descriptions

Case 1, Licorice Extract for Food and Tobacco Manufacturers - ZFTZ MAFCO BIOTECH CO., LED.

Mafco Worldwide in the United States has been the world leader in quality licorice products since 1850. The Company specializes in manufacturing licorice extract and other derivatives for use as flavoring and moistening agents in various consumer products, including candies, pharmaceuticals and tobacco products. Its primary brand of sweetening and flavor-extending products is Magnasweet. Mafco Worldwide also markets Right Dress, gardening mulch, as well as other flavor and plant products, including natural roots, spices and botanicals. ZFTZ MAFCO, the branch of Mafco worldwide is established in 1985 in the bonded area of Zhangjiagang, Suzhou, Jiangsu. With the advantage of export in bonded area and the cheap cost in China, ZFTZ focus on processing and export. Another branch of Mafco worldwide is located in Dubai, United Arab Emirates, with the main target to manage the purchase of licorice material in Central Asia and the sales of licorice products in Europe.

The licorice value chain is highly vertical integrated in MAFCO. They have established a stable international value chain of sourcing material in Central Asia, processing in China, and marketing in Europe and America. As the leader of licorice industry, their value chain distribution is also the representative for world licorice industry.



Licorice Supply

Central Asian countries have become the major licorice roots supplier for the world. With a high acid content and low colloid percentage, the licorice grown in Central Asia countries are suitable for processing as extracts and other derivatives, and thus is preferred by many processing companies world widely. For MAFCO, over 99 percent of the licorice roots are sourced directly from Uzbekistan, Turkmenistan, Kazakhstan, Azerbaijan and Afghanistan. Most of them are wild grown. The company is also

experimenting the artificial planting of licorice in Central Asia for sustainable resource. They show optimistic attitude towards artificial licorice. However, the large capital requires during the long growing period (normally more than two years) reduces financial liquidity, and may bring risks.

Initial processing

The licorice roots (dry) are transported from Central Asia to America by sea for initial processing. Benefited from the long trading history between Central Asia and America, MAFCO has optimized the system of licorice transportation, entry quarantining, and initial process. In contrast, the licorice plant importation in China requires more complex entry quarantine, which prevents ZFTZ MAFCO from direct importing from Central Asia countries. As a result, large amounts of licorice roots are processed into black and semifluid extract in MAFCO headquarter in America. And those extracts are transported to ZFTZ MAFCO in China for deep processing.

Deep processing

The deep processing factory is located in the bonded area of Zhangjiagang, Jiangsu, one of the most dynamic areas in the Southeast coast of China. In this factory, the extracts are processed into glycyrrhizic acid (brown powder) and various licorice salts (white powder). Those final products as well as the materials are stored in Litian Warehousing besides ZFTZ MAFCO, which covers an area of 300square meters. Convenient transportation condition, cheap rents, as well as preferential policies all contribute to the operation of ZFTZ MAFCO. The most preferential policy for MAFCO is the waiver of exportation license by China Custom in 2005. Since then, MAFCO was able to export freely through any port, and thus the transportation cost was largely reduced.

Marketing

At last, the products of glycyrrhizic acid and salts are transported either back to MAFCO parent company in America and processed into tobacco, sweet (Magnasweet), or be sold to processing companies in Europe, Japan, Korea and other countries. The domestic market in China only accounts for 1% of the total sales of 400 billion RMB. The final markets of licorice products range from tobacco, food to cosmetics. Tobacco industry is the primary user of licorice products in MAFCO, followed by are cosmetic industry and food addictive industry. They are also exploring the use of licorice as environmental cleaner. But due to the environmental cleaning license in China, they are not qualified of producing such environmental dealing product. Although pharmaceutical industry is the primary demander of licorice in China, MAFCO did not target their market on pharmaceutical industry. One reason is the relatively low profit; another reason is that the strong demand in foreign market set them no time and effort on opening new market in China.

Case 2: Beijing Shizhen Chinese Herbal Medicine Technology Ltd⁵³—licorice seeds and cultivation technology provider

Beijing Shizhen Chinese Herbal Medicine Technology Ltd(hereafter Shizhen) was registered as a private company in Daxing District of Beijing 2005. Before that, it was established as Beijing Shizhen Chinese Herbal Medicine Technology Research Institute in 1992. The owner is Dr. Zhou Chengming who is an expert of licorice. The Company is actively involved in the planting technology research and extension of Chinese herbal plants including licorice. In recent years, Shizhen has spent great efforts developing the licorice (*G. Uralensis*) value chain through the quality control of licorice seeds and cultivation technology services, benefiting thousands farmers in Xinjiang, Inner Mongolia and Gansu provinces. As showed in diagram-1, Shizhen plays critical role of technical service provider on the licorice cultivation value chain.

G. uralensis, also known as Chinese licorice is a flowering plant native to Asia, which is one of the 50 fundamental herbs used in traditional Chinese medicine. It is most commonly produced in the Inner Mongolia, Shanxi, Gansu and Xinjiang regions of China. Due to the over digging, the natural reserve of licorice has sharply dropped in past decades. The Chinese herbal medicine industry suffers from the shortage of supply. As an alternative, licorice cultivation is promoted by both government and private sector to fill the gap. However, the quality of seeds and cultivation technologies are two key technical constraints. Seeing the demand, Shizhen grabs the business opportunity to develop its strength in selling branded licorice seeds (*G. uralensis*) and providing related cultivation technologies.

Shizhen sells about 50 tons seeds (*G. uralensis*) on annual basis, accounting for 10% of the national sales. The current price of seeds is about 200 RMB per kg, dramatically increased from 120 RMB per kg in 2011. The seeds are purchased from individual collectors in field through the traders. All the seeds are collected from the wild. Although cultivation of licorice has been promoted for over 15 years in China, but the seeds from cultivated licorice are not popular in market place. This is mainly because it takes at least 5 years to harvest the seeds while the licorice roots can be harvested within 3 years. This implies the investment return on seeds cultivation is too long and risky comparing with the collection of wild licorice seeds.

The quality of seeds is critical to the success of licorice cultivation. In market place, it is reported that some poor quality licorice seeds mixed with other seeds or impurities have caused low rate of germination and sprouting resulting in low yield. Although there is no national standard for the licorice seeds quality, but the provincial government such as

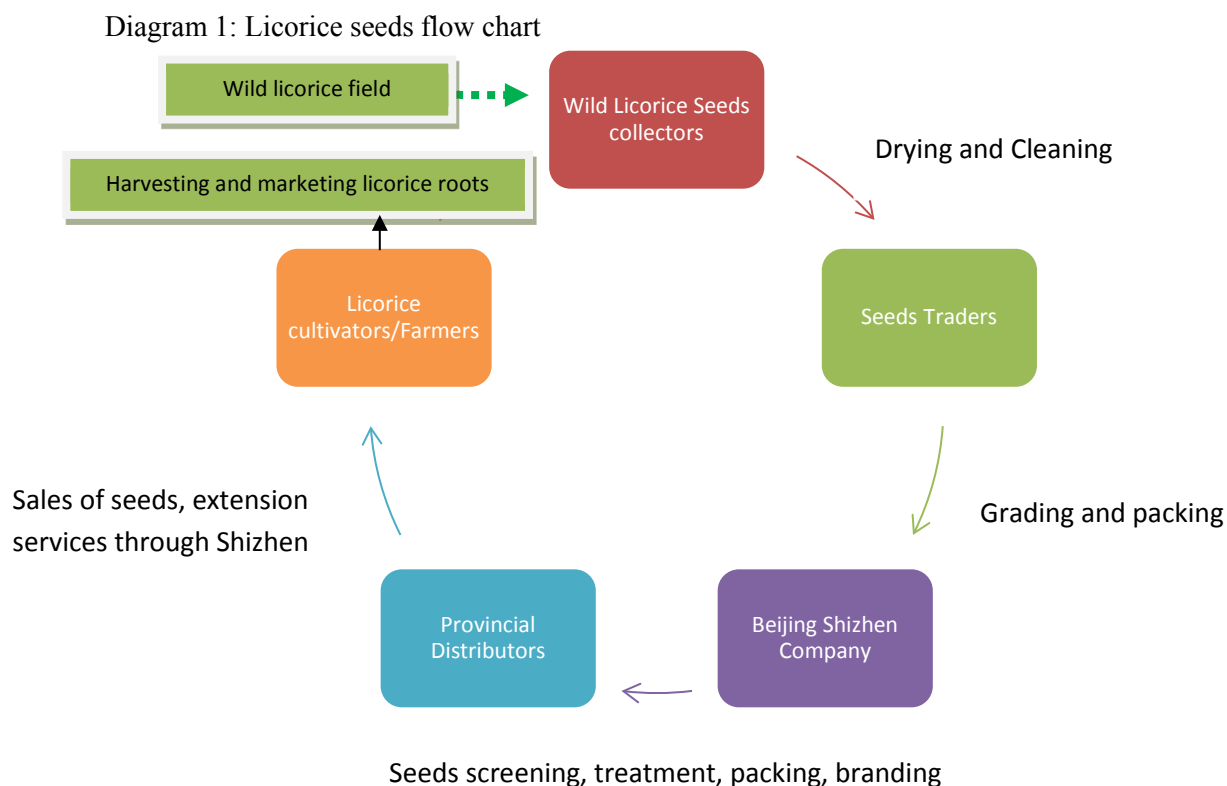
⁵³Corporate website: <http://shizhenzy.com/index.asp>

Gansu government developed local standard for licorice seed (DB 62/T-2010). Shizhen also develops corporate standard (QB) which is higher than government standard in terms of germination rate, as showed in below table. The survival rate is also an important index. It means the rate of germinated licorice that can successfully grow out strong roots. Shizhen reports their survival rate as about 10%, higher than the industry. The high germination rate and survival rate is assured by the process of purifying and chemical treatment of the seeds. The treated seeds are packed in 25 kg water proof plastic woven bag with Shizhen brand on it.

Table: Quality standards for licorice seeds

Standard	Purity (%)	Cleanness (%)	Germination rate (%)	Moisture (%)
DB 62/T-2010	≥99	≥98	≥60	≤14
QB-Shizhen	≥99	≥97	≥85%	≤12

Besides the supply of quality seeds, Shizhen also provides technical services to the licorice farmers through training and on site consultation. For example, Dr. Zhou has published a number of technical materials, such as the books *Licorice*, and *Questions and Answers about Licorice Planting*, etc. The technical materials cover all the aspects of licorice production, such as seeds and seedling, planting, fertilization, weeding, pest control, watering, harvesting and storage, etc. All are available in bookstore and internet. Since 1995, over 3,000 farmers have been trained through workshops and seminars, more than 200,000 *mu* licorice cultivation farms have been built. In addition, the Company manufactures and sells planting and harvesting machines for licorice through the contracted factory. The price of planting machine is about 3500 RMB per set for simply design and 15,000 RMB for the one with function of plastic mulching. The mechanic planting can cover 1000 *mu* per day. The harvesting machine is about 35,000 RMB per set. It is reported that mechanic harvest is about 50 times more efficient than manual planting, easily covering 50 *mu* per day. Shizhen Company has showed interest in growing licorice in Uzbekistan, initiated a pilot project by planting 200 *mu* *G. uralensis* licorice in NUKUS area in 2010. It is said the plant grows well and will be ready for harvest next summer.



Case 3: BKY Licorice Farmers' Cooperative

The Baikangyuan (BKY) Licorice Farmers' Cooperative has 159 members and actively involved in the production, slicing and marketing of licorice in Jinghe County at Bole Prefecture of Xinjiang Autonomous Region. The Cooperative has about 8,000 *mu* (equivalent to 533 hectares) farm land specialized for licorice (*G.uralensis*) cultivation, accounting for 80% of the total planting areas of licorice in Bole Prefecture. Of 8,000 *mu*, 3,000 *mu* is cultivated and managed by Mr. Wang Haiting as President of the Cooperative. The Cooperative is also applying for the Green Food Certification and aims to produce licorice seeds as well as branded (Kangdehuiyuan[®]TM) licorice products in the future.

The cooperative was initiated by Mr. Wang Haiting and other 5 licorice farmers with a land of about 300 *mu* in January 2009. Mr. Wang Haiting was a trader of wild licorice before that. Since the reserve of wild licorice became less and less, Mr Wang decided to cultivate licorice. By chance, he saw the licorice cultivating technology posted on internet by Beijing Shizhen Chinese Herbal Medicine Technology Ltd. He approached the Shizhen Company to buy licorice seeds and planted in Jinghe County. However, it was a failure as the young licorice plants were dead after sprouting and resulted in a significant financial loss for Mr. Wang. The problem was that Mr. Wang didn't water the

plants properly. The splashed water picked up the alkalized soil and left some on the leaves of the plant that burned the leaves. The problem was solved by using the dripping irrigation technology.

At the beginning stage of the Cooperative, the members were limited to purchase licorice seeds and other inputs such as fertilizers as group purchasing. The members realized soon that there were three major challenges. First, the licorice seeds purchased from some dealers are not consistent in quality. Such consistency in purity of variety, sprouting and seedling is critical to the yield of licorice. Since all the seeds are collected from the wild and sold through different dealers, the quality of seeds is uncertain. Second, the long licorice production cycle (at least 2 years for the licorice to be matured) requires the larger initial investment than that of regular crops such as corn and cotton. It is critical to have access to financing in order to start the licorice cultivation. Third, farming technologies including planting, fertilization, weeding, irrigation, pest controlling and harvesting are important to assure the yield and quality. The collaboration among the members can address above challenges better than individual-based approach. For example, the external financing agency such as Bole Rural Credit Cooperative Union only provides maximum 1 year bank loan to the farmers, yet the harvest and sales of licorice can only occurs after 2 or more years. To address the gap, internal self-help financing program is developed by the members who are wealthier to help the members in short of cash or credit. Meanwhile, the Cooperative borrows money from the Agricultural Bank of China which allows longer period for at least 2 years at the rate 6-9%. The scope of loan is based on the size of the licorice farm land, normally 1,000 Yuan per *mu*. On the other hand, the Cooperative hires external experts to train the members to grow the licorice properly. The Cooperative was able to achieve a yield at the level of 1,500 kg per *mu*. 1,500 kg per *mu* is considered high comparing less than 1,000 kg per *mu* from non-members. The margin is 3,100 RMB per *mu* for the two year period, or 1,550 RMB per *mu* per year as showed in below table, much higher than the margin from growing cotton or corn which is about 800 RMB per *mu* per year.

Furthermore, the Cooperative decided to process the licorice roots into slice to add value. A small processing factory was built in an abandoned school campus. Small scale slicing machine, washing and drying facility, cleaning, grading, weighing, and packing equipment as well as warehouse were well organized in the factory compound. In order to market the products, the Cooperative was registered with 1 million RMB capitals as corporate at the Bureau of Industry and Commerce on April 13, 2011. The products are sold to the pharmaceutical companies through trader. The trader plays a role of financing intermediate between the farmer (cooperative) and pharmaceutical company, because the Cooperative prefers to be paid cash while the pharmaceutical company holds the payment before the quality of shipped licorice is verified, this process takes at least 2-3 weeks. Nowadays, the Cooperative has established three production bases with 1,800 *mu* for

demonstration and training purpose plus some more farm lands with participation of small farmers.

The government plays important role in the success of the BKY Farmer Cooperative in terms of technical service and financing. The local Plant Protection Station, Agricultural Technology Extension Station, and Agribusiness Administration of the Agriculture Bureau provide technical supports to the production of licorice, such as standardized operation procedures, pest control, on farm quality assurance (Pollution Free and Green Food Certification), and setting up Cooperative and follow up management. Meanwhile, the government recently provides 800,000 RMB to support the expansion of the Cooperative.

In conclusion, this case presents the factors of success growing licorice, including 1) a good initiator and leader of Cooperative who has good access to the market and farming technology, 2) proper farming technology from the selection of land, seeding, sprouting, seedling, fertilization, etc, 3) access to financing to afford the higher investment than regular crops, 4) government supports in terms of funding and technical services, 5) the quantity and quality of seeds supply to assure the yield.

Table ?Economic analysis of licorice cultivation (2 years period)

Title	Cost items	Quantity (kg)	Unit Price (Yuan/kg)	Cost Yuan/Mu
Revenue		1500	4	6000
Cost	Seeds	3	200	600
	Fertilizer			1000
	Water and electricity			240
	plastic mulches			50
	Sowing (machine, labor)			200
	Harvesting (machine, labor)			600
	Dripping irrigation facility			110
	Land rent			100
Sub-total cost				2900
Margin				3100

Source: Mr. Wang Haiting, leader of BKY Licorice Farmer Cooperative, interviewed on November 6, 2013

Case 4: Exploring New Usage of Licorice in Cosmetic Industry - Nanjing Zelang Medical Technology Ltd

Nanjing ZelangMedicial Technology Ltd. is a private company established in 2004. The company has specialized in production and wholesale of natural plant extracts including licorice. We chose Zelang as the case is for three reasons. First, the company produces

glabridin, a highly processed and profitable licorice extract that has huge market potential in cosmetic industry.. Second, the company is medium-scale and a good representative for the extract industry that are mainly operated in the domestic market. Third, the company is growing very fast. Its investment had been increased then times in the past three years alone from 2010-12. Zelang represents a good case to demonstrate the promising usage of licorice in cosmetic industry.

Zelang produces more than 50 kinds of plant extracts that share the same production line on cleaning, crashing, and extracting. The main licorice product is Glabridin, a highly processed extracts from *G.glabra*. It is either white or yellow powder and is widely used in cosmetic product as cream, paste, water solution and emulsion. The powder has many functions including skin whitening, anti-inflammatory, anti-oxidation, anti-aging, UV absorption, and spot removing. The skin whitening effect gains glabridin the reputation of “whitening gold”. In 2012, the sale of glabridin accounts for about 6% of the total sales for the company. Whether this percentage will rise or not is hard to assess due to the unpredictable export market, according to Liu Kun, the customer manager in Zelang.

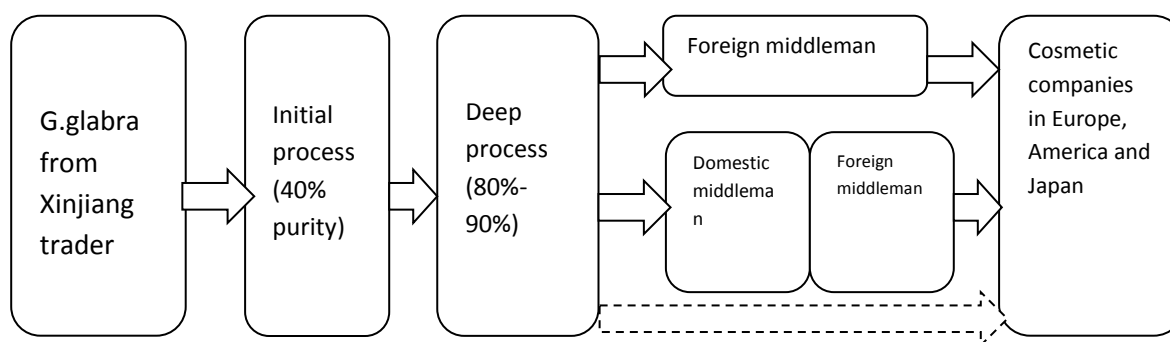
The company sources *G.glabra* directly from Xinjiang province. Their purchase of licorice initially relied on Bozhou herbal wholesale market in Anhui, one of the 17 national herbal markets. However, the quality of licorice sourced this way was sometimes below the standard required. As a result, the company suffered from loses from the time to time due to the poor quality. They had to search for direct suppliers in production areas. Since 2007 the company has established a stable purchase with a trader in Xinjiang. The company is not willing to share the name of the trader due to commercial confidentiality. The licorice roots are typically transported from Xinjiang to Nanjing by trucks (usually with a capacity of 10 tons) that take about 3-4 days. Xinjiang trader defrays the transport fees.

It takes about 6-8 ton licorice roots to produce one-kilogram glabridin of 90% purity. The production takes about one month to produce 3-4 kg of glabridin. Required licenses for processing glabridin include production license from State Council, hygienic license from NHFPC and Good Manufacture Practice (GMP) certification. While Zelang owns the former two licenses, it has yet to be qualified for the GMP. Zelang is in the process of applying for the GMP despite its high cost. Glabridin is very valuable and its price depends on its purity, as showed in the table below. Specially, as most of Glabridin producers implement price discrimination, the prices for different customers vary a lot.

Purity	Character	Price (RMB/Kg)
20%	Brown powder	30,000-50,000
40%	Brown powder	60,000-100,000
60%, 80%	Yellow powder	Immediate product, not for sale
90+ %	White powder	150,000-200,000

Due to its high value, the company typically do not possess the product in stock and only produce it with an order from customers. Meanwhile, over 95% products are exported to America, Europe, Japan and Korea. The domestic cosmetic producers in China can hardly afford the high price of glabridin. Even though most of the glabridin companies don't own the export quota, they find middleman to export the products to their targeted market abroad. The domestic middleman covers 80% whereas the rest are international middleman.

Glabridin supply chain is shown as the following chart.



The primary obstacle for the company's licorice product is the redundant channel. As a result, the company is trying to build direct and stable business relationship with end customers to increase profits.

Annex 3. Administration on Export License for the Approved Commodities (2012)

(Translation from the Chinese government document⁵⁴)

In accordance with the Measures for the Administration of Licenses for the Export of Goods (Ministry of Commerce No. 11 of 2008) and the 2012 Catalogue for Goods Subject to the Administration of Export Licenses (Ministry of Commerce, General Administration of Customs Announcement No. 98 of 2011), the 2012 Catalogue for Graded License Issuance of Goods Subject to the Administration of Export Licenses is now issued and relevant questions are notified as follows:

First, there are altogether 49 kinds of goods under the administration of the export license. The export licenses shall be issued by Quota License Bureau of the Ministry of Commerce (hereinafter referred to as the License Bureau), Special Commissioner's Offices of the Ministry of Commerce (hereinafter referred to as Special Commissioner's Offices) as well as local commerce department issuing agency authorized by the Ministry of Commerce.

1. License Bureau is responsible for issuing export license for the following 6 goods: corn, wheat, cotton, coal, crude oil, and product oil.

2. Special Commissioner's Offices are responsible for issuing export license for the following 26 goods: Rice, corn flour, wheat flour, rice flour, lumber, cattle, live hog, chicken, coke , rare earth, antimony and antimony products, tungsten and tungsten products, zinc ore, tin and tin products, silver, indium and indium products , molybdenum and phosphorus ore; rush and rush products, carborundum, talc lump(powder) , magnesite , bauxite, licorice and licorice products; platinum (exported through processing trade) ,natural sand (including standard sand) .

3. The local issuing agency are responsible for issuing export license for the following 17 kinds of goods the : chilled beef, frozen beef, chilled pork, chilled chicken, frozen chicken, ozone-depleting substances, paraffin wax, zinc and zinc-based alloys , metal parts and products, motor vehicles (including complete sets of parts) and its chassis , motorcycles (including all-terrain vehicle) and its engine and frame , molybdenum products, citric acid, penicillin industrial salt , vitamin C, and sulfuric acid disodium .

Second, the License Bureau is responsible for issuing export licenses for central enterprise located in Beijing

Third, to maintain the normal order of operation, some export goods are designated to certain issuing agency for export license and to entry out through designated ports. To

⁵⁴<http://www.chinainportexport.org/2012-graded-licence-issuing-list-of-commodities-subject-to-export-licence/>

export such goods, enterprises shall apply to the designated issuing agency for export licenses and make export declaration at the specified port. The issuing agency shall issue an export license in accordance with the specified port .

1. Huangpu Customs, the Beihai Customs and Tianjin Customs are the Customs ports for the Antimony and Antimony products.

2. for Products under the category of magnesite that are mixtures containing over 70% magnesium oxide by weight (HS code : 3824909200) , the export license shall be issued by the Special Commissioner office and are no longer with designated customs ports. The export license for other products under the category of magnesite are issued by the Special Commissioner's Office in Dalian , and Dalian (Dayao, Yingkou , Bayuquan, Dandong, Dadong Port), Qingdao (Laizhou Customs) , Tianjin (East Harbour, Newport) , Changchun (Tumen) , Manchuria are designated as the Customs ports.

3. Tianjin Customs, Shanghai Customs, Dalian Customs are the designated Customs ports for licorice. And the Tianjin Customs, Shanghai Customs are the designated Customs ports for licorice products.

4. The designated Customs Ports for rare earth are Tianjin Customs, Shanghai Customs, Qingdao Customs, Huangpu Customs, Hohhot Customs, Nanchang Customs, Ningbo Customs, Nanjing Customs and Xiamen Customs.

5. The export licenses for export live cattle, hogs, and chicken to Hong Kong shall be issued by Guangzhou and Shenzhen Special Commissioner Office.

6. the issuing of re-export license for saw timber produced with imported log: Heilongjiang Provincial Department of Commerce is responsible for issuing export licenses for businesses within the province and the designated customs ports are Dalian Customs and Suifenhe Customs; Inner Mongolia Autonomous Region Department of Commerce is responsible for issuing the export licenses for businesses within the Autonomous Region and the designated customs ports are Manchuria, Erlianhaote, Dalian, Tianjin and Qingdao Customs; Xinjiang Uygur autonomous Region Department of Commerce is responsible for issuing the export licenses for businesses within the Autonomous Region and the designated customs ports are Alashankou , Tianjin and Shanghai Customs. Fujian Provincial foreign Trade Department is responsible for issuing export licenses for businesses within the province and the designated customs ports are Fuzhou, Xiamen, Putian and Zhangzhoucustoms .

7. Special Commissioner's Office in Guangzhou and Hainan Province are responsible for issuing within their respective province the export license for natural sand to Hong Kong and Macau. Fuzhou Special Commissioner's Office is responsible for issuing the export license for natural sand to Taiwan and the Customs port are designated to the customs of

the province where the enterprises are located. And the Fuzhou Special Commissioner's Office is responsible for signing and issuing of the export license for natural sand to Taiwan.

Fourth, In accordance with the 2001 Administration of Export Pilot of Saw Timber Produced with Imported Log (Forestry [2001] Issuing No. 560) jointly issued by the State Administration of Forestry , the former Ministry of Foreign Trade , and General Administration of Customs, enterprises qualified for the re-export license for saw timber produced with imported log shall apply for the licenses from the issuing agencies listed in the Article 3 Paragraph 5 of the notice in accordance with the Export Certificate of Saw Timber Produced with Imported Log, and the issuing agencies shall indicate "Saw Timber Produced with Imported Log" in the reference column.

Fifth, the export license for the ozone-depleting substances shall conform to the rule of "each license for each batch" mechanism.

Sixth, when issuing the export licenses, the issuing agencies shall strictly conform to the Measures for the Administration of Licenses for the Export of Goods, the 2012 Catalogue for Goods Subject to the Administration of Export Licenses and Work Specification of the Issuing of the Export Licenses(Issuing No.398[2008]) published by the Ministry of the Commerce.

The Catalog shall come into force Since January 1, 2012, and the 2011 Catalogue for Graded License Issuance of Goods Subject to the Administration of Export Licenses shall be abrogated on the same date.

Annex 6:

December 13, 2012 Announcement on First Open Bidding for Export Quotas of Licorice and Licorice Products in 2013

Published: 17 Apr 2013 20:33:56 PST

In accordance with the Measures for the Invitation of Bid for Export Commodity Quotas and the Detailed Rules for the Implementation of Invitation for Bids for Export Industrial Products Quotas and relevant provisions, the matters with respect to the first open bidding for export quotas of licorice and licorice products in 2013 are hereby announced as follows:

I. Commodities Subject to Bidding and H.S Codes

- (i) Fresh or dried licorice (whether or not cut, crushed or powdered): 1211903600
- (ii) Licorice sap and extract: 13021200
- (iii) Glycyrrhizic acid powder: 2938909010

Glycyrrhizic salts:2938909020

Glycyrrhetic acid and its derivatives:2938909030

II. Volume Subject to Bidding

- (i) Fresh or dried licorice: 4,200 tons for the whole year and 2,400 tons for this bidding
- (ii) Licorice sap and extract: 1,400 tons for the whole year and 800 tons for this bidding
- (iii) Glycyrrhizic acid powder, glycyrrhizic salts, glycyrrhetic acid and its derivatives: 700 tons for the whole year and 400 tons for this bidding

III. Bid Qualification

Please refer to the provisions of Announcement on Bidding Qualifications for the First Bidding for Export Quota of Licorice and Licorice Products in 2013 and Their Preliminary Examination and Review (MOFCOM Announcement No.80 of 2012) for details.

IV. Time of Bidding

Time of bid: December 17-18, 2012

Time of bid closing: 16:00 December 18, 2012

Time of bid opening: 10:00 December 19, 2012

V. Bidding Mode

The bid shall be conducted through "China International Electronic Commerce Network". A bid enterprise can only submit one electronic bid before the specified closing time. When the same bidder successfully submits more than two (inclusive) electronic bids, such bids of the bid enterprise are deemed invalid.

Ten minutes after a bid enterprise accomplishes bid operation, the bid enterprise may visit the "Enterprise Information Service System of Electronic Bidding" under China International Electronic Commerce Network to check whether its bid has been successfully accepted by the host or not. No feedback on the successful acceptance of a bid by the host can be guaranteed as for checks submitted by the bid enterprise within 30 minutes before bid closing.

If any fault occurs on the electronic bid, please contact with China International Electronic Commerce Center at the customer service hotline at least two hours before the time of bid closing so that it can be settled in a timely manner. Otherwise, the bid enterprise shall be responsible for its own bid operation failure.

The technical support for the electronic bidding&bid is undertaken by China International Electronic Commerce Center (EDI) which assumes the responsibility for the interpretation of specific issues concerning operation.

Tel.: 010-67870108 (Customer Service Center)

Fax: 010-67800343

VI. Bid Volume

The maximum bid volume is classified according to the average export volume of enterprises from 2010 to September, 2012. The detailed classification scheme is as follows:

(i) Fresh or dried licorice

Average export volume from 2010 to September, 2012	Maximum bid volume
700 tons or more	400 tons
130(inclusive)-700 tons	190 tons
50(inclusive)-130 tons	70 tons
Less than 50 tons (including new enterprises)	30 tons

(ii) Licorice sap and extract

Average export volume from 2010 to September, 2012	Maximum bid volume
200 tons or more	240 tons
80(inclusive)-200 tons	110 tons
Less than 80 tons (including new enterprises)	30 tons

(iii) Glycyrrhizic acid powder, glycyrrhizic salts, glycyrrhetinic acid and its derivatives

Average export volume from 2010 to September, 2012	Maximum bid volume
40 tons or more	80 tons
20(inclusive)-40 tons	30 tons
Less than 20 tons (including new enterprises)	10 tons

(iv) For licorice importers, the bid volume shall be increased by 5% on the basis of their import volume of the last year. The volume increased can be applied to the products at the option of the enterprises, for which the enterprises are qualified for bidding.

(v) Any bid with a higher bid volume than the maximum volume is deemed invalid.

VII. Bid Price

A minimum bid price is set for the bidders. The bidders can directly accept the minimum bid price as set by the bidding committee in the electronic bid. Any bid with a lower price than the minimum price as set by the bidding committee is deemed invalid.

VIII. Price and Volume of Accepted Bid

All the bid prices of bid enterprises will be ranked from the highest to the lowest, according to which their bid volumes will be accumulated. When the accumulated bid volume equals to the bidding volume, enterprise(s) accounted in the accumulated bid volume (i.e., the bidding volume) is/are the accepted bidder(s).

The accepted volume(s) of the accepted bidder(s) is/are its/their bid volume(s). If the accumulated bid volume of the accepted bidders with the lowest price is more than the remaining quotas, the remaining quotas shall be allocated among the bidders with such price proportionate to their bid volume. The accepted price of an enterprise is its bid price.

IX. Inquiry of Bid Acceptance

The preliminary bid acceptance result will be released on China International Electronic Commerce Network the next day after bid opening. Any bid enterprise with questions may submit its questions to the bidding office before 15:00 on December 20. As of December 25, all bidders may check the bid acceptance result approved and officially announced by the bidding committee on China International Electronic Commerce Network. The bidding office will not issue Acceptance Notice to the accepted bidders in written form. The bid-winning quota can be applied for since January 1, 2013.

X. Accepted Bid Security

The accepted bid security of this bidding is 10% of the accepted bid amount. After the bidder is accepted, it shall deposit the accepted bid security (accepted bid price \times accepted bid volume \times 10%) in the designated bank account before February 28, 2013.

Unit name: China Chamber of Commerce for Import&Export of Medicines & Health Products

Deposit bank: Beijing Wanda Plaza Branch of China CITIC Bank

Account No.: 7112410189800000737

The bid enterprise that fails to submit the accepted bid security in a timely manner and makes the quota invalid will be penalized by the bidding committee in accordance with relevant provisions of the bidding method and its implementing rules.

XI. For enterprises qualified for bidding for licorice and licorice products

with a trade mode of processing with incoming (imported) materials, their volume export quotas are not subject to the total bidding volume of quotas for the whole years, and the bid price shall be reduced by half according to the average price of corresponding accepted bid. The specific application procedures shall be subject to relevant regulations.

XII. Bidding Office of Export Quotas of Licorice and Licorice Products

Add: 11/F(Building 3, Beijing INN), No.6 Nanzhugan Lane, Chaoyangmennei Street, Dongcheng District, Beijing. Zip code: 100010

Tel:010-58036253 Fax: 010-58036254

Annex 4. List of Enterprises Bidding for Export Quota of Licorice and Licorice Products (2013)

I. Enterprises qualified for bidding for fresh or dry licorice (38)

1. China National Pharmaceutical Foreign Trade Corporation (under the central administration)
2. China Meheco Corporation (under the central administration)
3. Northern International Group Tianjin Medicines and Health Products Imp &Exp
4. Tianjin V-Sent Medicine Technology Co., Ltd.
5. HebeiShenglun International Industry Group Co., Ltd.
6. TongliaoZhaohua Planting Co. Ltd.
7. Liaoning Chengda Trade Development Co., Ltd.
8. Dalian Rising International Trading Company Ltd.
9. Jilin Lincun Traditional Chinese Medicines Development Co., Ltd.
10. Strong Ginseng & Herbs (Baishan) Ind. Co. Ltd.
11. Hangzhou Farfavour Enterprises Ltd.
12. Zhejiang Medicines & Health Products Imp.& Exp. Co., Ltd.
13. Anhui XieheChengyaoye Prepared Herbal Pieces Co., Ltd.
14. Anhui Bencao Chinese Medicine Herb Pieces Co., Ltd
15. BozhouSunglim Traditional Chinese Medicine Co., Ltd.
16. Jilin Longkang Pharmaceutical Co., Ltd.
17. BozhouShenglin Chinese Traditional Medicinal Electuary Co., Ltd.
18. Anhui Guangyintang Pharmaceutical Ltd.
19. Anhui Tienho Herbal Source Company
20. Botanicalink Co. Ltd.
21. Xi'an Myokoen Pharmacy Co., Ltd
22. Shaanxi Youthsun Co., Ltd.
23. Gansu Meheco Import & Export Co., Ltd
24. Gansu M-Top Trading Co., Ltd.
25. HuanxianHongkang Medicinal Material Development Co., Ltd.
26. Ningxia Higharea Import & Export Co., Ltd.
27. Yuli County Jinxing Licorice Products Co., Ltd
28. ErdosYili Pharmacy Co., Ltd.
29. Sino-Nature International Co., Ltd.
30. HebeiYuanfa Commercial Co., Ltd.
31. Xinjiang EcoOne Naturals Co., Ltd
32. Chengdu Toonlyn Herbs Co., Ltd.
33. Jiangsu Ruikang Organic Food Co., Ltd.
34. AnguoHongyuan Foreign Trade Co., Ltd.
35. Inner Mongolia Prosperous Earth Trade Co., Ltd.
36. Inner Mongolia Hengdu Trading Co., Ltd.

37. QingyangZhongkai Agricultural Products Co., Ltd.
38. ChengdeShenzhou Pharmaceutical Development Co., Ltd.

II. Enterprises qualified for bidding for licorice sap and extract (17)

1. China Meheco Corporation (under the central administration)
2. Tonghengyuan Export & Import LLC
3. Beijing Gingko Group Biological Technology Co., Ltd.
4. Northern International Group Tianjin Medicines and Health Products Imp &Exp
5. ZFTZ Mafco Biotech Co., Ltd.
6. Xi'an Myokoen Pharmacy Co., Ltd.
7. Gansu Meheco Import & Export Co., Ltd.
8. Gansu Wode Import and Export Co., Ltd.
9. Gansu M-Top Trading Co., Ltd.
10. Qinghai Province Qinghai Lake Medicinal Co., Ltd
11. Xinjiang Tianshan Pharmacy Industry Co., Ltd.
12. Yuli County Jinxing Licorice Products Co., Ltd
13. Xinjiang Jinshuo Plant Additive Co., Ltd.
14. Inner Mongolia Hengdu Trading Co., Ltd.
15. HuhhotTiantan Licorice Product Co., Ltd.
16. Xinjiang Alar Xinnong Licorice Industry Co., Ltd.
17. Tumushuke City Kunshen Plant Extracts Limited Liability Company

III. Enterprises qualified for bidding for glycyrrhizic acid powder, glycyrrhizic salts, and glycyrrhetic acid and its derivatives (25)

1. China Meheco Corporation (under the central administration)
2. Tonghengyuan Export & Import LLC
3. Beijing Gingko Group Biological Technology Co., Ltd.
4. Northern International Group Tianjin Medicines and Health Products Imp &Exp
5. Shanghai Fanzhi Pharmaceutical Co., Ltd
6. ZFTZ Mafco Biotech Co., Ltd.
7. Zhejiang Medicines & Health Products Imp.& Exp. Co., Ltd.
8. Hangzhou Farfavour Enterprises Ltd.
9. Vital-Chem Zhuhai Co., Ltd.
10. Gansu Meheco Import & Export Co., Ltd
11. Gansu Wode Import and Export Co., Ltd.
12. Gansu Fanzhi Biotechnology Co., Ltd
13. Gansu M-Top Trading Co., Ltd.
14. Xinjiang Tianshan Pharmacy Industry Co., Ltd.
15. Yuli County Jinxing Licorice Products Co., Ltd
16. Qinghai Province Qinghai Lake Medicinal Co., Ltd
17. Xinjiang Jinshuo Plant Additive Co., Ltd.
18. Lanzhou Dafeng Plant Technology Co., Ltd.

19. QingyangZhongkai Agricultural Products Co., Ltd.
20. Lanzhou Jindi Chemical Co., Ltd.
21. HuhhotTiantan Licorice Product Co., Ltd.
22. ShayaLuyuan Plant Industry Co., Ltd.
23. BaojiJinsen Pharmacy Co., Ltd
24. Jiangsu Tiansheng Pharmaceutical Co., Ltd
25. Shache County Fuyuan Licorice Product Co., Ltd.

Annex 5. Overview of various utilization of licorice

Licorice has been used in food and as medicine for thousands of years. Also known as "sweet root," licorice root contains a compound that is about 50 times sweeter than sugar. Licorice root has been used in both Eastern and Western medicine to treat a variety of illnesses, ranging from the common cold to liver disease. Nowadays, licorice and its derivatives are widely used to make various value added products including but not limited to tobacco, food and candy, medicine and cosmetics.

Tobacco

Most liquorice is used as a flavoring agent for tobacco. For example, MacAndrews & Forbes reported in 2011 that approximately 63% of its liquorice product sales are to the worldwide tobacco industry for use as tobacco flavor enhancing and moistening agents in the manufacture of American blend cigarettes, moist snuff, chewing tobacco and pipe tobacco. This percentage was higher in earlier years, when American blend cigarettes made up a larger portion of worldwide tobacco consumption. MacAndrews & Forbes sold approximately 73% of its liquorice products to the tobacco industry in 2005, and a consultant to MacAndrews & Forbes stated in 1975 that it was believed that well over 90% of the total production of liquorice extract and its derivatives found its way into tobacco products.

Liquorice provides tobacco products with a natural sweetness and a distinctive flavor that blends readily with the natural and imitation flavoring components employed in the tobacco industry, represses harshness, and is not detectable as liquorice by the consumer. Tobacco flavorings such as liquorice also make it easier to inhale the smoke by creating bronchodilators, which open up the lungs. Chewing tobacco requires substantially higher levels of liquorice extract as emphasis on the sweet flavor appears highly desirable.

Food and candy

Liquorice flavour is found in a wide variety of liquorice candies or sweets. In most of these candies the taste is reinforced by aniseed oil, and the actual content of liquorice is

very low. Liquorice confections are primarily purchased by consumers in the European Union.

In the Netherlands, where liquorice candy ("drop") is one of the most popular forms of sweet, only a few of the many forms that are sold contain aniseed, although mixing it with mint, menthol or with laurel is quite popular. Mixing it with ammonium chloride ('salmiak') is also popular. The most popular liquorice, known in the Netherlands as zoutedrop (salty liquorice) actually contains very little salt, i.e. sodium; the salty taste is probably due to ammonium chloride, and the blood pressure raising effect is due to glycyrrhizin, see below. Strong, salty candies are popular in Scandinavia.

Pontefract in Yorkshire was the first place where liquorice mixed with sugar began to be used as a sweet in the same way it is in the modern day. Pontefract cakes were originally made there. In County Durham, Yorkshire and Lancashire it is colloquially known as Spanish, supposedly because Spanish monks grew liquorice root at Rievaulx Abbey near Thirsk.

Liquorice flavouring is also used in soft drinks and in some herbal infusions where it provides a sweet aftertaste. The flavour is common in medicines to disguise unpleasant flavours.

Liquorice is popular in Italy (particularly in the South) and Spain in its natural form. The root of the plant is simply dug up, washed and chewed as a mouth freshener. Throughout Italy unsweetened liquorice is consumed in the form of small black pieces made only from 100% pure liquorice extract; the taste is bitter and intense. In Calabria a popular liqueur is made from pure liquorice extract. Liquorice is also very popular in Syria where it is sold as a drink. Dried liquorice root can be chewed as a sweet. Black liquorice contains approximately 100 calories per ounce (15 kJ/g).

Chinese cuisine uses liquorice as a culinary spice for savory foods. It is often employed to flavor broths and foods simmered in soy sauce.

Other herbs and spices of similar flavor include anise, star anise, tarragon, saffron, and fennel.

It is also the main ingredient of a very well known soft drink in Egypt, called سوسقرع ('erk-soos).

Sticks of liquorice typically have a diameter between two and ten millimetres. Although they resemble plain wooden sticks, they are soft enough to be chewed on. They used to be popular among Dutch, Danish and Swedish children[citation needed]. In Lancashire and Yorkshire in the early 1950s & 1960s, wooden sticks of liquorice, around 8mm diameter, were readily available (and popular) in sweet shops. Also in Essex during late

50s. They were bought as 'sticks of liquorice', and they were chewed by young children. The wood was yellowish, and fibrous when chewed. Liquorice root can have either a salty or sweet taste. The thin sticks are usually quite salty and sometimes taste like salmiak (salty liquorice), whereas the thick sticks are usually quite sweet, with a salty undertone[citation needed]. Liquorice root is also widely available in Denmark. It is also sold by the drugstore and drysalter chain Matas and many greengrocers.

Medicine

The compound glycyrrhizic acid, found in liquorice, is now routinely used throughout Japan for the treatment and control of chronic viral hepatitis, and there is a possible transaminase-lowering effect. Hepatoprotective mechanisms have been demonstrated in mice. Recent studies indicate that glycyrrhizic acid disrupts latent Kaposi's sarcoma (as also demonstrated with other herpesvirus infections in the active stage), exhibiting a strong anti-viral effect. The Chinese use liquorice to treat Tuberculosis

Liquorice affects the body's endocrine system as it contains isoflavones (phytoestrogens). It might lower the amount of serum testosterone slightly, but whether it affects the amount of free testosterone is unclear. Consuming liquorice may prevent the development of hyperkalemia in persons on hemodialysis.[26] Large doses of glycyrrhizinic acid and glycyrrhetinic acid in liquorice extract can lead to hypokalemia and serious increases in blood pressure, a syndrome known as apparent mineralocorticoid excess. These side effects stem from the inhibition of the enzyme 11 β -hydroxysteroid dehydrogenase (type 2) and subsequent increase in activity of cortisol on the kidney. 11 β -hydroxysteroid dehydrogenase normally inactivates cortisol in the kidney; thus, liquorice's inhibition of this enzyme makes the concentration of cortisol appear to increase. Cortisol acts at the same receptor as the hormone aldosterone in the kidney and the effects mimic aldosterone excess, although aldosterone remains low or normal during liquorice overdose. To decrease the chances of these serious side effects, deglycyrrhizinated liquorice preparations are available. The disabling of similar enzymes in the gut by glycyrrhizinic acid and glycyrrhetinic acid also causes increased mucus and decreased acid secretion. As it inhibits *Helicobacter pylori*, it is used as an aid for healing stomach and duodenal ulcers, and in moderate amounts may soothe an upset stomach. Liquorice can be used to treat ileitis, leaky gut syndrome, irritable bowel syndrome and Crohn's disease as it is antispasmodic in the bowels.

Studies of the use of liquorice extract (usually at 7%) in the treatment of melasma have shown that glabridin inhibits tyrosinase activity of melanocytes.

The compounded carbenoxolone is derived from liquorice. Some studies indicate that it inhibits 11 β -Hydroxysteroid dehydrogenase type 1, an enzyme that is highly expressed in liver and fat tissues, where it plays a role in metabolism, and in the brain, where the same

enzyme is involved in stress response that has been associated with age-related mental decline.

Alternative medicine

In traditional Chinese medicine, liquorice (甘草, نایبن یری ش) is commonly used in herbal formulae to "harmonize" the other ingredients in the formula and to carry the formula to the twelve "regular meridians" and to relieve a spasmodic cough.

In herbalism it is used in the Hoxsey anti-cancer formula, and is a considered adaptogen which helps reregulate the hypothalamic-pituitary-adrenal axis. It can also be used for auto-immune conditions including lupus, scleroderma, rheumatoid arthritis and animal dander allergies.

Glycyrrhizin from Glycyrrhiza root has been shown to modulate airway constriction, lung inflammation and infiltration of eosinophils in bronchial areas by stimulating CD4 and CD8 immune cell function.

More recently licorice has been used for symptomatic improvement in patients with the Postural Tachycardia Syndrome.

Liquorice may be useful in conventional and naturopathic medicine for both mouth ulcers and peptic ulcers.

Cosmetic

Glycyrrhizin and its salt and Glycyrrhetic acid, which is aglycone of Glycyrrhizin, have many functions for cosmetic, such as anti-inflammatory, anti-allergy, promotion of fibroblast, granulation formation, production of antibody, etc. Great facial steaming herb used to open and soothe the pores so that other herbs may cleanse and medicate them. Liquorice being anti-inflammatory, astringent, anti-microbial, free radical scavenger, UV absorption, helps reduce the appearance of skin discoloration. Licorice root is said to be very soothing to dry, irritated skin.

Glycyrrhizic acid derived from liquorice root. It has antibacterial properties, which make it particularly suitable for use in deodorants. It relieves inflammation, stems harmful bacterial growth and is often used in cosmetic preparations to combat impure skin. AHA apricot seeds kernel oil and liquorice help to re-texturise and smooth the skin leaving it feeling supple and comfortable.

Licorice root extract is used in Ayurvedic medicine as a treatment for inflammations, burns, wounds, abscesses, boils, and skin problems in general. It was either used as a poultice or made into a paste to be applied directly to the skin. Liquorice extract inhibits

melanin biosynthesis while scavenging free radicals (antioxidant). Treats acne and calms allergic skin.

Note: this article is compiled from publications on internet including:

<http://en.wikipedia.org/wiki/Liquorice>

<http://www.naturalcosmeticsupplies.com/liquorice-root.html>