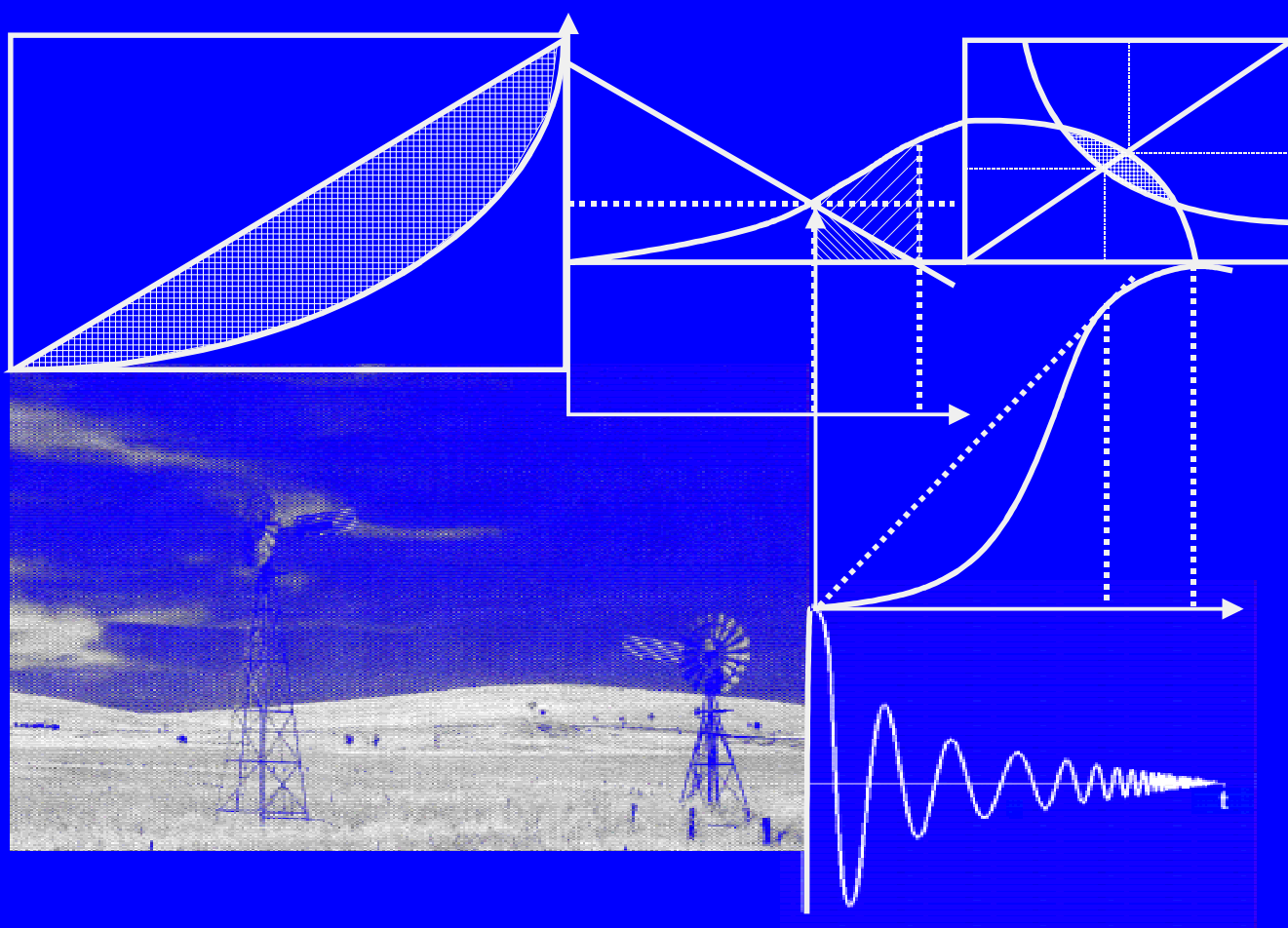


Agricultural and Natural Resource Economics Discussion Paper Series



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September 1999

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ABSTRACT

Agricultural reform started in the late 1970's stimulated the great expansion of Chinese beef and cattle industry and then the development of beef and by-product processing industry. Driven by the export market many mechanized and modernized cattle slaughterhouses were set up at the end of 1980's and, in the meanwhile, large number of specialized slaughtering households and specialized slaughtering villages sprang up after mid 1980s. Due to global economic downturn and the shrinkage of the export market most slaughterhouses have been cornered while slaughtering households progress well under way, which slaughter over 90% of the cattle resources. Affected by slaughtering pattern most of the beef have been sold and consumed in the fresh form without any further processing. Processed beef products such as soft-packed beef and caned beef only account for a small proportion of China's beef output. The increase in popularity of fast food restaurants has led to the popularization of beef products.

China consumes lots of animal offal and by-products. Trade in cattle offal and by-products, therefore, has been a unique phenomenon in Chinese beef and cattle industry. Households and dealers are major players in the circulation and processing of cattle offal and by-products. Hide, a main by-product from cattle, can be used to make a lot of products such as clothes, shoes, suitcase, bag and many others. Though Chinese beef and cattle industry has been developing rapidly in the past two decades, there is still a shortage of cattle hides over 10 million year. So China has to spend much foreign exchange on the import of cattle leather and skins each year. Cattle bone is another by-product that has been fully used to some extent, which is used to make bone meal, bone particle, bone glue, gelatin, bone black and bone handcraft. Due to the close relation to cattle raising and slaughtering most of the bone processing enterprises are located in those major beef and cattle producing provinces. But there seems to be few large mechanized slaughterhouses engaging in bone processing. It is bone dealers and small bone processing factories that control most of bone resources and bone processing industry. At present over 90% of medicinal and veterinary products have been made from pig by-products and little from cattle by-products. But allured by the great potential and the bright prospect of the Chinese beef and cattle industry in the future, many localities not only stresses the advantages of developing such sector but also expresses the will to seek foreign investment and set up joint ventures.

Introduction

As is well known, China began to reform its agricultural sector in the late 1970's with the

widespread introduction of household responsibility system. This dramatic change in rural economic system brought about three far-reaching changes on Chinese beef and cattle industry, that is, the change of cattle raising form from collective raising to household raising, the change of purpose of cattle raising from draft use to the dual purpose of draft and beef and to the commodity beef finally, and the shift of beef production from the pastoral area to cropped area featured by the rising of “Zhongyuan Beef Belt” (Central Plain Beef Belt). These notable changes, supported by the implementation of “Straw for Ruminants” project and the relaxation of control over market especially the lift of the ban on cattle slaughtering by the State Council in 1980, stimulated the great expansion of Chinese beef and cattle industry and then the development of beef and by-product processing industry. Products of the Chinese cattle industry include processed beef products, edible by-products and non-edible-products such as hides, blood, bone and medicinal and veterinary products.

Processed beef products

China has a long history of cattle raising. To raise cattle, especially to raise beef cattle for commercial purpose is, however, a new industry in China. Because in the past cattle had been kept by farmers mainly for draft use and beef production was only a by-product of the draft power system—this is still the case in many of the poorer sections of the rural community as we visited in Yunnan. At that time the slaughtering of cattle, which was regarded as the means of production, was strictly controlled. In order to ensure the sufficient animal power for farming work, protection measures and policies such as slaughtering prohibition were taken by the central government to protect the draft cattle. Any yellow cattle younger than 13 and buffalo younger than 15 were not allowed to be killed. And cattle were usually only slaughtered when they are no longer fit for the purpose of draught, reproduction and milk. Even for these culled old cattle, their slaughtering had been operated by the General Food Company in a way of monopoly. There used to be at least one cattle slaughterhouse subordinate to General Food Company in each provincial and prefecture capital city, one slaughterhouse or slaughtering line at some county level and even in some large enterprises and places where Hui (Muslin) people lived. Beef produced by them was mainly used to meet the needs of Muslin people rather than the social consumption. So in one word, before the introduction of reform and open policy there was actually no beef processing industry in China at all. But with the relaxation of control over cattle raising and slaughtering and the improvement of people’s living standard, such a monopoly state controlled by the commercial department was totally broken. Other departments such as agricultural department, land reclamation department and people’s liberation army began to get into cattle slaughtering and processing they never touched before. Hua An Company directly under the Ministry of Agriculture was set up during this period in 1983 and ever since China began to introduce foreign investment, advanced equipment and technology into beef processing sector.

The great expansion of Chinese beef processing industry took place at the end of 1980’s with the increase of beef export. Driven by the export market in the former Soviet Union and East Europe General Food Company in Henan established six beef cattle slaughterhouses in Xinxiang, Anyang, Luoyang (Chundu), Luohe (Shuanghui), Nanyang and Zhengzhou. Department of Foreign Trade and Economic Relations in Hebei also set up eight modernized beef cattle slaughterhouses in response. And all the mechanized slaughterhouses in Anhui were built up during this period and thereafter too. In the meanwhile, encouraged by the market-oriented policy large number of specialized slaughtering households and specialized slaughtering villages based

on them sprang up after mid 1980s and soon became the main part in cattle slaughtering industry. In almost all the major beef producing provinces there have been some specialized cattle slaughtering villages formed with the development of cattle industry (see Table 1 below).

Table 1 Number of Specialized Slaughtering Villages in Major Beef Producing Provinces

Provinces	Number of specialized villages	Name of representative village or town	Actual cattle number slaughtered a year (1000 head)
Hebei	100	Beiwu village	120
Henan	28	Mazhuang township	250
Shandong	80	Liumiao village	60
Anhui	21	Changguan town	150
Sichuan	30	Zhangmu town	30

Note: By specialized slaughtering village here it refers to those villages actually slaughtering cattle over 5000 head a year.

Number of villages in Henan, Anhui and Sichuan are survey data while number of villages in Hebei and Shandong are estimated data by the responsible animal husbandry department.

Due to the sharp decrease of beef export beginning from 1992 and fierce competition in purchasing cattle with slaughtering households most of the modernized and mechanized slaughterhouses were cornered and stopped to operate or switched to other operations. Of those six beef slaughterhouses under General Food Company in Henan only Shuanghui in Luohe is now still in operation. Even for those slaughterhouses survived they have been operating under capacity. Fucheng and Hua An companies in Hebei province, for example, are two mechanized slaughterhouses. But both of them only slaughter cattle two days a week, Fucheng on Wednesday and Saturday and Hua An on Monday and Thursday. In order to reduce the production cost and compete with slaughtering households some slaughterhouses have stopped slaughtering cattle by machine and, instead, by hand. It is introduced that there are over 20 slaughterhouses operating well and making money at the present moment. And most of them are either private, shareholding or joint venture companies.

By comparison, individual slaughtering households and specialized slaughtering villages have been progressing well under way. An investigation into Henan province showed that cattle slaughtered by individual slaughtering households accounted for 82.3%. Cattle slaughtered by specialized slaughtering villages (referring to those villages actually slaughtering cattle over 5000 head a year) accounted for 13.5% while cattle slaughtered by slaughterhouses only accounted for 4.2%.

Such a slaughtering structure would inevitably affect the pattern of beef processing. Individual slaughtering households and most specialized villages do not have any refrigerating facilities. They usually slaughter cattle in the morning or at previous night and then sell the carcass beef to urban and rural consumers directly during the day. Because individual slaughtering households slaughter over 90% of the cattle resources, it would be safe to say that most of the beef produced by Chinese beef industry have been sold and consumed in the fresh form without any further processing. This basically conforms to the estimation offered by the livestock experts from the Institute of Animal Science. They estimated that the processed meat products would account for only 3-4% of China' total meat output, much lower than the situation (80%) in those developed countries.

Cooked beef has been a very popular form to be sold on the market. It is estimated by Henan Industrial and Commercial Administration Bureau that cooked beef would account for 60% to 70% of the beef sold on the market. Because those cooked beef sold on Nongmao markets is only a simple beef product treated by boiling with some flavorings it should not be counted as (deep) processed beef product. Such kind of beef product is usually prepared by slaughtering households or specialized beef processing households. But those cooked beef in soft pack or vacuum pack displayed on supermarket should be counted as (deep) processed beef product.

Soft-packed beef is a new product selling well on the market in the past few years. Originally there were only several companies like Wanguang Group in Shandong, Chundu Group and Shuanghui Group in Henan engaging in processing such products. But more companies have been established to produce such products along with the improvement of people's living standard and the rise of tourist industry. In Henan alone there are 14 such companies with the capacity averaged 1000 ton of soft packed beef. Bangjie Group in Zhoukou prefecture of Henan is a relatively larger processor of the same kind. They processed 6000 ton of soft-packed beef in 1998. Their product could be divided into three types: Chinese-style beef such as five spicy beef, five spicy shin, beef with cayenne pepper, five spicy tendons, five spicy tripe and braised beef seasoned with soy sauce; Western-style beef such as beef sausage; and Muslim-style beef such as braised beef seasoned with soy sauce. Such soft-packed beef products have been sold on domestic market and never exported abroad. Due to inadequate market demand most of such companies have been operating under capacity. One company in Jiaxian of Henan, for example, processed only 100 ton while the designed capacity is 1000 ton.

Caned beef is another item of processed products in Chinese beef and cattle industry. Of all the processors Henan is the major producer and largest exporter of caned beef with Russia the largest buyer. Export of caned beef to Russia reached 26 thousand ton in 1993 and peaked at 30 thousand ton in 1995 and stabilized at 15 thousand ton each year beginning from 1996. Export of caned beef to Southeast Asia (mainly to Hong Kong, Singapore and Malaysia) stood at 2 thousand ton each year. There are four principal can factories in Luohe, Mengmiao, Xinxiang and Shangqiu. Besides Henan there are also some other factories in Hubei, Hebei and Shandong producing and exporting caned beef.

There are few other deep processed beef products such as beef jerky besides the above-mentioned forms. And also there are few companies involved in preparing of food using beef. But it is well worth mentioning the impact of the development of fast food industry on social consumption of beef. The most typical example is the increase in popularity of western food outlets such as McDonalds, KFC and Pizza Hut, which have led to the popularization of beef products. McDonalds now has opened more than 250 restaurants in China beginning from 1992. They consumed about 2000 ton of beef in 1998 and, they estimated, 2500 ton in 1999 with an increasing rate of about 10-15% every year. Fuxi Company, located in Dachang hui autonomous county of Hebei province, is one major supplier of domestic beef to McDonalds. They sold 1200 ton of beef to McDonalds in 1998 while it was only 850 ton in 1997. This year, they estimated, this number would reach 1500 ton. Beef noodle restaurant is another type of fast food outlet which consumes a lot of beef. One such beef noodle restaurant in Zhengzhou of Henan we visited would consume 2500 kg of fresh beef a month, which is equivalent to 3 ton a year. And there are tens of thousands of such beef noodle restaurants throughout the country.

Different uses demand different beef and different beef and cattle are used for different products. Those improved and quality cattle have been raised for either export of live cattle or

frozen beef or domestic consumption to replace the imported beef. Those soft-packed beef processors would like to use local cattle in order to reduce the production cost. Those beef noodle shop owners, however, would prefer the cattle younger than one and half years old for the convenience of boiling and cooking.

Edible by-products

Traditionally China is not only a nation mainly consuming pork, but also a nation consuming a lot of animal offal and by-products. Trade in cattle offal and by-products, therefore, has been a unique phenomenon in Chinese beef and cattle industry.

Table 2 Output of Cattle By-products Tested in Fuyang of Anhui

Unit: kg

Regions	By-products	Yield	% of live weight
Individual live weight		312.2±41.4	100
Blood	Blood	10.1±1.2	3.2
Skin	Skin	28.8±2.8	9.2
Head	Head meat	5.0	1.6
	Tongue	1.8±0.3	0.6
	Eye	0.5	0.2
	Brain	0.5	0.2
	Head bone	6.0	1.9
Offal	Stomach	10.6±1.4	3.4
	Intestinal	6.4	2.0
	Heart	1.2±0.2	0.4
	Liver	3.5±0.5	1.1
	Spleen	0.6±0.1	0.2
	Lung	2.9±0.4	0.9
	Gallbladder	0.3±0.1	0.1
	Pancreas	0.4±0.1	0.1
	Offal fat	6.2±0.6	3.0
	Penis	0.6±0.2	0.2
	Subtotal		32.5

Edible cattle by-products include head and offal, which account for about 15% of live weight of the cattle (see Table 2 above). They are usually sold in 'bundles' by slaughtering households and slaughterhouses based on the cutability (meat percentage). Price is different for different parts, which are usually divided into two categories: five large pieces and other small pieces. Five large pieces include heart, liver and lung; intestines; tripe; bible; and skeleton (including head meat, foot and skeleton). The price for five large pieces is 154 yuan for every hundred kg of meat produced, which includes 19 yuan for heart, liver and lung, 20 yuan for intestines, 35 yuan for tripe, 15 yuan for bible and 65 yuan for skeleton. Other small pieces include tail, kidney, sinew, front lymph, hinder lymph, blood, kidney fat and other fats etc. Price for these small pieces is 50 yuan per

hundred kg of meat produced. But these by-products sold in 'bundles' exclude those inedible and valuable things like bile, pancreas and penis, which are sold separately at the prices of 7.4 yuan, 4.0 yuan and 32 yuan per kilo respectively. For each bull slaughtered slaughterhouses would get another extra income of about 40 yuan from the by-products (penis, testicle and fat etc.) compared with that of cow slaughtered. Because of the value difference of by-products it is considered more economic to slaughter bulls than cows and most processors, therefore, would like to kill bulls rather than cows.

Most of the edible by-products displayed on Nongmao markets are prepared or treated by households and dealers, who have played an important role in the circulation and processing of cattle by-products. They usually have a fixed business relation with slaughterhouses to purchase those by-products at regular time and negotiated price. They also travel around the countryside to purchase by-products from individual slaughtering households. It is estimated that the net profit for households engaged in cattle offal and by-product marketing would reach 50% in winter, 20% in summer and 40% in average for the whole year.

China not only consumes all the cattle offal and by-products produced at home but also imports lot cattle offal (such as cattle bible) from abroad. According to statistics, China imported only 889 ton of fresh and frozen offal in 1992 while in 1995 this figure increased by a big margin to 7039 ton, an increase of nearly 7 times in five years.

Hides

Chinese leather industry is now composed of such four main sub-industries as leather-making, leather shoes, leather goods and fur and of four auxiliary industries including leather chemical materials, mechanical equipment, shoe-making materials and hardware fittings. Based on it's rich domestic leather resources, Chinese leather industry has been developing quickly in the past two decades. As a general industrial survey in 1995 showed, there were about 16 thousand leather processors (excluding those village and individual enterprises with the sales volume below one million) employed two million staff. Due to small scale, ancient equipment and more stringent pollution regulations many of these have been forced to shut down operation in the past few years. This number decreased to about 14 thousand in 1997. Of which, there were 2300 of leather-making enterprises, over 7200 of shoe-making enterprises, over 1700 of leather garment enterprises, over 1200 of fur enterprises, 523 of leather suitcase enterprises and 1501 of leather bag enterprises. In Henan alone as we visited, there had been 1500 leather processing companies with the capacity over 30 thousand skins by the end of 1998. In 1997, the output value of the industry reached 140 billion yuan while in 1980 it was only 1.26 billion yuan. Leather output (standard cattle skin) increased from 26.6 million in 1978 to 100 million in 1997, an increase of nearly three times. Other leather outputs also increased by a big margin during the same period (see Table 3 and Table 4 below).

Table 3 Output of Main Leather Products from 1978-1987

	Unit	1978	1980	1982	1984	1986	1987
Leather tanned	10000 skins	2659	4144	3776	3818	5096	5667
Leather shoes	10000 pairs	10053	15745	18661	19676	26440	30910

: converted into cattle skin

Table 4 Output of Main Leather Products from 1988-1997

	Unit	1988	1990	1992	1994	1996	1997
Leather tanned	10000 skins	5203	5156	5824	8530	9441	10014
Leather garment	10000 pieces	959	1462	3724	3427	4979	7939
Leather shoes	100 million	3.5	4.4	7.7	15.4	24.3	24.7
Leather suitcase	10000 pieces	1384	1171	1384	2612	4159	4234
Leather gloves	100 million	0.85	1.24	1.00	1.93	4.41	4.97
Leather bags	100 million	0.47	0.44	0.57	5.17	12.84	12.60

:converted into cattle skin

Of the total 100.14 million leather (standard cattle skin) tanned in 1997, cattle hides were more than 30 million and the rest were over 50 million of sheep and goat skins and over 90 million of pig skins. It is estimated that China could only supply about 80 million of pig skins, over 40 million of sheep and goat skins and over 20 million of cattle skins a year.

As a result of the old planning system animal slaughtering and leather processing belongs to different ministries. And slaughtering has been the business of General Food Company under the Ministry of Commerce while leather processing goes to Ministry of Light Industry. So it is impossible for a leather processor to engage in animal slaughtering, which means that all the leather processors have to purchase their cattle hides outside. There are three ways for leather processors to buy cattle skins:

Direct and self-purchase -- Leather processors would sign a contract with the slaughterhouses to purchase their cattle skins or send their own staff out to look for and purchase the cattle hides needed. This is regarded as the most common and economic way for most leather processors to do.

Commission purchase -- Sometimes leather processor might want to ask someone else or an agent to purchase the cattle hides for them. As we visited in Yunnan, one-third of the cattle hides had been purchased by the local Supply and Marketing Cooperatives trusted by the leather processors.

Factory gate purchase -- This is a simple way for processors to increase their supply of cattle hides. Processors would only stay and wait for the delivery of cattle hides by dealers or slaughterhouses at the factory site rather than to go out for purchasing. The problem is that processors usually have to offer a higher price to attract deliveries.

No matter through which way the processors purchase hides, it seems that dealers (especially Hui dealers) play a very important role in the trade of cattle hides as the Daying leather market showed. It is said that this leather market, located in Songyang town of Songming County in Yunnan province, is the second largest leather market nationwide only next to Xinji leather market in Hebei province. The annual turnover reached 2 million skins at the beginning period since the

establishment of this market in 1993. Of which, cattle skins accounted for about 30% and buffalo skins 25%. To our surprise all the skin sellers at the market are dealers. We were also told that local leather processors never purchase cattle skins through the market. Which, they said, would increase the purchase cost. So it could be easily found that such a market would only serve as the function to market the locally produced skins rather than to meet the needs of the local processors for cattle skins. Actually 80% of the skins had been sold out of the province to Zhejiang, Guangdong, Henan, Hubei, Anhui and even Hong Kong and Thailand while the skins on the market mainly came from Yunnan and neighboring provinces of Guizhou and Sichuan. Prices for hides on this market have decreased from 9 yuan per square chi during the peak time between 1993 and 1995 to 7 yuan per square chi in 1999. Cattle hides produced in central China such as Henan, Hebei, Anhui and Shandong have been regarded as the best ones by the industry and then came the hides produced in Sichuan, northwest and northeast provinces. The worst ones came from Yunnan and Guizhou. Price data from Hebei and Guangxi leather markets in August of 1998 showed that cattle hides from central China would sell at 5.5-6 yuan per square chi. While cattle hides from northeast and northwest would sell at 4.5-5 yuan per square chi, and salinezed hides from Yunnan and Guangxi was only 4-4.5 yuan per square chi.

Though Chinese beef and cattle industry has been developing rapidly in the past twenty years especially since the implementation of "Straw for Ruminants" project, there is still a shortage of cattle hides over 10 million a year. And also the quality of the hides was not satisfactory mainly because of long raising period and natural keeping outside, which would bruise the hides and make the quality of the hides vary in different parts of the hides and coarse in surface.

So in order to meet the crying demand for hides by the fast growing leather industry, China needs to import lot of leather and skins each year. Though over half of the leather tanned in 1997 were pig skins, cattle leather and skins had been the main import item which accounted for 78% of the total import while sheep skins accounted for 11%, pig skins 5%, goat skins 3% and other leather 3%. In 1997 China imported about 1.7 billion of bovine leather. The top five exporters of bovine leather to China were South Korea, Taiwan, United States, Italy and Japan (see Table 5 below).

Table 5 Top Five Exporters of Bovine Leather to China in 1997

Unit: Million US\$

Nations	South Korea	Taiwan	U.S.	Italy	Japan	Total of five	Grand total
Value	636.1	482.4	144.8	88.0	61.2	1412.5	1707.2
Position	1	2	3	4	5		
%	37.2	28.3	8.5	5.1	3.6	82.7	100

In 1997 the top five exporters of raw cattle skins to China were United States, Canada, Kazakhstan, Australia and Holland which accounted for 58.2%, 9.4%, 6.4%, 5.5% and 4% of the total respectively. In total China imported over 10 million cattle leather and skins each year.

Chinese leather industry is a traditional and also a big foreign-exchange-earning industry. In 1978 foreign exchange earned through the export of leather commodities was only 210 million US\$. Between 1988 and 1997 foreign exchange earned through the export of leather commodities went up from 1.09 billion US\$ to 9.95 billion US\$, ranking first in term of the capacity to earn foreign exchange within the light industry. Statistics shows that China's export volume of leather, major leather goods and leather shoes in recent years accounted for 2%, 9% and 15% of world's total. In 1997, the top five destinations for the export of major leather goods (including leather shoes, leather garment, leather gloves, travelling articles and cases and bags) are the United States, Hong Kong, Japan, Russia and Germany, accounting for 41%, 13%, 9%, 7% and 5% of the total

export volume respectively. These five top countries imported 75 percent of the major leather goods exported by the Chinese leather industry. In 1997 China also exported about 240 million US\$ of bovine leather. Of which, Hong Kong, South Korea, Taiwan, Thailand and Italy are the top five importing countries, which imported 94 percent of the total and accounted for 59%, 20%, 7%, 5% and 3% respectively. The major export items and principal destinations are detailed below in Table 6 and Table 7.

Table 6 Major Export Items of the Leather Industry in 1997

Unit: 100 million US\$

No.	Items	Export volume	Growth rate than 1996
1	Leather shoes	36.4	22.1
2	Suitcase & handbags	33.0	21.7
3	Leather garment	16.12	11.9
4	Other shoes & boots	12.69	8.4
5	Leather gloves	4.83	11.5
6	Shoe-making material	3.92	-1.6
7	Leather	3.27	22.0
8	Other leather goods	1.90	36.2
9	Fur clothes	1.10	-12.6

Table 7 Top Five Export Destinations of Major Leather Products in the First Half of 1998

Order	Leather goods		Leather shoes		Leather gloves		Cases and bags		Leather garment	
	Places	%	Places	%	Places	%	Places	%	Places	%
1	U.S.	40.6	U.S.	68.3	H.K.	24.8	H.K.	21.9	Russia	35.8
2	H.K.	13.0	H.K.	6.3	U.S.	24.4	U.S.	17.3	U.S.	27.8
3	Japan	8.1	Japan	4.5	Japan	12.2	Japan	13.8	Germany	13.1
4	Russia	5.7	Canada	2.1	Germany	9.7	Germany	5.9	Holland	4.2
5	Germany	5.1	Russia	1.7	Canada	5.1	Britain	5.9	H.K.	4.2
Total		72.5		82.9		76.2		64.8		85.1

Chinese leather industry has been featured by the characteristics of small in scale and dispersed in distribution. It is estimated that over 97% of the tanneries and leather processing companies are small ones. And these so many enterprises spread all over China. In terms of regional distribution about 70 percent of them have grouped mainly over the east and south China like Guangdong, Fujian, Zhejiang, Hebei and Heilongjiang. Due to more stringent pollution regulations imposed by the central government many of these tanneries and companies have shifted their operations from medium and large cities to small cities, towns and townships, which led to the establishment of so many new "Leather City" or "Leather Shoes City" in Wenzhou, Haining of Zhejiang, Quanzhou of Fujian, Tongpu of Heilongjiang, Xinji of Hebei and Luyi county of Henan. As for the ownership structure, among those enterprises at or above township level (such kind of enterprises in 1997 amounted to 7859) state-owned and collective-owned enterprises dominate the industry, which accounted for 62% and 7% while foreign invested enterprises accounted for 24% and others 7% respectively. It is worth mentioning here that though those foreign invested enterprises accounted for only 25 percent in number their sales volume made up 53 percent of the total sales volume and over 30% of the foreign currency made by the enterprises at or above township level.

Among the problems facing by the Chinese leather industry the low utilization rate of capacity and pollution are the two most serious ones. It is estimated that the utilization rate of capacity of leather processing companies was below 50% and the utilization rate of capacity of shoe-making enterprises was only 66%. Taking Henan as an example, its leather processing capacity was 17 million (standard cattle skins) of which cattle hides account for two thirds while the actual processed skins were only 7 million standard cattle skins. Even so the leather processing and shoe-making capacity still increased by 86% and 42% respectively in 1997 over the previous year. According to an analysis and survey to 65 leather processing enterprises (including 32 tanneries, 21 shoe-making enterprises and 13 leather goods factories) in the first half of 1998, all the indices of tanneries went down compared with the same period of previous year. Output value, sales volume and profit decreased by 13%, 10.4% and 8% respectively, which means more loss suffered. The situation for leather goods factories was even worse. Their output value, sales volume and profit decreased by 11%, 17% and 47.8% respectively. By comparison, situation for show-making enterprises was much better. Their output value, sales volume and profit increased by 12%, 7.5% and 32.1% respectively. The export of major leather goods from January to September in 1998, though, increased by 0.6% over the same period of previous year. The growth rate decreased month by month from 12.1% in February to 0.6% in September.

Due to the lack of capital input and effective and low cost technology of sewage treatment and comprehensive use of waste material environment problems is also one of the focus concerned by the government and the public. To solve this problem Chinese government signed an agreement with the United Nations Industrial Development Organization in 1993 and accepted a donating project to deal with the sewage treatment facing by the industry for a long time in the past. This project had been established with a donation of 2.07 million US\$ from the Germany government. The aim of this project was to upgrade three leather processing enterprises in Shanghai, Nanjing and Xi'an and then extend the advanced sewage treatment technology across the country.

Facing the above-mentioned difficulties government officials and most processors, based on the huge domestic market and export potential, are still optimistic about the future of the industry. Fast growth rates have been set for the output of main leather goods at 5% per year and sales income and foreign currency earned at 7% during the period from 1998 to 2010 by the Chinese Leather Association.

Blood and bone

Cattle bone is another by-product that has been fully used to some extent. Theoretically cattle bone can be processed to make such products as color film, black film and x-ray film, medicine, food or feed additives and other bone products in order of the value added. Due to problem of high pollution bone processing industry is now shifting from developed countries to developing countries. But an advanced bone processing industry needs a good bone collection, transportation system and other measures related.

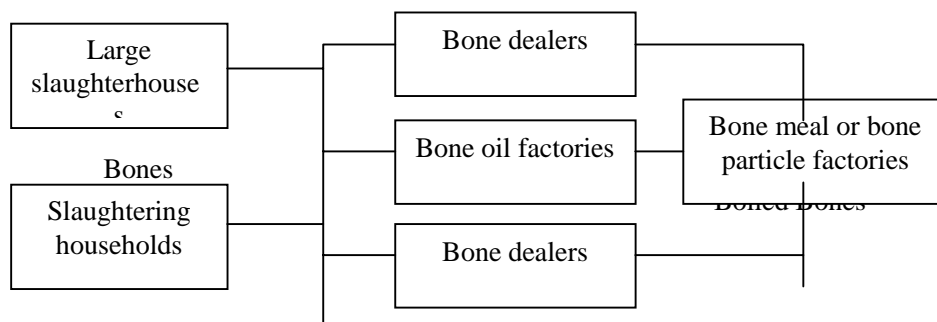
China produces a lot of cattle bone each year in direct proportion to cattle inventory and slaughtering. A test conducted in China's principal beef producing provinces of Henan, Hebei, Shandong, Anhui and Sichuan showed that the proportion of bone weight in individual live cattle weight varied from 9% to 13.6% in 1995. Based on the beef output in 1997 and calculated by 10% we can work out that China's total bone output should be 415 thousand ton. But because over 90 percent of the cattle had been slaughtered by the individual slaughtering households, it becomes difficulty for the processors to collect these bones and control the quality of bones, especially for the modernized and specialized bone processing enterprise of large scale. In 1995 the U.S. Kodak Export Sales Limited once came to China and explored the possibility of making film with cattle bone. Later they changed their original idea after a thorough investigation because most of the abattoirs in China are not large enough to support the operation of such a joint venture. It is said that the minimum slaughtering capacity of the Chinese party should be over 200 thousand head a year. There has been no one who can actually slaughter so many cattle a year under the present situation. However, abundant cattle bone resource in China still arouses the attention of the foreign investors. Companies from Japan, Australia and Hong Kong visited Henan and China one after another to study the possibility of setting up a joint venture in bone processing. Japan had set up such a joint venture in Luohe of Henan province to produce flavoring with cattle bone, which had been put into operation in June 1995.

Cattle bone processing is closely related to cattle raising and slaughtering. So most of the bone-processing enterprises are located in those major beef and cattle producing provinces in order to ensure a timely, stable and adequate supply of fresh bones. There have been several bone processing enterprises of fairly large scale in each of the above-mentioned provinces. There are two gelatin factories in Hebei, two gelatin and glue factories in Sichuan. There are 12 bone processing enterprises with the capacity over 600 ton and they process about half of the bone resources in Henan. Of which, there are three gelatin and glue manufacturing enterprises with the capacity over 4000 ton each. Tanghe Bone Manufacturing Company would process 15 thousand ton of bones a year. Luohe City Gelatin Company would process 4200 tone of bones while Songji Township Glue Company in Xiping County of Zhumadian prefecture would process 5000 tons a year. In addition, there is a bone particle chemical company in Yexian of Pingdingshan City which makes high-grade ornamental handicraft with cattle bone and then use the leftover bits and pieces to manufacture bone particle. The annual capacity also reached 2800 tons. Chengdu Gelatin and Glue Company, the largest of its kind in Southeast China, introduced some advanced machines and equipment from Japan. The designed capacity was 1500 ton with the consumption of 200 thousand ton of raw bones. But due to the short of bone supply this company only purchased 7000 ton of bones and produced 600 ton of glue in 1995.

Besides these relatively larger bone-processing enterprises there are thousands of small and medium size factories varied in ownership and technology base with little investment. There are at least over 100 such bone processing factories in Henan, owned by either private households or village collectives. While in Anhui specialized households and private enterprises have been the main forces in bone processing. These small enterprises locate mainly nearly the large slaughterhouses or within the specialized slaughtering villages. There are 15 such enterprises in Mazhuang township of Henan. There are four bone oil factories even in one village named Zhuqiao village of Sixian, Anhui province. Such enterprises are often small in size, simple and crude in equipment. And the technology process is very simple too. They usually use a high-pressure steamer or simply a big cooking pot (by most farmers and household factories) to extract bone oil by boiling and steaming at first, then dry those steamed bones by stoving or airing and finally break them into pieces by grinder. After sifting larger granule becomes bone particle and smaller one becomes bone powder (bone meal). At present most of the cattle bones have been processed into such forms used as additives to feed animal and poultry.

According to our survey there is a broad market for bone products at home and broad. But not like other products there is no any fixed and regular place for the trade of cattle bone. There seems to be few large mechanized slaughterhouses engaging in bone processing. Their bones have been sold either directly to bone processing factories or to bone dealers. In most cases they would sell those cattle by-products in bundle or bone separately to those dealers who have a fixed purchasing relation with the slaughterhouse. And bones produced by those specialized slaughtering villages and slaughtering households have been processed by the local bone processing factories or purchased by individual dealers for reselling. So it is bone dealers and small bone processing factories that control most of bone resources and bone processing industry.

Marketing and Processing Channels of Cattle Bones



Prices for fresh bones and bone products vary greatly in different provinces and even in different places within the same province. Such difference is mainly related to the quality of the

bones. It is introduced that the fatter the cattle are, the higher the price of bone is. Because bones from fat cattle contains more bone oil. In addition, such difference is also related to geographical location and the distance of transportation. Such a big difference in bone price indicates that a unified bone market has not been shaped up nationwide yet.

Table 8 Price of Fresh Bones for Different Provinces in 1995

Unit: yuan/kg

Province	Bottom price	Ceiling price
Hebei	1.20	1.80
Henan	0.62	1.20
Shandong	1.10	1.30
Anhui	0.80	2.00
Sichuan	1.00	1.10

Note: Prices above are all the selling prices at the slaughterhouses.

These are the purchasing price at the slaughterhouses. Dealers would raise the price by 0.15-0.20 yuan per kilo and then sell to bone processing factories.

Table 9 Prices of Bone Products from Different Companies of Hebei in 1995

Unit: yuan/kg

Companies	Fresh bones	Bone oil	Bone particle	Bone powder
Hua An	1.65	4.00	1.15	1.42
Dachang	1.40	4.00	1.15	1.42
Fucheng	1.80	5.10	1.65	1.75
Xinle	1.40	4.00	-	-
Gaocheng	1.20	6.00	1.80	1.80
Average	1.49	4.62	1.44	1.60

Cattle blood processing is not so popular as the bone processing. As mentioned above, individual slaughtering households kill over 90% of cattle resources in China. Because they usually do not collect cattle blood, most of the cattle blood has been wasted. Only those slaughterhouses collect cattle blood. But they never process blood and, instead, sell the blood to dealers, individual households or other buyers. In most cases cattle blood is mainly used to produce blood meal, which is usually sold to livestock farms or feed agency as feed material.

Medicinal and veterinary product

Biological medicine is now one of three major ways for medicine manufacturing (traditional Chinese medicine, chemical medicine and biological medicine) in China. In 1998 there were 289 biological pharmaceutical enterprises employed 34 thousand workers. And the total output value of the industry reached 5.9 billion yuan while it was only 1 billion yuan in 1991. The annual growth rate during the period from 1978 to 1998 amounted to 14.5%. The industry now produces 778 kinds of biological medicine curing ten types of different diseases. It is introduced that, however, over 90 percent of the biological pharmaceutical products have been made from pig by-products and little from cattle by-products. Three things account for this occurrence. First, although cattle number in China has been increasing rapidly in the past decade, it is still little compared with pig number. Secondly, most of the cattle have been slaughtered by individual slaughtering households and processed by so many dispersed enterprises, which, therefor, makes it difficulty to collect cattle by-products timely. And timely and fresh collection is a key to biological production. For example, pancreas must be collected and properly kept within 30 minutes immediately after slaughtering otherwise it would lose the value for pharmaceutical production. Thirdly, due to more and more direct consumption by consumers the prices for cattle by-products have been gone up, which have increased the purchasing cost for cattle by-products and then the production cost of the enterprise considerably. And this has been confirmed by a visit to Nanyang Biological Pharmaceutical Factory. They used to make pepstatin from cattle lung and cytochrome C from cattle heart. Now they have stopped to make such medicine because of the price increase for cattle lung and heart. The once popular used calculus bovis (bezoar) has also been stopped to use in medicinal production thinks to the scare of such resource and the successful development of synthesized calculus bovis factitius. But as introduced there is at least one

biological pharmaceutical company in Sichuan still using cattle viscera to make medicine.

The only exception to the utilization of cattle by-products is bone processing. Though the products made are pretty primary, bones have been widely utilized and manufactured into various products. Most of them, mainly bone meal and bone particle, have been used as additives to feed animal and poultry. But there are also some high grade and high value-added products produced and even exported abroad such as bone glue, gelatin, peptone, bone black and bone handicraft. Bone glue has been used to make capsule in the pharmaceutical industry. Quality packed bone meal and particle produced by Longdu Company in Huanyang and Hongxin Company in Xiping of Henan has been exported to Japan in large amount. Zhumadian prefecture alone would export 5000 tons of such quality bone meal a year. And Hongxin Company also manufactures organic compound fertilizer with cattle bone and then exports to Japan. Company in Yexian of Henan exports not only all the bone meal and particle produced locally to Japan, but also bone products produced in Hubei on commission while Dingtao Glue Company in Shandong exports all of their products to Southeast Asian countries.

According an visit to Bone Particle Chemical General Company in Yexina of Henan, out of every 6 tons of raw cattle bones one ton of bone protein, 2.5 ton of bone meal (particle) and 1.5 ton of bone oil would be produced. Bone protein can be divided into three types with different prices: edible protein 25000 yuan per ton; medicinal protein 9000 yuan per ton; and feed protein 7400 yuan per ton. Bone meal and bone particle, as mentioned above, has been sold as a calcium feed at the prices of 1450 and 1500 yuan per ton respectively. And bone oil has been used in the chemical industry to make grease and soap at the price of 3800-4000 yuan per ton. Benefited from bone processing this company would invest 8 to 10 million yuan to further develop bone protein drink which is richen in amino acid. They estimated that all the investment would be recouped within one and half a year. It is really a profit-making industry that resulted from the fast development of beef and cattle industry. Based on pig processing it is estimated that the output value from viscera processing would be equivalent to the output value from meat.

It is interesting to find that biological pharmaceutical industry benefit greatly from the designated slaughtering policy of pigs. Since the implementation of this policy in 1998 those enterprises once stopped operation now has come back to life again and the proportion of loss-suffering enterprises within the biological pharmaceutical industry decreased from 70 percent before the implementation of the policy to 25 percent thereafter.

Allured by the great potential and the bright prospect of the Chinese beef and cattle industry in the future, many localities not only stresses the advantages of developing such sector but also expresses the will to seek foreign investment and set up joint ventures. This has been one of our deep impressions during the field trip in the past three years.

An estimation of the value of the Chinese cattle industry

It is estimated by Henan Animal Husbandry Bureau that each commodity cattle, turned off with a live weight of 278 kg at the age of 18 months under the present condition, would produce an output value of 4150 yuan. Of which, 2700 (including cost of cattle purchase) yuan is from beef processing, 1200 yuan from leather processing and 250 yuan from by-product processing. If new technology is introduced in cattle raising and deep processing in the future and individual live weigh increases to 475 kg at the age of 22 months, the output value of each commodity cattle, then, would further increase to 9763 yuan. Of which, 7363 yuan (including cost of cattle purchase) is from beef processing, 2000 yuan from leather processing and 400 yuan from by-product processing. Based on this estimation the output value of Henan beef and cattle industry in 1997 would be 19.3 billion yuan (Henan turned off 4.65 million head of cattle in 1997). And the projection value of the industry would be 45.4 billion yuan supposing the turned off cattle number remained unchanged in the future. Applying this to the whole national beef industry we can work out that the total output value of the industry in 1997 would be 128.9 billion yuan (China turned off 31.06 million head of cattle in 1997). And the projection value of the industry in the future

would be 303.2 billion yuan with the turned off cattle unchanged. If cattle offal, blood, bone and other by-products could be further processed or used to make biological pharmaceutical products and if the processing technology is further improved, the output value and economic results of the Chinese beef and cattle industry would be much higher.

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