An overview of Trade opportunities in China's pork chain

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An overview of Trade opportunities in China's pork chain

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Foreword

China is the world leading country in the production of pork. The industry plays an important role in China's rapidly developing agricultural economy. In the fall of 2006 the department of Agriculture, Nature and Food Quality of the Embassy of the Kingdom of The Netherlands in Beijing. P.R. China published the report "An overview of China's pork chain". The report gave Dutch enterprises a first impression of the Chinese pork supply chain, from production level to end-consumer.

It is expected that pork consumption in China will continue to grow in the future. It is also expected that Chinese consumers are likely to pay more attention to food quality especially food safety. With increasing pork meat demands there is a need for China to continue the production leadership in the future and raise it to a higher value level.

This report under the authority of the Ministry of Agriculture, Nature and Food Quality describes the opportunities for Dutch enterprises in the expanding and rising Chinese pork market. Not only opportunities related to trade of high quality inputs (housing equipment, animals, feed stuffs, processing equipment, meat and meat products), but also to transfer of know-how (knowledge and technology).

Nanjing Agricultural University played an important role in the information collection to judge the attractiveness of China's pork chain for Dutch agribusiness. They consulted top processing, slaughtering and feeding companies, and interviewed several experts. In conclusion, without their efforts it wouldn't have been able to compile this report.

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Abstract

Pork consumption and production

Pork is one of the most important food sources for urban and rural residents in China. Pig farming is next to rice production traditionally the basic industry to guarantee food security for Chinese residents. The annual per capita consumption of pork was about 39 kg in 2006 and pork represents about two third of the total meat consumption. The official statistics in China, however, do not account for meat consumption in restaurants and for institutional consumption. Traditional 'Chinese style' meat products concern fresh, chilled and frozen meat and on a much smaller scale further processed high temperature meat products (HTMP). 'Western style' low temperature meat products (LTMP) nowadays have a small share of 5% in the meat consumption.

China is since 1990 the world leading country in the production of pork. The total annual output of pork grew from 24.0 million tons in 1990 and a share of 39% in world production to 51.2 million tons respectively 49% in 2005. Annual slaughtering reached a top of 660 million pigs in 2005. Due to serious outbreaks of blue ear disease (PRRS), output declined to 495 million heads in 2006 and 447 million heads in 2007.

Pork trade

Total import of pork varied between 400,000 and 800,000 tons per year over the past 10 years. Direct import into the mainland of China is only allowed through bilateral agreements. A large part is therefore traded through Hong Kong. Pig offal, seen as delicious by Chinese consumers, is the major product imported into China. It concerns either fresh, chilled or frozen offal. Carcasses and boneless pork are other important products. Viewed in the light of total production and consumption in China, the import only accounts for 1-2%. It is yet valuable to trading countries to make pork sales in their domestic region more profitable. Denmark, The Netherlands, Germany and France are the major European offal trading partners of China.

Current pork chain

It is forecasted that consumption and production will grow and will have it's consequences to scaling of the sector, quality requirements and restructuring of production chain. As China becomes more and more integrated in the global meat market, foreign investors are keen to step into China's fast growing pork chain. However, the current Chinese pork chain witnesses many paradoxes: e.g. small-scale farms with 5 pigs versus large-scale farms supplying the slaughterhouse over 10,000 pigs annually, illegal slaughtering versus HACCP certified companies, or open-air wet markets versus foreign invested hyper-markets.

Attractiveness of the pork chain for Dutch agribusiness

Eight Chinese slaughtering and processing companies, two Chinese feed producers and several Chinese experts were consulted and questioned on their perceptions of the current situation of China's pork chain, how they operate in this chain, and what their strategic plans are. They want to increase the quantity and quality of the annual output of meat products, pigs or commercial feed. While The Netherlands is just known for its highly skilled firms, farms and professionals in the pork industry, the Chinese plans imply excellent business opportunities (but also threats) for Dutch agribusiness. Opportunities exist in the fields of information technology to support tracking and tracing in the chain; advanced fresh keeping techniques and packaging methods; technology and know-how to improve meat quality on-farm, pre-slaughter and post-slaughter; high quality transport of live pigs; supply of breeding material; sales of farm equipment to greenfield large-scale farms; high quality feed manufacturing and feed formulation; training of university staff, dealers or farm employees on live pig production; and projects to secure feed and food safety in the production chain.

Drawback or risks for doing business in China are for example the creative mind of Chinese and their mind-set of 'I can do it myself much cheaper'; the fact that the agricultural sector is relatively down in fields like application of high-tech equipment, logistics and information technology; the scarce judgement of investments on cost-effectiveness or on rate of return, but rather on cash (at times of low cash-flows it occurs that investment projects are temporary brought to a halt or even totally cancelled); regional differences in the enforcement of laws and regulations; and the occasionally prejudice of companies towards e.g. the U.S.A. or Denmark. It is therefore a challenge for Dutch agribusiness to jointly promote their high quality products and know-how in order to market and sell 'Nederlandse waar'.

1. Introduction

Pork is one of the most important food sources for urban and rural residents in China. Pig production is next to rice production traditionally the basic industry to guarantee food security for Chinese residents. It is forecasted that consumption and production will grow and will have it's consequences to scaling of the sector, quality requirements and restructuring of production chain. The trends and developments that will take place in the Chinese pork production chain need to be researched to get insight in the opportunities for Dutch enterprises in this market.

1.1 Pork consumption

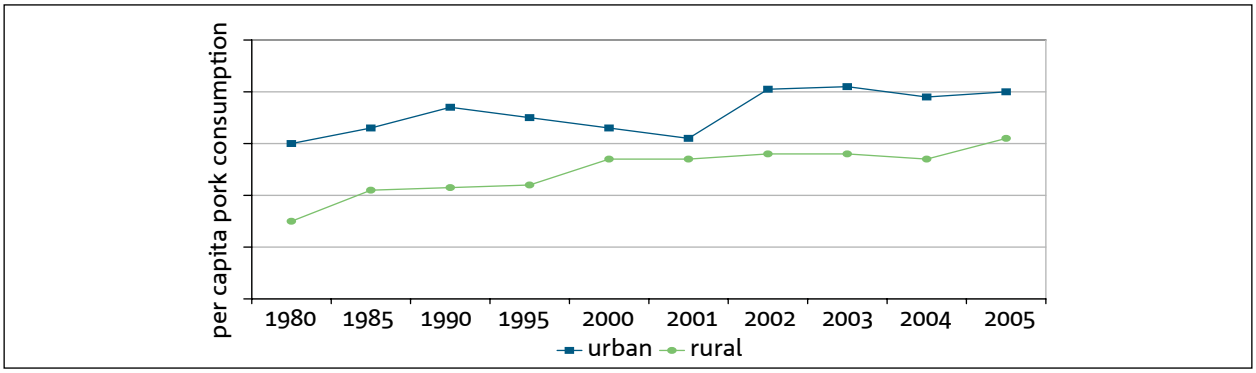
The annual per capita consumption of pork in 2006 was about 39 kg and pork represents about two third of the total meat consumption (China Statistical Yearbook, 2007). The official statistics in China, however, do not account for meat consumption in restaurants and for institutional consumption. Therefore, the official statistics are nearly half of the pork that is consumed in real daily life. It is not uncommon to use the average per capita availability or possession when reporting meat consumption in China, i.e. how much each person can consume on average by adjusting production for import and export.
The amount of pork consumption is subject to regional variation due to the impact of habit, production structure and religion. In northwestern areas of China, pork products are not in a favourable position. In the northwestrn areas, pork has on religious grounds been regarded as "inferior meat". The main pork consumption area is in the south of the Yangtze River area and the south-east coast.

Pork consumption is subject to macro-influences such as rising incomes, urbanization of the population, changing dietary habits, greater availability of ruminant meat (beef, goat meat and mutton) and rapid development of poultry industry in the last decade (Rabobank, 2007). Rising incomes have a positive relationship with pork consumption. Higher income families consume more pork than those with lower income, although the consumption of the latter group is also increasing. The difference in pork consumption between the richer urban residents and the poorer rural residents is becoming smaller. The urban residents consumed 2.2 times of pork than the rural residents in 1981. Almost 25 years later, the difference was less than 1.3 times in 2005 (see also Figure 1.1).
Urbanization also has an impact on the meat demand in terms of type and variety. People living in the cities tend to change their dietary habits and turn to convenient, healthy and value-added products and differ more in their daily choice of products. The higher living standards of these urban residents is also accompanied by increased awareness with respect to food safety, resulting in an estimated growth potential of safe meat demand of 139% compared to an overall increased meat demand of 48% (Rabobank, 2007).
Although in absolute terms pork consumption is increasing more than any of the other meats, the share of pork consumption among all meat is decreasing. Irrespective of the effects of the macro-influences on pork consumption, it is expected that in the coming years total pork demand will continue to grow in China, simply and solely due to population growth.

1.2 Pork production[2]

Since 1990 China is the world leading country in the production of pork. The total annual output of pork grew from 24.0 million tons in 1990 and a share of 39% in world production to 51.2 million tons in 2005 accounting for approximately 49% of the total pork production in the world (FAO, 2006). Annual slaughtering reached a top

Figure 1.1: Per capita pork consumption (kg), divided into urban and rural residents.
Source: China Statistical Yearbook, several issues.



of 660 million pigs in 2005. Due to serious outbreaks of blue ear disease (PRRS) in the latter half of 2006 and it 's impacts on pig inventory, pork prices and consumption, production declined to an output of 495 million heads and 52 million tons in 2006 and 447 million heads and 47 million tons in 2007. In order to ease the temporary shortage of pork for domestic demand, frozen meat was imported mainly from Denmark, France, Canada and USA. Furthermore in the light of pork shortage, trade agreement negotiations to lift import bans of pork from Holland, Germany or UK were started.
Two major policy reforms contributed to the rapid agricultural sector development. The first was the dismantling of the communes after 1978 and the introduction of the Household Responsibility Systems (HRS). Under the HRS, farmland was distributed equally to individual households based on labour availability. Farm households only needed to provide certain quota to the state (mainly grain and wheat); the leftover yield belonged to the farm households. Introduction of the HRS system spawned a proliferation of rural markets in which households and state companies could trade "surplus" agricultural commodities (i.e. those not procured by the state). By 1985, with the exception of pork-price stabilization measures, the market for livestock and meat products along with fruit and vegetables was decentralized. This move to free markets for most agricultural products was the second major reform that paved the way for the rapid development of livestock production (Longworth et al., 2001; Lu, 2007).

But pork production has not kept pace with the growth in output of other meats in China in recent years. Pork production is grain-intensive, and a shift to beef production is strongly promoted by the Chinese government. Nevertheless, pork production is still of strategic importance to the government. (Table 1.1).

1.3 Meeting demand with supply

With increasing pork meat demands there is a need to continue the production leadership in the future and raise it to a higher value level. It is also stated in the Five Year Plan that China wants to become self-sufficient regarding protein production, but the government policy is rather focused on feed imports than on meat imports. The Chinese pork industry, however, is considered relatively under-developed. Farm production experiences low animal productivity, the main focus is on meat quantity instead of quality, and the majority of meat and meat products still finds its way to the consumer through traditional markets. Logically, governmental incentives to expand the capacity in the Chinese pork chain are based on establishment of new production and processing facilities rather than on increasing quality and efficiency of current facilities and development of infrastructure and market channels. It is known that within this expansion (focused on profitability) there is relatively low concern for sustainability (regarding environment, labour etc.).

1.4 Outline of report

The required expansion of the Chinese pork production, slaughtering and processing capacity implies large opportunities for Dutch enterprises in this market.
Not only with trade of high quality inputs (housing equipment, animals, feed stuffs, processing equipment, meat and meat products), but also with know-how (knowledge and technology). The challenge will be to combine trade interest with sustainable development of the Chinese pork chains. It is therefore necessary to know more in detail trends and developments taking place in Chinese pork chains, which trade opportunities are present in these chains in relation to activities of Dutch agri-business, and which of these opportunities can contribute to improvement of product quality and chain development.
This report gives a more in-depth insight in the Chinese pork chain, and concludes on the attractiveness of this chain for Dutch agri-business.
Trade patterns are presented in Chapter 2 and give a view of China's main import partners and products into Hong Kong or the mainland of China. Chapter 3 describes the context of the daily operation environment in the Chinese pork chain. This was obtained by examining leading companies in the Chinese feed, meat and processing industry. Their strong and weak points and their expected strategic developments complete the overview of the Chinese pork chain nowadays and how it might progress in the near future. An analysis of the total information gives insight in the trade opportunities of Dutch agribusiness companies in the Chinese pork chain (Chapter 4).

Table 1.1: Production of pork, poultry and beef in million tons in P.R. China. Source: Statistical Yearbook China, several issues.

	1985		1995		2005	
	Output	%	Output	%	Output	%
Pork	16.55	85.9	36.48	69.4	50.10	64.7
Poultry	1.60	8.3	9.35	17.8	14.64	18.9
Beef	0.47	2.4	4.16	7.9	7.12	9.2
Other meats	0.65	3.4	2.62	4.9	5.58	7.2
Total meat output	19.27	100.0	52.60	100	77.43	100.0

[2] Pork output is thought to be understated, because statistics do not include illegal slaughtering and undesignated slaughterhouses (mainly in rural areas where meat is sold to local consumers) (Rabobank, 2007)

2. Meat trade patterns

Insight in China's meat trade patterns is complex mainly due to definitions of national borders. Direct import into the mainland of China is only allowed through bilateral agreements. A large part is therefore traded through Hong Kong. Over the past 10 years total import is varying between 400,000 and 800,000 tons. Viewed in the light of total production and consumption in China, the import only accounts for 1-2%. It is yet valuable to trading countries to make pork sales in their domestic region more profitable. By-products, such as offal, are seen as delicious and Chinese consumers are willing to pay more for them. Price contrasts rise to 1000% if consumer prices are compared between China and her trade partners. Denmark, The Netherlands, Germany and France are the major European offal trading partners of China. Alas, no specific data were available on types of offal traded.

2.1 Introduction

A clear understanding of China's imports and exports of pigs and pork is not easy. The first aspect concerns the definition of 'China': does it mean China including or excluding Macau, Hong Kong, or Taiwan? Hong Kong and Macau are part of China, but have separate customs territories and are trading hubs. Including them in the trade data for China makes the mainland economy look more open than it really is. Taiwan is more complicated, because mainland China considers it as a province while the Taiwanese operate as an independent country. In this chapter 'China' means China inclusive of Hong Kong, Macau and Taiwan, unless specified differently. The next aspect is that trade often focuses on fresh, chilled, and frozen meat. It sometimes excludes trade in live animals. Data of e.g. the USDA Foreign Agricultural Service do not include live animals, resulting in underreporting imports compared to the statistics of FAO. Furthermore, processed canned products and products of animal origin such as guts and skins (HS 05) can have a substantial share in the trade flows, but are practically not included in the data. Lately, the FAO Statistics database on trade (TradeSTAT) includes detailed trade data for wet and dry skins. Whether trade is measured in physical volume (metric tons) or in value (e.g. US dollars), has a considerable influence. When trade is measured in tons, China was a net importer in 2000 and 2001. However, China imports lower price products and exports higher price products, yielding a net export status in value terms (figure 2.1). With regard to underreporting of imports, substantial smuggling in meat products occurred prior to 1999. The import tariff rates were 45% or even higher, which made illegal imports attractive. In the preparation for entry into the World Trade Organization (WTO) China reduced tariffs on meat products in the end of 1998 to 20%, which led to distinct increases in reported imports from 1998 to 1999 (Han and Hertel, 2003).

2.2 Import into China by product group

When taking a look at the import of pigs, pig fat, pig meat and pig offal into China, the latter is the major product imported. It concerns either fresh, chilled or frozen offal. Carcasses and boneless pork are other important products (figure 2.2).

2.3 Import into China by country

The top ten countries importing pigs and pig meat into China and taking care of over three quarters of the imports, are USA, Canada, Denmark, Brazil, Netherlands, Germany, France, Spain, Vietnam, and Belgium (figure A.1 and A.2, Appendix A). From the perspective that the top producer in the world is China, followed by USA, EU and Brazil, it is not surprisingly that USA ranks first in terms of import volume into China. The market share of USA in imports into China expressed in tons ranges between 20 and 30%. For The Netherlands it ranges between 5 and 10%, with an outlier of 21% in 2000.
It is interesting to express the import into a value per kg product (figure 2.3). Remarkably, Vietnam and Brazil

Figure 2.1: Total import of pigs, pig fat, pig meat and pig offal into China (in 1,000 metric tons and in 1,000 US $). Source: TradeSTAT.

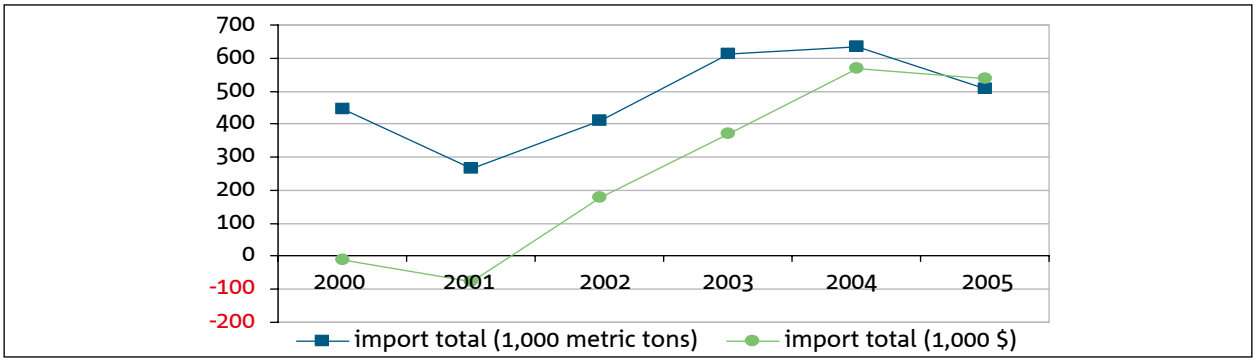


Figure 2.2: Import into China, accumulated by import of pigs, pig fat, pig meat and pig offal (in 1,000 metric tons). Source: TradeSTAT.

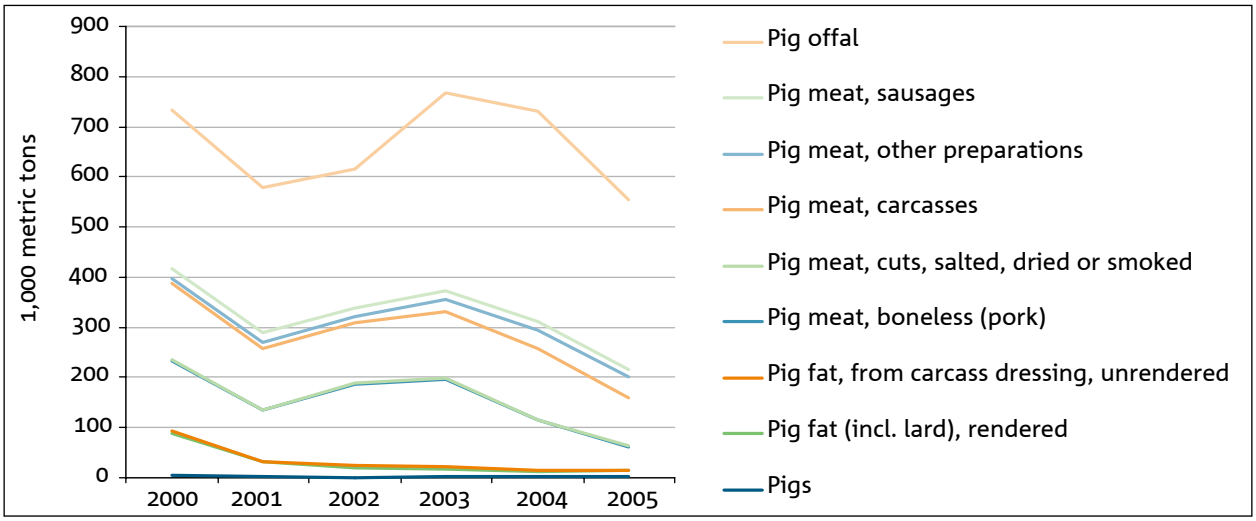
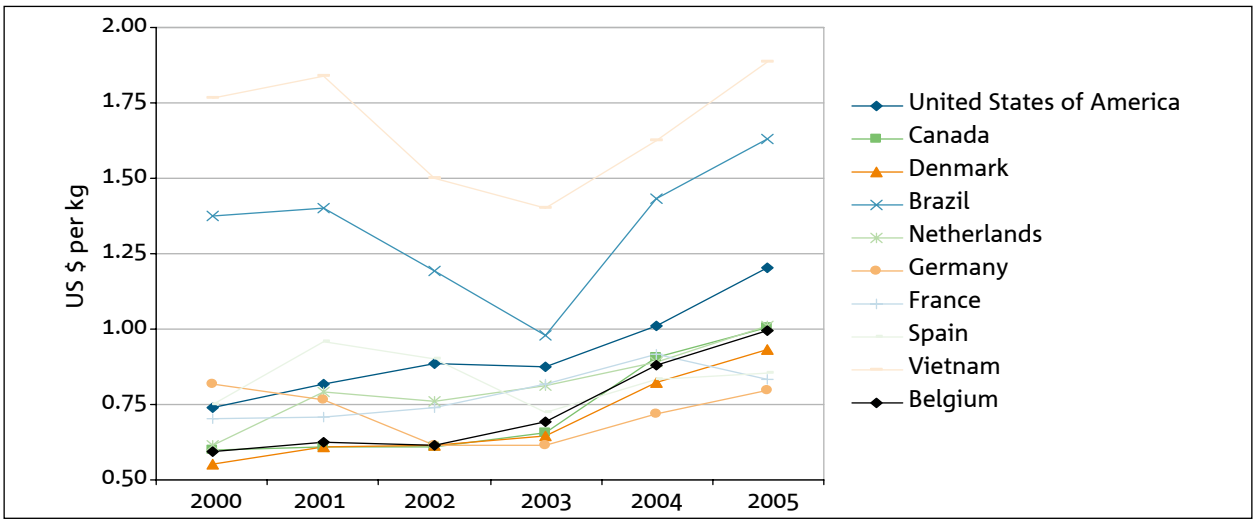


Figure 2.3: Value of imports into China, expressed in US dollar per kg product including pigs, ordered by country. Source: TradeSTAT.



are in economic terms the most important importers. Imports from Vietnam are low in quantity, but concern for more than 95% higher value carcasses. Also Brazil has a focus on import of carcasses, although to a lesser extend. Spain and Belgium are strong in imports of special meat products (e.g. hams). Countries like USA, Canada, Denmark, The Netherlands, Germany and France import for the major part offal which has a low value in the countries of origin. This trade is yet valuable to these countries to make pork sales domestically more profitable. A price survey in USA and China shows the vast price contrasts of retail prices of offal products in both countries (table 2.1). Chinese consumers are willing to pay more for by-products since these products are seen as delicacies, or hold certain health benefits. The import of high value (breeding) pigs by USA, Canada, Denmark and France has a negligible influence on the average value of imports into China, due to the low volumes.

2.4 Import into China mainland and into Hong Kong

The majority of the countries import into China through Hong Kong. With reference to the imports of offal in 2005, only USA, Canada, Denmark, France and Ireland were allowed to trade directly into the mainland of China. However, the share is substantial. Half of the total imports are directly undertaken by these countries into the mainland of China (table 2.2). In the end of the 90's Denmark and France signed a protocol with China to directly import fresh, chilled or frozen offal, fat and meat. Germany and The Netherlands had a protocol signed as well, but due to disease outbreaks the protocol was suspended. However, still occasional little imports are reported as can be seen in the imports of offal from Germany into mainland of China in 2005.

2.5 Import into China mainland and into Hong Kong from Europe

The mainland of China and Hong Kong are after Russia the major export markets for the EU-27. Total volume as well as share in export to China increased the past years. One-sixth of Europe's export to third counties ended in China in 2007: 86,291 tons into mainland China and 243,203 tons into Hong Kong. In 2008 this was even one-fourth: 146,138 (+69%) tons into mainland China and 454,242 (+87%) tons into Hong Kong. The first quarter of 2009 compared to the first quarter of 2008 did not show these growth figures anymore, +22% and +2% respectively, but the growth is still going at a stronger pace than the growth of the total export of Europe to third countries (+1%). As indicated in paragraph 2.2 offal was the major component in the exports. Frozen offal shares over 98% of the offal export. Unfortunately no data were available on types of offal, e.g. legs, noses or tails. In terms of volume Denmark, The Netherlands, Germany and France are the major European trading partners of China. Taken over the last few years the Danish exports to China have increased rapidly, growing by 16 percent in 2008, and growing more than in other EU countries. Denmark has thus gained market share. Danish exports in 2008 amounted to nearly two per cent of EU's total exports to China. [3]

Table 2.1: Comparison of retail prices for offal products in the USA and in Beijing. Source: Fabiosa et al (2005) and Price survey in Beijing (2006).

	USA ($/kg)	China ($/kg)	Price dissimilarity (China compared to USA)
Ears	1.68	2.02	120%
Hearts	0.44	1.39	316%
Hocks	0.31	1.57	506%
Stomach	0.55	1.77	322%
Tongues	1.19	2.27	191%
Kidney	0.18	1.89	1050%
Livers	0.20	0.88	440%
Lungs	0.09	0.97	1078%
Feet	0.32	1.52	475%

Table 2.2: Import of offal into China in 2005 through the mainland or through Hong Kong (in metric tons and as percentage of total import into China (total)). Source: TradeSTAT.

	Import into China (mainland)		Import into China (Hong Kong)		Import into China (total)
	volume	percentage	volume	percentage	volume
Canada	28,784	8.5%	4,136	1.2%	39,295
Denmark	46,337	13.7%	20,627	6.1%	67,821
France	26,255	7.7%	4,269	1.3%	30,524
Germany	135	0.0%	34,049	10.0%	34,184
Ireland	324	0.1%	2,190	0.6%	2,514
USA	66,905	19.7%	10,995	3.2%	87,122
Total	168,740	49.8%	151,716	44.7%	339,167

[3] Confederation of Danish Industries, www.di.dk

3. Daily operation and strategic plans

China becomes more and more integrated in the global meat market and foreign investors are keen to step into China's fast growing pork chain. To be able to judge trade opportunities, it is essential to portray the context of the daily operation of Chinese pork chain enterprises and how they perceive this. Top Chinese feed, slaughtering and meat processing companies were consulted for this purpose and stated that the Chinese pork chain witnesses many paradoxes: e.g. small-scale farms with 5 pigs versus large-scale farms supplying the slaughterhouse over 10,000 pigs annually, illegal slaughtering versus HACCP certified companies, or open-air wet markets versus foreign invested hyper-markets. The strategic developments set forth by the companies examined revealed that they are very ambitious: They either strive to be an innovative enterprise, want to be a registered food export business, be recognized as an international prestigious enterprise, want to belong to the top 3 suppliers in the world, or want their brand to be the favourite part of any eating occasion. They are driven strongly in their strategic plans by their aspirations.

3.1 Introduction

Eight slaughtering and processing companies, two feed producers and several experts from research, business and government were consulted. They were questioned on their perceptions of the current situation of China's pork chain and how the companies operate in this chain. Special emphasis was given to governance, quality management and standards, information exchange with downstream and upstream partners, and innovations (product, process, market and organisational). Furthermore, the companies were investigated for their future developments. All slaughtering and processing companies had strategic alliances, joint ventures or were integrated with their pig suppliers and meat product buyers. This revealed also a good insight in the upstream and downstream activities of these companies.
This chapter describes the information from the company research from an upstream point of view, i.e. from consumer to producer. Within each paragraph a division is made between a description of the daily context[4] and the future plans of the companies examined[5].

Pig producers defined. In this chapter, three types of pig producers in China will be used: unspecialized households (or small holder backyard farms), professional farmers and large-scale commercial farms. Most backyard farms keep 1 to 5 pigs. Professional farmers have up to 1,000 pigs and use more advanced management practices, better swine breeds and higher quality feed. Large-scale farms have more than 1,000 pigs, but their presence is limited.

3.2 Consumer markets

Chinese and Western style meat products

Purchase and consumption of meat and meat products can be classified into 'Chinese style' or 'Western style'. Traditionally, Chinese consumers purchase for the majority fresh, chilled and frozen meat and on a much smaller scale further processed high temperature meat products (HTMP[6]). These traditional Chinese meat and meat products are brought to the consumer market in more than 500 varieties. 'Western style' low temperature meat products (LTMP[5]), such as assorted sliced cold meat, bacon, or hotdogs, were for a long time unknown to the Chinese and were not part of their meat consumption port folio. These LTMP products nowadays have a small share of 5% in the meat consumption. Chinese pork chains can for this reason mainly be classified as cold chains (figure 3.1).

Market outlets

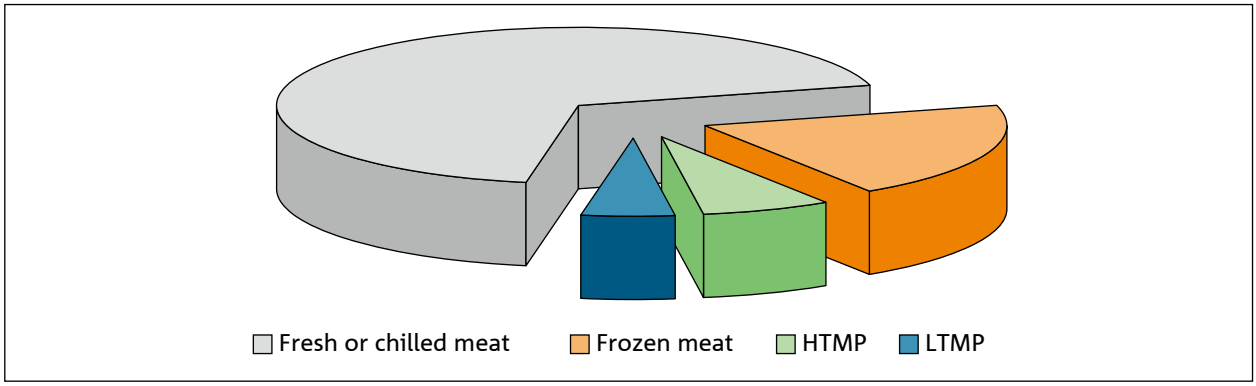
Pork products reach final consumers via wet markets (including nóngmào markets), shop-in-shop or franchise stores, wholesale markets and super- or hypermarkets.
Open-air wet markets. Typical for the Chinese pork production chain is the direct outlet of freshly slaughtered meat products to consumers by local farmers through open-air wet markets. Nowadays, many wet markets are being closed or reformed since they are viewed as unsanitary. In addition, tax revenues from wet markets are small compared to other better regulated markets. In some areas, local authorities have decided to move the open markets into indoors. These indoor markets are usually called nóngmào markets (agricultural commodity trade markets). Nóngmào markets have developed a wide portfolio in recent years. With a population of about 6

[4] Part of the text on the daily context has been extracted from drafts of Han (2009), for the reason that the work performed by Nanjing Agricultural University served both the BO-10-006-071 (Az18) project funded by the Ministry of Agriculture, Nature and Food Quality as well as the Q-PorkChains inventory of European and non-European pork chains funded by the EU 6th framework programme.

[5] The information in this chapter is based on consultations with representatives of leading companies in the Chinese pork chain. It can not be excluded that the information given was subjective, indicative or only referring to the subsidiary visited and not being representative for the entire company.

[6] HTMP are sterilised processed meat products, mainly instant sausages which can be stored at room temperature for several months. The sausages are known in China as 'hou tui chang'. LTMP are pasteurised processed meat products, with a shorter shell life than HTMP products.

Figure 3.1: Pork product breakdown. Source: Rabobank.



million people in Nanjing, a medium size city in China, there were nearly 300 Nóngmào markets in 2005[7]. In rural areas and small towns, nóngmào markets remain the most popular retail outlets.

Shop-in-shop or franchise stores. In some of the more sophisticated and developed nóngmào markets, several of the examined Chinese meat companies have established what could be described as Western-style butchers' shops. With regard to the franchise formula, contracts are made with the listed ones including free-to-go prices. The professional shop-in-shop or franchise stores have cooling facilities and display the companies products in glass cabinets. In vegetable nóngmào markets the stores create one-stop-shopping for the consumers. In nóngmào markets selling fresh meat, they are in sharp contrast to the open-air display of pork on wooden tables in other stalls in the same market. One of the companies examined indicated that they have representative offices in cities to monitor management of their franchise stores and to promote their brand among local consumers.

Whole-sale market. As in other centrally planned economies, wholesale markets did not exist in China before the reforms started. Until the mid-1990s, wholesale markets were usually owned by municipal governments or state-owned enterprises as the government's perceived responsibility to guarantee food supply to urban citizens against low prices. Moreover, these entities had the best access to finance while private agents still faced constraints in legally establishing their business. Since then the situation has changed and there has been a massive entry of private

[7] Personal information provided by a Nanjing vegetable company

companies. For one of the companies examined, wholesale agents account for 30% in the downstream retail outlet. They have a strict selection of the agents every half year, excluding the 10% less performing agents from further business cooperation. This leads to increased competitiveness between and capability of agents in the short run, but also to improved product quality and costumer service in the long run. Formal written contract between the processing company and the wholesale agent are applied by some of the examined companies, stating a.o. regions represented, sales volume and financial settlement.

Super-and hypermarkets. Not until the late 1990s supermarkets emerged in Chinese cities. Two important innovations were introduced by the supermarkets. First, there were offers of a wide range of vacuum-packed and branded cooked pork and pork offal products from open-fronted chiller cabinets. Second, shoppers were offered purchasing opportunities that more closely resemble the traditional nóngmào market situation, but the quality of the product and the way it is presented is significantly better (Longworth et. al., 2001). Therefore, the prices also tend to be higher. Although supermarkets develop very rapidly in China, many of them have been handicapped by a poorly managed fresh products sections. Compared with domestic supermarket chains, the foreign-invested hypermarkets have a better managed cold chain for meat products. The popular foreign hypermarkets include Carrefour, Makro, Metro and Wal-Mart. These hypermarkets, together with the large Chinese supermarket chains, usually have a limited number of suppliers of meat products. These carefully selected suppliers are mostly integrated commercial-type producers that can assure both product quality and consistency in supply (Fabiosa et al., 2005). The examined companies like to cooperate with international retailers like Wal-Mart or Carrefour as they represent high quality standard and advanced retailing business. One of the companies examined even sells 60% of its meat products through these retailers. However, slaughterhouses and processors perceive also very strict requirements from them, which they feel to a lesser extent with domestic supermarkets. Irrespective of international or domestic supermarkets, the slaughter and processing companies examined have the feeling that they are bled dry by supermarkets in promotions. They sense that they pay for the incentives given to consumers to buy meat products on sales. The shop-in-shop and franchise stores established by the slaughter and processing companies are a way to bypass supermarkets and overcome frictions with supermarkets in the case of promotions. Experts predict that the market share of meat sales through supermarkets will increase from 15% to 40% in the future decade (Zhou, 2006).

Future plans of companies with regard to consumer markets

Market differentiation and specific marketing policies are key issues in future plans of the companies investigated. Next to continuation of the usual market outlets, many companies want to extend in institutional, outdoor dining and direct-consumer markets. They are aware that these plans ask for tailored marketing activities. The following specific plans have been ventilated:

- Selling fresh meat through wholesale and supermarkets or pork through franchise stores, asks for different marketing systems. A leading integrated slaughtering and processing company will therefore start two approaches, each tailored to the specific market. National brand marketing will be applied for franchise stores, through e.g. advertising on domestic food industry websites and e-marketing.
- Branding is an important feature for a integrated shareholding company. They want to put more emphasis on the invitation of consumer representatives to visit production lines and production farms to increase consumer acceptance of their product brand.
- A fresh pork chain operating company wants to extend its market portfolio and enlarge its market share. They aim at selling fresh meat through wholesale and retail channels, arrange specific customer-oriented distribution and build up a strong position in institutional distribution (e.g. canteens of universities, companies and hospitals). Strategic partnerships and alliances with retailers will be established to realise less volatile distribution of carcasses. New products will be launched to serve specific costumer markets, e.g. highly tasteful products originating from specific Chinese breeds, small vacuum packaged pork, chilled products and so on.
- Widening of the market portfolio to non-retail channels is also in the future plans of a processed pork chain company. Next to outlet of meat products through hypermarkets, future focus will also be on supply to the growing segment of outdoor dining in restaurants and hotels.
- A complete cold chain distribution and sales network to sell pork products directly to consumers at home will be set up by an industrialized feed and food company. They also want to expand the distribution of products through shop-in-shop and franchise stores. To increase sales and margins of their products in these stores, different pork parts will be combined into one package (e.g. meat and offal, meat and bones). To expand their sales to the outdoor dining and institutional market, they will invest in the development of western-style LMTP products (with special emphasis and bacon).
- The non-traditional Chinese product segment is seemingly very appealing for the pork chain companies. A meat and meat products conglomerate will focus on product development in the segment of further processed and convenience pork products for the market segment of high speed and high income families, rather than expansion of their traditional meat slaughtering capacity. They

want to launch special pork products featuring the following characteristics: secure in quality, delicious in taste, nutritious in an organic way, convenient to prepare.
- A large meat based food group operates on a more regional level and sticks for their future plans to the credo 'local to local': pig procurement and product marketing will be in the region where the branch company is located.

What to do with 'leftovers'. Meat which has minor quality problems due to poor looks but no safety problems, will be processed and sold in other forms by the supermarket. Unsold frozen meat is for example processed into salted meat products, and put for sale. Meat that has really gone bad will be disposed of immediately.

3.3 Processing and slaughtering

Ownership and scale of processing and slaughter companies

Before 1985, the processing and slaughter sector was under the state monopoly. Slaughtering operations and distribution outlets were organized by the General Food Companies set up under the predecessor of the Ministry of Commerce. Reforms from 1985 created the opportunity for other agencies to become involved with pork processing and marketing. In addition, many county governments established slaughtering and processing plants to generate their own sources of fiscal revenues and development funds. Various smaller slaughterhouses were also established at the township and village level (Longworth et al., 2001). At the same time, private butchers also gained rapid development serving backyard farms at low cost. The liberalization has helped to promote the pig production sector. However, illegal slaughtering arose as well causing potential quality and safety problems. This became and still is a major concern of the Chinese government.

From the 1st of January 1998, the Designated Hog Slaughtering Act is applicable, regulating that all pigs need to be slaughtered at designated slaughterhouses. According to the experts examined, designated slaughtering can reach about 95% of the total in cities and township areas, while only 70% in rural. Many of the designated slaughterhouses operated well below the capacity, or, in many cases, have survived by charging service fee from the private slaughterhouses or butchers. This means that the private slaughterhouses or butchers rent the facilities of the designated slaughterhouses by paying an agreed amount of cost for each pig they slaughter. According to statistics, China had 25,000 designated meat slaughterhouses in 2006. Eighty percent were involved in pig slaughtering. They are far from a homogeneous group, especially with regard to ownership and scale.

Ownership. Economic reform and market imperatives have placed great pressure on state-owned slaughterhouses to restructure their ownership. Many of the General Food Companies previously owned by township governments or village collectives are now run by small groups of private shareholders. Medium scale state-owned slaughterhouses have also been under great pressure to restructure and to seek external funding and acquire the necessary management skills to survive. With regard to foreign investment, some international players have already started operation in China. The American Hormel Foods operate two joint ventures in Shanghai and Beijing, with a retail market share of 0.6% in 2005 (Euromonitor International, 2006). The China Association of Food Industry investigated the ownership of the meat processors in 2006, see table 3.1.

Scale. Three scale categories can be defined for slaughtering and processing companies: small-scale, medium-size and large-scale companies. The Chinese Ministry of Commerce classifies a company into a "scale company" if its annual sales reach a RMB 500,000 (approximately € 50,000). According to the statistics of the China Association of Food Industries, there were 2686 scale companies in meat slaughtering and processing in 2006, of which 1613 enterprises are slaughtering and processing integrated. Nearly 6,000,000 employees worked in the meat industry, accounting for 12.6% of the total employees in food industry (Huajing Tianzhong, ECC, 2006).

In general, the designated pork slaughterhouses at village level are rather small in scale, slaughtering only several dozen of pigs per day. The hogs are slaughtered into half/quarter carcasses for local sale. They usually source their hogs locally. The medium-size slaughterhouses kill around a million hogs per year. The largest scale processor slaughtered 13.1 million hogs every year. The percentage of hogs slaughtered by the three leading meat processors was only 4% in 2006[8], but they lion-shared over 35%[9] of the total market of processed products. In addition to the difference in the amount of pigs slaughtered, a major difference between the medium-size and the large-scale companies is that the latter operate better cold storage

Table 3.1: Ownership and main economic parameters of meat (by) products companies in China. Source: China Association of Food Industry, January and September 2006.

	No. of companies	Total asset (1,000 million ¥)	Sales turnover (1,000 million ¥)	No. of employees (10,000)
Total	1,067	631	1,032	27.2
State owned	52	19	16	1.1
Collective	34	5	13	0.3
Share-holding	619	285	520	13.3
Joint venture	171	286	407	10.4

facilities. Pigs killed by medium-size slaughterhouses are normally sold immediately in nearby rural or urban markets as fresh meat. They usually avoid the need for cold storage facilities. The medium-size and large scale slaughterhouse and processors only account for about 20% of the total.

Transport from slaughterhouse to processor or retail

Transport of meat or meat products from the slaughterhouse to the processor or the retail channel is undertaken by company-owned refrigerator trucks and/or by trucks of a commissioned 3rd party logistics company. Use of 3rd party logistic hampers the information exchange with the downstream partner. Therefore many of the companies examined have their own vehicles and transport organisation. For cold-chain transport vehicles are equipped with cooling systems to keep the temperature constantly between 0°C- 4°C. However, the companies examined indicated that improvements need to be made in the instalment and maintenance of temperature test equipment. Measurements are made on the water content in the meat against the standard level of below 77%. In case of water evaporation from fresh meat due to warming during the transport from slaughterhouse to processor or retail channel, the meat is treated under low temperature environment to lower down its temperature.

Procedures for fresh pork. The entire fresh meat slaughtering process consists of 18 procedures of quarantine and inspection. Quarantine involves e.g. detection on presence of any epidemic diseases. Inspection involves e.g. ruling out any quality defects such as waterlogged meat. The process is terminated with the sealing "Two Certificates and Two Seals" onto the finished fresh pork. This includes an approval certificate for animal products, a quality inspection approval certificate for meat product, a quarantine acceptance seal for animal products and an inspection acceptance seal for meat product.

Carcass weighing and quality assessment

Live pigs delivered to the slaughterhouse are kept in separation between 6 to 24 hours. No information was given on availability of water and food to the resting pigs. After killing, the pigs are weighted. Some companies indicated that they assess carcass confirmation and meat quality, but in general it can be said that Chinese slaughterhouses don't have an objective system to do so. Farmers or the middlemen are most often paid on carcass weight, but payment on live weight still takes place to suppliers from areas further away from the slaughter location. This is for the convenience of the suppliers as they usually leave immediately after they have brought the pigs to the slaughterhouse. In case of payments on carcass weight, there is low trust of the farmers and middleman in the weighing system of the slaughterhouse and together with the absence of a well established grading system, it leads to disagreement and to price discussions. The result is increased costs for the slaughterhouse due to an inefficient transaction. The deficiency in objective assessment of pork quality also gives rise to discussions between the slaughterhouse and the wholesaler, franchise agent or processor. Checks for lung-liver inspection are performed batch-wise by some companies. An industrialized feed and food company has a own testing centre with high-tech American and German equipments for detection of residues. Testing systems also have been imported from Europe. To increase slaughter quality and productivity many of the examined companies have imported processing lines from USA, Europe (Germany, Denmark or Holland) or Japan.

Future plans of companies in the processing and slaughtering industry

- 'Vierkantsverwaarding' is also an issue in the Chinese pork chain. Legs and offal run short and fillets and tenderloins are in excess. A large-scale slaughtering and processing company is looking for new PMCs which contribute to total valuation of the pig carcass.
- In their wish to become a registered food export business, a fresh pork chain operating company has plans to upgrade their slaughterhouse facilities. This includes improvement of the anesthesia technology through electric shocks and application of high quality cold chain technology. Joint research with universities will be carried out to improve their slaughtering technology. To have sufficient meat products to expand their distribution activities, they are focussed on purchase of legs and offal from strategic partners. They applied for a import license.
- Many of the examined companies are looking for technology and know-how to increase meat quality due to good handling of pigs before slaughter, optimal stunning of the pig (through electrical or gas stunning) and good handling of the carcass directly after slaughter. Also the topic of animal

[8] http://finance.sina.com.cn/stock/companyresearch/20070719/10423800922.shtml
[9] According to meat product and by-product processing monthly report 2006 VIII edition China Food Industry Association Statistics and Information Department

welfare arises in this issue. They stated that if Chinese slaughterhouses and processors want to achieve competitive advantage and export their pork products to foreign countries, they need to acquire international advance knowledge on how to improve the welfare and release stress of pigs waiting for slaughtering, through e.g. music or showering.

- Although a meat and meat products conglomerate is very strait that they do not have any plans to establish a new slaughter or processing firm in the near future, a industrialized feed and food company has planned to start a new slaughtering and processing firm in 2009 in Hunan province.
- An integrated shareholding company wants to introduce international advanced fresh keeping techniques and advanced packaging methods (air adjusted, vacuum and heat shrink, heat shaped extrusion and PVDC high barrier foil) to improve product quality and to create competitive advantage for their brand.

3.4 Pig procurement and transport to the slaughterhouse

Transport to the slaughterhouse

Transport of pigs from the production farms to the slaughterhouse is often undertaken by private truck owners or even by individual farmers themselves. Consequence is that one of the companies examined deals in total with more than 250 individual suppliers entering with their own trucks the company's premises. Open trucks are the usual means of transportation, not all of them being of superior quality. Besides, individual deliverer's vehicles are not for the sole purpose of live pig transportation, bearing the risk for cross-contamination threatening the health and safety of live pigs.

Pig procurement demands

In the process of pig procurement, the pig suppliers are required to provide the slaughterhouse with three types of certificates: (1) The 'pigs from non-epidemic region' certificate proving that there are no contagious animal diseases in the neighbourhood, by which the risk of spreading diseases through transport of live animals is excluded. (2) The 'quarantine approval' certificate proving that the pigs are healthy and inspected by the relevant authorities. And (3) The 'vehicle disinfection' certificate proving that the transport was disinfected at a veterinary station in the county before the first pigs were loaded. If any of these certificates is not shown, the slaughterhouse can refuse the acceptance of the live pigs. One of the companies requires also that their pig suppliers provide information on feed, health situation and lab testing reports (e.g. on clenbuterol). In practice, however, the main assessment of the pig suppliers often lies on transport distance, the guarantee of live pig quantity and on-time delivery. Some companies apply a more advanced evaluation system. A large-scale slaughtering and processing company evaluates every month their pig suppliers and perform an overall evaluation every year. In this yearly assessment they rank the suppliers and discriminate in treatments in relation to procurement time and ways of payment. A large meat based food company also selects its next year pig suppliers according to their performance in the previous year. An industrialized feed and food company has signed contracts with their pig suppliers and distribute an identification number to them. They pay them a higher than average price. About 50% of the contractors do supply to the company for more than 5 years.

Future plans of companies with regard to pig procurement and transport to the slaughterhouse

- The number of contacts with pig suppliers and the intervention of middleman is a burden for many of the companies examined. They want to reduce pig procurement from backyard farms. Focus is on direct contact and strategic alliances with professional and large-scale commercial farms or to develop upstream integration through investments in green field commercial pig farms. Next to security and stability in pig supply, it opens up easier possibilities for quality and safety assurance.
- To increase the quality of transport of live pigs and to reduce sanitary risks, two leading companies want to invest in special-purpose built vehicles. They aim at whole-course closed transportation of live pigs from the farm to the slaughterhouse.

3.5 Farming

Production farms

Backyard farms mostly keep 1 to 5 pigs. This type of farmers can be found in Middle, Western as well as the North Eastern areas of China. The production costs for unspecialized households are in general rather low due to low labour costs, low investment costs for housing since most pigsties are semi-open with mud walls, and low cost of feed. However the 2006-crisis in the pork industry has discouraged small holder backyard farmers to invest and to restock the farm. The input costs of pigs and feed were too high in relation to the output revenues, and the farmers faced adverse competition on labour costs due to their scale. Due to rapid economic development in East and South East areas of China, especially along the coast, pig production is much more specialized in these areas and larger scale farms can be found. Professional farmers have up to 1,000 pigs and use more advanced management practices, better swine breeds and higher quality feed. Although the government encourages the development of large-scale farms and new establishments of more than 10,000 pigs are announced, the proportion of producers with more than 1,000 pigs is still very limited. Generally speaking, decision makers of professional and large-scale farms do not directly participate in farm management, and the staff/employers of the farm are not allowed to make decisions. It is therefore hard for the companies examined to communicate and increase quality on the farm directly. They bypass this situation through the employment of specific professional

employees for on-site visits at production farms to monitor and control pig production and to examine quality and safety on the farms, i.e. on use of illegal medicines.

Middleman. The pork chain in China is fragmented and quite long due to the existence of middlemen, traders or agents in almost all stages of the chain. They are predominantly small private companies or individuals and are especially active in bridging pig producers and slaughterhouses, pig producers and feed producers, but also processors and small retail outlets. Main target group of middleman are small backyard farmers. For slaughterhouses or feed producers logistic costs are too high to deal with these farms directly. As middleman usually have more information, the farmers don't have much power in the transaction process. Therefore, in these local markets, competitiveness depends largely on low cost. Part of the large middleman developed their business to the wholesale market. They trade pigs to slaughterhouses, carcasses to processors, or cut carcasses to nóngmào markets and supermarkets.

Breeding farms

Breeding companies are often integrated with the farrowing stage of pig farming, especially in the professional and commercial large-scale pig production farms. China hosts a large number of breeding farms; 3,449 in the year 2004 (Huajing Tianzhong, ECC, 2006). Nevertheless, swine breeding among these farms are not given enough attention and thus registered with comparatively low production capacity (Huang Ruihua, 2008). The nursing period is often between 8 to 9 weeks until the piglet weighs about 20-30 kilograms.

As confirmed by a government notice of August 22, 2000, about 20 pig breeds were under then national protection. For example, Taihu Pig of which Meishan is one of the types, or Jinhua Pig with a white body and a black head and hind, leading to the common name of "two-end-black". The back and loins are slightly curved. The breed is especially noted for its thin skin, fine bones and tender meat. After special processing, 'Jinhua ham' is favored for its attractive flavor and rosy color and it has a high reputation in the international market. Jinhua pigs are early maturing and may be mated as early as 3 to 4 months old. They are fairly prolific with an average litter size of 13 and seven pairs of teats (Wu, 2006).
To increase quality and productivity of farrowing sows, the companies examined import foreign pure-bred lines. They apply two and three way hybridization schemes with national breeds on the pure-bred lines, to make the crossing fit for the Chinese consumer market. A fresh pork chain operating company is elaborating plans to outsource their breeding activities. That had invested in a self-breeding-self-production unit supplying 15,000 pigs to their own slaughterhouse, but don't want to invest further in it due to too large investments. Therefore, they contract breeders who are trained in health management and sell the high quality breeding stock to the company's pig suppliers. It will decrease their operation costs and increase their own pig production capacity.

Veterinary services

The veterinary service system is built on a hierarchy of five levels, from the top Bureau of Veterinary under the administration of Ministry of Agriculture down to the county or township establishments. At county or township level, a local animal husbandry and veterinary station is the major framework of the veterinary system. They are responsible for disease control, vaccination and consultancy service to the pig producers. The veterinary system in the other four layers is composed of administrative institutions, administrative executive units and technical supporting units. The total number of veterinary employees sums up to about 420,000.
Despite the established extended veterinary service system, many of the companies examined experience a lack in the independent monitoring and auditing system for quality, safety and health. Large-scale farms and/or slaughterhouses therefore have stationed veterinarians in their companies for specific health management on the production farms. Nevertheless, the knowledge level of veterinary service is still not optimal. Misdiagnosis, excessive use of drugs and inadequate quality and amount of vaccine administering happen. Difficulties also exist with the veterinarians' decision-making regarding the waiting times to be applied before a medicated pig can be send to slaughter. Absence of a quality system for veterinary services contributes to this. On the other hand, own veterinarians stationed on-site in the company's slaughterhouse are assumed to be capable of assessing

whether drug residuals have been excreted through normal physical digestion and whether the pig is healthy for market release.

Identification and registration

Since July 2006, identification of pigs is obligatory. Each animal should now have an ear label, instead of only vaccinated pigs under the former regulation. The label, often ear notching, should enable tracking of the pig back to a farm. In view of the overwhelming number of backyard farms, the regulation is expected to be only suitable for professional farmers and large-scale commercial farms.
Breeding farms are already familiar with ear notching for a longer time. They use it for identification in record keeping of breeding sows. However, problems with ear biting impair the practical implementation of the system.

Future plans of companies with regard to farming

- The production skills of Chinese pig farmers are relatively low. A well known feed enterprise and a integrated shareholding company both have plans to provide technical support to farmers to increase their skills. This also benefits the image of the company and in the long run increase its market share.
  Data recording on the production farm to monitor production improvement is part of the support.

3.6 Feed manufacturing

China is the second largest feed producer, and it's feed production accounted for 1/8 of the world's total feed output. Energy-based feed stuffs are for the majority produced locally. But, protein-based feedstuffs as soybean and soymeal are for the majority imported, making China the largest soy importer worldwide. Imports account for one third of all global soy imports (Rabobank, 2007; Rabobank, world map).
Only 40% of the total feed demand in China is provided by commercial feed companies, indicating large opportunities in expansion of feed production. In 2006, China hosted 15,518[12] feeding companies. Among them, pork feed companies accounted for 36%. The top ten companies have a 25% share in pig feed production (Tao, 2007). Equal to feed companies in Western countries, they produce three kinds of feed: compound feed, concentrated feed and additive premixed feed.
Commercial large-scale farms usually use compound feeds, and professional farmers or backyard farms use the other two feed types to mix it with their own grain stuffs (Bean and Zhang, 2007). All feed is sold and transported in bulk bags. Feed silos are unknown in China.
The top feed companies sell their feed for the major part through feed distributors. The main end users of feed distributors are backyard farms and smaller professional farms who lack in planning and make orders of distributors unpredictable for the feed producers. Since 2006, distributors have more open accounts to pig farmers due to the higher volatile pig market and the changing structure of the pig sector, which negatively influences the liquidity of the top feed companies. Therefore feed companies are trying to shift to direct sales to large-scale farms. The transaction with distributors is changing from only sales to sales including service.
Feed costs account for 70-80% of the production costs. Productions farms are therefore very sensitive to feed prices and especially back yard farmers focus in their feed supply only on price. This to some extend influences the innovation of feed manufacturers in developing feed varieties to provide higher-standard nutrition for pigs, resulting in that China does not have a large market for high quality feed yet.
Feed producers are subject to the application of GMP. The local animal husbandry bureau and quality supervision bureau conduct irregular inspections and audit feed companies, to make sure that the feed produced does not contain harmful ingredients and that the product label truly reflects its ingredients. To increase feed quality and factory productivity some of the companies examined have imported feed formulation systems.

Future plans of companies with regard to feed manufacturing

- Processing costs in the feed factory are high due to quick aging of equipment and subsequently high

[12] http://www.chinafeed.org.cn/cms/_code/government/itemdetail.php?column_id=121&item_id=85477

maintenance costs. Investments in durable feed processing equipment is foreseen by a well known feed enterprise.

- To establish further integration, a processed pork chain company wants to expand the cooperation with (or integration of) small and medium sized feed producers. They aim at the development of higher quality feeds.
- A leading integrated slaughtering and processing company will build affiliated feed production factory to produce self-made feed. They want to save costs on feed purchasing.

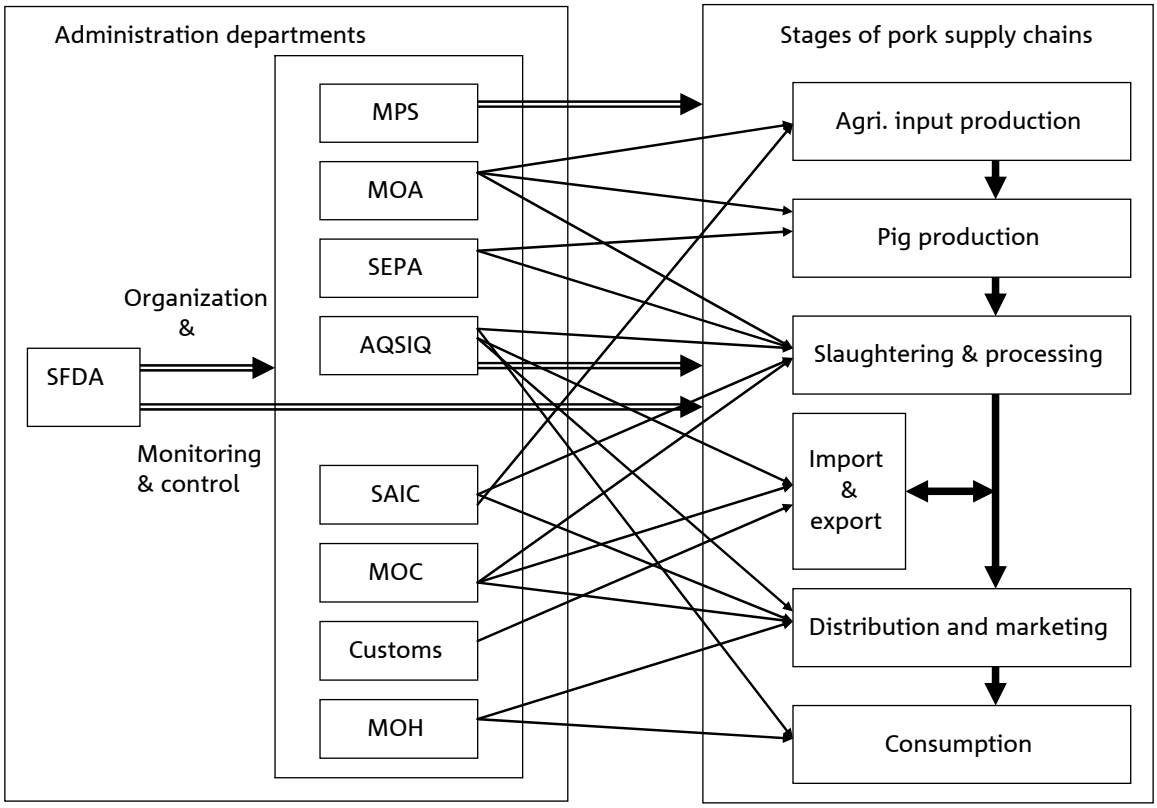
3.7 Food safety and quality in the pork chain

Pork safety and quality is becoming the main concern of Chinese consumers in purchasing pork products. A consumer survey carried out by Wu (2006) to 650 consumers in Sichuan province in the summer of 2005 indicated that 77% of the respondents had 'great worries' or 'worries' about pork quality and safety. Only 3.6% of the respondents indicated 'not worried'. The result showed that drug residues, biological pollution and water-logged meat are major factors affecting consumer's perception of pork quality and safety (table 3.2).
Due to food safety incidents in recent years, the Chinese government has attached special attention to the establishment of legal systems and government agencies responsible for food quality and safety. Figure 3.2 shows the institutions directly involved (Wu, 2006; Han, 2009). The figure clearly indicates the overlapping functions between the administrative departments in managing pork safety and quality. It bears the risk that too many departments are involved are no department is involved if necessary. Or, as one of the experts said "everybody's business is nobody's business". The government has stated to install an umbrella organisation to direct quality and safety issues.

Table 3.2: Factors affecting consumer's perception of pork quality and safety. Survey to 650 consumers in Sichuan province. Source: Wu, 2006.

Factor (max. 3 answers)	Frequency	Percentage (%)
Drug residue (e.g. antibiotics)	407	22.3
Biological pollution	407	22.3
Water injection	351	19.3
Heavy metals	278	15.2
Chemical pollution (e.g. Clenbuterol)	134	7.3
Others	204	11.2
Total	1824	100.0

Figure 3.2: Administration agencies involved in food quality and food safety monitoring



Quality and safety management

The members in the different stages of the chain all follow to a certain extent quality standards, however, the degree of quality awareness is different. According to one of the companies examined, the members of the pork chain who are in a weak position with regard to quality and safety management are producers (including breeders), veterinary services, live pig transporter and the retailer. Lack of quality standards in some stages tend to result in ineffective guarantee of quality and safety. The company indicated that efforts are needed from governmental authorities, the sector and enterprises to enhance the awareness of quality and safety management and work out a set of practical, measurable and traceable standards.

The major quality management systems used in the pork chain in China include the internationally practiced quality schemes GMP, HACCP, and the ISO 9000 series. The application of GMP is compulsory for the veterinary medicine and feed companies. HACCP and ISO are voluntary. The percentage of pork slaughtering/processing companies with HACCP and ISO 9000 series certificates is still limited. In a 2005 survey into 218 pork processing companies, only 30% companies had applied HACCP system and 40% ISO system (Han et al., 2006). The companies examined apply periodical training of their staff on quality and safety. Manuals are available. But for a large share of the staff it is difficult to meet the increasing demand on the upgrading of quality and safety management, and the required data and information recording. This poses a great challenge to the training of employees.

Food quality standards

Since 1999, the Chinese government has invested 30 million RMB every year for setting up or improving standards of agricultural products. Three types of quality standards exist, namely 'pollution-free food', 'green food' and 'organic food'. The quality standards for pollution-free are compulsory for all agricultural products in China, although not all producers comply with it. It was launched by MoA in 2001. Green food has two different levels: Green A and Green AA. Green AA food standards can be seen to be equal to organic food standards. The objective of the development of green food quality standards is to protect ecological environment, upgrade agri-food quality and increase export of agricultural products (Lu, 2006). With an annual turnover of more than 10 billion $, the export value reached 1.25 billion $. In 2005 the number of certified green food products reached 7,117 of which 461 reached the green AA standard. Less than one percent are green A or AA pork products being produced by 10 different companies. Up to the end of 2004, there were altogether 588 certified organic food products. Among these products, the export products accounted for 35%. Livestock products only accounted for 5.3% (Wu, 2006).

Future plans of the companies with regard to food safety and quality

- One of the companies examined promotes organic production through a demonstration farm. Organic products are, however, not in their future product portfolio due to too small sale volumes. A leading integrated slaughtering and processing company is just challenged by this upcoming market segment and is planning to shift its focus to organic pig production.
- The huge development in information technology that has taken and still is taking place in China, has partly passed by at the agricultural sector. Although it has to be said that the current situation is already what couldn't be imagined 10 years ago. There is a very strong demand from the slaughter and processing companies for information technology which can support traceability along the whole pork chain. Two of them, a large-scale slaughtering and processing company and an integrated shareholding company want to apply Radio Frequency IDentification technology (RFID) to improve their information management system with regard to safety and quality of meat.
- Laboratory facilities supporting quality and safety control are available for a fresh pork chain operating company, but seemingly not in full use. They want to reinforce it upstream.

3.8 R&D and innovation in the pork chain

The development of companies in the pork chain is heavily depending on policies of the government. One policy is that companies are required to apply together with universities and research organisations for financial support with regards to innovation projects. Knowing that about 75% of the companies do not have their own R&D, there is also a need to apply for research together. Complaint of companies is that universities don't know the real situation of the sector. So research is not focussed and far from applicable for the company. Another problem is the shortage of professionals in R&D. Adding the overall poor quality of the labour force in feed mills, on farms, in slaughterhouses or in processing firms, quality of staff is seen as the biggest threat for pork chain innovation.

3.9 Information management and exchange in the pork chain

There is an increasing awareness in the use of information in the chain. However, information systems are comparatively well established in the downstream chain, e.g. in slaughtering and processing, while weaker systems are witnessed in the upstream pork chain e.g. in transportation, production and veterinary services. Upstream information exchange needs to be settled with focus on completeness and accuracy, while downstream information exchange can still be improved on timeliness and user-friendliness to stimulate usage. Due to the limited scale of the upstream pig producers, the development of a management information system in this stage is falling far behind and not expected to

improve in the near future. There will be a greater demand in the downstream companies to achieve real-time information exchange with their upstream suppliers. They will gradually march on the road of modernized logistic management, including e-commerce.

Future plans of the companies with regard to information management and exchange

- A processed pork chain company wants to strengthen the use of information technology in the upstream chain, push ERP utilization in the whole chain and transfer to E-commerce.

3.10 Performance in the pork chain

Performance indicators

The performance indicators being used by certain chain members have consequently changed the past five years. The dominant use of quantitative financial indicators is gradually transferring to the use of a combination of financial and non-financial indicators in the field of efficiency (energy consumption, utilization of production capacity), quality (meat quality and safety, costumer complaints), flexibility (in e.g. volume) and responsiveness (product availability, product range). The transformation to non-financial indicators is still a challenge. In the abundance of non-financial indicators, it is hard to focus and the companies can't see the wood for the trees. Also, in practice, many of the examined companies still act strongly cash-driven and are influenced for their future plans by market prices of pigs, meat and feed. High prices sometimes result in an immediate stop of investments.

Production costs

The production costs on pig farms have increased extensively in the last years. Factors contributing to the increase were mainly feed costs and labour costs. As feed inputs accounts for 70-80% of the total costs, the rapid increase in feed prices in the past years had a high impact on production costs. The examined companies indicated that labour wages are increasing up to 20% per year. The increased costs are partly compensated by an increased wholesale price of pork (figure 3.3). It is expected that both pig cost and pork price will continue to increase in the future to a certain limit, also due to the increasing demand of consumers for quality and safe pork and the upgrading of the industry. If costs and prices arrive above a certain level, they will be mitigated under the macro-control of the Chinese government.

Value chain analysis

In 2008 a survey was conducted by the Rural Economic Research Centre of the Ministry of Agriculture to provide information on the costs and benefits of two pork chains:

a. pig production → procurement and → transportation → slaughtering → wholesale → nóngmào market
b. pig production → procurement and transportation → slaughtering → supermarket

The survey was carried out for the example of pig supply to Beijing from Hubei province. The transport distance is about 150 km and pigs are delivered to the slaughterhouse at 100 kg live weight. The costs and benefits for the various stages in the value chain are represented in table 3.2 and Appendix B.

3.11 Governmental policies

Long term objective

In the 11th five year plan, the government has set out it's goals for agricultural products. In relation to pork it is predicted that in the future the demand will grow and that only 800,000 tons the total output of pork will be available for export, indicating a goal of almost being self sufficient in pork supply. Two third of the pigs will by 2015 be grown by large scale operations, part of them being non-polluting production systems. The quality of pork will by that time be evidently improved due to the completion of a safety control and inspection system. To secure the supply for the increasing demand in quantity and quality of pork, the production chain needs to be improved. The plan is to construct four advantages zones fulfilling the

Figure 3.3: Monthly wholesale prices of pigs, pork (left ax) and corn (right ax) in 2007 and 2008 in Chinese Yuan per kilo.

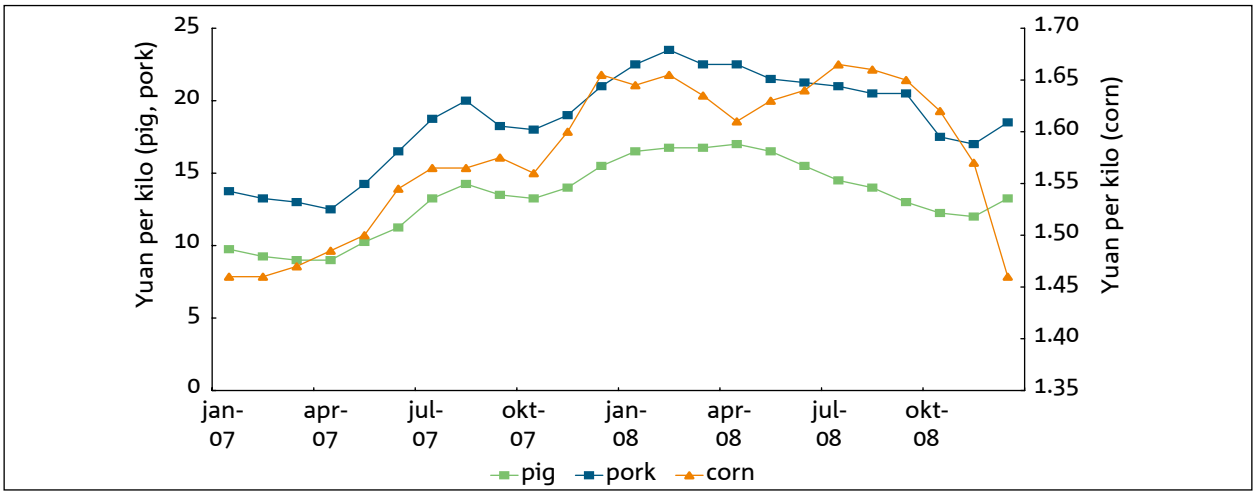


Table 3.2: Cost and benefit comparison of two pork chains, for period March 2008 and region Beijing (Jiang and Han, 2008).

Chain a (nóngmào market as the retailer)			Chain b (supermarket as the retailer)		
Cost per head					
	Absolute (¥)	Relative (%)		Absolute (¥)	Relative (%)
Pig production	1332	94.6	Pig production	1332	86.9
Procurement and transport	1714	1.0	Procurement and transport	1714	0.9
Slaughtering	1744	2.5	Slaughtering	1818	7.1
Wholesale	1474	1.0	Supermarket	1639	5.1
Nóngmào	1517	1.0			
Benefit per head					
Pig production	1700	81.6	Pig production	1700	69.9
Procurement and transport	1721	2.0	Procurement and transport	1721	1.3
Slaughtering	1761	3.8	Slaughtering	1860	8.0
Wholesale	1504	6.4	Supermarket	1748	20.8
Nóngmào	1547	6.0			

needs:

- The Northeast zone will have the task to develop large-scale pig farming projects in order to ensure the supply to Beijing, Tianjin and other large and medium-sized cities.
- The Central zone needs to focus on developing healthy farming and to enhance stability in pork supply.
- The Southwest zone will be involved in developing various types of ecological and large-scale pig farming systems to broaden the market.
- The Coastal zone have the function to develop the modern pig farming to ensure a certain degree of self-sufficiency rate within the zone.

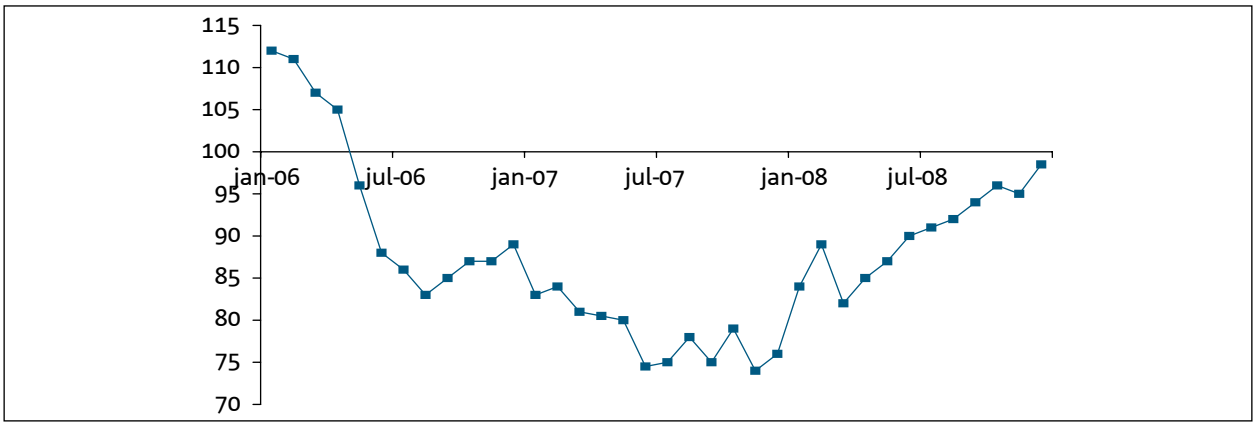
Despite the good general policy of the government, the companies examined struggle with the practical implementation of it. They experience a lack of specific policy support to innovate and guarantee e.g. quality and safety of meat and meat products.
Some of the examined feed companies and some slaughter/processing companies perceive an unfair competition in the pork production chain. With legislation not well established for the pork sector, regional difference in the enforcement of laws and regulations and gentle punishment of unlawful acts and, illegal actions and existence of illegal slaughterhouses are not banned yet. Also opportunistic or even dishonest behaviour and blackening of names happens.

Temporary extra promotion of pig farming

In 2006, due to disease outbreaks and high feed prices, pig producers stopped production and pig supply was in shortage for the first time in the last decade (figure 3.4) On July 30, 2007, the State Council released measures to promote pig production and stabilize market supply. Local authorities, local credit and insurance organizations, and local banking and finance institutions were assumed to elaborate plans, services and support for the development of large standardized production farms or production zones. Central and local governmental subsidies were made available to the upstream part of the pork chain, mainly focusing on production and restructuring of the sector:

- The purchase of sows was stimulated through a

Figure 3.4: Live pig supply index. Values below 100 indicate lower supply than consumption demand and values above 100 indicate higher supply than consumption demand (after www.soozhu.com).



subsidy of 50 RMB per sow; 30 RMB from the central government and 20 RMB from the local government.

- With the blue ear disease not yet under control, it was possible to take out an insurance on sow mortality for 60 RMB per sow, concerning an imbursement of 1000 RMB for each sow which died. Of this 60 RMB the producers needed to pay 12 RMB per sow. Local and central governments paid the remaining 48 RMB.
- Financial support was available for construction of new breeding farms to a maximum of 2,000,000 RMB per farm. For new sow reproduction farms a maximum of 1,000,000 RMB was available. Enlargement of existing farms was supported according to the size of the farm (table 3.3).
- Support was provided to slaughtering and processing, in order to consolidate the sector. The support varies between provinces or local municipalities. For example, in Nanjing area any slaughterhouse which merged with another one or was closed down by the local government, received a subsidy of 100,000 RMB by the municipal government. Governments also invested in modern equipment for pig slaughtering.
- Free vaccines were provided to the pig producers for blue ear disease, but also for other epidemic diseases, such as foot and mouse disease or swine fever.

The advantage of being a dragon head

In the desire of China to present leading, large-scale agribusiness firms as an example to the general public, the Chinese government conducted in the nineties a extended study over companies in the pork chain. Companies could apply themselves to be incorporated in the study, but finally the central, provincial or local government decided about the designation of being a dragon head company or not. Enterprises were marked as dragon head either because of their economic strength, operation scale, level of technology and management and their potential to improve farm incomes. The firms agree to develop production or marketing systems for local farmers – systems that include market access, technology, technical assistance, credit and other inputs. In exchange for their role in rural development the dragon-head firms receive support and other privileges from all levels of government and, since 2002, financing from the Agricultural Development Bank of China (Guo et al 2005). Management decisions of the dragon head companies, therefore, resemble to reflect governmental development plans for the pig production chain. A dragon head company nowadays has the public image of being a large and trustworthy company.

Table 3.3. The subsidies for swine production (Source: Farmers Daily, Dec. 4, 2007)

Pigs raised per year	Subsidy(1,000 RMB)
300 – 499	100
500 – 999	200
1,000 – 1,999	400
2,000 – 2,999	600
More than 3,000	800

4. Attractiveness of the pork production chain

China faces the coming years an increase in pork consumption and a grow in safety requirements of pork products. Companies in China's pork chain are motivated in their strategic plans by these developments and want to increase the quantity and quality of the annual output of meat products, pigs or commercial feed. While The Netherlands is just known for its highly skilled firms, farms and professionals in the pork industry, the Chinese plans imply excellent business opportunities (but also threats) for Dutch agribusiness. Opportunities exist in the fields of information technology to support tracking and tracing in the chain; advanced fresh keeping techniques and packaging methods; technology and know-how to improve meat quality on-farm, pre-slaughter and post-slaughter; high quality transport of live pigs; supply of breeding material; sales of farm equipment to greenfield large-scale farms; high quality feed manufacturing and feed formulation; training of university staff, dealers or farm employees on live pig production; and projects to secure feed and food safety in the production chain.

4.1 Opportunities for Dutch agribusiness

To capitalize opportunities in China's pork chain, it is highly advisable to be physically present on Chinese grounds and not to rely only on import of products into China. Depending on the commodity this means either having an own production base in China with Chinese staff, having a share in a Chinese company or having a representative office with Chinese staff. First, while the dimension of physical trade of products from The Netherlands to China is limited in comparison with the demand due to the projected expansion of the production chain taking place in China. Second, while only companies with a Chinese business registration can access the subsidies made available by the Chinese government to stimulate the expansion of and investments in the Chinese pork chain. And in practice only Chinese know when, where and how to secure these subsidies. Part of the information stays unknown to foreigners and/or they lack the network to be on the right place at the right moment. A national regulation on merges and acquisitions forbids foreign investors, however, to gain a monopoly position in the mainland market of China.

Opportunities in information technology within the chain

- To support product traceability along the whole chain, Chinese processing and slaughtering companies are in need of information technology. Specific reference has been made by them to Radio Frequency IDentification technology (RFID). Companies providing these technologies and/or slaughter companies with a proven track record in this field are appealing business partners for the Chinese companies.
- To increase the annual output of pig farms, it is a prerequisite to know current production levels and monitor developments on a regular and preferably automated base. Dutch software companies have a chance to introduce data recording systems on professional and large-scale farms and, if infrastructure on hand, to extend these systems to data exchange systems along the production chain.

Opportunities in processing and packaging

- Distribution of freshly slaughtered meat products is slowly shifting from nóngmào markets without cooling facilities to supermarkets with pre-packed meat. Therefore, the companies interviewed have interest to apply high quality cold chain technology and expressed a need for international know-how on advanced fresh keeping techniques and packaging methods.
- Although the market segment of further processed or convenience pork products is small in China, it offers opportunities for Dutch agribusiness. Chinese companies want to become more active in this market, but lack the competences to do effectively.

Opportunities in slaughtering (equipment) and meat sales

- Meat consumption in China is for the majority based on non-processed fresh, chilled and frozen meat and this will stay so in the future. To secure supply of parts such as legs and offals, some companies in China's pork chain apply for import licences to source it from the international market.
- Meat quality is becoming more important in Chinese slaughterhouses, especially meat quality influenced by handling of pigs pre-slaughter, the stunning technique and handling of the carcass post-slaughter. They are looking for international advanced technology and know-how to upgrade their slaughterhouse facilities to improve these processes. All in order to achieve competitive advantage and to be able to act on the world pork market.
- In relation to the foregoing, many slaughterhouses don't have a grading system and the infrastructure to measure and monitor meat quality traits such as lean meat arising from on-farm influences like breeding and feeding. It is therefore hard to establish payments to farmers on quality and direct meat quality to desired levels. Opportunities exist for Dutch equipment companies to provide the technique and infrastructure, being most easy in planned new to

build facilities of top slaughterhouses and processing companies.

Opportunities in live pig transport

- The usual means of transport of live pigs from the farm to the slaughterhouse are open trucks, not all of superior technology or high hygienic standards. To reduce sanitary risks and to increase transport quality (e.g. reduce broken legs and so on to minimize number of animals unfit for slaughter), two leading companies want to invest in special-purpose build vehicles according to international standards.

Opportunities in breeding

- There's an ongoing demand for foreign robust, high proliferative breeding stock. Most of the companies involved in pig farming do import or are interested to import pure-bred female lines, but apply themselves two way and three way hybridization to fit the product to the Chinese consumer market. However, they become more aware that breeding bears a higher financial risk than production farming and that it requires specific skills. Outsourcing of breeding is therefore considered by some companies. Breeders who are trained in production management will be contracted, and a subsidiary of the company will sell the breeding stock to their own pig production bases or external pig farms.

Opportunities in farm design and farm supplies

- There are sincere intentions of leading pork production companies to expand in green field professional and large-scale pig farms. Next to this, also non-agricultural companies have announced to step into pig farming out of dissatisfaction with current quality and safety levels of Chinese pork. The companies are interested to implement high-technological housing, climate, feeding or manure treatment equipment to create an environment to realize high productivity and efficiency. They are sympathetic towards contracting international expertise to advise on farm design and farm management. It has to be kept in mind that the published intentions often finally result in practice to projects smaller in size.

Opportunities in feed manufacturing

- In general, feed manufacturing companies often have old, severely repaired equipment or equipment subject to wear out rapidly. To be able to produce high quality feed for the top production farms, the leading feed companies are considering to invest in durable feed processing technology and equipment. Feed equipment supply companies do have a business opportunity here, but it concerns only a small market.
- The development of high quality or innovative feeds provides opportunities for Dutch companies to sell feed formulation systems and provide subsequent know-how on feed resources.

Opportunities in knowledge transfer and consultancy

- Safe feed and safe food is a hot issue for all animal production chains, especially after the melamine incident in the dairy production chain. There are opportunities for Dutch agricultural consortia to initiate or participate in large-scale projects to ensure feed and meat safety in the Chinese pork chain and to advertise the Dutch high level standards on these aspects. An example project is wide application of GMP^{+}.
- There are opportunities for Dutch educational and knowledge transfer organisations to upgrade basic production skills on farm level through either (1) training and support of large-scale farmers, (2) training of dealers, advisors, salesman within agribusiness companies who train and advise the farmers, or (3) training of staff of universities to improve the curriculum and the competences of animal science students.
- Specific opportunities exist for pharmaceutical companies in training on animal health issues and sales of related remedial products.
- Although consumption of organic products is still rather low, with increasing quality and safety concerns of Chinese consumers, organic or partly organic-based products do have the interest of some processing companies. Dutch consultancy and knowledge transfer organisations can have added value to these companies and provide them with know-how on organic farming equalling the IFOAM standards.

4.2 Drawbacks and risks for Dutch agribusiness

Although many opportunities exist in China's pork chain, Dutch agribusiness has to be aware of the drawbacks and risks in doing business in China. They are associated with social, technological, economic, environmental and political circumstances. In the following paragraphs some major risks utterly without pretension to be complete.

Sociological and cultural drawbacks

Some of the opportunities in the Chinese pork chain are not easy to realize for Dutch agri-business, because of a higher standing of other foreign countries in the eyes of the Chinese. Companies are occasionally prejudiced towards e.g. the U.S.A. or Denmark, not necessarily on the grounds of the quality of agribusiness firms in these countries but rather on grounds of better marketing of these countries in China. It is therefore a challenge for Dutch agribusiness to jointly promote their high quality products and know-how in order to market and sell 'Nederlandse waar'.

Not only a drawback but a serious threat for doing business in China is the creative mind of Chinese and their mind-set of 'I can do it myself much cheaper'. Examples of creative thinking and handling (or even to our opinion malversation or fraud) are e.g. sales of non-selected breeding material on an alternative market

or e.g. application of duffle coat repairs to equipment which finally hamper the functionality and effectiveness of it.

Technological risks

Despite the vast progress in infrastructure and high-tech solutions that has taken place in China, the agricultural sector is relatively down in fields like application of high-tech equipment, logistics and information technology. This bears a risk for some of the business opportunities mentioned in paragraph 4.1. Good intentions result sometimes in bad enforcement. E.g. ear notching is often used for identification of pigs. However, problems with ear biting impair the practical implementation of a data recording system on farm and a tracking and tracing system along the chain. Also, the agricultural production chains face low mechanization and automation of feed distribution. No bulk vehicles are deployed in the distribution of feed from the factory to the farm; bags up to 70 kg each are used. Furthermore, in many feed factories outmoded equipment or equipment subject to wear out rapidly is used, resulting in high or recurring investments.

Economic risks

Chinese are cash-driven. Companies within the pork chain barely judge investments on cost-effectiveness or on rate of return. At times of low cash-flows it occurs that investment projects are temporary brought to a halt or even totally cancelled. Dutch agri-business can therefore be confronted with an annulment of a (signed) contract. Also backyard and small professional farmers focus only on price in their supply of equipment and feed, the more so since due to their low production skills they have low alternative opportunities to increase cash. They make e.g. feed orders unpredictable and influence planning at the factory negatively.

Political drawbacks

Many Chinese companies perceive an unfair competition amongst themselves. First of all, regional differences in the enforcement of laws and regulations exist. The easiness of doing business in China's pork chain is therefore depending on the region. Second, unlawful acts were in the past sometimes punished gently by the government, although with the recent food scandals this diminishes rapidly.

The development of companies with regard to guaranteeing the quality and safety of meat and meat products is heavily depending on policies of the government, but the companies perceive a lack of specific policy support in slaughter and processing innovation. The good intentions of the Chinese government misfire in practice. The more since many governmental departments are involved in food safety and quality management without a clear division of responsibilities. This contains the risk to arrive at an impasse or a rigid situation with no progress.

References

Bean, C and J Zhang. 2007. People's republic of China, livestock and products semi-annual report. USDA Foreign Agricultural Service. GAIN Report Number: CH7014, 3/1/2007.

China Statistical Yearbook. 2007. National Bureau of Statistics, China Statistics Press, Beijing, P.R. China.

Euromonitor International. 2006. Packaged food in China. Country Report.

Fabiosa, JF, Hu, D and C Fang. 2005. A case study of China's commercial pork value chain. MATRIC Research Paper 05-MRP 11, Iowa State University, August.

Guo, H, Jolly, RW and J Zhu. 2005. Contract Farming in China: Supply Chain or Ball and Chain? 2005 World Food and Agribusiness Congress, 25th-28th June 2005, Chicago, USA. www.ifama.org/tamu/iama/conferences/2005conference/papers&discussions/1151_paper_final.pdf

Han, J. 2009. The Chinese pork sector. In: European pork chains. Diversity and quality challenges in Consumer-oriented production and distribution. Trienekens, J, Petersen, B, Wognum, N, and D. Brinkmann (Eds.). Wageningen Academic Publishers, Wageningen. p. 213-231.

Han, Y and T Hertel. 2003. The Puzzling State of China's Meat Trade. Choices, American Agricultural Economics Association, Second Quarter 2003, p. 11-16.

Huajing Tianzhong, ECC, 2006. Research report on the development of China's meat sector.

Huang Ruihua. 2008. Personal communication.

Longworth, JW, Brown, CG and SA Waldbron. 2001. Beef in China: agribusiness opportunities and challenges. University of Queensland Press, St. Lucia, Australia.

Lu, H. 2007. The role of guanxi in buyer-seller relationships in China. A survey of vegetable supply chains in Jiangsu province. Wageningen University Dissertation. Wageningen Academic Publishers, Wageningen, The Netherlands. 252 pp.

Price Survey Beijing, 2006

Rabobank, 2007. China's Animal Protein Sector. Challenges and opportunities of meeting demand growth. Rabobank International Food & Agribusiness Research and Advisory. 40 pp.

Toa, Y.S. 2007. Current situation and the future of China's feed industry and the effect of bio-energy sources to feed industry. Fourth IMS World Pork Congress, 14th-17th September 2007, Nanjing, P.R. China. www.worldporkcongress.com/report_download.asp.

Wu, XM. 2006. Studies on the pork quality and safety management systems in China. PhD-thesis, April 2006, Zheijiang University, P.R. China.

Zhou, G. 2006. The changing dynamic in China: The Development of meat industry and consumers. Presentation at World Meat Congress, 28th April, Brisbane, Australia. www.2006worldmeatcongress.com.au/presentations.

Appendix A

Figure A.1: Volumes of imports into China in 1,000 metric tons, ordered by country. Source: TradeSTAT.

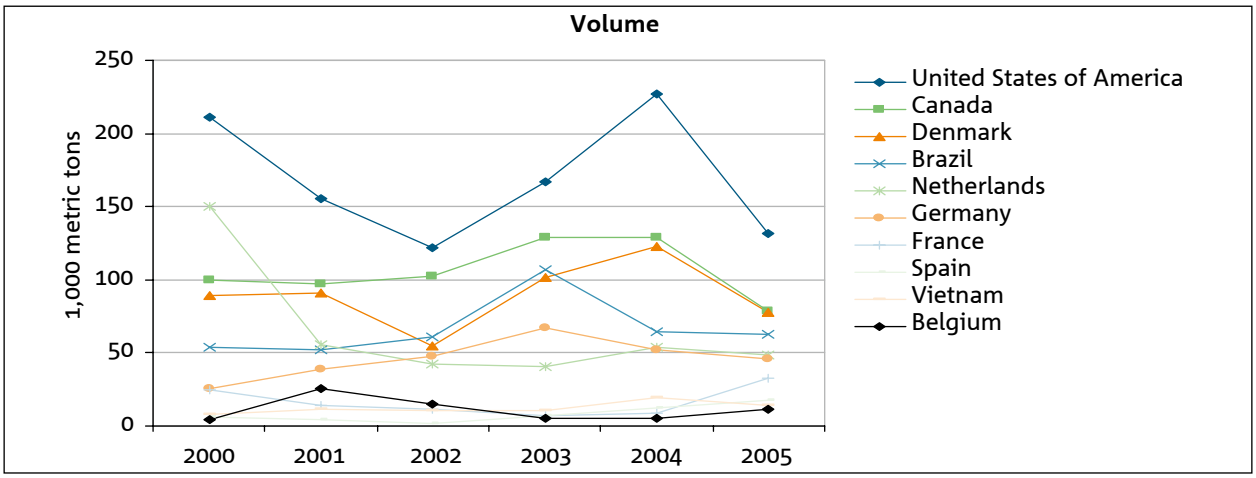
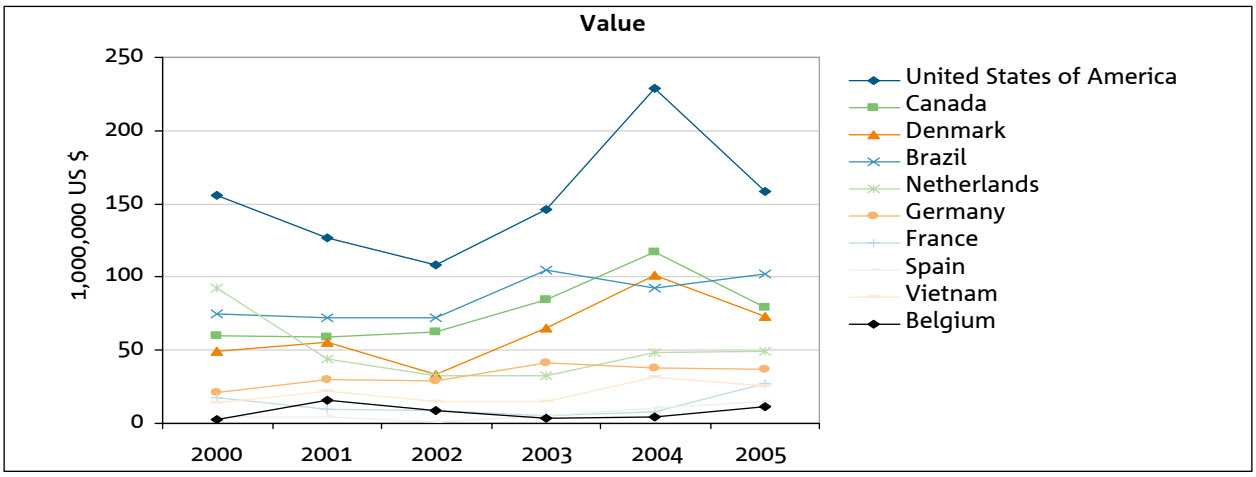


Figure A.2: Value of imports into China in 1,000,000 US dollars, ordered by country. Source: TradeSTAT



Appendix B

Cost and benefit of major stages of the pork chain according to Jiang and Han, 2008.

The survey was conducted by the Rural Economic Research Center of the Ministry of Agriculture on March 13-16, 2008. The investigators followed the process of two pork chains:

a. Pig production → procurement and transportation → slaughtering → wholesale → nóngmào
b. Pig production → procurement and transportation → slaughtering → supermarket

The survey was carried out by interviews, meetings and inquires of the relevant informants. The survey was focused on the hogs supplying from Baoding, Hubei province, to Beijing (distance: 146 km). The sample of pigs will take 100kg/head as an example. The survey is very informative with regard to the distribution of cost and benefit. It can however only be used as a reference as it is restricted to the specific area of China and a specific time period of the year.

Table B.1 Cost and profit in pig production stage (chain a and b)

	Items	Year of survey	Previous year	Growth compared to the same time (%)
Total cost (Yuan per head)		1332.1	823.5	61.76
	Piglet cost	450	200	125
	Feed cost	697.1	457.25	52.45
	Electricity	6.25	6.25	0
	Vaccination	40	40	0
	Labor	106.25	87.5	21.43
	Depreciation of fixed assets	20	20	0
	Land lease fee	12.5	12.5	0
Total income (Yuan per head)		1700	640	165.63
	Sales price (Yuan per kilo)	17	6.4	165.63
	Weight (kilo)	100	100	
Net profit (Yuan per hand)		367.9	-183.5	300.49

Table B.2 Cost and profit in hog procurement and transportation (chain a and b)

	Item	Year of survey	Last year	growth compared to the same time (%)
Total cost (Yuan per head)		1713.56	652.94	162.44
	Procurement price (Yuan per kilo)	17	6.4	165.63
	Weight (kilo)	100	100	
	Quarantine fee	2	2	0
	Express way fee	0.8125	0.6875	18.18
	Vehicle rent fee	6.75	6.25	8
	Introduction fee[13]	4	4	0
Total income (Yuan per head)		1720.64	669.8	156.89
	sales price (Yuan per kilo)	17.35	6.8	155.15
	Weight (kilo)	98.5	98.5	
	Subsidy	11.67		
Net profit (Yuan per hand)		7.08	16.86	-58.02

Note: During transportation from Baojing to Beijing, the hogs will lose some weight; usually a hog per 100 kg loses 1.5 kg.

[13] This cost is paid to the middlemen. Usually the slaughterhouse is not willing to cooperation with the individual hog producers (backyard hog producers due to high transaction cost). Therefore the middlemen get the introduction fee by telling the hog collection agents the sources of hog supply.

Table B.3 Cost and revenue in hog slaughtering & processing (to wholesale market) (chain a)

	Item	Year of survey	Previous year	growth compared to the same time(%)
Total cost (Yuan per head)		1743.98	704.8	147.44
	Procurement price (Yuan per kilo)	17.35	6.8	155.15
	Weight(kilo)	98.5	98.5	
	Processing cost	25	25	0
	Management cost	10	10	0
Total income (Yuan per head)		1760.95	746.44	135.91
	Sales price (Yuan per kilo)	20.6	7	194.29
	Carcass[14] weight(kilo)	70.92	70.92	
	Other income	300	250	20
Net profit (Yuan per hand)		16.97	41.64	-59.23

Table B.4 Cost and revenue in hog slaughtering & processing (to supermarket) (chain b)

	Item	Year of survey	Previous year	growth compared to the same time (%)
Total cost (Yuan per head)		1817.98	760.8	138.96
	Procurement price (Yuan per kilo)	17.35	6.8	155.15
	Weight (kilo)	98.5	98.5	
	Processing cost	25	25	0
	Sales cost	64	46	39.13
	Management cost	10	10	0
	Financial cost	8	8	0
	Shop entrance fee	2	2	0
Total Income (Yuan per head)		1860.24	803.18	131.61
	Sales price (Yuan per kilo)	22	7.8	182.05
	Carcass weight (kilo)	70.92	70.92	
	Other income	300	250	20
Net profit (Yuan per hand)		42.26	42.35	-0.26

[14] The carcass weight is usually 72% of the live pig weight. The other parts of the hog are head, feet, offal, hair and tale etc.

Table B.5 Cost and revenue in wholesale stage (chain a)

	Item	Year of survey	Previous year	growth compared to the same time (%)
Total cost (Yuan per head)		1474.47	508.96	189.7
	Procurement price(Yuan per kilo(	20.6	7	194.29
	Weight (kilo)	70.92	70.92	
	Shop entrance fee	6	5	20
	Vehicle fee	2.1875	2.1875	0
	Labor cost	3.125	3.125	0
	Booth fee	2.21	2.21	0
Total income (Yuan per head)		1503.5	538.992	178.95
	Sales price (Yuan per kilo)	21.2	7.6	178.95
	Weight (kilo)	70.92	70.92	
Net profit (Yuan per head)		29.03	30.03	-3.33

Table B.6 Cost and revenue in Nóngmào market stage (chain a)

	Item	Year of survey	Previous year	growth compared to the same time (%)
Total cost (Yuan per head)		1517.19	548.58	178.09
	Procurement price (Yuan per kilo)	21.2	7.5	182.67
	Weight (kilo)	70.92	70.92	
	Booth fee	6.67	6.67	0
	Tax	1.02	1.02	0
	Labor cost	6	6	0
Total income (Yuan per head)		1547.05	576.23	168.48
Net profit (Yuan per hand)		29.86	30.64	-2.55

Table B.7 Cost and revenue in supermarket stage (chain b)

	Item	Year of survey	Previous year	growth compared to the same time (%)
Total cost (Yuan per head)		1638.56	623.68	162.73
	Procurement price (Yuan per kilo)	22	7.8	182.05
	Weight (kilo)	70.92	70.92	
	Labor cost	31.52	23.7	33
	Water and Electricity	15.6	15.6	0
	Depreciation	31.2	31.2	0
Total income (Yuan per head)		1747.78	666.23	162.34
Net profit (Yuan per hand)		109.22	42.55	156.67