



Rabobank

Industrialisation of China's Pork Supply Chain

Rabobank International

Food & Agribusiness Research and Advisory

chenjun.pan@rabobank.com
+86 10 5695115
david.nelson@rabobank.com
+1 312 408 8210

www.rabotransact.com

Finding the Best Business Model

China is emerging as a major pork player on the world's stage. This is not only due to its already leading position in pork production, but is also increasingly due to its rising influence on global pork markets as China's fluctuating imports affect global supply and demand balances as well as prices. Along with the evolution of both economic and social environments, China's domestic pork industry is undergoing structural changes. After achieving great success in volume growth, China's pork supply chain is becoming more responsive to the consumption market and social issues, resulting in a transformation towards industrialisation. Changes taking place along the supply chain have led some leading players to develop emerging coordinated business models, such as vertical integration. However, it has yet to be determined whether vertical integration suits China's circumstances and whether China will rely on pork imports or will become self-sufficient.

Introduction

China, the largest pork market in the world, is seeing its pork consumption growth slowing down and pork's share in the total meat market decreasing. Nonetheless, pork will remain the most important meat for Chinese consumers in the long term. Value growth will be rapid due to the increasing demand for value-added products, convenience and food safety. In response to market dynamics, China's pork supply chain is undergoing industrialisation.

In the genetics segment, the rapid growth in imports of foreign breeds illustrates the strong demand driven by the industrialisation. Foreign companies play an important role in improving genetics.

Hog farming is also going through a restructuring phase. Smaller farms are leaving the market due to high market risks and losses made during the disease outbreaks from 2008 onwards, and larger-scale farms are expanding rapidly. However, the relatively faster pace of smaller farms' exit is resulting in occasional supply shortages and price volatility.

Consolidation in the slaughtering segment continues and the enforcement of new slaughtering regulations will only accelerate the process. While most leading players have aggressive expansion plans, overcapacity is already significant and could be a problem for some time. Risks of further overcapacity will increase if further expansion continues at the same pace.

After rapid growth in the 1990s and 2000s, growth in organised retail is slowing down in mature market segments. Despite slower growth, organised retailers have increased their bargaining power against suppliers, which will impact the supply chain as suppliers are required to meet certain quality standards.

Various new business models are emerging along with the industrialisation. While vertical integration is the centre of attention, and is perceived to be the solution for food safety issues, it brings along a number of challenges. There is no one model that could be rolled out in all the regions due to geographical diversity. But whichever model is adopted, the key consideration is improving coordination between farming and slaughtering to ensure food safety and traceability.

Policy has been favouring the development of the pork industry. However, the intervention may sometimes cause greater volatility. Subsidy policy plays an important role in

Contents

Introduction	1
How will consumer demand evolve?	2
Foreign genetics play a key role	4
Hog farming witnesses dramatic structural changes	5
Consolidation in the slaughtering segment will accelerate	8
Distribution and retail are gaining importance	11
What business model will suit China best?	12
Regulatory framework and impact on the industry	14
Meat import: supplement or major source?	16
Conclusion	17

encouraging farming, though subsidies are expected to be phased out gradually as the supply chain undergoes industrialisation.

China has become a net importer of pork meat in recent years due to supply shortages. However, we hold the view that China has the potential to maintain self-sufficiency of pork supply in the long term; but in order to achieve this, instead of relying on pork imports, China would need to increase corn imports in response to the industrialisation of the pork industry.

How will consumer demand evolve?

A number of factors are driving the development of the pork market. At the downstream end of the pork supply chain, the consumer market is driving the direction of industry development. China's diet structure has changed greatly over the past few decades as the population is consuming more meat and less grain than in previous years. However, pork's share of overall meat consumption has decreased sharply while other meats have gained importance. Pork consumption is expected to slow further in the coming years but will retain its dominant position.

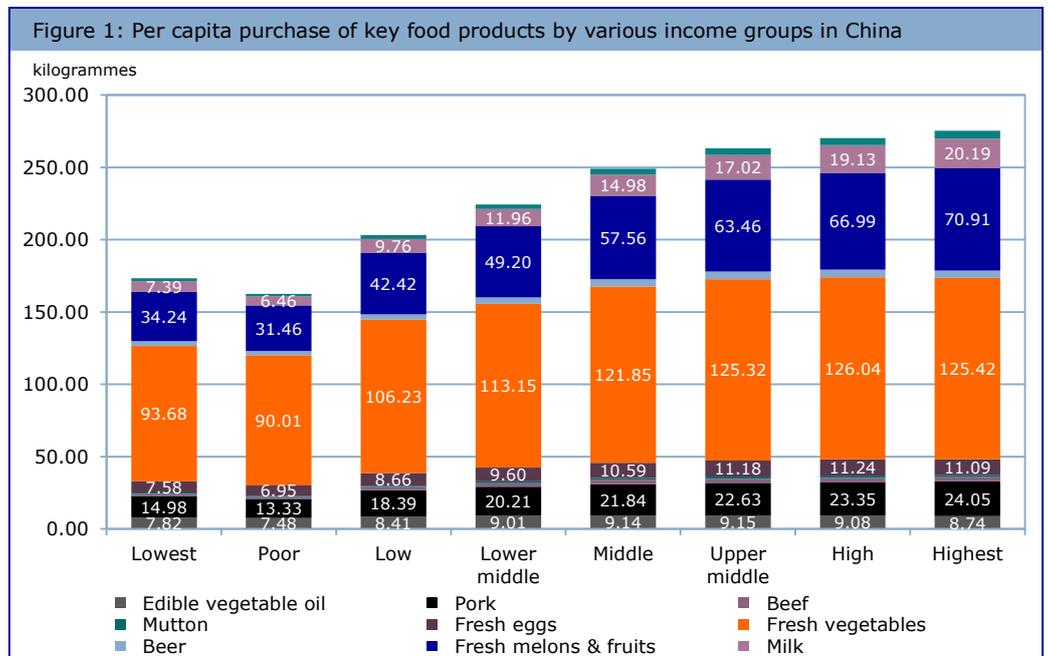
Diet structure changes in China

For thousands of years, the typical diet of Chinese consumers was dominated by grains. However, rising incomes and the introduction of a more Westernised diet have greatly altered Chinese consumers' diet structure. Annual per capita meat consumption has increased more than four fold since economic reform in the late 1970s, reaching 37 kilogrammes of pork, 13 kilogrammes of poultry and 9 kilogrammes of beef and sheepmeat, respectively.

Along with the growth of meat consumption, the structure of China's meat supply chain has changed accordingly. With the increased availability and affordability of alternative proteins, pork's share of total meat consumption decreased from 80 percent in 1985 to 65 percent in 2011. The shares of beef, sheepmeat and poultry have increased as these meats offer an alternative taste and attractive value relative to pork, and also add variety to Chinese consumers' diets. Beef and sheepmeat are perceived as being more nutritional, and as being 'greener' or safer compared to pork due to different feeding methods. Poultry is more popular in quick service restaurants (QSR), which are growing rapidly in China. The change in the diversity of meat consumption in China reflects increasing demand for greater added value, health attributes and variety.

Factors that drive consumer demand for pork meat

The volume growth of pork in China has already slowed from the previous double-digit record growth to the current 1 percent to 2 percent per year. There are a number of factors that impact consumer demand for pork meat. Income growth, population growth and urbanisation are the primary factors driving increased pork demand over the long term. Rabobank forecasts that total meat consumption in China will continue to increase but at a slower rate due to decelerating population growth, which is around 0.5 percent each year. Pork consumption is in line with this trend. Rising income levels are still having a positive impact on pork consumption, but also at a decelerating rate at the overall national income level now achieved in China (*see Figure 1*).

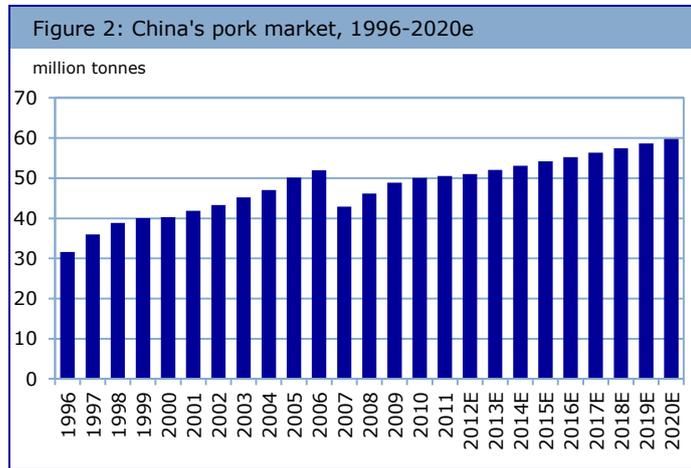


Source: China Statistics Yearbook, various years

In addition to the above factors, which will have a long term impact on Chinese pork consumption, others factors, including food safety issues, input prices and economic performance, create year-to-year volatility in supplies and prices. According to a survey by China Agricultural University in 2010, food safety was cited as the number one concern for most consumers. In recent years, several food scandals, such as the prominent example of Shineway's 'lean meat powder', have caused short term drops in consumption. After such scandals, it can take months to rebuild consumers' confidence. Chinese consumers seem to be increasingly willing to pay a premium for pork produced in a secure supply chain. However, there are few mechanisms to inform consumers as to how secure the production and supply chain is, and branding is sometimes questioned by consumers. Given the current fragmentation of the pork industry, it is expected that it will take years to develop a widespread coordinated supply chain that will convince consumers of food safety. Input prices are expected to continue their upwards trend in the coming years due to the competition between worldwide growing food demand and limited land and water availability. Over the past few years, volatility of input prices has been greater than a decade ago. China's pork prices have more than doubled in the past decade. As pork prices have remained at high levels—despite the fall in 1H of 2012—and are expected to stay high due to rising input costs, pork consumption will, to a larger extent, be negatively linked to the price movement. Pork consumption is also impacted by economic performance. As pork is a staple meat, there is generally lower elasticity for pork consumption relative to beef and sheepmeat. However, at the current high prices, the slowdown of China's economy in 2012 has impacted demand for pork from foodservice buyers, such as factories and plants in eastern and southern coastal areas, while demand for domestic consumer use has remained stable. In other words, the elasticity of pork consumption relative to income level will increase.

Outlook for pork meat demand

In the coming years, pork consumption volumes are expected to maintain a slow growth rate of about 1 percent to 2 percent annually. In the meantime, poultry consumption will increase due to its relatively lower price. Therefore, China's overall meat consumption will favour poultry at the expense of pork. Pork's share of consumption is expected to further decline to 62 percent by 2020. However, given the sheer size of the industry, pork will retain its dominant position in the long term, and will continue to see the largest volume growth (see Figure 2). Going forward, the major potential for volume growth in pork consumption will come from the lower income groups in urban areas—which still have low levels of consumption—as well as from rural areas, which will become more urbanised in the coming years. Further value growth will come from increasing demand in the value-added segment, driven by the urban middle class and the wealthy.



Source: Rabobank estimates, 2012

Foreign genetics play a key role

At the starting point of the pork supply chain, the genetics sector has an important role for the downstream. However, local breeding technology is lagging behind, clearing the way for foreign breeds and technology.

Overview of current genetic lines

China has numerous native hog breeds due to the country's diverse geography and natural surroundings. However, most native hog breeds have disappeared from the market because local hog genetic technology failed to keep up with market developments. Furthermore, many native breeds are not suitable for industrial farming due to their longer life cycle and special requirements. Therefore, native breeds are less of an option for the main market, which clears the way for imports of foreign breeds.

Foreign companies entered the Chinese hog breeding market in the 1990s, and since then, have rapidly increased their share. It is estimated that genetic lines imported from the United States (US) account for about half of the breeding market, and lines from Canada account for between 20 percent and 30 percent. The EU is another important supplier. Along with the introduction of foreign breeds as well as foreign technology, pig genetics have improved substantially in China. The prevailing genetic lines include Duroc, Landrace, Yorkshire, DeKalb and Hampshire.

Key players

The dominant players in the Chinese hog breeding industry include PIC of Genus, Hypor, TOPIGS and JSR Genetics. During 2H of 2011, TOPIGS imported a total of 2,050 breeding hogs into China through three separate imports of 1,000, 500 and 550 hogs within a short duration of only several months. The hogs were bred in nucleus farms based in Europe and Canada and will be used to expand breeding capacity for Chinese farms. The farms involved include TOPIGS Huanshan, a joint venture (JV) between TOPIGS and Shandong Huanshan Group Co., Ltd, and two other hog breeding companies in Shanghai.

In November 2011, Hubei Liangyou JSR Breeding Limited, a JV between JSR and Hubei Liangyou Livestock & Poultry Company, commenced operations on its 66 hectare nucleus farm. JSR also signed a GBP 1 million contract with a Chinese state-owned import/export company, the China Animal Husbandry Group (CAHG), to provide almost 800 hogs as well as a customised support and training package.

Other significant projects include a JV, called Hypor AgFeed Breeding Company Inc., formed in 2009 between AgFeed Industries Inc. and Hypor B.V. The new company will import hogs from Hypor's Canadian and French farms and supply AgFeed's farms in Lushan and Ganda. It was also reported that the Sichuan Giastar Group was making a new purchase of a nucleus herd from Genus earlier this year.

In addition to JVs or wholly owned foreign companies, local companies are gaining market shares but are technically relying on the imported breeds. The Sanyuan Breeding company, with its significant market share in northern China, would be one such example.

The majority of breeding firms operate independently and supply piglets to farmers based on the spot market. In recent years, along with the emergence of a vertical integration model, a number of large-sized companies (e.g. Tangrenshen Group Co Ltd, Wen's Group, Yurun Food, Shineway and Agfeed) entered into the breeding business to supply piglets to contracted farms. With breeding under their own management, these companies could control key points of the supply chain.

Rising imports of foreign breeds

It is noteworthy that imports of breeding hogs have risen substantially in China due to increased demand from the industrialisation of the hog industry in recent years. In 1H 2012, breeding hog imports were almost equal to total 2011 imports at 10,000 head, suggesting that China is doubling the number of large integrated hog farms. Imports are expected to continue this strong trend in the coming years as many large-scale companies have aggressive expansion plans.

Hog farming witnesses dramatic structural changes

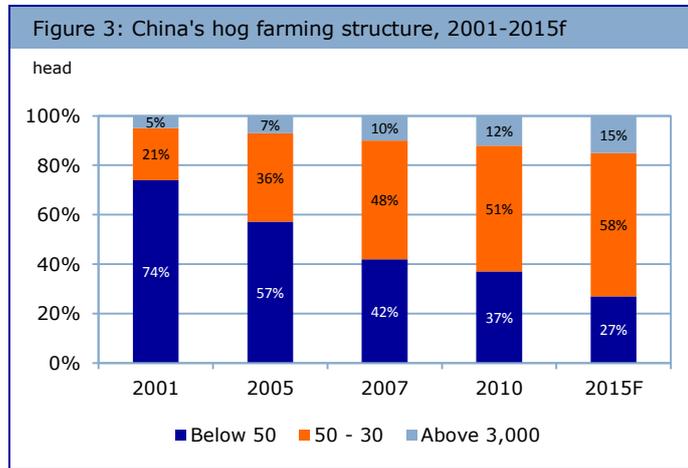
China's hog farming industry is currently restructuring. The share of smaller farms is sharply decreasing, while larger-sized (including specialised and commercial) farms are gaining importance. As smaller farms have been exiting the industry at a faster pace than the larger farms are expanding, the past few years have seen a hog supply shortage followed by volatile prices. Despite the up-scaling, the majority of hogs are delivered from farmgates to slaughterhouses on a spot market as coordination along the supply chain remains weak. In addition to business risks, disease is the key obstacle for hog production in China and is unlikely to be solved in the short term.

The structure of hog farms in China has greatly changed in recent years. Backyard farming, which used to dominate the market, has witnessed a sharp decrease due to rising market risks as well as economic disadvantages versus larger farms. Currently, about 37 percent of live hogs come from backyard farms, compared to about 74 percent in 2001.

The rapid change in China's farming structure began in 2007, when backyard farmers were hit harder than larger-sized farms by the disease outbreaks due to poor sanitation and inadequate farm management. Moreover, backyard farmers are more vulnerable to the uncertainty of input costs and market volatility. In addition, with urbanisation and migration of rural labour to cities, the opportunity cost of rural labour increased. These factors make backyard farming less competitive when compared to larger-sized farms. Going forward, it is expected that backyard farming will continue to decline along with its decreasing competitiveness.

Commercial and particularly specialised farms are gaining importance in China, especially in developed areas and the corn belt region. The increasing scale of farms facilitates the relationship between slaughterers and pork producers to reshape from a spot market towards a coordinated supply chain. An increasing proportion of specialised and commercial farms are shifting to supplying hogs directly to slaughterers/processors based on contracts, while they used to sell through middlemen. A number of leading slaughterers/processors are establishing their own farms to develop a vertically integrated operation. Wen's (7 million head per year), CP Group, Zhengbang Technology Co., Chuying Agro-Pastoral Group and Muyuan Foodstuff Co., Ltd, have farms with more than 500,000 head. COFCO Group, Shandong Liuhe Group and Agfeed have farms with more than 100,000 head. These companies have more ambitious expansion plans than their smaller followers. Generally speaking, farms with over 10,000 head have a faster expansion pace than the industry average, while smaller farms tend to shrink more rapidly.

In 2012, the Chinese pork market experienced oversupply, which depressed pork prices. This resulted in another round of consolidation. The weak market has had a negative impact on small farms that are being forced to reduce herd size or leave the market, while larger-sized farms continue to expand despite the market price volatility. China's farming structure is expected to continue its shift towards commercial farms (see *Figure 3*).



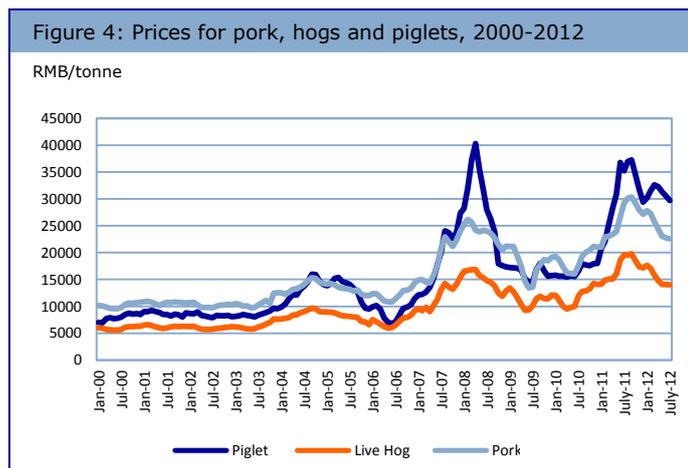
Source: MOA, Rabobank estimates, 2011

Hog price volatility

Hog prices in China have been on a roller coaster ride since 2006 due to the unbalanced supply and demand situation (see Figure 4). The imbalance is mainly driven by rising input costs and the departure of small farms, which has been at a faster pace than the expansion of large farms.

The soaring hog prices in 2008 and 2011 reflected the supply shortage at that time. There were many reasons behind the shortage, such as disease outbreak. Blue ear disease (PRRS) in 2008 caused a 20 percent decline in herd size for that year. Consequently, the hog farming sector entered into a transition phase as more price volatility followed. The Chinese government played an important role in the process when it announced policies to intervene in production, which ultimately intensified the volatility.

Chinese pork prices were blamed as the major driver for inflation during 2011. However, entering spring of 2012, pork prices began to fall due to a partial recovery in production, weak demand and the impact of imported meat. Despite the slight rebound in June, pork prices have been depressed for most of the first eight months of 2012. Declining pork prices will reduce farming profitability, and will jeopardise the replenishment and recovery in the coming year, which may lead to another supply shortage. Price volatility has increased market risks substantially but in the meantime it will quicken the process of shaking out smaller farms from the market.



Source: CAAA, Shennong, 2012

Prevailing production models

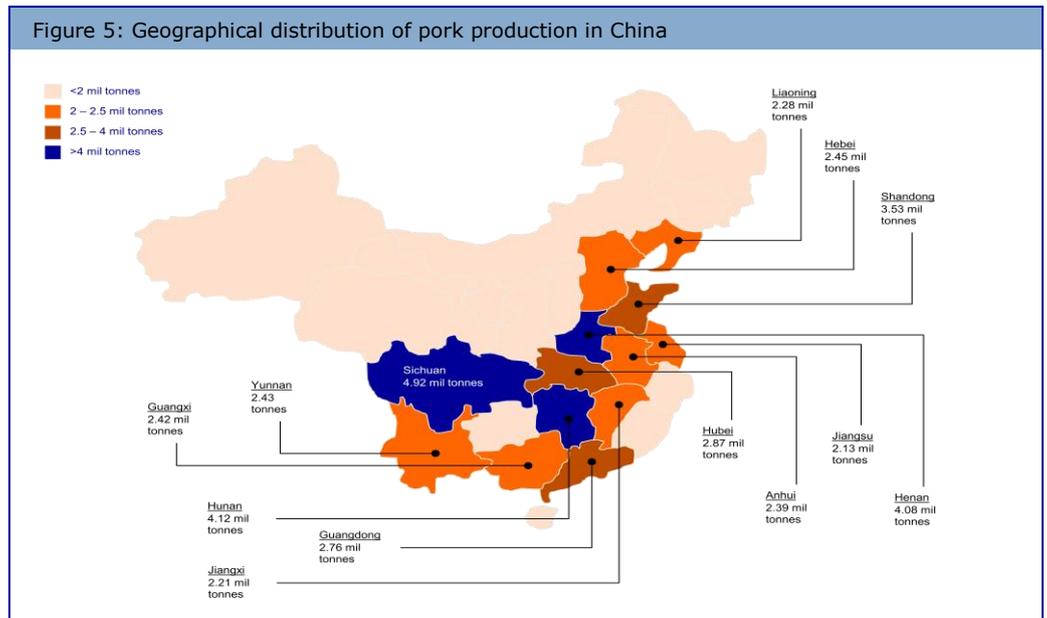
Traditionally, Chinese farmers raised one to three hogs, for both consumption and commercial purposes. Currently, hog production in China is conducted by three categories of producers: backyard farms, specialised households and commercial farms. While there is no strict definition of the three types of farms, backyard farms usually raise less than 50 hogs at one time, specialised farms raise 50 to 3,000 hogs and commercial farms raise more than 3,000 hogs in inventory.

There are two main market channels through which finished hogs are delivered to slaughterhouses. In backyard production and specialised households, hogs are mainly collected by middlemen who then sell to slaughterhouses by trucks. Hogs raised by commercial farms are mostly delivered directly to slaughterhouses, usually under contract. On some commercial farms, slaughtering is part of the integrated operation. Despite the rapid consolidation at the farming and slaughtering levels, most farmers still provide hogs to middlemen instead of directly to slaughterhouses.

Geographical distribution

Traditionally, the top pork production areas in China included Sichuan, Henan, Shandong, Hunan, Hubei and Guangdong (see Figure 5). Due to the structural changes in hog farming, production is moving towards grain production areas, primarily in the north. Investment for hog production is flowing into the northeast region, which is the corn belt of China, as well as northern China and the middle of China. In comparison, the development potential in coastal areas and southern China is limited due to higher requirements for environmental protection, limited land and grain access, and higher opportunity costs for labour. As a result, the mega-sized farms survive in coastal areas and southern China as they operate at higher efficiency and productivity levels and could meet the higher cost requirements, while small farms in those regions tend to rapidly disappear.

While investment flows into large-sized or even mega-sized farms, the types of investors have diversified. Not only do large meat companies have interests in hog farming, but private equity firms and even investors from other sectors, such as steel and information technology, could also invest millions in greenfield projects.



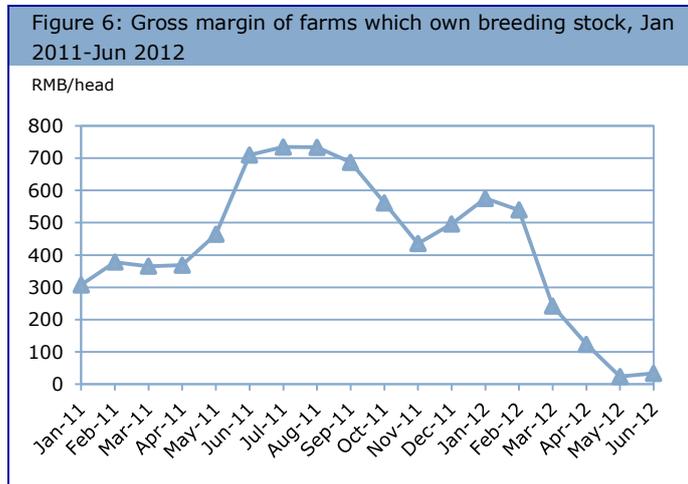
Source: Rabobank, 2012

Economics of hog production

China's hog production profitability has been volatile in recent years (see Figure 6). The falling pork prices in 1H of 2012 have resulted in losses at the farming level. Farmers who primarily own breeding stock from which they sell feeder pigs have been just breaking even or making only a thin profit at recent prices. Smaller farms that purchase piglets for fattening have seen significant losses over the past few months. In May, the losses for fattening one hog reached USD 24 at smaller farms. In contrast to falling hog prices, the cost of feed grains continues to rise. Small farms are liquidating due to cost pressure and the expectation of higher market risks.

Disease situation and other food safety issues

Disease has been the biggest obstacle for growth in China's hog production industry. In addition to disease originating from local markets, an increasing number of diseases have come in through imported breeding hogs.



Source: Soozhu, 2012

Recurring disease outbreaks, such as foot-and-mouth disease (FMD), diarrhea, PRRS and circle virus, have been infecting the industry in recent years. The latest outbreak to seriously impact the industry was piglet diarrhea, which began spreading in some regions in autumn 2011 and lasted until early spring 2012.

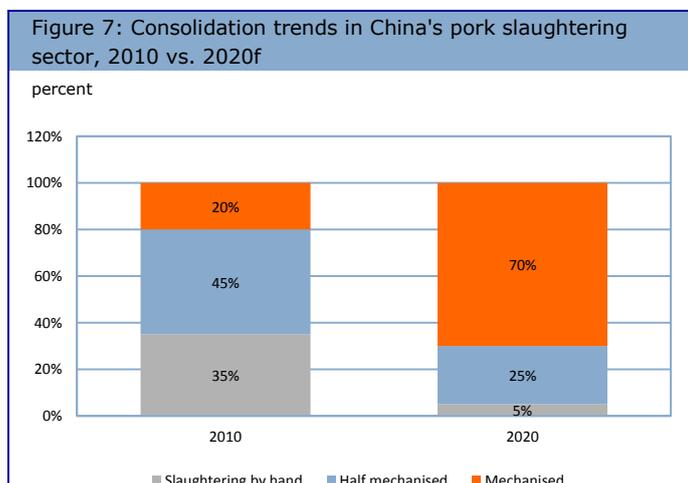
Disease outbreaks often reflect a poor sanitary situation at the farming level and a weak veterinary system. The inadequate supply of effective medicines/vaccines often exacerbates the spread of the disease.

Other food safety issues include medicine residue, mishandling of livestock that died from disease, and antibiotics use. However, disease will remain the largest challenge for China's pork industry going forward.

Consolidation in the slaughtering segment will accelerate

Consolidation has been taking place in China's pork slaughtering and processing segments for years, pre-dating the more recent consolidation in the hog production sector. Increased market volatility since 2007 and the government's efforts to close down medium and small-sized players have quickened the consolidation pace. As a result, the total number of designated slaughterhouses has decreased from 30,000 in 2006 to 10,000 as of today. This number is expected to decrease to 2,000 by 2020.

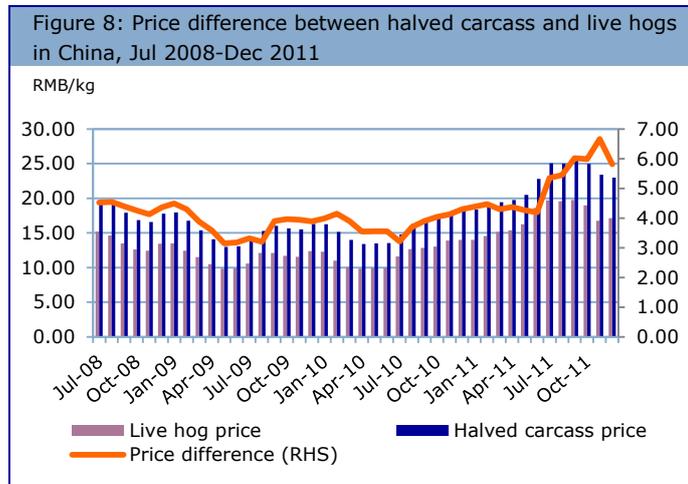
The decline of backyard farms and the emergence of specialised households will definitely provide more opportunities to larger players versus smaller ones as small or individual butchers mainly source from backyard farms, which are leaving the industry. Going forward, the consolidation will only accelerate with the enforcement of new slaughtering regulations. A structural change of the slaughtering segment is expected in the coming decade (see *Figure 7*). Mechanised slaughtering, which currently accounts for only 20 percent of the market, is expected to increase market share to 70 percent by 2020. This increase will be at the expense of market share for half-mechanised and hand slaughtering.



Source: Rabobank, 2012

Cost and margin dynamics

Margins of slaughterhouses tend to be seasonal, similar to farmers' margin variations. Margins tend to decline after the Chinese Spring Festival and then start to climb entering autumn. Despite this seasonality, slaughterers' margins are relatively more stable than farmers' margins. This indicates that slaughterers are in a better position to pass extra costs to downstream buyers and have less volatility than farmers. However, slaughterers' margins are still volatile (see Figure 8).



Source: Shennong, 2011

Key players and competitive landscape

China's national meat slaughterers/processors include Shineway, Yurun and People's Food; while key regional players are represented by Zhongpin, Gaojin, Tangrenshen and Shunxin (see Figure 9). Among others, Yurun and Zhongpin specialise in chilled and prepared meat products, which create higher value and higher profit margins, while the rest of the companies have heavy proportions of slaughtering or high temperature meat products (HTMP). The profitability of these companies has been quite volatile (see Figure 10). This is mainly related to market volatility, company strategy and product positioning. In 2011, Chuying and New Wellful were leading the industry in terms of profitability as both companies focused on hog production and farming and therefore benefitted from the soaring hog prices in 2011. Among the other slaughterer/processors, Yurun and Zhongpin have stronger profitability relative to other companies due to their product positioning in medium- to high end markets. However, their profitability decreased during the period from 2009 to 2011 (see Figure 11). This was because their production costs increased significantly along with rising hog prices, and they could not pass on all of the extra costs to consumers, although they were able to pass on the majority of the extra costs with a time lag.

Business models differ greatly. While many players aim to develop full vertical integration, very few of them are really covering the whole supply chain at this time. This model is being followed by COFCO, a conglomerate company but a newcomer to the pork industry, and Shaanxi Besun Group, a regional player targeting the high-end market. Most of the other leading companies are operating on the model of 'company+farmers (or farm bases)' using contract grow-out, but they may differ in contract details or ownership of housing or livestock.

While most of these companies have ambitious expansion plans, overcapacity is already significant and could be a problem for some time to come. Actual 2011 slaughter numbers reveal that the top three players have less than 50 percent utilisation of their capacity. This is mainly because the geographical expansion of hog farming has not caught up with the newly installed slaughtering facilities. This also reflects the fact that expansion of slaughtering companies is too rapid and far ahead of market development. Companies will compete for hog sourcing in order to improve operational performance. Despite overcapacity, leading players continue to announce expansion plans for the coming years. Yurun announced it will reach 70 million head of slaughtering capacity by 2015, and Shineway aims to achieve slaughtering capacity of 45 million to 55 million head by the end of 2012.

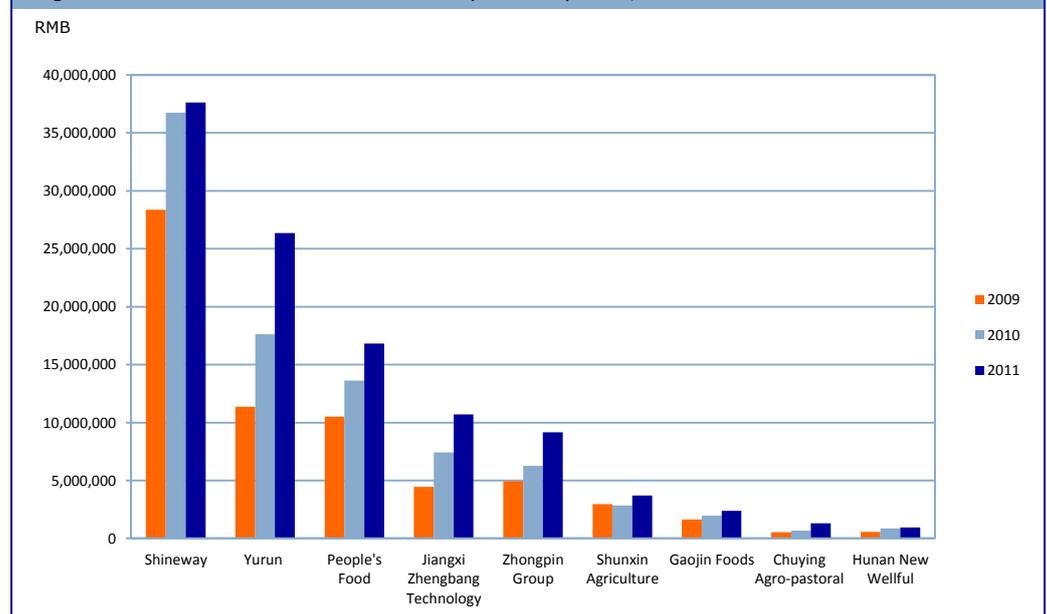
The industry is also moving towards expansion across provinces. CP Group, New Hope, Wen's and Zhengbang have rapid expansion plans towards the north or west. It is clear that geographical coverage has become a key strategic consideration for leading players to enhance competitiveness in accessing key grain supplies as well as to establish a national marketing network.

Figure 9: Slaughtering capacity and actual slaughter numbers for selected companies in 2011

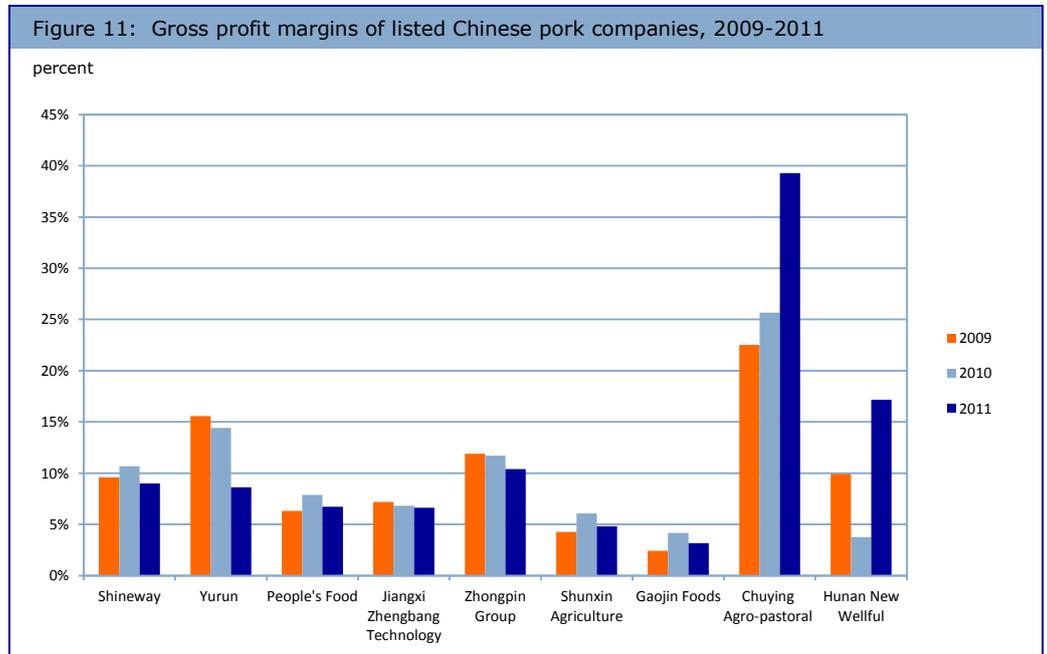
million head		
	Slaughter capacity by end 2011	Estimated actual slaughter numbers in 2011
Shineway	25	10
Yurun	46	15
People's Food	20	8
Shunxin Agriculture	3	2

Source: Company data, Rabobank estimates, 2012

Figure 10: Sales revenue of listed Chinese pork companies, 2009-2011



Source: Company data, Rabobank, 2012



Source: Company data, Rabobank, 2012

Distribution and retail are gaining importance

Driven by food safety concerns, Chinese urban consumers are shifting from conventional wet markets to supermarkets for purchases of perishable foods, including pork products. In the meantime, modern wet markets have been established in large cities to replace the old ones. This offers various channels for consumers to purchase pork products. Organised retailers have stronger bargaining power over pork suppliers than wet markets as the former provides a better marketing platform for suppliers to establish brand and market reputation.

Supermarket versus wet market

China's supermarket, or organised retailing, industry has achieved breath taking growth in the 1990s and 2000s. This has been attributed to strong economic growth and improved standards of living. While foreign retailers have established a strong presence in larger-scale formats, local players have quickly matured and developed different competitive edges. The store format has evolved rapidly; almost every western chain store format has been introduced in China thanks to rapidly evolving market segmentation. However, after rapid growth in previous decades, the rates of growth have slowed in mature markets as they undergo consolidation.

Wet markets used to dominate food retail. With rising hygiene concerns and city planning, many city governments transformed the wet markets, which use to be open and disordered, into covered and well organised markets. Some wet markets can even provide cold chain facilities. In wet markets, fresh meat is the major item available but frozen or chilled meat can sometimes be found. Meanwhile, open air markets co-exist with the newly established wet markets even in big cities, although they are gradually diminishing. Wet markets, either conventional or modern, continue to play an important role in China's pork market.

Cold chain development

Cold chain logistics and transportation have remained fairly underdeveloped in China. While import/export activities and some freight forwarding have traditionally been undertaken by state-owned players, such as Sinotrans (China National Foreign Trade Transportation Corporation) or Cosco (China Ocean Shipping Company), part of the domestic logistics and goods transport needs have been met by the pork industry companies themselves. These companies own and operate cold storage trucks to deliver goods downstream to chain stores. However, a larger amount is delivered by distributors to wholesalers who then move the meat to consumers through an antiquated and highly fragmented retail trade.

Trains and trucks are the two main modes of transporting frozen meat in China. Although the rail system has improved greatly, priority is given to passengers and critical

commodities. The limited capacity and lack of genuine service orientation of the train system makes trucks the most common method for transporting meat.

Due to the inefficiency of transportation, many manufacturers tend to focus on a regional market. In addition, fresh and 'hot' meat is sold most commonly in rural areas, due to a lack of cold storage capacity.

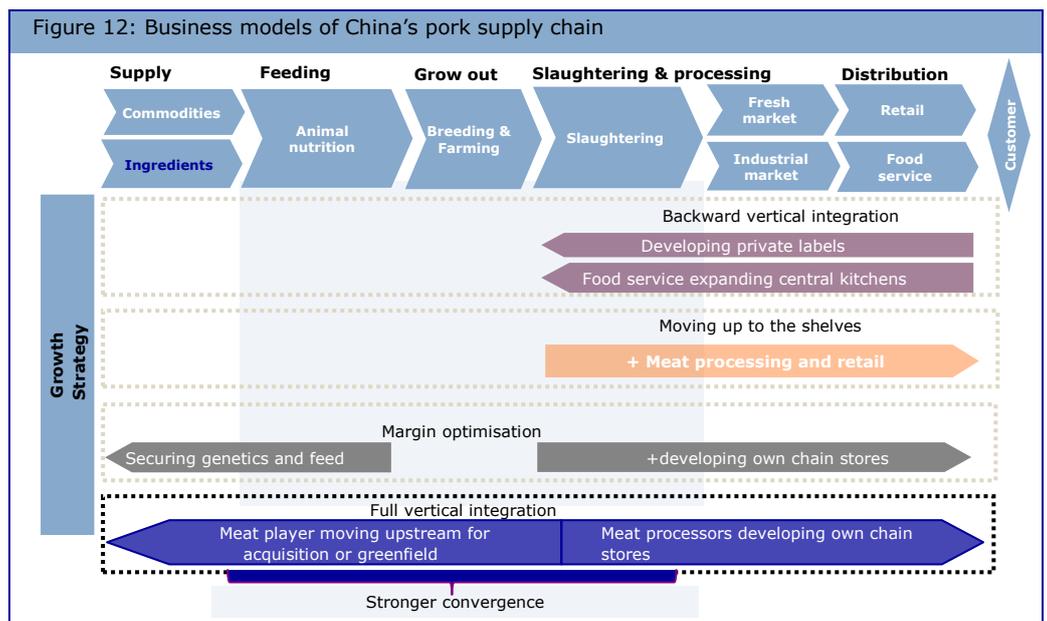
How are organised retailers impacting the upstream?

Due to the rapid expansion, organised retailers have increasing bargaining power over processors. Retailers, such as Walmart, Carrefour, Lotte Mart, China Resources etc., have developed their own private labels. Carrefour has set up its own quality standard for a number of products, including fresh meat, requiring suppliers to meet these standards.

Retailers are impacting the upstream in terms of pricing, quality requirement, product specification and even traceability. Confronting the rising food safety concerns, some retailers have begun to monitor the quality and the traceability of pork products. Suppliers need to compete for shelf space. It is expected that retailers will have a rising influence on the upstream along with the development of chain stores.

What business model will suit China best?

There are mixed business models in China's pork supply chain. The traditional supply chain was based on the spot market, with numerous middlemen playing an important role between farmers and slaughterers, and between slaughterers and retailers. This model is currently the dominant system, despite the industrialisation trends in farming and slaughtering/processing as coordination is growing at a much slower pace. Despite slower progress, emerging coordinated business models have been pioneered by some leading players who have proactively responded to market dynamics (see Figure 12).



Source: Rabobank, 2012

Backward vertical integration (VI) by retailers

Some leading Chinese retailers have integrated backwards into pork processing and slaughtering in order to ensure traceability and food safety. This is probably a temporary solution when food safety issues are of high concern. Carrefour, Walmart and Lotus have extended into slaughtering/processing to secure pork products. They have teamed up with specific meat companies for meat supply. For example, Carrefour has set up 16 requirements for the supply of pork products, including hog sourcing, no illegal additives during production, cold chain and full traceability. To meet all of these requirements, Carrefour has chosen Beijing Resource Group and Guangdong Dongjin Company as their main pork suppliers to cover supermarkets in the north and south, respectively. Before approving supply contracts, Carrefour had been working with these two companies, improving their quality systems to be in line with their own. The products supplied to Carrefour are labelled as Carrefour Quality Line Pork.

Moving up to the shelves

A number of meat players in China have been establishing their own retail outlets. The original purpose was to avoid the margin squeeze by retailers and to integrate distribution costs into the margin. Another purpose was to develop their own cold chain supply in second tier and third tier cities, where third-party cold chains are underdeveloped. All of the leading companies have followed this model. Shineway and Yurun have each established more than 1,000 retail outlets across the country.

Contract model

Chinese meat companies have partial vertical integration by controlling key points in the supply chain. The typical model covers breeding, feeding and slaughtering/processing, while leaving farming/fattening to either contracted farmers or individual farmers. This model has derivatives that are different in contract details but similar in terms of contract base. One example of a derivative model is Chuying Agro's 'company + farm base' model. Chuying Agro manages breeding and feeding, but leaves farming to 'farm bases', which consist of hogs from individual farmers but have centralised farm management. The farm bases are either established by Chuying or rented from independent farms. In the farm base model, farmers take care of hog farming under the unified standards of farm management and their income is closely related to the performance of hog production. Farmers' minimum income will be guaranteed by the company if there is any disease outbreak causing great loss. The advantage of this model is that farmers have incentives and Chuying has close management of the full supply chain. Another derivative is Wen's model, which is slightly different from Chuying's. Wen's has off-taking contracts with farmers who are smaller in scale compared to the farm bases. The farmers own the hogs but feed and piglets are supplied by Wen's. The advantage of Wen's model is that it can be rolled out with limited investment and can therefore be expanded faster than other models, particularly full vertical integration.

Full vertical integration

Full vertical integration is attracting attention in China's pork industry as it is believed to be the solution to food safety issues. However, few companies are fully integrated due to the large investment and land requirements. A handful of regional players are operating using this model, but are geographically limited to the region. At the national level, only COFCO is exploring full vertical integration as the company has already established facilities in different provinces. However, as a newcomer to the pork market, COFCO's experience is quite limited. While this model could ensure food safety, productivity and economic returns are not yet clear.

Which model will suit China best?

While full vertical integration is a hot topic and is being highly pursued by most leading players, we believe that it will not become the dominant model in the foreseeable future. This is because full vertical integration has such high requirements for capital, land access, environmental protection, and more importantly, professional experience. As the industrialisation of hog farming is a new experience for China, there is a lack of professionals in the market, particularly in management of mega farms. Land access is also a big issue for China, and efficiency of land use is critical for local governments to improve local finances. In coastal areas and southern China, land is already over exploited and occupied by industries. Land costs continue to rise, adding great pressure on hog production, which has volatile and sometimes thin margins. Environmental protection is another challenge that companies face, and the high associated cost in economically developed areas has already forced some hog farms to close down. As the vertical integration model requires more professionals, land, capital and investment in environmental protection than other business models, it is not realistic for a large number of Chinese companies to develop this model. Vertical integration will and should be developed in specific regions and by a handful of capable players on a selective basis.

In China, there is no single model that would suit all the regions due to the country's diverse geography. While the sizes of farming and slaughtering/processing companies are growing rapidly, the area that has not grown adequately is the coordination along the supply chain. The relationship between farming and slaughtering remains weak and fragile even in some contracted models. Therefore, improving the coordination between farming and slaughtering will definitely be the next area of focus for the industry in the coming three to five years.

Regulatory framework and impact on the industry

China's regulatory framework for the pork industry has been reviewed and adjusted along with the market development.

The ultimate goal of government policy is to ensure a stable market supply of pork and to provide reasonable profits for farmers. The government is trying to create a market-oriented system via control. On the one hand, the government encourages fair competition, which is driven by market demand. On the other hand, a number of policies have been launched to guide the development direction of the industry and to intervene in the market when violent ups and downs are anticipated.

Major policies

Subsidy policies

Subsidy policies have been and continue to be reviewed and adjusted in accordance with the supply and demand situation for Chinese pork. The first subsidy policy was initiated during a supply shortage in 2008. Government subsidy was provided directly to farmers or slaughterers. There are many kinds of subsidies, including tax exemptions for farming projects, VAT tax exemptions for feed production, income tax rebates for slaughtering, subsidy for the treatment of waste water from slaughtering, and a subsidy for fertile sow insurance. The latter subsidy policy will grant RMB 100 per fertile sow in order to increase pork supply and is designed to relieve price pressure. To push for upgrading of the slaughtering sector, a cash subsidy of RMB 50 per head will be granted to newly established and advanced slaughtering capacity. Local governments usually provide additional support relative to the investment amounts, tax breaks, land access, etc.

Looking at the subsidy received by key players in 2011 gives a clear indication of how important this policy has been to the profitability of many of them (*see Figure 13*). It is noted that the level of subsidy varies widely by company. This is because companies apply for different subsidies according to the type of operation, expansion or new investment. Usually, companies with new mega farms will obtain direct subsidies related to supporting large-sized farms, but they may also receive extra financial support from local governments if the investment happens to be in line with the local economic development plan. For investment in breeding, companies can obtain subsidies related to quality breeding or insemination, or financial support from local governments aiming to improve science and technology in the region. Therefore, there is flexibility in the scope of subsidies given to companies as regional governments play a role by providing additional financial support beyond the central government policy. Given the flexibility, a company's relationship with local governments and choosing the right place for new investment will be important factors in obtaining subsidies.

Subsidy policies effectively encourage the expansion of hog production and slaughtering, particularly when there is a supply shortage in the market. The subsidy policies are expected to continue in the coming five years, given that pork production needs support during this transition period of restructuring. However, the content of subsidies will be adjusted with the market supply/demand changes. In the longer term, with the industrialisation of pork production, direct government subsidy will be gradually phased out.

Figure 13: Subsidy to net profit in listed Chinese companies					
Key players	2011 subsidies (million RMB)	2011 subsidy to net profit (percent)	2010 subsidies (million RMB)	2010 subsidy to net profit (percent)	Types of subsidies
Yurun	529.85	36.33	606.63	26.77	<ol style="list-style-type: none"> 1. Merger & acquisition fund from government 2. Supporting fund of Agro-food industrialisation 3. Subsidy on banking loan interest
New Wellful	17.1	23.73	79.98	541.39	<ol style="list-style-type: none"> 1. Live hog reserve subsidy 2. Agricultural, light industry and textile products trade promotion subsidy 3. Special agricultural subsidy 4. Live hog farm and environment-friendly construction subsidy 5. Live hog science and technology subsidy 6. Subsidy on sow raising 7. Frozen pork reserve subsidy 8. Project management subsidy 9. Foreign trade development promotion subsidy
Shineway	120.47	15.94	33.01	2.49	<ol style="list-style-type: none"> 1. Local government financial support
Shunxin Agro	0.31	0.1	5.14	1.94	<ol style="list-style-type: none"> 1. Dazhou commerce business information subsidy 2. Dazhou project supporting fund 3. Subsidy on hog breeding
Gaojin	7.58	11.82	43.33	N/A	<ol style="list-style-type: none"> 1. Live hog slaughtering subsidy 2. Capacity expansion subsidy 3. Live hog processing line subsidy 4. Live hog industrial processing improvement subsidy
Chuying	4.21	0.98	10.19	8.29	<ol style="list-style-type: none"> 1. Purchasing breeding pigs subsidy 2. Housing construction subsidy 3. Advanced entrepreneurship subsidy 4. Live hog reserve subsidy

Source: Company data, Rabobank, 2012

Pork price monitoring system

In 2008, the Chinese government introduced a pork price monitoring system to ensure a stable pork supply to the market and to protect farmers' income. The hog-to-corn price ratio of 6 is considered a break-even point for pig farming to make a profit. This ratio is used as an important index for the government to assess the possible market movement in the near term. When the ratio is higher than 9 or lower than 5, the government may release pork reserves or make central purchases of frozen pork to adjust the market price. It is worth noting that the government will not intervene in the pork market directly by setting a cap or floor price.

Pork reserve system

China's government now keeps a closer watch on market price movements than in previous years because pork prices have shown more volatility. China's Ministry of Commerce and Ministry of Finance jointly initiated a pork reserve system in 2007. The system consists of two parts, a live hog reserve and a frozen pork reserve. This policy differentiates China from the rest of the world by treating pork as a strategically important food. Large scale operation of the live hog reserve began in early 2007, although it was already in existence on a smaller scale in previous years. The live hog reserve typically consists of a few million hogs, which are rotated every four months within 200 to 300 commercial farms. The frozen pork reserve was also initiated in 2007, when pork prices began to rise. The purchasing and storage of a frozen pork reserve is done through public bidding, open to any qualified meat plant with cold storage capacity of at least 3,000 tonnes. It is estimated that there are about 200,000 tonnes of frozen pork in reserve, which will be rotated every four months to ensure its freshness and quality.

Selling of the frozen pork reserve takes place mainly through two channels, public auction and retail outlets. Frozen pork sold via public auction is purchased by processing companies or institutional users. Due to price hikes in mid-2011, some of the frozen pork supply was released directly via retail outlets at that time.

In 2012, the government released pork reserves in the spring. Fortunately, this had a limited impact on the market which was already weak. A couple of weeks later, the government took opposite action and made purchases of frozen pork, aiming to support the weak prices. Central purchases were made in three rounds during the first seven months of 2012. The total reserve amount is less than 0.1 percent of the total market size. Although the amount is limited, such actions clearly signal the government's determination to support the pork industry, although the direct impact on pricing may be limited.

Meat import: supplement or major source?

While China has shifted from being a net exporter to becoming a net importer of pork products, we hold the view that China could maintain self-sufficiency of pork supply in the long term. Pork imports will be a supplement instead of a major source of domestic supply.

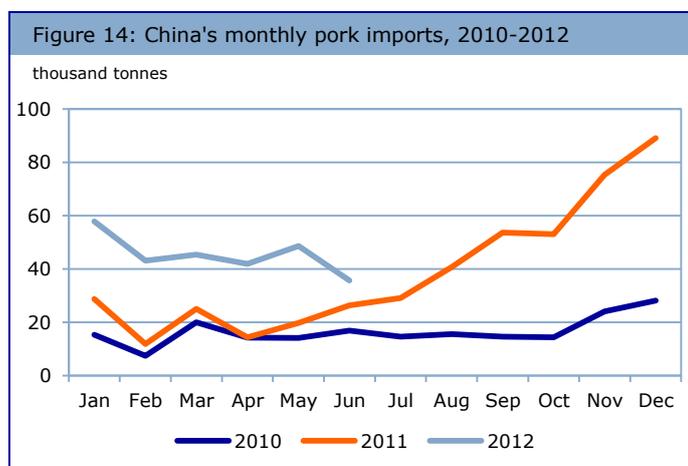
Regulatory framework

China's pork imports are made under bilateral agreements, meaning that only countries with signed protocols can export to China. Plants in overseas markets need to get approval from the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ) through an on-site inspection before exporting to China. There is no quota restriction on pork imports and, theoretically, all companies registered with the Chinese government can import.

Shifting from net exporter to net importer

In 2007, China was a net exporter of pork meat. China became a net importer as of 2008 due to significant supply shortages. Since that time, China has opened the market for pork imports from additional countries. The countries now able to export to China include the US, Brazil, Denmark and the UK. Imports for 2012 have been at higher levels despite the market depression (see Figure 14). It is estimated that part of the large volume seen in 1H 2012 was the delivery of goods contracted in November/December 2011, and the rest is a continuity of last year's 'panic order' due to shortage concerns.

Imported pork mainly flows into the foodservice channel through factories, schools, institutions and restaurants as well as further processors. These companies find it more economical to import frozen pork rather than buying from the domestic supply as China's internal pork prices are among the highest in the world. The imported frozen pork primarily flows to small processing companies with a small amount finding its way into retail and wholesale channels, while by-product pork imports flow into the wholesale and foodservice channels. It should be noted that imported pork does not go into China's pork reserve.



Source: China customs, 2012

Will imports be a major source or just supplement?

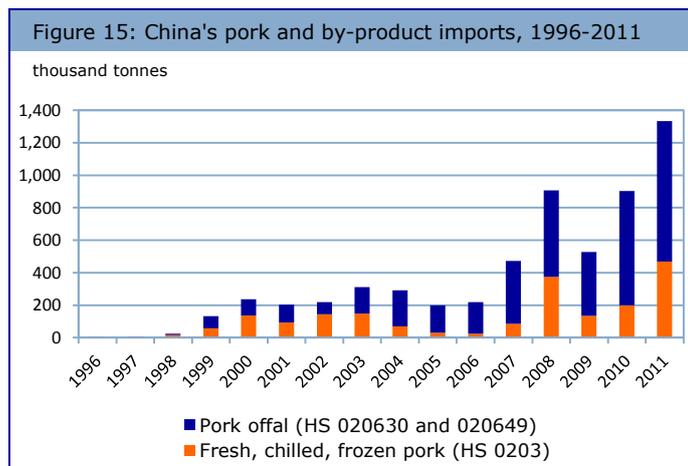
While China has increased its pork imports in recent years, this should be viewed as a temporary solution to fulfil the shortage in the short term rather than as a long-term strategy (see Figure 15). We maintain our view that China could be self-sufficient in pork

supply in the long term, although China will continuously increase pork by-product imports due to high domestic demand. There are three main reasons why we believe that pork imports will be only a supplement instead of a major source of domestic supply.

First, as China has no comparative advantage in land-intensive agriculture (e.g. corn), strategically it would make more sense for China to import such products instead of the products for which China has a certain advantage (e.g. pork). Pork production is less land-intensive if middle-sized farms play the dominant role. Therefore, instead of increasing pork imports, China should increase corn and soybean imports to facilitate the rapid domestic industrialisation of hog production.

Second, there is great potential for improving hog productivity in China. China's cost of hog production is currently one of the highest in the world. However, there is still room for production cost to decrease if productivity is enhanced. Some cases prove that this is achievable. For example, Muyuan Corporation is the leading hog producer in northern China, with above 1 million head of hog production capacity. Muyuan farms have higher productivity compared to the national average. The number of hogs per sow per year could reach above 20, while the national average number is less than 15 across China. Muyuan's feed conversion rate is lower than the national average, suggesting that production cost could be reduced through consuming less feed. Assuming that industrialisation will bring more efficient farm management and more professionalism to China's hog production, the production cost is expected to decrease. This will largely solve the pork supply issues in China.

Third, Chinese consumers have a strong preference for fresh meat, making imported frozen pork unpopular at the retail market. Frozen pork will flow to high-end restaurants as well as processing plants when there is a big price difference between local and international markets. Imported pork has limited application in the domestic market.



Source: China Customs, 2011

Conclusion

China's pork supply chain is in a transition period, shifting from traditional household farming to modern and commercial systems. The industrialisation trend is inevitable and fast moving. However, while farms and slaughtering/processing plants are growing rapidly in size, the coordination between the two remains undeveloped. The pork supply chain is still based on the spot market in most cases. Food safety issues cannot be solved under the current system. Therefore, developing coordination will be the next focus for the entire industry in the coming years. It is noteworthy that despite the slow improvement in coordination in the overall market, several emerging supply chain models are being implemented by industry pioneers—mainly leading pork companies at both the national and regional levels. Full vertical integration is one model that is attracting a lot of attention as it is believed to be the solution to food safety issues. However, given the diversity of China's geography, there is hardly one model that could best suit all of the country's circumstances. Timing of entry, location and professional experience will impact the choice of supply chain models. Along with the industrialisation, China is expected to improve its pork production productivity in the coming years.

The pace and success of the industrialisation that is rapidly taking place across China's pork sector will be a major determinant to whether China will move back towards self-sufficiency or become an even bigger importer. This in turn will have a major impact on world markets. If China could improve its corn yields and swine feed conversions ratios towards US levels then goals of self-sufficiency are mathematically achievable. However, there are many challenges in achieving this success, such as the continuation of disease problems, food safety issues, logistics and the lack of a cold chain. If China does not import pork, we believe that all indications are that it will need to import corn. If current trends in China's pork production and industrialisation continue, corn imports could approach 20 million tonnes per year within a five-year time frame.

China has recently been importing over 0.4 million tonnes of pork per year, in a world market with trade of less than 7 million tonnes per year. Changes in the landscape of China's pork industry will have major reverberations around the world. We believe that China will be an importer of pork and corn for the foreseeable future, but how much of each will depend on improvements in the supply chain discussed in this report.