The ongoing modernisation of China's dairy sector
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Introduction

China has long aimed to increase dairy consumption in order to improve public health and nutrition. In 2006, Prime Minister Wen Jiabao said “I have a dream that every Chinese person, especially children, can drink one jin of milk per day” (note: one jin is equal to 0.5 kg). The 2009 Dairy Industry Policy stated that per capita milk consumption was a key indicator of the country’s standard of living. China’s per capita dairy consumption is currently less than 100 grams per day, compared to the national daily recommendation of 300 grams. With these goals in mind, government policies aim to increase domestic production by nearly 50% by 2025.

Between 1980 and 2006, China’s raw milk production increased by more than 2000% from 1.4 million tonnes to over 30 million tonnes. Production peaked at 33 million tonnes in 2012. Consumption has continued to increase, but dairy production has declined. More than 30% of China’s dairy products (measured in raw milk equivalents) now come from imports, compared to about 5% in 2007.

Dairy production growth has stagnated since 2008, but consumption has continued to increase. China now relies on imports for about about 30% of its dairy raw materials (as measured in raw milk equivalents.)
During the past 10 years, the entire value chain has been modernising, but the sector’s transformation is not yet complete. The industrialisation of dairy farming, vertical integration by processors and upgrading of genetics and technology will continue. These trends will continue to deliver better food safety and quality, and a proliferation of new dairy products. China’s top three dairy processing companies account for nearly 50% market share, and they will continue to drive modernisation and innovation throughout the value chain.

The most difficult challenge to China’s ambitious growth plans is the high cost of domestic production. Imported dry dairy products are cheaper than domestic products. Limited domestic forage and feed crops are an important driver of the cost difference. China’s large-scale dairy farms depend on imported alfalfa and soy, and manufacturers often depend on imported milk powder. Increasingly stringent environmental and food safety regulations, as well as rising labour costs, also contribute to production costs.

Growth and new product development will be driven by cold chain expansion and rising disposable income. UHT milk was the first dairy product to achieve widespread consumption, but fresh milk is becoming popular as cold chain distribution capacity grows and as consumers look for products viewed as more nutritious. Yogurt sales recently surpassed liquid milk sales, and this trend is likely to continue as competition drives new yogurt product development in both the UHT and chilled categories. Infant milk formula (IMF) is still dominated by foreign brands, but government policies aim to increase the market share of Chinese brands to 80%. Dairy companies are looking to e-commerce, expanding chains of supermarkets, convenience stores and maternity stores, as well as third- and fourth-tier cities for revenue growth.

China’s government has been issuing new plans, policies and regulations to modernise production, improve food safety and quality, and reduce dependence on imports. Dairy manufacturers are encouraged to build or acquire controlling stakes in dairy farms. Government policies actively encourage the establishment of strong domestic dairy brands and increased consumption of pasteurised milk and dry products such as cheese. Because babies and children are the most vulnerable of all consumers, dairy products – especially IMF – are among the most strictly regulated of all food and beverage products in China.

China is has been one of the world’s largest dairy producers for more than a decade. In terms of modernisation, it is now far ahead of major developing countries, and its large corporate farms and factories increasingly resemble those of modern industrial dairy countries.

This report will look at dairy industry trends in China across the entire supply chain, and will highlight some keys to success in this dynamic environment.

2. 乳制品工业产业政策（2009 年修订）
3. 中国营养学会,声明:关于《中国居民平衡膳食宝塔（2016）》官方版本,18 May 2016, http://dg.cnsoc.org/article/04/8a2389fd54b6964c80154c1d781d90197.html
5. 乳制品工业产业政策（2009 年修订）
6. 中国营养学会,声明:关于《中国居民平衡膳食宝塔（2016）》官方版本,18 May 2016, http://dg.cnsoc.org/article/04/8a2389fd54b6964c80154c1d781d90197.html
8. 2019 China Dairy Statistical Summary, 1 kg of dry dairy product imports is estimated to equal 8 kg of milk as per the China Dairy Association methodology.
10. USADIA, China Diary and Products Annual, 15 Oct 2018
Dairy farming sector
Stagnating growth and farm consolidation

Between 1980 and 2008, China’s annual raw milk production incredibly grew from 1.4 million tonnes to over 32 million tonnes. The introduction of UHT processing and aseptic packaging technology in the late 1990s enabled longer shelf life and distribution without refrigeration, launching a period of rapid dairy industry growth. This made China one of the largest dairy producers in the world.

The fragmented structure of China’s raw milk production has made supervision over safety and quality challenging. Growth in raw milk production prior to 2008 was delivered by a vast increase in the number of dairy farms. In 2002, China had less than 1.4 million farms with dairy cows, of which 1.1 million had fewer than 5 cows. At the time of the melamine crises in 2008, China had nearly 2.6 million dairy farms, of which nearly 2 million had fewer than 5 cows. These small farm owners generally lacked the resources and expertise to implement best practices for efficient production, raw milk quality and food safety. Nearly half of all raw milk was extracted by hand. Compared to today, there was relatively little oversight for dairy farms and the collection and trading of raw milk.

Since 2008, raw milk production has practically stopped growing, but the government and China’s leading dairy companies have been focused on modernising the industry and on improving food safety and product quality. In December 2018, the government announced plans for a new period of rapid growth. The Opinions on Further Advancing Dairy Industry Rejuvenation set a production target of 45 million tonnes for 2025, an increase of nearly 50% over 2018. This growth will be driven by increasing China’s dairy herd, farm scale and productivity, as the number of dairy farms continues to fall.

Driven by government policy and increasingly strict regulations, the number of small dairy farms has been rapidly shrinking, while the average farm scale has been steadily increasing. The number of dairy farms has fallen by nearly 75%, from over 2.6 million in 2007 to 660 thousand in 2018. The decrease was especially steep between 2016 and 2018 when the number of dairy farms fell by nearly 50%, largely due to new environmental restrictions on livestock farming.

The number of farms with dairy cows has fallen by nearly 75% since 2007, even as raw milk production has remained steady.
In addition, large dairy processors are increasingly purchasing milk from large commercial dairy farms that they control or with whom they have long-term purchase agreements.

The trend in China since 2007 is similar to developments in the US and Western Europe during the past 30-40 years. Between 1987 and 2017, the number of US dairy farms fell from about 200 thousand to 40 thousand while annual raw milk production increased from about 65 million tonnes to over 95 million tonnes. The number of farms with dairy cows in the ten original EU member countries fell from 1.5 million farms in 1983 to about 290 thousand farms in 2013, an 80% decrease.

As the number of dairy farms in China fell by about 75%, the average number of dairy cows per farm more than tripled.

13. 九部委印发《关于进一步促进奶业振兴的若干意见》, 26 Dec 2018
15. USDA
21. China Animal Husbandry and Veterinary Yearbook
The government has been encouraging and incentivising the construction of larger dairy farms. The average dairy farm scale has increased from almost 5 to nearly 16 cows. The number of professional dairy farming cooperatives has grown from about two thousand in 2008 to over 16 thousand in 2017. The percentage of China's dairy cows on scale farms, (i.e. farms with more than 100 dairy cows,) has increased from 20% in 2008 to over 60% in 2018. The number of farms with more than 1,000 dairy cows has grown from 112 in 2002 to more than 1,350 in 2017.

China's dairy herd distribution by size of farm

China’s dairy herd shrunk by nearly 20% between 2008 and 2018, but the percentage of cows on farms with more than 100 cows increased from 20% to over 60%.
In spite of this ongoing consolidation, China’s dairy farm sector is still highly fragmented compared to the most modernised dairy countries, such as New Zealand and the US. In 2018 the US had only about 37,500 dairy farms with an average size of 251 cows.

<table>
<thead>
<tr>
<th>Number of dairy farms</th>
<th>Average number of cows per farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>China 661,760</td>
<td>China 16</td>
</tr>
<tr>
<td>Germany 65,782</td>
<td>Germany 64</td>
</tr>
<tr>
<td>US 37,468</td>
<td>US 251</td>
</tr>
<tr>
<td>New Zealand 11,590</td>
<td>New Zealand 431</td>
</tr>
</tbody>
</table>

China’s dairy farming sector is still highly fragmented, with over 660,000 farms raising dairy cows and an average size of nearly 16 cows per farm.

22. 2019 China Dairy Statistical Summary: Dairy Association of China, White paper of China Dairy Industry; PwC estimates
23. 2019 China Dairy Data Report
24. 2019 China Dairy Data Report
Dairy farm modernisation

China’s dairy industry has made great progress in modernisation. Government policies have increased the percentage of milk obtained by mechanical milking from 51% in 2008 to 95% in 2015. On China’s scale farms, 100% of milking is mechanised. The use of total mixed rations (TMR) for feeding is another indicator of modernisation. The share of scale dairy farms in China using TMR increased from 30% in 2008 to over 90% in 2018.

<table>
<thead>
<tr>
<th>Raw milk obtained by mechanised milking</th>
<th>Share of scale dairy farms using TMR technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>51% 2008</td>
<td>30% 2008</td>
</tr>
<tr>
<td>95% 2015</td>
<td>90% 2018</td>
</tr>
<tr>
<td>99% (planned)</td>
<td></td>
</tr>
</tbody>
</table>

The share of raw milk obtained by mechanical milking increased from 51% in 2008 to 95% in 2015, substantially improving China’s food safety and quality.

29. China Dairy Data Report 2019
Modern farming techniques, large-scale industrial farms, and improved genetics have all contributed to the steady increase in productivity. Average annual production for Holstein cows increased from just under 4000 kg per year in 2005 to 7,400 kg in 2018.

China’s leading dairy farming company, while accounting for less than 5% of total production, had already achieved annual production of more than 10,000 kg per dairy cow by 2018. Some companies have achieved annual production of more than 11,000 kg per dairy cow.\textsuperscript{29}

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|}
\hline
Year & 1-10 cows & 11-50 cows & 51-500 cows & 500+ cows \\
\hline
2005 & 3,891 & 4,760 & 6,000 & \textbf{7,400} \\
2010 & & & & \\
2015 & & & & \\
2018 & & & & \textbf{7,534} \\
\hline
\end{tabular}
\caption{China's average milk production for Holstein cows (kg/year)\textsuperscript{30}}
\end{table}

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|}
\hline
Scale of Farm & 2017 Average Milk Production per Cow (kg/year) \\
\hline
1-10 cows & 5,221 \\
11-50 cows & 5,507 \\
51-500 cows & 5,950 \\
500+ cows & \textbf{7,534} \\
\hline
\end{tabular}
\caption{2017 average milk production per cow by scale of farm (kg/year)\textsuperscript{31}}
\end{table}

China’s average dairy cow productivity has nearly doubled since 2005. Farms with more than 500 cows achieve a significantly higher level of productivity than other farms.

30. \textit{China Dairy Data Report 2019}  
31. NDRC, \textit{全国农产品成本收益资料汇编2018}
High production costs

There has been a shift from small farms to larger-scale farms, but China’s overall production costs appear to not improve with scale. NDRC estimates indicate that economies of scale reduce per-unit labour costs on dairy farms. But these savings are offset by other costs, including commercial fodder, electricity, veterinary services and management fees.32 Small and backyard dairy farms can often graze their cattle in nearby fields or gather their own forage. Large-scale farms must purchase alfalfa or other fodder for delivery to their farms.

According to NDRC estimates, larger farms have lower labour costs per unit of milk compared to backyard and small-scale farms. But these savings are offset by the cost of commercial fodder, electricity, veterinary services and management fees.

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**2017 estimated raw milk production cost by farm size (CNY/kg)**

According to NDRC estimates, larger farms have lower labour costs per unit of milk compared to backyard and small-scale farms. But these savings are offset by the cost of commercial fodder, electricity, veterinary services and management fees.

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32. NDRC, 全国农产品成本收益资料汇编2018
33. NDRC, 全国农产品成本收益资料汇编2018
During the period from 2006 to 2014, the shift to larger scale dairy farms improved labour productivity and average production per dairy cow. But the feed conversion ratio, (i.e. the amount of milk produced per unit of feed concentrate), did not improve significantly, nor was there much difference between the feed conversion ratios on backyard, small-, medium- and large-scale farms.34

Prior to 2008, China did not import significant amounts of fodder. But as the number and scale of large dairy farms grew, so did demand for commercial fodder supplies. By 2015, China’s dairy and livestock farms consumed 3 million tonnes of quality alfalfa, of which 1.2 million tonnes was imported. With growth in the number of scale livestock farms, China’s demand for quality alfalfa is expected to reach 6.9 million tonnes by 2020, of which 90% will be for dairy farms.35 China also depends on imports for soy, a key ingredient in feed concentrate.

Alfalfa and other forage products imports (tonnes)36

Soy imports (tonnes)37

Commercial dairy farms in China often depend on imported alfalfa and soy to feed their animals. This contributes to the high cost of raw milk.

36. UN Comtrade Database
37. UN Comtrade Database
China’s raw milk production costs are higher than those of other countries with large modern dairy farming sectors. These higher costs are due mainly to higher prices of feed concentrate (e.g. corn, soybeans) and fodder. Increasing labour expenses are also an important factor. In 2018, raw milk produced in China cost 46% more than raw milk in New Zealand, the largest source of China’s dairy imports, and 53% more than the global average.38

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**2018 raw milk prices (USD/100 kg)**  

<table>
<thead>
<tr>
<th></th>
<th>Global average</th>
<th>US</th>
<th>New Zealand</th>
<th>Brazil</th>
<th>EU</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price (USD/100 kg)</td>
<td>30</td>
<td>35</td>
<td>30</td>
<td>35</td>
<td>40</td>
<td>50</td>
</tr>
</tbody>
</table>

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China’s raw milk price is higher than other countries with modern dairy industries. Contributing factors include imported forage and increasing labour costs.

38. China Dairy Data Report 2019  
39. China Dairy Data Report 2019
Geographic and seasonal mismatch

In addition to the imbalance between total annual domestic supply and demand, China’s dairy sector also suffers from geographic and seasonal imbalances. Four provinces in the North (i.e. Heilongjiang, Inner Mongolia, Xinjiang and Hebei) account for more than half of China’s milk production, but less than 12% of the population. At the same time, twelve provinces clustered in the south and along the coast account for 52% of the population but less than 20% of dairy production. The distance between raw milk production and dairy consumers is a limiting factor for consumption of fresh milk and chilled yogurt, which have limited shelf life and require continuous refrigeration.

Raw milk production has seasonal variations that are not aligned with seasonal changes in consumption. These periodic imbalances between supply and demand can create temporary gluts of raw milk. When supply exceeds demand, raw milk prices fall and processors convert excess raw milk to powder. This domestically produced powder, however, is generally produced at a higher cost than imported powder. These seasonal imbalances can negatively impact small farmers who aren’t protected by price stabilisation measures or long-term purchasing contracts.

Seasonal changes in production and consumption contribute to annual price fluctuations. In 2019, raw prices have increased by 8% over 2018, reaching the highest levels since 2014. These high prices could support further investment in dairy farms.

It is also worth noting that China’s growing dairy consumption, combined with the withdrawal of hundreds of thousands of small farmers has resulted in an 8% year-on-year increase in raw milk prices during the second half of 2019. In August, prices reached their highest level since 2014.

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40. USDA, China Dairy and Products Annual, 15 Oct 2018
41. Wind, MARA
42. Wind
Ambitious growth target

While China’s dairy production has been flat since 2008, consumption has continued to grow. The gap between supply and demand has been met by growing imports, mainly in the form of milk powder. Powder is the most common dairy product for international trade due to its relatively low shipping costs and long shelf life. Imports accounted for more than 30% of China’s dairy consumption, (as calculated in raw milk equivalents), up from about 5% in 2007. China’s National Dairy Industry Development Plan (2016-2020) aims to maintain a self-sufficiency ratio of at least 70%.

The government has announced its goal of increasing annual domestic production to 45 million tonnes by 2025, an increase of more than 40% over 2018. Achieving this target will require both improved output per dairy cow and an increase in the number of cows. As the number high-productivity cows on modern, large-scale dairy farms grows and the number of cows on low-productivity small farms falls, the average productivity of China’s herd will continue to increase and could potentially reach levels seen in the US and Europe.

Even as dairy consumption has continued to increase, China’s dairy herd has shrunk by 15% since 2008. Achieving the government’s raw milk production target of 45 million tonnes by 2025 will require substantial increases in both the size and productivity of China’s dairy herd.

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44. 2018, 2019 China Dairy Data Report; 2019 China Dairy Statistical Summary；九部委印发《关于进一步促进奶业振兴的若干意见》. 26 Dec 2018

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The dairy herd, however, has decreased by 15% since 2008, as small farms left the industry. Expanding the percentage of China's herd on scale farms will require investment in new facilities and cows. Although there are plans to increase alfalfa planting, dependence on imported fodder will likely increase.

If the 2019 increase in raw milk prices continues, it will help make profitable growth more sustainable and investment in dairy farms more attractive. Nevertheless, increasing the number of scale farms will require continued subsidies and other government incentives in order to meet increasingly strict environmental, food safety and biosecurity requirements. Subsidies and incentives will also be needed to overcome high feed costs and to compete with relatively cheap milk powder imports.

Labour costs will continue to increase, driven by multiple trends, including the decrease in China's working age population, the decrease in China's rural population, and increasing wages and productivity in the manufacturing and services sectors. Labour costs will also accelerate the shift to larger farms, where costs can be spread over larger herds and there are greater opportunities for automation.

Future dairy farm modernisation

China's current wave of dairy farm modernisation is focused on standardisation, mechanisation, genetic improvement and farm scale. The next wave will be the shift to automated milking and feeding, and precision dairy farming. These technologies will further improve efficiency, productivity and animal health.

In the Netherlands, about 30% of raw milk is obtained by automated milking systems (AMS), but AMS is only used on an estimated 1-2% of cows in China. AMS eliminates the need for human involvement in daily milking, raises efficiency and improves sanitary conditions.

Precision dairy farming is “the use of technologies to measure physiological, behavioral, and production indicators on individual animals.” It includes the use of online or inline sensors to monitor milk quality and udder health, automatic feeding systems to better manage and monitor calf health, wearable technology (e.g. accelerometers, rumination sensors) to measure cow behaviour and activity, video analysis or facial recognition, etc. Wireless, cloud and big data technologies can facilitate transmission, processing and analysis of the stream of information produced by these monitors.

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45. 农业部关于印发《全国苜蓿产业发展规划 2016-2020 》的通知, 18 Jan 2017
The ongoing modernisation of China's dairy sector

Dairy processing sector
Consolidated industry structure

While China’s raw milk production is highly fragmented, its processing sector is much more concentrated. The largest three dairy processing companies in China account for about 50% market share, and the top two processors purchase 45% if the country’s raw milk production. In contrast, the top ten dairy farming companies together deliver less than 25% of China’s raw milk production. This gives large processors significant pricing power over farms.

The industry structure in China contrasts with that of the US. The US dairy industry is dominated by dairy farm cooperatives. The largest three account for about 50% of raw milk production. The largest three US dairy processing companies account for only 22% market share. In spite of these large cooperatives and the large scale of US farms, low milk prices continue to force family-owned farms out of the industry in favour of industrial scale farms. In Europe, dairy cooperatives account for about 55% of the market.48

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49. China Dairy Data Report 2019, IBIS
50. China Dairy Data Report 2019, IBIS
The consolidation of China’s dairy processing sector has been a long-term trend. The top two companies, Yili and Mengniu, together processed about 25% of raw milk production in 2010. By 2017, that number had risen to 45%. In 2008, China had 815 scale enterprises with combined revenue of 143 billion RMB. By 2018, the number of dairy processors had fallen to 587, while the sector’s revenue had grown to 340 billion RMB.

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51. “Scale” enterprises are those with annual revenue exceeding 20 million CNY

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China’s top two dairy companies processed about 45% of China’s raw milk production in 2018, up from 25% in 2010. This gives dairy processors significant pricing power over dairy farmers.
Vertical integration and cross-border expansion

China’s largest dairy companies are driving the modernisation of the industry through vertical integration and product development. In China and overseas, they are acquiring and investing in raw milk production bases, processing capacity and brands.

Within China, Mengniu has acquired a majority shareholding in China Modern Dairy, China’s largest producer of raw milk, and Shengmu High-tech Dairy, China’s leading organic milk producer. Overseas, Chinese companies have been investing in dairy farms and processing capacity, both to increase overall capacity and to deliver premium-priced imported dairy products. In 2019 Yili acquired Westland, New Zealand’s second largest dairy cooperative, in order to secure a new and stable supply of quality raw milk. In 2010, Bright purchased a majority stake in New Zealand’s Synlait Milk, and remains a major shareholder.

Shanghai Pengxin purchased several large New Zealand dairy farms in 2012. They have also joined investors linked to China’s largest e-commerce company to co-invest in an associated New Zealand company that owns dairy farms and exports premium-priced UHT and fresh milk to China, the latter via air transportation.

China’s dairy companies are also looking to Australia, New Zealand and Southeast Asia to grow their sales of yogurt, fermented milk beverages, ice cream and other products. In November, Mengniu agreed to acquire Australia’s Lion Dairy & Drinks, a manufacturer of dairy and other beverages, and owner of several popular brands. Mengniu opened a production facility in Jakarta in November 2018, the first factory opened by a Chinese dairy company in Southeast Asia. Indonesia’s yogurt penetration is only 17%, compared to 80% in China and 95% in Europe.

The value of China’s ice cream exports rose more than 300% between 2015 and 2017. 75% of 2017 ice cream exports went to Indonesia. This growth coincides with China’s largest dairy companies’ Southeast Asia growth strategies. Yili has launched a series of ice cream products in Indonesia and recently acquired Thailand’s largest ice cream producer.

During the past decade, Chinese companies have acquired foreign IMF brands, as well as overseas IMF processing capacity. For example, Yili and Mengniu have invested in IMF manufacturing plants in New Zealand. Feihe, China’s largest IMF producer, is building a plant in Canada that will focus on premium goat milk IMF for export to China. In 2019, Mengniu agreed to acquire Australia’s largest producer of organic IMF. In 2015, Yashili acquired Danone’s Asia IMF operations and brand, while Danone has purchased stakes in Yashili and Mengniu’s New Zealand subsidiary.

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57. Bright Dairy 2018 Annual Report
Product mix

China's dairy product market is roughly 400 billion CNY. The leading products are yogurt, liquid milk and infant milk formula (IMF). During the first half of 2019, milk powder showed the fastest growth of these major categories. Sub-categories with high growth rates include organic dairy products, goat milk IMF, fresh (refrigerated pasteurised) milk, UHT yogurt and premium UHT milk.

China's largest two dairy companies, Yili and Mengniu, both headquartered in Hohhot, Inner Mongolia, together account for more than 50% market share in UHT milk and yogurt (including both chilled and UHT). They are also the leading companies for ice cream production, combining for just over 20% market share. Yili is the largest ice cream producer, Bright is the leading fresh milk producer, and Feihe is the leading domestic producer of IMF.

The main retail channels are modern supermarkets, hypermarkets, convenience stores and maternity stores. E-commerce sales for China's leading companies grew by more than 50% in 2018.

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68. Yili 2019 interim report presentation slides
69. Euromonitor, annual reports
70. Annual reports
71. Australian Trade and Investment Commission, Exporting Food and Beverage to China, Nov 2018; China Daily, “Yogurt is Top Seller in Dairy Products”, 24 Oct 2017; Euromonitor, Company annual reports; PwC estimates
UHT milk

Because China has historically lacked cold chain capacity, UHT milk has been one of the most widely consumed dairy products. It accounts for more than half of the liquid milk market.72 With a shelf life of over six months at room temperature, UHT milk is ideal for long-distance distribution, as well as for warehouses and retail outlets that lack refrigeration. This has contributed to a highly concentrated market, with the two largest dairy companies accounting for about two-thirds of all UHT milk sales.73 China’s largest dairy company reports that its UHT products have a penetration rate of 84% overall and 86% in third- and fourth-tier cities.74 Longer shelf life also enables imported UHT milk to compete in China’s market.75

Fresh milk

Fresh milk is viewed as a premium product and more nutritious than UHT milk. Profit margins on fresh milk can be twice as high as on UHT milk76 and it faces practically zero competition from imports. With distribution range limited by shelf life, the fresh milk market is more fragmented than those of UHT milk and yogurt. Fresh milk accounts for less than half of China’s liquid milk market, compared to over 90% in the US, Canada and Japan.77 Fresh milk is now common in first- and second-tier cities, and China’s growing cold chain capacity is increasing fresh milk’s penetration in smaller cities and rural areas. The government is promoting consumption of fresh milk as part of its efforts to increase dairy consumption and foster premium products. At least one company uses a 24-hour shelf life as a key branding attribute to emphasise the freshness of its pasteurised milk.78

Bright Dairy, headquartered in Shanghai, is the market leader in fresh milk.79 In 2018, Mengniu reported that it had built up its fresh milk supply chain and sales channels to reach 30 major cities throughout China.80

Refrigerated warehouse capacity in China (m³) 81

China’s per capita refrigerated warehouse capacity is one-third that of the US and one-half that of Western Europe. But total refrigerated warehouse capacity has increased by about 150% since 2012.
In recent years, yogurt sales have grown rapidly, overtaking sales of liquid milk. China’s yogurt market is relatively concentrated, with the top three dairy companies accounting for more than half of the market, similar to the US. Gross margins for yogurt are estimated to be 30-40% for China’s leading dairy companies.

Yogurt offers higher margins than UHT milk, as well as greater potential for product differentiation and targeting of specific consumer segments. Chinese companies already offer a multitude of options for consumers, but they also need to actively develop new products and target specific consumer segments. Unique products and premium branding can support higher prices – directly improving dairy companies’ bottom line.

The US yogurt industry offers an example of how new products and branding can rapidly take market share from established brands. Between 2007 and 2014, US sales of Greek-style yogurt increased from 1% to over 50% market share, and drove a 50% increase in the overall yogurt market. During that time, a small Greek-style yogurt start-up quickly grew to become the second largest yogurt company in the country, while the erstwhile industry leader fell to number three. Every major yogurt producer quickly developed its own series of Greek yogurt products.

The lesson of the US market is that companies must continuously develop new products and branding that are targeted for very specific consumer segments. A typical supermarket in the US carries about 300 varieties of yogurt. Dairy companies, large and small, are constantly thinking of new ways to draw consumers away from their current favourite yogurt product.

Several yogurt products that delivered growth in the US have also been launched in China, including Greek, Icelandic and Australian styles, as well as organic, sugar-free, high protein and plant-based products. There are also many innovations specifically tailored to China’s consumers, including salted egg, avocado and green tea varieties of yogurt.

UHT yogurt consumption has been growing quickly and now accounts for about half of the yogurt market. Like fresh milk, refrigerated yogurt sales growth will depend on expanding cold chain capacity. Chilled yogurt contains live bacteria and its probiotic attributes are promoted as a health advantage over ambient yogurt. UHT yogurt has the advantage of long shelf life. It is more suitable for on-the-go consumption and for distribution to third- and fourth-tier cities with inferior cold chain capabilities.
Dairy companies must continuously develop new, differentiated products and branding that are targeted for specific consumer segments.

Product characteristics for differentiation

<table>
<thead>
<tr>
<th>Characteristic for differentiation</th>
<th>Liquid milk</th>
<th>Yogurt &amp; fermented milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh (chilled) or UHT</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Full fat, reduced fat or fat-free</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Flavourings</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Packaging (e.g. single serving, multiple serving, on-the-go)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Nutrient fortification</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Lactose-free</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Plant-based</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Organic</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>No artificial additives or preservatives</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>High protein</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Drinkable or spoonable</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Solid ingredients (e.g. fruit, nuts, grains, chocolate chunks, etc.)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Production style (e.g. Greek, Icelandic, Australian, Balkan)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Probiotic</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

Potential target consumer segments and related product differentiators for yogurt

<table>
<thead>
<tr>
<th>Consumer segment</th>
<th>Product attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents of young children</td>
<td>Healthy food that kids like to eat</td>
</tr>
<tr>
<td>Dieters / calorie counters</td>
<td>Low calories, low fat, low added sugar or low lactose</td>
</tr>
<tr>
<td>Athletes / fitness enthusiasts</td>
<td>High protein</td>
</tr>
<tr>
<td>Older consumers</td>
<td>Probiotic for better digestion</td>
</tr>
<tr>
<td>Foodies</td>
<td>Rich/creamy texture, foreign/traditional recipes, new or unique ingredients/flavours</td>
</tr>
<tr>
<td>Vegans</td>
<td>Plant-based milk and yogurt</td>
</tr>
<tr>
<td>Lactose intolerant</td>
<td>Plant-based or lactose-free</td>
</tr>
<tr>
<td>Organic and clean label consumers</td>
<td>Organic, no additives, no preservatives</td>
</tr>
</tbody>
</table>
Ice cream

According to industry estimates, China surpassed the US as the world’s largest producer and consumer of ice cream in 2016. China’s production has been growing quickly, estimated at 5 million tonnes in 2018, compared to about 3 million tonnes in the US. Annual per capita ice cream consumption is approaching seven litres in China, compared to about 18 litres in the US. US per capita consumption has fallen by about 25% since its peak in 1994.

The largest four producers account for about one-third of the market in China, compared to over 50% in the US. China’s leading ice cream manufacturer (by retail sales value) produced nearly 400 thousand tonnes of ice cream products in 2018 and reported gross margins of 47% for its ice cream products during the first half of 2019.

91. USDA, Includes ice cream, frozen yogurt, sherbet and other frozen deserts
93. IBISWorld, Ice Cream Production in the US, Dec 2018
94. Yili, 2019 Interim Results
Like yogurt, ice cream is a product that offers great potential for new product development and premium pricing. Its growth is even more dependent on cold chain capacity than refrigerated yogurt and fresh milk. As a desert item that is not associated with health functions, it is also dependent on consumers’ disposable income and willingness to spend on luxury items. Frozen yogurt is often perceived as a healthier option than ice cream, and will likely benefit from increased consumer interest in health and nutrition.

The cold chain distribution networks of hypermarket, supermarket and convenience store chains will facilitate growth in this category as these retail channels gain market share and displace independent shops and traditional markets.

China is a net exporter of ice cream. In 2018, China exported over 31 thousand tonnes of ice cream and imported nearly 22 thousand tonnes.95

China’s ice cream imports and exports (tonnes)96

China is a net exporter of ice cream. In 2018, China exported over 31 thousand tonnes of ice cream and imported nearly 22 thousand tonnes.

95. UN Comtrade
96. UN Comtrade
Cheese consumption in China (tonnes)\textsuperscript{99}

China imported over 108 thousand tonnes of cheese in 2018, compared to domestic production of only about 30 thousand tonnes.

\textsuperscript{97} Dairy Association of China, \textit{White paper of China Dairy Industry}

\textsuperscript{98} 2019 \textit{China Dairy Data Report}, Production amount from 2017

Infant milk formula

China’s infant milk formula (IMF) market is the world’s largest and is expected to grow by about 20% by 2023. The market is currently driven by two opposing trends: China’s slowing birth rate and its growing income. The number of infants, the number of women of childbearing age and the birth rate all continue to fall. At the same time, parents are increasingly willing and able to purchase more expensive products. To adapt to these trends, companies have been increasing premium IMF products that feature goat milk, organic milk, imported raw materials, foreign brands, etc. The leading domestic IMF brand has reported gross margins of 70% on its IMF products.

After a brief spike following the relaxation of China’s one child policy, annual childbirth numbers have continued their long-term decline. In 2018, there were only 15.2 million births, compared to 17.9 million in 2016. The birth rate in 2018 was 10.94%, down from 12.95% in 2016. At the same time, per capita disposable income grew by 54% between 2013 and 2018.

The IMF market is currently driven by two opposing trends: China’s slowing birth rate and its growing income.

102. China Feihe Limited, Global Offering Prospectus, 30 Oct 2019
103. National Bureau of Statistics
104. National Bureau of Statistics; PwC estimates
105. National Bureau of Statistics
Companies have also been shifting their focus to third- and fourth-tier cities where e-commerce and modern retail chains are increasing their penetration. With rising rural incomes, these consumers can increasingly afford premium-priced IMF products.

China’s IMF market is relatively fragmented compared to the US. The top four brands in China account for around half of the market, compared to more than 80% in the US. Government policies, however, are driving consolidation and localisation.

Specialised maternity and infant stores are the leading retail channel for IMF, followed by supermarkets/hypermarkets. According to estimates, there are now more than 100,000 maternity and infant stores in China. Online platforms, including cross-border e-commerce sites, are increasing their market share, and already account for an estimated 25-30% of IMF sales.

Market share of top four infant formula producers

The top four brands in China account for around half of the IMF market, compared to more than 80% in the US.
Four of the top five are foreign brands.

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108. Yashili, 2018 Annual Report

109. The A2 Milk Company, Stepping it up, Investor strategy day, 17-18 Sep 2019


112. Yashili, 2017 Annual Report
Domestic IMF producers face multiple challenges. The first is that raw material costs in China are higher than those of dairy exporting countries such as New Zealand and Australia. The second challenge is favourable consumer perception of foreign brands. Four of the top five brands in China are foreign brands, and the current market share of domestic brands is estimated at only 40-45%.

Many Chinese IMF brands use imported milk powder as raw material. This reflects China’s inadequate raw milk production as well as the cost advantages held by dairy farms in New Zealand and other exporting countries. Some Chinese brands produce and package premium IMF products overseas to meet consumer demand for imported products. Chinese companies have also purchased foreign-owned IMF operations in China, and continue to use those brands.

China’s new e-commerce law became effective in January 2019. It includes new, more stringent requirements for cross-border sales. Several foreign IMF producers previously relied on “daigou” channels or direct cross-border sales to China via foreign websites. Under the new law, they will likely need to complete the China infant milk formula recipe registration process, register with China customs authorities, establish a registered business in China and pay taxes in China. Failure to comply could result in their products being blocked by customs.

At the same time, foreign brands also produce IMF inside of China, using domestically produced raw materials. This helps to align with government plans to increase the amount of domestically produced IMF.

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113. UN Comtrade
Infant milk formula regulations and policies

IMF is one of the most strictly regulated products in China. The government has been enforcing increasingly stringent safety, quality and traceability requirements, and has been issuing policies to foster consumer confidence in domestic brands. The government aims to increase the market share of domestic brands and domestically produced IMF. Notable policies and regulations include:

- **The Rules for Control and Oversight of Infant Formula Milk Powder Production Enterprises**, issued in 2013, stated that IMF manufacturers who use fresh milk as a raw material must have self-built or self-controlled raw milk production bases and make progress towards obtaining all of their raw milk from dairy farms in which they own a controlling share.115

- **The Standards for Infant Milk Formula Powder Production Company Food Safety Traceability Records**, issued in 2015, contains very detailed record-keeping requirements, including product R&D and formulation, raw and supplementary materials management, production and processing, finished product management, sales management, risk information collection and product recalls.116

- **The Administrative Measures for Registration of Recipes for Formula Powder Products for Infants and Young Children (CFDA Decree 26)**, issued in 2016 and took full effect in 2018. All IMF products, including both domestic and imported products, must be registered with the State Administration for Market Regulation (SAMR). Each business entity is limited to three recipes for each of the following age groups: 0-6 months, 6-12 months and 12-36 months.117 This regulation reduced the number of IMF products in the Chinese market from over 2700 in 2016118 to about 1200 approved recipes from 155 enterprises at the end of 2018.119

- Draft revisions of the Measures were published for comment in July 2019. These revisions include more stringent requirements for IMF recipe registration, and a requirement that applicants must possess the complete manufacturing process. The revisions also clarify seven specific reasons for denial of registration applications, and provide more detailed requirements and prohibitions for labels and usage instructions.120

- **The National Dairy Industry Development Plan (2016-2020)**, issued in January 2017, set specific goals for consolidation, branding and vertical integration. According to the plan, there will be three to five companies in China earning more than CNY 5 billion in revenue from infant formula milk powder by 2020; and the top 10 domestic brands will account for 80% market share.121

- **The Action Plan for Promoting Domestic Infant Formula Milk Powder** was published by the NDRC and six other departments in June 2019. The plan aims to bring about greater industry concentration, and includes a goal for 60% of IMF consumed in China to be produced domestically. The plan also aims to achieve a clear rise in rankings for domestic brands.122

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115. 《婴幼儿配方乳粉生产企业监督检查规定》, 3 Dec 2013, http://www.gov.cn/gzdt/2013-12/03/content_2540737.htm
116. CFDA, 《关于印发婴幼儿配方乳粉生产企业食品安全追溯信息记录规范的通知食药监食监一〔2015〕281号》, 1 Jul 2016
119. Yashili, 2018 Annual Report

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China’s National Dairy Industry Development Plan (2016-2020) aims to have 10 domestic brands account for 80% of China’s IMF market.
Government policies for the dairy industry
In December 2018, MARA and eight other departments published the *Opinions on Further Advancing the Rejuvenation of the Dairy Industry (the Opinions)*. Its policy objectives included the establishment of scale dairy farming, closer links between the dairy farming and processing sectors, increasing raw milk production to 45 million tonnes by 2025, as well as improving quality, efficiency and competitiveness. The *Opinions* include eight measures to achieve these goals:

1. **Accelerate the establishment of the basic position of scale dairy farming** with measures including: support for developing scale and family dairy farms, support for farmers in developing processing and products, strengthening farming insurance and loans, etc.
2. **Lower the costs of dairy farming** by developing China’s forage industry, including large-scale planting of alfalfa in Inner Mongolia, Gansu and Ningxia, as well as by continuing the policy of changing grain production from food to feed in major dairy production counties.
3. **Improve dairy cow productivity** with improved genetics, support for dairy farming and manure recycling infrastructure, and development of the dairy farm services system.
4. **Strengthen and improve the dairy processing industry** by improving competitiveness, developing refrigerated products, supporting the production of dry dairy products (e.g. cheese, butter), and improving the competitiveness, reputation and market share of domestically produced IMF.
5. **Promote the integration of dairy farming and processing development** by encouraging cross-shareholdings and win-win relationships between processors and farmers; supervise and improve the standardisation and signing of raw milk purchase contracts.
6. **Improve the quality and safety of dairy products** by establishing municipal raw milk purchase testing centres, supporting major dairy counties, enterprises and qualified farms to establish their own testing systems, and improving safety and quality oversight capabilities.
7. **Encourage main dairy provinces to lead the dairy rejuvenation** with funds and policies to support plans that are drawn up by major dairy provinces.
8. **Strongly promote dairy consumption** with publicity about the nutritional benefits of dairy consumption, and by actively cultivating dairy product consumption habits, especially for dry dairy products (e.g. cheese, butter).

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Keys to success
In spite of cost pressures and import dependence, China’s dairy industry offers many opportunities based on China’s modernising dairy farms, growing cold chain capabilities, expanding middle class and favourable government policies. Dairy farming and manufacturing companies that take a rigorous approach to strategy will deliver long-term profitable growth. Here are some keys to success:

- **Premium products for growing middle class demand**: China’s growing middle class, cold chain capabilities and e-commerce market will sustain long-term growth in premium product sales. Companies and investors should invest now in premium raw materials and specialty product production, e.g. organic milk, goat’s milk, cheese, etc.

- **Thorough consumer segmentation**: Consumers can choose from hundreds of dairy products; and products that aim to please everyone are often chosen by no one. Companies need to target very specific consumer segments. Each product and marketing campaign should be tailored to specific age groups, health and fitness preferences, nutritional goals, consumption occasions, etc.

- **New product development**: Consumption habits in China have not yet stabilised, so there are opportunities for new products to quickly capture market share. The example of Greek-style yogurt in the US shows that even mature markets can quickly turn to new products and variations. Some categories, e.g. cheese, are still true blue ocean markets in China. Constant social media interaction with consumers and data analysis are necessary for timely and targeted product development.

- **Targeted, unique branding**: Dairy product innovations such as flavours, textures and packaging are easily replicated by competitors. Companies must develop highly targeted brands that will differentiate their products and build loyalty. As with product development, social media interaction and data analysis are vital.

- **Omni-channel agility**: Distribution channels are changing and companies need to act quickly to be in the channels that consumers currently prefer. E-commerce and modern retail chains (i.e. hypermarkets, supermarkets, maternity stores and convenience stores) are displacing traditional grocery stores.

- **Cold chain expansion**: Companies not only need to build their cold chain distribution channels as quickly as possible, but they also must have tailored low-temperature products that are ready to compete. Cold chain penetration is advancing in third- and fourth-tier cities via both retail chains and e-commerce.

- **Upstream integration**: Processing companies need to control their raw milk sources. Not only does this help achieve national industry goals, but it facilitates improvements to traceability, food safety, biosecurity, efficiency, supply chain resilience and raw milk price stability.

- **Human capital**: As every stage of the supply chain upgrades technology and scale, companies need managers and staff who are comfortable with technology, complexity and change. Key skills will include management of large-scale industrial farms, sophisticated cold-chain logistics and inventory management, social media data analysis, etc. Recruiting, training and retention must be tailored to these people.

- **Government incentives**: Growing domestic production, modernising dairy farms, developing strong Chinese brands, increasing dairy consumption and enhancing food safety are important national policy goals. Companies need to identify and utilise all the relevant government incentives in order to grow and compete profitably while supporting the revitalisation of China’s dairy sector.

- **Regulatory compliance**: Dairy products are among the most strictly regulated and monitored products in China, and regulations become more demanding every year. Companies must anticipate future regulations and policy developments, and incorporate them into their planning and strategy.

*This report was written by Brian Marterer of PwC China*
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