FAIRR
FARM ANIMAL INVESTMENT RISK & RETURN
A COLLER INITIATIVE

FACTORY FARMING IN ASIA: ASSESSING INVESTMENT RISKS

Written in collaboration with Asia Research and Engagement

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ABOUT THIS REPORT

FAIRR FARM ANIMAL INVESTMENT RISK & RETURN
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The FAIRR Initiative is a collaborative investor network. It aims to raise awareness of the material impacts factory farming and poor animal welfare can have on investment portfolios, and works to help investors share knowledge and form collaborative engagements on these issues. **www.fairr.org**

ARE ASIA RESEARCH & ENGAGEMENT

Asia Research and Engagement [ARE], based in Singapore, works with financial institutions, companies, and civil society organisations to understand and communicate the financial relevance of sustainability and governance issues. ARE provides specialist research, consultancy and engagement services to help these organisations reach their goals.

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FOREWORD

Jeremy Coller

Founder, FAIRR Initiative

Chief Investment Officer, Coller Capital

> *"Asia's meat, seafood and dairy industries face a range of badly managed sustainability risks – from emissions to epidemics, fraud to food safety, and abuse of labour to abuse of antibiotics"*

Are investors biting off more than they can chew when it comes to risk in Asia's meat and dairy sector?

A popular investment thesis for Asia is that its rapidly industrialising animal protein companies are a smart play on rising middle-class incomes and the growing demand for meat. As this report shows, however, Asia's meat, seafood and dairy industries face a range of badly managed sustainability risks – from emissions to epidemics, fraud to food safety, and misuse of antibiotics to misuse of labour. All these issues have significant potential to derail returns.

Factory farming is rising up the investment agenda

Since FAIRR released its landmark investment risk report assessing the global risks inherent in factory farming, the floodgates on investor concerns in this area have opened. In just over a year, investors representing over $3 trillion of assets have participated in FAIRR activities. These have included engaging with food multinationals on issues such as antibiotics and the resilience of their protein supply chains.

FAIRR's report highlighted incidents such as fines for companies and prison sentences for employees involved in the Shanghai Husi food safety scandal in 2014, which resulted in a $10.8bn loss of market cap for McDonald's and Yum! Brands. The report also triggered many requests for more information on the Asian food sector. This research aims to respond to those requests.

Pacific perils

It is clear that significant environmental and social risks are building up in Asia's food sector.

For example, China's shift towards more intensive farming practices is driving up antibiotic use, just as there is a global push to reduce usage in the face of antibiotic resistance. In South Korea, the outbreak of the latest strains of avian flu in 2016/2017 resulted in culls of more than a fifth of the poultry population, reducing the egg-laying hen population to a 12-year low.

Threats in Asia also affect the global supply chain. In 2016, China's demand for animal feed saw it import 35% of Brazil's total soybean production – encouraging further deforestation in South America, with potentially enormous consequences for global carbon budgets. It's scary.

Despite the focus on risk, there are also excellent opportunities in this space, as innovative Asian companies create sustainable food products. One study this year showed a 140% growth in new products making vegetarian claims in the South east Asia region.

Changing consumer behaviour and fundamental shifts in how the world produces and trades meat are creating environmental, social and governance risks that increasingly concern investors. How Asia responds to these challenges in the coming years will be a defining factor in whether the region can satisfy investor appetite.

SNAPSHOT OF FINDINGS

ESG risks in the Asian meat, dairy and seafood sector

Companies included in this report: Yum! Brands (YUM:NYSE) ▲▼ McDonald's (MCD:NYSE) ▲▼ Monde Nissin ▲▼ Tyson (TSN:NYSE) ▲▼ Fujian Sunner Development (002299:CH) ▲▼ Shandong Yisheng Livestock & Poultry Breeding (002458:CH) ▲▼ Charoen Pokphand Foods (CPF:TB) ▲▼ Venky's (WH:IN) ▲▼ Da Bei Nong (002385:CH) ▲▼ Fonterra (FCG:NZE)

Top 5 risks in terms of:

Risk rating

- Food safety and nutrition
- Public health risk
- Environmental footprint
- Animal welfare
- Labour standards

Top 5 risks in terms of:

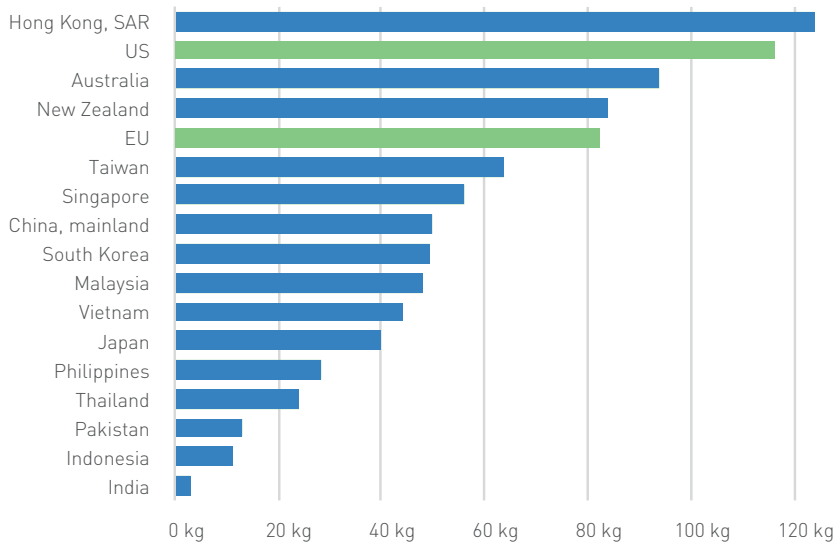
Timeline

- Food safety and nutrition
- Public health risk
- Environmental footprint
- Animal welfare
- Labour standards

Categories

- Very high
- High
- Medium
- Low
- Immediate
- Medium term

Annual per capita meat consumption in key Asian markets



Source data: FAO, OECD, ARE calculation. 2013. EU and US data included for comparative purposes

Asian meat demand predicted to grow **19%** from 2013 to 2025 to **144 million tonnes**.

All three Chinese companies (Yonghui Superstores, New Hope Liuhe, Henan Zhongpin) assessed by the Business Benchmark on Farm Animal Welfare in 2017 were ranked in its bottom two tiers, as was Thailand's CPF.

According to the World Bank, **80%** of low and middle-income countries used **antimicrobials for growth promotion** – seen as a major cause of antibiotic resistance.

The H7N9 avian flu outbreak in China has led to **570 deaths** since 2013, and resulted in a **46% fall** in the value of the Guangzhou chicken price index between June 2016 and March 2017.

A pollution census from the Chinese government found agriculture was responsible for **44% more water pollution** than other industrial operations. Waste from livestock was estimated at 243 million tonnes of faeces.

China already consumes almost **half** of the world's antibiotics, and due to increased intensive farming, Asia is estimated to increase antibiotic usage in chicken and pigs by **129% and 124%** respectively by 2030.

Southeast Asia suffers **175,000 deaths** per year from foodborne illnesses – the highest number of any global region.

EXECUTIVE SUMMARY

→ Investors in Asia view animal protein as a play on rising middle-class incomes across the region.

→ The Asian meat, egg, fish and dairy industries face a range of poorly managed sustainability risks that could derail returns. These include threats to food safety, public health, the environment and labour rights.

→ This report aims to help investors to understand the risks, and suggests questions that investors can use to assess the resilience of their holdings.

When it comes to the production of meat, eggs, fish and dairy, investors are increasingly vulnerable to a broad set of complex risks. This report provides a starting point for investors to help navigate these risks in 12 core Asia-Pacific markets: Australia, China (mainland), India, Indonesia, Japan, Malaysia, New Zealand, Pakistan, The Philippines, South Korea, Thailand and Vietnam.

The report reviews five critical issues:

- → Food safety and nutrition;
- → Public health risks due to antibiotic resistance and the outbreak of livestock viruses;
- → The high environmental footprint of meat production;
- → Changing consumer views on animal welfare standards; and
- → Labour standards.

In each case, it highlights how these issues can translate into risks or opportunities for companies and provides questions that investors can use to understand the ability of companies to manage those risks and opportunities.

In the appendices, the report summarises meat production and consumption patterns across major categories for these 12 leading Asia-Pacific markets. Demand in these markets is forecast to grow 19% to 144 million tonnes by 2025, according to Organisation for Economic Co-operation and Development (OECD) projections, driven by population growth and increased meat consumption by a growing middle class in the region.

At first, this steady, well-supported growth, looks like an attractive prospect for investors. However, closer scrutiny indicates that the range of risks associated with meat production has the potential to significantly damage returns.

Key risks in Asian meat consumption

There are five major types of risk that threaten the positive investment thesis for meat and fish consumption in Asia. The relative importance of each issue depends on factors specific to each commodity and market, such as the level of economic development, production practices and consumer preferences. Nevertheless, there are some clear signals and Figure 1 reflects our assessment of the relative priority and timelines of the different risks.

Five risk types

→ **Food safety and nutrition:** Food safety is a major issue for all the markets covered in this report. Many companies, such as Yum! Brands, have already suffered significant brand damage from food scares – particularly in China. Specific issues include expired meat and rising foodborne illnesses such as E. coli. Beyond this, nutritional guidelines increasingly reflect health concerns related to eating too much meat and, in countries such as China and Australia, are being used to reduce meat consumption. At the same time, ageing populations across Asia may reduce growth in per capita meat demand. In response, consumers are demanding, and manufactures are increasingly highlighting, products with healthy labels, including vegan and vegetarian products.

→ **Public health risk:** There are major public health risks associated with the livestock sectors in the markets covered by this report. There is increasingly compelling evidence that overuse of antibiotics in livestock production is contributing to the growth of antibiotic-resistant bacteria in humans and animals. This could make many common diseases and infections untreatable. China and India have both introduced national action plans to limit antibiotic use, which will affect livestock productivity. At the same time, viral infections and livestock epidemics are increasing in frequency and severity – with strains of avian and swine flu a key concern. These can result in significant livestock culls. For example, more than 35 million birds were culled in South Korea during 2016/2017, which depressed prices and lowered demand for the product.

→ **Environmental risk:** Livestock production puts significant pressures on the environment. Beef and lamb have the highest greenhouse gas (GHG) emissions and water footprints compared to other proteins, and even chicken, the least carbon-intensive meat, generates 65 times more emissions per calorie produced than legumes.[1] This impact is starting to be reflected in new regulation. Water pollution from concentrated feeding operations is increasingly subject to higher regulation in China. In New Zealand, the rapid conversion of land to dairy operations is putting significant strain on local waterways. In addition to the growing risks of direct regulation on pollution, there are concerns of price volatility and continuity problems in feed supply.

→ **Animal welfare risk:** How animal welfare is prioritised for consumers depends on the country. For example, there have been a number of recent news items highlighting poor animal welfare practices in Vietnam, while in India animal welfare concerns are linked to religious and cultural preferences and fundamental to the structure of the market. There is also growing momentum behind higher welfare farming in China. Elsewhere in Asia, healthy eating trends are driving a rapid increase in the production of vegetarian products, but from a low base, while animal welfare concerns are growing in importance for exporters.

→ **Labour standards risk:** We expect forced labour risks to increasingly materialise for livestock and seafood companies that sell to reputation-sensitive customers, such as European importers or multinationals with operations in Asia.

Figure 1: Key issues in Asian animal livestock production

Issue	Risk rating	Timeline	Supporting evidence
Food safety and nutrition			→ According to the World Health Organization (WHO), Southeast Asia is the region with the highest number of fatalities from foodborne diseases – with more than 175,000 deaths a year. Some 50,000 children under the age of five die from foodborne diseases in the region each year.[2] → There have been repeated food safety issues in China, such as the 2008 milk scandal that resulted in 300,000 hospitalisations and numerous cases of tainted meat and eggs. → Between 1998 and 2008, 60% of US foodborne illnesses that resulted in hospitalisation and 66% that resulted in death were attributed to bacterial contamination from land animals.
Epidemic risk			→ Antibiotic consumption for animals in the BRICS countries is expected to grow by 99% between 2010 and 2030, while use in humans is only expected to grow by 13%. China already consumes almost half the world's antibiotics. → By 2030, antimicrobial use in chickens and pigs in Asia is projected to increase by 129% and 124% respectively. → The H7N9 avian flu outbreak has led to 570 human deaths since the first instance in 2013. → In South Korea, the H5N6 and H5N8 avian flu pandemics resulted in culls of more than 35 million birds in 2016/ 2017 – more than a fifth of the poultry population – and reduced the egg-laying hen population to a 12-year low.
Environmental footprint			→ A Chinese government estimate found agriculture responsible for 44% more water pollution than industrial operations. Waste from livestock was a significant component, estimated at 243 million tonnes of faeces and 163 million tonnes of urine. → Ruminant meat (beef and lamb) has the highest associated GHG emissions. It produces approximately 5.6 per kilocalorie, which is on average 280 times more emissions per calorie than legumes.[3] The least carbon-intensive animal protein, chicken, causes 65 times more emissions per calorie produced than legumes. Beef also has by far the largest water footprint per calorie (10 litres per kcal). → Rapid growth of soy cultivation for animal feed contributes to South America's deforestation. In 2016, China imported 35% of Brazil's total soybean production, much of which is converted to feed for pork and poultry production.
Animal welfare			→ India's high levels of vegetarianism contribute to the lowest meat per capita consumption in the region (3 kg/person/year). The government has recently banned the sale and purchase of cattle in livestock markets for religious reasons. → New product launches with vegetarian claims increased by 140% and new product launches with vegan claims increased by 440% between 2012 and 2016 in the Southeast Asia region. → 70% of US egg production is already committed to go cage-free. In Canada, all egg production is set to go cage-free by 2036. Momentum in developed markets could change demand in export countries, including in Asia. → Several European and US-based animal welfare NGOs including the Royal Society for the Prevention of Cruelty to Animals (RSPCA) and Compassion in World Farming (CiWF) have received substantial funding to increase their presence in China and improve animal welfare standards.
Labour standards			→ In September 2016, a lawsuit, filed for alleged forced labour at a Thai chicken farm, sought $1.3 million in compensation for 14 Myanmar migrant workers.

Legend: Very high · High · Medium · Low · Immediate · Medium term

Source: ARE

Growing opportunities in meat alternatives

As meat changes from a luxury to a staple in many Asian diets, consumers are also becoming increasingly aware of meat's sustainability issues. Consumer concerns, particularly over health and safety, are resulting in increased demand for differentiated products such as organic meat, vegetarian and plant-based foods or higher welfare meats.

Between 2012 and 2016, new product launches with vegetarian claims increased by 140% and new product launches with vegan claims increased by 440% in Southeast Asia.

These can create opportunities for higher margin products and rapid growth, as exemplified by the growth of Healthy Living Biotechnology (see case study) and by the acquisition of meat substitute producer Quorn foods by Filipino food giant Monde Nissin. After the acquisition, Monde Nissin point out that the meat alternatives market is currently concentrated in Europe and North America, with barely 12% to 15% in Asia – hence creating an enormous market opportunity in an industry predicted to reach $5.2 billion by 2020.

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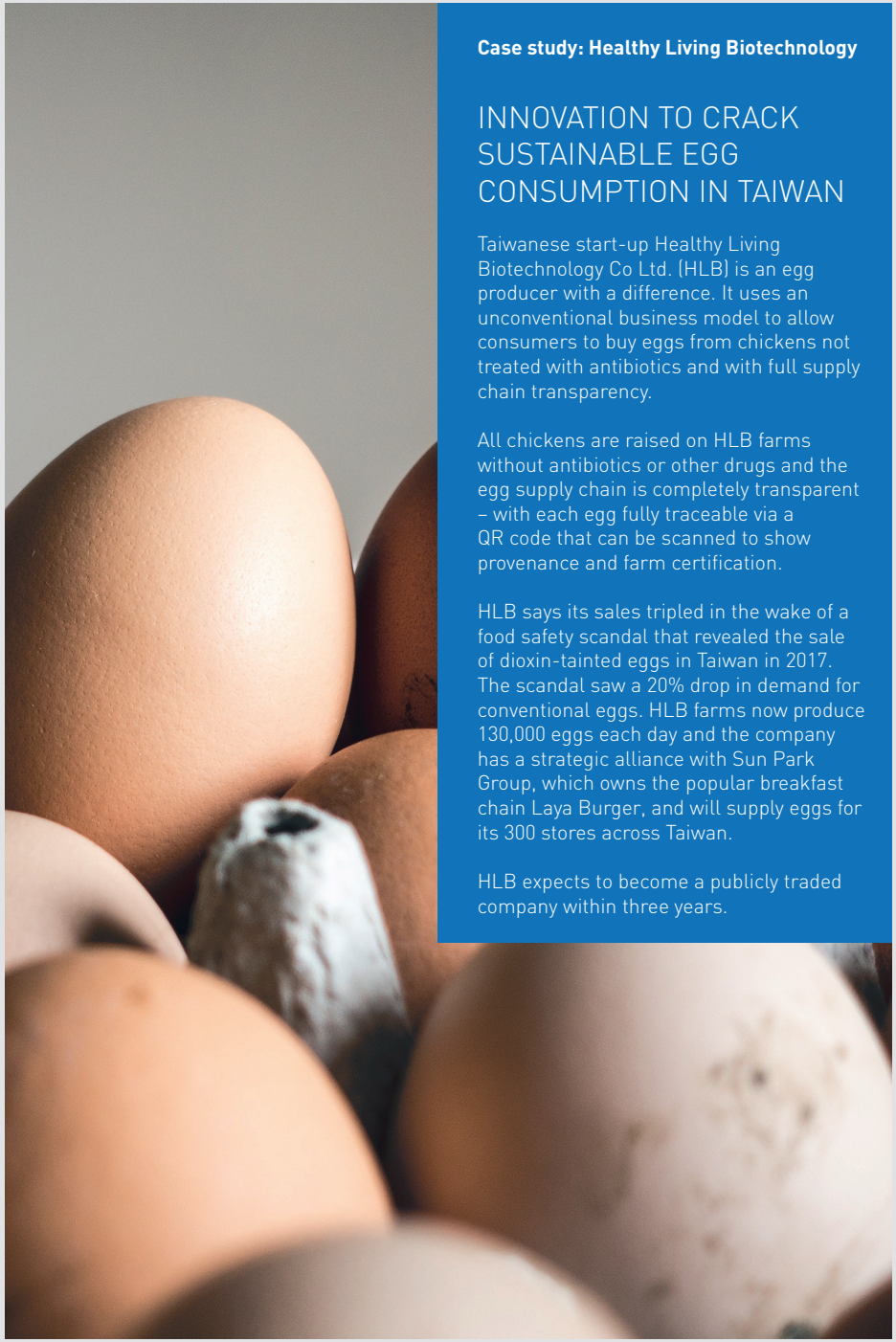
FEEDBACK

The aim of this report is to help investors and companies better assess and manage the sustainability risks inherent in meat, egg and dairy production in Asia. It is part of on-going analysis from the report's producers: FAIRR and ARE.

If you would like to provide feedback or learn more about our work, please get in touch at: **aarti.ramachandran@fairr.org**



Case study: Healthy Living Biotechnology

INNOVATION TO CRACK SUSTAINABLE EGG CONSUMPTION IN TAIWAN

Taiwanese start-up Healthy Living Biotechnology Co Ltd. (HLB) is an egg producer with a difference. It uses an unconventional business model to allow consumers to buy eggs from chickens not treated with antibiotics and with full supply chain transparency.

All chickens are raised on HLB farms without antibiotics or other drugs and the egg supply chain is completely transparent – with each egg fully traceable via a QR code that can be scanned to show provenance and farm certification.

HLB says its sales tripled in the wake of a food safety scandal that revealed the sale of dioxin-tainted eggs in Taiwan in 2017. The scandal saw a 20% drop in demand for conventional eggs. HLB farms now produce 130,000 eggs each day and the company has a strategic alliance with Sun Park Group, which owns the popular breakfast chain Laya Burger, and will supply eggs for its 300 stores across Taiwan.

HLB expects to become a publicly traded company within three years.

CHAPTER 1: FOOD SAFETY AND NUTRITION

There are three fundamental risks in this area: foodborne illness, food fraud and nutritional challenges.

Food safety is a serious threat to public health throughout Asia, and is a particularly high-profile issue in China where several recent food safety scandals have caused serious illness, deaths and damage to brand values. Food safety incidents can affect any type of food, but they are especially prevalent in the meat and dairy sectors. For example, Yum! Brands was hard-pressed to revive its brand reputation after a food safety scandal involving the sale of tainted meat in China. The scandal led to a $3.6 billion drop in equity for the company between July and October 2014[4], and ultimately to the demerger of the company's Chinese business interests.

The livestock industry also faces broader issues because of its outsize role in serious foodborne illness such as E. coli and Salmonella, and because of growing evidence linking high meat consumption with chronic and lifestyle diseases such as diabetes, cancer and heart problems.

High levels of foodborne fatalities link to livestock

According to WHO, Southeast Asia is the region with the highest number of fatalities from foodborne diseases – that is infections such as Salmonella or campylobacter which result from spoiled or contaminated food. WHO estimates the region suffers from 150 million cases of foodborne diseases per year, resulting in 175,000 deaths. This includes the deaths of some 50,000 children under the age of five.[5]

There is compelling evidence that shows that animal products play a leading role in such foodborne illnesses. The US Center for Disease Control and Prevention (CDC) estimates that in the US between 1998 and 2008, land animals were attributed with causing 60% of bacterial infections that resulted in hospitalisation and 66% that resulted in death.[6]

Food fraud is a major issue in Asia

There has been no shortage of food safety scandals in Asia linked to unscrupulous adulteration of food products. The most well known is the 2008 milk scandal in China. Widespread additions of melamine to milk and infant formula affected an estimated 300,000 people. Melamine increases the apparent protein content of food products but also causes kidney problems: six children died from kidney damage while 54,000 children were hospitalised. The incident involved more than 20 companies and resulted in significant value destruction. Sanlu Group, the company at the centre of the scandal, went bankrupt – while dairy giant Fonterra, which held a 43% stake in Sanlu, faced losses of NZD 200 million ($144.7 million) following these events.

Ten years later, milk-related scandals in China continue. In March 2017, a case went to court in Shanghai on the counterfeiting of more than 30,000 tins of baby formula, including the use of counterfeit trademarks from the US brand Abbott .

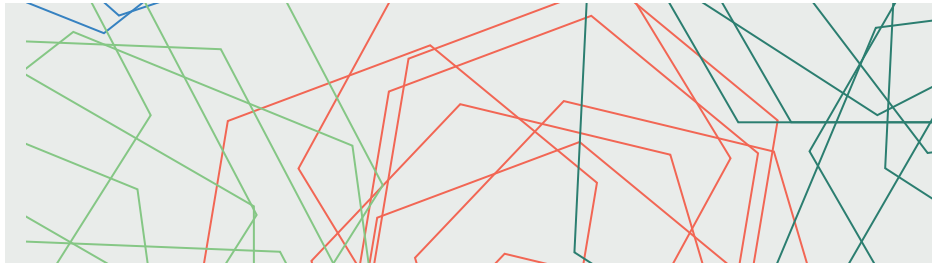
These problems are not confined to mainland China, nor to animal products. Taiwan, for example, also suffered a series of scandals in 2014 relating to sales of tainted oils and the use of toxic industrial dyes in tofu. In 2015, McDonald's had a series of food safety issues in Japan, including in relation to meat supplied from Thailand, denting brand performance. In India, tests in 2015 revealed high levels of lead in Nestlé's market-leading instant noodle brand, Maggi: estimates of lost sales ranged up to half a billion dollars.

Figure 2: A selection of food safety incidents involving meats

Country	Date	Type	Issue
Hong Kong	Feb 2017		Veterinary drug residue of chloramphenicol, a banned antibiotic, found in pig meat.
China	Jun 2015		Smugglers found to be illegally transporting expired frozen meat, some of which was 40 years old.
China	Jul 2014		OSI group found putting new labels on expired meat, among other food safety violations.
China	Dec 2014		Traders sold diseased pigs for nearly 10 years, some of which had foot-and-mouth disease that could infect people.
China	Aug 2014		Business operators had been selling chicken feet soaked in hydrogen peroxide to keep them white and fresh-looking. Some 30,000 tonnes were affected.

Source: Hong Kong Centre for Food Safety, SCMP, WSJ, Global Meat News, Financial Times

Legend: Pork, Chicken, Beef, Poultry



Case Study: Yum! Brands

YUM! CHINA DEMERGER FOLLOWS FOOD SAFETY FAILURE

The woes of Yum! Brands offer a salutary tale for companies that misstep on food safety in China. For many years, Yum! Brands paved the way as a rare example of an American company that had successfully entered the Chinese market. A major food safety incident in 2014, however, forced a strategic reorganisation.

By 2014, Yum! Brands had become the leading fast food operator in China, with more than 7,200 KFC and Pizza Hut restaurants. This included shrugging off a 2012 scandal when the company was accused of feeding chickens extremely high levels of growth hormones and antibiotics. However, when Yum! was hit by another governance scandal in 2014, including evidence of workers at a supplier company using expired meat, the company and its share price were not as resilient.

Financial analysis from July to October 2014 showed that the falls in sales had a substantial impact on Yum!: shares in the business dropped by 8.29%, wiping $3.6 billion off the company's value.[7]

Following a strategic review, Yum! Brands opted to separate out its China business into Yum! China and spent significant time trying to find a Chinese strategic investor. In June 2016, it announced that it had failed to complete a deal with China Investment Corp and private equity firm KKR. Yum! China was eventually spun off to two Chinese investment groups and an IPO in November 2016.

Meat increasingly linked to cancer, diabetes and lifestyle diseases

Lifestyle diseases including obesity, cancer and heart disease are on the rise across Asia. The role that nutrition can play in managing and mitigating these issues is an increasing focus for public health officials and consumers alike.

Nutrition is a complex topic. It is challenging to construct population-based health studies with specific links to diet, as these often rely on the accurate submission of information by the population over a long period of time. Nevertheless, there is evidence of links between high meat consumption and health, and increasing consensus that:

- → animal products are not required for a healthy diet;
- → well-balanced vegetarian diets have some health benefits[8,9]; and
- → meat consumption, particularly processed meats and red meats, is associated with health risks at high quantities.

In 2015, a working group convened by the International Agency for Research on Cancer – an agency of WHO – announced the findings of a literature review exploring the links between meat and cancer. The findings classified processed meats such as bacon, ham and salami as carcinogenic, and red meat (including beef, lamb, goat and pork) as a probable cause of cancer.

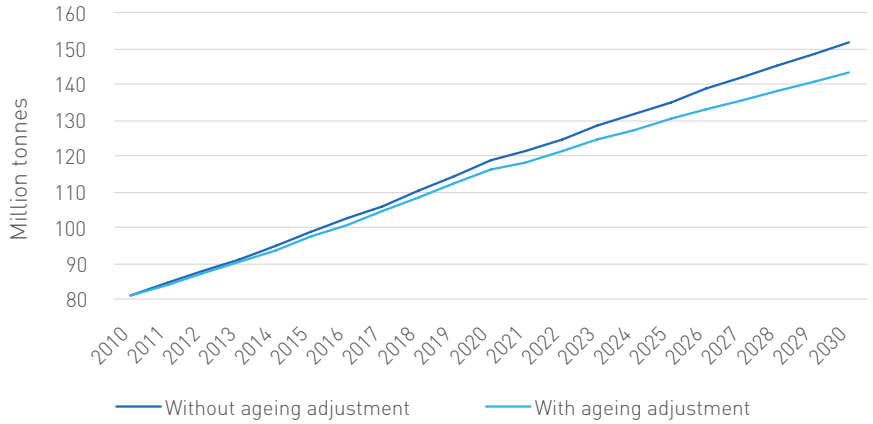
There are similar links between high levels of meat consumption and diabetes. A study in the US found that the consumption of red meat increased the risk of adult-onset diabetes by 19%.[10] The risk increases to 51% with the consumption of processed red meat, even when consuming half the serving. Another study published in the British Journal of Nutrition in 2017 confirmed this finding.[11] It tracked diabetes onset in 2,332 participants from Eastern Finland and found that replacing just five grams of meat-based protein per day with vegetable-based protein reduced overall type 2 diabetes risk by 18%.

Regulators and retirees could reduce meat consumption

Government policy and public communications across Asia increasingly include and reflect these concerns. One example is Singapore's Health Promotion Board, which notes that a well-balanced and healthy vegetarian diet is associated with a lower body mass index, lower blood cholesterol levels and reduced risk of death from heart disease. In Australia – a country with a large livestock industry and high domestic red meat consumption – official dietary guidelines now recommend a maximum of 455 grams of red meat per week. The 2016 version of China's dietary guidelines included a downward revision of the lower end of its recommended meat consumption range. This implied a maximum annual per capita meat consumption of 27 kg, which is 45% below the 2013 consumption figure of 49.7 kg per capita.

Another factor that could impact meat demand in Asia is the changing nutritional needs of an ageing population. While an increase in incomes has boosted per capita meat consumption, ageing could reverse the trend. Recent IMF analysis estimates that by 2050, the number of over-65 year olds in Asia will double.[12] At the same time academic research shows that meat consumption tends to decline as populations age. A study on ageing and meat consumption in China found a decline in meat consumption where households have members over age 60.[13] The simulation concluded that the incorporation of demographic factors such as an ageing population contributed to an overall decrease in annual meat consumption of 5.7%.

Figure 3: Ageing population reduces forecast demand for meat in China



Source: Journal of Integrative Agriculture

IMPLICATIONS FOR INVESTORS

Individual companies suffer most when there is contamination or a lapse in controls that results in food safety risks for customers. It is critical that investors ensure that the companies with whom they invest have the management controls in place to avoid such quality and safety scandals.

More broadly, while the new wave of middle-class Asian consumers currently seem willing to spend on meat, dairy, fish and eggs, they are also better informed on the downsides of meat consumption, particularly around nutrition and food safety. An increase in such consumer awareness has the potential to significantly impact long-term demand, with several companies already diversifying into plant-based alternatives.

Some forward-looking companies are beginning to do this, such as US meat producer Tyson, which bought a 5% stake in the plant-based protein company Beyond Meat in 2016. Filipino convenience food manufacturer Monde Nissin is another example, with its acquisition of meat substitute producer Quorn in 2015.

KEY QUESTIONS FOR INVESTORS

Food safety

- → What internal governance structures and testing and monitoring systems are in place to measure and evaluate food safety in the company's operations?
- → Are there any independent third-party certifications in place to verify the performance of these systems?
- → How sensitive are the company's brands likely to be to a food safety incident?
- → How does the company ensure traceability of its products throughout the supply chain – from distributors to suppliers?
- → Has the company analysed the costs and benefits of certification or traceability systems for its products?

Consumer concerns on nutrition

- → Has the company considered the nutritional characteristics of its products and how well are they suited to evolving demand in its target markets?
- → Has the company improved marketing and labelling of healthy or plant-based products to increase consumer interest?
- → What, if any, investment has the company made into alternative, more sustainable protein sources?

Ageing population

- → How exposed is the company to markets or countries with aging populations?
- → How well do the company's products cater to the tastes of older consumers?

Source: ARE and FAIRR

CHAPTER 2: PUBLIC HEALTH RISK

Major public health risks exist in the factory farming sector from both the overuse of antibiotics and the risk of livestock epidemics. These risks come into sharp focus in Asia.

Asian food giants are highly susceptible to antibiotic resistance

The growth of antibiotic resistance has been described by WHO as one of the biggest threats to global health and development today.

Every use of antibiotics results in a 'subpopulation' of bacteria that are resistant to the antibiotic. This diminishes the effectiveness of antibiotics over time and, given the slow pace of new antibiotic discovery, raises the prospect of a future in which we are no longer able to treat even simple cuts or infections. As one leading scientific paper on antibiotic resistance describes it, "Every individual's use of antibiotics affects the ability of every other person to use the same antibiotics."[14]

The livestock industry is a major user of antibiotics and antimicrobials more broadly. The industry uses antibiotics in multiple ways: to treat animals that become sick, to prevent animals from becoming sick (even where there are no signs of illness in the animal), and to promote the growth of the animals (feeding antibiotics to animals generally results in faster growth). These multiple uses have led to a situation where antibiotic use in animal agriculture accounts for the majority of all antibiotics produced – nearly half of all antibiotics in the UK, two-thirds in the EU and 70% in the US.[15] There are similar trends in developing countries. According to the World Bank, veterinary antimicrobials, including antibiotics, are available in most low and middle-income countries without restriction and sold over the counter without necessary veterinary prescriptions. In 2015, 80% of these countries reported the use of antimicrobials for growth promotion.[16]

In China, the routine prophylactic use of antibiotics – many of which are critically important in human medicine – is contributing to an alarming increase in antibiotic resistance. China is already the world's largest consumer of antibiotics and many of these are fed to animals to compensate for the poor conditions associated with intensive farming operations. In November 2015, the first instance of resistance to colistin, an antibiotic which is commonly regarded as medicine's 'antibiotic of last resort', was discovered on a pig farm in China. China is one of the world's largest users and producers of colistin for agriculture and veterinary use.

A study published in July 2017 in the Environmental Health Perspectives journal found that chickens raised in India's Punjab state harbour had worryingly high levels of antibiotic-resistant bacteria. It found an especially high prevalence of E. coli bacteria resistant to the broad-spectrum antibiotic fluoroquinolones.

A Princeton University-led study found that by 2030, almost half of the increase in antibiotics use in Asia will be driven by the shift to more intensive farming practices. The study projects Asian antimicrobial consumption of 51,000 tonnes in 2030, with an increase in use of 129% and 124% in chicken and pigs respectively. China's livestock industry is on course to use 30% of total global antibiotics by 2030.[17] Furthermore, antibiotic consumption for animals in the BRICS countries is expected to grow by 99% between 2010 and 2030, while use in humans is only expected to grow by 13% over the same period.[18]

Investors have begun to act. During 2016 and 2017, FAIRR brought together a coalition of over 70 institutional investors, worth $2.4 trillion, to ask companies to take action on the systemic overuse of antibiotics. The engagement is targeting 20 of the largest US and UK restaurant chains including McDonald's, Domino's Pizza Group and Yum! Brands, and calls for an end to the routine, non-therapeutic use of antibiotics throughout supply chains. This engagement shows that antibiotic resistance is rapidly rising up the agenda for investors and will likely become an issue for Asian food producers in the near future.

Case study: Antibiotic usage

ANTIBIOTICS IN FEED, RESISTANCE IN BACTERIA

The tables below illustrate the extent of the antibiotics problem in Vietnam. Figure 4 shows the results of a study of 1,462 commercial feeds available in the country. Over half of pig feeds contained antimicrobials, and the study estimated that 286.6 mg of antimicrobials were used to produce one kg of pork. In the UK, a government-commissioned review recommended a target of 50 mg/kg.

Figure 4: Percentage of feeds containing antimicrobials in Vietnam

Category	Number of feeds examined	Percent of feeds with antimicrobials	Antimicrobial content (mg/kg)	Amount to raise one kg (mg)
Pig	680	55.4%	62.3	286.6
Chicken	275	42.2%	25.7	77.4
Quail	37	18.9%	n/a	n/a
Duck	142	9.2%	n/a	n/a

Source: MDPI Antibiotics[19]

Figure 5 lists the resistance of Salmonella spp. samples isolated from poultry and poultry meat to antimicrobials across six Asian countries. In some markets, bacteria already show high levels of resistance to specific drugs, with more than half of samples from Bangladesh and Thailand showing resistance to the broad spectrum antibiotic Tetracycline.

Figure 5: Antimicrobial resistance in Salmonella spp. isolated from poultry

		Percentage of isolates resistant to each substance class (%)				
Country	Number of isolates	AMP	CIP	CHL	GENT	TET
Bangladesh	12	**75%**	0%	0%	0%	**50%**
Cambodia	152	17%	3%	6%	1%	21%
Malaysia (live)	38	n/a	n/a	3%	n/a	14%
Malaysia (meat)	11	**55%**	9%	46%	40%	**55%**
Sri Lanka	n/a	7%	n/a	0%	0%	7%
Thailand	211	49%	1%	28%	12%	**59%**
Vietnam (M)	50	20%	0%	22%	2%	32%
Vietnam (S)	36	17%	3%	19%	3%	33%

n/a = not available; AMP = Ampicillin; CIP = Ciprofloxacin;
CHL = Chloramphenicol; GENT = Gentamicin; TET = Tetracycline;
For Vietnam M = Medium-size farm; S = Small farm

Source: FAO[20]

Asian producers are pushing against tide to reduce antibiotic use

Governments are beginning to respond to antibiotic risk. Figure 6 shows regulatory measures in major livestock markets. Measures include bans on antimicrobials for growth promotion and preventative uses, and increased prescription requirements. The US Food and Drug Administration (FDA) has only issued voluntary guidelines, rather than a ban. Nevertheless, the guidelines, as well as consumer pressure, have led to a response from the food industry. For example, in August 2016, McDonald's announced that it had stopped serving chicken raised on human antibiotics in the US. It is now under pressure to implement a global ban that will have significant implications for suppliers in Asia.

The issue is on the agenda of Chinese regulators too. The Chinese Government's National Action Plan to Contain Microbial Resistance was announced in August 2016 and included a range of measures to manage the use of antibacterial agents, including setting new targets to contain bacterial resistance. The measures included the gradual withdrawal of antibacterial agents used on humans and animals which easily produce cross-resistance.

India also released a National Action Plan on Antimicrobial Resistance in April 2017. The plan includes six strategic priorities: improving awareness; stepping up surveillance; reducing infections; optimising antibiotic use; promoting investment in solutions; and strengthening commitment and coordination. The steps include elimination of non-therapeutic uses, use as growth promoters and use in feed.

Figure 6: Regulation of antimicrobial use in livestock for growth promotion

Country/region	Ban for growth promotion	Prescription required
Europe	Yes – 2006	Yes
United States	No	No
Australia	Partial ban – 2013	In most cases
Japan	No	Yes
New Zealand	Yes	Yes
South Korea	Yes – 2011	Yes
India	No	No

Source: OECD[21]

Severe livestock epidemics becoming more frequent

By keeping large numbers of animals in confined spaces, Asia's concentrated animal production systems also create ideal conditions for the rapid spread of livestock viruses on previously unseen scales. Such outbreaks can have enormous health and economic implications.

> *"Every individual's use of antibiotics affects the ability of every other person to use the same antibiotics"*

Avian flu and swine flu cases frequently emerge in one location and then quickly spread across great distances. This leads to significant culls, a fall in prices, and disruption for both companies and consumers. Diseases can transmit from country to country with a pattern of escalation and then a decline in infections as control measures become effective. Risks of infection in humans are often higher where there are live poultry markets, which are common in Asia, as humans may come into direct contact with infected birds.

The outbreak of avian flu H5N1 in 2003 followed this pattern. In its first four years it resulted in 158 deaths out of 263 cases (see Figure 7). By 2016 the disease had spread across a number of countries, including Egypt, Indonesia, Vietnam, Cambodia and China, and was responsible for over 450 deaths.

The H7N9 strain of avian flu which emerged in China in March 2013 developed more recently and has proven to be more infectious than H5N1. In its first four years it resulted in 291 deaths from 761 cases (see Figure 7). By May 2017 there had been 1,486 confirmed cases in humans, including 571 deaths, according to WHO.

Other strains include H5N6 and H5N8. These pose lower risks to humans, but have had a significant effect on the industry in some markets. Together, they have caused the worst ever outbreak in South Korea's poultry industry, leading to culls of more than 35 million birds in 2016 and 2017 – more than a fifth of the poultry population – and diminishing the number of egg-producing hens in the country to the lowest in 12 years. South Korea looked to the US to make up supplies, but had to switch to Thai suppliers, following the discovery of the H7N9 strain in Tennessee.

Figure 7: Comparison of avian flu H7N9 and of H5N1

In its first four years:

The H7N9 strain of avian flu has proved much deadlier than the earlier H5N1 strain. In its first four years H7N9 resulted in:

→ **189%** more cases of infections;

→ **84%** more human deaths.

H7N9 cases in China

Year	Cases reported	Deaths
2013	19	1
2014	330	135
2015	196	92
2016	216	63
Total	761	291

H5N1 cases globally

Year	Cases reported	Deaths
2003	4	4
2004	46	32
2005	98	43
2006	115	79
Total	263	158

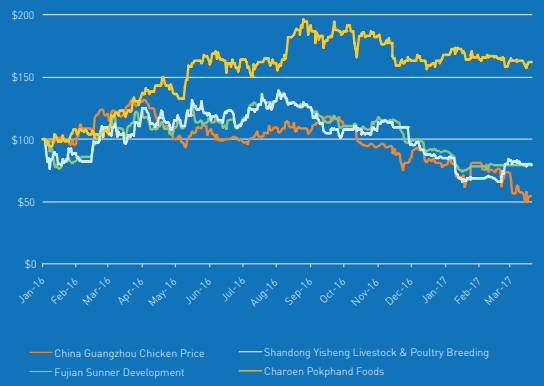
Source: National Health and Planning Commission, WHO

Case study: Avian flu

CHINESE CHICKEN MARKETS CATCH A COLD FROM AVIAN FLU

Poultry markets have suffered notable fallouts from the H7N9 avian flu outbreaks. For example, Figure 8 shows how the Guangzhou chicken price index fell by 46% between June 2016 and March 2017. Leading Chinese suppliers Fujian Sunner Development and Shandong Yisheng Livestock & Poultry Breeding have both tracked lower than the index. At the same time, China's CSI 300 Index increased by over 9% over the same period.

Figure 8: Relative performance of chicken price in Asia and major poultry companies in the region (USD)



Source: Bloomberg, 20 Mar

By comparison, leading Thai producer Charoen Pokphand Foods (CPF), which is also shown in the chart, has managed to avoid the challenges from the latest round of avian flu in its home market so far and is outperforming. The company has recently made a strong effort to differentiate itself by its high governance standards. It was the first Thai company to receive Germany's highest accreditation for food safety and quality, the QS Standard. In March 2017, the company announced its first major sale in to Germany since its accreditation and is now primed to expand sales further in to the EU. CPF is also developing its own food quality and sustainability standard applicable to all its products globally, designed to enhance food safety while also minimising loss of natural resources. While the company performs relatively poorly in BBFAW compared to Western equivalents, this new standard may also improve its animal welfare performance. In 2017, CPF stated that its migrant staff are employed in adherence with Thailand's new migrant labour law.

Implications for investors

Antimicrobial resistance is a serious global health issue. Failure to ensure the prudent use of antibiotics could result in the rise of antibiotic-resistant superbugs that have the potential to undermine modern medicine, cause hundreds of thousands of deaths and cost the global economy trillions in lost output. Simultaneously, the growing effort to restrict the use of antibiotics is likely to impact productivity in Asia, at least in the medium term, as companies and suppliers will need to adjust their production methods and may face slower production. As awareness of the antibiotic resistance risk increases, producers and investors will also need to be sensitive to changing customer demand for antibiotic-free animal products.

It is highly probable that viral outbreaks leading to huge culls and depressed prices will continue to impact producers in the coming years. Exports are often banned from an entire country when there is an outbreak. Companies that vigorously uphold standards may have added protections from viral infections, though they can still be subject to price risk and may have their exports barred where an outbreak impacts a domestic peer.

> *"A paper from the UK government estimated that drug-resistant infections could cost the world around $100 trillion in lost output by 2050"*[22]

KEY QUESTIONS FOR INVESTORS

Antibiotic usage

→ Does the company routinely use medically important antibiotics for non-therapeutic purposes?

→ Does the company have policies to restrict antimicrobial use:

  → for the purposes of promoting growth?

  → where there is no prescription?

→ What proportion of sales are to international buyers that have, or are likely to implement, policies on antimicrobial use?

→ A set of detailed engagement questions on antibiotics can be found on p 14–15 of FAIRR's Superbugs and Super Risks report.

Viral outbreaks

→ For poultry meat, egg, and pork producers, how does the company manage risks of avian or swine flu outbreaks?

→ Does the company keep a record of stock losses and financial impacts due to viral outbreaks?

Source: ARE and FAIRR

CHAPTER 3: ENVIRONMENTAL FOOTPRINT

Meat production has a significant environmental footprint. Compared with other forms of food, animal products are linked to higher GHG emissions, a higher water footprint and substantial pollution problems. These issues can occur at different points in the value chain, with a distinction between environmental pressures that relate to livestock production by itself, and those that occur upstream in feed supply.

Livestock-related pollution is a growing problem in Asia due to the huge challenge in handling manure runoff from concentrated feeding operations. However, studies show that the overwhelming majority of the water footprint from the meat industry comes from growing the crops that are fed to animals, rather than due to water consumed by the animals themselves. Feed production, including use of nitrogen-based fertilisers or changes in land use, also accounts for a large proportion of GHG emissions for most animal products. For ruminants – cows, goats and sheep – the dominant factor is methane emissions from the animals during digestion.

Local-area pollution is perhaps the highest regulatory risk as it is linked to health issues and is directly attributable to producers. Livestock producers face direct weather-related risks, such as from flooding, heat stress or drought, which are projected to increase due to climate change. Climate change-related regulation could also apply to livestock producers over time, particularly those that handle ruminant animals.

Feed supply issues include changes in land use (such as deforestation), fertiliser availability and use (where Asia faces constraints) and water availability and use. These pressures can manifest themselves as input cost volatility, risk to business continuity and reputational risk.

Managing manure

Livestock is a smelly business, as a short trip to a farm can quickly confirm. But the waste stream from large numbers of animals in concentrated areas can go far beyond the smell. Pollution of water supplies can affect drinking water and other food production such as aquaculture.

China has the largest animal population in Asia and faces some of the biggest challenges. In 2010, the Chinese government published the results of its first ever pollution census with a baseline year of 2007. This was a massive undertaking, involving more than half a million people and over a billion data points. It found that agriculture is responsible for 44% more water pollution than industry operations. Waste from livestock is a significant component, estimated at 243 million tonnes of faeces and 163 million tonnes of urine.

Pollution from livestock production is frequently in the headlines. In 2013, 16,000 diseased pig carcasses were found floating in tributaries of the Huangpu River. This resulted in bans and closures of farms and production facilities as the government sought to increase its level of supervision. In 2016, primarily to reduce wastewater emissions, the Ministry of Environmental Protection announced a new tax of RMB 1.40 ($0.20) per animal for larger farms. The Chinese government estimates the new tax will raise RMB 50 billion per year to help clean waterways.

China has supported large-scale farming over small-scale agriculture for several reasons: economies of scale; a belief that large focused players have stronger incentives to invest in productivity; and the ability to better manage issues such as food safety and pollution by controlling a small number of large players, rather than a large number of small players.

But there is evidence that in terms of managing pollution, this support is misguided. Figure 9 shows the results of a study on waste usage from hog farms in China. It suggests that small farms can generally find a use for manure as fertiliser, while large firms will discard more waste. Areas surrounding large farms may find it hard to absorb the significant quantities of manure produced.

Figure 9: Primary waste management by herd size in 2012 for hogs

2012	Fertilisers	Biogas	Feed	Sale	Discard
Backyard (1–9)	60	40	0	0	0
Medium and medium-large (10–500)	59	19	12	7	4
Large (→500)	26	25	21	17	11

Source: IIED[23]

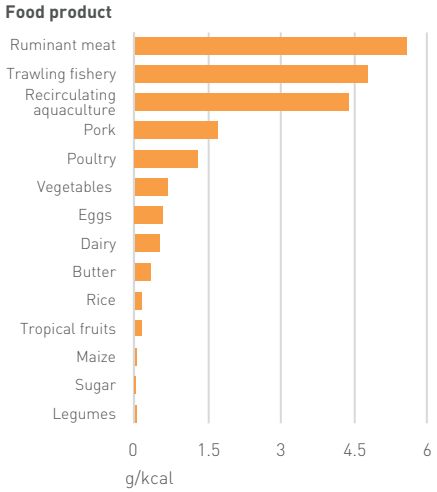
Livestock is highly exposed to carbon taxes and climate-change action

Animal products, especially beef and lamb, have significantly higher associated GHGs than most foods. For most forms of livestock, emissions are due to fertiliser use and land use change for feed supply. For ruminants, such as cows and sheep, methane released from the animals during digestion results in a high GHG emissions intensity. Even chicken, the least carbon-intensive meat, causes 65 times more emissions per calorie produced than legumes.[24]

As shown in Figure 10, beef and lamb both create GHG emissions of over 25 kg of CO_2e/kg. This dwarfs the emissions intensity of other food staples including rice, cereals and fruits. This is likely to become increasingly significant to investors if China goes ahead with plans to implement a carbon tax on emissions in the future.[25]

The expected growth in Asian middle-class meat consumption presents a significant hurdle for global efforts to address climate change.

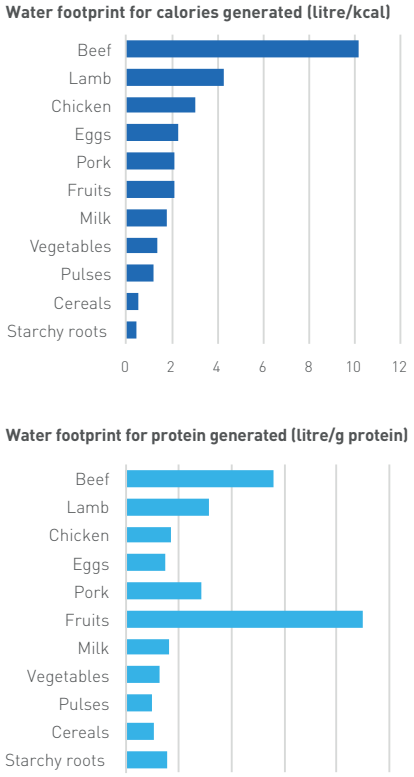
Figure 10: Grams of GHG emissions per kilocalorie of food product[26]



Meat's large water footprint

The livestock sector is also highly exposed to issues of water scarcity because the water footprint of animal products is much larger than for pulses, cereals and starchy roots. A water footprint is defined as the amount of water used per calorie or per gram of protein produced. Figure 11 shows that beef production is particularly dependent on water.

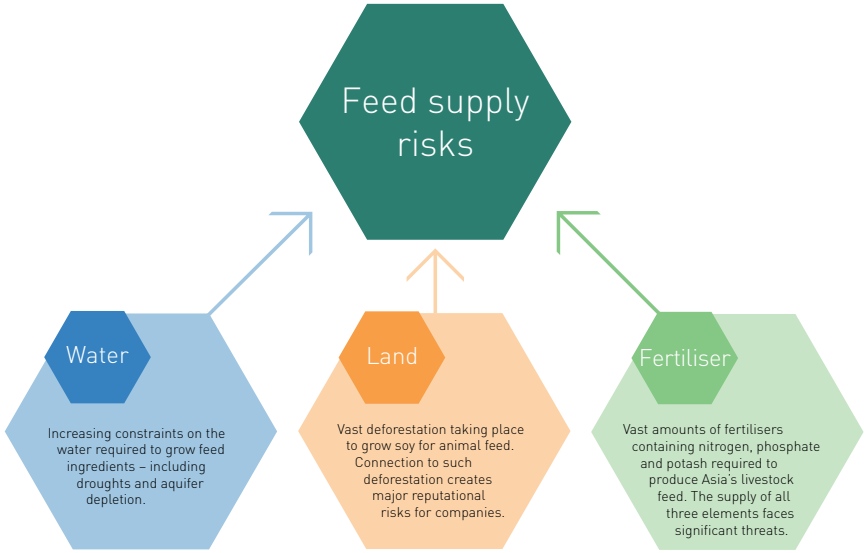
Figure 11: Water intensity of nutrients for different foods (carbohydrates and protein in litre/g of nutrient)



Source: Mekonnen and Hoekstra (2012)[27]

As well as the amount of water used, it matters where and how water is used. Animal products have high water footprints because of the water used to grow feed, rather than the water used at the production site itself. Consequently, producers may experience indirect risks from water scarcity when this constrains growth in feed supply – see the case study on Venky's in India.

The water, land and fertiliser required for animal feed are all under threat



Case study: Venky's

FEED SUPPLY RISKS AND OPPORTUNITIES

Livestock companies rely on a steady supply of feed to grow animals. This input makes up a significant component of overall costs.

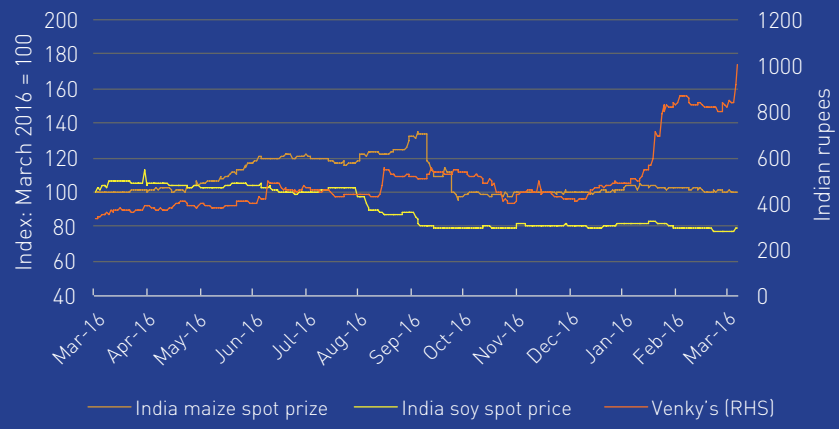
However, rising pressures including limited land, natural hazards, deforestation, the cost of fertilisers, herbicides and pesticides, and constraints on water availability mean that prices for animal feeds are increasingly volatile. This price volatility can have significant impacts for livestock producers.

Venky's, a leading integrated poultry group in India, is a good example of how companies are vulnerable to this price volatility. Venky's has three segments: poultry and poultry products, animal feeds and oilseed. The company's share price and profit are also dependant on the cost of feeds such as soy and maize.

In 2016, Venky's performance significantly rebounded from an INR 18 million ($278,000) loss in quarter one, to an INR 540 million ($8.3 million) profit in quarters two and three. The financial statements do not allow for a full analysis of the cost structure for the separate businesses; however, the declines in input prices, which form a significant component of the costs, played a significant role in improving the company's margins.

The chart below shows Venky's price (right-hand side) alongside the prices of two significant feed components – soy and maize.

Figure 12: Venky's stock price and main input market prices



Source: Bloomberg

Demand for animal feed in Asia driving deforestation

The conversion of land to crops with the primary aim to produce animal feed is an increasingly controversial issue. This has been a major challenge in Latin America, where rapid growth in soy cultivation over the years has come at the expense of the rainforest. Asia is a major destination for this soy, with China taking 35% of Brazil's total production for 2016, much of which is converted to feed for pork and poultry production.

In developed markets, the focus on preserving forests has resulted in reputation-sensitive food manufacturers seeking to exclude raw materials linked to deforestation from their supply chains. McDonald's Commitment on Forests is one example. Launched in April 2015, McDonald's Commitment covers all its 3,100 suppliers and the network of suppliers beyond them. It sets out standards to eliminate deforestation from the supply chains of its five priority products, including beef and poultry, by 2020, and for its entire supply chain by 2030. The measures include the assessment of feed production, such as soy.

While it may be a long time before Asian livestock players feel pressure from domestic Asian restaurant or retail brands, they are increasingly likely to face demand from multinationals like McDonald's that are implementing 'no deforestation' policies across their global supply chains. Asian producers will have exposure where they sell to international markets as well as through their domestic sales to multinational brands. Asian suppliers that fail to adapt to these changes in buying patterns face a growing risk of losing customers.

Case study: Fertiliser in Asia

FERTILISER CONSTRAINTS IN ASIA

Along with water and land, fertilisers are a key input to Asia's livestock feed supply – and Asia's food supply more generally. However, there are challenges due to supply constraints and pollution.

Fertilisers contain three main plant nutrients: nitrogen, phosphate (in the form of phosphorous) and potassium (in the form of potash). Nitrogen is mainly used to drive yield, while phosphorous and potassium are used to improve crop quality.

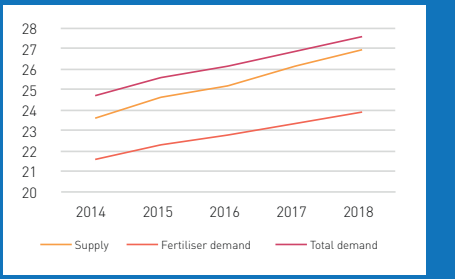
Nitrogen fertilisers are made from ammonia, which uses methane as a key input. Phosphate is generally produced through mining phosphate rock or harvesting guano deposits from seabirds. Potassium is used in the form of potash, and is produced from mined or manufactured salts. But demand for potash already outstrips the supply of potassium produced in Asia, resulting in the need to import potash from other sources worldwide.

The rapid development of the shale gas industry in the United States has led to plentiful sources of methane for the manufacture of nitrogen fertilisers – however methane is also a GHG and fertilisers are increasingly under the spotlight for their contribution to climate change. Phosphate and potassium have not experienced similar increases in raw material sources. As such, it remains a challenge to meet demand for both nutrients, particularly in Asia.

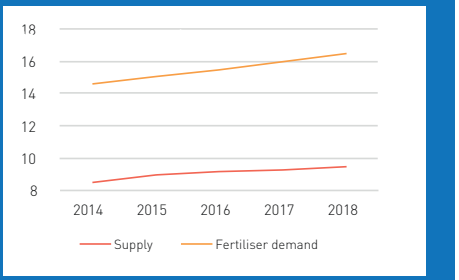
The demand for phosphate for fertiliser use also faces competition from other uses such as the manufacture of detergents, pesticides and in water treatment. As most phosphate is used for fertilisers, feed producers may risk having to pay higher prices to meet the demand for phosphate fertilisers.

Figure 13: Phosphate and potash supply and demand in Asia (phosphate quantity based on phosphoric acid availability)

Phosphate (thousand tonnes)



Potash (thousand tonnes)



Source: FAO (2015)

IMPLICATIONS FOR INVESTORS

Environmental issues can create multiple pressures for livestock producers that can crystallise in different ways, presenting growing risks for industry and investors.

Local-area pollution, such as pollution to waterways and damage to land has perhaps the highest regulatory risk, as it links with human health issues and is traceable directly to producers. Investors have seen regulatory action in developed markets on this issue – for example, in 2007, North Carolina permanently banned new pig factory farms to protect water courses and prevent pollution. And the direction of travel in China and other parts of Asia suggests similar action may emerge in the region.

The Asian livestock sector is also highly exposed to regulation designed to foster a low-carbon transition. Animal products, especially beef and ruminants, have extremely high associated GHG emissions. If China introduces a national emissions trading scheme and possible carbon tax on emissions in the coming years then this will significantly impact the sector.

Water scarcity and drought are risks that can constrain growth in several parts of Asia. Livestock producers face direct weather-related risks, such as from flooding or heat stress, all of which are projected to increase due to climate change.

Feed supply pressures can also lead to input cost volatility, risk to business continuity, and reputational risk.

KEY QUESTIONS FOR INVESTORS

Air, water and soil pollution

→ How much waste does the company produce on an annual basis?

→ What is the company's waste management/disposal policy and process?

→ Are waste-related regulations tightening in the company's core markets?

Water availability

→ How much of the company's production is from water-stressed or water-scarce areas?

→ What steps can the company take to mitigate water scarcity issues should they rise in operating areas (for example, after a long drought)?

→ Does water availability restrain growth in the company's current locations?

→ How detailed is the company's assessment of water availability when it considers investment in new facilities?

Land use competition

→ To what extent does the company have conflicts with communities around its production areas?

→ How are these conflicts managed?

GHG emissions

→ How is the company addressing GHG emissions from production – particularly methane release for dairy?

→ Does the company have a policy on emission mitigation, both in terms of improving efficiencies of their animal protein production and diversifying into lower carbon products (e.g., plant-based dairy)?

Feed supply risks

→ How well does the company understand the sources of its feed supplies – are they fully traceable?

→ To what extent is the company sourcing from regions where there are potential or growing risks that may limit feed availability, including water scarcity or natural hazards?

→ Are suppliers able to manage related issues and do they have the capacity to expand their production in line with the needs of the business, – e.g., they are not subject to land use constraints and have sufficient access to fertiliser?

→ Has the company implemented policies relating to feed supply-sourcing areas, such as on deforestation or labour standards?

→ How does the company monitor its suppliers on adherence to its policies?

Source: ARE and FAIRR

CHAPTER 4: ANIMAL WELFARE

> *"Asian markets are increasingly focused on animal welfare. In China, a rapidly growing animal welfare movement is becoming increasingly effective at advocating for policy changes"*

At first glance, animal welfare looks like a consumer issue — if someone wants better welfare, they can pay a premium and producers will supply it. However, this misses several key points about the way that welfare standards evolve. Many of the people that care most about animal welfare, vegetarians and vegans, do not consume animal products and so will not pay more to consume higher welfare products. Instead, they often engage in advocacy with industry and regulators to press for higher welfare standards and frequently raise their concerns publicly, including via social media.

These efforts have targeted the increase in concentrated livestock production. This growing secular concern builds on strong religious traditions of consideration for animals across the region. Religious convictions play a strong role in animal welfare standards and consumption in many Asian countries. In India, religious and cultural preferences have resulted in the world's highest prevalence of vegetarianism – the government estimate is 29%[28], but others estimate up to 42%. Together with high levels of poverty, this has resulted in per capita meat consumption of only 3 kg per person per year.

Countries with a significant Muslim population tend to have low pork production and consumption. Pakistan consumes almost none, while Malaysia consumes around 6.1 kg per person per year, far lower than other Asian markets with similar total meat consumption. Furthermore, Halal certification includes many standards that respond to welfare concerns, even if some secular advocates do not believe they go far enough. Buddhism – which has large numbers of followers across the region – is also linked to customary practices relating to animal welfare and vegetarianism in some interpretations.

It is hard to quantify the level of secular concern for animal welfare in Asia. Nevertheless, there is anecdotal evidence of broadening engagement on the issue in recent years:

→ The Mintel study 'Food and Drink Trends 2017' showed that between 2012 and 2016, there was a 140% growth in new product launches with vegetarian claims on the packaging and a 440% growth in new product launches with vegan claims in the Southeast Asia region. The same study showed that 15% of metro Thai and 23% of metro Indonesian consumers eat non-animal sources of protein. Health is a key driver for this, but not the only one.

→ There was a significant increase in bans by leading hotels and restaurant chains on serving shark fin.

→ There was a public outcry in China against the listing of a bear bile company.

→ Dog meat was banned in Taiwan in 2017.

→ Dog meat was also reportedly banned at the annual Yulin dog meat festival in 2017.

The growth of the Business Benchmark on Farm Animal Welfare (BBFAW) may also have an impact on progress in this area. BBFAW is the first global measure of animal welfare standards in food companies and is designed for use by investors, companies, NGOs and other interested stakeholders. The 2016 benchmark evaluated 100 companies, including three Chinese companies as well as Thailand's Charoen Pokphand – all of which were assessed in the bottom two tiers. The highest-ranking company from the Asia-Pacific region was New Zealand dairy giant Fonterra in tier four. For the 2017 benchmark, two additional Chinese companies (China Resources Vanguard and Lianhua Supermarket Holdings) and two Japanese companies (Aeon Group and Seven & I Holdings) will be included for the first time.[29]

IMPLICATIONS FOR INVESTORS

This report identifies a number of ways in which animal welfare can change the landscape for companies:

→ consumer substitution to plant-based proteins;

→ consumer preference for higher-welfare labelled products;

→ major buyers implementing higher welfare in their sourcing policies;

→ national import/ export barriers due to animal welfare concerns, and;

→ higher regulatory standards in domestic markets.

We expect these trends to strengthen over time.

Farm animal welfare has emerged strongly as a regulatory issue in developed markets over the last decade. In the US, several states, including California and Massachusetts, have introduced legislation banning the extreme confinement of calves, sows and hens. Last year Massachusetts became the first US state to pass a ballot measure that would prevent operations that confine calves, sows and hens from even selling their products in the state, and it passed with 77.7% of the vote – the most of any animal ballot measure in history.

Cross-border trade is also affected by farm animal welfare considerations. In 2011, the Australian government imposed a temporary ban on live cattle exports to Indonesia, following exposure of the poor treatment of the animals at Indonesian slaughter-houses. This caused significant disruption to the Australian cattle industry leading to a class action lawsuit against the government seeking AUD 600 million ($448 million). Similarly, in 2016, the Australian government ordered two of its cattle exporters to stop supplying to Vietnam due to mistreatment and abuse of Australian cattle in Vietnamese abattoirs.

Asian markets are increasingly focused on animal welfare. In China, a rapidly growing animal welfare movement is becoming increasingly effective at advocating for policy changes. The China Veterinary Medical Association is formulating national guidelines on farm animal welfare, while authorities in Shandong – the largest producing province, with over a fifth of national production – have released the first guidelines on the humane slaughter of chickens.

Consumer pressure has driven food buyers to act on animal welfare policies ahead of regulation in many markets. In Canada, for example, the egg industry has responded to consumer pressure by committing to transition to entirely cage-free facilities by 2036, giving egg-laying hens more room to move around and an enriched environment. In the US, food businesses making up 70% of egg demand, including McDonald's and Burger King, have already made commitments to go cage-free. In China, agri-food producer Da Bei Nong has committed to introducing higher welfare standards in its pork operations and the British-based welfare organisation the RSPCA is working on a European-style welfare assurance scheme for the country.

These factors are likely to create a changing opportunity set for Asian livestock producers, particularly those that sell to multinational companies, both through export and within the domestic market. New facilities built on old welfare specifications run the increasing risk of losing customers partway through the life cycle of the asset. Conversely, there are opportunities for producers that adopt higher standards ahead of the growing demand.

KEY QUESTIONS FOR INVESTORS

Animal welfare

→ Has the company assessed evolving consumer concerns on animal welfare in its key markets?

→ What proportion of revenues are to MNCs that are implementing higher standard welfare policies?

→ What proportion of revenues are to international/ developed markets (where standards may tighten)?

→ Does the company wish to enter new markets and, if so, do these have higher or different welfare standards?

→ What steps does the company take to manage animal welfare (e.g., policies, implementation, ongoing monitoring)?

→ Is the company assessed by BBFAW? Does it have plans to improve its ranking if so?

Plant-based proteins

→ What investments has the company made in sustainable plant-based protein sources (defensively or anticipating growth)?

Source: ARE and FAIRR

CHAPTER 5: LABOUR STANDARDS

Concerns over labour standards in the livestock and seafood industry have grown in recent years. Suppliers found to have poor labour standards face significant reputational and trade risks, while adherence to labour standards is an import requirement for most countries and economic regions.

For example, in 2014 news reports exposed numerous human rights abuses in Thailand's seafood supply chains. As a result, the EU threatened to ban seafood imports from Thailand. The country has also faced issues in the livestock sector that could create similar risks.

In November 2015 two Scandinavian organisations, Swedwatch and Finnwatch – funded by the Swedish government and the European Union – published an assessment of human rights risks in the Thai poultry sector. The report included the results of a field study with interviews of 98 foreign workers from four poultry producers that had exported to Sweden. It found that all factories had clear breaches of international standards. Figure 14 presents extracts from study findings at one of the factories.

In addition to export-related issues, poor labour standards can pose risks in domestic markets. In September 2016, 14 migrant workers from Myanmar filed a lawsuit alleging forced labour at a Thai chicken farm. The workers are demanding compensation of $1.3 million from the leading exporter Betagro, the farm itself and from Thai officials.

Aside from forced labour, there are also health and safety concerns associated with livestock, including in developed markets. A recent report from the National Employment Law Project in the US analysed data on severe injuries in 29 US states between January 2015 and September 2016. It found meatpacking and poultry workers were at high risk, with two livestock companies in the list of ten companies with the highest number of incidents, even though these companies had relatively low number of employees. Studies have also shown the rising prevalence of multi-drug-resistant staphylococcus aureus in people working in animal agriculture farms.[30] Frequent illnesses driven by antimicrobial resistance can hurt productivity within companies and increase the risk of class-action lawsuits.

Figure 14: Labour challenges at a Thai poultry factory

Issue	Finding	Comment
Reports of personal documents confiscated	Yes	Work permits and other documents held by broker
Indications of debt bondage	Yes	
Reports of underage workers	Yes	From 14 years old
Reports of abusive supervisors	Yes	Slapping around face and head
Reported issues with overtime payment	Yes	No overtime pay for three months, though appearing on pay slip
Pay slip in language worker understands	No	Thai only
Reports of manipulation during social audits	Yes	Slower work pace, supervisors softer
Toilet visits monitored	Yes	Salary deduction if exceeding 15 minutes

Source: Swedwatch/Finnwatch

IMPLICATIONS FOR INVESTORS

Requirements relating to labour are evolving in the region. It is likely that concerns will continue to materialise from reputation-sensitive customers, such as European importers or multinationals with operations in Asia. These issues can also crystallise in domestic markets, whether through increased regulation, domestic reputational problems, legal risks or even strikes in some countries. Continuing problems with labour standards may also raise concerns over quality of management in general.

KEY QUESTIONS FOR INVESTORS

Labour standards

- → What proportion of the company's products are sold to branded companies or export markets that expect strong labour standards?
- → How does the company ensure that labour standards are:
  - → in line with domestic regulations?
  - → in line with expected standards for international buyers?
- → How does the company deal with breaches of regulatory, internal or international buyer labour standards?
- → What are the company's employment policies towards vulnerable populations, such as migrant groups?

SPECIAL REPORT: ESG RISKS FACING ASIAN AQUACULTURE PRODUCERS

As with livestock production, factory farming of seafood in Asia (including seafood) is associated with significant ESG risks.

Over the last three decades, world aquaculture production increased from five to 63 million tonnes – and 90% of that production now originates in Asia. The region is also the biggest market for seafood, with a per capita consumption of seafood ranging from 11 kg per capita per year in India, to over 144 kg in Hong Kong. The most widely cultured species are carps, carpet shells, white leg shrimp, cupped oysters and tilapia.

Half of the aquaculture production in Asia is currently produced in intensive factory farms. The Asian aquaculture sector consists of thousands of medium-sized companies, cooperatives, state-owned enterprises and family farms. While this results in strong sector resilience, it reduces transparency in supply chains and complicates the implementation of much-needed management systems and practices.

American and European importers and retailers such as Walmart, Costco, Tesco, Carrefour, Amazon and Metro have considerable exposure to a range of sustainability and governance-related risks associated with aquaculture in Asia.

To mitigate these concerns, top producers in the sector are working towards developing sustainable production systems, certified through an increasing number of ecolabels. But environmental and social issues continue to attract international attention. A general lack of traceability in company supply chains has made it difficult for investors to evaluate and mitigate their exposure to these risks.

Public health and food safety risks

Like the meat production sector, aquaculture producers in Asia continue to shift towards more intensive farming practices. This approach goes hand in hand with an increased use of antimicrobials, resulting in public health risks from the potential development of antibiotic-resistant microbes. A recent study found that 74% of Thai shrimp farmers used antibiotics in shrimp production, largely prophylactically.[31] Another 2017 study on shrimp production from China found that 52% of tested samples contained antimicrobial residues, and in 10% of these samples, the residues exceeded legal limits.[32] The US imports about 70% of its seafood from Asia, half of which is cultured. In 2016 the US FDA recorded a record year for refusals to import Asian shrimp due to contamination with banned antibiotics.[33]

Regulations to curb excessive antibiotics use in top-producing nations such as China and Vietnam is becoming stricter. Consequently, producers are now shifting to neighbouring countries with weaker legislative systems. A recent study projects that some of the biggest increases in the use of antimicrobials in next 15 years are expected to be in Southeast Asia, led by Myanmar (an expected increase of 205%) and Indonesia (an expected increase 202%).[34]

In addition to antibiotics, other regularly added substances include antifungal drugs to prevent the spread of fungal infections and chemicals to minimise fouling of the feed.[35] In 2013, after public health concerns, Japan banned ethoxyquin, an antioxidant used to preserve fishmeal, resulting in a dramatic drop in shrimp imports from Southeast Asia. In 2017, the French retailer Carrefour decided to ban the sale of pangasius, a type of catfish, from all its stores due to similar concerns on dangerously high residue levels. Increasing consumer and buyer awareness is likely to fuel the trend of banning certain aquaculture products by retailers.

Environmental footprint

Some of the common negative environmental effects of factory-farmed aquaculture in Asia include:

- → the destruction of vast areas of mangrove forests for pond development;
- → large quantities of farm waste outputs from pond discharges and direct outflow;
- → the proliferation of parasites and diseases in open-cage environments;
- → the dependence on wild stocks for certain aquaculture species;
- → dependence on fish meal from overfished stocks; and
- → escaping exotic species that may negatively impact the biodiversity of the local environment.

Although many companies in Asia are not currently charged for their environmental damage, this is expected to change in the near future, with anticipated high costs for farmers and their investors.

At least 25% of all wild fish caught globally are used for the production of fishmeal and fish oil. About 90% of these fish are suitable for human consumption. Also, many of the fisheries producing fish meal are overfishing the stocks they target. Besides causing reputational risks to investors, this will result in higher fishmeal prices, as demand for fishmeal continues to increase even as stocks decrease, reducing the future profitability of aquaculture operations.

Case study: Myanmar

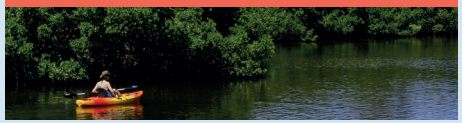
COST OF ENVIRONMENTAL DEGRADATION IN MYANMAR GROWING

The excessive cutting of mangroves for the development of fish ponds in Southeast Asia has scarred the region for decades to come.

In Myanmar's Irrawaddy Delta, for example, most mangrove forests have been cleared to make room for shrimp ponds. Mangroves play an important role as storm buffers: they decrease wind speeds and reduce the impact of flooding and tsunamis, especially important in an area where large storms are a common occurrence.

Thus when cyclone Nargis hit the Irrawaddy Delta in 2008, with no remaining mangrove buffer in place, the storm caused terrible loss of life, with over 140,000 people dead or missing. It also caused an economic loss of more than $4 billion, including the wipeout of all aquaculture farms.

With weather patterns becoming more erratic due to climate change, an increase in large cyclones and typhoons is expected for the whole of Southeast Asia.



Animal welfare and health concerns

The issue of animal welfare and health are strongly interlinked with food safety issues and the environmental footprint of aquaculture operations. Poor water quality observed in most farming areas results in lower growth rates and higher mortalities in cultured fish. Disease outbreaks become more common as certain diseases and parasites settle permanently in intensive farming areas, which in turn forces farmers to use more antibiotics and other veterinary drugs.

Some farming areas have become unsuitable for aquaculture because of pollution, resulting in significant losses. Moreover, the proliferation of pathogens has become a major constraint in many intensive farming areas in Asia and the Pacific. Thailand and Vietnam are struggling to maintain previous production levels of shrimp, as the early mortality syndrome (EMS) and other pathogens continue to wipe out entire farms. From 2012 until May 2016 EMS alone has caused investors in Thailand to lose more than $5 billion. In 2017, another pathogen, white spot disease, made its way to Australia. Although many believed that Australia had better production systems in place that would prevent this type of diseases from spreading, the disease has already infected over 100 family-operated farms in the first six months of arriving in Australia, decimating local production figures. The authorities are now questioning the suitability of certain areas for shrimp farming and are calling for a serious revision in production strategies and farming methods.

Producers

The few large aquaculture producers in Asia are conglomerates that generate only part of their revenue from aquaculture, with other revenues streams from fishing, including the production of fish meal and fish feeds, livestock and agriculture. Top producers include:

- Thai Union Group (annual revenue of $3.2 billion). (Thailand)
- Charoen Pokphand (annual revenue of $10.3 billion). (Thailand)
- Maruha Nichiro (annual revenue of $7.4 billion). (Japan)
- Nippon Suisan (annual revenue of $2.3 billion). (Japan)

Corporate figures for China are less readily accessible, but a few of the major producers in China include:

- Zhanjiang Guolian Aquatic Products Co. Ltd. (annual revenue of $0.84 billion).
- Dahu Aquaculture Company Ltd. (annual revenue of $0.95 billion).
- Zhanjiang Guolian Aquatic Products Co., Ltd. (annual revenue of $0.83 billion).
- The Zoneco Group (annual revenue of $43.04 billion).

- **90%** of global aquaculture production originates from Asia[36], with an average annual growth rate between 5–10% in the past decade.[37]
- China is Asia's top producer with about **60%** of the world's global aquaculture output and an estimated value of over $45 billion.[38]
- Other major producers in the region include **Indonesia** (15,649,311 tonnes), **Thailand** (8,970,906 tonnes) and **Vietnam** (3,450,200 tonnes).

APPENDICES

Appendix 1: Asian meat metrics

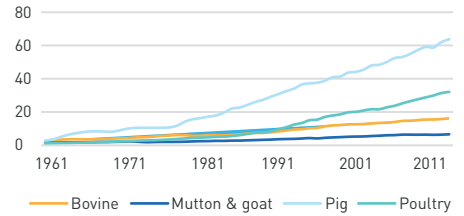
Meat production, particularly pork, has increased dramatically across the 15 major Asia-Pacific markets we reviewed. Total meat production increased **13-fold** between 1961 and 2013 and at a compound annual growth rate of 3% in the ten years to 2013. According to OECD projections, demand in these markets is forecast to grow by **19% to 144 million tonnes** by 2025.

Pork is the meat with the highest overall consumption rates, with poultry as the second-most widely consumed, having overtaken beef by the end of the 1980s. Around 6% of meat produced in Asia was exported in 2013, including cross-border trade within Asia-Pacific. However, exports have declined as a proportion of production since the 1980s, with a pick-up in recent years. Overall, imports have been on upward trend in recent decades and accounted for 8.5% of total domestic supply in 2013.

Annual per capita consumption for the 15 markets assessed in this report has shown strong growth. It increased more than **six-fold** between 1961 and 2013 and at a ten-year compound average growth rate of 2.1% to reach 35.2 kg in 2013. Australia's per capita consumption has gone sideways, with only 12% growth since 1961. The less developed countries have shown strong growth, aside from India, which has shown a small decline over the last ten years and almost no growth since 1961.

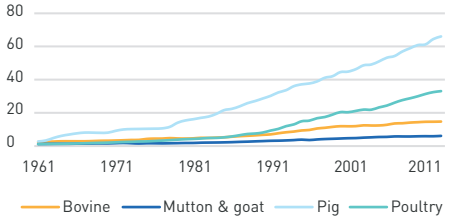
Total egg consumption increased **12-fold** between 1961 and 2013, with a ten-year compound annual growth rate of 2.2% to 2013. Aggregate per capita consumption has increased **five-fold** since 1961, to 10 kg in 2013, led by growth in all the main developing markets. Overall, annual milk per capita consumption outpaced egg consumption at a compound annual growth rate of 2.9% in the ten-year period to 2013, but only grew 6.9 times since 1961. India is by far the largest milk producer and consumer. However, in more developed markets, dairy milk consumption is starting to decline. For example, Mintel research indicates US dairy milk sales are set to drop 11% between 2015 and 2020 .

Meat production (million tonnes)



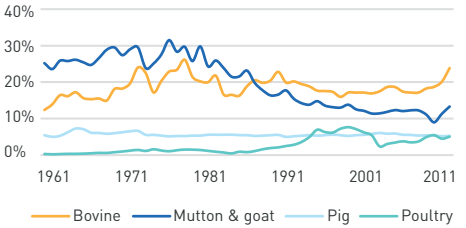
Sources: FAO, ARE calculations

Meat domestic supply (million tonnes)



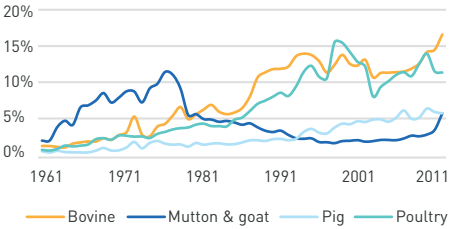
Sources: FAO, ARE calculations

Meat exports as a share of production



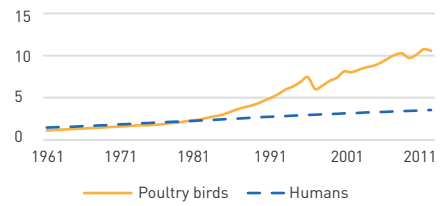
Sources: FAO, ARE calculations

Meat imports as a share of domestic supply



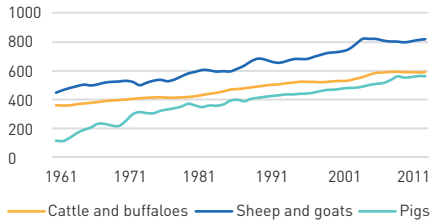
Sources: FAO, ARE calculations

Poultry flock (billion heads)



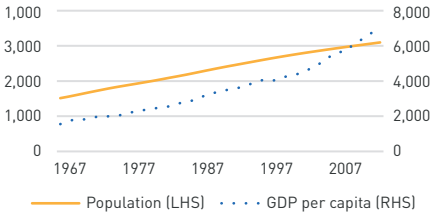
Sources: FAO, ARE calculations

Herds (million heads)



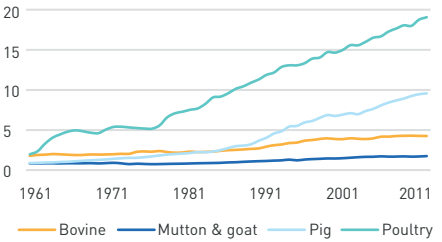
Sources: FAO, ARE calculations

Population (million) and GDP per capita (constant $ 2010)



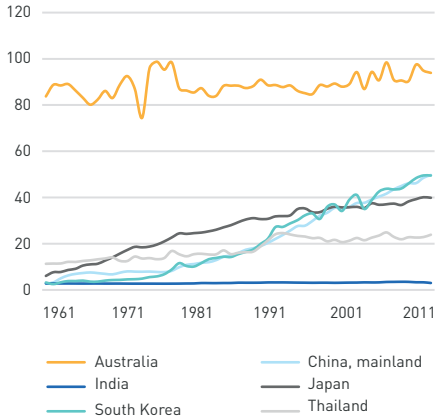
Sources: World Bank, US Federal Reserve

Per capita consumption (kg)



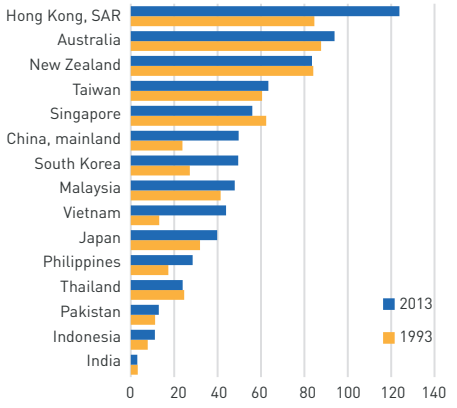
Sources: FAO, OECD, ARE calculations

Per capita consumption for selected countries (kg)



Sources: FAO, OECD, ARE calculations

Per capita meat consumption for all countries covered (kg)



Sources: FAO, OECD, ARE calculations

Australia

Australia's annual per capita meat consumption was 94 kg in 2013, second only to Hong Kong within the countries we reviewed. The country is mainly a meat exporter, with significant beef, mutton and goat exports. The country is self-sufficient for all the categories except pork, for which it has become a significant importer over the last two decades. Australia's per capita consumption of poultry and pork have increased steadily over the last few years, while mutton and goat have declined – beef has flattened on a total consumption basis, but declined on a per capita basis. Over the same period, the beef population has remained relatively stable, with a steady decrease in numbers of sheep and goats, and a marked increase in the poultry flock. As Australia has emphasised cattle and has plenty of land, the primary mode of beef production is through pasture, rather than concentrated production such as feedlots. Industry body Meat & Livestock Australia estimates one million cattle are in feedlots compared to a total herd of 27 million. This means that Australia has a lower epidemic risk than Asian markets using more concentrated production methods.

The country's milk consumption has increased slightly in the past few decades, with lower exports compensating for declining domestic production. Egg consumption has increased rapidly over the last ten years, following a decline in the previous decades.

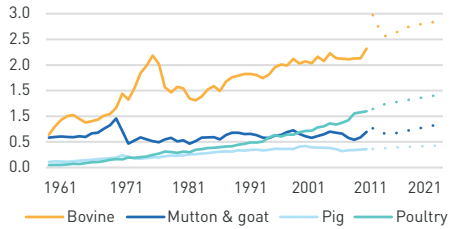
Australian dietary guidelines recommend a maximum of 455 grams of red meat per week due to its negative consequences for health. The country is notable for animal welfare concerns. In 2011, there was a temporary ban on live cattle exports to Indonesia that caused significant disruption, following the exposure of poor treatment of animals in Indonesian abbatoirs.

Key data (2013)

	Quantity	CAGR 10 years	Growth (1961–2013)
Total meat production	4.5 million tonnes	1.5%	3.2x
Total meat consumption	2.7 million tonnes	1.1%	2.4x
Total meat consumption per capita	93.9 kg	0.0%	1.1x

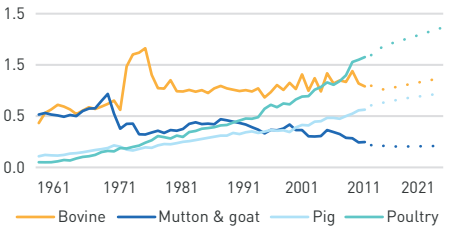
	Bovine	Mutton & goat	Pork	Poultry	Milk	Eggs
Production (thousand tonnes)	2,318	697	361	1,098	9,522	241
Consumption (thousand tonnes)	790	248	564	1,077	5,474	199
Consumption per capita (kg)	23.8	8.7	18.9	40.7	235	8.5

Meat production (million tonnes)



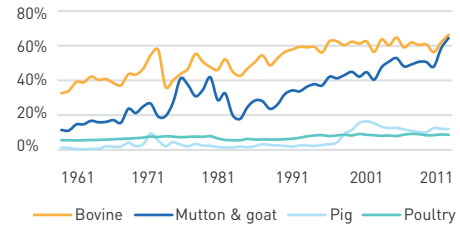
Sources: FAO, OECD

Meat domestic supply (million tonnes)



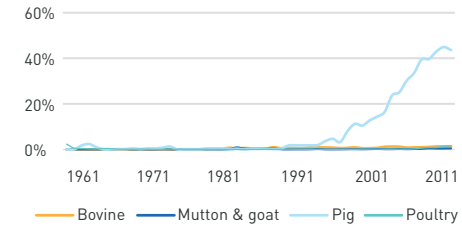
Sources: FAO, OECD

Meat exports as a share of production



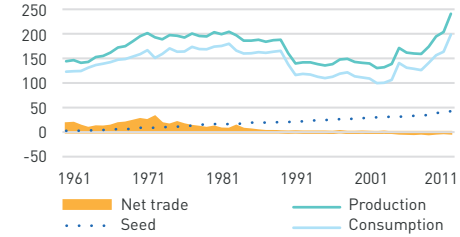
Sources: FAO, ARE calculations

Meat imports as a share of domestic supply



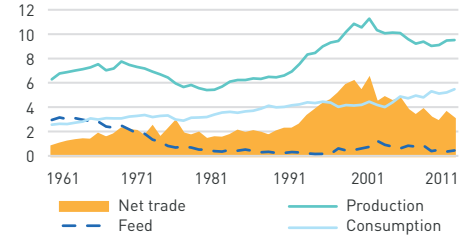
Sources: FAO, ARE calculations

Eggs balance (thousand tonnes)



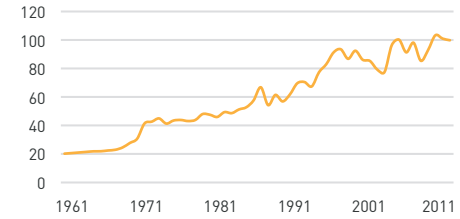
Source: FAO

Milk balance (million tonnes)



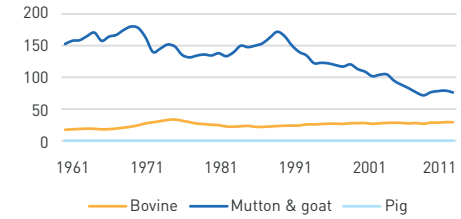
Source: FAO

Poultry flock (million heads)



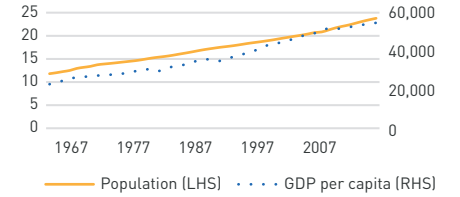
Source: FAO

Herds (million heads)



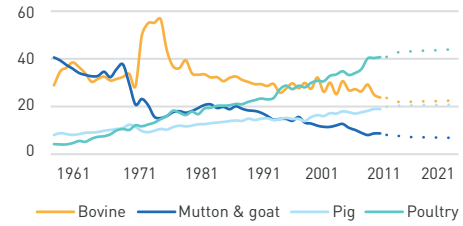
Source: FAO

Population (million) and GDP per capita (constant $ 2010)



Source: World Bank

Per capita consumption (kg)



Sources: FAO, OECD, ARE calculations

Leading producers

Name	Ticker	Livestock and poultry operations	Market cap ($ million)
Inghams Group	ING:ASE	Australia's largest poultry meat producer	873
Australian Agricultural	AAC:AU	Australia's largest integrated cattle and beef producer	648
Wellard	WLD:ASE	Meat producer and livestock exporter	74

Leading processors

Name	Ticker	Activity	Market cap ($ million)
Bellamy's Australia	BAL:AU	Bellamy's Australia Limited produces only Australian-made, certified organic foods and milk	330
Elders	ELD:AU	Brokers and processes wool; trades grain; retails seed, fertiliser and animal health and other farm products	401
Bega Cheese	BGA:AU	Provides dairy food products	750

Leading downstream companies

Name	Ticker	Activity	Market cap ($ million)
Wesfarmers	WES:AU	Food retailer through its subsidiary of Coles supermarkets	37,866
Woolworths	WOW:ASE	Retailer operating supermarket chains across Australia and New Zealand	25,618
Metcash	MTS:ASE	Wholesale grocery and fresh produce distribution and marketing company	1,679

China, mainland

China is by far the largest producer of all main meat categories, with upwards of 83 million tonnes in 2013 – more than 12 times the second-largest producer in the region, Japan. China has become a net meat importer in the past decade, with low levels of pork, poultry and bovine meat imports and, following significant milk consumption growth since 2000, an increase in milk imports to 18% of domestic consumption by 2013. China's per capita consumption of meat has steadily increased. Pork is the preferred meat and is, on average, consumed nearly three times as much as poultry, in second place. Imports of poultry have maintained at a low level, with some volatility. A significant proportion of bovine meats were exported in the 1980s, but this declined in the 1990s. In the last few years, China has started importing much more beef and veal.

The significant quantities of meat produced in China mean that it is exposed to the whole range of sustainability risks. Epidemic risk is a current issue in the country. The H7N9 avian flu virus appeared in China in 2013. By May 2017 it has led to 1,486 confirmed cases in humans, including 571 deaths, causing significant disruption to poultry markets.

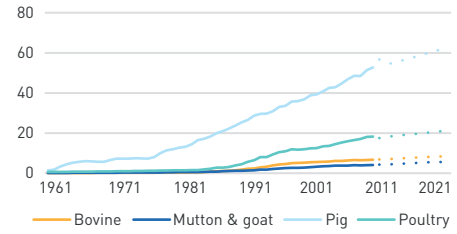
The 2016 version of China's dietary guidelines included a downward revision to the lower end of its recommended meat consumption range so that the recommendation became 40–75 g/day from 50–75 g/day. This implies maximum annual consumption of 27 kg/year compared to 49.7 kg consumed in 2013.

Key data (2013)

	Quantity	CAGR 10 years	Growth (1961–2013)
Total meat production	83.5 million tonnes	3.2%	37.6x
Total meat consumption	84.6 million tonnes	3.4%	38.5x
Total meat consumption per capita	49.7 kg	2.8%	18.3x

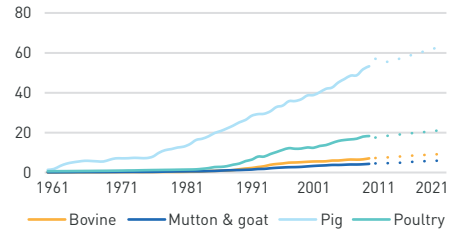
	Bovine	Mutton & goat	Pork	Poultry	Milk	Eggs
Production (thousand tonnes)	6,730	4,081	52,733	18,265	40,193	28,760
Consumption (thousand tonnes)	7,083	4,337	53,268	18,285	45,252	25,999
Consumption per capita (kg)	3.6	2.8	30.5	11.8	32.7	18.8

Meat production (million tonnes)



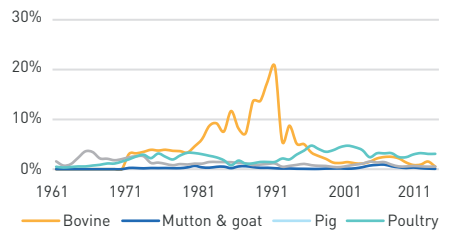
Sources: FAO, OECD

Meat domestic supply (million tonnes)



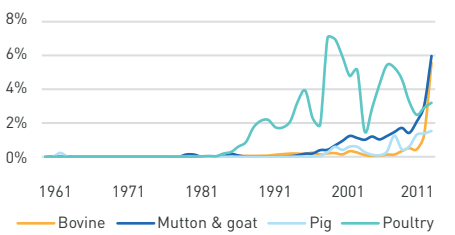
Sources: FAO, OECD

Meat exports as a share of production



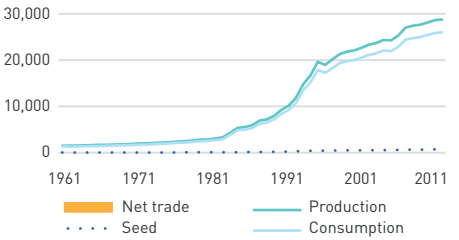
Sources: FAO, ARE calculations

Meat imports as a share of domestic supply



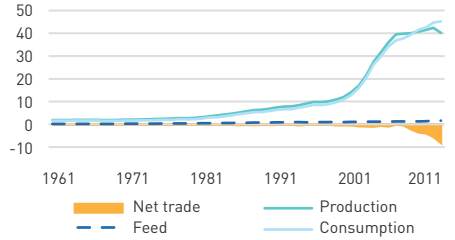
Sources: FAO, ARE calculations

Eggs balance (thousand tonnes)



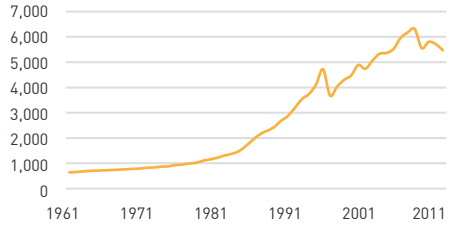
Source: FAO

Milk balance (million tonnes)



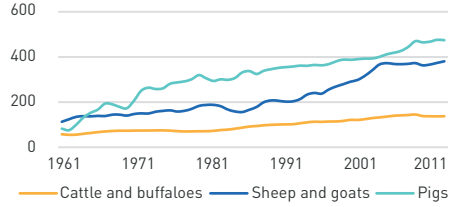
Source: FAO

Poultry flock (million heads)



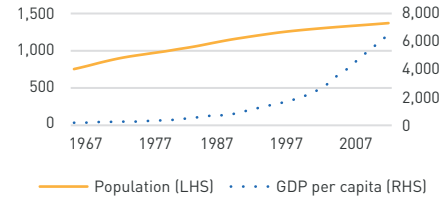
Source: FAO

Herds (million heads)



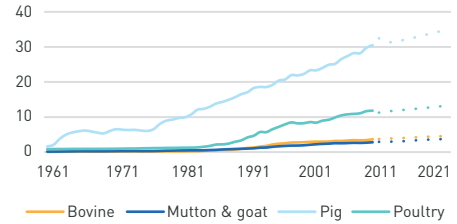
Source: FAO

Population (million) and GDP per capita (constant $ 2010)



Source: World Bank

Per capita consumption (kg)



Sources: FAO, OECD, ARE calculations

Leading producers

Name	Ticker	Livestock and poultry operations	Market cap ($ million)
Guangdong Wens Foodstuffs Group	300498 CH	Integrated chicken, duck and pork producer. Also manufactures and markets cooked and frozen meat	21,082
New Hope Liuhe	000876 CH	Develops, produces, and markets a variety of animal feeds and poultry farms	4,951
Muyuan Foodstuff	002714 CH	Breeds and sells boars and commodity pigs	4,210

Leading processors

Name	Ticker	Activity	Market cap ($ million)
Inner Mongolia Yili	600887 CH	Produces milk, powdered milk, ice cream, and other dairy products. Also produces frozen food and noodles.	1,462
Henan Shuanghui	000895 CH	Manufactures meat products and frozen food	10,796
China Mengniu Dairy	2319 HK	Manufactures and distributes dairy products in China, including liquid milk, ice cream and milk powder	7,885
China Huishan Dairy	6863 HK	Produces dairy products. Also grows alfalfa and supplementary feeds	4,928

India

India's annual per capita meat consumption is the lowest of the countries reviewed at 3 kg, due to the high prevalence of vegetarianism and low incomes. The number has fallen further in the last few years, as a sharp decline in bovine meat consumption has more than offset a longer-term rise in poultry consumption. Mutton and goat meat have also declined over the long term, which is attributed to substitution to poultry, because it is cheaper. India meets almost all of its demand through domestic production, importing a very small amount of pork. The share of exports of bovine meat (mainly buffalo) has increased significantly in the last few years, in tandem with the decline in domestic consumption.

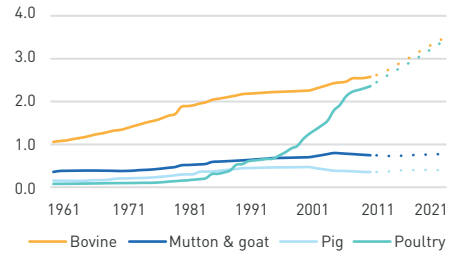
India boasts the world's largest number and proportion of vegetarians – we have seen estimates ranging from 29% to 42% of the population. Religious convictions play a significant role in the diet as well as in the treatment of cows, which affects trends in bovine markets. Poverty is also a significant factor in the low levels of meat consumption among the non-vegetarian population. The government's recent ban on cattle sales for slaughter is expected to disrupt the global beef industry and have a negative impact on the country's dairy and leather industries.

Key data (2013)

	Quantity	CAGR 10 years	Growth (1961–2013)
Total meat production	6,125 million tonnes	2.5%	3.7x
Total meat consumption	4,627 million tonnes	0.4%	2.7x
Total meat consumption per capita	3.0 kg	-0.6%	1.1x

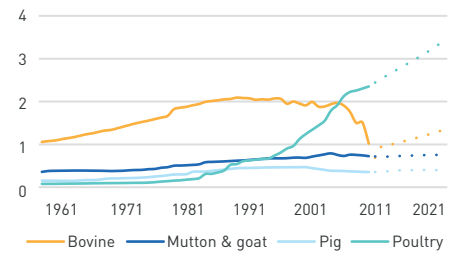
	Bovine	Mutton & goat	Pork	Poultry	Milk	Eggs
Production (thousand tonnes)	2,577	747	354	2,358	135,600	3,835
Consumption (thousand tonnes)	1,017	725	354	2,352	105,807	3,231
Consumption per capita (kg)	0,6	0.5	0.2	1,6	84,5	2,6

Meat production (million tonnes)



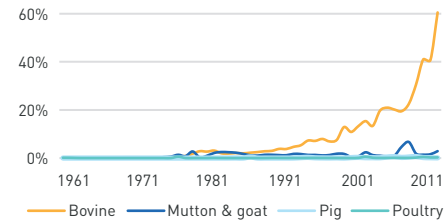
Sources: FAO, OECD

Meat domestic supply (million tonnes)



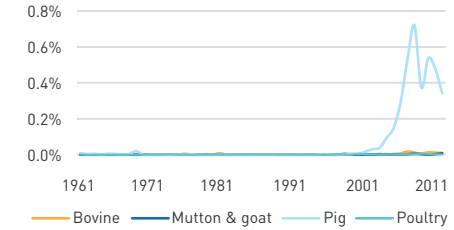
Sources: FAO, OECD

Meat exports as a share of production



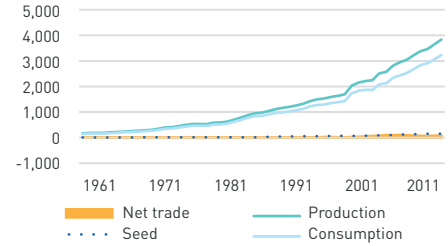
Sources: FAO, ARE calculations

Meat imports as a share of domestic supply



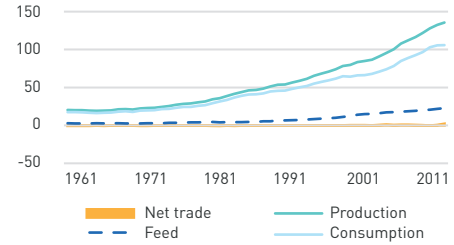
Sources: FAO, ARE calculations

Eggs balance (thousand tonnes)



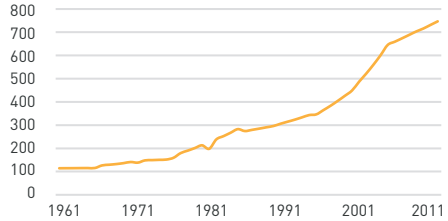
Source: FAO

Milk balance (million tonnes)



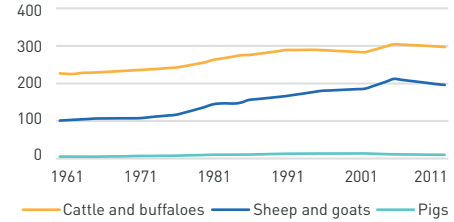
Source: FAO

Poultry flock (million heads)



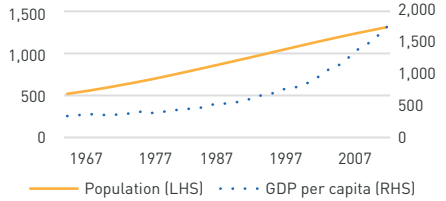
Source: FAO

Herds (million heads)



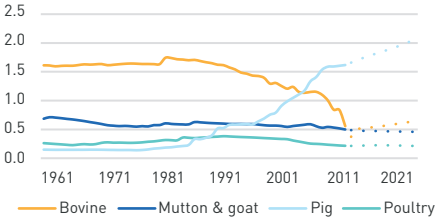
Source: FAO

Population (million) and GDP per capita (constant $ 2010)



Source: World Bank

Per capita consumption (kg)



Sources: FAO, OECD, ARE calculations

Leading producers

Name	Ticker	Livestock and poultry operations	Market cap ($ million)
Kwality	KWALITY IN	Producer of dairy products	561
Venky's India	WH IN	Poultry breeder and processor, and producer of animal feed and health products	181

Leading processors

Name	Ticker	Activity	Market cap ($ million)
Nestlé India	NEST IN	Manufactures brand-name milk products and other food products	9,302
Hatsun Agro Products	HTSMF IN	Manufactures powdered dairy products	1,228
Future Consumer	FCON IN	Food and household product manufacturer	755

Japan

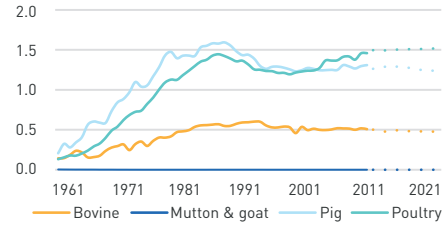
Japan is not self-sufficient in any meat category. The domestic herds and flocks have shown a slight decline since the 1980s. As a result, Japan now imports between 40% and 60% of its domestic demand for poultry, pig and bovine meat, making scrutiny of supplier practices a critical issue for food processors and manufacturers. Demand for mutton or goat is negligible and virtually all is imported. Although the country has the second highest available meat supply and high personal incomes, per capita consumption is only around average for the Asian countries we reviewed.

Key data (2013)

	Quantity	CAGR 10 years	Growth (1961–2013)
Total meat production	3,285 million tonnes	0.8%	4.8x
Total meat consumption	6,399 million tonnes	1.0%	8.8x
Total meat consumption per capita	39.8 kg	1.0%	6.6x

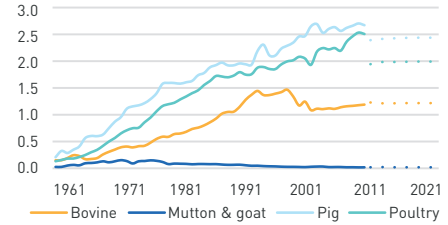
	Bovine	Mutton & goat	Pork	Poultry	Milk	Eggs
Production (thousand tonnes)	508	0	1.309	1.459	7,508	2,522
Consumption (thousand tonnes)	1,189	19	2,670	2,506	9,162	2,435
Consumption per capita (kg)	6.4	0.1	16.1	17.1	72.1	19.2

Meat production (million tonnes)



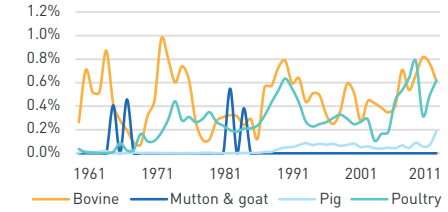
Sources: FAO, OECD

Meat domestic supply (million tonnes)



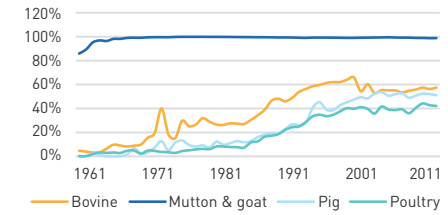
Sources: FAO, OECD

Meat exports as a share of production



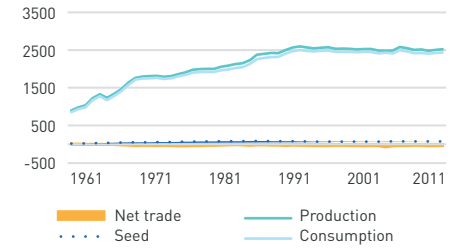
Sources: FAO, ARE calculations

Meat imports as a share of domestic supply



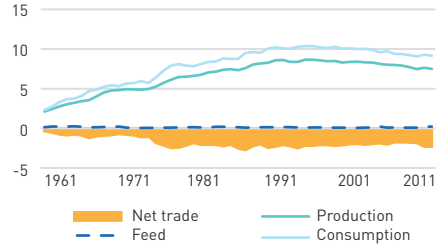
Sources: FAO, ARE calculations

Eggs balance (thousand tonnes)



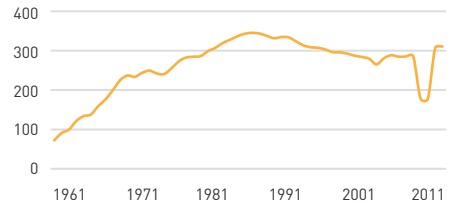
Source: FAO

Milk balance (million tonnes)



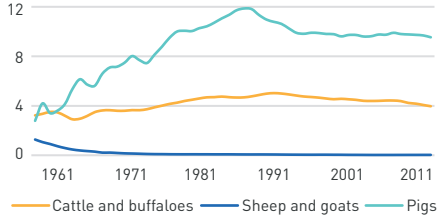
Sources: FAO

Poultry flock (million heads)



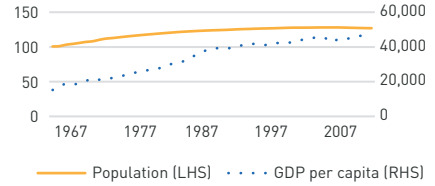
Source: FAO

Herds (million heads)



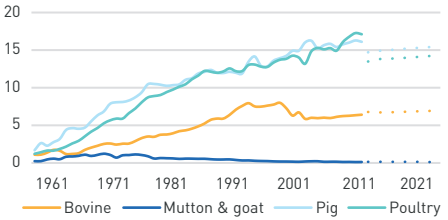
Source: FAO

Population (million) and GDP per capita (constant $ 2010)



Source: World Bank

Per capita consumption (kg)



Sources: FAO, OECD, ARE calculations

Leading producers

Name	Ticker	Livestock and poultry operations	Market cap ($ million)
MEIJI Holdings	2269 JP	Conglomerate, producing and marketing dairy and livestock products, among others	12,659
NH Foods	2282 JP	Food producer, of ham and processed meat. Also rears cattle, and has other diverse interests	5,599
Nichirei Corp	2871 JP	Producer of frozen and fresh food products and leading cold storage logistics company	3,703

Leading processors

Name	Ticker	Activity	Market cap ($ million)
Ajinomoto	2802 JP	Produces and markets food products, including dairy, amino acids, pharmaceuticals and chemicals	11,516
Yakult Honsha	2267 JP	Produces food and beverages including dairy products, pharmaceuticals and cosmetics	9,391
Itoham Yonekyu Holdings	2296 JP	Producer and distributor of pork, beef and poultry meat	2,916

Leading downstream companies

Name	Ticker	Activity	Market cap ($ million)
FamilyMart UNY Holdings	8028 JP	Operates a convenience store chain in Japan, with franchises in Taiwan, South Korea and Thailand	7,663
Lawson	2651 JP	Operates a chain of grocery and general merchandise convenience stores in Japan	6,822

South Korea

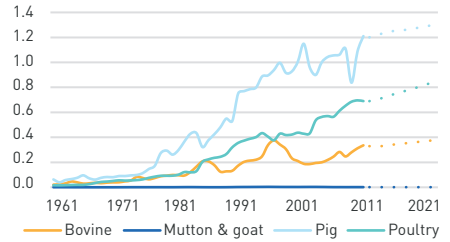
Total and per capita meat consumption has rapidly increased over the last few decades, outstripping production. Pork consumption is about twice that of bovine or poultry. Koreans eat more beef than in most other Asian markets, while domestic consumption of mutton and goat is negligible. South Korea relies on imports for a significant share of its consumption – around 60% for beef and 30% for pork. The poultry market faced significant disruption due to avian flu outbreaks in late 2016 and early 2017, which resulted in culls of over 20% of the bird population. Imports of poultry have risen to nearly 20% of domestic consumption.

Key data (2013)

	Quantity	CAGR 10 years	Growth (1961–2013)
Total meat production	2,242 million tonnes	2.4%	21.1x
Total meat consumption	3,134 million tonnes	2.4%	29.5x
Total meat consumption per capita	49.5 kg	1.9%	15.4x

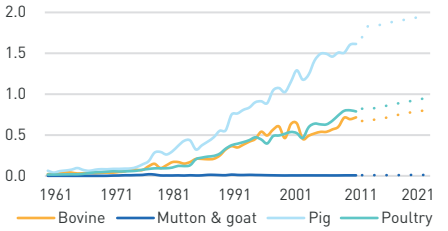
	Bovine	Mutton & goat	Pork	Poultry	Milk	Eggs
Production (thousand tonnes)	336	1	1,210	690	2,097	647
Consumption (thousand tonnes)	716	7	1,614	788	1,431	554
Consumption per capita (kg)	10.1	0.1	25.3	13.9	29.4	11.2

Meat production (million tonnes)



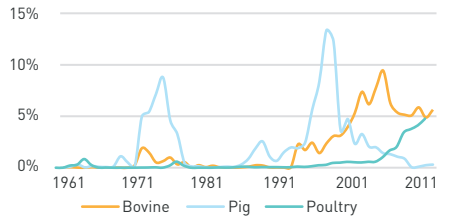
Sources: FAO, OECD

Meat domestic supply (million tonnes)



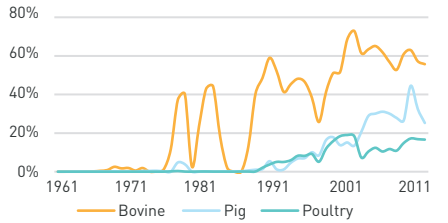
Sources: FAO, OECD

Meat exports as a share of production



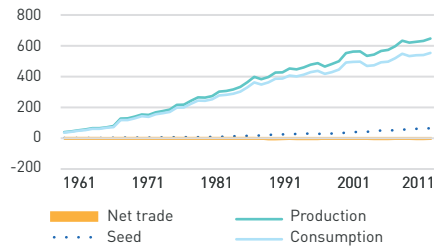
Sources: FAO, ARE calculations

Meat imports as a share of domestic supply



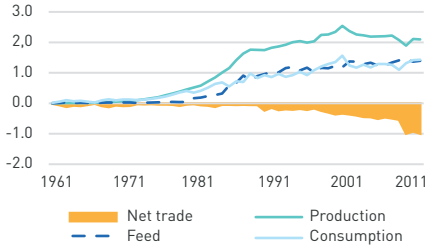
Sources: FAO, ARE calculations

Eggs balance (thousand tonnes)



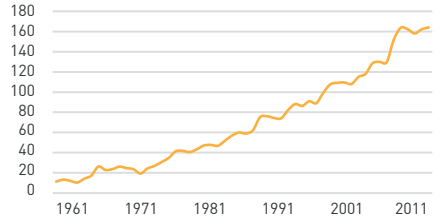
Source: FAO

Milk balance (million tonnes)



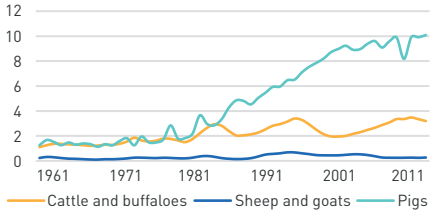
Source: FAO

Poultry flock (million heads)



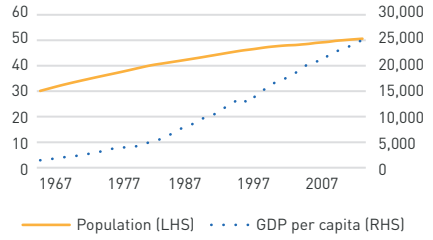
Source: FAO

Herds (million heads)



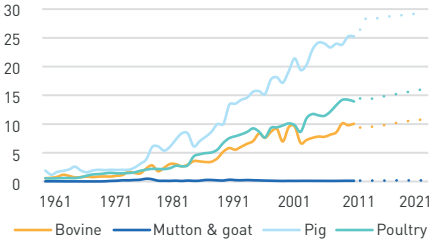
Source: FAO

Population (million) and GDP per capita (constant $ 2010)



Source: Wold Bank

Per capita consumption (kg)



Sources: FAO, OECD, ARE calculations

Leading producers

Name	Ticker	Livestock and poultry operations	Market cap ($ million)
Harim Holdings	024660 KS	Manufactures packaged chicken and chicken products	333
Sunjin	136490 KS	Pig farmer, producer and distributor of meat products and animal feeds	278

Leading processors

Name	Ticker	Activity	Market cap ($ million)
CJ Corp/ CJ CheilJedang Corp	001040 KS/ 097950 KS	Manufactures processed food products, including processed meats	4,259/ 4,079
Maeil Dairy Industry Co Ltd	005990 KS	Manufacturer and marketer of dairy products and other beverages	553

Leading downstream companies

Name	Ticker	Activity	Market cap ($ million)
BGF Retail Co Ltd	027410 KS	Grocery and general merchandise retailer through convenience store chains	4,601

Thailand

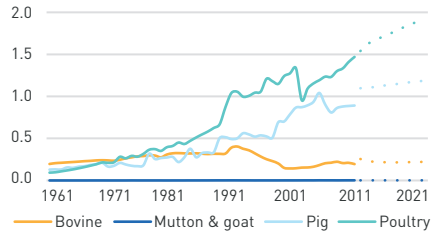
Thailand has been a significant poultry exporter for several decades, and more recently has begun to export a significant proportion of its beef. The country faced dramatic challenges to its poultry market in 2004, following an outbreak of avian flu, from which it has finally recovered. Thailand's per capita consumption of meat has remained broadly stable throughout the past two decades, with increased pork consumption substituting for declining bovine demand. This pattern is roughly reflected in absolute levels of demand, partly thanks to the decelerating pace in Thailand's population growth. The country imports much of its milk. Labour standards are an emerging social and governance issue for Thai exporters, which have recently come under scrutiny from markets such as Europe and the US.

Key data (2013)

	Quantity	CAGR 10 years	Growth (1961–2013)
Total meat production	2,558 million tonnes	0.8%	6.1x
Total meat consumption	1,880 million tonnes	0.4%	4.5x
Total meat consumption per capita	23.9 kg	0.6%	2.1x

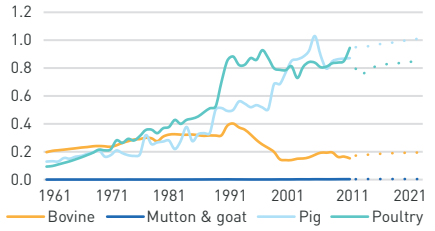
	Bovine	Mutton & goat	Pork	Poultry	Milk	Eggs
Production (thousand tonnes)	195	2	891	1,470	1,095	1,063
Consumption (thousand tonnes)	152	3	871	945	1,967	827
Consumption per capita (kg)	1.8	0	10.1	12.0	29.4	12.4

Meat production (million tonnes)



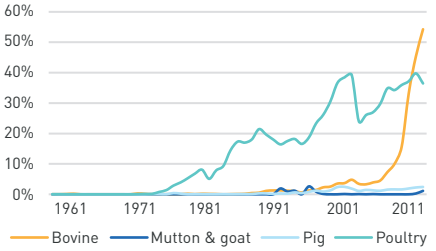
Sources: FAO, OECD

Meat domestic supply (million tonnes)



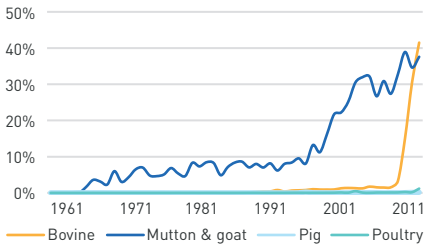
Sources: FAO, OECD

Meat exports as a share of production



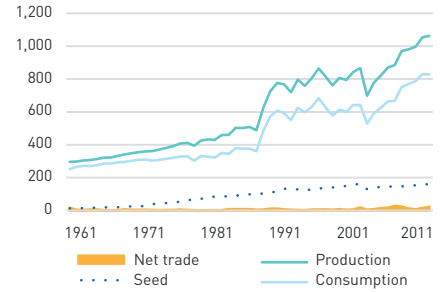
Sources: FAO, ARE calculations

Meat imports as a share of domestic supply



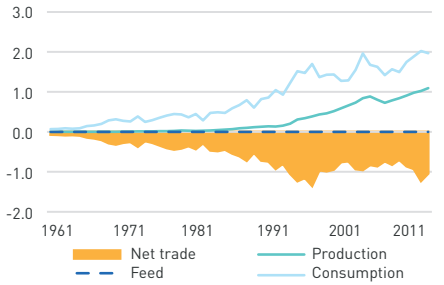
Sources: FAO, ARE calculations

Eggs balance (thousand tonnes)



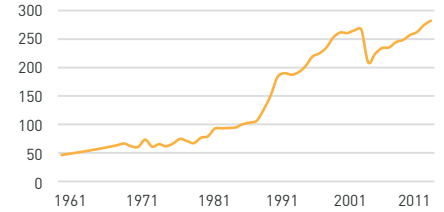
Source: FAO

Milk balance (million tonnes)



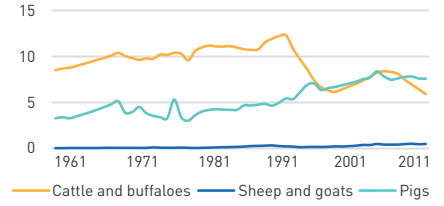
Source: FAO

Poultry flock (million heads)



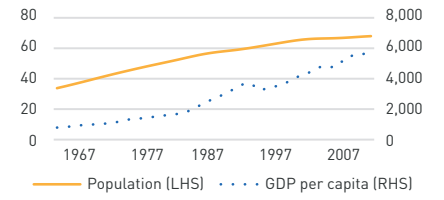
Source: FAO

Herds (million heads)



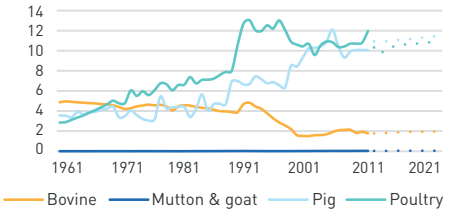
Source: FAO

Population (million) and GDP per capita (constant $ 2010)



Source: World Bank

Per capita consumption (kg)



Sources: FAO, OECD, ARE calculations

Leading producers

Name	Ticker	Livestock and poultry operations	Market cap ($ million)
Charoen Pokphand Foods PCL	CPF TB	Leading regional food conglomerate, manufacturing and marketing pork and poultry products	6,186
Thaifoods Group PCL	TFG TB	Manufacturer and marketer of poultry and pork products in Thailand and for export to Southeast Asia	1,000
GFPT	GFPT TB	Producer and distributor of frozen and processed chicken meat, including under Nichirei brands	614
Bangkok Ranch	BR TB	Duck breeder and meat producer	175

Leading processors

Name	Ticker	Activity	Market cap ($ million
Thai President Foods	TF TB	Produces instant noodles, including with poultry and pork meat	1,140

Leading downstream companies

Name	Ticker	Activity	Market cap ($ million)
CP ALL	CPALL TB	Retailer operating convenience store chains in Thailand and China	15,388
Big C Supercenter	BIGC TB	Thailand's second-largest hypermarket operator	4,869

Appendix 2: Definitions

Domestic supply is the balancing figure of production, net trade and change in stocks. Food refers to the total amount of the commodity available as human food. Our charts and figures on per capita consumption are based on the food quantity. The other charts and tables are based on the domestic supply of meat.

Per capita consumption is based on the Food and Agriculture Organization of the United Nations' (FAO's) figures for each commodity's availability for human consumption, divided by population and discounted by the following factors provided by OECD[39] to convert values to retail weight: 0.7 for beef and veal, 0.78 for pig meat and 0.88 for both sheep meat and poultry meat. (We assumed that FAO figures refer to what OECD defines as carcass weight because of the systematic discrepancy between per capita figures.) We used an average of these discount factors for other meats to calculate total meat consumption. Total meat values include other meats not part of the four main categories.

The aggregates of all countries' import share of consumption and export share of production are weighted averages calculated as the division of the aggregate total imports by total consumption and total exports by total production.

The U.S. Environmental Protection Agency (EPA) defines factory farms as agricultural enterprises where animals are kept and raised in confined situations. Factory farms congregate animals, feed, manure and urine, dead animals, and production operations on a small land area. Feed is brought to the animals rather than the animals grazing or otherwise seeking feed in pastures, fields, or on rangeland.

Appendix 3: Data

Meat production, 2013 (thousand tonnes)

	Bovine	Mutton & goat	Pork	Poultry	Total meat	Total 10y CAGR	1961–2013
China, mainland	6,730	4,081	52,733	18,265	83,462	3.2%	37.6x
India	2,577	747	354	2,358	6,215	2.5%	3.7x
Australia	2,318	697	361	1,098	4,534	1.5%	3.2x
Vietnam	379	8	3,218	633	4,265	5.6%	11.4x
Indonesia	586	114	743	1,872	3,318	4.2%	9.8x
Japan	508	0	1,309	1,459	3,285	0.8%	4.8x
Philippines	297	55	1,681	1,079	3,128	2.9%	9.4x
Pakistan	1,646	459	0	912	3,040	5.1%	8.3x
Thailand	195	2	891	1,470	2,558	0.8%	6.1x
South Korea	336	1	1,210	690	2,242	2.4%	21.1x
Malaysia	31	2	217	1,458	1,709	4.8%	16.7x
Taiwan	6	2	887	642	1,538	-0.3%	6.5x
New Zealand	627	482	47	170	1,355	-0.6%	1.8x
Hong Kong, SAR	8	0	124	28	167	-2.8%	1.9x
Singapore	-	-	-	0	0	-	-
All countries	**16,243**	**6,650**	**63,775**	**32,133**	**120,815**	**3.0%**	**13.2x**

Meat domestic supply, 2013 (thousand tonnes)

	Bovine	Mutton & Goat	Pork	Poultry	Total meat	Total 10y CAGR	1961–2013
China, mainland	7,089	4,337	53,268	18,285	84,615	3.4%	38.5x
Japan	1,189	19	2,670	2,506	6,399	1.0%	8.8x
Vietnam	682	13	3,209	1,133	5,063	7.4%	13.5x
India	1,017	725	354	2,352	4,627	0.4%	2.7x
Philippines	400	55	1,811	1,171	3,454	3.1%	10.0x
Indonesia	647	115	746	1,874	3,378	4.4%	10.0x
South Korea	716	7	1,614	788	3,134	2.4%	29.5x
Pakistan	1,606	448	0	912	2,989	4.9%	8.2x
Australia	790	248	564	1,077	2,731	1.1%	2.4x
Malaysia	194	28	226	1,477	1,925	4.6%	17.3x
Thailand	152	3	871	945	1,880	0.4%	4.5x
Taiwan	122	21	920	750	1,815	0.2%	7.7x
Hong Kong, SAR	195	17	500	449	1,184	3.4%	9.2x
New Zealand	101	86	100	158	458	-1.4%	1.7x
Singapore	11	11	92	189	303	0.8%	-
All countries	**14,910**	**6,133**	**66,946**	**34,064**	**123,953**	**3.1%**	**14.7x**

Meat per capita consumption, 2013 (kg)

	Bovine	Mutton & goat	Pork	Poultry	Total meat	Total 10y CAGR	1961–2013
Hong Kong, SAR	18.2	2.0	52.6	48.5	123.9	2.6%	4.0x
Australia	23.8	8.7	18.9	40.7	93.9	0.0%	1.1x
New Zealand	15.9	16.8	17.5	31.1	83.5	-0.5%	1.0x
Taiwan	3.6	0.8	30.7	28.3	63.5	-0.2%	3.7x
Singapore	2.0	2.0	17.0	35.0	56.0	-2.0%	-
China, mainland	3.6	2.8	30.5	11.8	49.7	2.8%	18.3x
South Korea	10.1	0.1	25.3	13.9	49.5	1.9%	15.4x
Malaysia	4.6	0.8	6.1	36.4	48.0	1.7%	4.6x
Vietnam	5.2	0.1	27.4	10.9	43.9	6.4%	5.0x
Japan	6.4	0.1	16.1	17.1	39.8	1.0%	6.6x
Philippines	2.9	0.5	14.5	10.6	28.5	1.6%	2.9x
Thailand	1.8	0.0	10.1	12.0	23.9	0.6%	2.1x
Pakistan	6.2	2.2	0.0	4.4	12.9	2.7%	2.1x
Indonesia	1.8	0.4	2.3	6.6	11.1	3.1%	3.8x
India	0.6	0.5	0.2	1.6	3.0	-0.6%	1.1x
Average	**7.7**	**1.6**	**16.9**	**12.4**	**39.2**	**2.1%**	**6.2x**

Eggs production, domestic supply (thousand tonnes) and per capita consumption (kg), 2013

	Production	CAGR 10y	1961–2003	Food supply	CAGR 10y	1961–2003	Per capita	CAGR 10	1961–2003
China, mainland	28,760	2.0%	19.2x	25,999	1.9%	19.3x	19.1	1.4%	9.3x
India	3,835	4.3%	22.6x	3,231	4.5%	22.4x	2.5	3.2%	8.0x
Japan	2,522	0.1%	2.8x	2,435	0.1%	2.9x	19.2	0.1%	2.1x
Indonesia	1,504	3.1%	26.9x	1,220	2.9%	29.6x	4.9	1.7%	10.6x
Thailand	1,063	4.3%	3.6x	827	4.6%	3.3x	12.3	4.2%	1.4x
Malaysia	699	4.7%	52.9x	492	4.6%	27.2x	16.7	3.0%	7.8x
Pakistan	661	5.5%	76.7x	537	5.1%	85.4x	3.0	3.2%	21.7x
South Korea	647	1.9%	16.4x	554	1.7%	15.2x	11.1	1.2%	7.9x
Philippines	469	2.9%	5.6x	395	2.8%	5.7x	4.1	1.3%	1.6x
Vietnam	378	6.7%	6.8x	352	6.9%	6.9x	3.9	6.0%	2.5x
Taiwan	368	-0.2%	17.1x	305	-0.1%	18.0x	13.1	-0.4%	8.4x
Australia	241	6.2%	1.7x	199	7.1%	1.6x	8.5	5.4%	0.7x
New Zealand	57	1.3%	1.3x	45	0.9%	1.1x	10.0	0.0%	0.6x
Singapore	28	1.4%	0.2x	101	4.2%	–	18.7	1.5%	–
Hong Kong, SAR	0	0.8%	0.2x	104	2.5%	4.4x	14.6	2.0%	2.0x

Milk production, domestic supply (thousand tonnes) and per capita consumption (kg), 2013

	Production	CAGR 10y	1961–2003	Food supply	CAGR 10	1961–2003	Per capita	CAGR 10y	1961–2003
India	135,600	4.1%	6.7x	105,807	4.1%	6.1x	82.7	2.8%	2.2x
China, mainland	40,193	3.9%	21.9x	45,252	5.6%	29.1x	33.2	5.1%	14.0x
Pakistan	39,017	3.1%	6.5x	33,356	3.2%	6.5x	184.1	1.3%	1.7x
New Zealand	19,469	2.6%	3.7x	618	4.9%	1.4x	138.5	4.0%	0.7x
Australia	9,522	-0.6%	1.5x	5,474	3.2%	2.1x	235.2	1.6%	1.0x
Japan	7,508	-1.0%	3.5x	9,162	-0.9%	3.9x	72.2	-0.9%	2.9x
South Korea	2,097	-0.7%	433.0x	1,431	2.0%	98.2x	28.7	1.5%	50.8x
Indonesia	1,388	5.0%	6.9x	3,704	5.3%	11.8x	14.7	4.1%	4.2x
Thailand	1,095	2.7%	547.5x	1,967	0.0%	28.4x	29.2	-0.3%	11.9x
Vietnam	487	10.3%	30.5x	1,500	6.8%	23.0x	16.4	5.8%	8.5x
Taiwan	377	0.9%	64.6x	973	1.4%	38.2x	41.7	1.1%	17.8x
Malaysia	83	6.2%	2.5x	751	-4.4%	3.0x	25.5	-5.9%	0.9x
Philippines	20	5.4%	1.0x	1,541	-0.3%	4.3x	15.8	-1.7%	1.2x
Hong Kong, SAR	0	-33.4%	0.0x	763	6.4%	9.5x	106.4	5.9%	4.3x

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Investor viewpoints

Jaideep Panwar, Manager of Sustainability & Governance at Dutch pension giant APG Asset Management Asia said:

"Today's research reminds investors to keep a close eye on the long-term risks of food assets in Asia. Antibiotic resistance is a serious global health risk with long-term potential economic consequences. The evolution of what are now early-stage domestic regulatory moves in Asia, supplier conditions introduced by international brands and import restrictions in response to the misuse of antibiotics in animal production can impact the productivity of Asian producers and their access to markets. Investors will assess the ability of companies in the meat supply chain to position themselves ahead of these risks."

Jeremy Coller, Founder of the FAIRR Initiative and CIO of Coller Capital, said:

"Simply put, a failure to reform the Asian meat and dairy industries in areas like food safety, could spell a nasty bout of financial food poisoning for global investors. Investors must step up to the plate.

"Investors have a big appetite for Asia's animal protein sector. But growth is driven by a boom in factory farming which tends to mean more emissions and more epidemics, abuse of antibiotics and abuse of labour. All risks to returns.

"It's exactly three years since McDonalds and KFC reeled from a $10.8bn loss of market cap due to the expired meat scandal in China. But lessons have not been learnt. Far-sighted investors are looking to alternative proteins for future growth, with the likes of Asian-owned Quorn growing 19% in the first half of 2017."

Lauren Compere, Director of Shareholder Engagement at FAIRR member Boston Common Asset Management said:

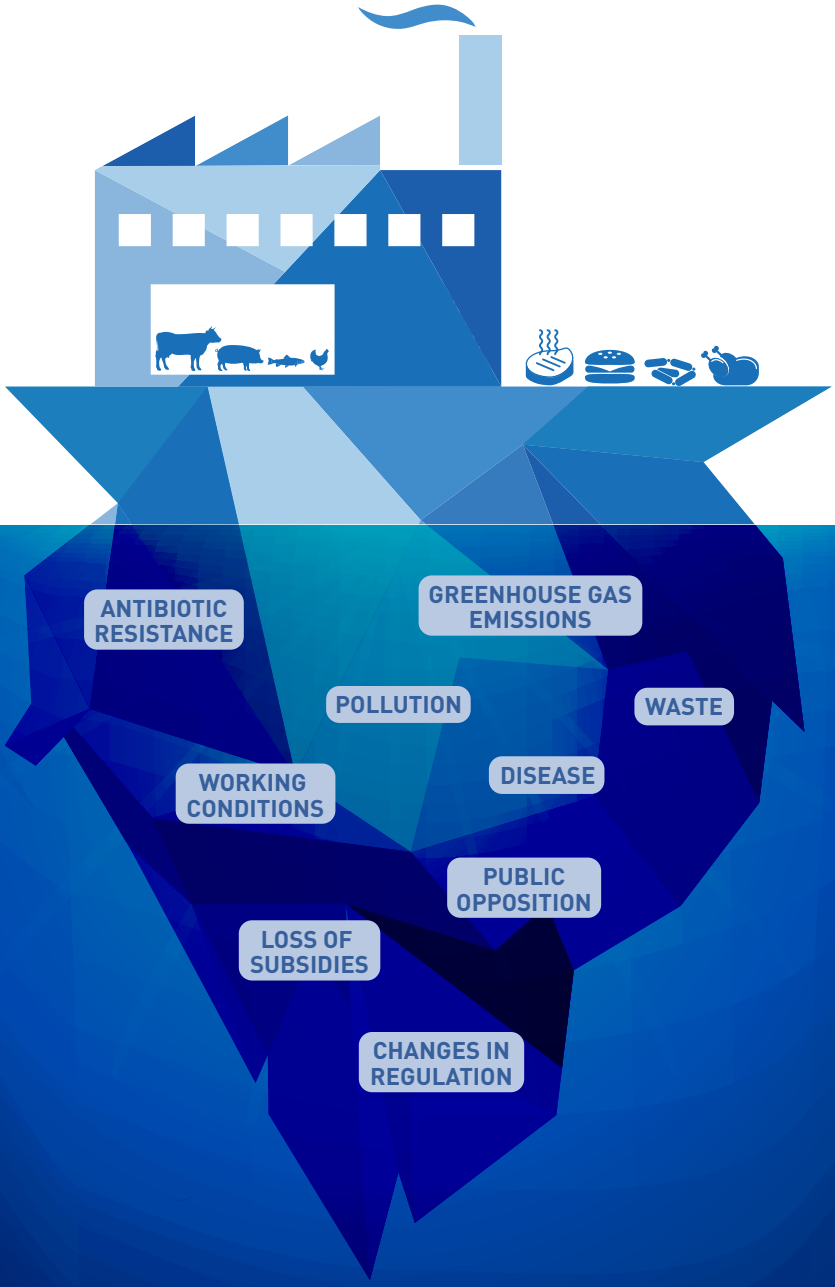
"As active investors in Asia, we see both the potential and the pitfalls of the animal protein sector in Asia. The 19% growth predictions and global supply chain make the sector seem an appetising prospect, but that is not the full story. Growth in Asia is driven by the rise of intensive factory farming and that has led to generally poor standards of food safety, animal welfare and environmental management. Given the global footprint of the Asian meat sector, that puts returns at risk for investors here in the US and across world markets."

Melissa Brown, a partner at Hong Kong-based Daobridge Capital said:

"Few issues are as politically-sensitive in Asia as food safety. And yet, far too many food sector equities have been priced as if ESG risks don't matter and that good risk management won't be recognised in the market. This report makes it clear that the ESG issues afflicting factory farming in Asia are material and growing. It's time for long-term investors to get on the right side of this trade."

Stuart Palmer, Head of Ethics Research at Australian Ethical Investment, said:

"Population growth, urbanisation and rising incomes in Asia have resulted in a mass shift from traditional farming to industrial farming. But the model is broken. From antibiotics to animal feed, the inputs that Asian factory farms rely on to do business are proving catastrophic for public health and the environment. Global investors are exposed to these risks in myriad ways and in multiple sectors through investments operating in and outside of Asia. It is crucial that investors understand the rapidly evolving Asian food landscape in order to safeguard the value of their investment portfolios and to support development of sustainable food production and consumption models."



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