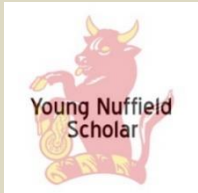




**A Nuffield Farming Scholarships Trust
Report**

Award sponsored by

**The Food Chain Scholarship and The
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The Food Chain Scholarship

**British Dairy Exports:
the opportunities and challenges**

Richard Walker

October 2021

NUFFIELD UK

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Tel: 01460 234012
Email: director@nuffieldscholar.org
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A Nuffield (UK) Farming Scholarships Trust Report



*"Leading positive change in agriculture.
Inspiring passion and potential in people."*

Date of report: October 2021

Title	British Dairy Exports: the opportunities and challenges
Scholar	Richard Walker
Sponsor	The Food Chain Scholarship and The Young Nuffield (Bob Matson) Award
Objectives of Study Tour	To investigate the British Dairy Industry's standing in the global dairy market. To identify opportunities for integration of British dairy products and ingredients with developing world markets in order to deliver greater prosperity to the whole UK dairy supply chain and the rural communities it underpins.
Countries Visited	Vietnam, Indonesia, China, Japan, United Arab Emirates, USA, New Zealand.
Messages	<ul style="list-style-type: none">• Yes, there definitely is potential to integrate British dairy products and ingredients with developing markets but significant challenges exist.• A growing dairy deficit in some key Asian markets presents a significant opportunity for UK dairying.• Dairy <u>processing and marketing infrastructure</u> in the UK is not currently geared to serve these markets.• International market knowhow and industry expertise is required <u>before</u> investing in concrete and stainless steel.• Pitching processing investment at the optimum point in the dairy value chain is key.• Seeking out 'win-win' joint venture partners with existing marketing and distribution networks in key markets is paramount.• Renew the focus on production of milk solids as opposed to simply litres of milk.

Executive Summary

Total domestic milk production in the UK is strong, reaching a thirty-year high of around 15 billion litres in 2020. Continued technological and genetic advances at farm level, coupled with a near ideal climate for grass growth, mean further increases in milk output are achievable and most probable.

The UK dairy market is dominated by high volume but relatively low value liquid milk serving the domestic retail sector. As a result, British dairy products currently have very little exposure to developing export markets. Furthermore, consolidation of UK milk processing capacity in recent years has been in an effort to streamline individual business efficiency by stripping overheads and concentrating processing on a smaller number of sites made to work longer and harder – a result of intense competition for domestic retail market share, particularly in the liquid milk sector.

Although dairy consumption per capita across Western Europe continues to decline slightly year on year, from a global perspective there is cause for cautious optimism. A recent report from the International Farm Comparison Network (IFCN) shows the massive potential for export-led growth in the UK dairy sector. It predicts an increase of 1.2 billion consumers globally by 2030, plus an uplift in dairy consumption per capita from 116ME (milk equivalent of dairy products) to 135ME. This will require an additional 295 billion litres of milk annually, giving the UK's dairy industry a potentially fantastic opportunity to flourish within such an optimistic global demand outlook.

This Nuffield Farming study explores opportunities to integrate British dairy products and ingredients with developing export markets, particularly in Asia, through grasping the food cultures and socio-economic drivers which are resulting in double-digit growth in dairy consumption in many key regions. While consumption of dairy products experiences exponential growth in these regions, their domestic milk production at farm level is often unable to balance regional demand.

The many complexities surrounding international trade and successful penetration - while operating in the high value consumer-facing branded market – encountered by some of the world's most dominant dairy companies and co-operatives became evident. The pursuit of Asia's gen-Z, ultra-fast-paced food trends, and subsequent need for constant product innovation in order to remain relevant, inevitably leads to massive added cost for dairy processors. But does this necessarily result in overall added value of milk throughout the whole supply chain? *"Today's value-add is often tomorrow's commodity!"*

Globally traded dairy commodities, technical dairy ingredients and consumer-facing branded products are all potential channels for UK milk. Which routes to international market could consistently deliver greater value to the whole UK dairy industry? At farm level we are technically well placed to compete on a global stage, and a rapid surge in dairy demand leading to a growing dairy deficit in some key Asian markets presents a significant opportunity. However, export-gearred investment in stainless steel processing capacity is required in the UK to gain market exposure globally. Furthermore, industry skillsets and international market know-how is required before concrete and stainless steel, as there are significant challenges and complexities surrounding international dairy trade. Having an element of export-focussed dairy growth in the UK would drive competition for farmgate milk, put greater value in the bottom end of our market and optimise the whole seasonal profile of UK milk production.

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Please note that the content of this report is up to date and believed to be correct as at the date shown on the front cover

CONTACT DETAILS

Richard Walker
Dumfriesshire, Scotland, UK.

Email: richard@lakeheadfarming.co.uk

Twitter: @lakeheadfarming

Nuffield Farming Scholars are available to speak at Industry Events, NFU Branches, Agricultural Discussion Groups and similar organisations.

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email : director@nuffieldscholar.org
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Chapter 1 - Introduction



Figure 1: The author, Richard Walker.
Source: NFST

Having grown up on our family dairy farm in southwest Scotland and been actively involved in the business since a young age, it was always my aspiration to return home and farm. However, like many farmers' sons of my generation it was seen as a good move to broaden horizons and to leave home for a time and study outwith the agricultural arena. This gave me the opportunity to use my studies, rugby and bagpiping to travel globally and experience other cultures, allowing me to view the world under a more unconventional light.

After completing my A-levels and, four years later, graduating from The University of Edinburgh with a first in Structural Engineering, I spent some time in New Zealand working on a grass-based, Kiwi-style dairy unit in Canterbury during their busy calving and breeding season. It coincided nicely with the

2011 NZ Rugby World Cup allowing me to combine two of my passions – dairy farming and rugby.

New Zealand's dairy industry at that time was at the peak of its boom years with extraordinary infrastructure development underway at both farm and milk processing levels. The export-led growth of the dairy sector was largely riding on the wave of China's seemingly insatiable demand for dairy protein. Mid Canterbury, where I worked, was at the heart of this with dairy conversions of more marginal land ten to the penny, and numerous large processing plants being developed to soak up the increase in milk output. There was huge industry confidence, an excitement and, on the face of it, a bottomless overseas market to satisfy.

Now, in 2020, having spent the last few days visiting many Kiwi dairy farmers and processors, it's clear that dairy industry sentiment here is somewhat more subdued than I experienced a decade ago – the lessons and learnings of NZ's dairy growth journey being one aspect this Nuffield Farming Scholarship will explore further.



Chapter 2 – Background to my study

In 2018 the International Farm Comparison Network (IFCN) published a long-term dairy outlook report (<https://ifcndairy.org/>) predicting that, by 2030, a global increase of 1.2 billion consumers and an uplift in dairy consumption per capita from 116ME (milk equivalent of dairy products) to 135ME will require an additional 304 million tonnes (295 billion litres) of milk to be produced per year. Global output in 2018 stood at around 864 million tonnes (Source: IFCN).

Figures released by HMRC show that the UK dairy trade balance – exports minus imports – was positive, in volume terms, at 95,000 tonnes during 2019. “It is the first overall UK trade volume surplus since records started in 1997”, said AHDB Dairy analyst Katherine Jack.

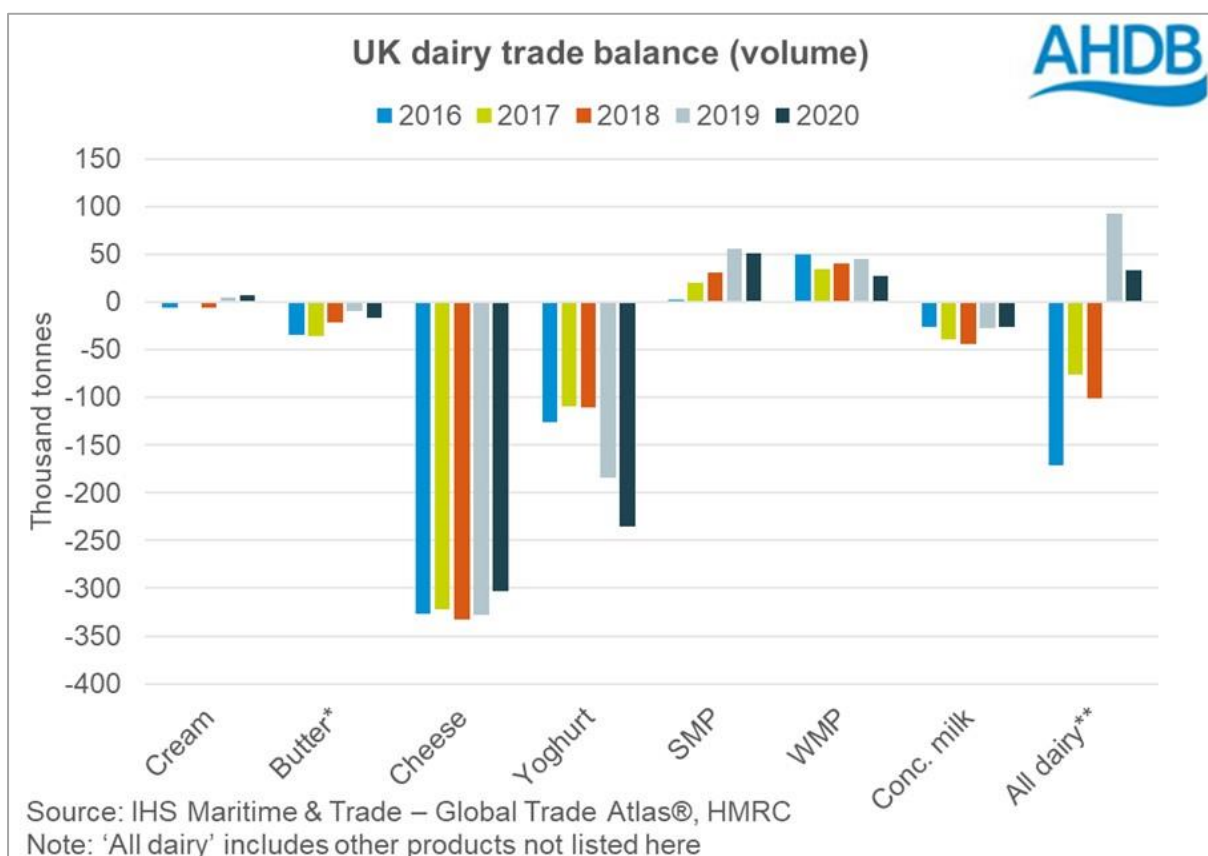


Figure 2: UK dairy trade balance (volume) 2016-2020. Source: AHDB

The UK's national milk output was approaching a record high at almost 15bn litres while, conversely, many of the UK's major milk processors were consolidating the country's milk processing capacity. This consolidation action was in an effort to streamline individual business efficiency by stripping overheads and concentrating processing to a smaller number of sites made to work longer and harder – a result of intense competition for domestic retail market share, particularly in the liquid milk sector.

In a global context dairy farming in the UK is, in general, well advanced and relatively efficient in producing milk. Continual technical and genetic advances at farm level, a near-ideal climate for grass



growth combined with relative political stability, mean the UK's ability to further increase national milk output is realistic and probable.

Our domestic retail and foodservice sectors will always remain fundamental markets for the British dairy industry. However, with domestic (in fact European) dairy consumption in slight annual decline, and our ability to increase milk production strong – **our industry will require increased processing, marketing and trading infrastructure in order to gear itself towards sustained export-led growth.**

Strong growth in global demand for dairy products in the next decade certainly provides cause for optimism. In theory this positive macro-economic outlook presents a major opportunity for British dairy farmers and processors. However, actually capturing and capitalising on these opportunities is far more complex – something this Nuffield Farming study has investigated.



Chapter 3 – My Nuffield journey

My Nuffield Farming study tour covered the countries indicated in the diagram below:



Figure 3: Diagram depicting countries visited by the author on his study tour. *Graphic: author's own composition*

- China – Beijing, Tianjin, Harbin – October 2019.
- Japan – Tokyo, Yokahama, Hokkaido – November 2019.
- Vietnam – Ho Chi Minh City, DaLat – January 2020.
- Indonesia – Jakarta, Bogor, Malang East Java – January 2020.
- United Arab Emirates – Dubai – February 2020.
- New Zealand – Auckland, Waikato, Taranaki, Wellington, Canterbury – March 2020.

Editor's Note: A UK Nuffield Farming Scholarship consists of:

1. A briefing in London.
2. Joining the week-long Contemporary Scholars' Conference attended by all new Nuffield Farming Scholars worldwide, location varying each year.
3. A personal study tour of approximately 8 weeks looking in detail at the Scholar's chosen topic.
4. A Global Focus Tour (optional) where a group of up to 10 Scholars from a mix of the countries where the scheme operates travel together for 6-7 weeks acquiring a global perspective of agriculture.

The Nuffield Farming Scholarships scheme originated in the UK in 1947 but has since expanded to operate in Australia, New Zealand, Canada, Zimbabwe, France, Ireland, and Netherlands. Brazil, Chile, South Africa and the USA are in the initial stages of joining the organisation.



Chapter 4 – British dairying within a global market context

4.1 – A global perspective

The relatively consistent growth in supply and demand of around 2.3% pa observed over the last decade is expected to be maintained heading towards 2030. The resulting demand-led growth will mean 304 million tonnes more milk will be consumed in the next decade. The predominant demand drivers will be a 16% global population uplift to around 8.7 billion, coupled with an increasingly affluent and health-conscious middle class in developing regions. Such regions include China and Southeast Asia where a wealthier population and an increased focus on health and wellbeing after the Covid-19 pandemic is stoking demand for better nutrition.

However, a positive macro-economic outlook on a global perspective can always be affected short term by the market dynamics of supply and demand.

4.2 – The global supply and demand balance

The cyclical nature of global dairy markets is the natural response to supply and demand constantly neutralising – a fundamental which is the single biggest factor in determining farmgate milk price. The constant balancing - resulting in fluctuating prices - is both normal and essential to provide the necessary price signals to ensure efficient market dynamics.

As a dairy industry, the problem often encountered during price cycles is milk supply inelasticity. The length of the milk production cycle is months or even years, meaning it is near impossible to turn the taps on and off as market signals evolve in a shorter time frame. Farm infrastructure development programmes; calving patterns; genetic progress and variations in weather and climate; all result in a time lag between when a dairy farmer reads market signals to increase or decrease production, and the effect of his or her consequent actions impacting the market place.

Traditionally farmers used mixed-enterprise farming to mitigate against price fluctuations by spreading their risk profile across a range of commodities - living and dying by the old adage “up horn, down corn.”

However, increasingly farmers are developing larger agribusinesses, geared to specialise in the technically efficient production of one specialist commodity. High levels of on-farm capital investment and strong technical management acumen are required for the efficient production of one product: in this case milk. Having the agility to ride these international market fluctuations, both at individual farm level and as a British dairy industry, is becoming ever more critical.

4.3 – Farmgate and world milk prices

In East Java, Indonesia, I had a fascinating visit to one of Nestle’s local milk collection centres - “Koperasi Margo Mulyo”. It was a hive of activity from 6.30 am onwards as dozens of local smallholder farmers arrived to deliver a churn or two of milk.



These farmers were being paid more per litre of milk than the top prices being paid in the UK. And they were by no means living or investing extravagantly – they needed this price to sustain their basic farming model.



Figure 4 : Visiting dairy farmers at Koperasi Margo Mulyo, Est Java, Indonesia.
Source: author's own

The IFCN estimates the long term world milk price to be 41USD/100kg milk (33.5 GBP/100kg or 33.5ppl). The UK average farmgate milk price has been, and continues to be, significantly less than this. This Nuffield Farming study goes on to investigate some reasoning of why.

4.4 – UK Dairy Market

4.4.1 – UK milk production

British dairy farmers are reaching new levels of efficiency and output resulting in a thirty year high in milk production. Furthermore, it is predicted that this production trend is likely to continue for the next decade.

See chart overleaf

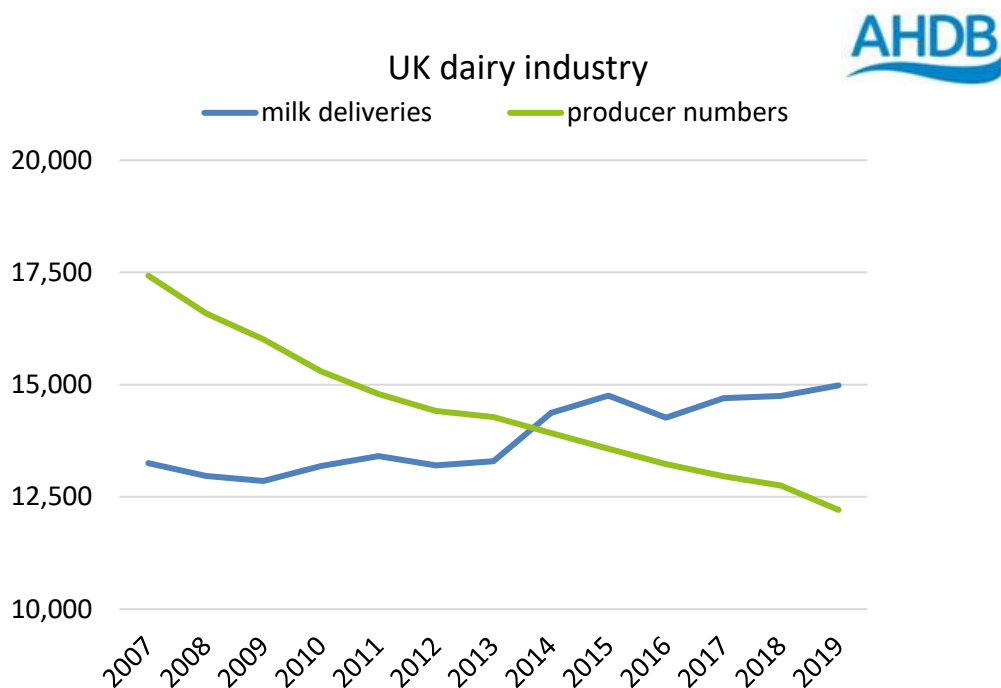


Figure 5: UK milk production trends: Source AHDB

As a result of the natural grass growth cycle in the UK, we also have a seasonal milk supply effect to consider, with production peaking in April and May. Balancing this peak continues to provide a significant challenge to most of the country's milk processors. A large chunk of milk produced in these months is devalued through lack of competition for it. This is due to underinvestment in processing capacity for longer life product solutions. Thus, value is immediately stripped out of the whole supply chain for both producers and processors.

4.4.2 – UK milk utilisation

The UK dairy sector has historically had a domestic liquid supply focus at its core. This has resulted in the market being dominated by high volume, but relatively low value, liquid milk – to fulfil the standardised liquid milk requirements of the UK's highly competitive retail sector.

The historic legacy of this liquid dominance is that, over the last two decades, many British farmers have geared their breeding policies, feeding and housing strategies towards a high output Holstein cow and taken their eye off the milk solids ball. However, as more milk processors attach a higher premium to milk protein and butterfat, the last few years have seen a slight shift in focus towards milk solids at farm level, with still some way to go for many.

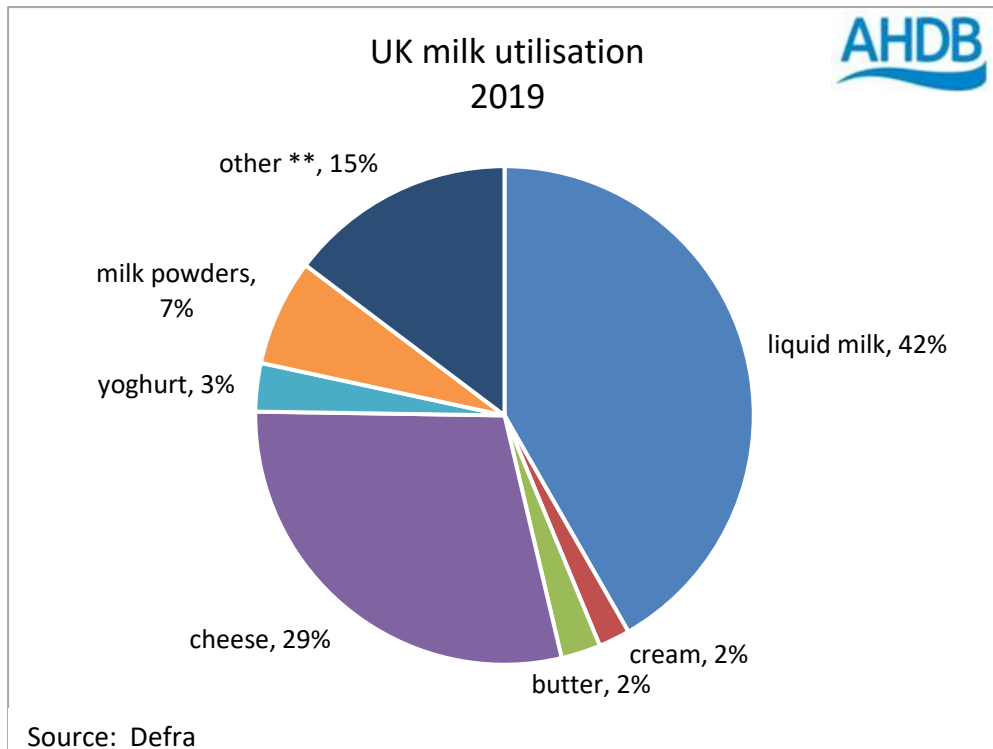


Figure 6: Utilisation of milk in the UK. Source: AHDB

4.4.3 – UK exports by product group

Although the UK domestic market will always be key to British agriculture, British dairy exports are growing year on year – albeit from an extremely low base.

But much of our export base is offloading of fresh milk and cream especially at peak seasonal supply in order to empty silos on farms and at processing sites.

See chart overleaf

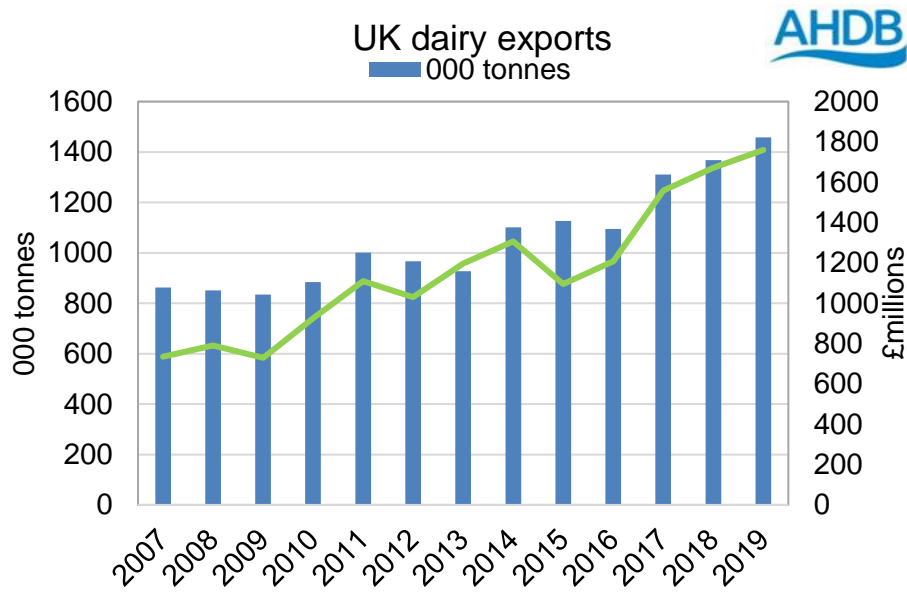


Figure 7: Dairy Export volumes. Source: AHDB

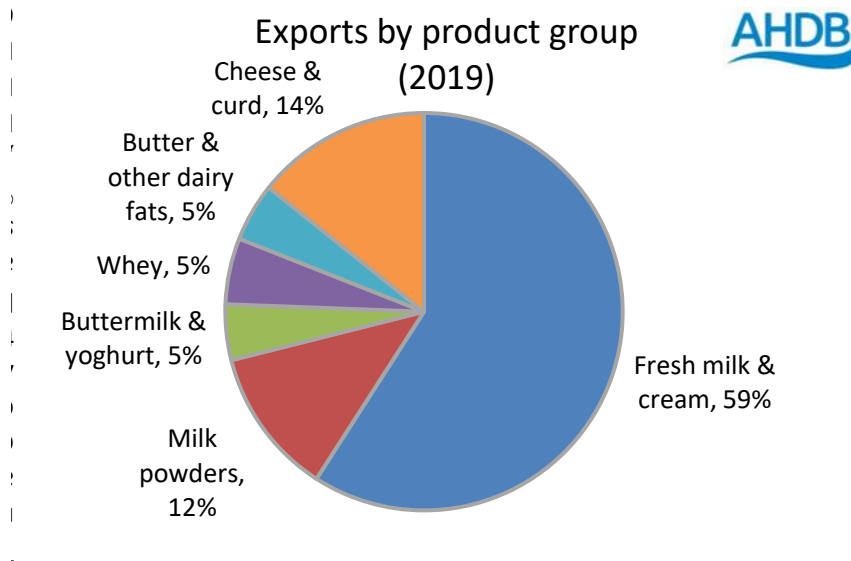


Figure 8: UK Dairy Exports by product. Source: IHS Maritime & Trade-Global

4.6 – Scottish dairy supply, demand and processing capacity

Total milk collections from Scotland’s dairy farms in the year 2020/21 surpassed 1.5bn litres for the second consecutive year. This represents an uplift in total output in excess of 18% when compared to the year 2010/11 when milk collections stood at 1.3bn litres (source: AHDB Dairy).



Conversely, the Scottish dairy industry has recently undergone some significant structural changes resulting in a reduction in ability to process milk across the country.

Several milk processing sites in Scotland have been decommissioned in recent years in an effort to streamline and find operational efficiencies and remain competitive in a tough domestic retail environment. Ultimately, this has led to a growing number of Scottish dairy farmers being served supply contract termination notices with few or no other options of milk buyer. Many more are facing significant haulage charges to have their milk transported to serve markets south of the border – often uneconomical, and severely eroding profit margins at farm level.

Of the 1.5bn litres produced on Scotland’s dairy farms in 2020/21, only 84% was processed in Scotland, with the remaining 16% being transported into England or Ireland for processing. The overall surplus of milk in Scotland for 2020/21 is estimated to be around 240 million litres, or the equivalent of 8000 artic lorry loads of milk per year (22 artic loads per day) being hauled over the border.

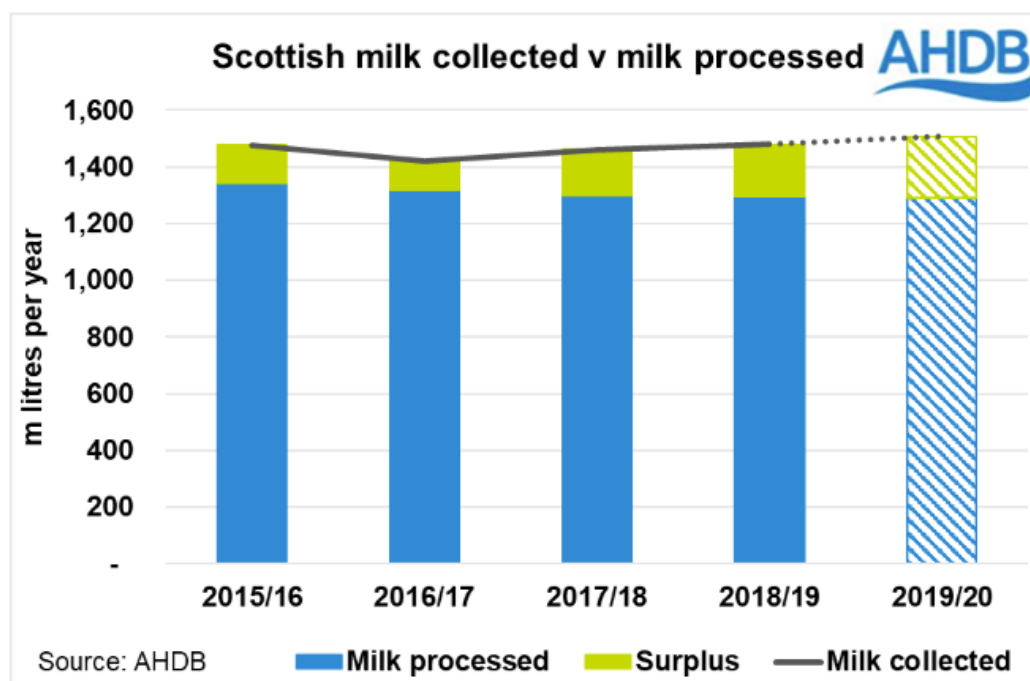


Figure 9: The growing Scottish milk surplus: Source: AHDB

A fine balance exists between the economies of scale achieved through fewer, but larger and more efficient processing sites, and the subsequent increase in haulage costs. Looking ahead, the key to Scotland’s dairy supply chain profitability will be getting this balance right.

See overleaf for Chapter 4 Summary



4.7 – Chapter 4 summary

- A consistent global growth in both dairy supply and demand is expected to continue towards 2030.
- The cyclical nature of dairy markets, when viewed in a narrow time frame, will continue to result in market volatility. Riding this volatility, both as individual farmers and as a British dairy industry, is becoming ever more critical.
- At farm level the UK dairy sector is in general well placed to compete globally.
- However, the UK market has historically had a domestic liquid milk focus at its core with lack of processing investment in longer life dairy product solutions.
- Going forward, Scotland's dairy value chain growth will hinge on the fine balance between fewer but larger processing sites and the subsequent increase in haulage costs.



Chapter 5 – Developing markets, socioeconomic variances and food cultures

5.1 – Variations in per capita dairy consumption globally

While consumption of dairy products in Europe and North America outstrips that in all other areas of the world, there continues to be a huge unlocking of consumption in many key developing regions. I spent two weeks of my Nuffield Farming travels in October 2019 exploring consumer insights and consumption drivers in the rapidly advancing Chinese market.

When arriving in China I met with around eighty of the world's leading dairy farmers and industry analysts at the Global Dairy Farmers Congress in Beijing.



Figure 10: Delegates at the Global Dairy Farmers Congress, Beijing, China. October 2019.
Source: Global Dairy Farmers

Professor Sandy Chen, lead global dairy analyst at Rabobank, explained that the phenomenal growth in Chinese dairy consumption experienced in the last decade is likely to slow down to around 2.5% over the next five years. Still significant growth; however, a big shift from volume to value growth.

China is going through a premiumisation process with dairy products – a gradual move away from just fluid milk and standardised milk powders towards higher value branded products and convenience food solutions (see Figure 11).

Ten years ago, China was a dumping ground for the world's surplus standardised milk powders. Although demand for powder as a food manufacturing ingredient will remain strong going forward, demand for higher value technical dairy foodservice ingredients and convenience food solutions means the Chinese market is fast sliding up the value chain.

The rapid expansion of quick-service restaurants and the insatiable advance in e-commerce in Tier 1 and 2 Chinese cities (such as Beijing, Harbin and Tianjin that I visited) are two key dairy consumption drivers. The resulting protein gap creates huge opportunity for the growing international trade of quality dairy ingredients and globally-traded processing cheeses



Figure 11: Premiumisation driving revenue growth in the Chinese dairy sector. Source: Prof. Sandy Chen, Rabobank

Looking at the example of global cheese consumption in isolation, Eucolait data (below) shows that in 2017 total Chinese cheese consumption was 0.3kg/capita. This contrasts with over 12kg/capita in the USA and almost 18kg/capita in the EU. So, with a multiplier effect of 1.4 billion Chinese population, the scope for growth in market demand is phenomenal.

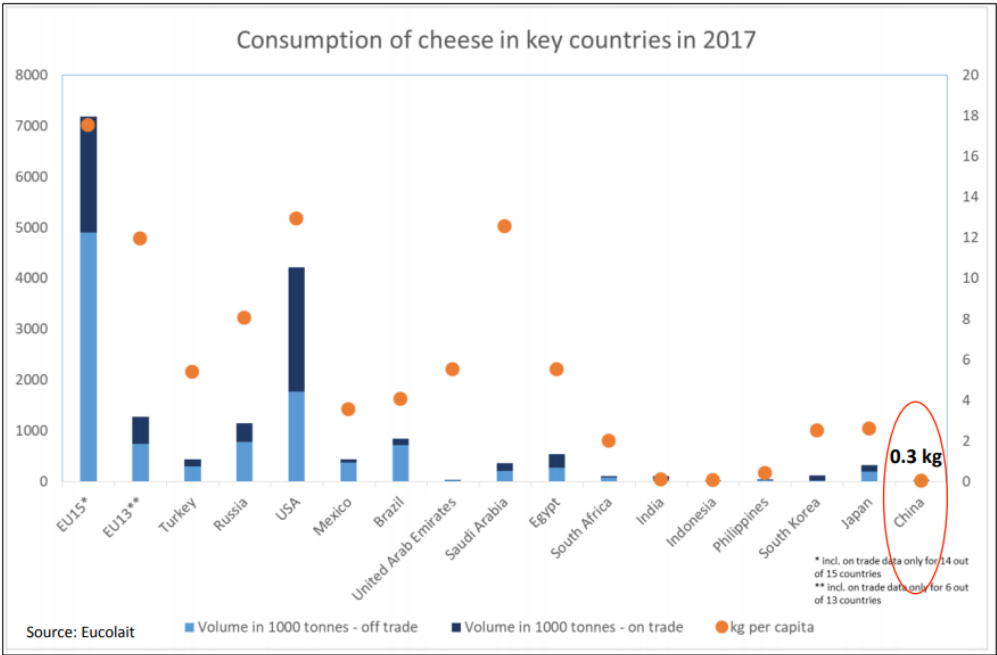


Figure 12: Global variations in cheese consumption 2017. Source: Eucolait



5.2 – Health, wealth and happiness: consumption drivers

Christina Zhu, who headed up Fonterra’s China business, explained their growth story and shared some fascinating consumer insights in China. However, she was also honest in sharing the tough public lessons and learnings Fonterra has recently encountered in pursuing their Integrated China business strategy.



Figure 13: Christina Zhu, head of Fonterra Greater China, presenting at the GDF Congress in Beijing, October 2019. Source: author’s own

Chinese consumers are evolving rapidly, and getting as close to them as possible is key, she explained. China is seeing a gradual transition away from manufacturing, investment and export, towards more domestic-consumption economic drivers. Continual urbanisation and a nuanced trade-up in tastes, preferences and lifestyles typically characterise the evolution of Chinese dairy demand. Nowadays it’s all about premiumisation; buy for social; and digital food. Young Chinese consumers are the rich end of society, unlike the position in most other economically advanced regions.

Previous generations in China have been about value for money, now it’s about “*my pleasure and I want it now.*” Gen-Z don’t eat or drink the product first – they photograph it and post it on WeChat or Instagram. Young consumers are very experimental, so constant and relentless product innovation is non-negotiable. It’s all about creating perceived value – as Christina explained: “*value is in the eye of the beholder*”.

It’s all going digital, and fast. China already has the world’s largest eCommerce market, dominated by a handful of digital oligarchs, such as Tmall and Alibaba. And it’s so competitive that if you’ve got an online business in China and can’t deliver within 30 minutes then you’re out of the game!

“*They want health and indulgence both together.*” Demand for carbonated drinks is shrinking at 3% p.a. but for functional drinks (milk, soya etc) it’s growing at 8%.



Figure 14: (Refers to the above 4 photos). Sale of functional dairy drinks commonplace in central Beijing.
Source: author's own

This became clear when I took an afternoon out of the dairy world to visit some of Beijing's tourist icons such as Tiananmen Square, The Forbidden City and The Great Wall of China. It was staggering how many dairy-based functional drinks (flavoured drinking yogurts and UHT milks) were being sold



by street vendors and small retail units, many of whom sold no other food or beverages. This far outweighed sales of sweetened, carbonated cans, commonplace in Western Europe and America.

5.3 - Grasping food cultures

Much of my time spent during my Nuffield Farming travels centred around grasping local food cultures with one eye on where dairy slotted in. This involved everything from fine European cheeses in Dubai's high-end retail malls to the butchering of pigs' heads and cockroach kebabs in Saigon's wet markets. And from a traditional Inner Mongolian feast in northern China to a bowl of ox-tail soup (with bone, skin and hair) in Indonesia.



Figure 15: Inner Mongolian meal at GDF Congress in Harbin, China.
Source: author's own



Figure 16: Butchering of pigs' trotters in a Ho Chi Minh wet market.
Source: author's own

In January 2020 I spent a week in Ho Chi Minh City exploring the rapid advance of urbanisation in Vietnam's post-war society and subsequent development in consumption trends. Food culture is becoming ever more diverse, defined by each individual's financial situation. I spent a couple of fascinating hours walking around one of Saigon's wet markets, observing local people going about their everyday business.

Within two minutes of leaving the basic daily grocery trading in the wet market, I walked into a new development of high-end cafes, restaurants and retail outlets.

Sitting at the table adjacent to me, I watched two GenZ Vietnamese guys order hot milky coffee drinks - rich in dairy and topped with cream. But before even tasting them, they spent considerable time positioning and photographing their dairy-laden drinks to upload onto social media.



This to me was an impromptu piece of cultural symbolism. This generation in Vietnam aspire to such indulgence as hot, milk-rich coffee drinks and feel the need to immediately post it online. And as south east Asia's younger generations ever increasingly live their lives, and are influenced by, social media channels, the multiplier effect on dairy consumption alone is staggering and presents real opportunity as the dairy void in this region grows.



Figure 17: Vietnamese GenZ young men sharing milky drinks on social media in a central Ho Chi Minh coffee retailer. Source: author's own

After flying from Saigon to DaLat in the central highlands of Vietnam, I met with Truong Phuoc Tien (Tin Tin), an 'Easy Rider' motorbike tourer. We jumped on our Honda bikes and took off for two days of touring the central highlands' lakes and mountains to experience real Vietnamese rural life.

See photo overleaf



Figure 18: Motorbike tour of Vietnam's central highlands, lakes and rural life:
Source: author's own



Figure 19: Street vendor cooking traditional rice bread on open coals at DaLat's TET street festival.
Source: author's own

As I explored the street vendors' food stalls, one image sticks. A street vendor with an open hot coal grill served up a traditional Vietnamese rice bread, bursting with fresh greens and spices. But, delicately placed on top, was a triangle of Laughing Cow cheese.



Tintin told me he had only started seeing these kind of cheese triangles recently in Vietnam, and they are considered by Vietnamese people to be a premium food. This one image symbolises where and how dairy products are slowly creeping into the traditional southeast Asian diet. The growth in dairy demand this will stoke in subsequent years, when demand is multiplied up, is vast.



Figure 20: Triangles of processed cheese are a recent addition to traditional Vietnamese street food.
Source: author's own

5.4 – Product innovation – a non negotiable

Those dairy companies operating in the fast-paced consumer-facing marketplace are in a relentless cycle of constant product innovation in order to remain relevant in a highly competitive retail environment.

While in Beijing, I met with Fonterra's Director of New Product Development, Desheng Xu, and their Global Connections Director, Amy Shi, at their central Beijing offices. Our discussions centred around:

- Growing food trends - how to identify them?
- Number of new product innovations
- Speeding up innovation
- Measuring product success
- Collaboration with other business partners
- Connecting directly with the consumer



Figure 21: Life size cow at the entrance to Fonterra's offices in central Beijing.
Source: author's own

In the liquid milk segment, the Chinese market ten years ago was dominated by UHT milk - due to shipping limitations and poor local cool-chain distribution networks. However, the trend is now towards fresh milk with total sales in Tier 1 and 2 cities growing by around 15% pa. The focus is now on understanding the fresh milk market sub-segments. This is where the value lies in liquid milk, Desheng told me.

Creating perceived value is at the heart of all product innovation. The 'Hema' brand milk project, has created that value perception through the image of "daily freshness."

Fonterra's premium "Hema Fresh" daily milk concept has a number representing each daily delivery of milk printed on the bottle: simple but effective marketing which persuades customers to buy a fresh bottle every day. Retailing at 8.0 RMB per litre, compared to 3.6RMB per litre for standard raw milk, sales of Hema fresh have tripled in the last year and it's now the largest E-commerce milk seller on Alibaba.

Fonterra's NPD team in China have worked on no less than 635 premiumisation product developments in the last year.



Figure 22: Hema Fresh premium milk, available on Alibaba, has each day printed on the bottle to show daily freshness. Source: Dairy Reporter.com

The rate of new product development is unprecedented. McDonalds' soft-serve purple potato-flavour ice cream was launched in 30 days. Kids' lollipop snacking cheese was about to go live at the time I visited; and cheese-flavoured yogurt drinks were in development. The pace of food innovation must keep up with Chinese consumers – they have no brand loyalty and change extremely quickly, I learned.

Food innovation in China is on a par with the fast-paced fashion industries of the US and Europe. Take Tea Macchiatos – they're a cold, flavoured tea with a topping of cream cheese. It's astounding that this is from a nation which, 15 years ago, wouldn't even put a drop of milk in their green tea. With such a rapid rate of product development, I was intrigued as to how to put a measure on the number of product successes and failures. However, I was told – *"nothing is a failure, everything is a learning opportunity!"*



Figure 23: Fonterra's recent Tea Macchiato innovations using their Anchor foodservice range. Source: Fonterra



5.5 – Consumption uplift potential in developing regions

Ho Chi Minh City (formerly Saigon) is really only one full generation post war, and the desire of the Vietnamese population to succeed and prosper is still evident today, which is leading to a surge in economic activity. The centre of Ho Chi Minh is a patchwork of major building projects of new hotels, shopping malls and apartments, interspersed with traditional small retailers and street vendors.

5.5.1 – Jardine Matheson

During my time in Ho Chi Minh City, I met with Alain Cany who is country chairman of the Jardine Matheson group in Vietnam. Jardine Matheson is a Hong Kong-headquartered multinational conglomerate, founded in 1832 and still majority-controlled by the Scottish Keswick family. The group have a diverse portfolio of business interests across the Asia Pacific region including finance, real estate, automobile manufacture, construction and retail – worth some \$66bn and employing 403,000 people globally.

Alain explained to me the reasoning behind Jardine’s growth in Southeast Asia and why Vietnam has become a strategic market from which the group can further grow their presence in the region. The socioeconomic growth presents real opportunity in the consumer-driven marketplace. A growing, health-conscious middle class find themselves with surplus income and a growing social media influence while many major cities across SE Asia gear themselves towards global trade and tourism.

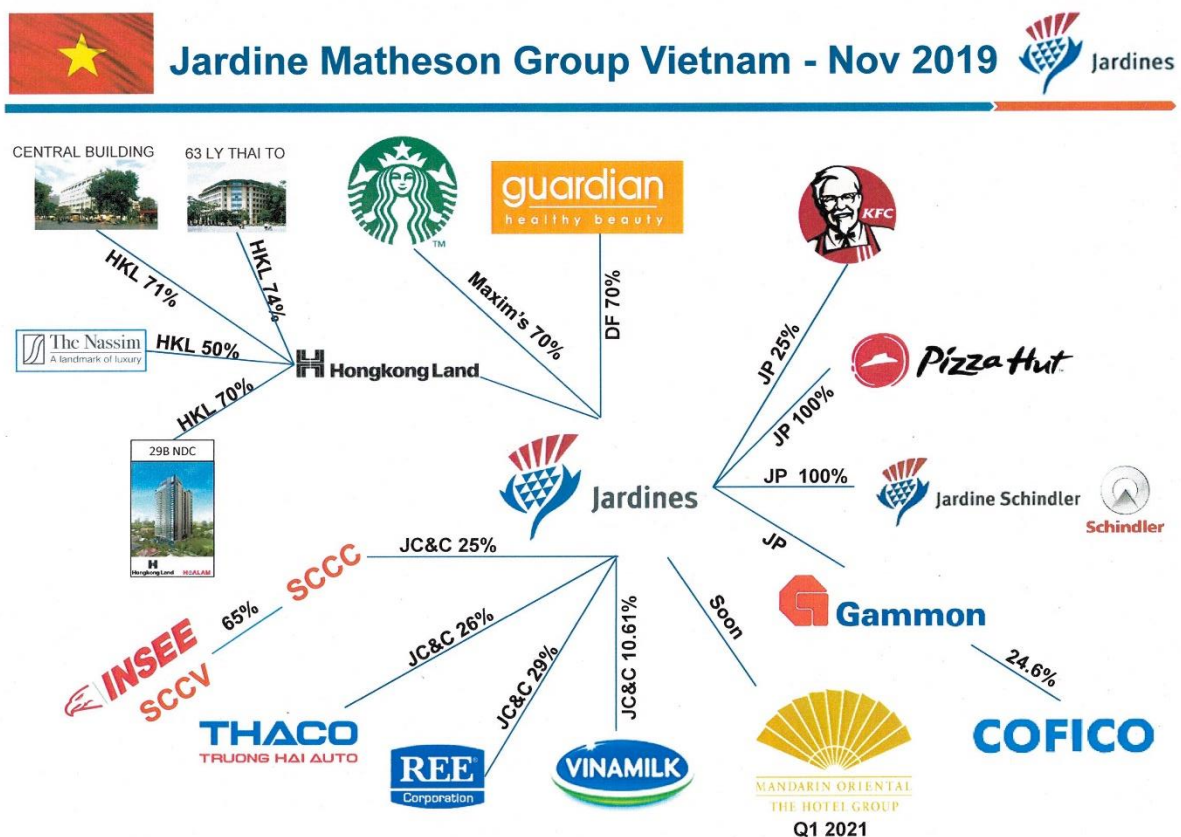


Figure 24. Jardine Matheson group structure. Source: Jardine Matheson



During a three-day visit in September 2019, Jardine's Executive Chairman and Managing Director, Mr Ben Keswick, affirmed the Group's development strategy in Vietnam.

Since this visit the group has pressed on with the opening of the new Jardine Schindler factory (Schindler lifts and elevators) in Hiep Phuoc Industrial Zone, Ho Chi Minh City, as well as further investment in the group's Siam City Cement and Gammon construction businesses. These strategic investments are intended to capitalise on the foreseeable construction boom as economic prosperity continues.

Jardines also control the franchise in this region of the global giants in convenience food - Pizza Hut, KFC and Starbucks. The rate of growth in this segment is staggering with dozens of outlets for convenience food retailers being opened each month.



Figure 25: Statue of former leader Ho Chi Minh in city centre. Source: author's own

5.5.2 – Vinamilk

In a further strategic investment move, 2017 saw Jardine Matheson pay \$616m for a 5.53% stake in Vinamilk - Vietnam's largest listed company and dairy group. Jardine's stake has now grown to exceed 10%. This sale comes as Vietnam's leaders attempt to unload more interest in state-controlled companies to private and foreign investors, part of the government's enterprise equalisation process.

I met with Vinamilk's Executive Director of dairy development, their agriculture director and their finance director at Vinamilk Tower - Vinamilk's headquarters in Ho Chi Minh City. Vinamilk is the largest dairy processor in southeast Asia, supplying dairy products not only in Vietnam but neighbouring Thailand, Cambodia and Laos, as well as exporting further afield to the Middle East, Iraq and Iran.

While Vinamilk themselves farm 27,000 cows across 12 dairy farms in Vietnam, the country remains only around 40% self-sufficient in dairy supply.

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Figure 26: Meeting with director of dairy development at Vinamilk, central Ho Chi Minh City. Source: Vinamilk



Figure 27: Vinamilk Tower, Vinamilk's headquarters in Vietnam. Source: Vinamilk

The demand for fresh milk in Vietnam is growing exponentially. This results in domestic milk ever increasingly being channelled into the liquid milk segment, with imported milk powders and specialist dairy ingredients required for food processing and manufacture to meet the 7% growth in overall dairy demand seen in 2019.

The growth in liquid milk consumption is in part being driven by better logistics and cool chain distribution across the country, but also by the National Schools Milk Program. This program is jointly

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funded by the Government (25%), Vinamilk (25%) and by parents (50%) with the aim, I was told, “to drink more milk and be more like the Europeans - taller and smarter.”

As conversations developed, I discovered that Vinamilk has recently made some significant strategic outward investments into global pockets of strong milk production.

These investments include a stake in Miraka dairy in New Zealand’s Waikato region, and the formation of a dairy product sourcing team based in Warsaw, Poland, to secure supply of product from Europe. This points to Vinamilk’s ambition to meet sustained growth in demand for dairy through filling the void with imported product.

5.6 – Capacity of domestic production to balance regional demand

A recurring theme in all the key regions of demand-growth visited, was their inability to balance this growth through the scaling up of domestic milk production.

5.6.1 – China

The evolution of mega dairies in China was triggered by the melamine food safety scandal of 2008, combined with a continued insatiable demand for dairy as a health promoter.

Two decades ago, the dairy industry in China was dominated by small scale household producers with up to 10 cows each, with hundreds of local village milk collection centres.

However, the food safety scandal led to a major government restructure of the Chinese dairy sector. There was widespread shutdown of local milk collection centres, and the era of large-scale mega dairies was born.

On my visit to Harbin, Heilongjiang province in Northern China, we visited several new large-scale dairy units.



Figure 28: Aerial view of a China Modern Farming mega-dairy. Source: China Modern Farming

At cow level, attention to detail was extremely variable. Average milk yield in China has increased from 4.6t/cow in 2008 to 7.4t/cow in 2018 – a significant rise yes, but still far short of where that needs to be on the type of high input system being rolled out.



It was explained to us that there is a lack of “industrial technicians” with the required skillsets and knowledge to manage high output Holstein cows on a fully housed TMR system. The other significant underlying factor is that 50% of Chinese dairy farms have no land, leading to huge forage and slurry challenges. A historic cultural tradition of land occupation in and around villages means small plots of land are farmed by the same families for generations. Hundreds of these small-scale farmers grow plots of corn to supply large scale dairies with forage, which leads to huge variations and unpredictability in forage quality and quantity.

The decade-long state-backed surge in dairy industry development since 2008 is now slowing down significantly as mega dairies are generally not increasing in magnitude or number.

It was clear that there are several underlying fundamental issues in the decade-long scaling up of Chinese dairying and it is accepted that the small gains in on-farm technical efficiency which may be achieved in coming years will nowhere near balance the surge in demand for dairy consumption in urban China. So the ever increasing dairy void will need to be filled by imported product.



Figure 29: Dairy cows in loafing area at privately owned dairy unit in northern China. Source: author's own

5.6.2 - Japan

I met the international dairy development team at J-milk, a milk promotion organisation which collates data and represents dairy farmers’ and processors’ interests in Japan.

They explained that the Japanese dairy industry was at a crossroads. Continued rising demand for dairy since the second world war, combined with the domestic dairy sector in steep decline, means Japan is now the third largest importer of dairy products in the world.

Due to an aging population, the number of dairy farms (and subsequently milk production) has been in decline for several years. This, combined with competition for the limited land area, has meant the dairy sector is suffering and has in general become severely underinvested.



There have been several government interventions in recent years aimed at reversing Japan's decline in milk production. I visited a greenfield robotic dairy unit when in Hokkaido. This farmer had taken advantage of the government's 75% technology grant funding scheme to invest in dairy technology. The other staggering scheme currently in place is a 100% subsidy on imported Australian dairy heifers - a result of an extremely strong domestic beef market resulting in the vast majority of dairy cows being bred to Wagyu bulls.



Figure 30: Visiting a greenfield robotic dairy unit in Hokkaido, Japan, which had taken advantage of government technology grants. Source: author's own

The market is tightly controlled, with farmgate milk price at the time of my time of visit the equivalent of £0.78/litre. Cost of production is high and relative efficiency is low.

It astounded me that with 75% technology grants, 100% subsidised replacement heifers and 78ppl for their milk, they still could not keep farmers producing milk!

5.6.3 - Indonesia

In recent years Indonesia has touched on double digit growth in demand for dairy products - as urbanisation continues in mega cities such as Jakarta, and dairy protein gradually creeps into everyday diets. However, local milk production capacities are limited by an equatorial climate not conducive to efficient milk production; lack of cultivatable land area due to one of the highest population densities on the planet; and a lack of infrastructure and transport links.

I was extremely fortunate to spend a day with the Nestle Milk Procurement and Dairy Development (MPDD) team in Malang, East Java. In Indonesia, Nestle are the single largest milk processor by



volume, sourcing milk from 26,000 subsistence farmer suppliers who operate through 532 local village collection centres.

Koperasi Farm was run by two brothers with nine cows between them – one had 5 and the other with 4. They had recently taken up the Nestle “Agripreneur” offer of a two-year interest-free capital loan to install a DeLaval vacuum pump, vacuum lines and portable stainless steel milking gear. Milking was all done by hand until this recent investment.



Figure 31: Koperasi farm in East Java recently installed a DeLaval vacuum line system. Source: author’s own

We visited a forage grower who sells his produce (Napier grass and corn) to dairy farmers through the co-op’s “Fodder trading program”. The use of nutrients to facilitate crop growth was a relatively new practice but aided him (alongside the equatorial climate) to be able to take 8 cuts of the same Napier grass crop per year.



Figure 32: Up to eight cuts of Napier grass per year are harvested by fodder growers for sale to local dairy farmers. Source: author's own

Olah Limbah Jadi Berkah farm was very much a well invested unit with 15 cows, a vacuum line, a crop chopper and recently installed cooling fans. They were a very progressive family who recently built a biogas digester allowing food to be cooked with free gas. A real revelation compared to the solid fuel cooker being used until recently!

Lastly we visited the Koperasi Margo Mulyo co-operative milk collection centre. It was a hive of activity from 6.30am to 8.30am as dozens of local farmers turned up with a churn or two of milk – on the back of a moped or in a wheelbarrow.

On reflection, while most of Indonesia's milk production is through the local collection centre model and a drive for marginal efficiency gains and higher output is happening, the overall effect on national milk output from a low base is likely to remain modest.

However, there are other key players in Indonesia's dairy sector (such as Greenfields and Indolacto) who are investing in larger and more sophisticated dairy units, housing several hundred cows on high input TMR type systems. But significant obstacles around climate, cow cooling, quality and availability of forage mean that it will be a slow burn if this type of system is to have any significant effect on keeping pace with the rapid surge in Indonesian dairy consumption.



Figure 33: Hand milking a cow at Olah Limbah Jadi Berkah Farm, East Java.
Source: author's own



Figure 34: Milk being tested for freshness and density on arrival at the village collection centre. Indonesia.
Source: author's own

Figure 35: Milk being poured into the cooling vat at village collection centre. Source: author's own

5.7 – Chapter 5 summary

- The Chinese market is seeing a big shift from volume to value growth as consumers evolve rapidly towards buying for social, digital food trends and premiumisation.
- The fast paced consumer-facing marketplace is a relentless cycle of constant dairy product innovation in order to remain relevant in the highly competitive retail marketplace.



- The rapid advance in south east Asia's economic growth is resulting in food culture becoming ever more diverse, defined by each individual's affordability.
- Liquid milk consumption growth in Vietnam is ever increasingly being satisfied by domestic milk production. Therefore, growing volumes of imported longer life product is being channelled into food processing and manufacture.
- Domestic milk production will be unable to balance future insatiable demand growth in all developing markets visited.



Chapter 6 – Dairy business structure, strategy and route to market

6.1 - Evolution of dairy co-operatives

Globally, farmer-owned dairy co-operatives still dominate on-farm milk collections. Over 50% of Europe's milk production, 50% of South America's milk, over 80% of both North America and New Zealand's milk, and over 95% of the world's largest milk producer, India's, milk, is all being handled by co-ops.

Farmer-owned co-ops can be an incredibly effective model in delivering value, but only if effective business strategy and governance is in place. Take, for example, Friesland Campina and Arla Foods, two of Europe's most dominant dairy players; Glanbia leading on Ireland's global dairy ambitions; and Fonterra at the forefront of New Zealand's dairy surge in the last two decades – all successfully pursuing global dairy market integration.

Co-ops tend to evolve in a similar manner across the globe and tend to be characterised by similar structural problems which has, in the past, led to some catastrophic failures. Look at, for example, the Australian Co-op Murray Goulburn, which was bought out in a distressed state in 2018 by the private equity of Canadian dairy giant Saputo; also Westland Milk Products in Hokitika, New Zealand, formed as a farmer-owned co-operative in 1937 and bought out of financial difficulty by China's Yili Group in 2019. And closer to home we've seen British co-operatives sailing close to the wind in recent years, as well as the catastrophic collapse of Dairy Farmers of Britain in 2010, leaving a trail of debt across its lenders and farmer shareholders.

The evolution pattern of dairy co-operatives tends to be initiated with a clear base strategy of raising equity from members to invest in a relatively narrow range of products, usually cheeses or powders.

However, co-ops inevitably seek to add value to their base strategy by diverging into brands and the consumer-facing marketplace. Mergers and acquisitions usually characterise this cash-hungry phase as existing successful brands are sought after. Co-ops tend to have limited resources of investment risk capital, leaning on farmer members' balance sheets, and the misalignment of capital structure with company strategy often ensues. This tends to create tension in the corporate governance of co-ops as they are often governed politically rather than commercially. High levels of debt and a high-cost base, in order to keep brands relevant in the consumer-facing marketplace, mean farmgate milk price is often subordinated to debt.

The constant tension between the high levels of capital investment required to slide up the value chain and delivering a strong farmgate milk price inevitably lead to the misalignment of shareholder preferences for investment: such as those in the high value branded health foods and sports nutrition sectors for example.

For farmers, milk price is paramount and cash returns are a high priority - and for sure co-ops can deliver on this if a clear strategy regarding the dairy value chain is adopted and adhered to. Investment activity absorbs cash but can create huge value if executed well, but equally can be a huge burden if executed poorly. Hence, co-ops require a clear value chain strategy which should be characterised by two fundamentals – appropriate capital structure and competent governance.



6.2 - Glanbia

Dominant Irish dairy co-operative Glanbia processes around a third of Ireland's milk and have been one of the country's processors spearheading a government-backed journey towards export-led growth within Ireland's dairy sector in the last decade.

Bergin, CEO of Glanbia Ireland, explained in London at the 2018 Dairy Industry Newsletter conference that Glanbia's vision towards "demand-driven high value product solutions" within the dairy sector was at the heart of their strategy to integrate with global markets outside of the EU. In order to achieve this, he explained, Glanbia has set out to invest in the R&D, internationalisation and global marketing required.

Interestingly, early on in this journey, Glanbia acknowledged that partnering with other dairy processors with a truly global reach was key in building innovative and sustainable agri-food chains. However, Jim added, finding those partners with the same business values around social licence and responsible growth is paramount; as this is what will define business success and ability to operate globally in the future.

In 2019 a major international collaboration was announced between Glanbia and Royal Dutch A-Ware, a leading global dairy processor in the Netherlands. The project will see an investment of around 140 million Euros in building a new continental cheese manufacturing facility in Belview, Co Kilkenny, which is set to process 450 million litres of Irish milk annually. With Royal A-Ware's current international market expertise and integration, this move will facilitate the manufacture and global distribution of a range of soft and semi-soft continental cheeses, spreading the risk away from Cheddar and mitigating the longer-term effects of Brexit on Ireland's dairy sector.

This strategic partnership is seen as a seriously smart move by Glanbia in joining the dots between an Irish dairy co-op with growing seasonal milk volumes; a Dutch processing partner with existing expertise of global market integration; and those developing markets where demand is surging.

6.3 – The boom years of NZ dairying and the bumps in the road

For the last 25 years, the greatest opportunity for wealth creation for most of New Zealand's farmers has been to milk cows, and then to milk more and more cows. This has led to a near doubling of the dairy industry since the turn of the century. This growth in seasonal supply has been balanced by the required investment in stainless steel processing capacity, particularly by dominant dairy co-op Fonterra.

Fonterra have adopted a commodity whole-milk powder (WMP) and skimmed milk powder (SMP) base strategy that has allowed the industry to maximise nature's greatest gift to New Zealand – seasonal pasture production. Matching the dairy cow's biological cycle with this seasonal pasture results in a huge amount of milk in a concentrated time period (10 billion litres in 4 months of the year). There is no way all that milk can be valorised in the short term other than to dehydrate it and store it in the form of WMP, SMP or, to a lesser extent, butter and some soft and semi-soft cheeses. It is this ability to valorise such vast volumes of milk at peak national production that has been the fundamental value pillar of the NZ dairy industry. If NZ was ever to depart from that by starting to



fight nature and producing milk out of season, ultimately global industry competitiveness would be damaged.

As Fonterra's milk supply volume and revenue streams grew from around 2010, so did their global aspirations. Being a co-op, naturally they migrated away from their base strategy and moved into offshore value-add and consumer-facing brands in multiple markets from Australia to China to Latin America.

However, during my Nuffield Farming visit to New Zealand in early 2020 I found the mood of the dairy industry much less buoyant than a decade earlier. Fonterra was going through a major governance transition phase and being forced to undertake a business restructuring as industry confidence and share value plummeted.

Many of the offshore divestments into consumer brands had turned sour and Fonterra has been forced to unwind their troubled expansion into - particularly - China and Latin America, by taking massive balance sheet impairments. The co-op has been forced into the write-down of several of its businesses in China, Brazil, Venezuela and Australia by around NZ\$820m in 2019 alone, and for the first time in history it never paid an annual dividend to its 10,000 farmer members as it dealt with a NZ\$7.4 bn debt mountain.

One dairy farmer and Fonterra member commented to me *"The problem has been Fonterra's capital structure has not been fit for purpose. Far too much risk is placed on the farmer by chasing global brands. They should have split the shareholding for these risky overseas acquisitions away from NZ's core milk processing business. Fonterra's value-add strategy has been their weak link. Where you add value you inherently add cost, and far too often the cost outweighs any gain in value. Also, it can also be extremely difficult to even quantify the cost as it often gets lost in other areas of the business"*.

As cracks emerged in Fonterra's global strategy, their share value has been eroded from a high of around NZ\$6.60 in 2018 to around NZ\$3.50 at the time of my visit in early 2020. And the strong message coming through when speaking to several farmers was that this was having a significant impact on farmers' balance sheets and the confidence of banks and lenders.

Much of the rapid growth at farm level between 2005 and 2015 was financed on interest-only borrowings, with farmers often aggressively expanding by revaluing and refinancing one unit to develop the next. With confidence in Fonterra taking a shake, the banks are now making life seriously tough for many highly geared farmers by revaluing businesses and often calling in capital.

As it was explained to me, when the bank comes knocking, farmers generally have three options to raise capital. They can either sell their cows, sell their farm or sell their Fonterra shareholding. Often the more desirable of these three is the latter and hence more and more private corporate dairy processors, particularly Chinese, are building processing sites and entering the NZ market by soaking up milk from ex-Fonterra members. These farmers can cash their member capital, reduce their debt burden and supply a corporate – and this is happening at quite a rate.

As the restructure of NZ's industry continues to evolve, Fonterra have gone from controlling over 90% of NZ's milk to now about 80% and falling. However, this will not be the demise of the New Zealand dairy sector or Fonterra, but merely a bump in the road.



Another significant factor in the reshaping of NZ's dairy industry for the next decade is that dairy expansion in New Zealand has reached its environmental limits with regard to water quality, irrigation water resources, and some consumer-perception challenges. Environmental integrity is now a prerequisite for milk production and it's evolving quickly with carbon footprinting, nutrient field mapping, and watercourse protection all now to the fore.

Since my time in NZ in March 2020, the restructure of Fonterra has been viewed as a relative success and the business has now re-focused on its members and its core ingredients and foodservice businesses. Fonterra recently announced plans to invest about NZ\$1 billion by 2030 to develop higher value foodservice products, in an environment of flat or declining milk volumes. The co-op is also on course for a record member milk price of up to NZ\$8.75/kgMS for season 2021/22, driven by a recent strong Fonterra performance and a surge in economic activity since the COVID19 pandemic.

6.4 - Value chain strategy and pitch point balance

Sliding up the value chain generally delivers greater revenue but inherently adds cost in doing so. These costs tend to be particularly acute when moving into the consumer-facing marketplace where it's all about constant brand relevance – product innovation, branding, packaging, promotion, tariffs, transport and distribution costs.

New Zealand's dairy industry has an incredibly strong base around basic dairy manufacturing done well. This solid base has allowed multiple other developments to deliver growth in value over the last two decades. Fonterra's successful global ingredients brand NZMP is consistently achieving premiums for distinctive and specialised products. For example, specialist skimmed milk powders consistently command premiums on the world market due to specification reasons.

Achieving higher margin by sliding up the value chain from its strong manufacturing base is at the heart of Fonterra's value growth strategy for the next decade. Fonterra's Research and Development Centre, located adjacent to Massey University in Palmerston North, is one of the largest of its kind in the world. It employs around 280 scientific and technical personnel and is constantly building upon the strong NZMP base to deliver practical solutions to common food manufacture and retail challenges.

An example of such a challenge I learned of during my time in New Zealand was the issue of fat seepage in Chinese dessert display fridges. With cheesecake desserts having drastically risen in popularity in China in the last decade, the team at Palmerston North alongside colleagues at the R&D facility in Shanghai, have recently developed a cream cheese ingredient which does not seep fat when the cheesecake is on display. This has overcome a major aesthetic problem encountered by Chinese food manufacturers and retailers. Fonterra hold the intellectual property to the ingredients' creation and, in turn, can slide up the value chain and extract more value from the market.

Another recent foodservice breakthrough at Palmerston North has been the development of a special formula cooking cream. This special formula allows chefs, when cooking, to reduce the cream in just a couple of minutes, whereas conventional cooking cream would take around ten minutes. It is also less likely to curdle when cooking or split when reheated from cold or frozen. The secret dry ingredient formula, which Fonterra calls "*the black box*", is a closely guarded secret and has intellectual property

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protections around it. Fonterra is commercialising this innovation with a recent announcement of entry into the huge American fast food and hospitality market through a partnership with Fortune 500 company, Land O'Lakes. This facilitates access to a strong, well established distribution network serving the large foodservice customer base with NZ-produced cream cheeses and special formula cooking cream.

6.5 - Joint venture gravy train

The power of successful joint ventures between global agri-food producers, processors and traders became a recurring theme during my time in Asia.

Grasping food cultures and having the market intelligence to operate in diverse foreign trading environments are the two fundamentals which underpin business success in these markets. True appreciation of both of these is extremely difficult from, for example, a product development lab or boardroom half way around the world in Europe, and hence successful navigation of these markets requires partnerships which lean on existing market expertise.

6.5.1 - Arla Mengniu

During my time in China I spent a day with Snorri Sigurdsson who heads up Arla's China-Denmark Milk Technology Co-operation Centre (CDMTCC) on the edge of Beijing. This centre was opened in 2018, and is the Chinese product development hub for the joint venture between European dairy co-operative Arla and one of China's most dominant dairy players Mengniu Dairies.

For fuller details of this visit please see APPENDIX 3

6.5.2 - Vinamilk Miraka

Vinamilk recently made a strategic investment in Miraka's greenfield dairy processing site in central Waikato on New Zealand's north island.

Fuller details of this investment can be seen in APPENDIX 1

6.6 - Inward Investment in Chinese dairying

Inward investment into the Chinese dairy sector's development is commonplace for those major global dairy players enjoying market access.

6.6.1 – Fonterra Farms China

In 2008 Fonterra embarked on a journey to invest over NZ\$1bn constructing and operating nine large industrial dairy farms in China which are split into 3 distinct hubs:

- Yutain Hub (NE Beijing) – 4 farms built between 2008-2013
- Shandong Hub (SE Beijing) – 2 farms built between 2016-2017
- Shanxi Hub (West Beijing) – 3 farms built between 2015-2016



For fuller details of Fonterra's Yutain 2 dairy farm please see APPENDIX 2

6.6.2 – Nestle Dairy Farming Institute (DFI)

Swiss-based global dairy giant Nestle has been active in China since the early 1990s, both in the dairy sector and the Nescafe Coffee Centre in Yunnan, NE China.

Nestle's dairy strategy in Qingdao district, China, has been based around creating shared value by developing small family farms with a focus on manure management, environmental sustainability and technical efficiency gains.

To aid these objectives, Nestle invested US\$20million in 2015 building the Nestle Dairy Farming Institute (DFI) near Harbin in northern China.

On visiting the DFI, the general manger Zhang Zhendong explained that the institute is designed as a training centre to educate dairy professionals and farmers in China, with a 1300-cow demonstration farm alongside. The centre offers full and part time courses across four levels - from on-farm staff through to farm managers and agricultural graduates.

The DFI has also partnered with a number of global agricultural technology providers (Alltech, Land O'Lakes, Allflex, ABS, Boehringer Ingelheim, Bayer, Kuhn and John Deere to name a few) who operate lab- and field-based research projects across a range of areas from forage analysis, mastitis screening, bovine semen mobility testing and activity/rumination technology systems. This allows these global players to have a presence in China and ultimately a chance to develop a route to a potentially massive market.



Figure 36: Nestle's farm research and education centre: The Nestle Dairy Farming Institute, Northern China. Source: Retail Design blog.net.



Figure 37: Alltech's forage analysis laboratory within the DFI. Source: author's own



Figure 38: Meeting with the DFI general manager Zhang Zhendong. Source: author's own

6.7 – One eye on South East Asia

Southeast Asia is one of the world’s fastest growing markets and also one of the least well known. But, ever increasingly, investors and multinationals are turning their gaze southwards from the Goliath of emerging markets, China, to the ten dynamic markets that make up the Association of Southeast Asian Nations (ASEAN). Founded in 1967, ASEAN today encompasses Vietnam, Thailand, Singapore, the Philippines, Myanmar, Malaysia, Laos, Indonesia, Cambodia and Brunei – economies all with huge growth potential, albeit vastly different stages of economic development.

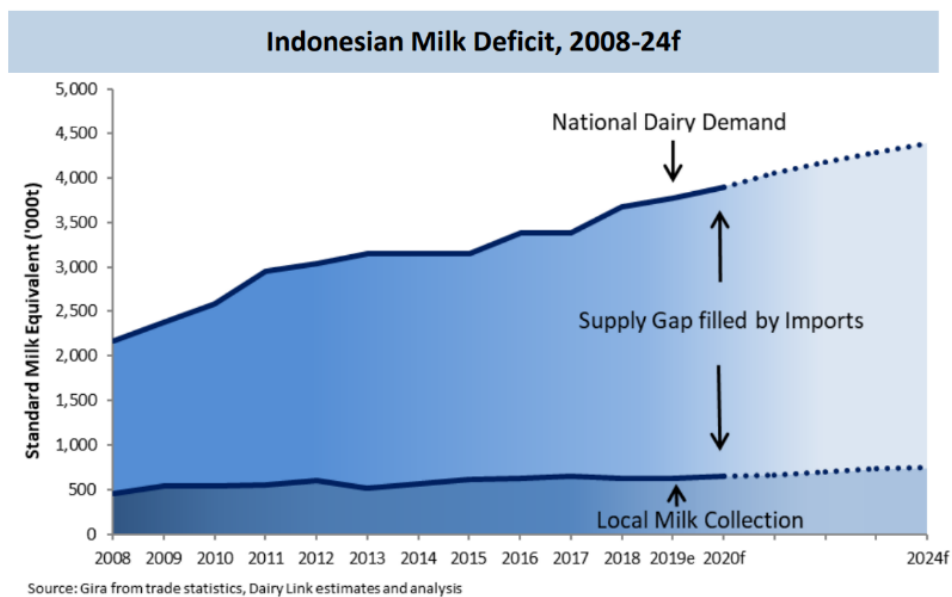


Figure 39: The growing Indonesian milk void



The region is one of the fastest growing consumer markets in the world as well as a major hub of manufacturing. Its economic profile is rising sharply as it seeks to capture an even greater share of global trade. However, as economic prosperity and food preferences advance, the dairy deficit in these ASEAN nations continues to grow.

While in both Vietnam and Indonesia it was key for me to get to the heart of the challenges and opportunities within local supply chains and food distribution networks. These are the nuts and bolts of connecting product with consumer. I met with several local food importers, processors, manufacturers and distributors to truly connect with and understand these supply chains.

6.7.1 – TMT Distribution Co Ltd

TMT Distribution was formed in 1998 after founder Mr Ho Van Sau recognised the potential of the growing import-export trend in the Vietnamese food and beverage markets. Based in Ho Chi Minh City, the business is now a major importer and distributor of global food products in the dairy, confectionery, frozen and dried food categories and now has coverage throughout the whole of Vietnam through regional branches and sub-distributors.

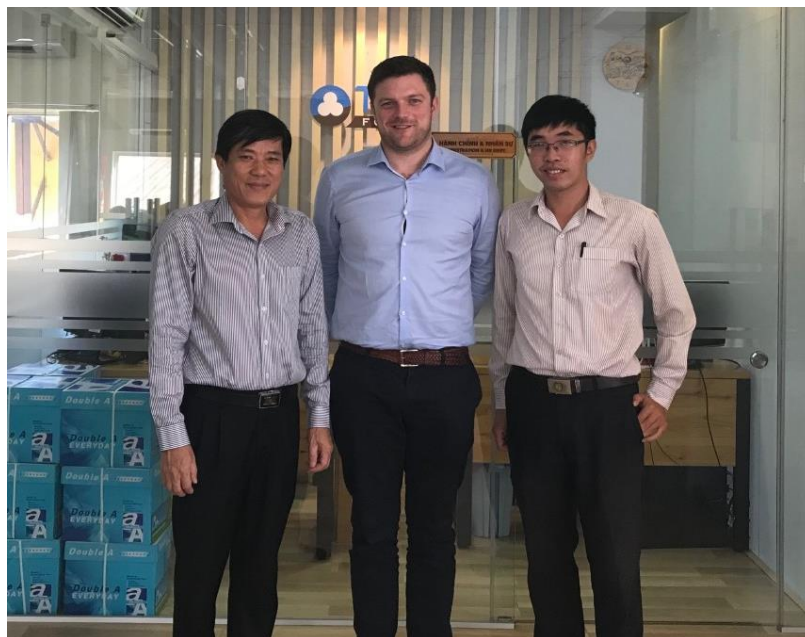


Figure 40: Meeting with Mr Ho Van Sau and his international business development manager at TMT head office. Source: author's own

He explained the longstanding trading partnership with Nestle and Fonterra (particularly in the Anchor range of foodservice: cooking creams, butter, cream cheese and shredded mozzarella) but also showed me products imported from less well-known dairy manufacturers such as Muldoon Dairy (Wisconsin) beaded mozzarella sticks and Teams processed cheese triangles and burger cheese slices



– a huge growth market in Vietnam. Mr Sau explained that, as Vietnamese tastes and preferences advanced, so too had the cool-chain and freeze-chain logistics division of his business in order to keep up. Cool-chain logistics has been a limiting factor for some products in the Vietnamese market in the past.



Figure 41: TMT distribution warehouse in action - Fonterra's Anchor shredded mozzarella stacked ready for dispatch. Source: author's own

6.7.2 – Cisarua Mountain Dairy

Cisarua Mountain Dairy was formed in 1996 in the mountainous area of Cisarua Pancak, West Java, Indonesia. Traditionally focussing on the fresh liquid milk market, sourcing and distributing fresh dairy products in the West Java region under the Cimory brand, recent product innovations have seen the business grow into flavoured milks and drinkable yogurt ranges. This market sub-segment is growing at over 10% p.a. This growth is a sign of consumers buying into the company's message that nutritious and delicious dairy products will result in a healthier and happier Indonesian society.



Figure 42: Cisarua Mountain Dairy, West Java, Indonesia - factory visit and product tasting.



6.7.3 – Yummy Foods

Yummy Foods are market leaders in Indonesian yogurt and cream cheese production. Spending a fascinating morning with the product sourcing and sales team, I learned of the dairy ingredient sourcing challenges often encountered in Indonesian dairy processing.

Milk is supplied to the Yummy Foods Utama factory by three of their own dairy farms and a minority of locally supplied liquid milk for balancing. Of interest was that significant quantities of imported milk powder were reconstituted and combined with local milk in order to standardise the product for yogurt manufacture.

After a product tasting and factory tour at Yummy Foods Utama, I visited one of their goat farms (a recent venture to target the niche Indonesian goat's cheese market) and their largest bovine dairy farm to fully understand the Yummy milk supply and demand mismatch.

Large quantities of imported mild cheddar are blended on site to make cottage cream cheese. Also, imported butter and mozzarella are used both in further food processing and cut and packed for the Indonesian retail market.



Figure 43: Yummy Foods recent Yofit flavoured drinking yogurt range. Source: author's own



Figure 44: Product tasting and meeting with Yummy Foods sales and product sourcing team. Source: author's own



Figure 45: Collage above shows visit to Yummy Foods-owned Taurus cow and goat dairy farms, Sukabumi, Indonesia. Source: author's own

6.8 – Chapter 6 summary

- Dairy co-operatives can be an incredibly effective model in delivering value back to the farmgate but only if a robust value chain strategy and competent governance is in place and adhered to.
- Failures in co-op strategies tend to be characterised by similar fundamentals: an insufficient capital structure to support investment in non-processing consumer-facing activities and a loss of focus on the co-ops' core domestic processing base.
- Social licence and responsible dairy business growth are paramount as this is what will define business success and ability to operate globally in the future.
- Pitching processing capacity to the optimum point in the value chain is key. Too low, and often
- not enough value can be extracted from international commodity markets, and too high, then too much cost is incurred to remain relevant in the consumer-facing marketplace.
- Seeking out “win-win” joint venture partners already with marketing and distribution networks in developing markets is key.



Chapter 7 – Government, NGOs and industry bodies

7.1 - UK Government Dept of International Trade (DIT)

The UK Gov DIT (Department of International Trade) in China is based within the British Embassy in Beijing. Here I met with Freya Han and Wei Sun who are employed by the UK Foreign and Commonwealth Office to promote and analyse food and beverage exports into the Chinese market.

Efforts by the DIT to integrate British dairy products with Chinese distributors have centred around small, niche product offerings such as specialist high end retail cheeses, specialist infant formula and Welsh organic UHT milk. It became clear during my discussions that the UK dairy sector entered the Chinese market very late and there were several recurring challenges:

- Price – UK product considered expensive in China (especially compared to NZ tariff-free trade)
- Apprehension to enter the Chinese market
- Reliance on EU markets
- Poor marketing strategies – need to promote UK history, heritage and Royal Warrant
- Strong cheese and yogurt flavours often incompatible with traditional Chinese tastes and preferences
- Delays in obtaining required Chinese certification – GACC (General Admin Custom Control).

7.2 – Scottish Development International

I met with Keigo Yoshida at the Department of International Trade's office within the British Embassy, Tokyo. Keigo is employed by Scottish Enterprise to promote Scottish food and drink to the Japanese market.

Keigo explained that, traditionally, dairy had virtually no place in the Japanese diet. He explained there is huge market demand for good quality butter, especially in the confectionery and bakery markets, as many processors have moved to using vegetable-fat margarine due to availability and price point issues. However, what complicates the butter market is that purchases are regulated through the Japanese government purchases (ALIC) scheme and do not necessarily conform to normal supply and demand dynamics. The Agriculture and Livestock Industries Corporation (ALIC) support payments incentivise Japanese food processors to use domestic butter and non-fat dry milk instead of imported product.



Figure 46: Entrance of the British Embassy, Tokyo, for meeting with Scottish Development International.
Source: author's own



Figure 47: Range of Lactalis McLelland British cheeses on display at Gulfood, Dubai.
Source: author's own



7.3 – AHDB Dairy Export

I flew out to Gulfood, Dubai, in February 2020, the world’s largest annual food and beverage trade exhibition. AHDB Dairy Export manager Lucy Randolph explained to me the work that was underway to promote British dairy products to the North American, Asian and Middle Eastern markets. The export strategy within the wealthy Middle Eastern market is centred around premium added-value products serving the HORECA (an acronym that refers to a foodservice industry sector that sells food and/or beverages) and premium retail markets.

The AHDB-co-ordinated “Food is Great” trade exhibition within the Gulfood dairy hall promoted premium British cheese exhibits from several cheese manufacturers including Singletons, Coombe Castle, Somerdale and Lactalis McLelland.

Interestingly, I learned that while sales of premium cheese were gaining traction in the Middle Eastern market, the challenge was always achieving the critical mass required to fill containers and achieve economies of scale for efficient logistics.



Figure 48: “Food is Great” dairy trade stand at Gulfood, Dubai. Source: author's own



Chapter 8 – Discussion

The British retail and foodservice markets are likely to remain key to the development of the UK dairy industry. However, competition and options for farmgate milk have slowly been eroded in recent years as farmgate milk output reaches record levels and processing capacity has been consolidated.

Many of the UK's dairy farmers have few, if any, options of milk buyer and many others must incur significant haulage charges to have milk transported for processing. And while it's important to acknowledge there are many farmers enjoying premium contracts in the UK, there is a whole segment of the middle and lower end of the UK's market not being valorised sufficiently, especially in and around the seasonal peak of national production. This is potential value escaping our local and national economies.

My Nuffield Farming travels have highlighted some of the many rapidly advancing pockets of global demand for dairy protein, particularly in the far East and Southeast Asia. However, actually capturing and capitalising on these opportunities is far more complex as there are many challenges and complexities surrounding international dairy trade.

Industry skillsets with international trading expertise and joint venture partners with existing marketing and distribution infrastructure are required in order to facilitate the development of export-led investment strategies within UK dairy businesses. Pitching this investment in processing capacity to the optimum point in the dairy value chain is key, as adding value inherently adds cost.

It's a common perception that pitching at the top end of the value chain is the optimum-value strategy. However, operating in this consumer-facing segment has significant business risk attached as it requires a continual stream of cash in order to remain relevant in the highly competitive retail sector – a relentless cycle of product development, packaging, marketing, promotion, logistics and retail dynamics. There are numerous global examples of costly and, at times, catastrophic failures, particularly farmer-owned co-operatives which have adopted and pursued this strategy.

I believe there is a significant opportunity for a processor to develop a British, or even a Scottish, dairy ingredients brand, geared towards the global foodservice sector – perhaps using grass-based milk as the USP. A solid base strategy of modern and agile milk drying technology would allow milk powders to be manufactured to global foodservice customer specifications and command premiums – something the UK dairy sector currently lacks.

With this solid base strategy in place, sliding up the value chain into other globally traded food manufacturing ingredients is possible through product innovation and targeted capital investment.

While there is often a train of thought that investing in drying milk is futile and the wrong strategy, there is a reason that nearly every new entrant into the New Zealand market in the last ten years has at first built a drier. It provides a sound base strategy to valorise milk, facilitates balancing of seasonal supply peaks, and provides a footing from which to develop into other product categories to slide up the value chain.



Chapter 9 – Conclusions

1. The UK, but in particular Scotland, has a growing imbalance in milk supply with dairy processing capacity.
2. At farm level, the British dairy sector is technically well placed to compete on a global stage, with a near ideal climate and continued on-farm technological and genetic advances in our favour.
3. A growing dairy deficit in some key Asian markets presents a significant opportunity for UK dairying. The nature of demand in Asia will find a new norm in the next decade, with a rapid surge in dairy demand from Southeast Asia eclipsing that of China.
4. Domestic milk production in these key regions of growth will lag well behind demand – the dairy deficit will grow – as on-farm technical efficiency and climate are often not conducive to efficient milk production.
5. Significant investment in stainless steel processing capacity is required in the UK to gain market exposure globally. This would bring an element of competition to the retail dominance we experience today, put some value in the bottom end of our market, and optimise the whole seasonal profile of UK milk production.
6. Simply building more processing infrastructure is not a silver bullet. Industry skillsets and international market know-how are required before concrete and steel, as there are significant complexities surrounding international trade and penetration of key markets.
7. Adding value to milk inherently adds cost. So, pitching UK processing infrastructure to the optimum point in the dairy value chain is key. Too low, and often not enough value can be extracted from commodity markets. Too high, then too much cost is incurred in order to remain relevant in the consumer-facing marketplace.
8. There is a significant opportunity for a processor to develop a British (or even a Scottish) dairy ingredients brand within global food manufacture – perhaps using grass-based milk as a USP. An agile milk powder core base strategy could then be built upon by sliding up the value chain into globally traded technical dairy ingredients to serve confectionery, beverage, bakery and food manufacturing categories in key markets.
9. Embracing globalisation through a shift of balance in British milk processing capacity, geared towards global dairy ingredients markets, will drive competition for British milk at farm level and ultimately deliver greater value to the whole UK dairy supply chain.



Chapter 10 – Industry Recommendations

Dairy Farmers

- By working collectively as existing farmer-owned dairy co-operatives, alongside their co-op's executive board, farmers should seek to develop an export-led growth strategy – attracting inward investment and the industry skillsets required to integrate with developing markets.
- Farmers need to expect and accept global market volatility is here to stay, and we're not immune. This is the natural response to the market dynamics of supply and demand constantly neutralising.
- A renewed focus on production of milk solids (as opposed to litres of milk) is required in the UK. This is a legacy of the liquid milk dominance of the UK retail market seen in the last three decades.

Milk Processors

- Attracting industry skillsets with global market expertise is key.
- Undertake the research and due diligence required for the investment in the stainless steel needed to produce specialist milk powders; high value technical dairy ingredients; and some globally traded cheeses.
- Create a British, or even a Scottish, global ingredients brand within food manufacture.
- Seek out “win-win” joint venture partners who already have the marketing and distribution infrastructure in place within key developing markets.

Government, NGOs and Industry Bodies

- Clarity is required on international trading conditions for the next decade in the post-Brexit, post-COVID world.
- And if the UK is to be a truly global dairy player – direct funding and tax incentives will be required for dairy ventures willing to invest in processing capacity to target international markets. The economic trickle-down effect into the wider rural economy, farms, and beyond, would be unprecedented.



Chapter 11 – After my study tour

My Nuffield Farming scholarship has given me a fascinating insight into the opportunities, complexities and challenges of the international dairy value chain. However, a positive macro-economic outlook for global dairy demand in the next two decades will only be optimised here in Britain if sufficient dairy processing, marketing and trading infrastructure is in place to integrate with developing markets and to drive competition for farmgate milk.

Working alongside key industry stakeholders and within a farmer-owned dairy co-operative, I intend to contribute to, and implement, a strategy to future proof Britain's dairy value chain for my and subsequent generations. This will focus around optimising the value of the entire national production profile, ultimately delivering greater value to the whole dairy supply chain and facilitating sustainable dairy industry growth. The economic trickledown effect into our rural communities and ultimately our national economy will be significant.



Chapter 12 – Acknowledgements and Thanks

Firstly, I would like to thank the many farmers, processors and dairy industry insiders across the world who welcomed me into their businesses to share their experience and learnings, and also to challenge me on my thoughts, ideas and ambitions.

The team at the Nuffield Farming Scholarship Trust do a fantastic job in facilitating the practicalities and logistics around each scholarship, so thank you.

Thank you also to my sponsors for the financial backing: The Young Nuffield Bob Matson Scholarship and The Food Chain Scholarship.

And finally, thank you to my family for the support at home during my international travels.

Richard Walker

Please see Appendices 1, 2 and 3 overleaf.



Appendix 1: Miraka Dairy visit

See 6.5.2. in main body of this report

Vinamilk recently made a strategic investment in Miraka's greenfield dairy processing site in central Waikato on New Zealand's north island.

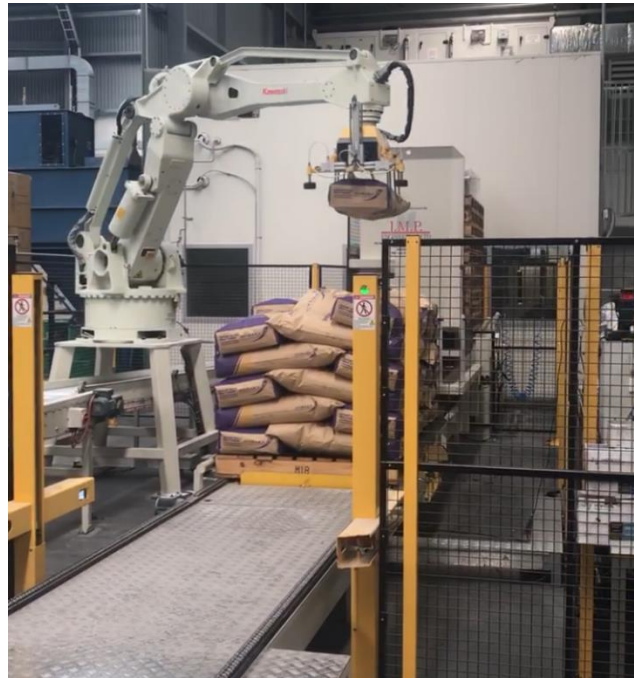
In March 2020, I visited the highly impressive Miraka milk drying facility near Mokai, 30 km west of Lake Taupo.



Figure 49: Miraka's greenfield milk drying facility in Waikato, NZ, was commissioned in 2011. Source: Tuasopaki.com

Miraka is predominantly owned by two Maori trusts, with a 17% Vinamilk ownership stake. Commissioned in 2011, the site now processes 240 million litres/year into whole milk powder, and a further 60 mn l/year through a later-added UHT TetraPak filling line. The purpose-built drying facility, designed and installed by GEA Processing Technologies, was achieving 8.5t/hr of WMP with the versatility of being able to spec powders to each customer's requirement depending on their food manufacturing application. Having versatile drying technology facilitates access to a broad range of global markets and a wide customer base when compared to some of the older or more basic milk drying facilities around the world. This allows specification premiums to be achieved in higher margin food manufacturing markets.

The processing site was constructed adjacent to a geothermal power station, owned by the same Maori trust, where natural geothermal heat is piped into the dairy plant to be used in milk drying. In turn, waste heat and milk by-product were being used in a worm farm and greenhouses further down the site, creating a circular, closed-loop, sustainable process. However, an interesting point was that it was proving difficult to use the "sustainable" thing as a USP to attract higher margin sales in the Asian market.



**Figure 50: A robotic palletiser stacking bags of milk powder coming off the fully automated bag filling line.
Source: author's own**



Figure 51: Warehouse full of WMP palletised and ready for export to Asian markets. Source: author's own



Figure 52: Visit to Miraka's milk powder processing facility near Mokai, Waikato, New Zealand. Source: author's own

See APPENDIX 2 overleaf



Appendix 2: Fonterra's Yutain 2 farm

See 6.6.1 in main report

I visited Yutain 2 farm which housed 3000 Holstein cows on a high input TMR system, housed year-round in American style free-stall barns. This was the first eyebrow-raising moment - why and how has a business whose foundation blocks and competitive global advantage is based on seasonal, low input pasture production become involved with something at completely the opposite end of the dairying spectrum?



Figure 53: Visiting Fonterra's Yutain 2 Farm, China. Source: author's own

We learned of the huge challenges facing Yutain 2 farm, and indeed these challenges were mirrored across all Fonterra farms in China.

The farm was a ringfenced site of about 20 acres of concrete and steel with no agricultural land attached. Due to a complex historical culture of land occupation in rural China, the countryside is spilt into small 1-2Ha plots, each farmed and worked by the same family for often 15-20 generations. They supply the large industrial farms with forage, usually corn silage in small quantities. However, this leads to huge forage quantity and quality variations over which Fonterra has little control.

Alfalfa has been imported from the USA for the last few years in high density containerised bales. This is extremely costly and made even worse at the time of my visit by the Trump/China trade issues when a 25% import tariff was slapped on US alfalfa.

Disposal of slurry from these large dairy units also came as a cultural and costly surprise to Fonterra. On establishing these farms, they neglected the cultural aspect of slurry in rural China. Slurry is seen



as a waste produce and of little to no value by local small-scale farmers who don't have the ability or inclination to use the vast quantities produced. As a result, Fonterra were forced to throw hundreds of millions of dollars at slurry purification plants attached to each farm.

At the onset, Fonterra shipped in thousands of surplus Kiwi X heifers from NZ to initially stock these farms. The grass-based Friesian/Jersey genetics, combined with the seasonal block calving pattern was at odds with the US-style infrastructure which had been designed and constructed.

There were several other issues, especially in the initial construction phase, around integration with local people, communities and local government as intergenerational culture is well woven into rural China. The strong message I took home from Fonterra's experiences was not to underestimate local people as you can't necessarily buy tradition and emotion from them.

The whole Fonterra China Farms project has haemorrhaged cash for the last decade, so much so that during the recent review and co-op re-focus, the decision was made to sell all nine of the Fonterra China farms and effectively cut their losses.

Fonterra's stake in all of these farms was recently sold to a subsidiary of the China Youran Dairy Group Limited. Although nowhere near recouping the initial infrastructure investment and ongoing operational losses endured during this 10-year venture, the sale is seen by many co-op members as a relief and a chance for consolidation and refocus on the co-op's core NZ processing business.



Figure 54: Meeting Fonterra's Yutain 2 farm manager. Source: author's own



Appendix 3: Arla Mengniu

During my time in China I spent a day with Snorri Sigurdsson who heads up Arla's China-Denmark Milk Technology Co-operation Centre (CDMTCC) on the edge of Beijing. This centre was opened in 2018, and is the Chinese product development hub for the joint venture between European dairy co-operative Arla and one of China's most dominant dairy players, Mengniu Dairies.

The partnership was initiated in 2006 when China Mengniu Co Ltd collaborated with Arla Foods with the aim of producing and distributing solid milk products for the Chinese market. Although slow to gain traction initially, the collaboration has strengthened in recent years with the opening of the CDMTCC, and Arla providing European expertise to focus on two key areas – dairy product innovation and the rollout of an on-farm training and quality assurance program known as Mengniu Garden.

As I was being shown round the CDMTCC, a number of product development chefs and food scientists were working closely with colleagues in Arla's Danish product development centre and European manufacturing facilities. These chefs and scientists are at the forefront of dairy product innovation to keep pace with the fast-moving Chinese consumer marketplace. New product developments and recent launches included Spongebob Squarepants kids' cheese lollipops, Lionel Messi-fronted cheesy bites, and a range of China's latest convenience drink craze: flavoured Tea Macchiatos. Keeping ahead of the consumer curve is key, I was told. The market is extremely fast moving so ongoing market research and innovation is vital.



Figure 55: Meeting with Snorri Sigurdsson at the Arla Mengniu CDMTCC innovation centre in Beijing, China. Source: author's own

However, the innovation centre is definitely not all about consumer-facing branded products. The Arla-Pro dairy ingredients range provides the backbone of Arla's export volume into China. This includes everyday cooking, baking and confectionery ingredients for food manufacture and the hotel, restaurant and catering trades. Part of the CDMTCC team's role is to demonstrate to Chinese chefs and food manufacturers how to cook with and use these products, as often dairy ingredients do not form part of a typical Chinese dish.



The rollout of the farmer training and milk quality assurance program (Mengniu Garden) was a fascinating area of discussion. The program aims to educate farmers and farm staff on being proactive in improving animal health and milk quality. Dairy farms in China tend to be high-cost production systems reliant on predominantly bought-in feed. A serious skills and knowledge gap within farm management personnel, and heat stress, are a major factor in reproductive issues.

So why are Arla investing so much time, money and knowledge on Chinese farms – effectively teaching them how to do the job themselves? What’s the return on investment for Arla’s European members? Arla has a 7% stake in the Mengniu business so, in simple terms, it’s about a return on that invested capital. But by looking a bit deeper, it became clear it’s about keeping the door open for Arla’s European products to flow into the Chinese market. The first to experience restricted market access will be the companies who are only interested in profiteering from the Chinese market.

Arla clearly have pursued a long term integrated Chinese strategy and, although maybe initially slow to provide a tangible return to its European members, the evidence of successful joint ventures such as Arla Mengniu is now evident in the form of a market-leading farmgate milk price in Europe and a healthy annual cash dividend for all Arla members.



Figure 56: A selection of the ArlaPro dairy ingredients range supplying the vast Chinese foodservice sector. Source: author's own



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Southill Farm, Staple Fitzpaine, Taunton, TA3 5SH
T: 01460 234012 | E: director@nuffieldscholar.org