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Factors Influencing the Dairy Trade from New Zealand

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Introduction

Most dairy products in the world are consumed in the region or country in which they are produced. This is hardly surprising as milk and its various derivatives are highly perishable products. Milk also provides important nutrients in the diets of many communities so is a key plank of food security and hence protectionist legislation. Trade in a large quantity (46%) of milk is informal (IDF 2015) through short supply chains, and even with the formal trade most milk does not cross currency borders. Global trade in milk therefore, in most countries, involves milk that is surplus to a country's requirements. In 2014, the share of globally-traded (crossing currency borders) dairy products was just 9% of overall production. Because the total volume of international trade in dairy is small, it is considered to be a "thin market" and small imbalances in supply or demand can "shake" or disrupt the market (IFCN 2015).Of the globally traded dairy products, just four exporting regions cover 70–80% of the trade with New Zealand, the largest, accounting for up to a third.

In New Zealand (NZ), in stark contrast to other milk producing countries, less than 4% of its milk is consumed within the country. It has a small population (4.47 million) and produces more than 21 billion liters/year. Its customer/client base is therefore predominantly off shore and mostly, but not exclusively, includes those countries that are not self-sufficient in dairy. The focus of NZ dairy is, therefore, global by definition and the factors influencing dairy trade are global, although within NZ there are also societal and political influences on production and processing. This paper will first present global dairy trends with respect to how they have and do influence NZ dairy and then will drill down to one geography before describing specifics of the NZ dairy scene and global and local issues that are currently having the most impact.

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Global Dairy Trends

World cow and buffalo milk production increased by 38% from 2000 to 2014 with cow milk growing at a compound average growth rate of 2.2% and buffalo milk at 3.3% (IDF 2015). Combined cow and buffalo milk production grew from 559 million tons (MT) in 2000 to 769MT in 2014 with the OECD–FAO (OECD–FAO 2016) estimating 831 MT in 2017 (Figure 1). Regions with the highest cumulative average growth in cow milk production from 2000–2014 were Asia (4.9%), Africa (4.4%) and South America (3.1%), mainly due to increases in the number of dairy animals and farms. In 2014, as in previous years, the top milk-producing regions were Asia (28%), EU (24%) and North and Central America (18%). In terms of specific countries the largest milk producers continue to be India (141 MT), and USA (93 MT). With a milk production of 21.3 MT, New Zealand accounted for just 3% of global milk production in 2014.

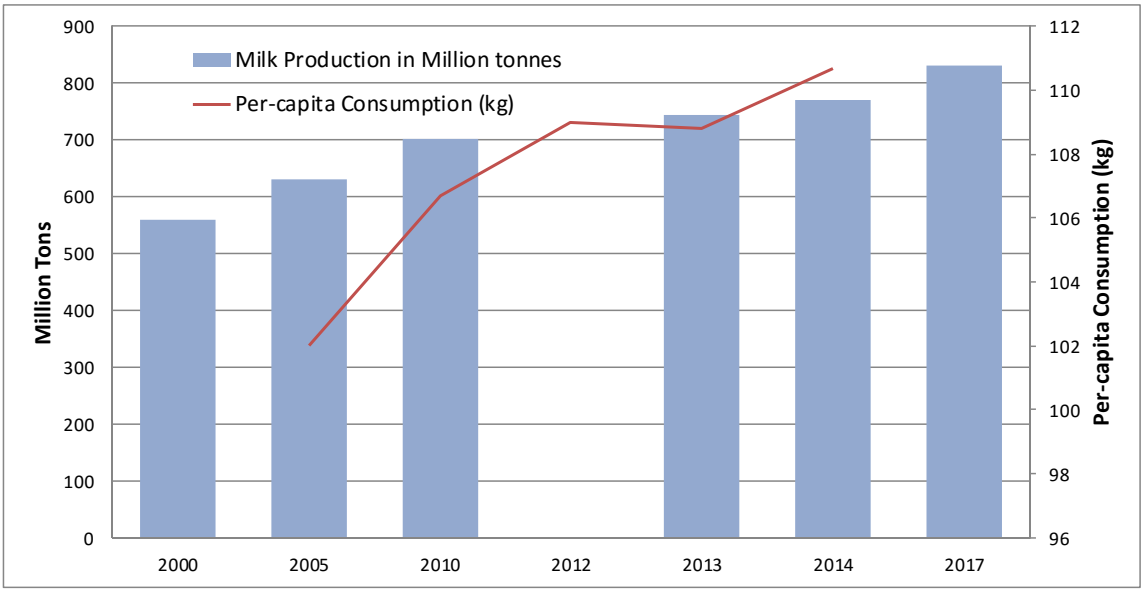

Figure 1. World milk production and per capita dairy consumption
Source. International Dairy Federation (IDF) 2015; OECD–FAO 2016

Increased production was driven by an increase in demand created by both an 8.5% increase in per-capita consumption (Figure 1) and a global population increase of 10% from 2000 to 2014. Asia (337 MT) and Europe (201 MT) were the largest dairy consumption regions accounting for 43% and 26% of world dairy consumption respectively in 2014 (IDF 2015).

Both growth in per-capita consumption levels and growing wealth in Asia implies potential for future growth in Asian dairy demand and consequently in domestic supply and world trade (Dong 2006). According to OECD-FAO Agricultural Outlook projections global dairy consumption is expected to increase by 21% by 2025 (OECD-FAO 2016) with per capita consumption increases forecast of 1.7% and 1.1% per annum for fresh dairy and whole milk powder respectively in the developing world.

Despite growth of organized dairy (specifically in the developing regions of the world), a large part (46%) of dairy consumption is the result of informal trade. Of the remaining 54%, fresh milk and dairy products account for 17%, followed by butter (15%),cheese (13%), whole milk powder (WMP) (4%), skim milk powder (SMP) (3%) and other (2%) (Figure 2). With economic progress it is expected that the share of milk that passes through the formal sector will increase.

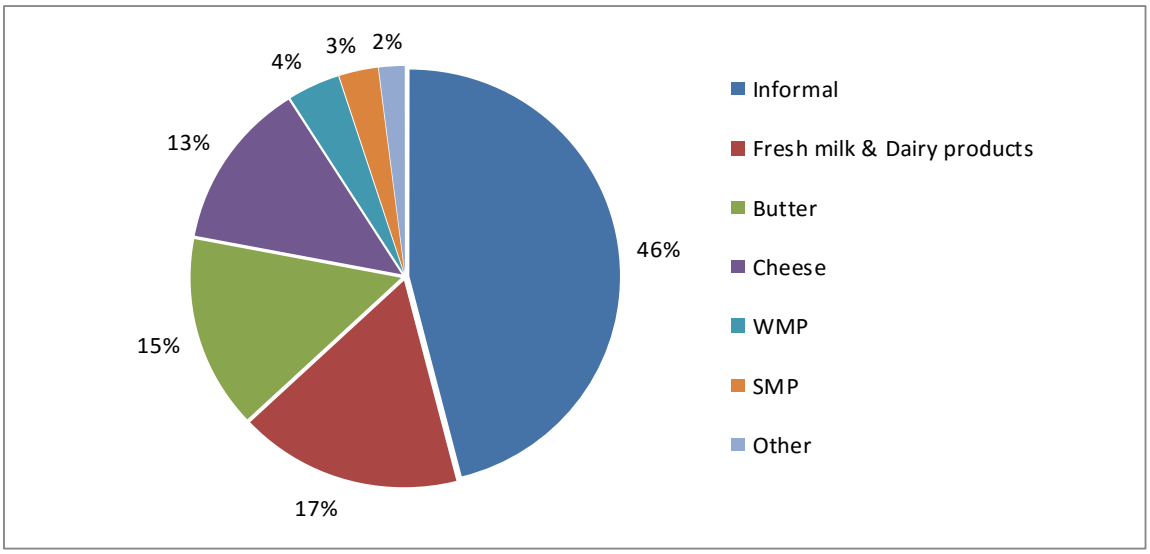

Figure 2. World dairy consumption– by product type.
Source. (IDF 2015)

Trade

Cross border trade of some dairy products is significant. For example, in 2011, almost 80% of WMP production and 50% of SMP production was traded internationally (IDF 2012). The OECD-FAO projection is that by 2025 this will still be high at 61% and 49%, respectively, with New Zealand's share of WMP world trade remaining at 54% (OECD-FAO 2016). For such product categories (having a high trade to production ratio), a relatively small change in supply-demand balance of milk can have a significant impact on the dynamics of trade as witnessed in WMP when China (which held 28% of world import share in 2014), dropped its imports 34% from 2014-15 (OECD-FAO 2016). This phenomenon, along with the impact of protectionist legislation, act as an important source of volatility in global dairy markets.

Dairy Exports and Imports

Although the world dairy industry is extremely fragmented, when it comes to international trade, the market is quite concentrated with the top four supplying regions covering 70–80% of the world's total export volume (IDF 2015). However, on the demand side the market remains fragmented.

Currently, New Zealand is the largest exporter of dairy in the world and accounts for 28% of world trade. The other key exporters are the EU (26%), US (14%) and Australia (6%). Since the year 2000, New Zealand and the United States have seen an increase in their share of world dairy

trade, while both the EU and Australia have seen a decrease (Figure 3). New Zealand in 2014 was the largest exporter of WMP and butter and butter oil, while the EU was the most significant exporter of cheese, SMP and whey.

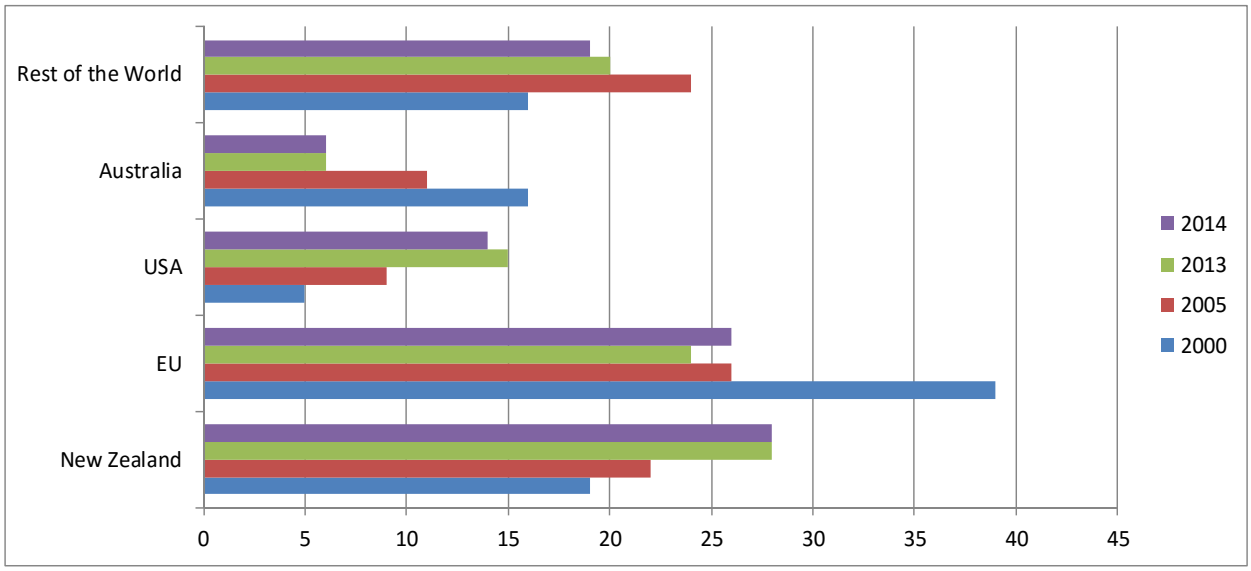

Figure 3. Export share of key dairy exporters–over time (%)
Source. International Dairy Federation (IDF) 2015

On the import side, the mix of nations is quite variable and is product dependent. Russia has been the largest importer of cheese and butter (oil), and China the largest importer of WMP, SMP, and whey. Other significant importers are Japan (Cheese), China (butter oil), Algeria (WMP), Mexico (SMP) and Russia (whey).

The self-sufficiency rate, defined as the ratio of a country or region's share of global milk production and global milk consumption, is an important factor that influences the degree as well as the direction of trade flows. From 2005 to 2014, the only region to report a decrease in self-sufficiency has been Asia. In 2014, Asia with a 38.4% share of world production and 42.9% share of world consumption had a self-sufficiency rate of 90% (IDF 2015).

Dairy Industry

The global dairy industry is extremely fragmented with the top twenty-one processors accounting for just 21% of world milk production. The industry is dominated by many small players that operate at the regional/local level. In terms of revenue/turnover (in Billion USD from dairy alone), the top five dairy companies in 2014 were Lactalis (21.9), Fonterra (18.7), Nestle (18.3), DFA (17.9) and Friesland Campina (15.0) (IDF 2015). Furthermore, there were twenty-five dairy companies (located in eleven countries) that recorded a dairy turnover exceeding 3.5 billion USD (IDF 2015). A unique feature of the dairy industry is that these companies can just as likely be clients of each other or working in strategic alliances in certain markets as competing with each other with branded products. The cooperatives, who commit to pick up all milk produced by their members, are more often the companies that provide ingredients to other companies as well

as develop their own brands. In recent years there have been significant mergers, acquisitions and strategic alliances between various players as they jockey for position in the growth of global dairy trade.

The leading customers for dairy products in the formal market are food retailers, the food service industry and the food processing industry. The products they purchase range from branded products (mostly regional with few global brands) to ingredients with a wide range of higher value specialized ingredients in between. Base ingredients, commodities, are traded on various derivative markets including the NZ Stock Exchange (NZX) and the Chicago Mercantile exchange (CME). The prices attained on these markets often form the reference point for more specialized ingredients' values and for the price paid to farmers for their milk.

The NZ Dairy Industry

Historically, the New Zealand dairy industry has been dominated by co-operatives, and this continues to be the case. Currently, co-operatives account for nearly 95% of New Zealand's milk production, with New Zealand's largest company the Fonterra Co-operative group alone accounting for about 85% of NZ milk production. However, as a result of the expansion in global demand for milk and new dairy products and encouraged by NZ legislation (described in the next section), New Zealand has increasingly become a destination for global dairy companies for sourcing quality milk and producing dairy products. This has been reflected in an increase in Foreign Direct Investment in dairying and milk processing in New Zealand in recent years, and it now accounts for over half of all disclosed agribusiness investments, with 31% in milk processing and 20% in dairying (KPMG 2015).

In 2014, for example, several foreign firms either entered or consolidated their presence in the NZ dairy sector. The French firm Danone, through its subsidiary Nutricia, acquired a milk drying plant (Gardians) and a packaging operation (Sutton Group). The Dutch dairy cooperative Friesland Campina, increased its stake in the New Zealand dairy company Synlait by 2.5%, raising its shareholding from 7.5–10%.

In 2014/2015, there were three dairy related investments by Chinese firms in NZ. The Chinese dairy company Yili, which reported a turnover of 8.8 billion USD in 2014, purchased the NZ dairy company Oceania Dairy in 2013 and is in the process of constructing a new milk powder and UHT milk factory in New Zealand. The Yashilli group made a $212 million investment in a milk processing plant that will manufacture infant milk powder products. On the farming side, SFL holdings have acquired Synlait Farms for $85 million. In general, Chinese investment in NZ reflects a strong focus on dairy (KPMG 2015).

Apart from foreign firms and investors, New Zealand-based dairy companies have also made significant investments in milk processing and product manufacture. In order to be better placed to make a product mix that delivers improved returns to its NZ farmers and meet the needs of its global consumers and customers, the Fonterra Cooperative Group has made investments to the tune of US$1.1 billion in New Zealand since 2012 (CNIEL 2014). The majority of this investment (US$870 million) has been in milk powder manufacture with smaller investments made in cheese manufacture (US$130 million) and UHT milk production (US$100 million) (CNIEL 2014). Of the other NZ based dairy firms, the cooperative Tatua made a NZ$65.5

million investment in a new dryer in 2014. The South Island based dairy cooperative Westland invested NZ$114 million in an infant nutrition plant and NZ$40 million in a UHT milk production plant. Synlait, a listed dairy company with significant Chinese ownership, also in the South Island invested $100 million in 2011 in a dryer.

New Zealand currently exports dairy products to nearly 140 countries. As there is no uniform consensus and agreement on market access requirements across countries NZ dairy processors cannot produce a product of a single specification and hope to export it to all their markets. Instead they need to produce products keeping in mind the specific market access requirement of the destination market/country. This adds another layer of complexity and challenge for NZ dairy exports. Apart from the specific known market access requirements, NZ exporters also need to be aware of the local context of import markets and work closely with the NZ government to predict possible hurdles to market access that might be introduced.

The Legislative Background

In 2001, the Dairy Industry Restructuring Act 2001 (DIRA) was passed that enabled the establishment of Fonterra, a merger of two dairy co-operatives (Kiwi Co-operative Dairies Limited, the New Zealand Co-operative Dairy Company Limited) and the New Zealand Dairy Board. The form that Fonterra took was determined in part by legislation and in part by changes to the constitution approved by co-operative members at Fonterra's inception.

DIRA provided for significant ongoing constraints on Fonterra's behavior to address concerns about the possible competitive effects of the merger. One of the primary constraints placed on Fonterra by DIRA was the requirement of "open entry and exit" at fair value as described by Shadbolt and Duncan (2016). DIRA also required that Fonterra must make up to 5% of its milk production available to independent processors at a regulated milk price that references Fonterra's farmgate price. This was to ensure that NZ consumers could be served by a variety of providers, not all of whom needed to have the capability to pick up milk. The rationale for this regime was also to keep barriers to entry for new competitors sufficiently low to promote a competitive price for milk at the farm gate, despite the fact that as a cooperative Fonterra has an imperative to pay the highest milk price to its owner-suppliers on a long-term sustainable basis.

Fonterra's constitution determined that shares were issued and surrendered at their "Fair Value." The motivation for this change stems from "free-rider" tensions within the Co-operatives during the phase of rapid industry expansion in the last half of the 1990s which required substantial investment in new processing capacity. Fonterra also determined the rules by which it sets its farmgate milk price (which ultimately determines its share price). The Global Dairy Trade (GDT) auction platform was implemented in July 2008 to provide an objective reference point for the setting of Fonterra's Farmgate Milk Price and hence improve price transparency. Fonterra sets one average farmgate price, based on five reference products sold on GDT, for the whole season's supply of milk. This final price evolves over the season as market demand and exchange rates vary, so it is not determined and paid in full to the farmers until after the end of the season.

The China Factor

New Zealand dairy exports to China have increased substantially over the last seven years, enabled by the NZ-China Free Trade Agreement (NZ-China FTA). Domestic milk production in China increased 9.3% per year from 2004 to 2009, but after a food safety issue in 2008 there was no growth (-0.7% per year) so imports were required to meet their increasing demand (IDF 2015). The demand increase saw the value of NZ dairy exports to China increase significantly from 21% of total exports to 46% in 2013 (Figure 4). Supply, and to a lesser extent demand, shocks have had a big impact on exports. Undersupply, due in part to animal disease outbreak in China, led to the sharp increase in imports and price spikes in 2013/14 (Figure 5). Farmer response (unfettered in the EU post quota removal) to the price spike (unfettered in the EU post quota removal) led to oversupply in 2015. This plus inventory and demand issues led to a 34% decrease in WMP imports by China (OECD-FAO 2016) and a subsequent correction in global dairy price.

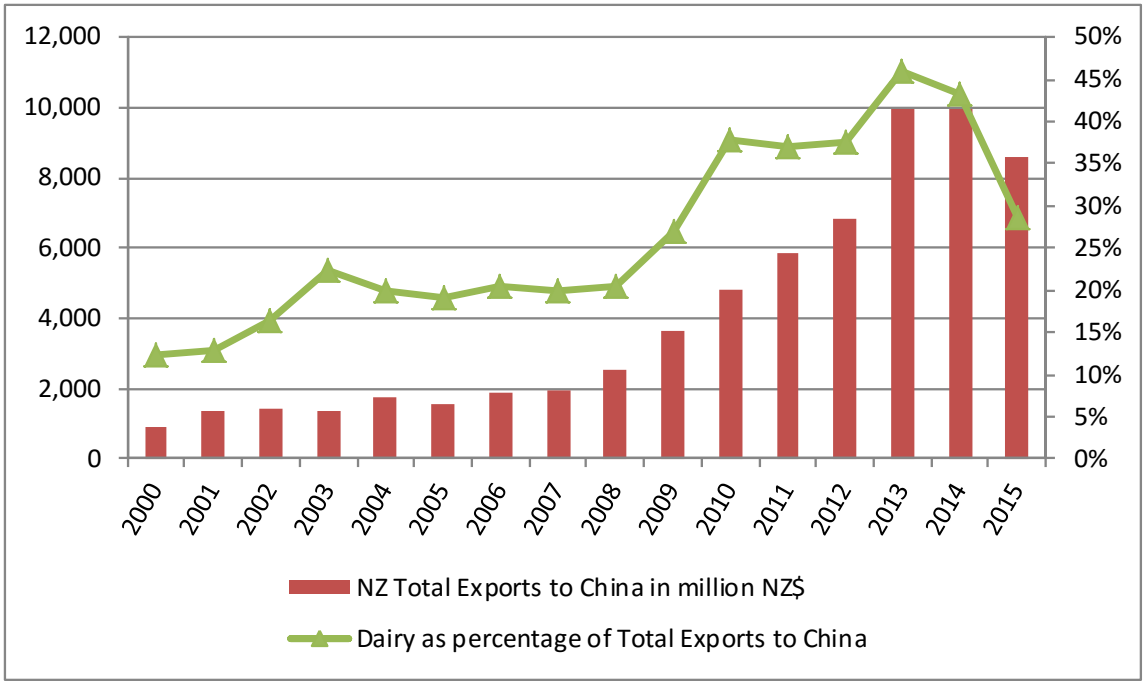

Figure 4. NZ total exports to China and dairy exports as a percentage of the total.
Source. NZ Statistics (2016)

Despite the correction in 2015, China's economic growth, increasing urbanization and growing household incomes, combined with limitations in its own dairy sector, continue to deliver opportunities to the New Zealand dairy industry. China's domestic supply, estimated at 30.3 million tons in 2014 (IDF 2015), is insufficient to meet its growing demand. The Chinese government has initiated reforms and implements programs that enable productivity and production improvement that also address animal health and food quality issues. This has included requiring importers of dairy product to invest in the dairy industry in China to assist in the development of safe, high-quality Chinese dairy products.

Milk Production in New Zealand

Over the last twenty years milk production in New Zealand has increased by 127% from 9.3 billion liters (1995–1996) to 21.3 billion liters (2014–2015), and grown at an average rate of 4.7% per dairy season (SD = 4.6%) (Figure 5). During this period, variation in milk production by year were more related to climatic conditions than market conditions (IFCN 2015), a significant point of difference of NZ dairying. The steady climb in milk production, despite short-term price variation, indicates a longer term perception of the opportunities in dairying. Analysis of NZ dairy farmers' perceptions of risk by Shadbolt and Olubode-Awosola (2013) observed an interesting combination of perceived threats from global economic and political situations with perceived opportunities from global supply and demand indicating a perspective of NZ dairy farmers commensurate with global players in an international market.

The rapid increase in milk production has had some unintended consequences within NZ. The environmental impact of higher stocking rates especially on free draining soils and under irrigation, or in high rainfall areas, is now being closely monitored and controlled. As NZ environmental legislation is outcome driven, the farmers are being tasked with delivering to increasingly tighter specifications which have resulted in significant investments on the farm to improve water quality. Society also has a heightened awareness of animal welfare and labor issues. Despite being an agricultural nation, urbanization has increased the lack of understanding of farming and farm practices, hence the stronger scrutiny.

Farmgate milk price volatility has increased since 2007 as can be seen in Figure 5. While the average price since 2007 is 70% higher than the preceding years, the volatility is 150% more. With over 96% of milk products exported the vagaries of both global markets and exchange rates have a significant impact on price achievement.

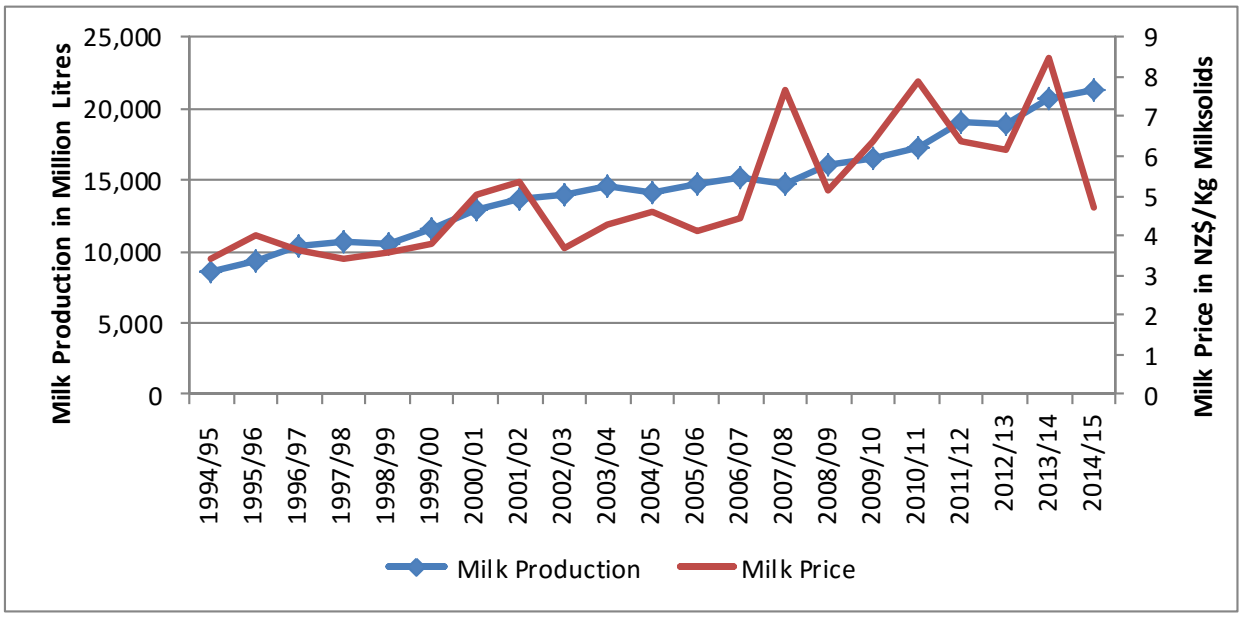

Figure 5. NZ milk production and price trends
Source. LIC (2015)

Farmers achieved this increase in milk production by increasing cow numbers and the area of land under dairying from 1980/81 to 2014/15 (Figure 6). The average annual growth rate for cows was 2.7% (SD = 2.2%), while the growth rate for the area under dairying was 1.7% (SD = 2.6%). From 1980/81 to 2007/08, the number of dairy herds decreased by 170 herds per season but then increased due to more conversions of non-dairy farms to dairying. In 2014/15 there were 11,970 dairy farms, 5.02 million dairy cows and 1.746 million hectares under dairying in New Zealand (LIC 2015). The average farm size in terms of cows was 419 and in terms of hectares were 146 ha. Much development of dairy farms this century has occurred in the South Island that now has 26% of farms and 39% of cows and milk production; and has larger farms, many of them irrigated.

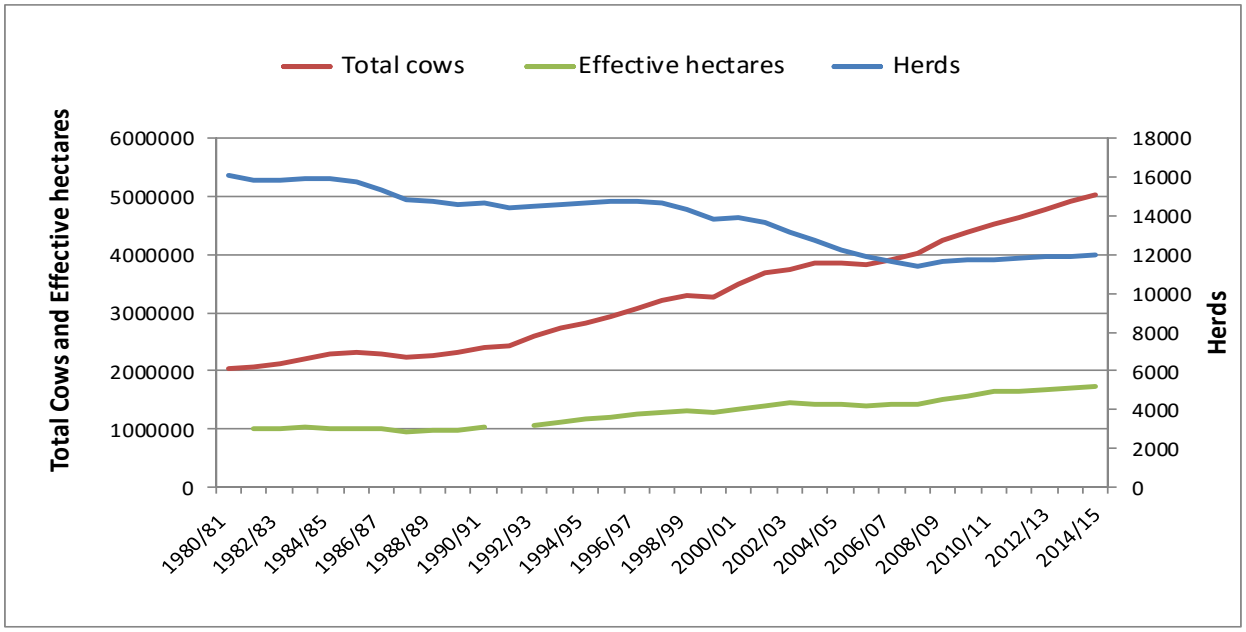

Figure 6. NZ–Trends in number of cows, herds and area under dairying
Source. New Zealand Dairy Statistics 2014–2015 (LIC 2015)

Optimism in dairying has resulted in increases in land prices, conversions of land to dairy and significant on-farm investment with a commensurate increase in dairy sector debt from $11.3 billion to $37.9 billion between 2003 and 2015 (Dunstan et al., 2015) representing 10% of total NZ bank lending. Farmland in NZ has a much higher turnover than in many countries, and multiple forms of ownership and management structures have evolved since 2003 as farmers have built equity (Reekers et al., 2007). The 'home' farm can now be the base for a number of equity partnerships or sharemilking contracts on other farms. While farmland values increased it was possible to gain leverage on debt but when milk prices decrease, land prices can adjust down putting debt at risk. But, as outlined by Dunstan et al. (2015), a combination of low-interest rates and a positive long-term outlook for milk prices have supported land prices throughout 2015. However, based on their estimate that 49% of farmers did not break even in the 2014/15 season, and that 80% could have a negative cash flow in the 2015/16 season, they suggest a weakening of land values is possible.

Seasonality–A Unique Feature of New Zealand Milk Supply

In the extensive pasture-based farm systems of New Zealand cows are free range and not housed. Pasture growth is dependent on climatic conditions and has a distinct seasonality curve (Figure 7) and varies according to climate, specifically rainfall and temperature. Pasture growth is most abundant and reliable in Spring (September to November), lowest in Winter (June to August) and least predictable in the summer (December to March).

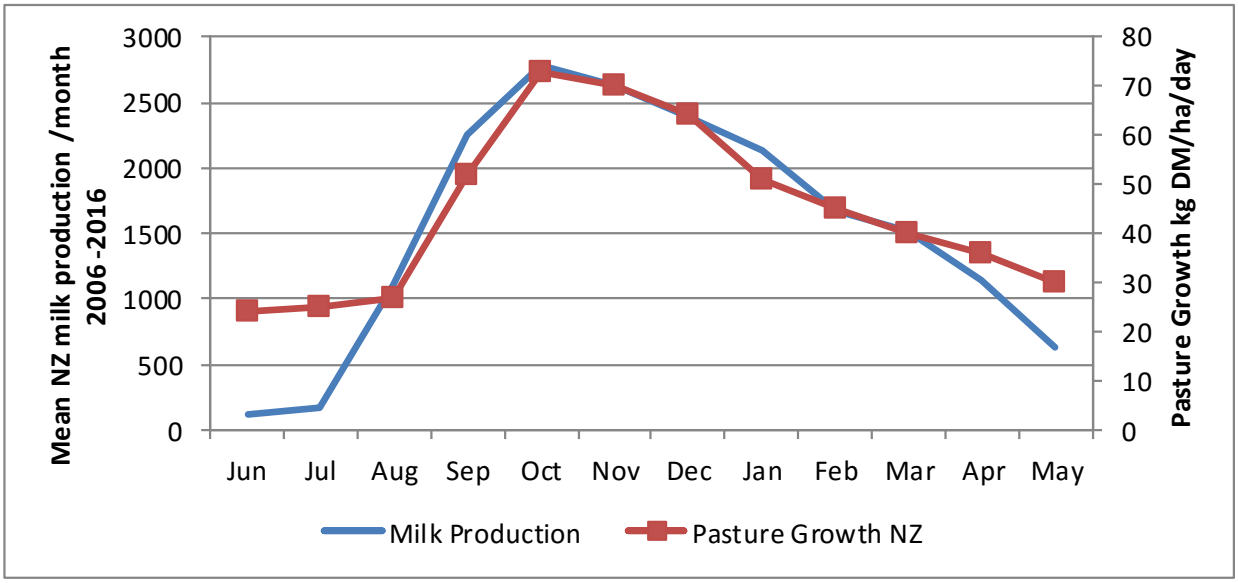

Figure 7. Typical pasture growth curve of NZ and Mean NZ milk production per month
Source. DairyNZ (Ruakura -16.4t DM/ha /year); DCANZ 2006–2016 (www.dcanz.com).

Since milk production in New Zealand is driven by available pasture and forage crops, it too follows a distinct seasonal pattern with the shape of the milk production curve being a reflection of pasture seasonality (Figure 7). In practice, the milking season in New Zealand starts in August (with cows calving) and ends in May (with cows being dried off). This ensures that the period of a herd's maximum feed requirement (at potential peak milk production and based on a tight calving pattern) is alignmed with the period of maximum pasture growth in spring. Few farms produce milk during the winter months of June and July. The low levels of milk produced during the months of June and July (termed "winter milk") primarily supply the domestic dairy market with fresh dairy product and the export of shorter shelf-life products such as UHT milk.

Milk output from pasture shows distinct variability both in volume and quality, with a lower degree of control over intake and diet quality and hence cow performance expected in pasture-based feeding systems (Gazzarin et al. 2011). The standard deviation around the mean milk production illustrated in Figure 7 shows variation up to 14% during the months of September to March and up to 25% in the shoulder months. Milk produced from pasture also shows higher variability in fat and protein content over time; a lower proportion of saturated fatty acids (Wyss et al. 2011) and lower total somatic cell counts than milk from indoor systems. Such variability, coupled with the normal changes in milk composition over lactation, which are concentrated by seasonal production, provide challenges for the processor.

The processing industry, in response to the seasonal production curve, has evolved to efficiently make long-life products from milk at peak – powders (WMP, SMP), cheeses, whey products and fats (butter and AMF). With milk production at peak nearly twenty-five times that of production in mid-winter the processing plants operate at varying levels of capacity through the season. The optimal product mix for NZ to manufacture is based on the relative values of the various products. In recent years the powder prices have dominated resulting in all processors (existing and new) increasing dryer capacity. Powder manufacturing in NZ has achieved significant economies of scale, the Fonterra Darfield D2 dryer producing at 30 tons per hour (www.fonterra.com). The relative value of cheeses, whey products, and fats with respect to powders varies from year to year, so optimizing production requires variable use of the existing capacity in NZ. More perishable products such as soft cheeses and UHT milk require a more constant milk supply so they are less suited for strong seasonal supply curves and are catered for to a lesser, but growing, degree by additional processing capacity.

Farmer Decisions that Influence the Milk Supply Curve

As pasture growth is reliant on the weather, variability of feed supply is common. As outlined above variability in farmgate milk price is also common with the final price not known until after the end of the production season. In order to profitably balance the supply and demand of feed, dairy farmers in New Zealand use a range of management practices. If pasture is in short supply later in the season, farmers will reduce feed demand by milking once a day, reduce the number of cows on the milking platform by drying off early and culling unproductive cows. They might also feed supplements (grass or maize silage or palm kernel extract) if available and economic to do so. Earlier in the season, they will attempt to boost pasture growth by applying nitrogen fertilizers and also use feed supplements if available and economic to do so. When pasture is abundant, farmers will conserve surpluses into silage and hay and make every effort to keep cows in lactation as long as possible. When milk prices are trending favourably farmers might carry more cows and purchase more supplements to meet any feed deficits, and vice versa. Interestingly, if pasture is available but milk prices are low cows will still be milked, this response is due to their high fixed-cost system, and is contrary to farmer responses in the higher variable-cost systems of the EU and US. Other than those farmers carrying higher cow numbers, when milk prices vary they are not as influenced by milk–feed price ratios as US and EU farmers. Instead, production is influenced by pasture availability which, for all but the irrigated farmers, is determined by rainfall. Farmers in New Zealand aim to optimize production per unit area (hectare), instead of production per cow, as is more common in intensively housed systems.

Cost of Production–The NZ Advantage

The International Farm Comparison Network (IFCN) produces a comparison of cost of milk production by country and presents their findings annually. In the IFCN reports New Zealand has historically and continues to have the lowest cost of production along with other Southern hemisphere countries that also export into the global markets. In 2014, the average costs of production for New Zealand were around US$37/100kg milk while that in Western Europe and North America were around US$61/100kg milk and US$53/100 kg milk respectively (IFCN 2015). In that year the prices achieved were not dissimilar between countries resulting in NZ farmers being very profitable. Since then prices have decreased significantly, although global price signals took longer to be reflected in US and EU farmgate prices. At such levels profit is elusive to almost all dairy famers in the world.

Following milk price increases in 2007/08, NZ dairy farmers increased their spending. Costs of production, operating expenses, went from $3.70 to over $5/kg milk solids (Hammond 2016). While some farmers intensified, moved up the cost curve, producing more milk with more cows and bought in feed, others just spent more. Commentary in the NZ farming press suggests intensification removes NZ's competitive advantage but initial analysis by Shadbolt (2012) further extended by Hammond (2016) show the cost of production per kilogram of milksolids being no different across both low input and higher input systems. The challenge as milk prices fall is to decrease cost of production per unit of milk. This is not as simple as just reducing costs. Recent analysis has identified how in pasture-based farms where the majority of costs are fixed, this is best achieved by those who successfully harvest more grass and therefore produce more milk from those fixed costs (ANZ 2016). Pasture and grazing management skills are a necessity when prices are low. Reducing cow numbers, and reducing the use of imported feed when marginal feed costs are higher than the price of milk, is a given. Preliminary IFCN cost of milk production only estimates for 2014/15 indicate a 16% reduction (Shadbolt, pers comm.). DairyNZ (2016) report a further decrease in net costs[1] of 10% in response to lower milk prices in 2015/16 and predict an additional 4% for 2016/17. While the break-even price they calculate is still above the predicted milk price it does illustrate the ability of NZ farmers, in the absence of any government support, to respond quickly to global milk prices.

For those farms with high debt levels servicing that debt is an additional fixed cost. As outlined earlier dairy farm debt has increased, with debt to asset percentages increasing from 35% to 46% in the last ten years (DairyNZ 2016a). However the impact of this debt has been softened by decreases in interest rates during the same time period such that interest and rent paid as a percentage of gross farm income has reduced from 23.5% to 21.5% despite interest and rent paid per kilogram of milksolids increasing from $1.08 to $1.36 over those same ten years. Decreases in milk price, production levels and land price all worsen the metrics used to determine vulnerability of businesses—ultimately it is the cash flow of the farm and the ability to manage discretionary spend that determines the robustness of the business. In depth analysis over six years of data by Shadbolt and Olobude-Awasola (2013) determined that debt and its various metrics were not the distinguishing factor in business success over time, instead it was the operating profit margin, the ability to flex with the seasons adjusting expenditure to revenue.

Future Scenarios

Uncertainty is a fact of life in NZ dairying. However significant investments are made both on and off-farm based on a view of the future. A recent scenario analysis exercise by the Centre of Excellence in Farm Business Management (Shadbolt et al. 2016) identified the common view of the future and compared that with three other possible, plausible futures. The rationale for this exercise was a belief that too many farming systems were being developed around the 'common view' with a strong on-farm focus, paying little attention to emerging global trends, other than the growing demand for dairy.

The futures identified in the scenario analysis reflect the interpretation of sixteen specific local and global uncertainties. The analysis involved a multitude of stakeholders to arrive at four

[1] including farm working expenses, interest and rent, tax and drawings; and net of livestock and other income received. Excluding unpaid family labour and depreciation.

possible plausible future scenarios that the NZ dairy industry could be operating in in ten-years-time (See Table 8). These scenarios include: **1) Base Case**—increased complexity, competition and volatility, **2) Consumer is King**—the volume to value revolution, **3) Governments Dictate**—political chaos and shrinking markets and **4) Regulation Rules**—it is our "privilege to serve". The scenarios developed describe a range of futures. No attempt was made to assess the relative probability of these futures, and each of these futures is deemed possible and plausible. Shadbolt et al (2016) concluded that the future is most likely to contain a mix of elements from the various scenarios, and it is probable that the future will lie somewhere between the four scenarios. The base scenario reflects the current trends but the setting is delicately balanced, hence, each of the four scenarios is equally relevant to the industry.

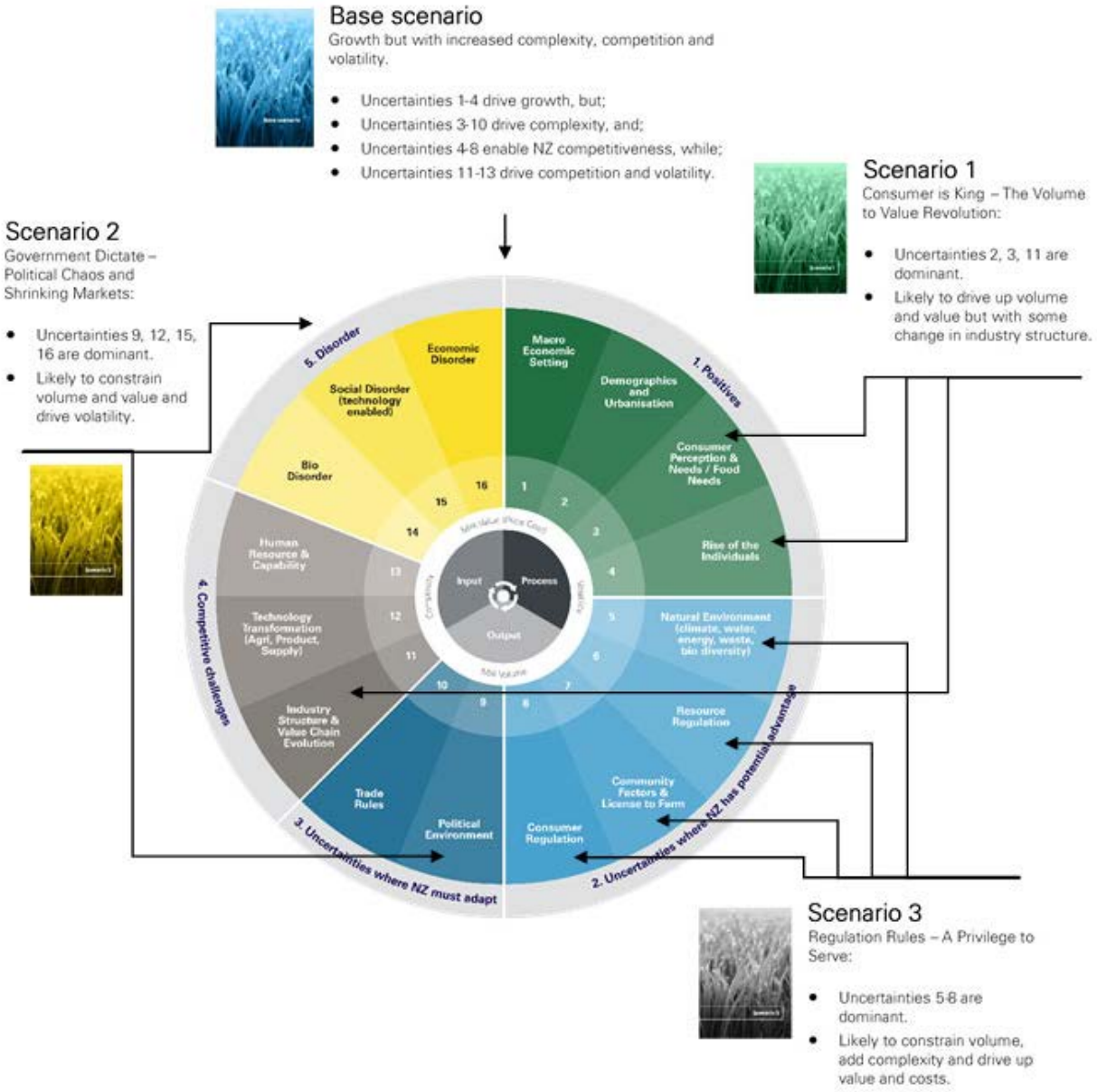

Figure 8. Four Scenarios for the NZ Dairy Industry developed from sixteen uncertainties.
Source. Shadbolt et al. 2016

Overall, each scenario presents challenges to the NZ dairy industry which indicates that changes are required across the NZ dairy value chain in order to thrive and be resilient across the scenarios described.

Conclusion

New Zealand is a global trader in dairy by definition so must pay heed to changes in global supply and demand. Within NZ the dairy industry must also ensure it minimizes its environmental footprint and is exemplary in its treatment of animals and staff. Despite being a major contributor to the nation's wealth, it cannot take its freedom to operate for granted. While well positioned to take advantage of the forecast increase in demand for formal trade in dairy products in Asia, in particular, it is challenged by the high trade-to-production ratio for most of its products. Although it is a major player in global dairy trade it is challenged by the thinness of the market and the impact that quite small supply or demand shocks can have on world price. The reliance on rainfall provides an additional complication to seasonality of production with processors running plants at varying levels of capacity throughout the season. Ultimately it is the ability of the integrated dairy chain, from NZ to all of its various markets, to flex with the uncertainties of production and prices, local and global issues, and achieve returns for all players that does and will determine its success. It is this ability to produce milk competitively that has enabled NZ to establish itself as a major player in global dairy markets.

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