

Dairy Industry Scenarios: Informing Dairy Farm Systems for the Future

Professor Nicola M Shadbolt (MU)
Simon Hunter (KPMG) - Facilitator
DJ Apparao (MU) – Project Manager
Dr Kathryn Bicknell (LU)
Dr Liz Dooley (MU)
Guy Trafford (LU)

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Ministry for Primary Industries
Manatū Ahu Matua



DairyNZ 

FOREWORD

Hello and welcome to our dairy industry scenarios document in which we will take you through our journey of deliberation in the quest for possible, plausible futures for the NZ dairy industry. There were quite a few people/organisations who joined us, on and off, in this journey, and all contributed greatly to making this a rigorous exercise. Creating discomfort by forcing discussions beyond the current norm is the strength of scenario analysis, thank you to all those involved who provided argument and counter argument as each scenario was built, and then strengthened.

Why did we take this approach when our project was ostensibly about improving farm system design and analysis capability? It was quite simply because we felt that such capability was being limited by the fact that too many farming systems were being developed around a common belief of the future. Industry commentary tended to deliver very similar pictures of the future, which were not being challenged or extended. Often such commentary was trite, short term in its perspective, producing simplified 'recipes' for success with a strong on-farm focus and paying little attention to emerging global trends, other than the growing demand for dairy. Given the volatility we face we must be able to see through the noise of current events and understand the underlying issues that are shaping the future of our dairy industry.

While we can learn a lot from history, it certainly informs, it cannot be used to set strategy. This is because strategy is future focused and is crafted on a perception of future issues and their ability to deliver opportunities and threats. Strategy inherently includes risk, as the future is unknown, so it is sensible to identify those risks and understand the impact they will have. This is where scenario analysis is most powerful as a tool and I hope once you have read our journey of deliberation you will have a wider appreciation of those risks. You will not necessarily agree with any one or more of these scenarios as your view of the future is already influenced by your history, prejudices, preferences, bias, knowledge and experience. We do not ask that you agree, per se, but that instead you reflect on the scenarios presented and ask how prepared are New Zealand farming systems for any one of these possible, plausible futures.

New Zealand dairy farmers have a reputation for being agile and responsive to whatever the environment throws at them – climatic extremes, legislative constraints, changing quality standards, variable milk and input prices, to name but a few. That agility is partly born from necessity, as they farm with minimal support, so their business skills must be such that investment decisions are sound and on-farm practices robust. Their response to change is swift, often in advance of their trusted advisors, and just as swiftly has led to success or failure followed by a great deal of 'wisdom in hindsight' commentary. The current volatile climate has challenged the business skills of our farmers and our rural professionals, hence the need for this research project. The research team has worked with a wide industry group to develop and deliver this scenarios document to you. From here, a sub group, the modelling team working with farmers and consultants, has been developing and analysing systems for each scenario. If you would like to be involved in the development and testing of their ideas, please do let us know as applying collective wisdom to their solutions will best determine how NZ dairy can compete in the future.

I hope you enjoy reading about our journey of deliberation and thank you again to all those who have contributed to date.



Professor Nicola M Shadbolt (Project Lead)

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1. EXECUTIVE SUMMARY

The purpose of the Dairy Farm Systems for the Future project¹ is to explore how best to identify and design farming systems best suited to the changing environment and farmer circumstances.

The first step in the project was to describe that changing business environment to develop a better understanding by farmers, industry and researchers of possible, plausible future scenarios for dairying in New Zealand. These scenarios are now providing reliable and comprehensive information, a context, for the design and rigorous evaluation of a range of farming systems best suited to each possible, plausible future.

The scenarios were developed through a series of workshops and research phases throughout 2014/15. The process involved 68 industry stakeholders (25 organisations plus farmers/farm consultants) and resulted in the development of four scenarios. The scenario development process, outlined in this report, looked beyond the current views (the base scenario) to come up with three very different futures that the dairy industry could be facing in 10 years' time.

The futures reflect the interpretation of 16 specific local and global uncertainties/risks. In-depth research into the level of variation in, and the implications of, each uncertainty informed the scenario building process.

The four scenarios developed for the project were:

- Base Scenario – *Growth with increased complexity, competition & volatility,*
- Consumer is King – *The Volume to Value Revolution,*
- Governments Dictate – *Political Chaos & Shrinking Markets,*
- Regulation Rules – *It is "Our Privilege to Serve".*

The key conclusion from the process of building the scenarios is not a prediction of which scenario is more plausible, but that there are a diverse range of factors and uncertainties that will shape volume, value, cost, complexity and volatility across the industry. This is inherently understood by most stakeholders but is not always explicitly considered when making decisions. The key observations are:

- The process of developing scenarios forces consideration of the plausible alternatives and this by itself will enable better decision making.
- The analysis of the soft signals points to recent events that suggest each of the scenarios is already evolving today and should, therefore, be treated as being plausible
- It is impossible to predict the most likely setting and it is also clear that the future is likely to be some form of a fusion of the various scenarios

The four scenarios provide a framework for thinking in a world where disruption is the one evitable future, and to avoid the pitfall of naively thinking either the past will continue or there is a certain direction (the base scenario). This is useful for all stakeholders today. The key points when examining the group of scenarios are that they are all plausible, they all represent a significant shift from the status quo, they all involve significant investment and change and that none of these is easy. In all four scenarios there is a need for improved technology throughout the value chain; delivering to this challenge will be NZ's biggest challenge. Also of note is the need to be agile and to find solutions in which farmers, processors, marketers, funders, government, NGOs and society all play a role. There are significant risks identified for each scenario and New Zealand will have to respond effectively to stay competitive

The process of designing and modelling farm systems for each of these scenarios will take this a step further by making farm system options clearer, quantifying their outcomes, and therefore help stakeholders to make better decisions. Given the importance of Dairy to New Zealand's prosperity and the volatility the industry is currently experiencing, managing this next stage is critically important to the industry and New Zealanders in general.

¹ <http://www.onefarm.ac.nz/research/current-research/dairy-farm-systems-for-the-future/>

2. CONTEXT, OBJECTIVES AND APPROACH

2.1 Context and Objectives

New Zealand's current and future economic performance and prosperity is tightly tied to the success of our dairy industry. The dairy industry represents more than 40% of the primary industries' exports and 25% of the country's total exports. The dairy industry has been a significant contributor to the country's success for decades and in particular, New Zealand has relied heavily on the industry in the last decade to:

- Maintain our economic growth rates relative to those of our peers
- Buffer the New Zealand economy from declines in the other agribusiness sectors (Wine, Horticulture, Red Meat, Wool and forestry have all suffered significant downturns in the last 10 years)
- Protect our economy from the external impact of the Global Financial Crises

The success of the industry can be linked to a combination of:

- New Zealand's natural competitive capability (highly efficient pasture based farm systems and processing systems)
- The rapid evolution of New Zealand's farm systems (a combination of improved animal genetics, changing pasture and feed systems, precision farming, irrigation and better farm management)
- The relative success of New Zealand's primary processors and marketers
- Changes in global supply and demand

While this success is acknowledged, it is also very evident that:

- The industry is inherently volatile - New Zealand has a limited domestic market and competes in a relatively small traded market that is subject to quite significant shifts in supply and demand volumes and prices.
- The market environment is extremely competitive and there has been a significant shift in supply
- Dairy farmers must invest significant capital and operational spend to continue to grow and improve the farm system and stay competitive.
- Many external factors are having an increased impact on the industry (e.g. local resource regulation or global consumer expectations around animal welfare or the environment).

In this context, dairy farmers in NZ have been adapting their farming systems, often quite swiftly and in advance of industry analysis, with mixed results and much 'wisdom in hindsight' subsequent analysis. The Dairy Farm Systems for the Future project was established to develop a more rigorous approach for evaluating farming systems (current and future) for the industry. The development of farming systems requires first an appreciation by all stakeholders of the different possible futures the farming businesses might face. The objective of this first phase of the Dairy Farm Systems for the Future project, therefore, is to determine what those future business environments might look like.

The Centre of Excellence in Farm Business Management (www.Onefarm.ac.nz) leads this project in collaboration with key industry players. In the North Island, the farming system design work, will be associated with the Massey University's No 1 Dairy Farm, in the South Island with the Lincoln University Dairy Farm. It is supported by relevant literature reviews and informed throughout by Centre and university funded postgraduate research on all topics of relevance

The first phase, the scenario development process, looked beyond the current probable future to come up with 3 or 4 very different, but plausible future environments that the NZ dairy industry could be operating in in ten years' time. In the system design, analysis and modelling stage that followed, these

alternative futures provided the context for designing high-performing farm systems that are resilient under different scenarios and for exploring their performance under the different scenarios.

The scenario planning/development stage of this project, designed and facilitated by KPMG started in May 2014 and centred on 3 half-day workshops at Massey & Lincoln Universities. The workshops comprised of participants (named the Working Group) from throughout the industry with diverse backgrounds (with a direct or indirect interest in dairying).

The objective of the first Workshop (held in June & July 2014) – was to identify the most important issues/ uncertainties that could potentially influence the future of dairy farming in New Zealand. A total of 16 issues/uncertainties were identified. Following the first workshop, the research team worked on putting together a short research brief on each of the identified uncertainties.

The purpose of the second Workshop (held in October 2014) was to develop a set of future scenarios for the dairy industry. To achieve this, participants drew from previous workshop discussions as well as research briefs developed by the research team. At the end of the second workshop, the base assumptions and 3 Scenario themes (Consumer specificity, Geo-political chaos, and Increasing regulation) were finalized/ agreed upon by the working group. Following the second workshop, the research team worked on creating a description of the base case plus 3 scenarios.

At the third workshop (held in December 2014) the plausibility of the base case and 3 scenarios developed by the research teams was reviewed and validated by the working group.

At the end of this process, the following 4 scenarios were developed:

- Base Scenario – Growth with increased complexity, competition & volatility,
- Consumer is King – The Volume to Value Revolution,
- Governments Dictate – Political Chaos & Shrinking Markets,
- Regulation Rules – It is our “Privilege to Serve”.

During the farm systems design and modelling phase (second phase) of the project, the scenarios were presented to two distinct working groups – one that comprised entirely of farmers and one that comprised entirely of rural professionals. Although the primary objective of this exercise was to use the scenarios developed to inform the farm systems modelling discussion, valuable feedback was provided by both the groups, and was used to refine the scenarios further. The final version of the scenarios that incorporated the feedback received from the groups is presented in this report.

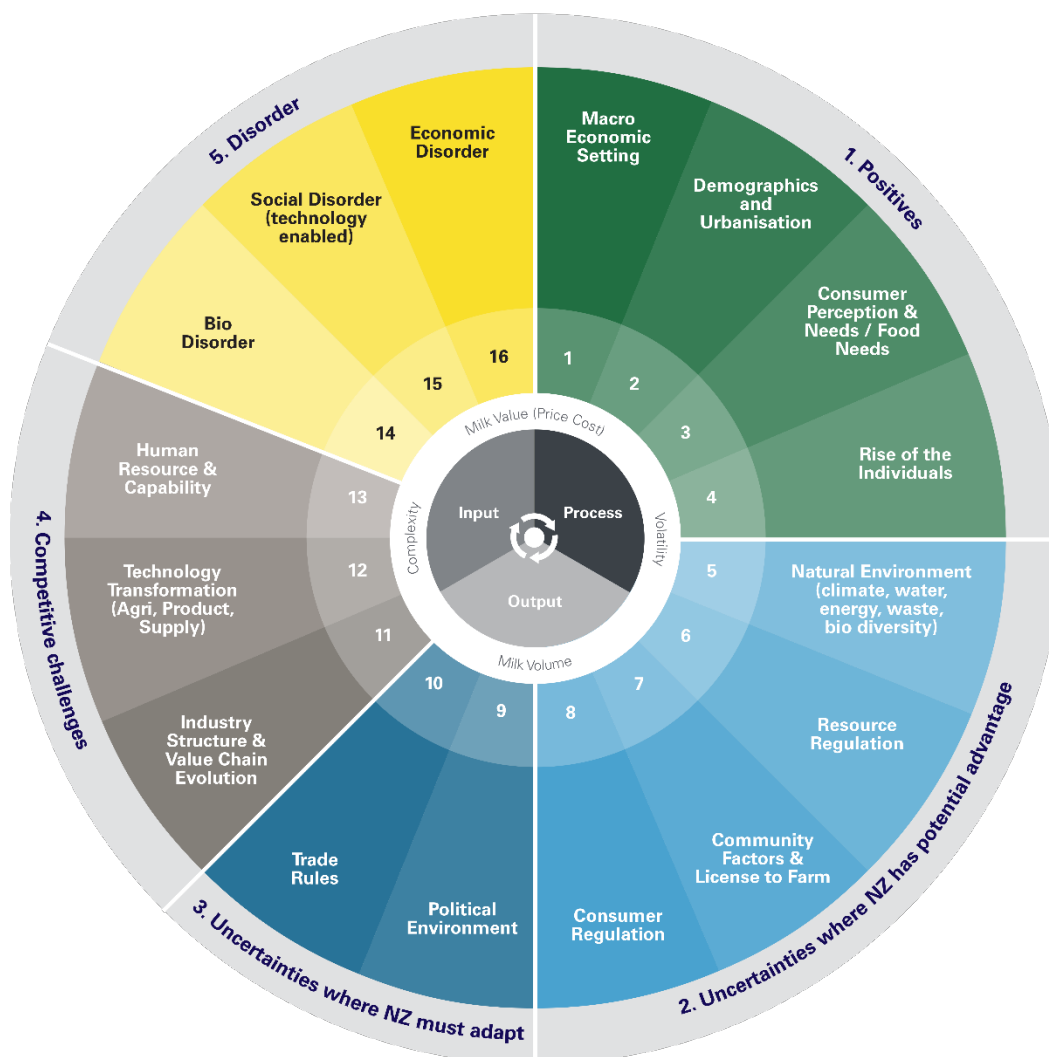
3. SCENARIO DEVELOPMENT AND TRENDS

The three phases of the scenario development process included:

- Identification of a range of uncertainties that could influence the farm systems
- Collation of facts related to the current uncertainty's and insights into the range of future settings (the trends) and rating of the uncertainty's in terms of both the potential level of variation and the implications
- Prioritisation and grouping of the uncertainty's to define and describe "a range of plausible futures"

3.1 Identification of Uncertainties

Subject matter experts identified factors from the economic, environment, social and political operating environment that might influence milk value, milk volume, costs or volatility or complexity in the industry. These factors were classified into levels - extreme or chaos factors and uncertainty factors. The initial 15 uncertainties and 4 chaos factors were systematically refined and regrouped through the process. These were refined to 16 uncertainties and disorders as the process evolved.




3.2 The Trends

The following table summarises some of the critical issues and trends associated with each of the final uncertainties. The uncertainties are segmented into 5 groups to reflect the current implied expectations or direction for New Zealand. This includes:

- Uncertainties where the direction is generally positive for New Zealand but the magnitude and explicit direction of change is unknown
- Uncertainties where there will be challenges for the industry (farming through to the consumer) but where New Zealand is perceived to be relatively well placed to respond
- Uncertainties where there will be change that requires New Zealand to adapt to
- Uncertainties that will play out in the relative competitiveness of the New Zealand industry
- The chaos factors

The following tables summarises some of the key factors

Uncertainty Groups	Uncertainty	Trends (10-20 Years)	Scenario Notes
Mainly Positive Trends – These factors should support growth and improved value	 <p>1 Macro-Economic Setting</p>	<p>Two paced global economy (with variability and hot spots)</p> <ul style="list-style-type: none"> • Developed world grows at >4% vs Developing world <2% (with pockets of distress) • Solvency of developed economies will be challenged by debt (Global net debt in developed world has increased from 46% in 2007 to 78% in 2013 and projected to 98% 2025), the cost of aged care (Developed world pension spend increases by 1.3% GDP over the period), health (increased by 3.1% GDP) and youth unemployment. The power of economies shifts to Asia (China and India will have 35% of the population and 25% of GDP). Developing countries will contribute 57% of GDP and cities will dominate (The top 600 cities account for 50% of GDP today – This will continue to grow. • Income inequality will have risen in 70% of countries (Urban Slum population is already 1bn and will increase) • There is massive Increase in connectedness (Global trade as % of GDP grows at 5% per annum vs 2% GDP growth) with growth of the “mega companies” (20 mega companies already dominate the food retailing and this will grow) • The pace of change will be too fast for many (The life span of companies at the top declines - S&P 500 companies life span has gone from 75 in 1937 to 15 in 2011 and is projected at 5 in 2025) 	These factors are positive for New Zealand's competitors

	<p>2 Demographics and Urbanisation</p>	<p>1 million more mouths to feed in 20 years (note: more older people, more people in Asia and more people in developing economies)</p> <ul style="list-style-type: none"> • 8bn people (Up 1bn - driven by growth in China/India/Africa), • 1bn or 13% above 65 years, • 90% of the global youth population reside in the developing world, • 80% of the global middle class will reside in developing regions (up from 58%) <p>The population will have moved to the cities</p> <ul style="list-style-type: none"> • 60% of population will live in urban cities (up from 50% ; 80% of growth is in Asia and Africa). • 1.3m people move to cities each week. • Mega cities will dominate the growth (cities with >10m people will increase from 20 to 37 – all these new mega cities will be in the developing world). China will have an urban population of 1bn. 2/3 of ASEAN urban population will live in 5 mega cities) • Many rural areas won't be able to maintain the infrastructure to be sustainable as a community 	
	<p>3 Consumer Perception & Needs / Food Needs</p>	<p>Consumer diversity will prevail (individual consumer decisions depend on the driving beliefs or factors such as religion, economic, environment, health) and:</p> <ul style="list-style-type: none"> • The hyper informed scrutinise what's important to them • Consumers will be less loyal, more demanding and more fickle or sensitive • Technology and data will allow consumers to focus on "attributes" - premium prices will be possible if the attribute can be authenticated 	<p>New Zealand should be able to leverage this but it will require significant investment</p>
	<p>4 Rise of the individuals</p>	<p>Supply chains will have adapted to hyper connected/informed individual consumers with diverse needs</p> <ul style="list-style-type: none"> • Middle class has grown from 2bn to 4bn (4.9bn by 2030) • 75% of population already has access to a mobile device (mainly smart phones) - 50% will have access to internet by 2020 • Mobile commerce will be 15% of global trade (this will be highest in Asia Pacific) • There will be very fast dissemination of information 	

<p>Uncertainty where NZ may have advantage</p>	<p>5 Natural environment</p>	<p>Natural resource stress will have been magnified:</p> <ul style="list-style-type: none"> • Climate is projected to be increasingly volatile - 0.5 c warmer by 2025 (2c by 2050) • Demand for energy will increase by 28% (fossil fuels still dominant at 75%) • Price of oil at US\$120/barrel by 2035 - Solar energy will be economic • Bio fuel production will compete for land use • There will be a water supply vs demand gap for 40% of the globe – 1bn people will live in areas of water stress and another 3bn in water scare areas • Water scarcity and ecosystem decline will contribute to serious decline in crop yields (mainly Africa) • Urban development compounds resource stress • Bio Security and Bio Terrorism are critical issues 	<p>There is potential for uncertainty 5-8 to be aligned</p>
	<p>6 Resource Regulation</p>	<p>It will become a rules driven world (as per consumer regulation)</p> <ul style="list-style-type: none"> • The dual drivers of consumer expectation and resource stress will force increased global regulation related to the natural environment (particularly emissions, water, energy use and bio-diversity) • Regulation will continue to move to ensure that the true cost of environmental impacts are accounted for in the P&L (Note: Unaccounted for environmental costs of Food production have been estimated to equate to 224% of EBIT – this is easily the highest across all sectors) • Regulation will be accompanied by increases in transparency through to the consumer • Regulation changes will be global (assume that NZ is well positioned but expectation is that resource regulation must be centralised to be effective) 	
	<p>7 Community Factors and License to Farm</p>	<p>It will be harder to operate (as per consumer and resource regulation)</p> <ul style="list-style-type: none"> • Community and consumers real understanding of food production activities and impacts on the environment and animals is imperfect leading to higher levels of scrutiny • Regulation change is global (assume that NZ is well positioned but technology is needed to enable transparency) 	

	<p>8 Consumer Regulation</p>	<p>It will be a rules driven world:</p> <ul style="list-style-type: none"> • There is likely to be a massive increase in compliance driven by heightened Consumers expectations (particularly food), data and technology capabilities, government intervention to “protect” its consumers (and local suppliers) and retailers desire to protect their position with their customers • There will be rapid changes in the amount of global trade, role of global companies and increased supermarket penetration which will magnify the demand for compliance • Food is the product category most affected (focus on health, safety, animal welfare, free trade etc.) with expectations of traceability and transparency 	
<p>Uncertainty NZ may have to adapt too</p>	<p>9 Political Environment</p>	<p>There will be shifting instability (instability continues to move across the globe):</p> <ul style="list-style-type: none"> • Level of conflict (1.5 b. people in conflict zones now and escalating) • Increased religious based division • Equality for women vs oppression of women – Woman in labour force increased 60% from 1990 to 2011 but patterns vary • Youth unemployment and Male / Female imbalance in some countries 	<p>This is likely to be linked to one of the disorder factors</p>
	<p>10 Trade Rules</p>	<p>Give and Take</p> <ul style="list-style-type: none"> • Bilateral trade deals continue at pace • Major Multi-lateral Trade deals are expected to be completed (e.g. TPP and Free-Trade Area of the Asia-Pacific (FTAAP)) • Non-Trade barriers (particularly for food) are a major risk / constraint (Magnified by food security concerns) • Global Debt means average farmer support for OECD must reduce from current 18% • Dairy remains one of the most challenging commodities and significant barriers will be retained through to 2025 	

11

Industry Structure and Value Chain Evolution

There will be a trade-off between Globalisation / Scale / Complexity / Control and the nimble niche

- Global trade grows at over 2.5X GDP growth
- Mega enterprises develop in most sectors to control a significant portion of trade (Top 20 companies)
- Shelf life (how long they last at the top) of leading enterprises will shorten
- Value will often be realised at the ends of the value chain (e.g. input providers value from intellectual property and technology, value from brands or value to the seller to the end consume) with those in the middle being squeezed (e.g. resource suppliers and processors)
- Value chains become more complex (requiring a much more diverse range of integration, collaboration and contract options to get products to the market)
- There will be many niche opportunities (both niche product form or position on the shelf and niche channels)
- Note: Dairy is one of the most fragmented global industries

Food Industries will evolve rapidly

- Estimated Demand for food increases by 34% (50% by 2050) (Note Food production rose by 45% between 2008 and 2012)
- Pace of change in food industries is very rapid (response to demand factors, natural factors and differential rates of technology adoption across different food types which impacts supply)
- Price volatility remains a major factor (natural environment is more unstable and technology etc. enables faster change in supply)
- Global food prices could rise by 70-90% by 2030
- Global food sales are dominated by 20 major brands
- More global food sales occur through supermarket channels (there are exceptions such as India)
- Super market sales in most economies are dominated by a small group of retailers
- Retailers "own brand sales" grow (but must become more targeted)
- Food products evolve rapidly (as per consumer needs e.g. nutraceuticals)

	<p>12 Technology Transformation (Ag, Product, Production, Supply)</p>	<p>Technology is the pivotal balancing factor for the dairy industries (vs demographics, resources, consumers etc.)</p> <ul style="list-style-type: none"> • Technology (Information & communications at the customer end, data and analytics across the supply chain, information systems to enable management science, robotics and automation across the production activities and for food industries the added lever of bio-technology impacts on the plant, animal and animal products) changes rapidly and disrupts the industry • The ability of sectors of the economy to develop and deploy technology faster and more effectively than competitive and substitute industries will be pivotal to success - this can add to volatility • Data use is growing exponentially (matched by ability to use data), the app economy grows exponentially (17% of commerce on line <u>but</u> on line role in all transactions will be much higher because of Apps and mobile technology) • Technology is the major threat to commerce (e.g. Cyber-attacks which already cost US\$300bn to US\$1,000bn and bio-terrorism) 	
	<p>13 Human Resource & Capability</p>	<p>Human resources are a significant constraint:</p> <ul style="list-style-type: none"> • The labour force in developed countries is shrinking • Demand for human resource input increases with volume • Farms are less able to rely on owner labour (combination of ageing farm owner population, succession challenges, increased scale and changes in ownership model) • The capabilities required to operate "precision farms which rely on technology" have evolved (many farmers lack the required capabilities) • Supply of human resources for dairy is limited by education gaps, inadequate community infrastructure for farm workers (education, health, community facilities etc.) and negative community response to farming (dirty dairy etc.) 	

Potential Disorder	<p>14 Bio Disorder</p>	<p>Biological disorder is more likely:</p> <ul style="list-style-type: none"> • Biological threats are common (e.g. global threats such as Bird flu, Ebola and NZ issues such PSA and Varroa bee mite) • The biological threats are magnified by a combination of resource constraints, climate, farming intensification, GE developments and global travel • There is increased potential for malicious biological threats (linked to social and political disorder) 	
	<p>15 Social Disorder</p>	<p>Social (or political) disorder could escalate</p> <ul style="list-style-type: none"> • Social and political disorder is common in range of geographies (Eastern Europe, Africa, and Middle East). The level and location of the disorder tends to shift over time but has the potential to rapidly escalate to become a major factor • Social disorder could be linked to biological or economic disorder 	
	<p>16 Economic Disorder</p>	<p>Economic disorder could escalate</p> <ul style="list-style-type: none"> • The global economy is still recovering from the GFC and many economies are still at risk - Relatively small changes in economic prosperity in a single location could quickly spread across multiple locations with severe impact. 	

4. SCENARIOS

4.1 Overview

The analysis and workshop process suggested there were some factors that were considered to be fairly common with “less uncertainty” or expected variation over the 10-20 year horizon. These factors were defined and documented as the “base scenario”. The base scenario is reasonably consistent with “current trends and industry expectations without shocks”.

The process of scenario selection involved facilitated workshops to define plausible future states where one uncertainty or a group of uncertainties were given greater weight and set to move more strongly in a certain direction. This process enabled three alternative scenarios to be defined.

No attempt has been made to assess the probability of the scenarios. The base scenario does reflect the current trends but realistically the setting is very finely balanced and as such, each of the four scenarios is considered as equally relevant for industry participants as they plan for the future and assess the potential performance and resilience of their activities in different settings.

The four scenarios developed for the project were:

- Base Scenario – *Growth with increased complexity, competition & volatility,*
- Consumer is King – *The Volume to Value Revolution,*
- Governments Dictate – *Political Chaos & Shrinking Markets,*
- Regulation Rules – *It is “Our privilege to Serve”.*

The four scenarios paint a picture of the future in 2025-2035. This is not a “forecast” but an overview of what the future could look like. The picture includes

- An overview of what the world might look like in 10-20 years’ time
- A snap shot of the dairy industry at this time
- An overview of the NZ dairy industry across the value chain (consumer, retailers, processors, farmers)
- A theoretical timeline of how this has occurred
- A summary of soft signals or indicators from today that highlight why this is a plausible future

The scenarios describe a range of futures. No attempt has been made to assess the relative probability of these futures but it is clear that these futures are possible and farming systems may have to adapt to them



Base scenario

Growth but with increased complexity, competition and volatility.

- Uncertainties 1-4 drive growth, but;
- Uncertainties 3-10 drive complexity, and;
- Uncertainties 4-8 enable NZ competitiveness, while;
- Uncertainties 11-13 drive competition and volatility.



Scenario 1

Consumer is King – The Volume to Value Revolution:

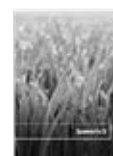
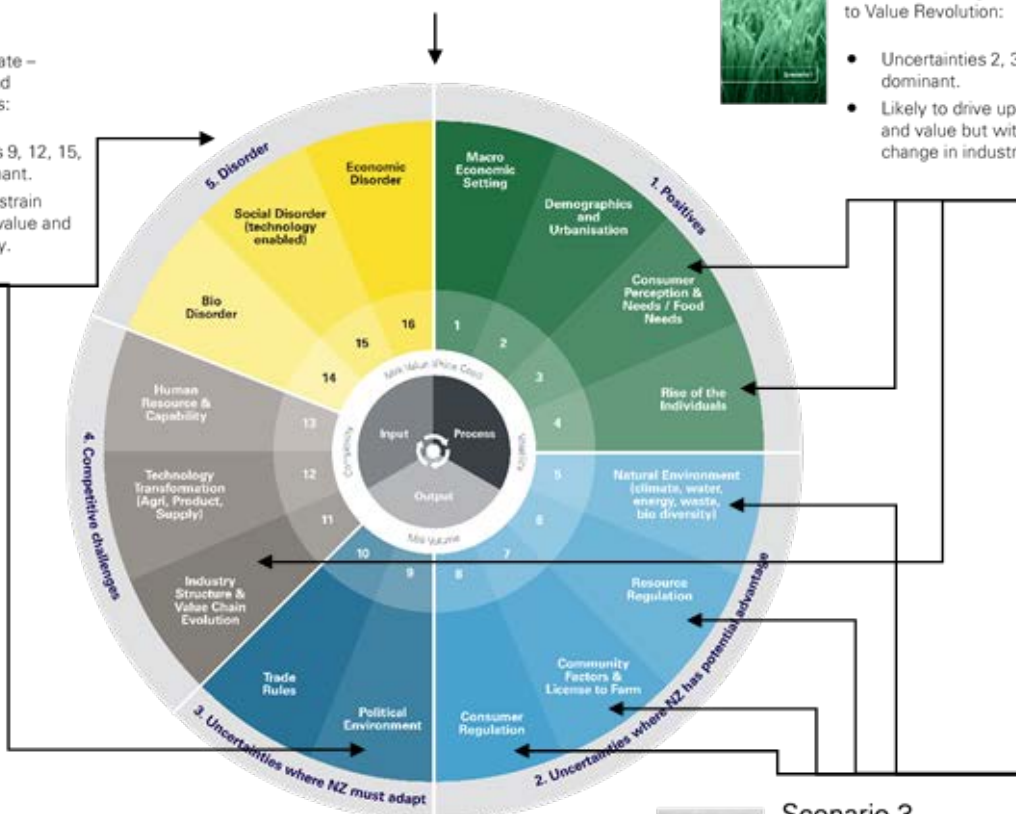
- Uncertainties 2, 3, 11 are dominant.
- Likely to drive up volume and value but with some change in industry structure.



Scenario 2

Government Dictate – Political Chaos and Shrinking Markets:

- Uncertainties 9, 12, 15, 16 are dominant.
- Likely to constrain volume and value and drive volatility.



Scenario 3

Regulation Rules – A Privilege to Serve:

- Uncertainties 5-8 are dominant.
- Likely to constrain volume, add complexity and drive up value and costs.



Base scenario

Growth with increased complexity, competition and volatility

THE WORLD IN 2025



The world is more globalised, the middle-class has expanded and the levels of world trade in agrifood products have increased. However, a combination of regional conflicts (in Eastern Europe, the Middle East and Africa) and un-favourable weather events have made the geo-political environment more complicated.

Global food industries have enjoyed 10 years of sustained growth but are battling with increased competitive intensity across the value chain and between suppliers and substitute product producers in an environment that has become complex and volatile.

STRONG GROWTH

The positive demand environment for food industries has been sustained by the need for food for an additional one billion people. The world's population has grown to 8 billion people with the majority of the growth occurring in China, India and Africa. The food industry is continuing to adjust to two mega-changes in global demography i.e. 90% of the global youth with the fastest change in food needs now reside in the developing world and there is now a 1 billion, and growing, population of consumers who are aged over 65 years.

The positive demand environment for food industries has been magnified by people moving into urban environments and positive economic cycles that have brought an additional 3 billion people into middle-income categories.

The urban population has increased to 60% of the global population with most of the change occurring in Asia and Africa. Urbanisation includes two critical changes – the development of mega cities with populations of over 10m individuals (There are now approximately 40 mega cities and overall there are 600 cities across the globe that account for the majority of the global GDP) and global depletion of rural communities and the infrastructure to support these communities.

The move into “middle income” has been driven in the developing world (> 80% of world population) by sustained economic growth of > 4% per annum. The two paced nature of the global economy (developing world growth is double that of the developed world) has effectively shifted economic power to Asia.

While the trend is generally positive, it is evident that there are conflicting patterns in specific geographies where geo-political and climate related events create or maintain pockets of poverty. Overall, there are 1.5 billion people living in conflict zones, and 20% of the population lives below the poverty line including over 1 billion people living in urban slums with extremely limited opportunity to produce food.

The shift in economic power to Asia has come with a massive shift in the role and makeup of global enterprises. At an enterprise level, “mega companies” increasingly dominate the landscape with key changes including the rise of Asian mega companies, the global connectedness of the companies and pace of change in the fortune of the individual companies (companies rise to the top quickly but the lifespan in the top has reduced from 15 years to 5 years).

INCREASING COMPLEXITY

In parallel to the growth trend, Food Industries have adapted to an operating environment that is significantly more complex. The change is driven by consumer and regulation factors.

A combination of increased income, technology and global connectedness and consumer assessment of positive and negative food attributes (including physical, cultural and credence attributes) has driven divergence in the food industry. There is a base market for undifferentiated commodity products that is driven by price and the need for food security plus a proliferation of new food categories and products responding to very specific market segments and needs.

The demand led complexity is matched by increased levels of scrutiny and compliance at every stage of the value chain. Increased consumer, community and regulator knowledge, the implication of resource constraints and higher levels of global trade plus the increased technology capability has driven an expansion of rules and monitoring activity. Societies are hyper-connected, well informed and more aware of environmental, social, animal welfare and food safety issues. The growing middle class in developing countries, as well as those in the developed countries, have increasingly low tolerance to practices perceived as unjust or detrimental to society, particularly in their own countries but also globally. The sensitivity to this is magnified as the impacts of land and water constraints and climate change become more apparent. Technology tools (such as information & communication technologies, social media etc.) enable both the consumers and communities that are impacted by farming activities, to engage more actively in the scrutiny and response to products and impacts.

ADAPTING TO SHIFTING OPPORTUNITIES AND CONSTRAINTS

The global landscape remains unstable. There has been an expansion of trade deals that open up new markets. But this is matched by a combination of shifting instability in many regions (e.g. Eastern Europe, Middle East & Africa) and new rules and regulations that increase the challenge to global trade. These sudden shifts in the global operating environment can have a profound impact on both the supply/demand balance (and price) and on individual enterprises.

INCREASED COMPETITIVE INTENSITY

The intensity of competition in food industries has risen. The rate of information and physical technology change and adoption in different regions and different food sectors has had the impact of changing the underlying competitiveness of growing operations. This shifts the supply / demand balances and increases volatility unless the grower has a differentiated product or supply chain.

In addition to grower competition (from substitute product producers), there has been a rise of mega-businesses at each stage of the value chain. The global food industries are dominated by 20 mega companies that control a high proportion of the shelf space in the supermarkets and smaller retail outlets. In the retail environment there has been a power shift as the super-markets have increased their share of food sales; and consolidated so that in each geography there are fewer than 5 major players. Furthermore, global connections and local connections into the tier 2 retail outlets have been created. In parallel, an increasing amount of food sales is happening via the digital/online retail channel.

Against this trend, there has been growth in niche and specialty value chains and channels that have created new opportunities.

THE DAIRY INDUSTRY – AT A GLANCE



MILK PRICE

- Commodity prices are constrained to current levels (Technology enables supply to grow in line with demand)
- Commodity prices are more volatile (climate change, faster supply change and more regular geo-political shocks)
- New Zealand's superior ability to respond and excel in a global environment where resource, community and consumer demands have been magnified enables NZ suppliers to realise premiums in specific markets.
- Milk price is differentiated with payment for 'content and attributes' driving significant variation (in price and volatility)

FARM CHARACTERISTICS

- REGULATORY IMPACT
- FARM SYSTEMS
- PRODUCTIVITY
- FARM TYPES
- FARM CAREERS

- Farmers and farm systems respond to strong signal for increased volume but commodity price is constrained by global supply and supply is more complex and costly (more regulation etc.)
- Total milk volumes continue to increase (Driven by productivity and increased land area including specialist feed crop and support land)
- Farmers are forced to specialise (low input/ high output) systems or differentiated systems to meet specific product and attribute needs.
- To be globally competitive farm systems vary from "pure pasture" to a spectrum of hybrids – to reflect a range of farmer responses.
- Technology adoption (Information & communications at the customer end, data and analytics across the supply chain, information systems to enable management science, robotics and automation across the production activities and biotechnology impacts on the plant, animal and animal products) requires investment and specialist capability.

DEMAND FOR DAIRY

- Total Demand has strengthened in line with demographic and economic growth but is much more complex and challenging to fulfil (NZ is positioned well to meet challenges)

SUPPLY OF DAIRY

- Technology gains enable global supply to grow in line with demand (offsetting resource constraints). The pivotal factor is NZ's ability, relative to other nations and other food categories (particularly plant based food categories), to create and adopt new technology

DIFFERENTIATED VS COMMODITY

- Systems diverge between low input / high volume systems and differentiated systems. "Commodity systems" also need to deliver on more demanding attribute specifications. Overall, the product balance moves toward value-add.

ENVIRONMENTAL & SOCIAL IMPACT

- Farming and processing operators are very sensitive to their environmental and social impacts but NZ is a high performer in these areas (enabled by a dominant cooperative and more consistent regulation)

RISKS

- Critical risks that may undermine the balance include inability to respond to customer's changing needs (Scenario 1), geo-political instability (Scenario 2), faster and more intense change in regulation (Scenario 3)
- The base case acknowledges the rapid pace of technology change and assumes NZ systems keep pace with global systems – Failure to keep pace with technology adoption by global dairy industries and substitute product producers would undermine the competitiveness of the New Zealand industry
- Events or issues that undermine the integrity of the NZ or a competing supply chain would have a significant impact
- The balance of power between Mega-Brands, Mega Companies and large retailers is set and could change
- Consumer response (negative) to specific attributes (resource use, health, ethnic, safety etc.) may change

THE NZ DAIRY INDUSTRY



The New Zealand Dairy industry has transitioned from its homogenous operating model that was once dominated by the cooperative production of milk powder for supply into global ingredients supply chains to a more diverse and complex operating model.

The NZ Dairy industry has leveraged the positive operating environment that is driven by strong demand, particularly in the close Asian markets, and the less constrained resource base in NZ (NZ has water resources, uses less energy, has available land) to grow.

NZ's superior ability to respond to critical constraints (Non-trade barriers, resource regulations, community license to farm, consumer regulation, needs of the individuals for product attribute information etc.) and to demonstrate superior performance (through systems etc.) relative to our global and national peers (dairy and substitute products) protects our operations and enables the growth.

The pivotal factors that concern the industry are the pace of technology adoption in New Zealand Dairy relative to global dairy and other substitute products, and the increased power in the value chains of the mega brands and retailers. These factors constrain prices and retain price volatility across the initial stages of the value chain (Farm & primary processors)

CONSUMERS

The global consumers of New Zealand dairy products have become more diverse and demanding and this change touches all parts of the value chain.

Consumer needs are far more differentiated and specific and often require the entire supply chain to change to deliver very specific product attributes. This has created distinct supply chains including chains for traditional commodity products where price is the dominant driver and then an array of different chains meeting the specific needs. Consumers pay a premium in the differentiated value chains but there are often additional costs associated.

For all value chains, there is an expectation of reliable and safe supply. In commodity chains, governments regulate to maintain standards. In differentiated chains, there are technologies and information flows that provide consumers with the transparency and visibility to support their purchasing decisions. This provides assurance at the point of purchase and enables very rapid communication between connected consumers where there are issues.

RETAILERS AND FOOD SERVICE

New Zealand Dairy products are sold through a range of retail formats (varying from traditional brick & mortar stores to digital/online channels).

The dominant channel for New Zealand dairy is large format supermarket retailers, which control an increasingly larger share of total global sales as they expand and consolidate.

The alternatives include specialised operations that enable supply into traditional markets (particularly in Asia where traditional markets still account for less than 50% of sales) and supply into niche retailers. Both alternatives require very sophisticated and much more agile operations to manage large numbers of relatively small product transactions.

The share of product consumed through food service channels increases rapidly. Increased economic wealth and changes in diet to include more dairy products drives demand and makes the food service channel significantly more important to the industry. Supplying food service channels has become more complex as consumers seek greater levels of transparency and assurance of the content of food and its safety.

PRIMARY PROCESSORS AND FOOD MANUFACTURERS

Increased complexity, and changing demands in the consumer and retail stages of the value chain, flows into the manufacturing operations.

New Zealand manufacturers have the option to supply primary product (ingredients) into a limited number of mega-brand-manufacturers (> \$50 b. turnover), transition toward a fully integrated consumer products business to supply specific large scale retailers and food service markets or enter niche product segments or niche supply chains.

The primary product (ingredients) channel is driven by volume and cost efficiency but demands a very high level of reliability and food safety. To maintain volumes and reduce volatility the primary product manufacturers become more integrated, through long-term toll contracts or investment, with the brand manufacturers.

Fonterra is the only NZ food manufacturer with the scale and resources to transition some of its business toward integrated consumer products business. The transition required significant investment over a long period in manufacturing assets, an agile supply chain and new market facing capabilities. The rest of the NZ industry is focused on niche opportunities.

Overall, the manufacturing operations have become more varied and more sophisticated to manage new complexity and standards and stay competitive.

The trends in New Zealand are replicated across the global dairy industry and have driven consolidation at all stages of the manufacturing process.

FARMING

Farming evolves along multiple paths that are aligned to the specific requirements of each manufacturing model.

This leads to the parallel development of larger scale and automated farms that meet the efficiency demands of the primary product manufacturers, and specialised farm operations where production is aligned to producing milk that meets specific consumer goods requirements / specific product attribute expectations.

In all models, the farms are forced to adapt to more stringent and demanding regulations associated with the environment, animal husbandry and the make-up of the milk product. This constrains some types of activity, and in some areas may limit the production capacity and add to the cost of production.

All farm models rely on new levels of management and operational science and the application of new technologies (Bio, IT and Physical) to stay competitive (viable). The rapid adoption of precision technologies enable's productivity gains and drives the adoption of hybrid farm systems that mix the traditional pasture based system with new supplementary feed regimes, housed operations and increased reliance on farm support operations. The adoption of new farm systems is constrained by access to the human resource.

To stay competitive the farm operations drive for scale by increasing the size of each operating unit (average herd production), connecting multiple farm units under a single ownership structure and developing cooperative farming structure that allow specialist resources to be shared.

The evolution of the farm system is constrained by a more challenging community environment. Farm workers have reduced access to the community infrastructure to meet education, health and social needs. Farmers are placed under increased community pressure regarding the impacts of the farm operations on the environment.



Scenario 1

Consumer is King – The Volume to Value Revolution

THE WORLD IN 2025



Fuelled by globalization and freer trade, the world has seen significant economic growth over the past decade. Tremendous wealth has been created, especially in emerging nations of Asia and Africa. Increased incomes have meant the global middle class has swelled to be in the many billions. This new global middle class with higher disposable incomes is eating fewer staples (e.g. rice, corn & wheat) and increasingly demanding high-value agricultural products (e.g. dairy, meat, fruits etc.). Driven by higher levels of food-literacy, empowered by increased disposable incomes and facilitated by technology, a sizable number of these consumers are also making very sophisticated decisions with respect to the food they consume. As a result, the agrifoods market is far more complex and fragmented.

The fundamental tenets of efficiency, costs and margins still remain relevant and important for agrifood value chains. However, driven by increasing consumer consciousness, other factors - both tangible and intangible have become equally important. New Zealand is a global leader in dairy and the NZ dairy industry is world renowned for its impeccable quality and safety standards, high levels of innovation and efficiency, and a non-compromising focus on sustainability. Enabled by freer trade rules consumers and customers across the world increasingly look globally for their dairy needs. NZ dairy now has more choices on where to trade its small fraction of world production – it delivers an extremely diverse range of specialized high-value products.

THE VALUE CHAIN IS DRIVEN BY A TREND TOWARDS INCREASING CONSUMER SPECIFICITY

More consumers have added dairy to their daily diet for taste, health, convenience and nutrition. But, the average global consumer of dairy products is better informed and more sophisticated; and is increasingly demanding products that suit their specific/individual needs – when they can afford it. This has created a highly segmented & complex consumer market for foods – providing multiple differentiation and value-capture opportunities for dairy exporters, processors and farmers.

SCIENCE & TECHNOLOGY HAS A SIGNIFICANT INFLUENCE ACROSS THE VALUE CHAIN

Amalgamation of disparate research bodies has created a critical mass of scientists dedicated to solutions for NZ Inc. From providing critical solutions in a resource constrained world (e.g. precision agriculture tools) to empowering consumers (e.g. smart labelling), the impact of technology has been revolutionary. For example, progress in the fields of dairy chemistry, biotechnology, and food engineering etc. – have identified newer components in milk (or cows that can secrete novel/specific milk components); and also provided several more application possibilities (both food & non-food) for dairy components – for example in the nutraceutical space. This has provided firms with several opportunities to differentiate. However, technology has also significantly increased the threat from dairy substitutes/alternatives.

**PARTICIPANTS &
POWER WITHIN
THE VALUE CHAIN
IS DYNAMIC.**

With alternative supply chain and distribution models becoming commonplace (at a global scale), the number of participants and the architecture of the value chain is now quite variable. Exercising market power within the value chain is now viewed as being detrimental to firm performance and most firms across the value chain are pursuing the concept of creating shared value. Cooperation amongst the various participants is more important than ever in order to secure a stable supply of milk that meets specific qualities and generate sustainable profits. Access to marketing channels, logistics and reducing food-wastage still present challenges – however significant efficiency gains have been made on this front.

**VALUE-CHAINS ARE
INCREASINGLY
UNIQUE,
REQUIRING A
DEDICATED /
SPECIALIZED
SUPPLY CHAIN
SERVICE
PROVIDER**

The high level of consumer specificity has meant that a large number of unique value chains are now operational. A single firm could belong to several such value chains. There has been a clear shift away from the large aggregated supply driven model. But consumers demand a connect is retained between the products they consume and the farms that produce it – via identity preserved supply chains. As a result a dedicated supply chain and logistics service provider has emerged as a key actor for a large number of unique value chains.

**AGILITY &
INNOVATION
ACROSS THE
VALUE CHAIN ARE
CRITICAL TO
ACHIEVING A
SUSTAINABLE
COMPETITIVE
ADVANTAGE**

High value niche markets are constantly emerging and evolving; and the pace at which they become obsolete or commoditised is very rapid. The focus of firms is therefore on being agile, innovative and constantly adapting – in order to be able to identify & capture opportunities being presented by the ever evolving niche markets, and to stay a step ahead of competitors.

THE NZ DAIRY INDUSTRY – AT A GLANCE



MILK PRICE

- Most New Zealand farmers get a premium for their milk.
- The milk price (& premium) is quite variable – depending on the “class” of milk.
- The milk price of certain classes of milk are quite volatile, while others are relatively stable

FARM CHARACTERISTICS

- FARM SIZE
- NUMBER OF FARMS
- FARM TYPE
- PRODUCTIVITY

- The ability to differentiate and capture value has meant farms do not need to expand in size to grow wealth. Many farms have therefore remained the same size and specialized.
- There has been an increase in the number and type of farms as dairying is found to be quite lucrative – relative/compared to other agricultural operations. However, the increased volatility & complexity has led to different farm structures and risk management strategies to evolve.
- Dairy Farm Types are quite diverse and milk supplied is dependent on/driven by the specific value chain the farm is delivering to /operating in. For example, farms operating in a value chain delivering to a 100% Natural-Oceanic segment – are 100% pasture based (& import no feed). Regional clustering of farm types is now the norm.
- As farms have traded volume for value, the focus on increasing volumes per unit area has been less intense. Therefore, productivity (KgMS/Ha) growth has decreased.

DEMAND FOR DAIRY

- The global (total) demand for dairy is robust. However, unpredictability at the consumer end has ensured that considerable variability in demand exists at any given point in time.

SUPPLY OF DAIRY

- Driven by increasing constraints the supply of dairy has not been able to keep up with demand in many regions. This has allowed NZ dairy to consolidate its place as a global player, as well as presented it with numerous (market) opportunities.

GROWTH OF GLOBAL INDUSTRY

- The global dairy industry has grown considerably and there are several “billion” dollar dairy firms. However, most operate at a local/regional/national level.

DIFFERENTIATED VS COMMODITY

- The New Zealand dairy industry has shifted from being a major player in the low-value commoditised space to one that is very active in the high-value differentiated category.
- The low value-commoditised segment is largely supplied by – alternate sources of protein, dairy deliveries from Latin America & Africa, and the domestic (local/regional) suppliers operating in the foreign markets.

ENVIRONMENTAL & SOCIAL IMPACT

- Driven by the consumer and society, there is a far greater focus on the environmental and social aspects of the dairy value chain. As a result, bio-diversity, water quality, soil health, energy efficiency, animal welfare, working conditions, social responsibility and waste management are continuously under the spotlight.

RISKS

- Due to the speed at which information travels - value can be lost in a matter of hours. A single-food safety (or fraud) related incident is sufficient to destroy a firm/value chain.
- The “fickleness” of consumers & transient nature of markets – adds a significant amount of complexity & volatility; and life span of an opportunity is highly uncertain. Significant risk to a producer who has made massive changes to the farm system!
- Agility & adaptability is now extremely critical for the survival of value-chains. As a result, the attrition rate of value-chains and firms is high.
- High level of heterogeneity across the value-chains, but specifically at farm level, will challenge and require adjustment to the cooperative model.
- Depending on where ‘niche’ begins, the shift away from commodity could lead to redundancy of current processing investments.
- For NZ dairy to be agile & innovative – human capability is a critical requirement.

THE NZ DAIRY INDUSTRY



The global dairy-foods market has become more vibrant, sophisticated and diverse. Fuelled by factors such as advances in technology (specifically ICT's & social media), better education/awareness and rising incomes (growing middle class) the average global consumer of dairy products is better informed, more sophisticated and increasingly demanding products that suit their specific/individual needs – when they can afford it. There is far greater emphasis on the attributes of the product – both tangible (taste etc.) and intangible (credence etc.). The consumer is clearly “king” with focus being on “me”- the individual. Products now need to be highly tailored to meet individual demands. However, tremendous variability in the needs and wants of (between) individuals has created a highly segmented and complex consumer market for foods – providing multiple differentiation and value-capture opportunities. Dairy-food companies that are extremely vigilant and agile, are able to rapidly unbundle and re-bundle attributes (in various permutations & combinations) to deliver products that meet the needs of this value conscious consumer.

In order to deliver to these diverse, constantly evolving, more aware and increasingly exacting demands of consumers, the dairy value chain in entirety is forced to innovate and evolve at all levels. The NZ dairy industry has been at the forefront of this evolutionary process and continues to remain a global leader – dominating the export market, which is characterised by far more relaxed trade rules. Moreover, in order to capture more value/higher margin, there has been a shift away from sheer volume based commoditised production.

Most NZ dairy companies have adopted a differentiation strategy to leverage NZ's comparative and competitive advantages (e.g. pasture based system, oceanic flavours, food safety, high tech.) and simultaneously deliver to the needs of a highly segmented consumer market. There has also been a growth in number of smaller and highly specialised dairy value chains that cater specifically to high-value (niche) market segments. Segregated/identity preserved value chains are common, connecting a cluster of farms producing milk with unique attributes (in NZ) to a distinct consumer segment/need (in a foreign market). As a result of these, significant changes have been made to the structure and design of the traditional value chains, and in NZ, the cooperative model has been challenged. The tyranny of distance still exists so small firms now rely on the supply chain and logistics service firm(s) to ensure they can reach their consumers at a competitive cost. The imbalance between NZ levels of production and ‘niche’ global markets means scale is still necessary for viable value chains.

CONSUMERS

The average consumer's engagement with technology is at numerous levels (e.g. devices, interfaces etc.) and at a pace that is phenomenal. The consumer is therefore better informed and more aware of the positives and negatives a product has to offer. This in-turn plays an immense part in shaping their purchasing/buying behaviour. Price though relevant, is no longer the most significant factor. Value, has become critical, and the overall set of attributes (both tangible and

intangible) that a product has to offer (price included) are most important to the consumer. Amongst the attributes, factors/issues such as sustainability, food-safety, health & wellness, convenience, the consumption experience etc. have become very significant. However, the perception of value (influenced by personal preference, socio-cultural beliefs, tradition, etc.) is extremely diverse and constantly changing/evolving, giving rise to numerous market segments.

The consumers are drawn to dairy mainly by the “natural goodness” of milk. Any factor that the consumers perceive as being un-natural or diminishing the natural goodness of milk – are unacceptable. This has materially benefitted the pasture based systems of New Zealand. Moreover, pressure from consumers has ensured that the minimum standards (with respect to food safety, animal welfare, environmental stewardship etc.) in general and for the higher-value categories in specific are very high. This has provided NZ Dairy Inc. with a significant competitive advantage over local and international suppliers in several foreign markets – especially in the emerging nations. Furthermore, NZ’s nuclear energy free and GM free stance is now paying rich dividends as society has become increasingly opposed to these technologies – and consumers demand products that are produced in a nuclear energy free and GM free environment.

The world has moved from a traditional three meals a day structure to a more “modular” eating phenomenon (i.e. more regular consumption throughout the day). Consumers are increasingly shifting towards snacking for convenience and nutritional reasons; and find products that come in the format of a drinkable snack appealing. Dairy-Food companies have taken advantage of this trend and have supplied the market with a range of drinkable options – such as flavoured milk, yogurt drinks, milk-juice blends, smoothies, breakfast-shakes, indulgent milks etc. Dairy is the high tech solution for the nutritional needs of the aged, the ill and the young. The consumer loathes being kept in the dark and increasingly wants to know the back story of the products they consume, and how that relates to their own lifestyles. Brands and products that provide the most information are able to capture vital market segments. However, the consumer is less trusting of product claims and stories. Firms now need to ensure that they are backed by reputed independent/3rd party organisations. Therefore, many more auditing and certification schemes have come into effect. But certification has moved beyond being just a mere endorsement of a claim. It is now about communicating a story of how a product meets consumers’ needs and is consistent with consumer beliefs – whether this be food safety, animal welfare, environmental sustainability or wider social and ethical considerations. The product stories have become as important as other product attributes such as taste, flavour and convenience.

RETAILERS & FOOD SERVICE

The retail space has been completely transformed. Physical stores are unable to compete with online stores on price and convenience. As a result, there has been a significant shift away from physical retailing and the space is now dominated by digital/online retailers. Due to this phenomenon, the entire retail space has become quite fragmented. The physical stores that operate are highly sophisticated and focused on

providing the consumer with the best shopping experience possible.

In the digital retailing world, consumers increasingly use “virtual” grocery stores to do their shopping. They can now “build their own”/ “customise” their food products (e.g. composition, portions, packaging, branding etc.) online and have them home delivered or made-ready for pick-up at the physical store or specific pick-up points. Smart devices like smart-fridges (& smart pantries) - keep track of consumption and either alert consumer when stock is low or automatically place orders online. Smart labels on products seamlessly connect with devices / gadgets (smartphone, tablets etc.) to provide consumers with all the information they seek. This could range from the product stories to recipes to convert the product into more long lasting form - should expiry date be near.

In order to grow their own Private Labels (& digital retailing operations) and source artisan type products, some retailers are directly engaging with farmers and/or first stage processors. Food service institutions looking for unique raw materials are also increasingly dealing directly with farmers. Similarly, facilitated by advances in ICT’s, some farmers with differentiated or value-added products are engaging directly with end consumers, retailers and/or food service institutions – purchasing toll processing as necessary.

FOOD MANUFACTURERS & PRIMARY PROCESSORS

Due to the high level of differentiation and value-add possibilities, several dairy value chains now operate in this space. All of them have highly efficient and streamlined supply chains that seamlessly connect their products with consumers in destination markets. Some of the firms in the value chains are NZ owned; but, as connecting with consumers and responding to their demands at rapid pace is critical, quite a few are overseas based.

Driven by technological advancements, milk’s versatility is being exploited to its maximum. Combined research entities and dairy-food companies are finding more and more ways to stretch milk and are deriving more value per litre. Milk is being used in innovative ways to create new products and formulations. It is being increasingly combined with other ingredients such as juice, cereals, nuts, etc. to create new product formulations. Food-companies that are extremely vigilant and agile, are able to rapidly unbundle and re-bundle attributes (in various permutations & combinations) to deliver products that meet the needs of the value conscious consumer. But, to make this happen, firms need to be free of capital constraints and be able to innovate & re-invest at pace. Due to which significant changes have been made to the structure and design of the traditional value chains, and in NZ, the cooperative model has risen to the challenge. There has also been a growth in number of smaller and highly specialised dairy value chains that cater to specific market segments.

FARMING

The increased diversity and segmentation of markets has significantly increased the heterogeneity of farm types in New Zealand. The type of farm (or farm system) is now defined by the specific value chain the farmer wants (has chosen) to operate in. For example, farms that operate in the sustainable energy value chain meet 100% of their energy requirements from on-farm renewable energy sources such as bio-gas, wind and solar. Furthermore, with consumer specificity having extended up to the breed level – the national dairy herd is now quite diversified. For example, now there is a cluster of farmers who farm

purely 'Kiwi Pure' Cows and operate in a value chain that delivers to a consumer segment that demands milk/dairy products from 'Kiwi Pure' cows farmed in a 100% pasture based system! Enabled by technology and driven by market opportunities, some farms have moved up the value chain and now produce high-value dairy products themselves.

Many dairy farmers have increased the use of on farm technologies. Enabled by smarter products, better connectivity and much improved analytics - the use of management information systems has been revolutionary. Most farms have installed fully automated mobile-robotic milking systems and use precision agriculture tools to a large extent. Almost all farms use Unmanned Aerial Vehicles (UAV's) or other forms of robotics for monitoring & managing pastures and cows. These have considerably reduced the pressure and stress on the workforce, and also improved efficiency of operations. However, farms now needs a new type of work-force; and people with advanced qualifications and soft skills that encompasses several domains such as management information systems, data analytics, agricultural & animal science, agriculture engineering, farm management etc. are in most demand. Farmers too are better educated, technology savvy, business focused and more professional than ever before. The dairy industry works closely with tertiary education service providers to ensure that the knowledge and skills required are in good supply. The need to increase efficiency in research has meant CRIs and universities have combined forces which has further enhanced scholarship and learning.

Advances in measurement technology have made it possible to detect components at a far more minute level. This has tremendously empowered the regulatory setting and imposed operational constraints for the farm. But it has also provided opportunities to enhance the competitive advantage and capture value in the process.

For example, extremely stringent food-safety and milk quality standards in certain market segments has meant that dairy products supplied to these markets have to be made from milk that is free of specific microbial DNA (in addition to being low SCC and anti-biotic free!). Moreover, due to the high level of visibility/transparency and heightened consumer interest, taking short-cuts is highly frowned upon and is hugely risky for entire value chain. A farm that messes up immediately loses its licence to operate in that particular value chain.

HOW THIS SCENARIO COULD ARISE - TIMELINE



2015	<ul style="list-style-type: none"> • EU eliminates its Milk Quotas. Re-alignment of global supply begins • FTA Trans-Pacific Strategic Economic Partnership completed
2016	<ul style="list-style-type: none"> • A major international fast food chain captures the environmental benefit of grass fed production systems in its branding and related procurement strategies • Simplification of Resource Management in NZ (alignment and standardisation)
2017	<ul style="list-style-type: none"> • The WTO Doha Development Round of negotiations is completed and recommendations are implemented. World trade expected to increase significantly – providing numerous market options for NZ dairy • Global Bio-Catastrophe (e.g. Foot & Mouth or PSA type event)
2018	<ul style="list-style-type: none"> • A study published in Nature clearly proves that milk from cows raised on pasture based systems has significant health benefits • Global Dairy Mega Merger
2019	<ul style="list-style-type: none"> • Crude oil prices increase substantially. Farm inputs and animal feed cost more. High input systems in USA and Europe contract operation. • Pace of Bio (Genetic) breakthroughs rises - Plant and animal R&D changes • Introduction of national reporting standards for farm enterprises • TPP Extended to China (Based on Free Trade Area of Asia-Pacific (FTAAP))
2020	<ul style="list-style-type: none"> • Consumer right activists go on an intense campaign with the objective of painting an extremely negative picture of housed dairy farming. Demand for pasture based dairy products soars.
2021	<ul style="list-style-type: none"> • A Biotech firm in USA – is able to manufacture a substitute that is extremely similar to milk at 50% of cost. Huge consumer outrage. Demand for “natural” milk from pasture based systems rises further.
2022	<ul style="list-style-type: none"> • A technological break-through – has ensured dis-assembly and re-assembly of milk can be done in an efficient manner. Causing changes to value-chains.
2023	<ul style="list-style-type: none"> • A major re-structuring of shipping lanes and technological advancements in supply chain management has improved logistics/shipping efficiencies.
2024	<ul style="list-style-type: none"> • Precision based NZ farm systems set the global standard for real time data collection and interpretation for consumer on-line audit purposes • GS1 extended to create integrated global traceability systems (All Countries, all products, all ingredients, all attributes, all stakeholders)

SOFT SIGNALS – EARLY SIGNS OF POSSIBLE FUTURE TRENDS

CUSTOMERS ARE LESS TRUSTING

The Edelman trust barometer found that nearly 2/3 of respondents refuse to buy products and services they do not trust and almost as many criticise them to a friend or relative. <http://www.edelman.com/2015-edelman-trust-barometer/>

CONSUMERS WILL PAY A PREMIUM

While customers' needs have become more complex and trust has been eroded, they are also more willing to pay a premium of 17% to 204% for specific attributes with a typical premium in most markets of >20%. UL's 2013 Product Mindset study highlights the rising priorities as - ethical sourcing, environmentally friendly manufacture and products, health impact, traceability and transparency. <http://www.lincoln.ac.nz/PageFiles/24144/RR332.pdf?epslanguage=en-NZ>
<http://productmindset.ul.com/>

RETAIL CONSOLIDATION AND CHANGE ARE ADDING TO THE CHALLENGES AND COMPLEXITY

Top 8 retailers control of USA grocery sales has now increased over 20 years from 25% to 50% of the grocery sales (>70% in the main metropolitan areas). Long term there's an expectation that this trend continues but is also matched by a combination of new store formats (non-traditional niche store formats and markets whose share of in-home food sales is increasing), on line sales and food away from home sales (49% of USA Food sales, compared to 43% 20 years ago) <http://www.ers.usda.gov/topics/food-markets-prices/retailing-wholesaling/retail-trends.aspx>
<http://bizmology.hoovers.com/albertsons-files-ipo-amid-consolidation-in-grocery-industry/>
<http://www.economist.com/news/britain/21625869-upstarts-grab-market-share-shrinking-groceries-market-trolley-wars>
<http://nzheraldnews.com/heres-amazon-to-make-british-supermarkets-more-miserable.herald/>

ONLINE RETAIL – THE MILKMAN RETURNS!

A survey by Nielsen – in which they polled 30,000 online respondents in 60 countries to understand how digital technology will shape the retail landscape of the future, found that one-quarter of global respondents say they are already ordering grocery products online for home delivery and more than half (55%) are willing to use it in the future. <http://www.nielsen.com/content/dam/corporate/us/en/reports-downloads/2015-reports/nielsen-global-e-commerce-new-retail-report-april-2015.pdf>

3D PRINTING OF FOOD – THE CONSUMER CUSTOMISES!

The ability to tailor foods to specific needs has arrived. Foodini is a kitchen appliance that takes on the difficult parts of making food that is hard or time consuming to make fully by hand. By 3D printing food, you automate some of the assembly or finishing steps of home cooking, thus making it easier to create freshly made meals and snacks. <http://3dprintingindustry.com/2014/03/31/3d-printer-foodini-food-kickstarter/>

SOCIAL MEDIA & POWER TO THE CONSUMER – THE GREAT DISRUPTOR!

Consumers are becoming much more engaged in the world of food. They are learning about food from all over the world, and are delinking from tradition and historical ways of cooking and eating. Consumers want to be exposed to all of these global foods not just in the packaged goods section either, but in the perimeter, in the fresh department, in the perishables.

With the advent of social media such as Facebook and Twitter, an unhappy customer can tell hundreds of their friends and their friends “friends” about their unsatisfactory experience with your products or services.

<http://www.packworld.com/applications/food/food-thought-consumers-changing-attitudes-toward-food>

SUSTAINABLE PRACTICES THE EXPECTATION

Commercial Enterprises engage in practices that enhance the world. The concept of sustainable practices that enhance the world are now an integral part of economic growth models

<https://www.unilever.com/sustainable-living/join-in/UN-global-goals/Where-does-business-end-and-society-begin-02-10-15/>

<https://home.kpmg.com/content/dam/kpmg/pdf/2015/06/holcim-true-value-analysis.pdf>

<https://assets.kpmg.com/content/dam/kpmg/pdf/2014/10/a-new-vision-of-value-v1.pdf>

<https://spp-web01.ad.rackfish.net/?lang=en&mode=2>



Scenario 2

Governments Dictate – Political chaos & shrinking markets

THE WORLD IN 2025



The global geo-political environment is extremely complex and tense. A series of regional conflicts in Eastern Europe, the Middle East and Africa involving both state and non-state actors, has destabilized the global geo-political environment. In China, the terrorist attacks, once confined to western provinces, have spread to other regions unhappy with Beijing centralist policy in the face of slower economic growth. A large sense of mistrust and suspicion prevails. Attempts at global trade-liberalization have been abandoned in favour of less transparent bilateral trade agreements. Moreover, a period of sustained deceleration in economic growth – especially in the emerging economies has resulted in a contraction of the middle class and increased the proportion of people living in poverty. Additionally, disease outbreaks and weather induced natural calamities are causing significant shocks to agrifood supply. Locally, politicians must appease their constituents, who are increasingly concerned about employment, food security, health and the cost of living (and doing business) in general.

POVERTY, HUNGER & SOCIAL UNREST ARE A DOMINANT PHENOMENON

The global economic- slowdown and regional conflicts, in conjunction with un-favourable weather events, and natural disasters have resulted in significant levels of poverty and starvation in the developing and least developed nations of the world. Increasing social and physical vulnerability has led to a higher incidence of communicable disease, and there is a general air of social-unrest, fuelled by food insecurity, resource scarcity, and political mistrust. In many countries, people are taking to the streets in protest and civil wars are now a constant threat. Political instability is a fact of life.

FOOD INSECURITY & INCREASED MIS-GUIDED PROTECTIONISM

Geo-political tensions have re-introduced the use of “economic sanctions” as a tool of retribution, disrupting world trade and causing huge price volatility. Food security (now integral to national security) is a top priority, and government policies are focused on achieving this. In order to promote domestic production and discourage import dependency, several countries have resorted to insulating their agricultural sectors from the world markets. These countries are restricting agricultural exports and maintaining trade barriers for all but the most favoured nations. The resulting domestic price impacts initiate misguided attempts to control domestic consumption through a complex combination of food rationing, targeted (food) consumption subsidies, and taxes on non-food consumption goods. The majority of the food that enters developing countries is now in the form of aid delivered through the United Nations network of agencies. As a result of these actions, levels of unrestricted trade in agricultural commodities are at an all-time low .

CONSUMERS ARE PRIMARILY PRICE DRIVEN-- & DEMAND CHEAP, BALANCED, & NUTRIENT DENSE FOODS

Slower economic growth and increases in the cost of living have reduced real disposable income for an average household. This phenomenon is global. Consumers are therefore far more price sensitive than ever before. Proportionately, food is a large expense for most households. Consumers increasingly seek basic, inexpensive, nutrient dense food products – and attempt to maximize their nutritional gain for a minimum cost. They are not willing to pay a premium for non-essential credence goods. A food “biscuit” which is an inexpensive yet complete meal in itself is an important source of nutrition for the most food insecure groups. Food and pharmaceutical companies are working together to deliver such complete food products to a larger consumer base. The “biscuits” are essentially cheap/inexpensive staples fortified with supplements (amino acids, essential elements, vitamins, probiotics etc.). Dairy ingredients (WMP & SMP) are an important component of most complete-food recipes; but stand-alone dairy products are no longer considered holistic in their nutrient profile and are perceived as being relatively expensive per unit nutrient. Less expensive alternate sources of nutrients (e.g. from insects) are now widely available.

EFFICIENCY (COSTS AND MARGINS) IS CRITICAL FOR AGRI-BUSINESS FIRMS – COMPETITION PRIMARILY ON PRICE

As a result of increasing costs and demand for low-value and commoditised products, the margins for agribusiness firms are extremely slim. The entire industry is therefore highly focused on efficiency. Most firms have minimised wastage to near zero levels. Maximising logistics and supply chain efficiencies is critical. In a technology centric and rapidly changing world, this requires high levels of innovation across the supply chain. Only large firms are able to survive and operate. Minimal environmental sustainability objectives are achieved.

VALUE-CHAINS BEING OWNED & CONTROLLED BY STATE

Since imports are highly controlled, and multi-national food companies are being increasingly restricted from operating in the domestic agrifoods space in many countries, there has been a significant growth of domestic agribusiness firms in the less developed countries. A few of these agribusiness firms are state funded and controlled. Moreover, in order to secure supply, and deliver to their food-security objective, a few powerful nation-states now own and control global value chains – from farm to retailer – either directly or through their proxies.

INCREASED BIO- TERRORISM RISK

The threat from a terrorist event involving the use of biological agents has become quite real. Terrorist organisations (sleeper cells) are now capable of bioengineering pathogens that can pose a significant human health (e.g. anthrax) or economic (e.g. FMD) risk. To mitigate this risk, countries have enforced significant constraints around the movement of people and goods (especially foods). Consequently, trade and travel/migration are more costly and complex.



THE NZ DAIRY INDUSTRY – AT A GLANCE

MILK PRICE

- International prices for dairy are volatile due to supply shocks, and excess demand is low.
 - NZ excluded from higher valued markets due to biosecurity concerns and the cost and risk of international transport.
 - Relatively secure relationships for milk powder as a key ingredient into complete protein biscuit adds stability to price for NZ producers.
 - Synthetic protein substitutes and tendency for North American suppliers to dump excess supply puts downward pressure on price.
-

FARM CHARACTERISTICS

- The NZ industry has become more highly concentrated overall, but 'dichotomous'
 - Initial overcapitalisation resulted in industry exit as prices fell
 - Industry exit exacerbated by biosecurity breach
 - Less highly leveraged producers that remained disease-free survived
 - Some kept a 'lean' family structure with a pasture-based system,
 - Some expanded as land values declined
 - On average, the trend towards fewer, larger farms has continued.
 - Farming systems lack diversity as all farms are focused on producing at lowest cost.
 - Systems are pasture-based, to reduce reliance on imported supplements.
 - Technology has delivered some productivity gains. However, genetic gains have been higher, on average, in North America and the emerging economies – which have fewer restrictions on the adoption of genetic technology.
-

DEMAND FOR DAIRY

- Global demand for dairy highly constrained
 - General decline in economic growth has dramatically reduced excess demand
 - Protectionist policies and general 'political chaos' make major export markets extremely difficult to access
 - New Zealand's focus has shifted almost entirely to lower-value but secure contract with consortium producing High Protein Biscuit.
-

SUPPLY OF DAIRY

- Changes in domestic dairy policy have resulted in a net increase in supply from North America, the EU and parts of Asia.
 - Trade, strategic alliances and domestic self-sufficiency policies have increased dairy self-sufficiency globally.
 - Protectionist policies in the less developed, food insecure countries have bolstered domestic supply in the rural areas, but there is a shortage of protein in the densely populated urban areas.
-

DIFFERENTIATED VS COMMODITY

- Almost exclusively commodity
-

PROCESSING

- Processing / manufacture of fresh dairy products limited mainly to serving domestic consumption
 - Majority of milk produced in NZ processed into milk powder
-

ENVIRONMENTAL & SOCIAL IMPACT

- Since the global focus has been on delivering maximum nutrition at minimum cost - not much progress has been made on environmental and social objectives.
-

RISKS

- Geo-political
 - Loss of HP Biscuit contract to synthetically derived protein.
 - Biosecurity
-

THE NZ DAIRY INDUSTRY



Although financial constraints have forced consumers away from high value and differentiated dairy products, demand for commodity type goods still exists. However, due to a less globalised and more insular set of domestic policies, the level of trade in dairy has fallen substantially. Supported by protectionist domestic policies in the food-insecure developing world, several “billion dollar” dairy food companies have emerged. These firms are largely state funded and/or controlled; and are primarily focused on supplying their domestic market. There is no clear global leader in the dairy sector.

New Zealand pursued a strategy of maintaining positive diplomatic relations with other countries, and actively negotiating favourable terms of trade in an increasingly tense political environment. However, an outbreak of FMD in 2017 significantly challenged NZ’s place as a global leader in dairy. Although the outbreak was quickly contained, NZ no longer had guaranteed access to the high-value markets of Europe and North America. Following the FMD outbreak, bio-security systems in New Zealand were significantly reinforced – initially to contain the disease and subsequently to prevent a future incursion. The implementation of these systems imposed high costs on the industry, with multiplier effects across the entire country. Some of the off-farm costs (e.g. border protection) are transferred to the farmer.

A multi-agency private- and public-sector partnership initiated by the United Nations is now the single largest purchaser of dairy from New Zealand. Funding for the initiative is provided from monetary and in-kind donations from an international consortium of philanthropists and research institutions. One of the main projects is the production and distribution of a high protein, nutritionally complete biscuit that has been formulated by a team of nutrition experts, and is distributed via the World Food Programme Logistics Cluster. While the precise formulation of the biscuit can be tailored to the needs of the recipient countries, milk powder is a key ingredient in many of the blend recipes.

Due to extremely reliable food safety standards and low costs of production, New Zealand has become one of the main suppliers of milk powder to the food aid initiative. Since the intended purpose of the programme is to provide basic food to the billions of malnourished people in developing and least developing countries, the requirement is for cheap base commodities – mainly WMP & SMP. As a result, New Zealand dairy operates almost entirely in the base commoditised space. The NZ dairy industry is able to maintain a competitive advantage as a primary supplier of the UN initiative through low cost primary production, a solid food safety reputation, and collective representation globally.

In addition to a breach of biosecurity, the anti-nuclear and GM free stance of New Zealand has decreased NZ's competitiveness in what remains of the global environment. Many new generation merchant-ships are massive in size and a few are now nuclear powered. Since these ships cannot access NZ ports, the shipping costs are significantly higher for NZ exporters. Advances in biotechnology/genetic-engineering have delivered significant gains in the GM space. Cloning and gene-manipulation are commonly used to produce cows with desired characteristics – including increased disease resistance. The inability of NZ farms to adopt such technology has eroded New Zealand's competitive advantage.

The pace of innovation and entrepreneurship has slowed in the NZ dairy industry, which is suffering from a loss of vitality and resilience. Due to the low wages and difficult working conditions, the industry has not been able to attract or retain talent. The industry is heavily reliant on immigrant labour, but due to restrictions imposed on travel, the supply of immigrant labour is erratic.

CONSUMERS

New Zealand is supplying a commodity product, where consumers are fundamentally price driven. They are primarily interested in getting maximum nutrition at minimum price. The need is for cheap, balanced and complete foods with very long shelf lives. Consumers are not particularly concerned about the naturalness of food, nor are they overly interested in knowing where and how their food was produced. Globally, food insecurity has led to an increased tolerance of GM technologies and 'non-traditional' sources of protein (e.g. laboratory-derived) – as long as they are certified as being safe.

Technology, especially communication technologies play a significant role in people's lives. Both governments and firms actively use social media to communicate and engage with people. Consumers increasingly use technology to source and share information, and identify products that meet their needs/budget. Nutrient profiling technologies are widely used by consumers to match their specific nutrients needs at a given point in time with the least expensive product. A combination of food scarcity, prohibitive health costs, consumption taxes and the use of nutrient profiling technologies has ensured health conditions associated with excess consumption such as obesity, diabetes, heart diseases etc. are on the decline.

RETAILERS & FOOD SERVICE

Since the demand for high-value and differentiated products has decreased, retailers have considerable power in the value chain, which they exercise liberally. The upstream participants of the value chain are increasingly at the mercy of the retailer. Since competition is essentially on price, retailer owned private labels thrive while brands have become less significant. Multi-channel retailing is the norm, with retailers offering both traditional and online options to consumers. Due to protectionism, most retailers are domestic firms, and they work closely with governments to ensure delivery to the food & nutrition security agenda.

Higher end food service institutions struggle to survive as demand for luxury items has drastically declined and people eat out less frequently. However lower end food service institutions and community kitchens that are able to deliver in-expensive food to the masses operate successfully. They too have considerable power in the value chain and they buy large volumes of dairy ingredients.

Since it is critical to get stable supply at low cost, both retailers and food service institutions only work with a few preferred suppliers who can deliver volume. For global suppliers, they have to be from countries that enjoy most favoured nation status as well. This works in favour of the NZ dairy industry.

PROCESSORS & FOOD MANUFACTURERS

As margins are very tight, there is reduced spending on R&D, and the pace of innovation has decreased. The processors are focused on improving the efficiency of manufacturing powders (base commodities) – specifically WMP and SMP. While food manufacturers are focused on efficiently producing complete food products from the ingredients being supplied. Enabled by technologies, significant efficiencies gains have been made in the logistics and supply chain management area.

As a consequence of being squeezed by the retailers and food service institutions, horizontal integration and partnerships are now common. A NZ dairy-food company and global leader in commodity sourcing & processing have forged a partnership to produce and deliver dairy ingredient based low cost complete foods. The dairy-food company supplies the dairy ingredients and brings in the food manufacturing technologies while the commodity processor supplies the other ingredients of the recipe and brings in logistics/supply chain management technologies.

DAIRY FARMING

Price stagnation and increasing costs have resulted in very low returns to farmers. Several of the marginal and highly leveraged farmers have exited the industry. There has also been a corresponding drop in land prices and capital value for dairy farms. Banks have become extremely conservative in their lending approach to dairy farmers, and have begun to call in debts. Farmers that have managed to survive (principally those with low or no debt) are expanding their operations. The result is a more concentrated industry at the farm-level. Many of these farms are corporate in structure with ownership in the hands of investors and control in the hands of managers. A few farms serving the domestic/fresh market are part of a vertically integrated value chain with ownership resting with the retailer. Some large farms have horizontally integrated and invested in downstream processing assets. This is challenging the existing cooperative industry structure.

With limited scope for differentiation or value addition, farms are focused on producing milk at least possible cost. The degree of diversity has decreased. The import of feed inputs is highly regulated and the trading of farm inputs within New Zealand is also highly restricted. Supplement feeding is costly and the supply is variable, pushing most farmers to entirely pasture based systems.

An extremely intense focus on efficiency has resulted in an increase in technology adoption on farms. In order to solve labour related challenges, most farms now use fully automated milking systems. They also actively use management information systems and precision technologies to deliver efficient solutions. Moreover, in-order to reduce reliance on external sources of energy, several farms have invested in solar and biogas technologies. Enabled by scale and facilitated by technology a few very large farms now have their own processing plants on –site, and are able to produce evaporated milk. This has helped decrease the frequency of milk pick-up and reduced costs.

HOW THIS SCENARIO COULD ARISE - TIMELINE



2015

Australia-China FTA results in trade liberalisation between these two countries, to be implemented in phases over a 5-year time horizon.

EU eliminates its milk quotas. Re-alignment of global dairy supply begins.

Slower economic growth and a relative glut on the world market continue to depress crude oil prices. Russian economy particularly hard hit.

Additional infrastructure built to move oil and gas from Russia to China. Russia supplies China with additional nuclear capacity.

USA policy shifts strongly away from first generation biofuels, with a cap on corn starch-derived ethanol and increased focus on alternative feedstocks. Policy attention switches to achieving environmental objectives through increased fuel efficiency. Result is a surplus of feed grains that reduce the cost of intensive dairy systems in the USA.

2016

TPP negotiations successfully completed, and an accelerated reduction in trade barriers begins for member countries – improving access for dairy products from North and South America.

Past two years of sanctions and isolation have led to significant state funded investments in Russian agricultural sector. Russia is focused on developing bilateral trade agreements with “friendly” nations, including China.

As the global economy weakens, there is an increase in the frequency and intensity of targeted, violent attacks from non-state actors based in the Middle East.

2017

FMD outbreak in New Zealand after a relaxation of biosecurity standards on the importation of fresh pork in 2016. FMD outbreak is quickly contained, but market access restricted, particularly in the higher-valued markets.

Non-state attacks become more geographically disperse, weakening the effectiveness of a ‘case-by-case’ approach to resolution.

2018

Bioterrorism incident in the USA heightens awareness of food safety and domestic food security issues in the developed world, prompting an increase in the use of non-tariff barriers for food products.

Political unrest and restrictions on trade have magnified food security concerns globally – but sub-Saharan Africa particularly hard hit. Multi-agency UN effort is mobilised to develop a secure supply of basic food for the most food-insecure regions. Funding and non-financial support secured from a consortium of philanthropists and research-based institutions. Ration includes a High Protein Biscuit that is nutritionally dense. Milk powder and grains are key ingredients.

2019	<p>Russia continues to foster bilateral trade agreements with China, India and other important emerging economies.</p> <p>EU Financial crisis (Debt / Age / Unemployment) splits EU (Haves and Have Not's)</p> <p>Consortium of primary producers from NZ and Australia land five-year contract to supply ingredients for High Protein Biscuit. Demand is strong from both NGOs and the military.</p>
<hr/>	
2020	<p>Biotechnology breakthrough that increases milk production in cattle. New Zealand producers cannot access technology due to strong anti-GM sentiment.</p> <p>Australia signs a FTA with India, and begins a partnership on the development of low-cost non-cow dairy systems for Australia.</p> <p>IS reemerges</p>
<hr/>	
2021	<p>Pakistan becomes a major excess supplier of agricultural goods in Asia after the establishment of a military dictatorship, supported by China and Russia.</p> <p>Bio Terrorism attack in USA</p>
<hr/>	
2022	<p>A Biotech firm in USA commercialises a synthetic protein substitute that is a functional substitute for milk at 50% of cost.</p> <p>South American regional conflict</p>
<hr/>	
2023	<p>High Protein Biscuit becomes a key part of military ration and school meal programmes in the developing world.</p>
<hr/>	
2024	<p>NZs contract as a primary supplier for the High Protein Biscuit expires. Competition from non-dairy sources of protein (mostly laboratory-derived) is intense. After several negotiation rounds, the NZ contract is renewed for a further 5 years.</p>

SOFT SIGNALS – EARLY SIGNS OF POSSIBLE FUTURE TRENDS

THE FOOD BISCUIT – SPECIALIZED NUTRITIOUS FOODS

The World Food Programme (WFP) is using a wide range of specialised foods to improve the nutritional intake of the people they assist around the world. These range from Fortified Blended Foods (FBFs) and micronutrient powders to Ready-to-Use Foods and High-Energy Biscuits (HEBs). These products are being increasingly used in humanitarian efforts – such as typhoon-affected Philippines to refugees in Syria.

<http://www.wfp.org/hunger>

ENVIRONMENTAL CHAOS

In 2008 the world's 3,000 largest public companies were estimated to be causing US\$2.15 trillion of environmental damage. This figure is assumed to be increasing

It is estimated that USA topsoil has been depleted by up to 75% (e.g. Iowa prairie had 12-16 inches of top soil 150 years ago and the top soil is now down to 6-8 inches). The USA is estimated to lose topsoil at 10% faster than it can replenish it; China and India by 30-40% times faster than it can be replenished.

The ocean is similarly facing a degradation crisis with increasing ocean temperatures, ocean acidification and deoxygenation

Exposure and vulnerability - to extreme events triggered by climate change - is found to be influenced by a wide range of social, economic and cultural factors and processes; and climate-related hazards exacerbate other stressors, often with negative outcomes for livelihoods, especially for people living in poverty

<https://www.kpmg.com/Global/en/IssuesAndInsights/ArticlesPublications/Documents/building-business-value.pdf>

<http://www.fewresources.org/soil-science-and-society-were-running-out-of-dirt.html>

<http://stateoftheocean.org/research.cfm>

https://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_FINAL_full.pdf

ECONOMIC CHAOS GLOBAL ECONOMIC SLOW-DOWN

Public debt in developed countries has risen to from 49% 12 years ago to over 80% with the highlight being the Greece default on debt repayments and requirement for bail out. Developing countries such as Venezuela and Zimbabwe are on the brink of chaos and IMF is warning that China could trigger a toxic shock and the risks facing the global economy are increasing,

Link to mega trends -

<http://www.dailymail.co.uk/money/markets/article-3263830/China-lands-brink-Series-toxic-shocks-tip-world-economy-chaos.html>

<http://www.forbes.com/sites/nathanielparishflannery/2015/02/18/how-venezuelas-economic-crisis-hurts-u-s-companies/>

<http://www.revelation13.net/economy.html>

CONFLICT CHAOS

One billion people currently live in conflict zones including events related to the Arab Spring – in Tunisia, Egypt, Libya, Yemen, Bahrain and Syria have placed this part of the Arab world in a very precarious

position. The world is facing a massive humanitarian crisis with the 4-year Syrian crisis displacing 8 million people within the country and 4 million refugees. The Ukraine crisis is smaller in scale but has triggered huge financial implications in response to economic sanctions applied on Russia including financial crisis in Russia and impact on global food commodity prices (includes dairy)

<http://www.mercycorps.org/articles/turkey-iraq-jordan-lebanon-syria/quick-facts-what-you-need-know-about-syria-crisis>
https://en.wikipedia.org/wiki/Ukrainian_crisis

PANDEMIC EVENTS

The ongoing Ebola crisis has resulted in 11,000 deaths from 28,000 cases and has cost the three main countries impacted about \$2b (12 % of GDP). The scale of the crisis is relatively small (swine flu resulted in 200,000 deaths and HIV has resulted in 25m deaths and compares to the estimated 50 million deaths from the 1918 Spanish flu) but the crisis has reinforced both a trend in increased threats and increased financial vulnerability

<http://apps.who.int/ebola/ebola-situation-reports>
<http://www.rwjf.org/en/culture-of-health/2013/12/the-five-deadliest.html>

PEST AND DISEASE CHAOS

Animal pests including Avian Flu, BSE and Foot & Mouth remain a threat today. Plant pests and disease currently account for 40% loss in food production with numerous pest and diseases having an ongoing impact (South American Rubber Beetle, Coffee Wilt Disease, new strains of wheat stem rust, western corn rootworm and the Colorado potato beetle etc.). The impact of pests and diseases is magnified by increasing drought events (e.g. >800 counties in USA are currently declared as disaster areas due to drought), increase resistance to chemicals and threats from human manipulation of the plant, insect and animal gene pools

<http://www.bbc.com/news/science-environment-15623490>
<http://www.fao.org/docrep/meeting/009/j4968e/j4968e00.htm>
http://www.usda.gov/wps/portal/usda/usdahome?navid=DISASTER_ASSISTANCE



Scenario 3

Regulation rules – ‘It is our privilege to serve’

THE WORLD IN 2025



Globalisation has progressed, facilitated by bi-lateral and limited player multi-lateral trade agreements rather than across-the-board trade liberalisation. The level of world trade in agricultural products is robust, but participation requires dedication and an understanding of the 'rules of the game'. This situation has sustained a reasonable level of economic growth, particularly in developing countries of Asia and Africa where there is a growing middle class. Globally, these middle class consumers are increasingly less connected to rural communities as the urban-rural divide intensifies globally.

INCREASING SOCIETAL AWARENESS AND EXPECTATIONS

Societies are better informed and more aware of environmental, social, animal welfare and food safety practices. There is increasingly low tolerance from society in both the developed countries and the developing countries to practices perceived as environmentally unsustainable, and unjust or detrimental to society, particularly in their own countries but also globally. There is a growing belief that wider community should be proactive in driving practice change rather than leaving this to government or the market, and they pressure their governing bodies to intervene and regulate on food safety, environmental, animal welfare, and community and social issues. The middle classes in society tend to be urban-based, younger and wealthier, and spend conspicuously and routinely use social media: their beliefs are also reflected in their consumer choices where they prefer products with ethical or credence attributes. Consequently, agrifood supply chains who deliver to this growing middle class market are under increasing pressure to meet a wide range of society's needs – credence attributes such as environment, animal welfare, and labour relations, as well as delivering consumer needs for high food safety, convenience and other quality standards. For exporters, the rules of the game now include significant CSR initiatives such as developing in country capability

IMPACT AND RESPONSE

Businesses in agricultural supply chains have adopted a service-orientation in order to successfully deliver food and fibre products that meet, or surpass society's expectations. It is through this 'privilege to serve' stance that they accept the increasingly stringent regulatory standards that exist throughout the supply chain, and look to excel with products that exceed local and global expectations without disadvantaging their environment and citizens, current or future, in the process. Standards specified by national and local government regulations, international and industry-lead Codes of Practice, and supply chain relationships are the minimum standards that need to be met. In dairying, there has been a shift in focus from quantity to quality as restrictions on farm systems have limited production on-farm and throughout the supply chain, which has resulted in a stable or decreasing milk supply. There is considerable interest in, and uptake of, farming and manufacturing technologies and systems that enable economically viable production of high quality milk or milk products, which exceed society's expectations.

THE NEW ZEALAND RESPONSE AND “BRAND NZ”

The expectations of New Zealand’s now largely urban society, represented by various active interest groups, have had considerable impact. As a country highly dependent on tourism and primary production, New Zealand has worked hard to retain its ‘clean, green’ image. Regulations around food safety, environment, people management and animal welfare have increased throughout the entire agri-supply chains in response to expectations from both New Zealand and global customers. However, New Zealand is also aware that its natural, pasture-based agricultural systems means that agricultural products have a ‘naturally-produced’ Oceania attribute, which few countries in the world can replicate, and this is actively promoted as a point of difference. Throughout the supply chain, New Zealand producers and processors have adopted a proactive approach to meeting ethical and credence standards, which surpasses those of many other countries, and are internationally recognised. Hence, New Zealand product demands a relatively high return, even in the ingredient or commodity markets. New Zealand also benefits from low growth in the international supply of product meeting the credence attributes increasingly demanded by the World’s middle class markets, contributing to higher returns.

To deliver to its licence to operate criteria and enable high-value markets to be targeted, New Zealand producers have proactively engaged with, and responded to, the requirements of all stakeholders. Some producers have exited the industry, and have been replaced by those who believe in, and see opportunities to gain from, the advantages New Zealand Inc. has relative to its competitors in being able to deliver to the increasing demands for commitment to trading country well-being. Producers and industry representative bodies actively promote their best practice activities using communication technologies and social media. Retailers strive to differentiate their branded products and create an image that appeals to their consumers, including developing high ‘minimum standards’ on a range of ethical or credence attributes that their suppliers must meet, which often exceed regulated standards.

THE ROLE OF TECHNOLOGY

Auditing requirements on a wide range of compliance types have intensified throughout the supply chain resulting in increasing costs. There is more stringent food safety and milk quality compliance and testing from farm to consumer. Data is automatically transmitted to auditors from throughout the supply chain. Task automation, measurement, tracking, monitoring and data management technologies have been developed to help farmers and processors meet the increasingly high standards, facilitate audit requirements, track product throughout the supply chain, and reduce time, human error and audit costs.

On-farm technologies and systems which enable high per cow production while meeting animal welfare and environmental expectations have been developed and readily adopted, including precision agriculture, nutrient and effluent management technologies, water and energy conservation systems, shade and shelter facilities, improved animal health measures and reduced culling levels, and high quality feeds and feeding systems to replace banned feeds. Farm systems have adapted, integrating these new technologies and complementary farming enterprises are in place e.g. systems to utilise surplus calves or provide acceptable feeds to the dairy industry in New Zealand. Processing technologies that improve efficiencies, and reduce waste and pollution have been implemented.

Communication technologies enable greater scrutiny not only from auditing bodies, but also society, and farming is now operating in a virtual 'fishbowl' e.g. satellite technology and real time video cameras allow access to on-farm images via internet. Activists monitor agricultural and manufacturing activities, and use social media to communicate directly to consumers and the public. Businesses and supply chains that fail to meet public expectations are under threat of losing their licence to operate.

However, the same communication technologies that bring dairying under the microscope also enable strong support networks among farming communities, and provide the opportunity for farmers and industry to inform their local communities and global customers about the realities of farming, agricultural industries, and food production and products. Farmers, farming organisations, dairy processors and retailers actively promote good farming practices and their products' ability to exceed society's expectations via the web and other technologies.

THE NZ DAIRY INDUSTRY – AT A GLANCE



MILK PRICE

- New Zealand has invested in “Brand NZ”. NZ dairy products are recognized globally as being naturally produced, safe, environmentally and socially sustainable, and highly ethical. The advantage New Zealand has over most other countries in being able to run ‘natural’ pasture-based grazing systems is promoted.
- Product brands are well recognised.
- New Zealand receives a high return on dairy products because of supply and demand factors, and product attributes. As product specification increases, volatility lessens somewhat.

FARM CHARACTERISTICS

- REGULATORY IMPACT
- FARM SYSTEMS
- FARM SIZE
- PRODUCTIVITY
- COMPETITION
- NUMBER OF FARMS
- FARMING'S IMAGE

- Farmers actively promote their farming systems, products and willingness to please community and international and NZ consumers, as do their industry organisations.
- Farmers face increasingly tight regulatory constraints, which are largely outcome-based. The prescriptiveness of the regulations determines the viability of potential farming systems.
- A range of dairy farming systems have been adopted to meet requirements and new technologies are widely used.
- Strong monitoring and control systems are in place. The importance of meeting regulatory requirements has resulted in tighter management control (favouring smaller farms), automation to reduce human error and/or employment of specialist compliance staff (favouring larger farms). Farm size is relatively polarised.
- Regulations and auditing mean farmers and their staff require in-depth knowledge of farming systems, environmental interactions and regulations. Efficient systems and quality people with specialised skills are required.
- The regulatory burden shifts the focus from milk volume to quality. Production per hectare is reduced because of system limitations e.g. stocking rates, feeds available.
- Greater efficiencies and a higher milk price counter the higher dairy farm compliance costs and reduced milk volume.
- Competing agricultural industries face same or similar regulatory constraints. Industry relativity in ‘living within rules’ results in enterprise changes e.g. to high value crops. Dairy farm numbers are similar to, or less than, currently. Support blocks or complementary enterprises produce ‘acceptable’ feeds for dairying as well as raising dairy replacements or surplus dairy animals.
- Some regions are more affected than others are by changes in dairying because of natural attributes and dairy’s competitiveness locally.
- Farming is viewed positively as a career due to the professional approach, technology used, skills required and ethical standards.

DEMAND FOR DAIRY

- The global demand for dairy products is robust. There is a strong ‘stewardship’ requirement on farmers, and sustainability and ethical expectations throughout the supply chain.
- The growing middle class worldwide increasingly expects and will respond to these ethical attributes in their food products.

SUPPLY OF DAIRY

- Regulatory requirements constrain supply globally at the 'top end',
- World supply of dairy products that meet ethical and credence standards remains relatively constant because of regulatory restrictions on their farming systems, limiting production.
- Some countries cannot compete at this level. Internationally, polarisation of products occurs i.e. focus on service and quality versus quantity and commodity product.
- Consumers pay higher prices for dairy products in 'top end' markets.

DIFFERENTIATED VS COMMODITY

- There are a number of dairy processors in New Zealand, all of whom produce a competing range of high quality products with credence 'Brand NZ' attributes, and have CSR initiatives in place.
- Some processors extend these requirements to further differentiate their products through service.
- The naturalness of New Zealand farming systems is promoted across the board as a point of differentiation compared to most international competitors.
- The NZ product story can be substantiated / verified from pasture to plate. The lack of corruption in NZ gives this story credence.
- Across the board – NZ dairy is recognized as a high quality product that delivers to society's needs.

ENVIRONMENTAL & SOCIAL IMPACT

- The environmental and social impact of dairying is its fundamental point of difference, as is its ability to connect this impact to the requirement (regulatory, industry and voluntary) to deliver to societal and consumer expectations.

RISKS

- Cost of compliance, required system changes and associated costs, and lower production levels increase the per-unit cost of production. Margins can be squeezed unless there are increasing efficiencies and a willingness to pay for credence Brand NZ qualities.
- Conflicting objectives (food safety, environmental, welfare, social) make managing within constraints difficult.
- 'Shifting regulations' or 'tightening regulations' can mean that the rules of the game are constantly changing.
- Newer technologies make measurement more available and accurate, and can create the likelihood for even more regulation and auditing. On the positive side, these technologies can also be enablers in being able to meet compliance standards.
- The farm sets the standard necessary to be able to deliver to consumer experience e.g. credence attributes. Human error or poor practice could have severe implications for a farm business or processing business, and in a worst-case scenario, damage the industry's reputation.
- Social media means the license to operate can be very tenuous – this can be taken away quickly, without 'proof'.
- Market point of difference is delivering compliance 'plus'. The trick is determining from fickle consumers what the plus is.

THE NZ DAIRY INDUSTRY



As described previously in the 'World in 2025', this scenario is influenced as much by the expectations of New Zealand society, as by the global situation. Like their middle class counterparts globally, New Zealanders are better informed and more aware of environmental, social, animal welfare and food safety issues, and there is decreasing tolerance to farming and industry practices that have negative environmental, social and animal welfare impacts. Middle-class consumers in New Zealand's target markets also have increasingly low tolerance to practices perceived as unjust or detrimental to society, not only in their own countries but also internationally, and increasingly want their food produced accordingly. The expectation for high quality, safe food is a given.

Society's concerns have contributed to a highly regulatory approach to farming and food production activities. Domestic regulation at national, regional and dairy company level, contractual obligations with customers (primarily international) and carefully negotiated Free Trade Agreements have intensified. A wide range of compliance types (food safety, environmental, social, animal welfare) are specified throughout the supply chain. International standards (e.g. Sanitary and phytosanitary, Global gap standards incorporating these aspects of agricultural production) are in place or under development, and need to be met to be able to trade internationally. New Zealand, as an exporting country, has responded proactively to changing expectations and increasing regulation. The availability of land and water, and the use of natural pasture-based farming systems provide New Zealand with an advantage most global competitors do not have. Consequently, New Zealand's ability to deliver to society's and consumer expectations surpasses that of their international competitors, particularly on the 'natural Oceania' attribute of New Zealand farming systems, which is actively promoted by all New Zealand-based dairy companies (Brand NZ) and recognised world-wide.

Compliance requirements require intense monitoring and regular audits throughout the supply chain to ensure codes of compliance are met and exceeded, increasing workload and costs of production throughout the supply chain. Changing regulations mean all those in the supply chain, from the farm suppliers and farmers through to retailers are adaptable, and prepared to accept and implement change. Increasingly sophisticated technologies for measurement and monitoring, and the automation of data collection for auditing and other purposes have been developed and are readily adopted and used extensively throughout the supply chain. Similarly, technologies that enable standards to be met are readily adopted.

Farm systems are regulated by increasing food safety, environmental, HR and animal welfare requirements including limitations on hours worked, stocking density and nutrient management, time animals spend on pasture, and shelter and shade standards. Farming practices are under greater scrutiny and the use of antibiotics and killing of bobby calves have been banned. On-farm monitoring is commonplace and standards met must be within stringent limit. Some data is required to be uploaded to central electronic platforms accessible by government, processors, customers and/or the public. The industry is aware that one indiscretion could taint the 'Brand NZ' image and threaten their collective competitive advantage in the delivery of a high quality, sustainably and ethically produced product.

Activist groups around the World use webcam surveillance and real time streaming to the internet and social media to publicise non-compliant producers, putting agricultural producers in a fishbowl. Extreme footage, often taken from intensive farming systems overseas, fuel negative perceptions of farming practices. The New Zealand dairy industry and associated parties (farmers, industry DairyNZ, Federated Farmers, Fonterra and other processors, retailers) have responded with initiatives to familiarise society and customers with good farming practices, the benefits of dairy products and their ability to exceed expectations. Fewer New Zealanders have direct links with farming than in the past. The challenges farmers face in meeting multiple objectives and still remaining economically viable are not well understood by their urban counterparts and they lack trust in farming practices. However, the delivery over and above regulations, and industry activities and communications to urban society and global customers are making inroads in closing the gap in the urban-rural divide, particularly in New Zealand.

CONSUMERS

The middle class population worldwide, who are the ultimate consumers of New Zealand dairy products, continues to grow, and urban populations expand while rural areas lose population. Despite their distance, both figuratively and literally, from agricultural production systems, these middle class urban consumers want to ensure that the food that they eat is safe, and they have a definite preference for food production systems they perceive as natural, sustainable and ethical. These urban consumers tend to be younger, wealthier, inclined to use social media and are increasingly distanced from the realities of agricultural production as the urban-rural divide continues to intensify around the globe. They use real time information available to them, and are well-informed and aware of the food safety, sustainability and ethical issues associated with their food production.

Some of these international consumers are from countries where there is a perception – and often a reality - that their domestic market is not capable of delivering the credence attributes that they demand, and they are willing to pay a premium for products from global markets that meet their requirements. New Zealand products, or products containing New Zealand dairy ingredients along with other ingredients with similar attributes, are seen as desirable, particularly by those wanting a ‘natural Oceania’ type attributes in their food products.

RETAILERS & FOOD SERVICE

Multi-channel retailing, involving both traditional and online services, is the norm with much of the retail business taking place online. The New Zealand product story can be verified from pasture to plate with the information to support this being made available to customers online. High standards and the lack of corruption in New Zealand give customers confidence in this information. Brands are important as consumers are less price-sensitive and more principles-driven, and middle class consumers have moved away from cheap private-labels to embrace brands that they trust. This has reduced the power of the retailer.

Retailers and food service institutions are under intense scrutiny by regulators and others, including in the way they treat their suppliers and other up-stream participants in the supply chain. Activist groups and third party certifiers proactively monitor their activities. Fair and ethical treatment of all stakeholders and participants of the supply chain is critical, and bullying tactics can result in the loss of licence to operate.

Food service institutions are under similar community pressure and scrutiny. Much of the global obesity epidemic was attributed to the lower-end food service institutions that essentially sold excess amounts of sugar, salt and fat to the masses. These institutions increasingly face tighter operating criteria and are therefore slowly fading away or evolving. The higher end food service institutions do not face such challenges and operate successfully. These food service institutions promise their customers credence attributes in their products and increasingly seek a consistent supply of high-value dairy ingredient products from countries such as New Zealand, which meet their attribute specifications.

FOOD MANUFACTURERS & PRIMARY PROCESSORS

Community pressure and customer expectations are also brought to bear at this level of the supply chain. There is an expectation that food processing will be environmentally and socially sustainable, and there has been increased regulation and auditing imposed both by New Zealand regulation, and Codes of practice and customer specifications, to ensure environmental and social sustainability standards are met. Innovation in processing and transport has increased resource use efficiency and reduced waste and pollution, and manufacturer and processors strive to meet zero waste requirements. All players in the supply chain are expected to exhibit strong corporate social responsibility: a consequence of this is that dairy brands and associated products have replaced alcohol as key sponsors of events.

Stakeholders are treated ethically throughout the value chain, from farmer suppliers who receive a fair and reasonable milk price in return for providing high quality milk supply produced in an acceptable manner, workers who are treated fairly, through to customers whose product is guaranteed, and local communities who want sustainable and ethical practices. Transparency in the supply chain, and the demand for an ethically produced, quality product, means failure to deliver to these requirements could result in business failure. Technology has been developed which enables customers to find on-line those milk products or products with dairy ingredients, which are produced in a way that meets or surpasses the customer's corporate social responsibility preferences. Similarly, some dairy products or products with dairy components can now be disassembled and assembled to meet a customer's needs and wants, and this process also takes into consideration the credence attributes of the components.

Branding is important at this level, not only to portray the fact that product has Brand NZ attributes (which most or all NZ products meet), but also to reflect the company's own product specifications and attributes to their customers at the high-end of the market. Both ingredient and consumer goods are processed, with a range of differentiated attributes, including enhanced Brand NZ attributes and specifications in some products. Some companies use own brands, while others sell product directly into markets under the recognised brands of their strategic partners in overseas markets who want product from New Zealand to meet their consumers requirements. Technologies that track product from pasture to plate will be commonplace, and product specifications and attributes are able to be tracked as products move along the value chain with this information available to the end consumer.

Fonterra is still a major player, and the other New Zealand companies (Westland, Tatua and Miraka, which is part NZ owned) continue to operate. However, there is increasing interest in New Zealand from overseas companies who want high quality New Zealand dairy products (Brand NZ) to sell into their own markets, often under their own recognised brand. These largely Asian-owned companies often seek to control the whole supply chain, owning farms as well as manufacturing plants in New Zealand. Despite the high regulatory environment in New Zealand, they are prepared to invest in New Zealand to meet the requirements of the growing middle class in their own countries with the prices received for product at the upper end of their domestic markets making this worth their while.

FARMING

Farming systems remain diverse with some polarisation. Larger, more automated farms have the advantage of economies of size when investing in automation and specialised skills (e.g. employing IT or compliance technicians) to ensure compliance standards are met, and reducing labour costs and associated human error. Smaller farms can be more adaptable, and allow a greater degree of management control that is important in ensuring stringent compliance standards are met. The small family farm image is also socially appealing, and some smaller farms promote this aspect of their farming operation. The importance of exceeding the minimum regulatory standards means owners and managers see overseeing meeting regulatory requirements as their primary responsibility. This requires active engagement and trust between employer and employee, and everyone is encouraged to see meeting standards as a shared responsibility.

There are regional differences in farm sizes, systems and the prevalence of dairy farming because of differences in the natural environment, farm sizes, access to resources such as off-farm feed or irrigation, and competing or complementary enterprises. In some regions, competing agricultural enterprises are better able to meet the regulatory requirements imposed on agriculture, and land use change from dairying has occurred e.g. seed production on irrigated land with light soils in Canterbury. Pastoral farms must incorporate shade and shelter, with some farms opting for mixed pasture /herd home systems to meet environmental, animal welfare and 'natural' standards. Regulatory requirements have posed limitations on stocking rates and feed sources, reducing production potential. Stocking rate restrictions have resulted in a strong focus on per cow production, and a ban on antibiotics and concerns about cow wastage has resulted in greater attention to cow health and longevity. Feed and grazing costs have increased because of restrictions on feed type availability and the need to source any extra feed from other, mainly domestic, sources. Bobby calves can no longer be killed, and dairy farms have diversified or work in with other farmers to meet regulations e.g. raising or supplying dairy-beef calves that meet beef processors requirements. Farm systems have adapted to meet or surpass the regulatory requirements, including consideration of likely future expectations, and technologies and systems that help meet requirements have been readily adopted.

Milk production has remained constant or declined because of the restrictions imposed on systems, despite there being a similar area of land in dairy or dairy support. The constrained production, and extra infrastructure and monitoring requirements, have increased capital and operating costs, which increased milk income and greater efficiencies need to compensate for, for dairying to remain economically viable.

Farmers use a range of farming systems and technologies to meet regulatory requirements e.g. precision technologies. Communication and monitoring requirements mean all producers must be proficient with technology in the form of measurement tools, data and information technology, and social media. Compliance with various production and discharge standards is critical, and management systems are required to collect, summarise and analyse large volumes of data to provide information for monitoring and control. There have been significant advances in technology in these areas, with farm data collection by drones, microchips or collars on cows, environmental sensors and webcam surveillance being commonplace along with more recent advances in technology. Data systems are connected and information analysis is automated. Good internet access is now available to all dairy farmers.

The employee profile has changed because of the reporting and data gathering requirements associated with regulation. Staff have more diverse skills, and are rewarded accordingly. Information and data management is an important part of the job at all levels, with some of the more mundane jobs becoming highly automated to increase accuracy and reduce human error, as well as allow staff time required. Stockmanship is still critically important with animal welfare under the spotlight. The professional approach, technology used, skills required and ethical practices used have resulted in farming being viewed more positively than previously as a career.

Although removed physically from their most critical markets, producers participate in a virtual dialog with consumers overseas. They actively engage with stakeholders to reassure an increasingly watchful society and keep discerning international consumers informed. The same communication technologies that bring dairying under the microscope also enable strong support networks among farming communities, providing the opportunity for farmers and industry to inform their local communities and global customers about the realities of farming, the dairy industry and dairy products. New Zealand producers install on-farm electronic surveillance with real-time images and information accessible to the public 24/7 to demonstrate their natural-based farming systems to local communities and overseas consumers, and show that their environmental, animal welfare and employment standards are top-notch. Producers, processors and industry bodies are increasingly involved in school programmes and urban roadshows, and the farming community, from individual farmers through to industry bodies and processors use social media and other technologies to communicate with stakeholders.

HOW THIS SCENARIO COULD ARISE - TIMELINE



2015	EU eliminates its Milk Quotas. Re-alignment of global supply begins
2016	There is a ban on the use of antibiotics for dry cow therapy in the EU & USA – New Zealand follows.
2017	<p>A study published in Nature clearly proves that cows raised on pasture based systems have significantly better & more positive animal welfare outcomes.</p> <p>Much stronger regulation imposed on antimicrobial usage & ban on use of “controversial” feed inputs (e.g. PKE).</p>
2018	Newer & tighter regulations imposed on dairy farming in NZ. The primary focus being on eliminating negative environmental externalities.
2019	Farmers are forced (via regulation & societal pressure) to open-up their operations to the world- via 24 hour real time web-cam surveillance. Dairy farming is in an intense “fish-bowl” & constantly under pressure from activist groups.
2020	<p>The WTO Doha Development Round of negotiations is completed and recommendations are implemented. Globalization is expected to progress faster & World trade is expected to increase significantly.</p> <p>Cost effective technology available to enable global traceability systems (all Countries, all products, all ingredients, all attributes, all stakeholders)</p>
2021	<p>There is ban on slaughter of Bobby Calves in NZ & working hours are limited to 37.5 hours a week.</p> <p>Global Climate change agreement has been reached</p>
2022	<p>Technological advancement, specifically in measuring & monitoring, has significantly empowered the regulators.</p> <p>Global agreement on compulsory resource and sustainability reporting has been reached</p>
2023	Consumer right activists go on an intense campaign with the objective of painting an extremely negative picture of intensive dairy farming. Demand for extensive-pasture based dairy products soars
2024	Shipping industry forced to go green by activist groups & regulators, significantly increasing costs of transportation.

SOFT SIGNALS – EARLY SIGNS OF POSSIBLE FUTURE TRENDS

THE GLOBAL COMMITMENT TO SUSTAINABLE DEVELOPMENT GOALS

193 global leaders sign up to the UN Sustainable development goals, including New Zealand's John Key. The world leaders are committing to 17 Global Goals to achieve three extraordinary things in the next 15 years ... to *end extreme poverty, reduce inequality and protect the planet*. Over 8000 global business are aligned with this through the UN World Compact and individuals align through the global citizens initiative

<http://www.un.org/sustainabledevelopment/sustainable-development-goals/>
<https://www.unglobalcompact.org/>
<https://www.globalcitizen.org/en/global-goals/>

GLOBAL STANDARDS (GS1)

1 million enterprises now work with GS1. GS1 is developing the global standards for all product information and standards for information across the value chain (e.g. the latest standard for traceability of fish and standards for sustainable farming)

<http://www.gs1.org/about>
<http://www.prnewswire.com/news-releases/gs1-shares-its-standards-for-sustainable-farming-with-the-united-nations-300149443.html>

ANIMAL WELFARE STANDARDS

The code of Welfare, Dairy Cattle was established in NZ in 2014. Similar codes have been introduced for other stock and new standards that are increasingly restrictive are being introduced for housed stock (dairy, pig and poultry). Specific accepted practices are no longer tolerated (related to bobby calf handling and culling, calf inducement and tail docking)

<http://mpi.govt.nz/protection-and-response/animal-welfare/codes-of-welfare/>

RESTRICTIVE FOOD SAFETY RULES

China introduced new food safety rules in 2013. These were replaced in 2014 with much more restrictive rules including prescriptive licensing requirements

<http://www.china-briefing.com/news/2014/05/08/foreign-dairy-makers-locked-chinese-market.html>

ENHANCED CONSUMER PROTECTION RULES

Most countries are enhancing rules to protect consumers. China's new rules were introduced in 2014.

<http://www.china-briefing.com/news/2014/04/08/china-introduces-new-consumer-protection-law.html>

5. CONCLUSIONS

The key conclusion from the process of building the scenarios is that there are a diverse range of factors and uncertainties that will shape volume, value, cost, complexity and volatility across the industry. This is inherently understood by most stakeholders but is not always explicitly considered when making decisions and the key observations are.

- The process of developing scenarios forces consideration of the plausible alternatives and this by itself will enable better decision making.
- The analysis of the soft signals points to recent events that suggest each of the scenarios is already evolving today and should be treated as being plausible
- It is impossible to predict the most likely setting and it is also clear that the future is likely to be some form of a fusion of the various scenarios

In this context, as this project progresses into its next stage, and when farmers and industry participants are making critical investment and operational decisions, it makes sense to explore these futures to understand:

- What is the optimal system for each plausible scenario and how does this differ for each scenario
- What systems are most resilient (i.e. can be changed quickly and effectively from one setting to the other & can be successful in multiple scenarios)

The four scenarios provide a framework for thinking in a world where disruption is seen as the one inevitable future and to avoid the pitfall of naively thinking either the past will continue or there is a certain direction. This is useful for all stakeholders today. The four scenarios point to vastly different futures with the key conclusions being:

- *Base Case – Growth with increased complexity, competition and volatility.* The Base Case actually assumes there will be considerable change from the status quo and, in many instances, the farming systems of today will be uncompetitive. There is a clear trade off in this scenario between growth and increased value vs complexity and competition across the entire value chain. In this scenario, the future competitiveness of the NZ dairy farming system may depend on the pace of technology development and the methods by all players in the chain to get closer to the customer
- *Scenario 1 - Consumer is King – The volume to value revolution.* The Consumer is King Scenario is potentially the most positive of the four, with increased growth and value but it is also the scenario that would potentially require the greatest change and investment across the entire value chain. This scenario would therefore involve significant competitive risk as direct and substitute competitors will potentially have superior resources and capability than the New Zealand industry. It will involve adaptation at all levels of the value chain, not least on the farms, as consumers' requirements become more and more specific.
- *Scenario 2 – Government Dictates – Political Chaos and Shrinking Markets.* The Government Dictates Scenario is potentially the most negative of the four, with decreased volumes and value but is also a scenario that could favour the New Zealand system. We have a history of providing bulk nutrition at low cost to countries with a deficit in milk production. Again, significant change will be required across the chain and science/technology will play a key role. It will require adaptation from today's systems and business/government relationships.
- *Scenario 3 – Regulation Rules – it is our privilege to serve.* The Regulation Rules Scenario expands on the current trend to require far greater transparency and compliance with standards and expectations and pushes this to an extreme. This is already apparent and could be associated with any of the chaos factors or an extreme view from governments. This will affect every supplying country and New Zealand is well positioned to adapt to this but there

would be risks with the escalating demands to use technology at a micro level in every stage of the value chain from inputs to the farm through to the consumer. The 'privilege to serve' label is indicative of the response that successful NZ farms would adopt under this scenario.

The key points of the group of scenarios are:

- They are all plausible
- They all represent a significant shift from the status quo
- They all involve significant investment and change ... at the farm system level through to the customer
- None of these scenarios is easy ... there are significant risks in each scenario and New Zealand will have to respond effectively to stay competitive

In all four scenarios there is a need for improved technology and capability build throughout the value chain; delivering to this requirement will be NZ's biggest challenge. Also of note is the need to be agile and to provide total solutions in which farmers, processors, marketers, funders, government, NGOs and society all play a role.

The process of designing and modelling farm systems for each of these scenarios will take this a step further by making farm system options clearer, quantifying their outcomes, and therefore helping the stakeholders make better decisions. Given the importance of Dairy to New Zealand's prosperity and the volatility the industry is currently experiencing, managing this next stage of the project is critically important to the industry and New Zealanders in general.

APPENDIX A: The Dairy Future Farm Systems Scenario Brief

Background

NZ and the global Dairy industry are evolving rapidly. The long-term future of the Dairy industry is underpinned by growth drivers but there is a history of volatility and many uncertainties that may have significant implications for NZ's dairy farm systems (including scale, genetics, pasture, water, infrastructure, labour, information, management etc.). The dairy industry has developed a strategy around twin themes of "competitive and responsible" - The Scenario Planning process has been initiated to effectively explore future uncertainties and make better decisions on farm systems

Scenario Planning Overview

- The Centre of Excellence in Farm Business Management have initiated the Scenario Planning Process to provide reliable and comprehensive information for the identification and analysis of farming systems best suited to changing environments.
- The objective of the Scenario Planning Process is to explore the uncertain issues (e.g. supply, demand, trade, consumer, retail, food safety, climate, land or environment expectations etc.) driving NZ's future dairy farm systems and articulate a set of "plausible scenarios about the future (10-20 years)".
- The outcome of the process is specification of a group of scenarios (max 4) that challenge the status quo but are accepted as plausible. Each scenario groups together the set of issues with different settings and assumptions. The scenarios specify a "dominant set of issues and their settings" and allow decision makers to explore how the farm system might have to change to stay competitive.
- The Scenario Planning process forces the industry to look outside the current probable future for solutions that respond to the scenarios. The process enhances the capacity to perceive, respond to, learn from, and influence change and develop farm systems that are high performing and resilient under different scenarios.
- The Centre of Excellence of Farm Business Management Scenario Planning approach is designed to :
 - Build on existing knowledge (not create new knowledge)
 - Leverage the insight and expertise that already exists in the network
 - Actively engage teams in discussion to co-develop outputs
 - Ensure a focus on understanding implications & actions

The approach involves five key phases -



- The approach involves three main teams working over a period of approximately 6 months (see following page) including:
 - Steering Group to define the scope and drive the process (Weekly teleconference)
 - Working Groups of industry and farmers based in Canterbury and Manawatu that are engaged in the review of information and make decisions on key issues and the definition of scenarios etc. (this involves 3 key ½ day workshops)
 - Research Teams from the Universities that are responsible for compiling and presenting critical information. Effectiveness of scenario development requires clarity of purpose and scope.

Measures of Success

- Agreement on plausible scenarios and understanding of implications so that stakeholders make change decisions
- Complete process on time
- Gain support and agreement from all stakeholder groups

APPENDIX B: Dairy Future Farm Systems Scenario Milestones and Outcomes

PHASE	MILESTONES EVENTS	DESCRIPTION	OUTCOMES
Inform, Scope and Plan	Kick-off Planning Workshop and Steering Group Follow-up	<ul style="list-style-type: none"> • Introductions, kick-off and “set the scene” with project lead, stakeholder groups, subject matter experts (SME), steering and working groups. • Define and agree on roles and responsibilities for each party. • Define and secure buy-in for the project purpose, high-level plan and outcomes. • Agree on timeline, detailed plan and milestone schedule. • Define and agree on what is in and out of scope (i.e. time horizon for scenarios). • Validate proposed workflow with all parties. • Clearly defined sign-off criteria and deliverables at each phase. • Identify possible challenges, risks, issues and mitigating steps, agree on accountabilities. • Align (or make accommodations) in accordance to existing policies, procedures and business-as-usual constraint (i.e. procurement/ contract management, sharing resources, IT infrastructure, etc.). • Agreed on communication plan, tool and process (i.e. to whom, update on what, how often, using what medium, etc.). 	<ul style="list-style-type: none"> • Agreed Objective, Approach, Scope, Plan and Resources • Establish Communication, Tools and Process
Identify Issues	Issue Identification Workshop	<ul style="list-style-type: none"> • Workshop to confirm major issues (20+) and assumptions, and create working “research briefs” accordingly. • Coordinate and mobilise research team to review past trends and complete analysis on major issues and assumptions. 	<ul style="list-style-type: none"> • Confirm Major Issues (20+) and Assumptions (and research briefs)

Evaluate Issues	Issues Evaluation Workshop	<ul style="list-style-type: none"> • Understand the influence of key drivers, points of leverage, opportunities and vulnerabilities and probabilities. • Identify key issues (with “make or break” consequences), assumptions, interdependencies, dependencies and constraints. • Workshop to consolidate and validate research finding, including: assumptions, issues, key variables and range (i.e. objective, reasonable, factual, can be forecasted, etc.). • Discuss proposed scenario themes and next steps. • Narrow down, challenge and define plausible scenarios (i.e. relevant, challenging and logical) as opposed to the most probable scenarios. • Create working research briefs based on FOUR (4) plausible scenarios. Document any implications or constraints. • Review, confirm, change control and solve/mitigate risks and issues (i.e. changes to scope, timings, constraints, deliverables or milestones). 	<ul style="list-style-type: none"> • Validated Issues & Assumptions (document implications) • Proposed Scenario Themes (and research briefs)
Develop Scenarios	Scenario Development Workshop	<ul style="list-style-type: none"> • Workshop to build scenarios combining interactions between key and dependent variables, values / variations and assumptions to create plausible scenarios. Confirm understanding, challenge and actively evaluate. • Create draft of the four (4) scenarios, coordinate changes / iteration as required 	<ul style="list-style-type: none"> • Agreed Scenario
Finalise Scenarios	Scenario Presentation Workshop	<ul style="list-style-type: none"> • Seek feedback and add any additional needs, recommendations and input. • Present final scenario description document to stakeholders. 	<ul style="list-style-type: none"> • Scenario Description

APPENDIX C: Project Participants and Acknowledgements

Steering Group

NAME	ROLE	ORGANISATION / ASSOCIATION	CONTACT
Professor Nicola Shadbolt	Project Lead	MU	N.M.Shadbolt@massey.ac.nz + 64 (06) 951 7793
Simon Hunter	Facilitator	KPMG	Simonhunter@kpmg.co.nz + 64 (09) 367 5811
DJ Apparao	Project Manager	MU	M.D.Apparao@massey.ac.nz + 64 (06) 951 7819
Dr Kathryn Bicknell		LU	
Dr Liz Dooley		MU	
Guy Trafford		LU	

NAME	ORGANISATION / ASSOCIATION
Cam Lewis	Banker
Colleen Shelden	Council
Kimberly Crewther	Dairy NZ/DCANZ
Geoff Taylor	DairyNZ
Aidan Bichan	Farm Consultant
Christine Finnigan	Farmer
Shane Carroll	Farmer
Robert Ervine	Farmer
Tony Kuriger	Farmer
Andrew Hoggard	Federated Farmers
Mark Laurence	Fonterra
Blair Stewart	Fonterra
Richard Symes	Hopkins Farming Group Ltd
Peter Taylor	Horizons
Simon Hunter	KPMG
Julia Jones	KPMG
Mark Julian	Landcorp
Katie Bicknell	LU
Richard Lynch	MPI
Elzet Grant-Fargie	MPI
Wei Zhang	MPI
Irene Parminter	MPI
Ian Yule	MU
Alan Still	MU
Dave Horne	MU
Nicola Shadbolt	MU
Liz Dooley	MU
DJ Apparao	MU
John Holland	MU
Elena Garnevska	MU
Tom Phillips	MU
Panos Fousekis	MU
Nicolas Lopez-Villalobos	MU
Grant Rowan	MyFarm

NAME	ORGANISATION / ASSOCIATION
Robyn Dynes	AgResearch
Graham Kerr	Agriseeds
Mark Grenside	ANZ
Colin Glass	Dairy Holdings Ltd
Terry Hughes	Consultant
John Donkers	Consultant & Farmer
Jeremy Savage	Consultant & Farmer
David Chapman	DairyNZ
Paul Edwards	DairyNZ
Don Rule	ECAN
Juliet McLean	Farmer
Alan Davie-Martin	Farmer
Alvin Reid	Farmer
Mark Slee	Farmer
Jessie Dorman	Farmer
Murray Bowden	Farmer
David Irvine	Farmer
Steve Lee	Farmwise consultant
Michael Bennet	Federated farmers
Phil Griffiths	Fonterra
Simon Hunter	KPMG
Jack Hooper	LIC
Andrew Lingard	LU
Keith Cameron	LU
Ian MacDonald	LU
Suzanne Trafford	LU
Guy Trafford	LU
Marv Pangborn	LU
Katie Bicknell	LU
Peter Hancox	LUDF
Doak Murray	MPI
Liz Dooley	MU
Nicola Shadbolt	MU
DJ Apparao	MU
Barbara Nicolas	NAWAC
Charlotte Westwood	PGG-W
Mike Manning	Ravensdown
Ron Pellow	SIDDC/LUDF

