

THE JOURNAL

Vol 21
No 1
MARCH 2017
ISSN 1174-524X

The Official Publication of The New Zealand Institute of Primary Industry Management Incorporated



THE ECONOMY AND THE PRIMARY SECTOR KEY DRIVERS FOR UK AND EU MILK SUPPLY
FEASIBILITY OF STORAGE-BASED IRRIGATION **IMPROVING PROFITABILITY IN DEER HERDS**



NZIPIIM ACKNOWLEDGES
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Ministry for Primary Industries
Manatū Ahu Matua



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The New Zealand Institute of Primary
Industry Management Incorporated

Volume 21
Number 1
March 2017
ISSN 1174-524X

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The Journal is the quarterly publication of the New Zealand Institute of Primary Industry Management. *The Journal* is provided free of charge to NZIPIIM's members from across the rural profession including farm management advisors, rural bankers, farm accountants, fertiliser consultants, rural valuers, specialised service providers, farm managers, representatives from industry good organisations, CRIs and universities.

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SUBSCRIPTION RATES

\$75+GST (NZ)
\$100 (Australia)
\$120 (other countries)

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CEO's comment

Shifting expectations

How well do we understand the social and environmental expectations of urban New Zealand for the future?



Not that long ago depressed agricultural commodity prices would not only have impacted upon the primary industry, but would be felt throughout the whole economy where both urban and rural New Zealand would feel the economic pinch of low prices for our primary products.

While it's pleasing to see dairy prices lift over recent months, it would be fair to say that the financial situation is still challenging on farm looking to restore balance sheets and in the provinces servicing the farming community. But unlike past economic downturns in the primary sector, urban New Zealand has not necessarily shared the same economic roller-coaster ride over the last three to four years.

When we look at New Zealand's large metropolitan centres, most noticeably Auckland, they appear to be doing quite well and have done so for a number of years. Fuelled by increased immigration, escalating property values, and a vibrant service and construction sector, it would be fair to say that our large metropolitan centres have not suffered the same economic effects experienced by their country cousins.

We are one of the most urbanised countries in the world with 86% of the population living in urban areas. The time when everyone seemed to have a relation or friends involved in farming is no longer common place. The closest our urban friends may get to the country may be limited to the occasional excursion through the country to get to their favourite recreational spot, cycling through rural areas as part of the increasing network of national cycle ways, or visiting the local farmers' market.

Tourism is now held up as New Zealand's largest export industry in terms of foreign exchange earnings. In the year ended March 2016, international tourism's contribution to total exports was \$14.5 billion (20.7% of exports), surpassing export receipts from dairy products (\$12.3 billion) for the first time since 2010. Tourism is also a significant employer with 188,136 people (or 7.5%) employed in the sector, with a further 144,186 indirectly employed in the industry [Statistics New Zealand: Tourism Satellite Account – 2016].

Urban New Zealand's exposure to the primary industry may now only be limited to content from mainstream media and/or through expanding a ray of other media channels (e.g. blogs, Facebook, Twitter, Instagram, etc). The affinity that urban New Zealand had with the farming community is not as strong as it once was and there has been a shift in the expectations and general understanding of the primary industry.

In writing for this edition of *The Journal*, Warren Parker notes that up until recently the primary industry's response to environmental concerns has been largely political filibuster and mostly superficial. And that we have yet to effectively come to grips with sustaining our social licence to farm.

In reflecting upon this there has been an attitudinal shift in how urban New Zealanders view the social and environmental responsibilities of our agricultural and horticultural industries, in the same way as they do for businesses as a whole.

More and more agriculture is linked to polluted waterways and the rise in algal blooms affecting the use of some of our favourite rivers and beaches. Incidents such as the campylobacter outbreak in Havelock North from sheep faeces entering the water supply causing 5000 people to be violently ill are seen by some as further evidence of the impact of agriculture on water quality.

The bandwidth of tolerance by the New Zealand public of environmental degradation resulting from poor on-farm management practices has narrowed considerably. There are without doubt greater expectations about the manner in which we farm and manage our natural resources.

Increasingly the primary industry will have to demonstrate its environmental credentials and in effect our social licence to farm. So what is the primary industry narrative we wish to articulate around improving water quality and the enhancing our environmental footprint, but most importantly how do we intend to engage and work with urban New Zealand and regulators in developing a shared vision around developing a better environmental outcome for all?

Climate change and water quality drivers are positive drivers for more forestry.

Photo courtesy of Scion



WARREN PARKER

Conversations the primary industries need to have

The primary industries are operating in a rapidly changing environment. A clearer, more outward-looking vision is needed in order to secure productivity gains and face the challenges ahead for the sector.

Responding to a more uncertain future

The operating environment for the primary industries continues to change rapidly and can be encapsulated by the acronym VACU: volatility, agility, complexity and uncertainty. These attributes are interdependent – volatility gives rise to increased uncertainty and adds to complexity; less certainty requires more managerial agility. Some people relish this dynamism as it can be rich with opportunity, but others find it very challenging and stressful.

Volatility arises from a multitude of factors including rapid technological change powered by the internet, the rise of nationalism and demand for sovereign identity, increased inequality in society and the displacement of people, the failure of free trade to be 'fair' (non-trade barriers), cyber insecurity and industrial espionage, 'fake' news powered by social media and, increasingly, extreme weather events (i.e. climate change).

These factors are overlaid by the more traditional drivers of change: population growth, ageism, ethnic change and people movement; increased average wealth; changes in diet and disease (obesity, antibiotics resistance); growth of transnational companies with enormous scale and market influence; mega-cities and urbanisation; rapid growth in the value of intangible assets (brands, intellectual property) and services; and, not least, natural resource limits (especially water) and environmentalism (traceability, 'greening' of products, protection of biodiversity).

This cocktail of change drivers is adding to complexity and making it increasingly difficult to 'read' near- to mid-term market signals and events. Consider, for example, the recent dairy price crash. In hindsight it seems obvious that global supply was rapidly increasing (low grain prices and lower cull rates in the US, changes to EU regulations) and that Russia's tight restrictions on market access would

The transition from fossil oil products to low footprint alternatives such as wood-fibre bioplastics is gaining momentum.

Photo courtesy of Scion



Neither Brexit nor the election of President Trump were predicted by the mainstream media. Earlier, very few foresaw the 2008 global financial crisis and the advice of those that did was ignored by those who could have done something about it.

divert product to, and intensify competition in, other dairy import markets. Neither Brexit nor the election of President Trump were predicted by the mainstream media. Earlier, very few foresaw the 2008 global financial crisis and the advice of those that did was ignored by those who could have done something about it. Given that traditional sources of information are less reliable now, farmers must pressure their processing companies, banks and advisors to lift their game with respect to market intelligence, as well as look to other direct sources for insights.

Imperative for management excellence is increasing

Running a farming business in the face of VACU heightens the importance of the core functions of management: planning, implementation and control. A strong ability in systems thinking and synthesis is vital. It also further elevates the importance of communication (with family and

joint business owners, financiers, processors and regulators) and the need for active lifelong learning and keeping a close eye on the factors that are shaping future markets and business. There is no indication that VACU is going to lessen – indeed all pointers are towards its intensity increasing.

Many articles over the years have pointed to the distinctive management strength of New Zealand farmers, especially in executing grazing systems. However, the ‘rules of the game’ have changed as described above. In the 1950s to 1970s the focus was on production and land development. The 1980s saw deregulation and the removal of subsidies, as well as the need for better business management and acumen. The 1990s ushered in the need for environmental stewardship, and the 2000s saw the rapid growth in farm scale and the influence of the Chinese market and the need for people (labour) skills.

Now we are seeing the rising power of social media and a need for expertise in sustaining a licence to operate and community support. Today’s farmer (or at least a core member of their team) has to be skilled in managing not only in production but also the business – environmental assets and people (on and off-farm). While more and more of this is now IT-enabled (sensor networks, online accounts, health and safety, and information) computers and smart phones have not obviated the need for clear thinking for problem solving, opportunity recognition and early decision-making.

An interesting reflection on this evolution in farming is that very little of this change (at a sector level) was front-footed – mostly agriculture reacted. A transition package was negotiated to help with the move away from the heavy reliance on the UK market when it joined the EU (and now we have generated an over-reliance on China and allowed others to control key parts of value chains). The ‘Douglas reforms’ in the 1980s were effectively ‘cold turkey’, even though the late 1970s showed the level of subsidies was unaffordable. The response to environmental concerns has until recently been political filibuster and mostly superficial. Increasingly we are seeing media and the public cast a larger shadow over the currency of agriculture’s environmental credentials. We are yet to effectively come to grips with sustaining our social licence to farm. Hindsight is easy of course, but as they say, ‘Those who do not learn history are doomed to repeat it.’

Clearer, more outward-looking vision needed

This points to one of the most important conversations the primary sector needs to have – it must become more visionary and nimble in order to shape its future. In particular, we have been talking about de-commoditising our exports for decades, yet bulk products (e.g. logs and whole milk powder) continue to dominate export earnings. It is hard to find a compelling vision statement and preferred future scenario description (say for 2025 plus) for the future of New Zealand agriculture on any producer association website or document.

More often than not our producer funded and owned entities require farmer support to sustain their livelihood, but this potentially limits industries to an ‘inside out’ rather than ‘outside in’ view of the future for farming and essentially an extension of the status quo. It is likely at the root of Derek Daniel’s question in the December 2016 edition of *The Journal*, ‘Why is the hill country farmer feeling like a poor cousin of New Zealand farming?’ My sheep farm neighbour has a fixed land area, new nitrogen limits, increasing costs and a lambing percentage that has plateaued at about 150%. Is the only strategy for this farm to increase off-farm income, subdivide off lifestyle blocks and/or buy out the neighbour? None of this requires R&D.

Industry strategies generally have little reference to climate change – arguably the largest factor impacting the future of livestock farming via the physical environment for production and competition from low emission (footprint) synthetic foods (more on this below). So what is the primary sector’s long-term position on climate change? Will it only be considered during adverse weather events, or will a strategic stance be taken that reflects the political reality that at some point agriculture will be brought into the emissions trading scheme?

I labour the vision point because the conceptualisation of new ways of farming and land use is especially important. As Professor Doole observed in the December 2016 edition of the *The Journal*, ‘The accumulated knowledge pertaining to our system... continues to reduce production cost [and] ...pose a barrier to change to our current pastoral system... To overcome this inertia it will be important to consider ways to protect emerging systems and encourage innovation...’ We see this tension when farming practices and approaches are challenged as seen in the reaction to South Canterbury arable farmer Jeremy Talbot’s contemplation (available on *Stuff News*) that, ‘Grass-fed policy could be adding to our nitrate woes’ and with Doole’s views on nitrogen and intensive agriculture.

Securing productivity gains remains a big challenge

The vision thing can also be linked to New Zealand’s productivity paradox – economists believe it should be 20% above, not 20% below, the average for advanced OECD economies given the country’s policy settings. The reasons for sub-par gains have been studied extensively by the New Zealand Productivity Commission and others. The intransigence in adding value and increasing efficiency can be tracked to:

- ▶ Low investment in R&D (or more broadly, knowledge-based capital) compared to competitors
- ▶ Geography – small domestic market, lack of international connectivity and customer intimacy
- ▶ Slow technology diffusion, including dislocation of the information flow between producers and consumers
- ▶ Culture – satisfaction with the 3Bs (bach, boat and BMW)
- ▶ Misallocation of capital – into land and housing.

While some of these factors (such as geography) are ‘fixed’, most can be changed and that includes at the farm-, forest- and orchard-level. A combination of public policy (e.g. lack of a capital gains tax – New Zealand and one other are the only OECD countries without one, incentives to increase private sector R&D are more modest than most competitors, the directing of training to future workforce needs) and private initiative changes (e.g. celebrating success of exporters, increasing cross-sector collaboration to break down barriers and translating technology and practices) are needed to change the status quo.

Challenges we need to champion more aggressively

Three factors that will profoundly influence the future of New Zealand agriculture that we should focus on more aggressively than at present are:

Climate change

President Obama noted, ‘No challenge poses a greater threat to future generations than climate change.’ Adrian Orr, in the *NZ Super Fund 2016 Annual Report* wrote:



Indigenous species such as kauri grow faster in a plantation setting and provide options for farmers. Photo courtesy of Scion

This country needs to plant at least one million more hectares in trees by 2030 to reduce the forecast fiscal cost (estimated to be at least \$36 billion) to the Crown of meeting its nationally determined contribution (NDC) target for carbon emissions.

Climate change ... is a significant disruptive environmental and economic event that is inescapable. ... [it] means that global energy systems will change over coming decades. This creates substantial investment risks and opportunities for the Fund. Our actions alone will make minimal difference to any of these trends. That is not, however, an excuse for doing nothing and being party to the 'tragedy of the commons'...

The mix of physical and business transition risk is why the Australian Institute of Company Directors provided a legal opinion in October 2016 that addressing climate change risk is now a responsibility of boards. We know too that current commitments by governments on emission reductions will only limit global temperature rise to 3°C above pre-industrial levels by 2050, a level scientists consider dangerous.

In my March 2015 article in *The Journal* on 'Preparing New Zealand Primary Industries for 2040', I repeated the strategic advice from a 2014 (April) *Harvard Business Review* paper 'Resilience in a Hotter World' that agriculture too needs to fight short-termism, pursue radical innovation, place a value on natural capital, measure return on investment differently and form new collaborations. If the need for greater urgency on this matter by primary industries is not yet clear, author and consultant Rosie Bosworth's article for *Pure Advantage*, 'Lab Chops and Test Tube Milk and Why Kiwi Farmers Should Be Worried', illustrates the speed with which synthetic foods are growing.

Bluntly, agriculture must do more and the public will (rightly) expect it to do so as they bear more cost and personal impact. The role of forests in mitigating and adapting to climate change (notwithstanding fire, wind

Tertiary programmes for the primary sector should emphasise international perspectives and increase the diversity of approaches to management and leadership by lifting the level of engagement with non-primary sectors.

and disease risk) is a primary key to New Zealand meeting its obligations regarding this change. Indeed, this country needs to plant at least one million more hectares in trees by 2030 to reduce the forecast fiscal cost (estimated to be at least \$36 billion) to the Crown of meeting its nationally determined contribution (NDC) target for carbon emissions. Climate change, nutrient limits and biodiversity are some of the reasons why agriculture has to seriously re-look at forestry.

Genetic technologies

Genetic improvement underlies many of the productivity gains in agriculture. These gains are enduring and financially rewarding. New genetic techniques are advancing rapidly, empowered by increased computing capacity and 'big data' analytics. They are transforming medicine, industrial processes and agriculture. Advances in gene editing improve the precision and speed of breeding without having to introduce foreign DNA. While we can legally promote mutations through irradiation and chemicals, the Hazardous Substances and New Organisms (HSNO) Act does not allow this new method without specific (and expensive) approval.

The window of opportunity for legislative change in late 2015 was not strongly taken up by industry, except for forestry. The public stance on genetic technologies by other primary sectors has been mute. Forestry needs gene editing to produce sterile conifers as the long-term solution to the increasingly costly wildings problem and to overcome the constraints of long tree-breeding cycles. We must overcome the public's concerns about genetic modification (precision breeding) by providing knowledge that will address their misconceptions and fear of the unknown. This strategic issue requires industry leadership – it applies to almost every facet of the future of the primary sector whether it be for weed and pest control, reduced nutrient leakage into waterways, eradication of predators to protect biodiversity or enhancing attributes in consumer products. New Zealand's claims to being 'clean and green' are not axiomatic to being GE free.

Future of work

One of the challenges of the technology revolution is the loss of jobs due to automation and artificial intelligence. The displacement of jobs will accelerate as robots and machines are able to do more and more. At the same time, many economies are struggling with a combination of population issues such as aging, the drift to large urban

centres and increased ethnic diversity. Much agricultural work is transient – fruit picking, shearing, tree pruning – and unattractive compared to urban alternatives.

Remote rural areas are especially afflicted by these trends. Reinvigorating regional economies and training the future workforce are essentially public policy issues. Current trends are going the wrong way, pointing to public policy failure. Agricultural leaders will need to push for change. The market does not foresee long-term workforce needs, and neither does it care much about rural services or indeed whether firms with jobs locate in district A or B. Meanwhile farmers can tackle their succession planning, make jobs as attractive as possible, be good employers and support community-building initiatives.

Implications for farm consultants and advisors

VACU presents great opportunities for professionals servicing the agricultural sector. The requirement to be 'good at' synthesising across at least four domains – production, finance, environment and people – is already confronting consultants. For example, redesigning systems to meet new nutrient and other water limits cannot sensibly be considered in isolation of the imperative to respond to climate change or the skills required of staff. Health and safety requires another step up in advice on people and hazard management. Knowledge of forest systems and advances in forest technology is generally poor outside of the forest sector.

These examples point to the need for specialisation, either within consultant firms or secured by a collaboration arrangement, to complement the systems 'synthesiser'. People with both the natural aptitude and training in systems thinking are rarer than specialists. In that respect, the ability of our universities to deliver well-resourced and high quality farm systems programmes remains vital in preparing graduates for the wide array of opportunities that will continue to be available in the primary industry. Industry organisations can help the education and training sectors by continuing to prioritise investment into developing workforce plans and supporting their implementation. Tertiary programmes for the primary sector should emphasise international perspectives and increase the diversity of approaches to management and leadership by lifting the level of engagement with non-primary sectors.

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SHAMUBEEL EAQUB

THE ECONOMY AND THE PRIMARY SECTOR

We are living in an epochal transition in the global economy and global politics. Following three to four decades of broad consensus on economics and politics the tide has turned. Our understanding of economics and politics has been shaken to the core by the global financial crisis (GFC) and the near decade since then.

For the primary sector, this means there is less certainty in the economy. It needs to focus on factors in its control – in-business productivity gains, moving up the value chain and getting closer to customers.

The economy is not behaving as our models predict. Whether its commodity prices, interest rates, exchange rates or global demand – each have behaved in an unusual way. Prices have been low, our exchange rate has been high, interest rates have been at historic lows (even negative in some parts of the world) and economic growth has been slow and uneven across countries, sectors and regions.

The politics is also shifting. Brexit and Trump both represent a backlash against the establishment, against experts and against a consensus on globalisation. Without the leadership of the US on global trade, multilateral trade deals will be much harder.

For the primary sector, this means a stronger focus at home to keep the public opinion in their favour, and not relying on government for improving market access – the next decade of deeper global ties may be more business-led than government-led.

The sheer scale of investment has been spectacular. China poured more concrete in the three years to 2013 than the US poured in the century to 2000, but much of that was funded with hot money from advanced economies printing money and often for poor quality projects.

Economic backdrop

The last decade has been exceptional for the pace of change and sheer degree of unpredictability. Policy-makers have moved aggressively in many countries, but the world is trapped in a strange and timid low growth and low inflation environment. Overhanging this are the spectres of massive amounts of debt and experimental money printing policies from many major central banks around the world. The key marker for change was the GFC.

Policy-makers around the world unleashed novel and untested policies after the GFC to shore up their financial systems and economies. Interest rates were slashed to zero and even negative in some cases. Money printing, termed quantitative easing, was used to create economic growth. To an extent these policies worked. Financial systems stabilised and the recession ended. But policy-makers are now left with few tools and still too much debt in the global economy should economic growth falter again.

The global recovery from the GFC was uneven. Emerging markets, particularly China, drove much of the recovery. This was through significant investment spending on roads, infrastructure, housing and a host of other initiatives.

The sheer scale of investment has been spectacular. China poured more concrete in the three years to 2013 than the US poured in the century to 2000, but much of that was funded with hot money from advanced economies printing money and often for poor quality projects. That huge boost to investment means that there is so much capacity in so many sectors that we are unlikely to see many price increases for years to come.

After contributing massively to global growth in the aftermath of the GFC, China and emerging markets are now at risk of slowing. Foreign capital that flooded into these countries is now leaving. Banks are left with the consequences of mal-investments that cannot hope to pay their own way. But these are hiccups. The long-term fundamentals for emerging markets remain sound – large young populations that are rapidly becoming better educated, more urbanised and more industrialised.

In advanced economies the outlook is less certain. The long-term outlook is weighed down by ageing populations, but their strength has been in innovation and productivity gains. The latter have not changed but have been disappointingly slow in the last decade. In Europe the picture is much tougher, with many countries still struggling to escape from the effects of the GFC.

New Zealand was not affected as badly as feared by the GFC. Our economy had already slowed, finance companies had failed a few years earlier and the housing market was falling. This meant that there was little demand for new borrowing that had dried up globally and we had been through much of the pain of poor lending already. So our banks and our economy did not face the sudden stop that the US and other markets had to.

The GFC still had a big impact. During the worst of the crisis, when financial markets were dysfunctional, New Zealand banks could not access financial markets briefly. This was distressing as many of their borrowing commitments needed to be rolled over, but the Reserve Bank of NZ coordinated with global central banks to facilitate those transactions.

The true impact of the GFC was felt over a longer period through falling exports and falling commodity prices. The exchange rate also depreciated, softening the impact of the downturn.

The New Zealand economy shrunk for one-and-half years from the beginning of 2008 to mid-2009. Everything but government spending fell through this period. The recovery from the recession that ended in mid-2009 was spectacularly disappointing compared to previous cycles. While the depth and duration of the recession was similar to past cycles, the recovery has been markedly disappointing. It has been shallower than any other recovery based on data back to 1934.

The recovery has also been uneven, whether in terms of segments of the economy, export commodities or regional distribution of growth. Exports were dominated by a few markets (mainly China) and a few commodities (dairy, meat and forestry). Job recovery was dominated by Auckland (strong growth in real economy and a booming housing market) and Canterbury (earthquake rebuild). Job losses were widely spread across industries and occupations, but the recovery has been concentrated in a few high demand areas.

Economic outlook

The backdrop of the last decade is one of uncertainty and change. The outlook is even harder than usual. It is a bit like that infamous Yogi Berra quote, 'It is tough to make predictions, especially about the future.'

The world is currently in a low growth, low inflation, low interest rate and high debt environment. This is not a sustainable mix, but it is unlikely to come to a head in 2017. Politicians and technocrats will do everything in their power to avert a crisis. In some ways this is

averting a cathartic, vigorous and broad-based restart many economies and sectors need. Instead, the crisis management will deliver moderate growth and heightened uncertainty.

But monetary policy-makers are nearly out of policy headroom, which means that any future crises will be met with ever more desperate and experimental measures. And there will be a crisis: there is more debt relative to the size of the global economy than ever before. It will not simply go away because so much of the debt was mal-invested. This is unless government spending and public policy can join the fray. Government investment in physical infrastructure for nation building would pay a long-term dividend. The government also needs to rebuild social cohesion by rediscovering a more caring approach to welfare, education and health, which would mean spending more. Increased government spending and investment are surer bets to rekindle sustainable economic growth than easy monetary policy.

In 2017 and beyond we will see interest rates gradually increase from exceptionally low levels, led by the US. Global growth will muddle along. Remaining uneven across countries and conditions it could change suddenly. Exporters must be nimble to assess and then meet the demand of their destination markets carefully. There is still too much capacity in manufacturing, mining and other sectors, relative to a gradual increase in demand and a general climate of uncertainty. As a result, we are likely to see gradual increases in commodity prices and inflation, but nothing like what we are used to from the 2000s.

In New Zealand the economy is growing strongly. Twin booms in housing and immigration explain a large part of it, but there is also a more sustainable and broadening underlying recovery, particularly in tourism and the primary sector. There is a risk of the housing boom ending. It would dent our economic growth. But it would be accompanied by a much lower exchange rate, which would be welcomed by exporters and the primary sector.

Politics of Brexit and Trump

The primary sector is inherently global. Global politics is shifting rapidly and they must focus on what they can control. Brexit and Trump portend coming decades of nationalism and isolationism and an attack on establishment politics, which no longer represents the hopes and fears of the majority. The post-war period has been one of an unprecedented combination of peace, stability and economic progress. We are experiencing the end of that golden era. Expert advice has been overwhelmingly consistent in its analysis of Brexit and Trump, but a slim majority of voters believe that the benefits of nationalism and isolationism trump those economic costs.

Those who voted for change to the new order were more likely to have been affected negatively by globalisation and technological change. The discontent has been brewing for decades. Globalisation and technological change lost labour-intensive jobs in the manufacturing, mining and other sectors. Globalisation benefited the educated in the megacities of London and New York and other urban centres. Seeing migrants, often skilled, getting jobs while locals go without added another layer of resentment.

The discontents of globalisation have been festering for decades and welled over with the Brexit referendum and Trump's promise to 'get them' in Washington.

None of this is a surprise. Conventional economics goes like this: globalisation and technological progress are good in the long term but there are short-term adjustment costs. The latter part is glib and glossed over. The reality is that our lived life is in the short term and it matters a great deal. Even though academia has long sought to understand how to share the benefits more broadly, talking-head economists and politicians are mostly interested in the aggregate benefit, not how equally it is shared.

The suffering and human cost of large-scale job losses that hollow out communities is a reality faced by large parts of the UK and the US. Previously great regions of industrialisation are now shadows of their former selves, plagued by high rates of unemployment, insecure work and other social ills.

Without significantly increased welfare support, intensive investment in education, training and work placement programmes, the short-term costs of globalisation become long-term costs. But that is exactly what happened. More than that, those who lost out are abandoned.

The discontents of globalisation have been festering for decades and welled over with the Brexit referendum and Trump's promise to 'get them' in Washington.

The minority educated and successful urban population that has benefited from globalisation under-estimated the possibility of leaving the EU or electing Trump. They could not conceive how something that has clearly benefited them could be rejected. Logically, Brexit and Trump will also hurt those who relied on the redistribution of the successes of globalisation – however mean and grudging it may be. It will eventually sink in that there are no quick fixes to put up barriers against globalisation or magically create a brighter future for declining regions. But it was a message to the disconnected elites that the inequality has grown so large that the majority are now missing out.

The amount of land in farming has been falling since the late 1980s, down from around 18 million ha to around 14 million ha now. There are 20% fewer jobs in the primary sector since the late 1980s. In fact, job losses have been so sustained that there are roughly the same number of people employed in the primary sector today as a century ago. The efficiency gains have been massive though. The output of the primary sector has more than doubled since the late 1980s, despite reducing the amount of farmland and workers.

The educated urban elite is so disconnected from the other half that they do not understand the level of pent-up rage from decades of abandonment and seeming hopelessness. It is a reversion to a class-based society – drawn on the economic lines of winners and losers. Around the world we may see the delicate political balance of the last few decades tilt against the elites, against globalisation, against immigration, against a mean and grudging welfare system, against experts who denied the humanity of the losers from change and robbed them of their dignity.

A vote for nationalism and isolationism in the UK and the US matters for the primary sector. We rely on improving access to global markets and a stable economic backdrop.

Focus for the primary sector

Change is hard. Most of our primary sectors are in that position. Despite their long history and high importance in our economic history, their importance has shrunk. Our farming community needs to think differently about where they invest their efforts. They must continue to invest in productivity. Our farming community also needs to reverse the disconnection many Kiwis now feel to the rural hinterland and prepare for a less globalisation-friendly political backdrop in the US and Europe.

Farming is hard work. The return on equity for sheep and beef farming is averaging 3% a year. Nevertheless, farming is still the backbone of the rural economy and the agriculture sector is one of the bright spots when it comes to productivity. Farms keep making significant efficiency gains year in and year out – the factor they can control, rather than external things they can't control like commodity prices, exchange rates and interest rates.

The amount of land in farming has been falling since the late 1980s, down from around 18 million ha to around 14 million ha now. There are 20% fewer jobs in the primary sector since the late 1980s. In fact, job losses have been so sustained that there are roughly the same number of people employed in the primary sector today as a century ago. The efficiency gains have been massive though. The output of the primary sector has more than doubled since

the late 1980s, despite reducing the amount of farmland and workers.

The focus of farms is rightly on things they can control. On-farm efficiency gains and cost reductions keep them competitive. The economic environment remains uncertain and the primary sector must keep its focus on productivity and innovation. The primary sector also needs to focus on two other challenges: everyday Kiwis becoming disconnected from our farming base; and the risk of rising anti-globalisation sentiment.

New Zealanders do not identify with farming as palpably as in our history. The New Zealand economy has also changed significantly over time. A third of jobs were in the primary sector in 1900, but that has dwindled to less than 10% now. Coupled with a more urbanised population and more jobs in services (related to and caused by urbanisation), the population's engagement with farming has become more distant. This puts the farming sector at risk of being isolated on public policy issues. In an era of poll-driven politics, public engagement needs to be high or at least empathetic.

The rise of polarised politics is also a risk. Global politics has been positive toward globalisation for many decades, which has given us good access for our products in foreign markets. Without exports, our primary sector would be tiny. But the political tide is turning. The presidential race in the US is symptomatic of a broader trend in Europe and elsewhere. The political pendulum is swinging away from a golden era of increasing globalisation led by governments.

In the absence of political leadership and even rejection for globalisation, the primary sector must forge deep and meaningful ties right through the value chain to businesses and consumers in our destination markets. Relying on our government to forge formal ties through free trade agreements will no longer be enough.

The primary sector needs to keep investing to lift productivity and work harder to re-engage the public to the hinterland and prepare for a rise of anti-globalisation sentiment in global politics.

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Key drivers for UK and EU milk supply 2016-2020

Key drivers

Now we are in the post-quota era, how the supply situation develops in the UK and EU is key for world dairy markets. The schematic model in **Figure 1** shows the key drivers of milk flow that have been used by our business to forecast likely milk supply in the UK and we are now extending this to the EU given the removal of quotas.

Profitability

Profitability is set to improve as world prices for dairy products have risen during the fourth quarter of 2016 and are expected to continue increasing through to the second quarter in 2017. The most recent International Farm Comparison Network (IFCN) forecasts predict an average world price of \$40-45/100kg (6NZD/kg MS) by the second and third quarters of 2017. Price is foreseen as being the key driver for milk flow since it will impact on the milk price : feed price ratio and affect producer confidence levels.

This is likely to help reverse the sharp falls in UK production that have been seen through the second and fourth quarters of 2016, which have been over 8% year over year. Full recovery will be difficult in the short term since forage stocks are generally of moderate quality. In addition, the milk price : feed price ratio is only just reaching the 1.2 level where it is expected to see a stimulatory effect on milk flow. Looking forward to the spring of 2017, it is expected the feed price to be around 370NZD/tonne for a high energy 18% compound feed, requiring a milk price in excess of 5.25NZD to reach the 1.2 ratio. It is anticipated this milk price level will be reached in the first quarter of 2017.

It is expected there will be a similar situation across the EU as milk prices increase through the first to second quarters of 2017. EU 28 production was actually increasing in the first six months of 2016 by over 4%, but in the second half it fell by 2.7%, leaving the EU only marginally increasing its output by 0.7% over the whole of 2016, despite the removal of milk quotas (IFCN, 2016).

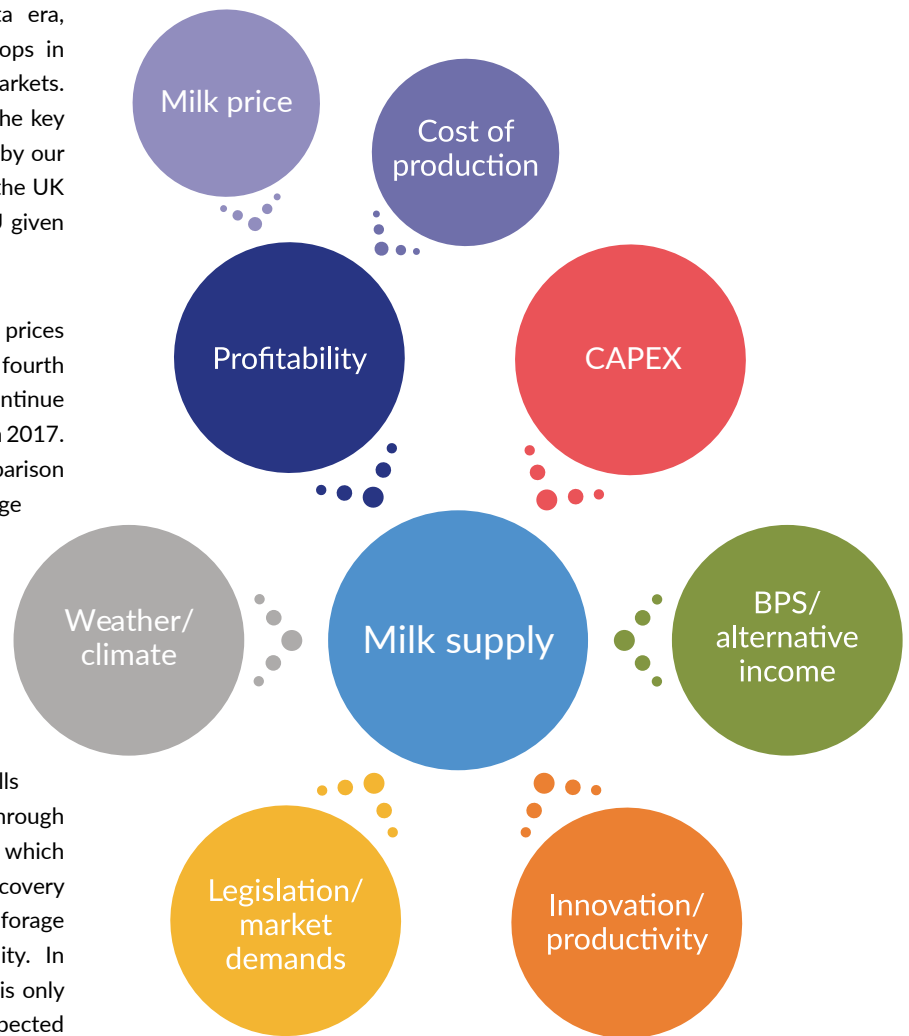


Figure 1: Key drivers for milk flow

There has been a 'shock effect' from the removal of quotas, especially in the main producing countries of Germany and France where output is currently running 5% and 6% lower respectively year over year. The shock was how low prices could fall in the EU without quotas and with limited intervention support.

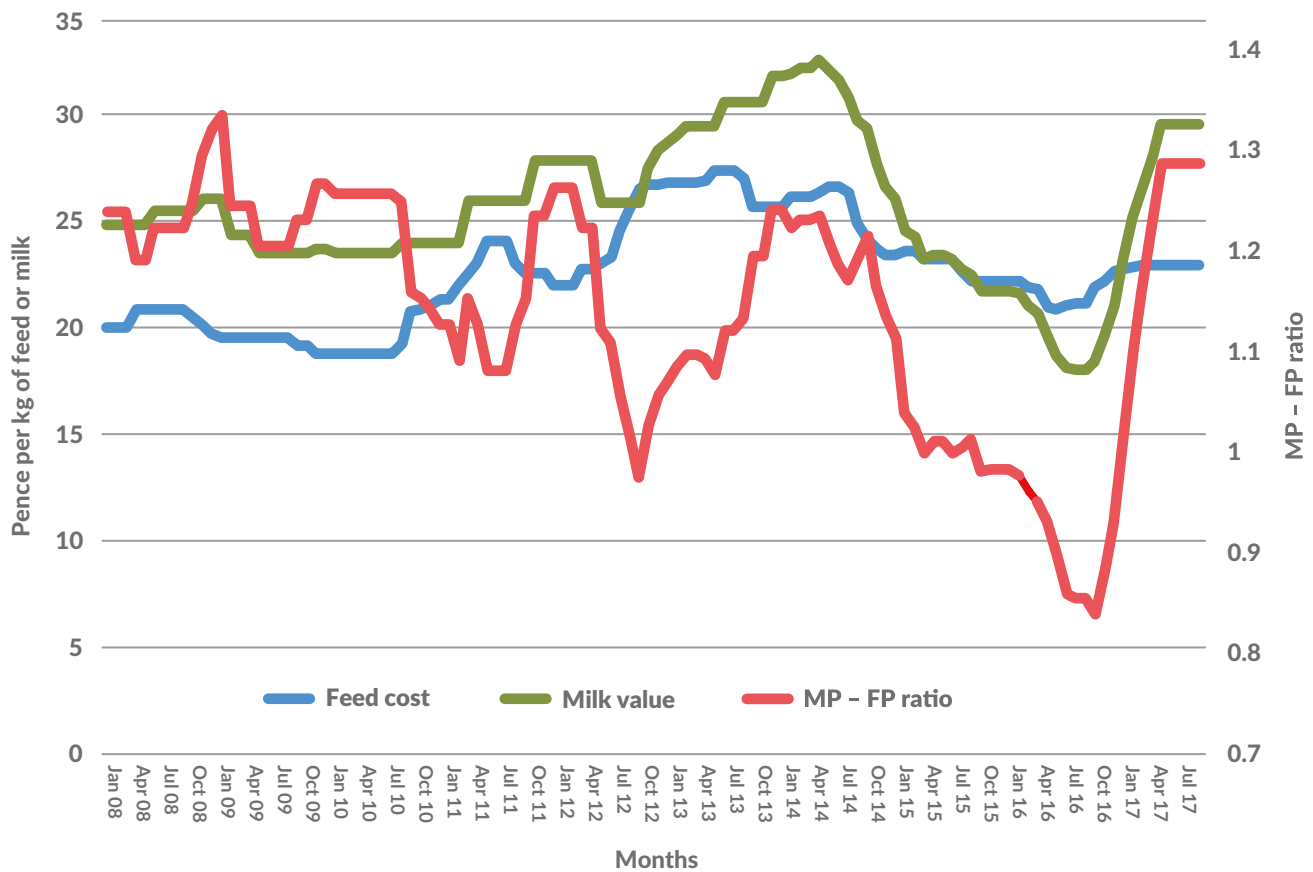


Figure 2: Milk price : feed price ratio with a forecast into 2017

We anticipate the year over year fall in EU output will continue into the first and second quarters of 2017 since there has been a 'shock effect' from the removal of quotas, especially in the main producing countries of Germany and France where output is currently running 5% and 6% lower respectively year over year. The shock was how low prices could fall in the EU without quotas and with limited intervention support. Prices fell to around 20 euro cents/kg (3.5NZD/KgMS) in the third quarter of 2016 in Germany where the break-even milk price is around 35 cents (6NZD/KgMS). It will be interesting to see how these two major dairy nations producers react as prices recover. If their dairy farmers' confidence is severely damaged, we could see a weak recovery.

The Netherlands

Not everyone may appreciate the turmoil that the Dutch dairy industry is going through. With over 1.6 million cows producing over 14 billion kg in 2015, the Netherlands had latent potential to increase output when EU quotas were removed. Buildings were available, and instead of heifers being exported Dutch producers filled up their own sheds and started to pump out milk as prices fell in 2015. During early 2016 they were producing nearly 20% more milk year over year in the first quarter, but the wheels fell off in a big way. Freisland Campina, their leading co-op, introduced a payment not to produce milk. Then farmers

reduced feeding levels to milking cows and sold-off heifers. The year finished with the fourth quarter having no year over year increase in milk supply.

The Netherlands is now introducing a new policy limiting the use of phosphates. This is in effect a phosphate quota, which will limit livestock numbers and means phosphate use has to be reduced by up to 10% in the near future, which will inject major uncertainty into the markets. Taken alongside similar environmental legislation in New Zealand, it now means that we are entering a new era where environmental constraints will increasingly impact on world milk supply and therefore probably increase milk prices.

Costs of production

Costs of production have eased over the last two years as oil and soft commodity prices have decreased. World stock levels of feed are at relatively high levels at over 200 days on a stock use basis for grains and 80 days for proteins (CRM, December 2016). This means that feed prices should remain reasonably stable for the next one to two years unless there is a major world weather event, which is possible.

However, the fundamentals for increasing costs remain strong in the medium to long term because of steadily growing demand based on world economic growth and population increase, so medium-run forecasts need to factor in feed price above current levels.

CAPEX

Figure 3 tracks CAPEX for the 10-year period to 2016 based on the Kite cost of production data. Historically, the UK dairy industry was under-invested because of the economic pressures leading up to 2009-2010. As the industry adapted and became more competitive, investment levels improved.

The year 2013 saw significant expenditure on-farm, exceeding 3.5 ppl (60NZD centsKgMS) for the first time. A greater proportion was spent on buildings and fixtures than before as producers invested heavily in infrastructure. This legacy of investment is probably one of the reasons why milk output defied the economic signals in late 2015 and early 2016 as buildings were filled to capacity as an antidote to falling milk prices.

Going forward we are unlikely to see a repeat of this phenomenon. In the medium term farm businesses will be more focused on rebuilding balance sheets, repaying debt and replacing machinery that is worn out before they embark on further expansion. Overdrafts and supplier credit levels have increased significantly just to keep businesses going and these will need to be repaid before any further thoughts of expansion are considered.

We anticipate that the EU could be impacted even more by a lack of CAPEX in the next two to three years since confidence will have been damaged by quota removal. In addition, some key producing countries such as Denmark

and The Netherlands have very large farm debts, with over 70% debt on their balance sheets for average farms, so this debt will limit further investment. The EU is going to have a lot of growing up to do with a world with less support as it moves beyond 2020.

Basic Payment Scheme (BPS) and subsidies

BPS incomes have steadily declined, especially in England where payments have been fully regionalised for some time and where there are higher rates of modulation (reduction top slicing payments). Forex has also had a significant effect over the last two years, although post-Brexit this trend is likely to be different for 2016.

Currently the 'subsidy effect' of the BPS on average dairy farms is 1.2 ppl (25NZD cents), depending on the region in the UK (currently more in Scotland and Wales but reducing as they also become area based). We expect this to be maintained until 2020 as the Treasury have given a reassurance that they will match EU subsidy rates until that time. Thereafter 'all bets are off' as it is unlikely that the UK government will maintain subsidies in real terms going forward. This will potentially disadvantage UK producers compared to other regions in the EU post-2020.

Within the EU a review process is underway to look at how agriculture will be supported when the current support regime ceases in 2020. If the UK had remained within the EU there would have been a vociferous voice led by it to see support payments reduced and EU agriculture become more market reliant with support

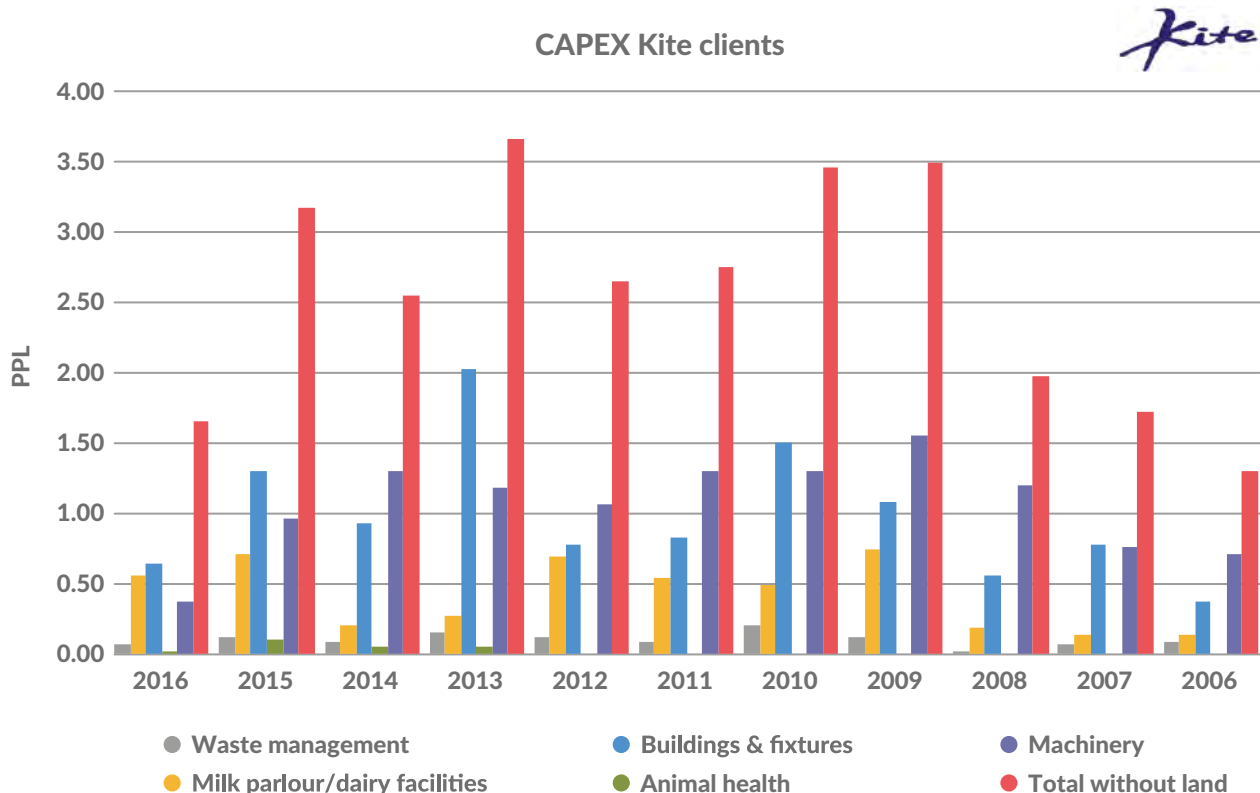


Figure 3: CAPEX trends 2006-16

In the UK and EU just about every sector of mainstream agriculture utilising land that could be used for dairy is operating at below the average cost of production, i.e. arable, beef and sheep.

increasingly directed towards environmental payments. Without the UK, and with the EU feeling insecure about its future following Brexit, then it is more likely that the EU support regime will be maintained and fine-tuned rather than totally reformed. This will become more likely if the US makes more protectionist moves on trade. This could be a counter-balancing element to the less competitive dairy farms we find across much of the EU.

Alternative income

Alternative income is based on how we see other agricultural and non-agricultural income streams developing and impacting on dairy businesses. In the UK and EU just about every sector of mainstream agriculture utilising land that could be used for dairy is operating at below the average cost of production, i.e. arable, beef and sheep. In a few areas there is competition from anaerobic digestion (AD) plants, which purchase in forages to produce 'green energy' but this tends to be very localised.

Many dairy farms are now in the west and not suited to large-scale arable production, so it is unlikely we will see a major loss of dairy farms to arable farming in key dairy areas, but we will still see a further reduction in dairying in arable regions such as East Anglia. The traditional beef and sheep sectors are almost completely dependent on BPS payments to mitigate losses, which provides an incentive to convert. Land is available to convert to dairy in some livestock regions, notably Southwest Scotland, Cumbria, West Wales and Southwest England, so there could be some new entrants in these areas. However, due to capital requirements they are more likely to go down a more pasture-based route with block calving and lower yields.

Land use for alternative energy supply has certainly been a driver within the EU during the past decade but this is coming to an end. Although the EU will not be exposed to the Brexit effects of reducing support payments, there will still be pressure on other sectors that could release land for dairying. The real problem in the EU is that the land for dairying really needs to be released in areas where there is less pressure on water supplies and there is an inherent infrastructure for dairying. This points to growth in dairying in Northwest Europe rather than Southern or Eastern Europe where there are still political factors limiting this growth. This issue is, however, a topic for another article.

Innovation/productivity

The major innovations currently within the sector at farm level relate to better housing and milking facilities. Sand-bedded 'free stalls' and new building designs linked to better protocols imported from the US have the potential to improve productivity on many UK farms, which are

focused on higher output systems, typically producing milk all year round. Robotic technology will develop and more robots on family operated units will increase to improve quality of life, but they will probably have negligible effect on productivity. A significant factor for the medium term are the improvements linked to the inherent genetic potential in a substantial part of the UK dairy herd through the use of genomics and genetic testing. Historically, genetic gain has been 1-2% p.a. We foresee this increasing with new technology, notably the use of genomics.

A further area of innovation that will impact on milk flows in the medium term is the increasing use of information technology for recording and managing data, which is enabling greater efficiency and scale on dairy farms.

A major innovation at farm level in recent years has been the availability of overseas (mainly Eastern European) labour that has enabled many UK farms to grow successfully and remain competitive. Post-Brexit this supply of labour is potentially in the balance and there may be staffing issues to deal with over the next few years that we have not seen for the past decade. This could be an Achilles heel limiting growth in the UK going forward.

Legislation/market demands/Brexit

The biggest driver at the farm level that we have seen recently was the implementation of the Water Framework Directive and Nitrate Vulnerable Zones being applied across the UK via the Nitrate Action Plan. This has restricted the growth of dairying in some heavily stocked areas, e.g. Cheshire, but generally it has been overcome to date in other areas by accessing extra land, adding to costs but still allowing growth in the main dairy areas of the UK.

The major market demand that can be foreseen growing in the next three to five years will be the need to address the move to more seasonality of production which is not demanded by the domestic market. There will be the potential for some levelling effect on overall milk flows if the increase in autumn block calvings matches those of the spring blocks, but financial incentives will need to be in place to encourage these.

However, all of this potentially will be overshadowed by the change in the political landscape post-Brexit. UK agriculture will no longer have the strong voices of the European farmers to argue their corner and ensure that the rural voice is heard. An increasingly urban-centric government could be more at the mercy of the very well-organised environmental lobby who will potentially have a greater influence on policy without fully understanding the ramifications on supply. Many policy-makers will be focused on retaining trading links for the wider economy

in the belief that agriculture and food is less relevant in a developed economy. This could lead to trade-offs that disadvantage agriculture.

Any funding for the rural areas is likely to become more based on environmental protection as opposed to food production. This could create a complicated juxtaposition as the farms that are more able to survive in the market place through adoption of innovation and scale are potentially going to be discriminated against by policies introduced as a result of lobbying by other interests.

International competitors and resilience

The international competitiveness issue has been partly covered above and the UK does have some competitive advantages relative to many EU competitors. The UK has been ahead of them in terms of industry re-adjustment since we contracted our output for nearly a decade up to 2010 and became more competitive. The UK is further along the 'curve' towards moving to an industry based more on 'business operators' who look to operate at scale and see more realistic returns than 'family operators' whose objectives are succession and a family way of life, which means they place less emphasis on economic returns and are therefore less rational business people. This growth of resilient characteristics in UK operators is a key factor going forward.

Weather/climate

Weather influences short-term production so it is climate that we are concerned about over the next three to five years. We may see more variability in weather events due to climate change. For a natural-based system such as farming, it means we need to carry more 'insurance' stocks of forage, etc, and be prepared to manage extremes of weather. In the short run this is not a key driver.

Summary

The profitability of UK dairying is likely to improve significantly in 2017, so we anticipate a recovery in UK milk flow throughout 2017-18, given a 'normal' season. This could take UK output back to around 2014-15 levels with the EU most likely to follow.

Soft commodity prices are anticipated to remain at similar levels for the next two years, controlling costs and helping the recovery of milk flows following falls in 2016-17. However, even with relatively good stock levels there is always the chance that prices could surge because of weather or political events. It is expected that world dairy prices will come under pressure in 2019-20 as we revert back to a three-year dairy commodity cycle.

CAPEX has been sufficient in the years running up to 2015-16 in the UK. However, this has been put on hold during the milk price crisis and significant debt has been run up. CAPEX has fallen below sustainable levels for the supply chain, excluding aligned suppliers. It is expected that repaying this and rebuilding balance sheets will be

the major priority of producers during the next upturn in the cycle. Any CAPEX will be in the form of replacement for machinery and equipment as opposed to new dairy infrastructure to provide additional productive capacity, hence the delay in the cycle mentioned above.

UK milk flow should improve from the low levels seen in mid-2016 during 2017-18. In the medium term there are threats from Southern Ireland and the anticipated move to more seasonal production in the UK.

The BPS subsidy will decline in real terms and will be a negative for milk flow throughout the EU, especially for family operators who are dependent on subsidies. As far as the UK is concerned the future of area-based subsidies is questionable post-2020 with Brexit. This has the potential to damage the UK dairy supply chain in the short run, but improve competitiveness longer term.

As farms become more specialised we are likely to see a continued drive of dairy production into western milk fields with the alternative land use for red meat production becoming less viable, creating opportunities for conversion to dairy, probably with pasture-based systems. There is likely to be more regional concentration in Southwest Scotland, Cumbria, Northwest England, South Wales and Southwest England. Across the EU a similar migration of dairy to Northwest Europe is expected, where water and infrastructure will support the growth of dairying.

The move to fewer larger herds run by more business operators will continue throughout the EU, especially as the need to be competitive at a world class level increases. Many operators throughout the EU and UK are not competitive long term. Poor policy-making and a lack of strategic leadership put the drive to make UK dairy more competitive at risk, e.g. planning for large dairies.

UK milk flow should improve from the low levels seen in mid-2016 during 2017-18. In the medium term there are threats from Southern Ireland and the anticipated move to more seasonal production in the UK. Producer resilience will be key going forward and developing these qualities in the dairy supply chain will ensure the sustainable growth of dairy. After all we have the example of New Zealand post 1983-84 to follow when the removal of subsidies actually created a more vibrant dynamic rural economy.

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New Zealand farmed deer herd growing as farmers invest in improving profitability



The deer industry's Passion2Profit (P2P) programme is lifting deer farming profitability through collaborative marketing and improved farm management decisions. Deer numbers are increasing as farmers recognise the solid future prospects for deer products and invest in measures to improve animal performance. Farmers are seeking advice to improve the integration of deer into mixed livestock systems.

Deer are firmly back on the agenda for many farmers across the country. Improved returns over the past decade and expanding market prospects have reversed a downward trend in deer numbers. The P2P programme is a Primary Growth Partnership co-funded by Deer Industry New Zealand (DINZ) and the Ministry for Primary Industries and it aims to:

- Increase demand to better align with New Zealand's seasonal venison production
- Encourage more informed management decisions among deer farmers to improve productivity and profitability.

The industry aims to:

- Lift national average survival to sale rates from 75% to 85%
- Lift average carcass weights from 55 kg to 60 kg
- Bring forward by two weeks the average slaughter date for young deer.

Making these changes, and others, will have a cumulative effect of increasing industry revenue by \$50 million per annum.

An important component of the P2P programme is to increase deer farmers' appetite for professional advice in making informed decisions on-farm, particularly on the complex issue of integration of deer into mixed livestock operations. With venison prices in the \$8/kg and \$10/kg range, and velvet at \$100/kg, many farmers with deer are seeking good advice as they invest in expanding their deer operations and look to improve productivity to capitalise on these prices.

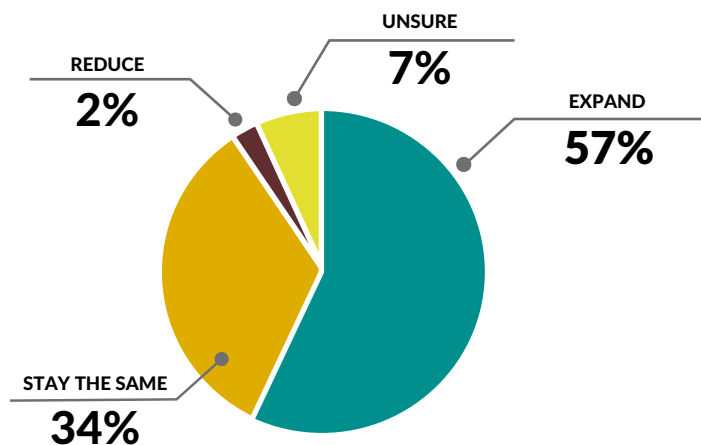
Deer numbers are increasing in response to positive market signals. DINZ forecasts the national herd may grow to over one million by the end of 2018 with around 2,000 farms with deer.

Farmed deer numbers growing

A sharp reduction in deer slaughter in 2016 signalled the increase in farmed deer numbers in New Zealand. Steady returns, improving productivity and confidence in the direction of the sector are encouraging farmers to expand their deer numbers. The uncertainty around returns for other livestock options and the reduction in national livestock numbers contribute to the renewed interest in deer. The steady and improving prices for most deer products over the past decade means more farmers now consider deer a good option (see *Figure 1*).

Figure 1: Intentions for deer numbers in next five years among members of Advance Parties (August 2016)

n=91, Source: Cinta Agriresearch



57% of farmers with deer expect to increase their deer numbers in the next five years. 'Good product prices' and 'an industry with a future' are given as reasons. Only 2% expect to reduce deer numbers, due to environmental constraints.

Source: Survey of Advance Party participants (June 2016). CINTA AgriResearch

Hind slaughter in 2016 was 25% below the previous year, indicating a substantial retention of breeding stock. New deer fencing is being put up as an expansion phase for the industry is underway.

Export destinations

New Zealand deer products are being sold in nearly 50 countries in 2017. The top 10 markets for deer products are given in **Table 1**. Germany, the US and China are the three biggest markets for the New Zealand deer industry. Total exports were worth NZ\$259 million in the past year.

Table 1: Export destination – NZ deer industry products NZD FOB (000s) 12 months to end July 2016

COUNTRY	HIDES AND LEATHER	VELVET	VENISON AND CO-PRODUCTS	TOTAL
Germany	\$640	-	\$45,855	\$46,496
US	\$304	\$133	\$39,540	\$39,977
China	\$4,226	\$21,501	\$12,229	\$37,956
Belgium	-	\$2	\$19,670	\$19,673
Korea	\$531	\$17,071	\$309	\$17,911
Netherlands	-	-	\$17,874	\$17,874
UK	\$8	\$3	\$13,269	\$13,280
Switzerland	-	-	\$12,434	\$12,434
Hong Kong	\$1,960	\$2,491	\$5,231	\$9,682
Finland	-	-	\$7,848	\$7,848
Others	\$6,864	\$1,638	\$27,506	\$36,008
Total	\$14,532	\$42,840	\$201,765	\$259,138

Source: Statistics NZ

Revenue streams

Venison finishing and velvet production are not complementary systems, but farmers running deer can benefit from the diversification that these two revenue streams provide. Venison and velvet are supplied to different markets, and in 2017 both are rewarding farmers well.

Venison

The spring peak in 2016 averaged \$8.90/kg gross. This is the seventh year out of the past nine above \$8/kg gross. The annual venison schedule has ranged between \$6.50/kg and \$10/kg over the past 10 years (see **Figure 2**). Venison marketing companies are increasingly able to offer suppliers fixed price contracts due to marketing programmes that allow certainty of future prices and sales volumes. It is now up to the farming sector to be able to supply these customers. Specialist venison producers using improved genetics and focusing on improved health and strategic feeding have achieved substantial increases in productivity. Ten-month-old animals can now easily hit killable weights during the period of peak prices.

Velvet

Velvet markets have performed strongly over the past half-decade (see **Figure 3**). Increased opportunities in mainland China, and a more integrated approach to marketing velvet through the supply chain, have improved returns and the stability of those returns. While velvet production takes significant time and investment to develop genetics and systems for top production, and is not something that farmers can jump into and out of easily, the returns from good velvet have been satisfactory over

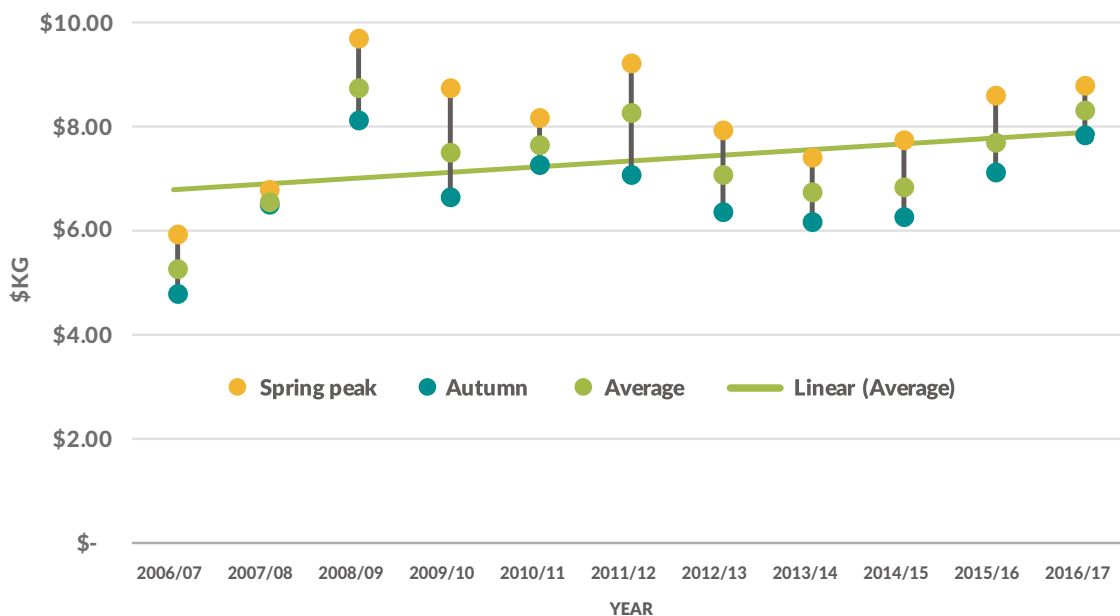


Figure 2: Average published venison schedule 55-60 kg AP stag. Source: Agrifax

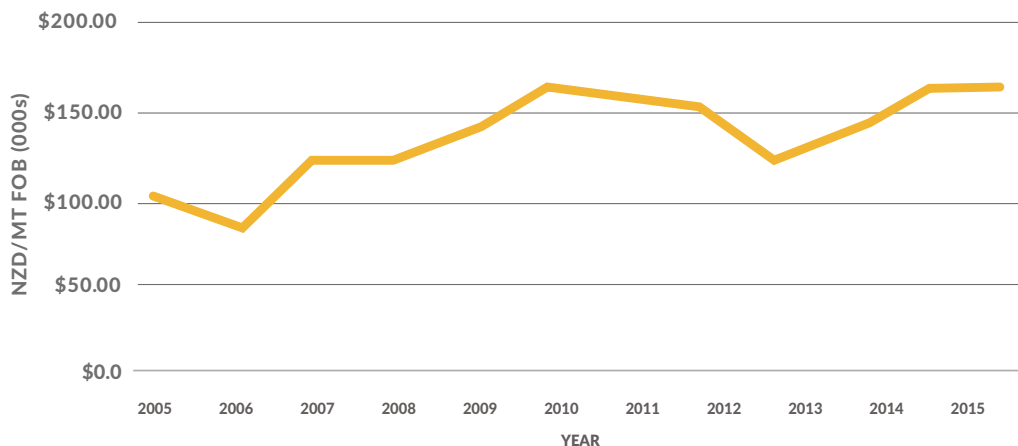


Figure 3: Average deer velvet export value NZD FOB. Source: Statistics NZ

the past six years. Farm gate prices of over \$100/kg for a weighted average across all grades, and average per head production around 4 kg, provide competitive returns for good producers.

Skins and co-products

Deer leather returns have suffered from a downturn in demand for leather goods and changes in processing options in China in 2016, with skins adding up to \$25/head on the farmgate schedule. Deer also provide a range of products that are valued in Asian markets. Sinews, tails and pizzles are used in traditional Chinese medicine. Improved access conditions, product development and improved linkages through the value chain have allowed returns from co-product markets, further contributing to the value of a deer. While values fluctuate depending on exchange rates and product mix, co-products can add \$20/head, which is reflected in the venison schedule.

Breeding herd increasing

Breeding hind numbers dropped from 498,000 in 2013 to 435,000 as at 1 June 2015. Breeders dropped numbers for a variety of reasons including exiting the deer industry entirely, or dropping hind numbers to increase velvet stag or venison finishing numbers. Increased demand for breeding hinds and increased confidence in spring venison schedules encouraged higher prices for weaner deer in 2016. Expectations for 2017 sales are for adequate levels once again, which is encouraging increased breeding hind retention.

Increased profitability

Some substantial changes are taking place among New Zealand deer farmers. Those who have been applying good practice to deer farming know that deer will perform well alongside other livestock options on the right class of land. The integration of deer with other livestock provides advantages for pasture and parasite management for other species.

To address an imbalance between the timing of venison supply and seasonal demand, the deer industry has recently embarked on P2P. The industry is rolling out this programme to assist farmers to identify and apply good practices to increase their profits from farming deer.

A range of initiatives is being undertaken to help deer farmers apply new knowledge and good practice. An example of this is the Advance Parties initiative. An Advance Party is a group of five to 10 farmers who work with a facilitator to work out solutions to improve their deer farming operation. The advice comes from other farmers in the group, not an external 'expert'. The members of Advance Parties are motivated to make changes because they see first-hand the benefits their fellow group members have enjoyed from making management changes and gain confidence that the changes will be beneficial for them too. At the start of 2017 the deer industry has 24 of these groups in operation across the country and is now aiming for 30.

Another means of encouraging adoption of change are regional workshops that the P2P programme is running. The workshops bring members of Advance Parties and the New Zealand Deer Farmers Association, together with topic experts, to learn what Advance Parties have been up to and agree on changes that will impact on their farm's performance.

Role for farm advisors

DINZ surveyed deer farmers on motivations for change and sources of information. The news wasn't great for farm advisors. Of the 600 farmers surveyed, only 3% said they used farm advisors to keep their deer farming skills and knowledge up to date. This is clearly an issue for the deer industry, and for farm advisors. It reflects a perception among deer farmers that some farm advisors lack expertise in deer and a low level of demand for professional advice among deer farmers. Few farm advisors advertise specialist deer knowledge – a quick search of the NZIPIM website lists only five!



Genetic improvement is not a free lunch – a central thrust of the P2P is improving nutrition to allow deer to express their rapidly improving genetic potential. On many farms deer have been run as the third class of stock. Deer need to be fed to grow: if they are fed well, they will grow fast.

As farm management becomes more complex, it is clear that advisory services have much to offer deer farmers, especially advice on the integration of deer with other livestock and the integration of the different and complex facets of farm monitoring and compliance.

Further advisory capability is required in the deer industry to support practice change at the one-on-one level. But in a chicken and egg situation, farm advisors might not focus on deer if they think deer farmers won't use advisory services, and deer farmers won't use them if they don't think farm advisors have deer-specific knowledge. The P2P programme is working with rural professionals to increase demand for, and improve the provision of, professional advice to deer farmers.

First, through Advance Parties and regional workshops, veterinarians, farm advisors and other rural professionals are working with deer farmers in a facilitation role. All parties are benefiting from this interaction. Facilitators are enhancing their deer knowledge and farmers are benefiting from more systematic management thinking and the integration of farm tools into their own operations. Several of the farmers involved in Advance Parties are now engaging the services of farm advisors to provide individual advice.

The benefits from Advance Parties are not limited to the farmers in the group. They are a means of testing and refining profitable changes and demonstrating those methods, and their limitations, to the wider deer farming community.

Second, DINZ will be running initiatives in 2017 aimed at improving farm advisors' deer knowledge. A series of one-day workshops for non-deer specialist rural professionals will provide an overview of deer-specific requirements. DINZ will be approaching farm advisory companies to encourage non-deer specialists to attend. The courses will be free of charge and attendees will be provided with resources and contacts to continue to build their deer capability.

Farm advisors are welcome to attend Deer Focus Farm field days and regional workshops to meet deer farmers and to listen to changes being made to increase profit. Details are available on the DINZ website (www.deernz.org/events).

In 2017, DINZ will also be offering three farm management undergraduates a two-week intensive deer experience joining researchers, farm advisors, marketers and industry leaders to learn what makes the deer industry tick.

Specialist deer information will be included in the NZ Veterinary Association CPD programme, which will also be open to other rural professionals through papers available from Massey University.

Individual farm advisors who seek specific deer knowledge are welcome to contact DINZ who can facilitate access to specialists such as AgResearch staff who can be called upon to provide expert advice in areas such as reproduction and nutrition.

Productivity opportunities

Within the P2P programme there are three central productivity themes to enhance the profitability of deer farming. Breeding success, adequate feeding and nutrition, and improved animal health are opportunities that exist for improved profit for deer.

Reproduction

A significant factor counting against breeding hinds is variation in reproductive rates. The long-term average figure for fawns alive at 1 June to hinds mated is only 75%. Given the natural fertility of deer, this is a poor result. Scanning rates of 98% are possible and survival to sale of 93% can be achieved. An average survival to sale of 75% means of course that 50% of farmers are achieving less. The main issues affecting conception are:

- Under-nutrition resulting in an average herd mating BCS of > 3 in adult hinds will likely increase the proportion of hinds within the herd that fail to ovulate. Any hind at or less than a body condition score (BCS) of 2 has a very high likelihood of ovulation failure. Lactation over the mating period will likely exacerbate the effects of low BCS.
- Low body weight of yearling (R2) hinds at first mating (16 months of age) is the principal cause of reproductive failure in young hinds. These animals fail to enter puberty, i.e. fail to ovulate. A recent innovation introduced by the deer industry is a tool to assist farmers calculate the minimum mob average weight needed to attain target conception rates (see www.deernz.org/growthcurves).

- Infertile, sub-fertile or low-libido stag. Corrective action: ensure that chaser stags are used within single-sire mating programmes. Replace stags that appear to show little interest in oestrous hinds during the mating period and obtain a vet check of sire stags before use to ensure there are no physical abnormalities.

Making genetics work

The industry's investment in genetics has also provided substantial improvements in the potential of deer to grow faster to meet market demand. Though the work of stud breeders focusing on growth breeding values, and the central sire referencing scheme run by Deer Select, stags are now available to commercial buyers that can deliver an additional 17 kg carcass weight in their progeny over average.

Deer Select is a database of pedigree records and performance data collected from performance-recorded animals in participating herds. Deer Select uses the SIL (Sheep Improvement Limited) genetic engine to calculate how much of the performance variation between individual animals is genetic. It then ranks these animals in order of their genetic merit for particular traits. Animals can be ranked across multiple herds when the stud herds are genetically linked through common sires, mainly through bought-in stags or semen.

The average genetic merit for weaning weight (WWT) in all Deer Select herds in 2015 was +8 kg compared to the 1995 average. The genetic merit of the top individuals was two to three times this, a huge difference when it comes to selling weaners. The average genetic merit for 12-month weights (LW12) across all Deer Select herds in the same period increased by +11.6 kg carcass weight. Top sires have values greater than +20 kg. Stud breeders, farming leaders, stock agents and farm advisors can assist their clients looking for stags by using the Deer Select service to identify farm goals and the genetics that can help achieve these.

Improving nutrition

Genetic improvement is not a free lunch – a central thrust of the P2P is improving nutrition to allow deer to express their rapidly improving genetic potential. On many farms deer have been run as the third class of stock. Deer need to be fed to grow: if they are fed well, they will grow fast. When the industry wrote the Deer Master Manual in the 1990s the mean winter liveweight for high performing weaner red deer was 59 kg. Among performance recorded red deer run in commercial situations in the mid-2010s the average 1 June weight was 72 kg.

The management of these high breeding value animals needs to catch up. For farmers wanting to finish deer during the spring-chilled peak, the knowledge that pre-1 June weight gain is the most important period is gaining common understanding. Waiting to put weight on deer

continued on page 22 >>

DEER WORKSHOPS

KNOWING MORE ABOUT DEER AND HOW THEY ARE FARMED CAN IMPROVE YOUR SERVICES TO THE RURAL SECTOR.

Deer numbers are growing. Farmers with deer are seeking advice on the integration of deer with other livestock and are looking to capitalise on good product prices with increases in productivity.

Join us for a day of total immersion into deer farming that will help you:

- ▶ Deepen your understanding of deer industry production and products, and deer farming practices
- ▶ Get to know the nature of deer and their differences from other livestock species
- ▶ Analyse real data and tour a working deer farm
- ▶ Discuss issues and questions with other professionals and think about how you can contribute your expertise to improving the bottom line on deer farms
- ▶ Become armed with a resources directory
- ▶ Develop contacts for this growing sector.

The programme comprises two half day sessions:

SESSION 1

- 9:00am** Deer industry products and farming practices
- 10:00am** Farm Tour
- 11:30am** Presentation on deer production
- 12:30pm** Lunch

SESSION 2

- 1:00pm** Analysis of deer farm production and financial data
- 3:00pm** Application of good practice and opportunities for professional assistance
- 5:00pm** Options for further learning

The workshop will take place on a commercial deer farm and include analysis of farm data. Materials and presentations will be supported by local technical experts in genetics, feeding, environment, health and management of deer. The course is free of charge.

This course may contribute to professional development programmes. Attendance will be recognised by the deer industry and this will provide invitations to future deer industry events to increase your contacts in this sector. Course will be held in the North and South Islands, in June and July. Dates are being finalised.

Contact Innes Moffat on innes.moffat@deernz.org or phone 021 465 121 for more information or to register your interest for you or your staff.

through winter and into spring is too late. For this reason, summer supplementation to boost hind lactation and fawn growth, pre-rut weaning, and weaning onto high quality pasture with supplementation are becoming more common to get weaner deer up to target weights early.

Tools that farmers and their advisors can use to help calculate feed requirements are available online (www.deernz.org/deerhub/feeding) thanks to David Stevens at AgResearch – his deer fed apps are used to calculate growing deer feed intake requirements. New tools include a spreadsheet that can plot expected slaughter weights and calculate revenue from venison sales. It has been developed by the P2P programme and is being used by deer farmers as a management tool to track deer weight and management intake in order to hit targets.

A tool that calculates R2 conception rates based on percentage of mature body weight is available to deer farmers to manage their replacement hinds' performance (www.deernz.org/deer-growth-curves). Specific information to assist farmers plan their forage rotations for deer is being developed and a forage rotation planner will be released in 2017.

Useful and usable information to farmers about strategic feeding options for deer to meet seasonal nutrition requirements is being provided online (www.deernz.org) and through the distribution of the 'Deer Facts' to all known deer farmers and interested parties (copies are available free of charge).

Farming healthier deer

Healthier deer are more profitable. Breeding and feeding set the potential for deer to perform, but without optimally healthy deer that potential cannot be realised. Identifying opportunities for improvement and eliminating wastage are cornerstones of profitable health management. As part of the P2P programme, work is ongoing to provide tools to assist in proactive health management.

The P2P Clean Bill of Health campaign aims to raise the awareness and working knowledge of the main production-limiting diseases that affect deer in New Zealand. The production of best practice health advice in the form of 'Deer Facts' fact sheets, available online as part of the 'Deer Facts' resource, has made it easier for farmers to have access to consistent and up-to-date information.

The best way to assess deer health issues on-farm is to have an annual health review with a veterinarian. Health reviews take a risk assessment approach and work on the principle of information-based decision-making. The P2P programme is developing resources for farmers and vets to work through annual health reviews, to identify areas where deer health can be improved and the health spend optimised by targeting appropriate management for

individual farms. Health resources will be added to www.deernz.org as they are developed.

A more knowledgeable and confident deer industry

The P2P programme aims to provide farmers with the confidence, motivation and knowledge to improve their performance (see **Figure 4**). The actions being undertaken in the programme are designed to encourage change through the combination of these factors. The Advance Parties, for example, provide farmers with the confidence and motivation to make changes by working with a peer group. Tools and information are being re-packed into more usable information via web, print and direct email to provide skills and knowledge to implement changes on farms to increase profit.



Figure 4: Change occurs when farmers have motivation, skills and confidence

Establishing agreed measures of performance allows farmers to gauge their performance in a meaningful way year on year, or against their peers if this is helpful. Agreed measures of performance are posted on www.deernz.org/production-targets and they propose achievable KPIs for survival and growth rates for commercial deer farms.

The skills, knowledge and tools exist to create an even more successful deer industry. With consistent returns more likely in the future, farmers are more confident in investing time and effort in deer as they recognise their potential. As a result of this increase in confidence farmers are seeking more advice on deer production. Farm advisors with deer knowledge have an important role to play in assisting the development of the industry and we welcome their involvement.

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Hill country symposium report

The symposium held on 12 and 13 April 2016 in Rotorua was the probably the first time in the last two decades that a broad range of people in the industry have focused on the management, interests and future of New Zealand's hill country.

Symposium aims

The symposium was organised by the NZ Grasslands Association, the NZ Society of Animal Production and the Grasslands Trust, and was sponsored by Beef+Lamb NZ and a range of industry sponsors. It was designed to:

- Provide an update on the relevant science
- Hear from farmers and other practitioners
- Discuss what the future should look like
- Condense thoughts into a position paper to ensure a profitable and resilient hill country
- Consider issues such as production, environment, markets and rural communities.

Hill country characteristics

Attendees were reminded that pastoral hill country covers around 5.6 million ha (or 18%) of the total New Zealand land area and is comprised of around 6,000 farms. The farmers are the stewards of the land and the catchments and integral parts of their local rural communities.

The hill country is now no longer seen as a producer of store lambs, cattle and wool. It is the critical engine room of the sheep, beef and deer industries as well as supporting other industries ranging from honey production to tourism. It is an important contributor to the economy as well as regional communities.

The hill country is characterised by a high degree of variability of natural resources with variations in slope, aspect, altitude, fertility, rainfall, etc, not only between farms, but also within farms and even within paddocks. This variability makes these farms quite complicated environments.

Markets

The lack of profitability for many hill country farmers continues to be a real concern. While there is increasing demand for our meat, Graeme Harrison (ANZCO Foods) highlighted the potential benefits of free trade agreements and value chains to extract increased value from the

markets. Farmers need the ability to participate in new value chains rather than the traditional transactional supply chain. The value chain relies on communication and understanding in order to provide a 'win/win' position for all participants.

The hill country is now no longer seen as a producer of store lambs, cattle and wool. It is the critical engine room of the sheep, beef and deer industries as well as supporting other industries ranging from honey production to tourism.

Production – remember the basics

Attendees were reminded to go back to the basics when considering the development of hill country. This included:

- Making the most of the cultivatable country, which gives the most reliable results and best returns
- Enhancing feed utilisation with subdivision and water supply
- Soil fertility is needed to promote the growth of legumes and grasses, especially through phosphorous and sulphur and considering nitrogen to enhance grasses
- Addressing aluminium toxicity on more productive hill country by using lime
- Understanding more about animal and plant genetics.

The general aim is to enhance the existing pasture production and target an increase in legume content.

Recent trends in hill country farming

Oversowing – spray and pray or spray and grow

While oversowing is a well-known and widely-used technology in hill country, there have been some recent innovations as farmers are seeking to improve feed quality and finish more stock off this land. In summer moist environments there has been excellent success from spraying and oversowing, with the introduction of species

Plantain, chicory, and red and white clover appear to be transforming large areas of North Island hill country, as they provide valuable lactation and finishing feed as well as feed for replacement hoggets.

and cultivars of plants that are adding significantly to both dry matter production and feed quality. Plantain, chicory, and red and white clover appear to be transforming large areas of North Island hill country, as they provide valuable lactation and finishing feed as well as feed for replacement hoggets. The pasture is often preceded by a brassica or break crop.

In the summer dry areas this technology still appears to be like Russian roulette. Soil moisture and soil temperature appear to be issues in this environment, but moisture fallowing and retaining some plant litter can enhance the establishment, provided there is still good soil/seed contact. In these areas, the preferred option is to lift fertility and perhaps apply seed annually with maintenance fertiliser. An alternative is chemical topping, or grass eradication, where the grasses are either suppressed or sprayed out to allow the existing clovers to grow and seed, thus enhancing the clover content at least for a period. The use of sub-clover and fine leaf cocksfoot appear to be among the preferred options on drier country.

Variable rate fertiliser application

Both Ballance and Ravensdown introduced their versions of variable rate fertiliser application on hill country. The aim was to apply fertiliser to productive areas, or those with potential for improved production, while reducing or eliminating fertiliser application to less favourable areas. The use of hyperspectral cameras, GPS and the automated control of hopper doors provides the opportunity for both improved pasture production and reduced fertiliser cost, significantly increasing the efficiency of fertiliser use on hill country. Precision fertiliser application also offers the opportunity for precision oversowing of seed.

Stock systems and feeding

A variety of speakers addressed recent trends in stock policies and feeding. Most options were focused on increasing the efficiency of animals, often by better feeding at times of production including:

- Better feeding of multiple ewes in late pregnancy and early lactation
- Better feeding of lower condition stock – cull or feed
- Mating of hoggets
- Triplet transfer and rearing
- Utilising finishing stock from the dairy industry – where there is no real need to run cows
- Once bred heifer – of dairy origin
- Use of easy calving beef sires
- Early weaning of calves.

One of the papers (McCread et al.) explored amongst other things the use of forages and functional supplements to enhance the production from stock (e.g. survival of multiple lambs, or those from hoggets). The paper highlighted potential technologies that could provide a significant boost to production in the future.

New innovations – alternative land use

Mānuka honey

Increased interest and returns from mānuka honey have offered an interesting opportunity for some hill country farmers. Farmers are now being paid a percentage of the gross income generated from hives on their farms. Some farmers are allowing regeneration of areas, while others are opting to plant areas with high UMF (unique mānuka factor) plants, which can have increased flowering and up to double the UMF of the local ecotypes.

Farms may well be able to accumulate carbon credits, as well as generate an annual revenue stream from honey from what was previously considered marginal land, and in areas where plantation forestry may be marginal.

Carbon farming

Forestry and carbon farming were mentioned at the symposium, but not explored in detail as an option for increasing returns from marginal country. The carbon credits offered the opportunity for annual cashflow enhancing the profitability of forestry operations. For those considering forestry this was considered a significant benefit.

Environmental challenges

The National Policy Statement for Freshwater (2014) has placed water quality as a key issue for hill country farms. A concern was highlighted that the approach by regional councils is different throughout the country, with some taking an effects-based stance while others have opted for a more prescriptive approach.



In hill country the issue is less about nitrate leaching and more about phosphate, sediment and faecal microbes caused by lateral movement on steep hill country. Radiant energy, potentially increasing water temperature, was also raised as an issue. There was discussion on the practicalities of fencing waterways and undertaking buffer planting of riparian strips. However, there has been good progress in many instances on the more intensive areas of hill country farms and as water exits properties.

It was generally accepted that increased productivity will potentially increase contaminant loss unless some form of mitigation is undertaken. Mitigation includes the use of less soluble phosphorus, precision fertiliser application, forestry/woody plants, riparian fencing and planting.

Apart from the management to mitigate losses, a further major concern for hill country farmers has been the calculation and allocation of baseline nutrients in a catchment. In particular, the perceived or possible inequities between those farmers who already have a high level of development and those with little development but wanting to protect the possibility of intensification in the future.

Extension programmes

A number of presenters spoke on the subject of farm systems research and extension. David Stevens of AgResearch talked of farms as complex adaptive systems. James Turner discussed a different extension approach being required for these complex system issues where the 'co-development' of solutions was more appropriate and effective. That is, the researcher, farmer and other stakeholders need to all be involved in designing the solutions and extension programme as a range of solutions may be appropriate under different conditions or situations.

With the advent of the Primary Growth Partnerships there has been a realisation that extension capability and techniques have been lost from the industry in recent decades. Both the Red Meat Profit Partnership and Passion2Profit (deer industry) programmes are undertaking work with small groups of farmers to enhance the uptake of new technologies. They are using a facilitated process which focuses on farmers learning and gaining confidence and motivation from each other. The opportunity for 'conversations' with their peers, partners, experts and trusted support networks appears critical to the adoption of new technology.



A central government standing committee for hill lands and associate rural communities should be established.

It was concluded that the most effective programmes are those which support the motivation, confidence and ability of individual hill country farmers to make changes. Capacity and capability of facilitation and extension were identified as issues that required strengthening within the industry.

Position paper outlines key issues

The symposium concluded with a series of workshops looking at a range of issues relevant to hill country farms. These workshops and the papers presented at the symposium formed the basis of the position paper entitled 'Future Pathways for New Zealand Hill

Country Farming' (Grassland Research and Practice Series No. 16). Some of the key points of this position paper are:

- Hill country farming contributes significantly to New Zealand's economy and regional communities. It is the nursery of our red meat industry; it comprises 70% of our pastoral area and stewards 5.6 million ha of land and associated freshwater catchments. However, dwindling investment and services will not sustain viable farm businesses and communities in the future.
- Hill land must continue to be both an attractive home to rural New Zealanders and a productive, environmentally acceptable contributor to national welfare. This can only be achieved through clear, consistent vision and planning supported by central and regional government as well as the industry itself. A central government standing committee for hill lands and associate rural communities should be established.
- Improved long-term profitability, knowledge and skills are required if current best management practices are to be more widely adopted. Research institutions, commercial companies and industry organisations need to collaborate more closely in developing and adopting new practices and technologies.
- New value chains which deliver to customer specifications are expected to lead to improved profitability on-farm. Case studies demonstrating such gains should be documented and disseminated by processors and exporters.
- New innovations are required to realise the full potential of hill land resources. R&D relevant to hill country farming must be reinvigorated and guided by a cohesive, forward-looking R&D strategy led by Beef+Lamb NZ.

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Managing cadmium in New Zealand's agriculture and food systems

In 2011, a national Cadmium Management Strategy was adopted with the aim: 'To ensure that cadmium in rural production poses minimal risks to health, trade, land use flexibility and the environment over the next 100 years'. As part of the strategy implementation, new information has been collated on cadmium levels in phosphate fertiliser, soils and in food consumed by New Zealanders. This paper provides an up-to-date picture of the status of cadmium in this country's agriculture and food systems and encourages farmers and rural professionals to understand and support appropriate cadmium management measures.

Background

Cadmium is naturally present at low levels in air, water and soil. Exposure to excess cadmium in the industrial setting is attributed to pulmonary and kidney diseases. Cadmium is accepted as a carcinogen by the inhalation pathway.

Cigarettes are a significant source of cadmium intake. For the non-smoking population, the main pathway of cadmium exposure is through the trace amounts present in food as a result of its uptake from the soil by forage and food crops. The sustained application of phosphate fertilisers and bio-solids can lead to an increase in soil cadmium, with implications for uptake by plants. Lifetime exposure to dietary cadmium in excess of accepted limits (the World Health Organization's Provisional Tolerable Monthly Intake is 25µg/kg of body weight) increases the risk of chronic human health effects, including kidney disease.

Management in New Zealand

The approach in this country to managing cadmium in agriculture and food systems has developed in stages starting in the early 1990s. From 1991, kidneys from sheep older than 30 months have been discarded from the human food chain as cadmium gradually accumulates in this organ over time. In 1995, the fertiliser industry established voluntary limits for cadmium concentrations in phosphate fertiliser, set at 280 mg Cd/kg P.

A Cadmium Working Group (CWG) was established in 2006, comprising central and regional government, primary industry bodies and fertiliser industry representatives. The CWG was tasked with assessing the

potential risks of cadmium in New Zealand's agriculture and food systems and developing appropriate responses. It concluded that cadmium does not pose a risk to human health in New Zealand, but that there is a small risk of occasionally exceeding food safety standards for this element in some offal types and some vegetables. An occasional mild breach of cadmium food safety standards is of little practical consequence for human health. On the other hand, elevated levels of cadmium in food could be used as a trade barrier.

In response the CWG developed a Cadmium Management Strategy (CMS), engaging an independent international reviewer. The strategy was adopted in 2011 and is now implemented and managed by the multi-stakeholder Cadmium Management Group (CMG) led by the Ministry for Primary Industries.

The CMS requires ongoing research and monitoring, with key elements relating to fertiliser, soil and food. A review of the strategy is scheduled for late 2017.

Cadmium in fertiliser

Since 2001, the cadmium concentration in fertiliser has been monitored and independently audited through the Fertmark programme. Nearly 3,200 samples of phosphate fertilisers taken between January 2003 to July 2015 have been analysed (**Figure 1**). The average cadmium concentration in fertiliser over this period was 184 mg Cd/kg P with 90% of the samples between 108 and 246 mg Cd/kg P. Since 2003, only four samples exceeded the limit. Two of those samples were subsequently found to have been mistakenly taken from rock phosphate prior to blending.

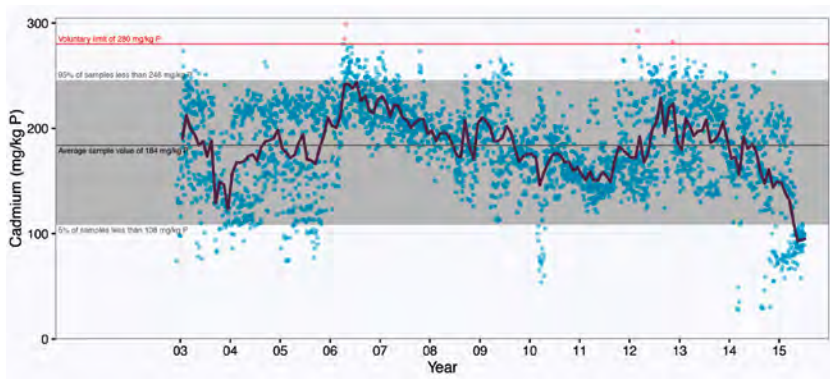


Figure 1: Cadmium concentration in phosphate fertiliser.
 Data: Ballance & Ravensdown Fertiliser Co-operatives. Analysis by Dragonfly Data Science

Not all sources of phosphate rock are equally suitable for the manufacture of fertiliser and the availability of rock phosphate with low cadmium levels, together with the required properties for processing and producing fertilisers, drives the variability in cadmium concentration in phosphate fertilisers used in this country. The fertiliser industry works with a range of suppliers of rock phosphate and phosphate fertilisers from around the world to ensure that New Zealand farmers have access to a reliable supply of high quality, low cadmium phosphate fertilisers at an appropriate price.

Cadmium in agricultural soil

The management of the accumulation of cadmium in New Zealand's agricultural soils is carried out through the Tiered Fertiliser Management System (TFMS). The TFMS includes management actions to ensure that soil cadmium levels never exceed 1.8 mg/kg soil, which was recommended by the international reviewer as a soil guideline value providing the best balance for the protection of human health, trade, land use flexibility and the environment over the long term.

Table 1. Management of phosphate fertiliser based on the TFMS

TIER	SOIL CADMIUM (MG CD/KG)	PHOSPHATE FERTILISER MANAGEMENT REQUIRED
Tier 0	<0.6	Soil cadmium is within the range of natural background concentrations. No restriction on phosphate fertiliser type or application.
Tier 1	0.6 to <1.0	Low level restriction on the rate of type and application of phosphate fertiliser. Implementation of appropriate management practices.
Tier 2	1.0 to <1.4	Moderate restriction on phosphate fertiliser type and rates of application.
Tier 3	1.4 to <1.8	High restriction on phosphate fertiliser type and rates of application.
Tier 4	≥1.8	No further cadmium accumulation allowed unless a detailed site-specific investigation is undertaken to identify risks and pathways for potential harm.

The TFMS recommends that all farms applying at least 30 kg P/ha/yr of phosphate fertiliser should test their soils for cadmium at least once every five years. The TFMS provides a standardised sampling strategy for screening pastoral soils, with a more detailed, definitive soil sampling protocol applied

when soil cadmium levels approach critical tier values. This definitive sampling also applies to cropping soils. Further detailed information on the application of the TFMS can be found on the Fertiliser Association of New Zealand's website (www.fertiliser.org.nz/Site/resource_center/Tech_Papers.aspx).

To obtain a baseline of the current status of cadmium in New Zealand's agricultural soils, cadmium concentrations were measured in over 8,800 soil samples taken across the country between 2007 and 2015 by the fertiliser industry, regional councils and research organisations. The mean concentration of cadmium was 0.43 mg Cd/kg soil and the highest recorded concentration was 3.05 mg Cd/kg. Ninety-five percent of samples had a cadmium concentration less than 1.16 mg Cd/kg and 0.3% of samples had a concentration at or above the TFMS Tier 4 threshold of 1.8 mg Cd/kg.

Data from 1,980 farms from across the country were available for analysis (Figure 2). There were four sampled farms with a soil cadmium concentration over 1.8 mg Cd/kg (Tier 4). These properties were in the Waikato. The occurrence of elevated soil cadmium in the Waikato and, to a lesser degree, Taranaki is almost certainly a legacy effect of a long history of phosphate fertiliser applications to intensive farming operations prior to the 1990s, i.e. before the voluntary limits on cadmium in fertiliser were introduced. It may also be associated with the predominance of volcanic soils in these regions which have a higher phosphorus demand than soils in other regions.

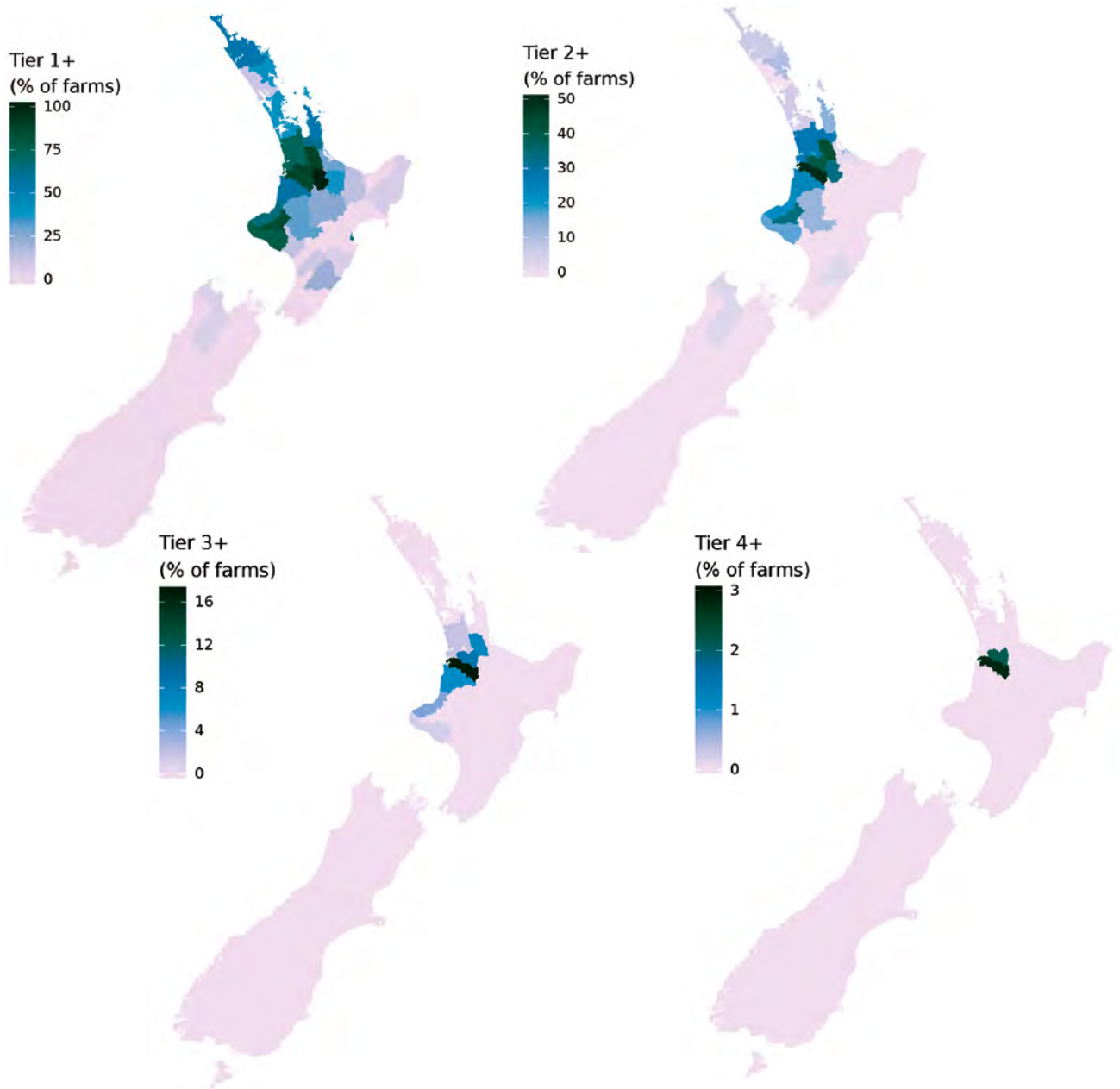


Figure 2: Percentage of sampled farms within each New Zealand territorial authority that had soil cadmium concentrations that were: Tier 1 or above (soil cadmium 0.6 mg Cd/kg or higher); Tier 2 or above (1.0 mg Cd/kg or higher); Tier 3 or above (1.4 mg Cd/kg or higher); or Tier 4 (1.8 mg Cd/kg or higher)

Analysis by Dragonfly Data Science

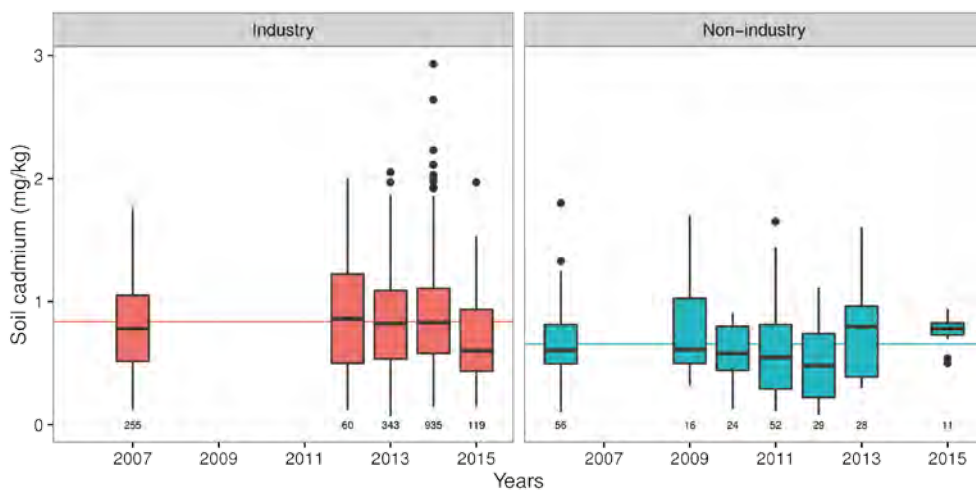


Figure 3: Cadmium levels in Waikato soils 2007-2015

Source: Ballance & Ravensdown Fertiliser Co-operatives; non-industry sources include the Waikato Regional Council and researchers. Analysis by Dragonfly Data Science

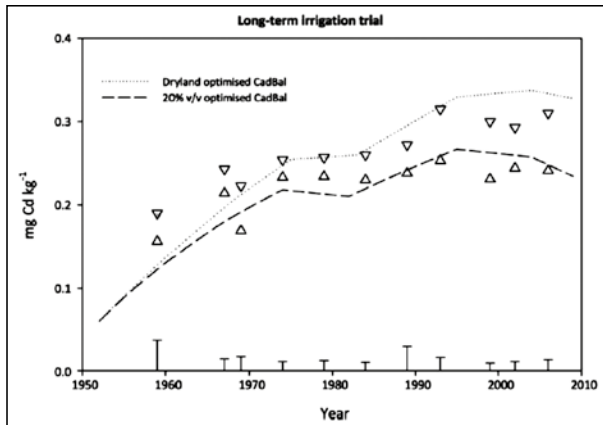


Figure 4: Trends in the amount of soil cadmium at Winchmore

Sources: Redrawn from McDowell, 2012. The dashed lines are best fit of a cadmium mass-balance model – CadBal, Roberts and Longhurst, 2005

Rate of accumulation of soil cadmium

Soil survey data from the fertiliser industry and regional councils in the Waikato region between 2007 and 2015 provided no evidence of an increase or decrease in soil cadmium over the survey period (Figure 3 facing page). Results from the Winchmore Research Station in Canterbury provide some further evidence that cadmium levels in agricultural soils may be stabilising. The trials undertaken here have maintained the same irrigation and fertiliser treatment for 60 years on sheep-grazed land. Measured and modelled time-series data of soil cadmium show an increase in it from the 1950s, peaking in 1992, with no significant change since then (Figure 4). There is no evidence of any increase in cadmium intake over time in a comparison of the most recent New Zealand diet study to earlier data studies.

Cadmium in food

New Zealand Total Diet Studies show the level of cadmium intake from food in New Zealand is less than 50% of the Provisional Tolerable Monthly Intake (PTMI) of 25 µg Cd/kg bodyweight/month recommended by the World Health Organization.

The highest relative cadmium intake, as a percentage of the PTMI, was in the diets of toddlers and children (43% and 45%, respectively). This is attributable to small children having an increased food requirement relative to body weight compared to adults.

There is no evidence of any increase in cadmium intake over time in a comparison of the most recent New Zealand diet study to earlier data studies.

Further research

Ongoing research is now addressing the issues associated with New Zealand specific soil-plant interactions which influence cadmium levels in crops. This is an important element of the CMS for managing dietary exposure and ensuring that food grown in New Zealand is maintained within accepted food safety standards over the long term.

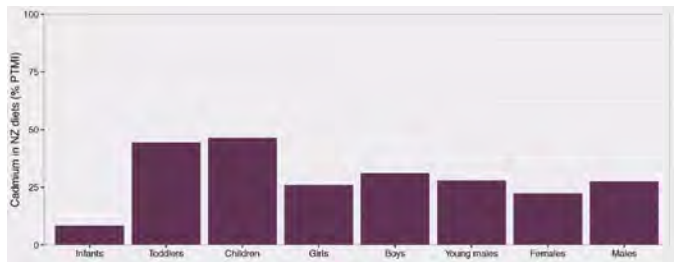


Figure 5: Cadmium in New Zealand diets

Source: 2009 New Zealand Total Diet Study, MPI

Protection of food safety standards is a complex topic. International science and recent research in New Zealand show only weak relationships between the level of soil cadmium and the uptake of cadmium by vegetables and forage plants. Elevated levels of cadmium uptake and mild exceedance of food safety standards can occur in crops grown in soils with low cadmium levels. Complex combinations of factors including plant cultivar, soil type and soil chemistry have a strong influence on plant uptake. Ongoing studies are required to better understand the factors influencing cadmium accumulation in different soil groups and plants. Thus, managing soil cadmium levels will be just one aspect of ensuring that food produced in New Zealand continues to meet food safety standards. Cultivar selection and the management of soil properties, along with the adoption of suitable mitigation, will also be required.

Summary and conclusions

The concentration of cadmium in phosphate fertiliser used in New Zealand has averaged 184 mg Cd/kg P, which is well below the voluntary limit of 280 mg Cd/kg P.

Elevated soil cadmium levels are largely confined to parts of the North Island, particularly in districts in the Waikato and Taranaki. This is likely a legacy effect of long-term use of high cadmium containing Nauru-derived fertilisers prior to the 1990s.

The reduction in soil cadmium loading from fertilisers since 1997 appears to be resulting in a slowing or plateauing of the accumulation in agricultural soils in New Zealand.

Dietary intake of cadmium by the New Zealand population is well below World Health Organization recommended levels.

Further research is needed to better understand the New Zealand specific soil-plant interactions which influence cadmium uptake in forage and crops.

Farmers and their advisers are encouraged to measure and understand their soil cadmium levels and adopt the TFMS.

PHILIP MLADENOV is Chief Executive and Greg Sneath is Executive Manager of the Fertiliser Association based in Wellington. Email: greg@fertiliser.org.nz

REGIONAL DEVELOPMENT BASED ON WATER STORAGE – IS IT AS SIMPLE AS ‘JUST ADDING WATER’?

This article examines the feasibility of storage-based irrigation by arguing low-cost water is the key factor that underpins South Canterbury’s successful Opuha Scheme rather than the provision of irrigation per se. Three other storage schemes are examined and an indicative water price ‘ready reckoner’ is applied, with the result suggesting the Opuha is unique as a source of low-cost water and is unlikely to be readily replicated. None of the other three schemes are economically viable.

Water storage and economic development

The premise behind water storage is seductively simple: collect water when it is abundant and use it when it is scarce, thereby unlocking the agricultural potential of large portions of the eastern seaboard of the North and South Islands. However, the reality is somewhat more nuanced than ‘just adding water’ to otherwise arid and semi-arid landscapes.

This article critically examines the proposition that water storage, as ‘enabling infrastructure’, is a catalyst for regional (and ultimately national) economic development and it is structured into four sections:

- A background into the contemporary economic policy context where central government is actively promoting water storage
- An examination of the Opuha Scheme, which is often used as an exemplar of the economic benefits that water storage can generate
- A consideration of the key challenges water storage faces to be economically viable
- An analysis of key problems faced by three distinct water storage proposals – the Waimea Community Irrigation Scheme (Tasman), the Ruataniwha Water Storage Scheme (Central Hawke’s Bay) and the proposed Wairarapa Water Schemes at Tividale and Black Creek.

It concludes that the ‘secret’ of the Opuha Scheme’s success is its ability to supply substantial volumes of low-cost irrigation, rather than the provision of irrigation *per se*. The result is the need for water storage promoters to continually monitor the water price of their prospective schemes. This is because the water price must be low enough to attract farmers, yet high enough to also attract investors. This can prove highly challenging, therefore making water price an ideal metric in terms of identifying a project ‘off-ramp’.

Policy context

As part of the 2013 Budget, Primary Industries Minister Nathan Guy announced the establishment of Crown Irrigation Investments Limited (CIIL). The economic rationale was as follows:

There is potential for another 420,000 hectares of irrigated land to be available for a variety of uses over time. Research from NZIER suggests exports could be boosted by \$4 billion a year by 2026, which would support thousands of new jobs (see www.beehive.govt.nz/release/irrigation-investment-company-established).



CIIL is part of a wider suite of policies, which includes:

- The Irrigation Investment Fund (IAF), which is intended to support the development of irrigation proposals to an 'investment-ready' stage
- The National Policy Statement on Fresh Water Management, which directs regional councils to set objectives for the state of for their water bodies
- The Fresh Start for Fresh Water Clean Up Fund, which is a contestable fund to help clean up nationally significant water bodies.

The economic rationale underpinning the IAF and CIIL fall under the rubric of the Government's Business Growth Agenda (BGA). The Agenda has a number of policy objectives including the doubling New Zealand's exports in real terms by 2025, with the facilitation of irrigation expected to play a key role.

From an economic policy perspective, none of the above is controversial. Instead, the question is whether the prospect of irrigating 420,000 ha of dryland New Zealand is economically feasible, and to this end the Opuha Scheme is often cited as an exemplar.

The Opuha Scheme

This scheme is located inland from Timaru at the confluence of the North and South Opuha rivers. The scheme is owned by 230 farmer-shareholders and consists of a 50m high dam that provides 74 million m³ of water. The scheme irrigates 16,000 ha and was opened in 1998. The Opuha Scheme has been a major economic boost to the South Canterbury region. A 2006 Ministry of Economic Development study (The Opuha Dam: An Ex Post Study of its Impacts on the Provincial Economy and Community) found the scheme:

- Added \$124 million to the South Canterbury economy
- Added \$20 million/year to the district's households
- Created approximately 500 full-time jobs.

Water price is a critical economic metric of scheme success as it intermediates between the needs of farmers (as users) and investors (as suppliers) – and Opuha has clearly achieved this. As an example of a successful scheme, a counterfactual is created whereby the scheme is 'rebuilt' today and the contemporary Opuha water price is then benchmarked against the indicative water price of other schemes. The following water price 'ready reckoner' illustrates this approach.

In today's dollars, the Opuha Scheme cost less than \$65 million to build. To derive an indicative water price, 8% cost of capital is applied, which gives an annual capital servicing cost of \$5.2 million. The capital servicing cost is then divided by 74 million m³ of water and the result is an 'indicative' water price of 7 cents/m³. At this price plus on-farm costs a wide array of land uses are economically viable, most notably irrigated dairying, which accounts for 53% of the scheme's water.

The question therefore is can a water price of sub-10 cents/m³ be replicated by other schemes, because if it can then Opuha is a reasonable exemplar of development potential.

Economic challenges faced by water storage projects

There are four distinct, but inter-related, challenges faced by water storage projects. The first is build cost, as low-cost water sources (such as bores and rivers) are increasingly exhausted. The implication is if irrigation is desired then it needs to be based on water storage. Storage-based irrigation can therefore be distinguished from run of river or bore-based schemes by having a higher cost structure due to the need to build a dam (and potentially a distribution system too). This means, all other things being equal, a higher comparative water price due to a higher build cost.

This leads directly to the second issue: managing project risk given the sunk and front-loaded nature of infrastructure expenditure, which is compounded by New Zealand's geography (i.e. mountainous with relatively short but fast-flowing rivers) and geology (i.e. earthquake-prone), which makes dam building a relatively expensive and complex exercise. The result is a coordination problem, or a collective action problem, associated with obtaining a sufficient volume of water pre-sales and/or equity subscribers to make construction possible.



The Waimea is a small scheme and provides 13 million m³ of water. It is estimated to cost (dam only) around \$75 million. In comparison, the Ruataniwha (dam only) is estimated to cost approximately \$150 million, but supplies 104 million m³. So while the Ruataniwha is twice the cost it delivers eight times the volume.

To overcome these issues, either a contracting solution (where the scheme is treated as a tolling operation with investors selling long-term supply contracts to users in exchange for funding the construction costs) or an ownership solution is required (such as a users' cooperative where user and investor are internalised in the same party). Recent experience shows that neither approach is easy.

A further risk associated with dam construction is the prospect of cost over-runs. For example, a 2014 Oxford University study (Ansar et al.) of 245 large dams built between 1934 and 2007 across 65 countries found, on average, cost over-runs of almost 100% and an average time delay of over 40%. These findings are consistent with recent New Zealand experiences relating to water storage, with the Central Plains Scheme exhibiting a five-fold increase in estimated costs, the Waimea Scheme almost a four-fold increase, and the Ruataniwha Scheme almost a doubling in projected cost during the planning stages. The result is a negative impact on the prospective water price.

The third issue is scale economies. Like any volume-based undertaking, water storage exhibits considerable scale economies. This is illustrated by comparing the Waimea Scheme with the Ruataniwha. The Waimea is a small scheme and provides 13 million m³ of water. It is estimated to cost (dam only) around \$75 million. In comparison, the Ruataniwha (dam only) is estimated to cost approximately \$150 million, but supplies 104 million m³. So while the Ruataniwha is twice the cost it delivers eight times the volume. This is starkly revealed in terms of water price. Using the same 'ready reckoner' approach employed above gives Waimea an indicative price of 46 cents/m³, whereas Ruataniwha water is only 12 cents/m³ (note: this price is exclusive of distribution costs).

The lesson is simple: build storage as big as possible to take advantage of scale economies.

The final challenge is striking a water price that simultaneously satisfies users and investors. Ruataniwha is a good example of how difficult this is. For example, in 2014 the Hawke's Bay Regional Council was advised a water price of between 40-50 cents/m³ was necessary to attract investors, which was unaffordable for farmers. The Council therefore initially set the water price at 26 cents/m³, which led to the withdrawal of private sector investors TrustPower and Ngāi Tahu.

However, 26 cents/m³ still proved too expensive for most farmers, with modelling by GSL Diagnostic in 2013 suggesting that irrigated dairying would struggle to pay a water price much higher than 10 cents/m³. This was a finding later verified as no prospective dairy conversions signed up for Ruataniwha water, despite the assumption irrigated dairying would account for 40% of the available water.

The result was that Ruataniwha fell into a 'valley of death', with the water price being too low for investors yet too high for farmers, and no prospect of a compromise due to diverging (rather than converging) price functions. The challenge of water price also raises two technical issues:

- Ruataniwha shows that it is very difficult for dam operators to price discriminate and charge higher water prices based on differentiated 'willingness to pay' functions
- The corollary is water is likely to be charged on the basis of marginal cost pricing, with the lowest value user setting the water price. This is no different to how electricity markets work, with the price being set by the least efficient plant rather than the most efficient. This means, for example, if the marginal user is irrigated dairy and if irrigated dairy can only pay 10 cents/m³ then the water price is 10 cents.

Table 1: Profitability of irrigated dairy in the Wairarapa under alternative milk and water price assumptions

MILK PRICE (\$/KG MS)	SOIL TYPE A (\$/HA)		SOIL TYPE B (\$/HA)		SOIL TYPE C (\$/HA)	
	WATER EXC	WATER INC	WATER EXC	WATER INC	WATER EXC	WATER INC
7.00	2,694	1,694	1,613	613	2,774	1,774
6.50	1,881	881	946	-54	1,964	964
6.00	1,068	68	279	-721	1,154	154
5.50	255	-745	-388	-1,388	344	-656
5.00	-558	-1,558	-1,055	-2,055	-466	-1,466
4.50	-1,371	-2,371	-1,722	-2,722	-1,276	-2,276
4.00	-2,184	-3,184	-2,389	-3,389	-2,086	-3,086

Specific scheme challenges

Waimea

Having considered generic challenges, it is useful to consider how these have affected specific schemes. Starting with Waimea, the challenge is the scheme is too big in terms of the potential command area, yet is too small to be a viable. This is surprising as Tasman has high-value land uses such as pipfruit (and minimal dairying) so one would expect the ability to pay a higher marginal water cost, yet water price remains uneconomic. Indeed, to match the indicative Opuha water price the Waimea build cost would need to fall from an estimated \$75 million to under \$12 million.

Ruataniwha

As noted, the fundamental problem Ruataniwha faces is volume (too much) and price (too expensive) once the cost of distribution is added. As a very large-scale scheme it needs a very large-scale water user and in New Zealand that invariably means the dairy industry. The problem is irrigated dairying is uneconomic in Central Hawke's Bay at 26 cents/m³ for water.

Again, to match the Opuha water price point implies a build cost of \$91 million rather than the estimated \$335 million, confirming this scheme is not economically feasible.

Black Creek and Tivdale

This leaves the two Wairarapa schemes. First, applying the 'ready reckoner' reveals a water price of 25 cents/m³ for Black Creek (based on an estimated build cost of up to \$205 million and 67 million m³ of supply) and 28 cents/m³ for Tivdale (based on an estimated cost of up to \$105 million and 30 million m³ of supply). The Wairarapa scheme – in its current form – involves initially irrigating 10,000 ha, with the balance of 20,000 ha following some time after 2040 and irrigated dairy is assumed to take 62.5% of the Stage 1 water. The simple fact is neither scheme is remotely viable as dairying is unable to pay a water price at these levels.

Indeed, work commissioned by Wairarapa Water from Baker Agriculture in 2014 shows that irrigated dairy struggles in the Wairarapa at a milk price much less than \$6/kg MS even if the water price is *excluded* (see Table 1). However, a water price *inclusive* calculation has been added as a planning exercise based on 400 mm of water being applied per hectare per annum at a cost of 25 cents/m³ (so \$1,000/ha for water costs).

The corollary is in the absence of irrigated dairy 20 million m³ of water becomes available, and like the Ruataniwha it is not readily obvious what alternative use there is for this volume of water.

It must also be noted that the build costs outlined above are only initial estimates, so are likely to be revised upwards as more information becomes available. For example, if either scheme experienced a cost increase of only half the expected international average then the result is a revised water price of 37 cents/m³ for Black Creek and 42 cents/m³ for Tivdale.

By means of comparison, to match the indicative Opuha water price the cost of Tivdale would need to fall from \$105 million to about \$26 million, whereas Black Creek would need to fall from \$205 million to about \$59 million. The simple fact is neither scheme is remotely viable, with the corollary being both should be abandoned.

Conclusion

Irrigation is often seen as a panacea for regional economic development woes, with the highly successful Opuha Scheme quoted as an exemplar. A more nuanced analysis suggests the Opuha's key success factor is its ability to deliver low-cost irrigation rather than irrigation per se. The problem is the three schemes examined have combinations of build cost and water volumes that are uneconomic as the water price is too high. This strongly suggests the success factors that underpin the Opuha Scheme are unlikely to be easily replicated.

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Sustainability in farming – WHAT DOES GOOD PRACTICE LOOK LIKE?

One of the ongoing debates in the primary sector is about the definition of good practice in sustainability. Rural professionals can be expected to play an increasingly important role in this discussion, which will continue to evolve over time.

This debate has been particularly important as regional councils set freshwater limits as part of the implementation of the National Policy Statement for Freshwater Management. In many cases, the starting point for limit setting is that all farmers and growers should be operating at good practice. While this premise is now widely accepted, tensions can arise when attempts are made to define good practice at a farm scale and when regional councils expect land users to do more than just good practice.

A short history of defining good

The Land and Water Forum (LAWF) was established in 2009 to develop a common direction for freshwater management in New Zealand. The Forum brought together a range of industry groups, environmental and recreational interest groups, iwi and other organisations with a stake in freshwater management. LAWF has prepared a series of reports and recommendations which continue to inform the government's freshwater reform programme.

One of the concepts that the Forum identified was the need for good practice. A *Fresh Start for Freshwater* (LAWF, 2010) defined good management practice as 'an umbrella term to describe industry-led programmes promoting practice changes to improve industry performance against water-related objectives.' In this context, good practice involves a wide range of factors such as nutrient management, feed, cultivation, irrigation and water use.

The Forum recognised that if freshwater outcomes are to be achieved then a robust policy framework is required that sets site-specific objectives for good practice. While good practice is certainly not a new idea, the discussions at LAWF helped ensure that the concept entered the lexicon of policy-makers during a period of radical change in freshwater management policy in New Zealand.

Good practice – a panacea for global peace or not?

One of the issues that has arisen is that some stakeholders have assumed that good practice is sufficient to achieve freshwater values. The problem is that in many catchments good practice alone will not be sufficient to meet wider community expectations. This is when it gets really difficult, particularly for farmers.

One of a number of examples is the Te Waihora/ Lake Ellesmere catchment in Canterbury where dairy farmers are required to reduce their nitrogen losses by an average of 30% beyond good practice from 2022. In Canterbury, good practice is defined by the Matrix of Good Management project described later in this article. Similarly, in the Hinds catchment in mid-Canterbury, good practice is required of all farming activities. Farms with a nitrogen loss/ha/year exceeding 20 kg are required to progressively reduce their discharges beyond good practice levels by 36% by 2035.

In the Waituna Lagoon catchment in Southland, some research suggests that land users could need to reduce their nitrogen and phosphorus losses in the order of 30% to 50% if some of the community's wider values for the lagoon are to be achieved.

It is worth noting that some parties have also mistakenly used the nitrogen loss rates calculated by Overseer™ as a proxy for determining what good practice looks like. In many catchments nitrogen loss rates will be a significant consideration, but there will also be other factors including water flows, sediment and phosphorus loss that need to be addressed to maintain and enhance water quality.

Similar issues are now being debated throughout the country, including in the Waikato where the regional council has recently released a plan change affecting much of the region. A number of parties, including the BNZ and Federated Farmers, have raised concerns about the significant economic implications of the plan change.

For any particular good management practice, there will be a range of estimated nutrient losses and these will vary with differing land uses, soil types and within different climate zones. This information is important for catchment modelling, which is subsequently used to inform freshwater limit setting.

Industry initiatives to define good practice and set standards

Over many years, primary sector organisations have been involved in a range of initiatives to define good practice in New Zealand. For example:

- Horticulture NZ has developed New Zealand GAP (Good Agricultural Practice), a quality assurance programme that provides a traceable, accountable system from crop to customer for the production of fruit, vegetables and flowers. By meeting the standards required, New Zealand GAP approved suppliers are able to demonstrate to their local and international customers that their products are of an acceptable quality, produced in a sustainable manner and are safe to eat. New Zealand GAP is benchmarked to GlobalGAP, a farm assurance standard accepted by retailers worldwide.
- The Forest Owners Association has developed an Environmental Code of Practice to support foresters accomplish good environmental performance (such as water and sediment control), consistent with health and safety, financial performance, community and regulatory expectations.
- The Sustainable Dairying: Water Accord is another example of good practice prepared by the dairy sector to provide a set of national good management practice benchmarks aimed at lifting environmental performance on dairy farms.

It is noteworthy that a number of these industry initiatives are becoming increasingly sophisticated to meet the expectations of overseas consumers and retailers.

Regional initiatives to define good practice

Waikato Menu of Good Practices

In 2013, the Waikato Regional Council (together with a number of primary sector organisations) developed the Menu of Good Practices for the dairying, drystock and cropping sectors. The Menu is designed to help farmers improve nutrient management and reduce impacts on water quality. An example for cropping management is to cultivate along contours, rather than up and down the slope, where slopes are greater than three degrees. Each practice's effectiveness at reducing nitrogen, phosphorus, sediment and micro-organisms entering waterways is rated.

Canterbury Matrix of Good Management

In Canterbury, work continues

on the Matrix of Good Management project which

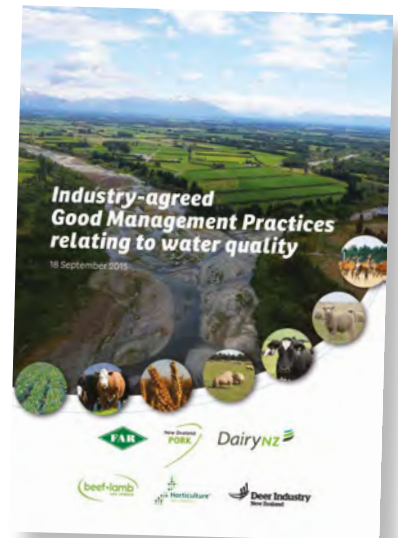
estimates the nutrient losses from different land uses under good management practices. These expected nutrient losses form benchmarks for farmers. The project involves Environment Canterbury, the primary industries and three Crown Research Institutes (AgResearch, Plant and Food Research and Landcare Research). It is partly funded by the Ministry of Primary Industries and a number of other regional councils on the basis that it could be picked up and adapted to local contexts.

The project assumes that, for any particular good management practice, there will be a range of estimated nutrient losses and these will vary with differing land uses, soil types and within different climate zones. This information is important for catchment modelling, which is subsequently used to inform freshwater limit setting.

One of the critical steps has been getting the primary sectors sitting down around the table and clearly defining what good practice consists of. These practices are then compared across sectors to ensure equivalence (that everyone is pulling their weight) across different land uses and then modelled to estimate nutrient losses.

A key step in the project was the release of a new set of definitions for good practice relating to water quality described as the 'Industry-Agreed Good Management Practices Relating to Water Quality'. At the time of its release, Federated Farmers' environment spokesperson Ian Mackenzie remarked that the pan-sector description of good practice is the first of its kind:

'This document goes beyond a list of practices that are good for water quality and outlines a suite of good management practices that all farmers, regardless of sector, are expected to achieve. As a first step to get all farmers up to a high standard of environmental awareness, we needed to agree as a sector what good management practice looks like. We have to involve farmers in that process to help us define that in very practical terms. We are now well on the way to getting industry-wide agreement on what 'good' looks like in terms of farming that protects water quality.'



Examples of good management practices include the need to:

- Design, calibrate and operate irrigation systems to minimise the amount of water needed to meet production objectives
- Ensure equipment for spreading fertilisers is well maintained and calibrated
- Locate and manage farm tracks, gateways, water troughs, self-feeding areas, stock camps, wallows and other sources of run-off to minimise risks to water quality.

Alastair Taylor, Farm Sustainability Services Manager at Ballance Agri-Nutrients, has been closely involved in the project. He feels that the good management practices are both a useful tool on-farm, and for telling a broader sustainability story to the public, because they are a system that is simple enough for a layperson to understand and which can demonstrate practical changes on-farm. He says:

'Given catchment complexity, improvements in water quality may be slow in coming and difficult to attribute. In the meantime, the industry needs to be able to share good news stories with our rural and urban neighbours and achievement of GMPs provide a measurable narrative to this.'

In 2015, Environment Canterbury took a further step with the project by notifying a regional plan change setting good practice as the minimum standard for all farming activities. The notified plan change requires properties that irrigate more than 50 ha, or have more than 20 ha for winter grazing of cattle, to obtain a resource consent once the plan change is operative. These properties will also be required to prepare and implement a Farm Environment Plan and have it audited.

Former Environment Court Judge Peter Skelton is currently a Crown appointee to Environment Canterbury. At the time of releasing the plan change introducing the Matrix of Good Management he commented that,

'We need to be clear about what constitutes good management practice on-farm. Implementation of good management practices responds to community expectations and will help achieve better water quality outcomes.'

Farmers will be required to register their farm details on a website, described as a farm portal, which helps them to understand their obligations under Environment Canterbury's planning framework. The farm portal takes farmers through various steps to calculate their nitrogen losses in terms of good management practice. It also helps farmers to determine if a resource consent is required.

Following hearings in 2016, decisions on the plan change are expected to be released early in 2017. It is possible that some issues will be resolved through

the High Court. The project has not evolved without controversy. One of the sticking points is that the plan change effectively sets a baseline nitrogen leaching rate that reflects good management practice as a starting point for all farmers. The project has significant implications, particularly for farmers and the wider agricultural sector. Landowners, real estate agents, bankers and other rural professionals are now mindful that a farm's nitrogen losses are part of the due diligence process when buying or selling property.

The project is of national importance as other regional councils will closely follow the outcome to determine its applicability in their region.

Role of the Trust in defining good

The New Zealand Farm Environment Trust was established in 2002 with the purpose of promoting sustainable farming practices that protect and enhance the environment. The Trust's flagship activity is the Ballance Farm Environment Awards which celebrate sustainable farm management. Through feedback and profiling of winners, the Awards encourage other farmers to be more proactive in their resource management by providing them with role models for good practice.

Role of rural professionals in supporting good practice

As freshwater limits are set and good practice is determined at a local level, we can expect that farmers will rely increasingly on rural professionals to support them to achieve regulatory requirements. In the meantime, discussions are beginning to take place about the need to define good practice at a national level across different sectors. It is essential that rural professionals are part of this discussion.

While the New Zealand Farm Environment Trust has a rigorous set of criteria for assessing good practice, one of the issues that it is beginning to grapple with is how all these different concepts of good practice across different land users can potentially be integrated to promote sustainable farming. Given increasing community expectations around environmental issues, health and safety, animal welfare and staff management, it is incumbent on us all to make it more straightforward for farmers who are having to deal with a complex range of regulatory challenges.

The Trust is currently evaluating its judging criteria to ensure our winners meet certain standards. We recognise that we need help as we go through this process to ensure our standards are robust and practical and that farmers meet the expectations of our community and our markets. As we go through this journey we look forward to the involvement of rural professionals.

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Governance of large farming businesses in New Zealand – research into its importance to finance providers

In line with the increasing focus on corporate governance worldwide and its impact on business performance, the primary sector is no exception. The governance of farming businesses has held growing interest in recent years for farmers, service providers and finance providers. However, until now little research has been completed on governance behind the farm gate in this country (or internationally).

What is governance? There is no single governance definition and governance does not always have to involve a company structure with a board of directors. A simple definition of governance is merely how businesses are run. A more complex definition is that stakeholders in any business all have the ability to influence governance and it is important to understand the various stakeholders and how they interact.

It is generally accepted that governance requires monitoring of performance and ratification of results or amendments to strategy. The roles of those in governance positions, including boards, are to set the correct structures and objectives (strategy and plans) for a business and ensure they delegate sufficient authority to management to achieve the objectives. The function of management is to take the strategy and plans set by the governors of the business and implement them. As most farms in New Zealand are family owned, a lot of farming businesses have owners in both governance and management roles (i.e. the owners can wear multiple hats).

With the high level of family ownership, regardless of structure, many family farm business owners will often make decisions on principles other than just business criteria such as values or lifestyle goals. However, many large farming businesses (LFBs) are companies, often created as such for structural efficiency, with directors in place to meet the legal requirements of being a company versus having a board of directors for effective governance.

The governance attributes of farming businesses within New Zealand, and particularly LFBs, have historically been considered modest despite these enterprises making a significant contribution to the economy. There is therefore a perceived need to increase governance practices in these businesses.

Research on large farming businesses

The author carried out research as part of study at Lincoln University in 2014 to consider why the governance of LFBs is important to finance providers and the governance expectations of them by those finance providers.

A theoretical model of governance of LFBs was developed (see **Figure 1** on following page), with six main concepts developed from the data. These are finance providers, external influencers, ownership structure, board architecture, board roles, and outcome and opportunity. The first two are external to LFBs and the final four represent the framework of LFB governance in the model. Six sub-concepts (also shown in Figure 1) were identified as key within the model as primary factors that have the largest influence (collectively) for the finance providers to LFBs: board structure, composition, strategy, risk, control and relationships. The model provides a fit with the data and also presents insights into governance that appear to have not been researched previously.

Finance providers categorise an LFB on scale (physical and debt), complexity of business model and number of properties. Finance providers also require LFBs to provide a high level of financial reporting and monitor their covenants and business performance. All finance providers studied in the research had a specialist division in place to manage LFBs, including relationship managers and a credit function.

The findings from the research summarised in this article present the owners of LFBs, as well as other researchers, rural professionals, finance providers and farm business owners, with the opportunity to consider governance from the perspective of finance providers. This may also influence either their current thinking on governance practices or the development of governance within their business. The findings also highlighted foundations and opportunities for further research to be completed into governance, as it relates to rural business within New Zealand, with likely future debate and amendment to the model.

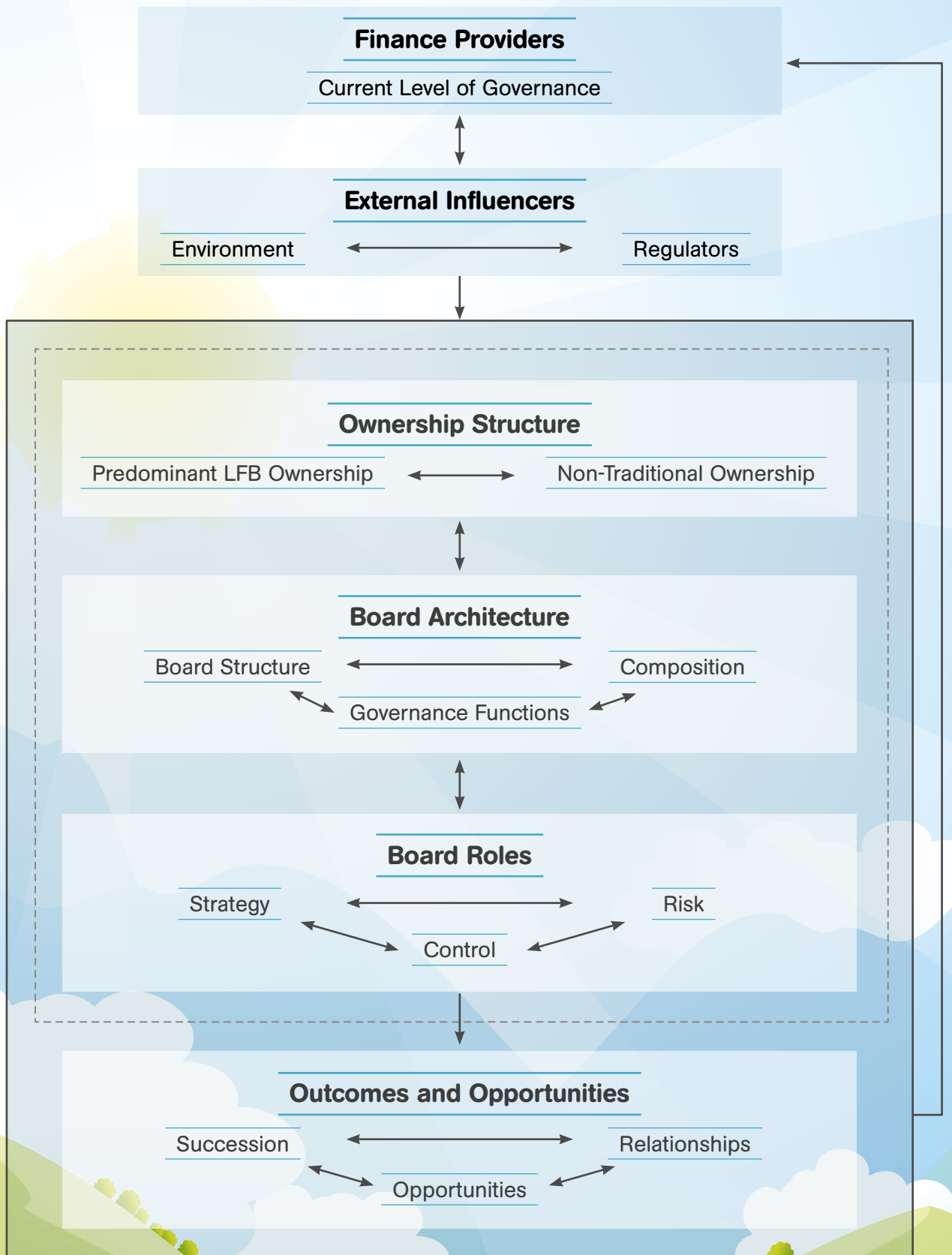


Figure 1: Theoretical model of large farming business governance

Board structure

There are LFBs that operate with informal structures for governance, which can still create positive outcomes. However, if an LFB has an expansionary focus – and there is some scale and complexity involved – it is considered that more formal governance often brings better business performance. In relation to the model, board structure is defined as the structure of the LFB when it is a family company, equity partnership or corporate farming entity, all with a board of directors.

With a perceived change in farm ownership occurring within the next five to 10 years (because of factors such as succession, retiring farm owners and aggregation), it is considered likely to include a rise in the number of LFBs owned under these structures.

Many LFBs with a company structure, particularly family-owned farming businesses, have been established for regulatory purposes (such as tax) rather than governance purposes. The finance providers considered that a low awareness of the legal responsibilities for directors that come with a company structure often existed. Often the board of directors did not function at all or the directors had a low understanding of the statutory regulations linked to a company structure.

A more formal structure is considered to bring both positive and negative influences to an LFB, depending on how it is utilised – and how formal the structures are. In equity partnerships, with shareholders who come from different backgrounds and have different goals, the structures need and tend to be clearer.

Corporate farms tend to hold more economic drivers versus the historical or emotional motivations held within many family LFBs. However, having a blend of family ownership in equity partnership LFBs or corporate farms is also seen as bringing another dimension to board of director dynamics. This includes family values and more functional and emotional drivers to the LFB. It is considered that LFBs operating under a corporate structure tended to have more formal governance in place, with the structure being purposefully created to facilitate governance, and there is a firmer understanding of the regulatory requirements of a company.

Composition

In relation to the model, composition is defined as the nature of the structure of the business and who makes up the key people within that structure, such as directors and advisors (including those who are independent) and advisory boards. This is considered important to ensure that the correct people are involved in the governance of LFBs. Having the correct advisors/directors involved is a key aspect of composition, with these individuals needing to bring the appropriate skills to each business.

Depending on the scale and complexity of the business, advisors are typically from local professional firms or hold the

relevant professional/technical expertise. Professional firms with a national footprint tended to have a wider pool of expertise available to draw on for more complicated business structures and to be more strategic in their focus. It was considered by all the finance providers that inter-generational or long-term local advisors might not always bring the most appropriate skills or level of independence. For example, for a business that has grown from a small one-farm family farming operation to a large multi-farm operation, the skill set required is different. This is particularly so if there is a complicated ownership structure and a meaningful level of debt.

Advisors are also seen to play an integral part in preparing reporting information for LFBs, again particularly if the business owners do not have suitable financial skills or where financial consolidation of multiple entities is required, which is a preference. In the research independence is defined as having people involved in the LFB who are not shareholders, primary stakeholders or paid service providers (other than for independent advice). Independence is seen as important to bring objectivity to decisions, provide the ability to challenge owners, and bring rigour to the debate around performance and decisions.

It is considered that an advisor could be conflicted if they are in a governance role but they are also a paid service provider (other than for independent advice) such as the businesses lawyer, accountant or a trustee. The finance providers also believe the relationship manager should be independent from the LFB's provision and completion of financial information and reporting and that and relationship managers should not hold governance roles with their clients.

The finance providers considered that the effectiveness of an advisory board versus a board of directors could be variable. There is often a predisposition to appoint friendly people to these positions as an advisory board member (or as a director), as opposed to having true independent directors or advisors to add true rigour and accountability to the process. How an advisory board is composed and implemented can move along a spectrum from formal to informal. A more formal advisory board will have, for example, independence, structure to meetings, a chairperson and minutes taken. Key determinants of the success of an advisory board are whether the advice is acted upon or whether the board has only been put in place to satisfy a requirement of an external stakeholder such as a finance provider.

Understanding the difference between an advisory board and a board of directors is also important. An advisory board is designed to provide advice, with the decisions resting with the owners, whereas a board of directors is mandated to make decisions. It is considered that an advisory board is a soft way to introduce more

Farm businesses historically have often held the ability to rely on their balance sheet without necessarily having to focus on the generation of cash flow and cash profits.

'formal' governance to a business without direct loss of control. When an advisory board is run as intended, then it can function similar to a board of directors.

Strategy

In relation to the model, strategy is defined as the plan that an LFB holds for its purpose and long-term direction, including the allocation of capital and the implementation/execution of the strategy. Finance providers place importance on LFBs having a strategy that they can understand and it has ownership of. Finance providers find it critical to the success of LFBs, and therefore their success as a stakeholder, for them to have a clearly defined strategy. The more formal that strategy is, often the better the LFB performance will be. Informal strategies can work, but it is important for them to be understood by other stakeholders. The finance provider needs to be aligned with an LFB's strategy and goals and this has become more important since the global financial crisis. Finance providers can have a direct influence on how close an LFB stays to its strategy.

The execution of a strategy is seen as critical to its success. LFB strategies used to have a growth focus, which has somewhat changed, with more focus now on financial performance. Formal and informal strategies both work when executed (LFB scale and complexity dependent), but a formal structure does not always guarantee execution. Those LFBs that own their strategy tend to execute it well regardless of the structure.

Allocation of capital relates to how LFBs use their asset base and cashflow. The need for LFBs to understand how they grow and what is the best use of capital is considered important in line with understanding that the principles of business apply equally to farming, when considering growth and business performance. Utilisation of external advice is considered important when considering allocation of capital. While leveraging a balance sheet via capital growth of assets has been a successful formulae over time, with a future-focused outlook it is considered important for LFBs to also focus on cash generation to support areas such as growth, balance sheet strengthening, succession or diversification.

Risk

Risk is an important consideration for finance providers and is related to external influences on an LFB as well as internal risk ratings of finance providers. Before the global financial crisis there was a view that LFBs did not always focus on risk and how to manage it (e.g. understanding their financial profile and how to deal with the impact of volatility in commodity prices).

Gaining a greater understanding of risk and business principles (e.g. understanding volatility and how this may impact their profit and loss statement and balance sheet) includes involving the right people to aid with this. Farm businesses historically have often held the ability to rely on their balance sheet without necessarily having to focus on the generation of cash flow and cash profits. The financial environment is considered to have transitioned since the global financial crisis, with this change having come about through a more difficult trading environment. Borrowers have had to become more aware of their businesses and this has brought about a positive change in the way they manage risk.

It is considered that farmers in general tend to favour physical tasks versus dedicating time to business-focused activities such as risk. A focus on risk (or in engaging those with suitable skills to help with this) is considered a good opportunity for LFBs to improve their governance. Management of risk is considered important not only for the business, but also for other stakeholders in it. If not well managed within the business this can impact external stakeholders as well and LFBs need to be cognisant of this. Both borrowers and finance providers need to continue to be aware of the changes (positive and negative) to the financial environment.

The level of governance in a farm business has a direct impact on its financial and physical performance. With debt to the agriculture sector having grown by \$40 billion since 2004 (see www.rbnz.govt.nz/statistics/c5), in the post-global financial crisis banking environment finance providers now place a stronger emphasis on risk-rating models when assessing lending decisions. They therefore require quality information from their customers, particularly larger borrowers, with the governance and management practices of LFBs playing an important role in the timeliness and quality of such information.

Another quote from the interviews: 'Financial planning needs to be thorough and we now require more conservatism in forecasting and understanding of volatility. Since the global financial crisis, banks have required an increased standard of information from LFB clients to support any lending transactions. This is due to the fact there is less focus on LVR lending with a better focus upon cash flow, leverage, the P&L and the balance sheet.'

Control

Once a strategy is set and the board structure is established (if relevant), control is considered to be an important consideration in how decisions are made and who has the authority to do so. Who has control within an LFB has a bearing on the performance, and those with the ability to control decisions or the power to influence can lead a business to a better governance culture.

Some LFB owners feel reluctant to hand over control (perceived or real), and understanding the transition that family businesses and dominant shareholders need to go through to hand over control is important for finance providers. The dominant shareholder is considered to be a key influencer in many LFBs, particularly when they are the patriarch or matriarch of the business and often the sole decision-maker. The dominant shareholder is considered less likely to be present in a corporate business or their influence is diluted.

Another quote from the interviews: 'A formal structure does not suit all family members, as they may feel a loss of control. However, a well-structured board of directors with members being chosen with the correct skills and attributes can work well.'

Relationships

Relationships are defined as the interactions that occur between LFBs and finance providers, with consideration given to the influences that these have on governance outcomes for LFBs.

To form a long-term business partnership between a finance provider and an LFB, it is particularly important for the former to understand the LFB's strategy and their performance (historical and forecast). Borrowers likewise appreciate long-term relationships that provide stability and understanding of their business. When all parties are aligned, the relationship becomes stronger and more enduring. The relationship manager is key to this as they are normally the primary person who provides the interface between the finance provider and the borrower. There needs to be complete transparency between the borrower and the finance provider and both need to be able to articulate their point of view accurately to ensure the right outcomes. Businesses with developed governance will normally do this well.

Communication lines need to be clear to enable this to occur, with the right relationship manager used for the LFB relationship, to ensure the correct decisions are made by the finance provider. The required capability of the relationship manager for an LFB is higher than a non-LFB. The relationship manager therefore requires an affinity with the rural sector as well as a good understanding of banking and finance. A strong business approach is considered very important when dealing with LFBs, with a focus not so much on the farm or physical and operational aspects of the LFB, but on the business and key financial ratios. Importantly, the relationship manager needs to have the ability to translate the customer's requirements to the finance provider and vice versa and there is a specific skill set required to do this. Finance providers work hard to train their relationship managers and to communicate with LFBs and seek feedback on the performance of both the finance provider and the relationship manager.

Summary

This research highlights a unique view of governance of LFBs from the perspective of finance providers. The findings will likely also be of interest to other smaller farming businesses, as some of the principles of governance will be equally applicable.

The model is considered to be novel, with its focus on the importance of governance of LFBs to finance providers in New Zealand, and with all of the concepts and sub-concepts in the model having an influence on governance. It is considered important that LFBs gain an understanding of governance. The six key concepts are primary factors that have the largest influence (collectively) for finance providers in regard to LFBs.

LFBs need to transition their structures toward those that facilitate governance, particularly as their scale and complexity grow. An LFB with ownership in a company needs to be aware of the legal responsibilities associated with a company structure and should seek to utilise this structure with the purpose of governance at its core. With the projected change of ownership of farms in the next five to 10 years the introduction of capital from non-traditional sources, or the evolution of ownership into equity partnerships or corporate entities, is likely to increase. This will require, and should result in, enhanced governance structures.

LFBs should pay particular attention to composition for governance, as this will reflect the validity of their intentions and influence performance outcomes. Ensuring that the most suitable advisors are engaged for any particular LFB is a key aspect of composition. To facilitate governance, LFBs need independence to bring objectivity and rigour to discussions around performance and decisions. This independence critically includes relationship managers and finance providers, which in turn pushes ownership of the business performance and governance squarely to the principals. Independence should bring accountability to the business. In turn, accountability should ensure strong business performance.

Composition will assist an LFB in the development and ownership of its strategy, which should be reviewed regularly and be one that the finance provider is aligned with. Critically, any strategy should be executed. Composition will also enable the LFB to be better placed to deal with risk and communicate this effectively to the finance provider. In turn, finance providers must ensure that they have the most appropriate relationship manager working with any LFB in order to develop enduring relationships.

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Ross Polson

Lincoln days

Ross was brought up in rural Otago, with his family being involved in stock and station companies and rural real estate. Attending Lincoln College was a natural progression following a rural upbringing, and in the late 1970s it was like a school (just about all boys), with 1,300 students attending and most finding their way to a rugby ground on Saturday. The rugby coaches were all lecturers and Ross was lucky enough to have Professor Stewart for two of his three years of rugby. The highlight of his Lincoln College rugby was being part of a team that travelled to the United States and Canada to play in an international university tournament.



The height of the interest rate fiasco came in the late 1980s. Ross says first mortgage interest rates were up over 20% and seasonal overdrafts were as high as 30%, and the government and the banks thought that farming was stuffed forever and mortgage interest rates were never going to get below 15%.

Rural Bank career start

Lincoln Ag.Com. graduates in the early 1980s had the choice of several starting careers. The Rural Bank, the Valuation Department, Lands & Survey, Maori Affairs and private enterprise personnel would all arrive at Lincoln and encourage graduates into their particular department or firm. Most graduates started with a government department, which were excellent training grounds for Lincoln graduates who ended up scattered throughout New Zealand.

Ross chose the Rural Bank and the Rural Bank chose Southland for him, starting in 1981.

Invercargill Rural Bank was at that time managed by Roger Minchin, with Alan Sewell as assistant manager. Both men were encouraging of young people and Ross found their support and wisdom invaluable in those formative years.

It was expected in the Rural Bank culture that staff automatically joined the NZ Society of Farm Management and Ross did so in 1981. The Southland branch was reasonably active and had a good balance of new and experienced members. One of the key areas of focus at the time was a Land Development Loan (LDL) programme together with a Livestock Incentive Scheme. Marginal and undeveloped land was improved and would follow with an increase in livestock numbers. Around this time New Zealand sheep numbers climbed to 70 million and the industry processed 12 to 14 kg carcass weight lambs.

The Southland landscape at this time was dominated by intensive sheep farming and the introduction of all grass wintering, which was successful in Southland as lambs could be killed at the lighter weights. Ross started his own farming activities in 1981 by leasing a small block which was previously a piggery, so the land had a very high level of residual fertility which resulted in huge pasture growth.

Lauriston Farm Improvement Club

Ross shifted to Canterbury with the Rural Bank in 1984 and initially went to Christchurch prior to joining the Lauriston Farm Improvement Club (LFIC), based in Ashburton, in the same year. The LFIC is a well-known organisation in mid-Canterbury, with its initial formation taking place in 1956. When Ross joined the club had two experienced advisors, Barry Croucher and John Kinvig. The experience and knowledge that both were able to pass on to him were invaluable to Ross and they have had a huge influence on his advisory career. This trio stayed together with the LFIC until John and Barry's recent retirements.

Mid-late 1980s – a difficult time for farmers

In 1984, mid-Canterbury farming was in the midst of irrigation development, and nearing the end of the all grass wintering fad, plus the Livestock Incentive Scheme (LIS). The grass wintering was never going to work for the Canterbury Plains and in Ross' view the LIS did not achieve much either.

He also feels the wheels started to fall off mid-Canterbury farming in 1986 with an extremely wet harvest, which caused havoc to the large legume areas that were grown at that time. The year 1987 was the world sharemarket crash, which affected most markets, plus world inflation and interest rates were really starting to rise, especially in this country. At the same time, the Labour Government restructured the economy and removed most assistance that rural New Zealand had.

The height of the interest rate fiasco came in the late 1980s. Ross says first mortgage interest rates were up over 20% and seasonal overdrafts were as high as 30%, and the government and the banks thought that farming was stuffed forever and mortgage interest rates were never going to get below 15%.

The last straw was a severe drought in 1988/89 which wrecked livestock markets for sellers and dryland arable farmers obtained record low yields. The saviour for arable farmers was the ability to buy store lambs as low as \$1 and \$2 per lamb in the autumn and sell them in the late winter and spring at \$40 per head. Although this was a lifeline for mid-Canterbury arable farmers it was catastrophic for the livestock farmers. Cull ewes had no value at all.

It was definitely the most difficult time that Ross has experienced as an LFIC advisor. Land that had traded a few years prior for \$5,000/ha dropped to \$1,700/ha and this was for the best of the Methven arable land. Most farmers at this stage had nil and negative equity and a number were forced to sell. The government initiated a New Start Grant where farmers were given \$45,000 to exit farming. Ross lent on the experience of the other LFIC advisors to help guide his clients and families through this most difficult time for mid-Canterbury farmers and indeed the whole of the district.

The following year after the 1988/89 drought was an excellent climatic year for arable farming and the slow recovery in the mid-Canterbury district started. For Ross, one larger arable property stands out as the profit from the farm for that year was the same as the capital value of the farm.

Irrigation

Ross took over a new client base for the LFIC and it quickly became evident that they had a low percentage of irrigation area compared with farmers who had been with the LFIC for a number of years. He believes that he has 'talked irrigation' every day of his LFIC career. In the early years it was often one rotorainer for 200 ha running ewes and arable crops, and expanding the mainline by one paddock per year out of cash flow. While irrigation was still relatively new, he says most farmers were good enough to make the system work.

Ross also notes that obviously in the last decade or so the banks have gained a fuller confidence in irrigation and encouraged their farming clients to redevelop their irrigation systems to what we see today. The pivot technology in the early years was based on a water drive system running the full length of the pivot pipe. Many of these early pivots were scrapped and stored under trees and for a number of years they were not accepted as an option. The technology changed and now pivots are the preferred option for all types of farming. There is relatively low labour input to run the pivots and they are very efficient in terms of water use. Pivots are often using half the water to irrigate any given area compared with some of the previous irrigation systems.

Ross believes that with the skill and innovation of farmers, combined with new technology, water use and efficiencies will further improve in the years to come. While all of the urban community are not convinced about the added benefit of irrigation, he believes that with time and further awareness most people will accept irrigation as the economic powerhouse that it is.

The family farm and succession challenges

The other notable change Ross has seen in his career is the number of young farmers wanting to come back to the family farm compared to the 1980s and 1990s. He has some clear ideas about succession and remembers one conversation he had with one of his long-term clients who had asked him, 'What should we be doing about future succession?' The next generation was still quite young at this stage. His reply was, 'It is quite simple. In the short term make some decent profits, expand your profitable business and in time that will give you alternatives for yourselves and the next generation.' For this client it worked out exactly that way, as they were able to grow their area with profitable farming and intensify land use.

There are many parts to any succession plan and each farming business is unique in its own circumstances. Ross believes that number one for any succession plan to be successful is for the next generation farmer to be better than the previous generation. There are a number of components to a successful farming business and if the next generation have not got the required skill set to take the business forward then he believes a training programme must be put in place.

Ross has advised a number of young people who either did a trade or worked outside agriculture in those early important formative years. When they do come home a number have not worked on any other farms. Some of the key skills he believes that young people need are:

> Commitment

Any business can be challenging, and mixed with the influence of climate and biological systems it often results in some unpredictable outcomes. Young farmers need total commitment to get through the challenges when the unexpected happens.

> Farming abilities

No-one has the complete repertoire but young people must strive to have an enquiring mind and an eagerness to learn. They need to obtain and gather quality information, decipher it, and then make a decision.

> Financial acumen

For some young people this is a real problem area and it needs to be addressed. Again, if they have the aptitude and acknowledge the importance of learning then the resources are there to fill this void.

> Business relationships

The first thing is to recognise the importance of building on-farm and off-farm relationships. A business culture needs to be set within the family team as well as having a consistent approach to people management.

To assist the younger members of LFIC, Ross developed a financial course which was held over a 10-week period and this will be followed up by a level 2 course in autumn 2017. The key to the success of this course was obtaining lecturer Bob Simpson, who has a passion for teaching young people and an amusing story for each lesson.

Also, Ross and the other LFIC advisors have started several discussion groups around mid-Canterbury. These groups have been hugely successful, albeit in their early stages. Already he has seen growth in the young people who have attended the courses and discussion groups.

The discussion groups must be organised and run by the group's members. The idea is to have once-a-month field days, visiting the farm of one of the members each time. While fathers are allowed to attend their own field day, they are not allowed to visit any of the other farms. The other golden rule is that advisors are also not allowed to be part of the discussion group. This makes the young people work hard and discuss all sorts of topics at a level they are comfortable with.

NZIPIM involvement

Ross was a committee member of the Canterbury branch between 2000 and 2010 and also chaired the local branch, including organising a national conference at Lincoln. He was also a member of the organising committee for the IFMA conference which was held in Methven.

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