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WATER QUALITY - THE BENEFITS OF CATCHMENT ENGAGEMENT PRIMARY SECTOR COUNCIL **NITROGEN CAP ON TAUPO FARMERS** ON-FARM TECHNOLOGY FOR RURAL PROFESSIONALS **ISSUES FOR NEW ZEALAND-GROWN PORK**



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Manatū Ahu Matua



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Separating the signals from the noise



In reflecting upon this year, the Government's legislative programme seems to have dominated many of my articles in *The Journal* over 2019. Coming to terms with the multiple levels of regulatory change likely to occur on-farm over the next five years represents a significant and daunting challenge for many involved in the farming community.

In this new world, rural professionals will have a pivotal role in supporting and advising their farming clients in navigating a pathway forward to meet the raft of new regulatory changes coming down the pipeline. At the same time, they will need to help clients continue to build profitable and sustainable farm businesses for the future.

Central to this will be rural professionals' ability to use and access vast amounts of information and data more effectively than ever before, so they are best placed to provide high quality advice and services across the farm system, as well as keeping ahead of new environmental regulations, scientific research updates, and innovative practices that improve on-farm performance.

While sounding easy in theory, this is often difficult to achieve when we are consistently being bombarded with information, opinions and scuttlebutt from an ever-increasing and divergent range of sources. More so because even reputable sources of information are increasingly being swayed to meet the cries of public opinion as opposed to upholding good science. The question then becomes how do we source and use high quality information over lower quality information, or (using an agricultural idiom) how do we sort out the wheat from the chaff?

The ability to assimilate, filter and use high quality information and data from a range of sources has become an essential core skill for rural professionals in supporting and advising their clients in running successful farm businesses. The development of this skillset will become increasingly valued by a sector bearing the weight of information overload and meeting increased environmental regulations.

We should expect technology-driven cognitive learning tools, such as machine learning and artificial intelligence, to play a greater role in analysing data collected on-farm and in helping inform decision-making processes in the future. This technology relies on algorithms to process data, and then adapt and learn based on the data received. The more inputs and statistical information collected, the better the algorithm will be at predicting a range of outcomes.

However, limitations still exist with cognitive learning technology in a farm system, given the complex interactions of highly variable biological systems that are constantly exposed to changing and unpredictable environmental and climatic conditions. Even as this technology continues to improve through the accumulation of more data points and statistical information, rural professionals will still have a critical role in interpreting and validating the outputs from this type of technology. They must also have the ability to apply softer skills and intuition (or gut instinct), developed through experience in the field in sensing something untoward.

The ability to shut out the noise and to develop our own optics to see and sense the signals in front of us is extremely difficult to achieve when the media, politicians and self-styled industry commentators seem to all be shouting at us. To detect the signals around us, we need to develop acute awareness and better techniques to filter out the noise. This could include making better use of high quality information sources, challenging and debating issues or existing paradigms, breaking down the argument into core components, and listening more carefully to the signals from the marketplace, amongst others.

Take, for example, the new Climate Change Response (Zero Carbon) Amendment Act 2019, which will require livestock farmers to meet some highly ambitious and aspirational targets to reduce greenhouse gas emissions below 2017 levels. While the Act will continue to be hotly debated, in filtering out the noise one thing that will not change is the baseline date from which emissions are set. So how well do livestock farmers know what their greenhouse gas emission numbers were for the 2017 year? If they don't, how do we determine this number from three years ago to demonstrate that livestock farmers and the industry are reducing their greenhouse gas emissions in two, 10 or 30 years' time?

While there are significant changes occurring within the primary industry, this is a very exciting time to be in the rural profession. Bring on 2020.

On a final note, this is the last issue for the year for *The Journal*. I wish to thank and acknowledge all the contributors in 2019, and the great work of the Journal Editorial Committee ably led by Nico Mouton and supported by our Editor Helen Greatrex. **J**

WATER QUALITY - MAKING MEANINGFUL CHANGE

Water quality has declined since humans arrived in Aotearoa and it will take time for improvements to show through. Should these changes be driven by central government or the community that lives in the catchment?

Community engagement

Most New Zealanders agree that water quality needs to improve. Depending on which lobby group you listen to there are a range of options to help achieve the gains expected. These include government-directed legislation (e.g. the Resource Management Act 1991 (RMA), National Policy Statements (NPS) and National Objectives Frameworks or regulations, through to regional and district council plans, calls for bans on cows (dairy in particular) and various community-led initiatives.

Again, some believe that community members are either incapable of making the improvements expected and need rules, or they will identify the real issues and solutions within a catchment. They will then get on with the job, often exceeding their original expectations.

Examples from around the country suggest that community engagement can achieve great results. Members who identify the values the catchment has then collaboratively agree on the improvements required, and will quietly get on with the process of making things better. They will take their community on the journey, and make a start as they want to see change occur and know the sooner they begin the faster the results.

As farmers on slip-prone land often say, 'The best time to plant a tree is 20 years ago, the next best time is now.' Long after the politicians, bureaucrats, policy analysts and compliance officers have gone, the farming families will still be living, working and playing together.

How can a community catchment approach work?

Parkvale Catchment example

An example of a community catchment approach is the Parkvale Catchment, a Wairarapa lowland stream. This catchment has been identified in Schedule 1 of the Essential Freshwater package as having a nitrogen (N) problem – dissolved inorganic nitrogen (DIN) – of 1.7ppm. This puts the catchment in the bottom 10% nationally and it will be required to reduce this to below 1.0ppm over time. There are measures identified to achieve this, including N limits/caps based on Overseer figures across the catchment.

Once a catchment threshold has been set, properties over this figure would be required to reduce losses to below the threshold within 12 months or apply for a resource consent. The Greater Wellington Regional Council (GWRC) will be required to administer and enforce this process. Farms will be required to have audited Farm Environment Plans with nutrient modelling from certified professionals, at considerable cost to the property owner.

I am part of the Ruamahunga Whaitua Committee, a collaborative group made up of community members, iwi, district councils and the GWRC which spent time investigating this catchment. Site visits, water quality sampling data, meetings with the catchment property owners and modelling data all produced valuable information. Key findings from this work included:

- Some of the N came from historical sources, as indicated by the high levels in samples at the top of the catchment, but most was run-off from farming, industry or septic tank discharges
- The stream is affected by periphyton growth made worse by low flows and high water temperature
- There is an extensive water race network that uses existing streams in places
- The catchment has a mix of farming types plus semi-urban and lifestyle blocks, as well as industrial activity
- A significant land use is dairy and dairy support
- Dairy farmers had already fenced off the waterway, but very few other farms or lifestyle properties have and most of the water races did not exclude stock
- Soils were typically stony with thin topsoil and are therefore 'nutrient leaky', particularly for N
- The surface water and groundwater were closely connected
- *E. coli* was in the E band and MCI (the Macroinvertebrate Community Index – a measure of stream health) was assessed as fair. Bands are used as in the NPS for Freshwater through the National Objectives Framework for Freshwater.
- Ammonia and nitrate (NO_3) toxicity were both in the B band. Subsequent data lifted ammoniacal N to the A band and dropped nitrate (NO_3) to the C band at the upstream monitoring site. It remains a B at the downstream site.



Parkvale Catchment – non dairy. This is a typical situation in much of the catchment and all dairy meets the Accord requirements



Parkvale Catchment – weed growth. Nutrient content, high temperature and light encourage weed growth

After wider community discussion the Whaitua Committee agreed that *E. coli* had to shift to the C band, the N measures to the A band, and then to aim for the MCI to lift to good. Information and ideas on solutions were gathered from regional council experts, outside specialists, Whaitua Committee members, local iwi members and the community who live and work in the catchment.

Solutions found

Some of the solutions identified were to:

- Encourage the formation of a Parkvale Catchment community group to identify values, and agree on the water quality problems and appropriate solutions
- Look at restricting stock access to the remainder of the waterway, especially cattle and deer
- Plant suitable trees on the northern and western side of the main stream to provide shade and help reduce the water temperature by 2°C. This was identified as the action that would result in the greatest improvement in MCI. Shade and lower water temperature will also reduce weed growth
- Encourage good management practice for grazing and fertiliser use.

At the time of writing, this process is underway. A meeting of 80 community members (including iwi, the local council, farmers, lifestyle block owners, businesses

and recreational groups) has committed to continuing the work of the Ruamahanga Whaitua. A subcommittee has prepared an extensive submission on the Essential Freshwater package. The submission seeks to have the Parkvale Catchment removed from the Schedule 1 list, and left to the locals to continue implementing science-based solutions that have been tailored to resolve local water quality issues.

Enaki Stream example

Another example of community action is my local waterway, the Enaki Stream in the Wairarapa, a project which started 18 years ago. Its headwaters are in steep bush and farmland and it is regularly flooded, bringing huge quantities of gravel downstream. It had an open riverbed with little stock exclusion or shade.

Working with the regional council the local community identified several issues:

- Gravel coming from the stream headwaters and from bank erosion on the flat land. More than 500 m³ per year was being removed annually from our property to help minimise flooding, and much more was being removed around the catchment
- Flooding had washed out the road bridge and fences and gravel deposits were covering good farmland
- *E. coli* was a problem, both from farm animals and people

- Water temperature was high in summer and made worse by low flow periods
- There were isolated pockets of bush along the stream, but no links between them.

Solutions found

A package of solutions was identified and a catchment plan developed to implement changes. Interestingly, it was found that most of the gravel was from bank erosion, not from the headwaters. The solutions included:

- Extensive possum control in the headwaters to improve the native bush, which would help stabilise the slope and reduce the rate of erosion
- Some land retirement from pasture in the headwaters to reduce *E. coli* and erosion
- Fencing the lowland section of the stream for stock exclusion and to protect planting
- Planting a mix of native and exotic species along the stream banks. Willows were planted close to the water to help stabilise the banks with their roots and to direct the floodwater away from the bank. Natives were planted behind the willows to provide further protection, create a biodiversity corridor and for their aesthetic appeal
- Some earthworks were required to better align the stream channel and to protect the banks

- Funding came from three areas: the local regional council provided advice, trees and expertise; fencing was done by landowners with some assistance from the council; and planting was carried out by council staff, landowners and volunteers from around the catchment. We also acknowledge the contribution made by landowners who retired their land from pasture.

Long-term results

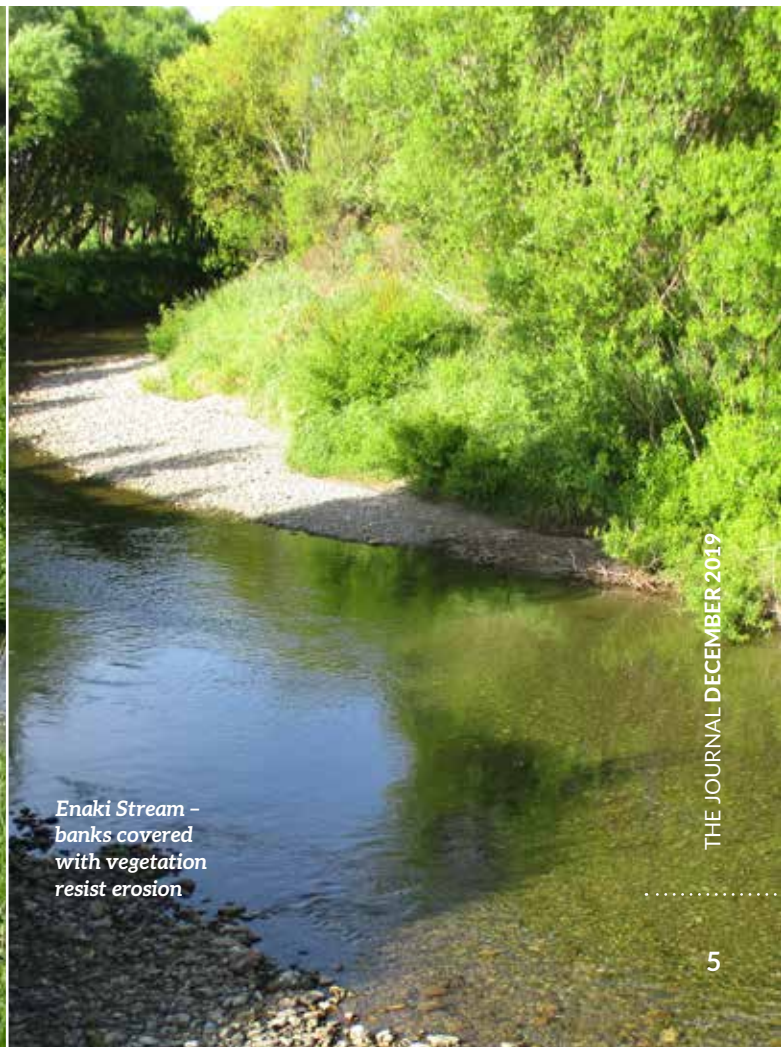
So, 18 years later what has happened to the Enaki Stream? There are almost no possums in the catchment. No possums were found over 650 ha in a recent survey. There is an extensive network of traps and bait stations to keep numbers low and these are helping to keep rat numbers in check as well.

All of the farms have fenced their sections of the stream. All properties except for one have carried out riparian planting, with the remaining farm planning to carry out future planting work. There is a solid wall of native species running almost the entire length of the stream. Native birds are flourishing and enjoy feeding on the variety of plants.

The stream channel has stabilised and reduced bank erosion. Gravel movement has almost completely stopped and nothing has been removed in the last 12 years in the lower sections of the stream. We have less flood damage and no gravel deposits.



Enaki Stream – a typical situation before the project with often not even a fence



Enaki Stream – banks covered with vegetation resist erosion



Enaki Stream - 18 years later natives can be seen on the outside and willows for shade and bank protection



Enaki Stream - shade helps lower water temperature and reduces weed growth

A common feature among the successful catchment groups has been a suitably skilled facilitator, and many farm management consultants have these skills.

The water temperature has reduced by 2-3°C over summer. While other stream health indicators have not been measured, lower water temperatures are usually associated with improvements in the MCI index. *E. coli* is also expected to have dropped as a result of stock exclusion.

The project has achieved multiple wins for the community. We have seen improvements to our environment with less erosion, less possums, more native trees and lower water temperatures. Our community has gained an attractive tree-lined stream and closer community ties, including an improved relationship with the regional council. In many regions the only interaction between the council and landowners is around resource consents for irrigation or effluent disposal, and this often creates anxiety. The stream project created a different working relationship, which has continued to be built on across the region.

What makes a successful catchment group?

These two projects have been successfully working together to introduce changes. They both have a group of people who care about their community and a community prepared to work together to achieve an agreed outcome. They also have supportive councils (local and regional)

helping the process. The Enaki Stream group started after a few keen farmers began fencing and planting their section of the river. This was picked up by the regional council who helped extend the project over the entire stream. By contrast, the Parkvale Stream group formed in part from the recommendations of the Whaitua programme and partly in response to the Essential Freshwater package and the huge impact this would have had on the community.

A common feature among the successful catchment groups has been a suitably skilled facilitator, and many farm management consultants have these skills. Support/ funding that helps with administration is also present, as is access to scientists, experts and people with practical ideas about how to implement changes.

One of the key recommendations of the Ruamahanga Whaitua Committee was that there were no hard limits set for water quality. Instead, it set out to encourage the continued formation of community groups to work collaboratively to achieve their goals for their catchment. The group received an award from the Institute of Planners for this alternative approach to freshwater management.

Why is the community-driven process better than a top down approach?

As it is community-driven, long term it will be cheaper than the regional planning processes that often result in appeals to the Environment Court. It is far better to support the community to lead change than to argue things through the courts. However, there is still the need to have rules and regulations for the laggards who don't work to make things better. It is also inclusive rather than directive. It identifies and fixes the real problem. Innovation comes from good policy direction and a community discussing how it can best meet this policy.

Improving water quality is something all New Zealanders want to see. However, there are often disagreements between different groups on how to achieve this. We have seen in the media that this issue can be quite divisive.

A catchment group approach allows communities to come together and use science to identify the issues affecting local waterways. It allows farmers, councils, iwi, research institutions, the community and environmental groups to form better relationships. It provides a forum for all of the options to be considered and to find evidence-based solutions which communities can agree on.

This approach can be very effective at identifying efficient solutions to improving water quality. Efficient solutions achieve the best results at the lowest cost and also have wider community support, making them easier to implement and less likely to create legal challenges. Farmers are keen not to let the team down and our Enaki Stream project had a very high level of support from them.

The Government recently undertook consultation on the Essential Freshwater package. The cost of the proposals is significant, with DairyNZ estimating the changes would result in New Zealand's GDP falling by \$6 billion. A catchment group approach can offer many benefits and may be effective in finding more affordable, acceptable and effective solutions tailored to local communities. With this in mind, we should be pausing to consider the merits of a catchment group approach before we embark on the Essential Freshwater package.

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WHAT WORKS BEST TO ACHIEVE OUTCOMES – TOP DOWN OR BOTTOM UP?

TOP DOWN:

- Sets high-level national goals/targets/policies
- Tends to be a one size fits all approach
- May alienate groups due to perceived problems – dirty dairying, spray and pray cropping, winter grazing, rural run-off, urban beach pollution
- Often written by well-meaning, but inexperienced, policy people with limited knowledge of how things actually work
- Has legislative clout to make things happen
- Could be the impetus that fires up the local community to take action
- May or may not adequately consider the effects on local communities (e.g. social, economic, cultural and environmental)
- Typically introduces solutions which require individual landowners to take action separately, and doesn't encourage communities to look at alternative options which involve collaboration and may be more affordable
- Requires good 'buy in' from targeted audience to achieve outcomes.

BOTTOM UP:

- Works with locals to decide what the values and outcomes are that they want for their catchment/waterway
- Identifies the specific issues in the catchment (e.g. sediment, nutrient, pathogens, lack of recreational opportunities)
- Encourages communities to consider a wide range of options and select those that achieve the best results for their investment
- Identifies pathways to achieve outcomes with timesframes that work for the community
- A 'get on with it' approach
- More likely to have a better understanding of the effects of proposed actions on local communities (social, economic, cultural and environmental), as local stakeholders are involved in the process and will express their views on impacts and look for solutions that minimise adverse impacts
- Can be derailed by personalities, administrative challenges or lack of commitment
- May require a push to get them going, which could be from central or regional government policy/regulation or from a group of locals wanting to make things better. There are many examples of groups that formed without outside encouragement (e.g. the Raglan Harbour restoration group and the Lake Brunner group – both have been going for more than 15 years).

LAIN JAGER

TOWARDS A VISION FOR THE NEW ZEALAND FOOD AND FIBRE SECTOR - THE PRIMARY SECTOR COUNCIL

The food and fibre sector is facing major international challenges needing transformational change and skilled leadership. This article looks at the establishment of the Primary Sector Council, and its recently released situational analysis report which sets out a vision for the sector and notes significant private and public sector support for this.



Challenge of developing a vision

The Primary Sector Council was established in April 2018 by the Hon Damien O'Connor, the Minister of Agriculture, to provide independent strategic advice to the Government on issues confronting New Zealand's primary industries. As the Minister stated when announcing the Council, 'New Zealand's primary sector is facing unprecedented levels of change.'

The primary focus of the Council is to develop a vision for the country's food and fibre sector, but doing this is at best challenging and arguably inherently problematic. It is certainly problematic to draw a figurative circle around the sector and consider its future in isolation from broader New Zealand society. From this perspective, a vision for the sector also needs to be a vision the rest of the country, including one that urban dwellers can buy into.

Looked at from the other direction, dairy is very different from produce, which is different again from fishing, and so the aspiration to develop a pan-sector vision risks loss of relevance at the sub-sector level. This relevance issue is exacerbated by the structure of the food and fibre sector that, at least for the purposes of farmer representation and investment, tends to operate as six largely independent verticals: dairy, meat, forestry, fishing, produce and wine.

However challenging its development, a vision for the food and fibre sector creates the potential for increased coherence as a vision can cascade through strategy to policy, regulation, investment and capability development. This work is relevant and meaningful if it translates into greater strategic and policy coherence, particularly in the context of the myriad challenges confronting the sector.

Industry feedback gained

As part of its work to develop a vision for the food and fibre sector, 43 vision statements were collected from industry organisations, and co-operatives and companies in both New Zealand and overseas. As expected, there was significant convergence in thinking across the sector with common themes being:

- Sustainable prosperity for stakeholders or, in other cases, the growth of value over time
- Identifying factors that might underpin sustainable competitive advantage (i.e. grass-fed in the case of the beef and lamb sector)
- Environmental sustainability.

Situation analysis created

This convergence of thinking reflects a journey well underway across the sector. A deeper question, however, is whether the future focus of individual organisations is also strategically optimal at the pan-sector level. To answer that question, the Primary Industry Council commissioned the Agribusiness and Economics Research Unit (AERU) at Lincoln University to prepare a situational analysis that offers a global perspective and a national context for developing that vision.

Information relating to the work of the Primary Sector Council together with the full situational analysis can be found in the website link in the 'Further reading' section at the end of this article. This situational analysis underpins the Council's work to develop a vision for the New Zealand food and fibre sector and it will be announced in December 2019.





What is the food and fibre sector?

The food and fibre sector is essential to New Zealand's economy, accounting for more than three-quarters of the country's merchandise exports. The sector includes the primary sector production industries, other than mining, and the related processing industries. It also includes service industries along the value chain from producer to final consumer, such as providers of transport, storage, distribution, marketing and sales.

The sector is affected by a series of diverse global challenges:

- Its contribution to climate change
- The impacts of climate change on production and global patterns of food consumption
- Consumer movements focused on environmental impacts
- Uncertainties in international trade, including Brexit
- Higher food standards in global markets and maintaining the social licence to farm domestically
- Increasing awareness of the impacts of animal-based production systems on the environment
- The commercialisation of plant-based substitutes
- Emerging disruptive biotechnologies
- The debt burdens carried by producers
- The amplified threat of biosecurity incursions.

Significant change in and support for the sector

Significant change in the food and fibre sector is taking place:

- Te Hono involves 217 primary sector leaders across the primary sector, pursuing a mission to transform from volume to value
- Māori enterprises are developing distinctive commercial brands in world markets
- The wine industry, Zespri, Beef + Lamb NZ, Pāmu Farms and Organics Aotearoa New Zealand are examples of large enterprises pursuing strategies that link environmental performance with consumer expectations
- Fonterra has published a sustainability report to Global Reporting Initiative (GRI) standards, although its sustainable co-operative commitment aims to support farmers without impacting production
- Smaller companies are also creating profiles to promote the quality of food and fibre sourced from New Zealand.

Public sector support for change in the food and fibre sector is reflected in a number of programmes:

- The Ministry for Primary Industries has adopted an ambition that New Zealand is the most trusted source of high-value natural products in the world
- The New Zealand Story is an initiative to support high-value exports

Like many countries, New Zealand is moving towards a wellbeing framework for guiding policy and monitoring trends in personal and community wellbeing. The Treasury's Living Standards Framework considers 12 statistical indicators of wellbeing.

- The Sustainable Food & Fibre Futures investment programme will fund projects that increase value in sustainable ways
- The National Science Challenge *Our Land and Water* has a key theme that focuses on how global agri-food value chains can create and capture value for New Zealand producers and processors.

These changes suggest solid foundations for the transformational change needed to meet the scale and range of international challenges facing the food and fibre sector, but there is no room for complacency.

Wellbeing framework

Like many countries, New Zealand is moving towards a wellbeing framework for guiding policy and monitoring trends in personal and community wellbeing. The Treasury's Living Standards Framework considers 12 statistical indicators of wellbeing. It recognises that the country's total wealth is comprised of different types of capital stocks that provide flows of services used by people to create wellbeing. The wellbeing framework emphasises the importance of reinvestment in the capital stocks of total wealth to sustain and expand wellbeing into future generations.

Employment, exports and productivity

The wellbeing framework can also be used to highlight the importance of the food and fibre sector to national economic wellbeing in New Zealand. It not only provides nutrition, but can also generate decent incomes and employment. The report shows that in New Zealand, for every \$5 of income created in the market economy, just under \$1 is created in the food and fibre sector. For every 10 jobs in New Zealand, just over one is in the food and fibre production and processing industries.

Drawing on Census data, people employed in the production and processing industries tend to have low-level qualifications compared to the rest of the New Zealand economy. Implementing production and processing systems that have smaller environmental impacts may require a more highly qualified workforce than is currently available.

The Treasury has projected that real gross domestic product in New Zealand might grow around 2% per annum looking out to 2060. If that occurs, and if the food and fibre sector maintains its current position in the structure of the national economy and there are no other changes

within it, this implies that primary sector production and food and fibre exports would have to double by 2051.

That observation supports the central theme of the situational analysis report that the food and fibre sector needs to transform itself from volume to value. A doubling in the volume of primary sector production is not feasible, given the impact that this production is having on the environment.

The food and fibre sector and the environment

Environmental quality is one of the key statistical indicators of wellbeing listed in the wellbeing framework. This recognises that environmental standards are important to citizens, including farmers, orchardists and other people involved in primary sector production. Consumers in international markets are increasingly expecting that sustainable environmental standards are maintained in the production, processing and distribution of food and fibre products.

New Zealand's Environmental Reporting Act 2015 was about the impact of primary sector production on five domains and the situational analysis report recognises these as very important: air; atmosphere and climate; freshwater; land; and marine. Intensification of farming through greater use of fertiliser and conversions to dairy farms is known to increase the amount of ammonia emitted to the air, which can acidify soil and cause changes in biodiversity by creating nutrient imbalances. Agricultural biomass burn-offs are associated with black carbon pollution (soot), which can cause health problems.

Primary sector production contributes to climate change. A high proportion of New Zealand's gross greenhouse gas (GHG) emissions come from agricultural production, the highest among OECD countries. New Zealand is also among the most efficient producers in the world in terms of emissions intensity. The release of methane gas from sheep and cattle amounts to almost one-third of this country's GHG emissions, and there is a clear scientific connection between methane emissions and global warming. New Zealand faces unique challenges, since agriculture has fewer options to make large emissions reductions quickly and cost-effectively compared to the power and transport sectors.

Water is a crucial input into primary production systems and is also one of the most high-profile environmental issues in New Zealand. Primary production can have negative impacts on the quality of local water bodies. The leaching of nitrogen and phosphorous are important

Trade modelling by the AERU at Lincoln University indicates that a 20% premium for dairy and meat exports to 10 trading partners would add \$2.1 billion to our annual export receipts.

examples, which mean that land use change can have large consequences for water quality, illustrated by the extensive conversions to dairy farms in Canterbury.

Urban expansion has caused the loss of some of New Zealand's most versatile land. The proportion of farmland used for dairying has increased at the expense of sheep and beef farming, while the intensification of farming has led to higher stocking rates, especially for dairy farms. The state of New Zealand's biodiversity and ecosystems, as well as its soil resources, is continuing to decline.

New Zealand's marine environment faces significant risks including: ocean acidification and warming from GHG emissions; extinction threats for some native marine birds and mammals; and degraded coastal marine habitats and ecosystems. New Zealand's most destructive commercial fishing methods have decreased, commercial fish stocks are managed with the aim of ensuring future harvests, and the percentage of New Zealand fish stocks assessed as being overfished has declined.

All of the above factors are important considerations when growing the food and fibre sector into the future.

Value-added transformation

If the goals are to increase the economic value of the food and fibre sector and to reduce the sector's negative impacts on the natural environment, there are a small number of possibilities that can achieve both goals simultaneously. The situational analysis report discusses four:

- Adopting new technologies and sustainable practices that will allow increased production with a lower negative impact on the natural environment
- Shifting land and water use to products that have a higher economic value and a lower negative impact on the natural environment
- Using the outputs of the primary sector to manufacture food and fibre products that are more highly valued by consumers
- Using knowledge-intensive business services to target high-value market segments in global agri-food value chains.

Need for skilled leadership

Transformation requires skilled leadership at the enterprise level, industry level and policy level. Professor David Teece of the University of California, for example, has emphasised the competitive advantage to firms that comes from the dynamic capabilities of sensing, seizing and transforming. A key consideration is the leadership skills required to create and sustain global agri-food value chains that return premiums to New Zealand producers and processors.

Leadership is also important in designing effective public policy that is supportive of the food and fibre sector's development to meet wellbeing goals. This is a challenge to the capability building strategies of organisations in New Zealand and to programmes offered in the country's universities.

Conclusions

The food and fibre sector is facing major international challenges. Changes are taking place in the sector, providing solid foundations for transformation to meet those challenges. This situational analysis produced for the Primary Sector Council by Professor Paul Dalziel from Lincoln University has documented the environmental constraints on expanding production in line with projected economic growth. It quotes the observation made by the Treasury in 2016 that 'the key issue is how to best support the transition to a world of "growth within limits".'

The potential rewards from achieving transformation are considerable. Professor Teece has proposed that New Zealand brands should be sufficiently valuable to support a 20-30% premium. Trade modelling by the AERU at Lincoln University indicates that a 20% premium for dairy and meat exports to 10 trading partners would add \$2.1 billion to our annual export receipts. Analysis commissioned by the *Our Land and Water* National Science Challenge showed that capturing that level of willingness-to-pay in five markets for improved credence attributes of four food and fibre exports would add about 2% to New Zealand producer returns.

The range and complexity of the international challenges facing the food and fibre sector mean that transformational change is necessary. The initiatives taking place in the private and public sector mean that transformational change is possible. The environmental and commercial potentials from success mean that transformational change is rewarding.

Further reading

Dalziel, Paul, Saunders, Caroline and Saunders, John. 2018. *The New Zealand Food and Fibre Sector: A Situational Analysis*. Client report prepared for the Primary Sector Council. Lincoln University: Agribusiness and Economics Research Unit. Available at: www.mpi.govt.nz/about-us/our-structure/government-advisory-groups/primary-sector-council/

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FINANCIAL IMPACT OF THE WAIKATO REGIONAL PLAN NITROGEN CAP ON TAUPO FARMERS

It is over 10 years since the nitrogen (N) cap was placed on farming within the Lake Taupo catchment. This article summarises the analysis of the financial impacts on farmers within the catchment of this policy.

Background

Lake Taupo is New Zealand's largest lake which is located in the middle of the North Island. It has a catchment area of 275,000 ha, of which 41% is owned by Ngati Tuwharetoa, 39% by the Government (mostly Department of Conservation estate), and 20% by private landowners. A total of 52,500 ha is in pasture and 64,000 ha in production forestry.

Following various reports of reducing water quality in the lake, in 2000 the Waikato Regional Council initiated a process that culminated in 2005 in the notification of Variation 5. For landowners in the catchment this included the following key elements:

- 20% of the 'manageable' N from pasture was to be bought out via a public fund
- N leaching was capped for each individual property at the highest over the period 2001 to 2005, as measured by Overseer (Nutrient budget software model – see www.overseer.org.nz/)
- Forestry was effectively grandfathered at its existing N discharge level
- A trading system for N discharge allowances was set up.

A key concern of the farmers, voiced at the time and subsequently, was that the N cap would exacerbate the ongoing cost/price squeeze. Given they would have difficulty in intensifying their farm systems, this additional pressure would mean their farms would eventually become uneconomic.

Cost-price squeeze

This is an ongoing phenomenon in New Zealand, where on-farm costs often rise faster than the general rate of inflation (i.e. Consumer Price Index, CPI) and faster than commodity prices improve. For instance, over the last decade on-farm cost inflation on sheep & beef farms has averaged 2.2% p.a., and on dairy farms 1.6% p.a., compared to the CPI average of 0.4% p.a.

On the limited information available, it was not apparent that the N cap was exacerbating this issue. The main issue was around the impact on reducing flexibility and the ability to intensify.

Compliance costs

This relates to the increase in costs associated with: compliance with Variation 5 regulations; ongoing monitoring and consent fees, annual audit fees and professional fees if needed; plus the cost of the personal time involved in managing and monitoring the consent.

In discussion with the farmers, these factors (and the time input required) varied considerably between the different farms, particularly the time input by farm management and staff. An estimated average across all the farms in the catchment was \$3,900/farm/year, or a net present value (NPV) of \$4.7 million over 20 years at a 6% discount rate.

For the Māori-owned entities, there are additional costs as well, due to the governance structures in place and the multiple-ownership nature of the entities.



Over the last decade on-farm cost inflation on sheep & beef farms has averaged 2.2% p.a., and on dairy farms 1.6% p.a., compared to the CPI average of 0.4% p.a.

These typically rely heavily on professional advice to manage and guide their business. There is also the time spent at a governance level discussing matters relating to the N cap, training and upskilling of new trustees, plus the cost of communicating with owners about the impacts of the N cap and the impact on the whenua. This cost varies between the entities and is difficult to quantify in the absence of any case studies.

Land values

This is often a good proxy for the cost of any change in farm circumstances, albeit a reduction in profitability and/or any restriction on intensification or change to land use.

Within the Taupo catchment, as in the rest of New Zealand, it could be expected that the main driver of changes in profitability would be any changes in commodity prices. On the other hand, the N leaching cap would have a greater effect on restricting intensification, which does impact on profitability, and the inability to change land use to a more intensive use (e.g. from sheep & beef to dairying).

The analysis involved comparing land sales within the catchment with those immediately outside of the catchment (the rest of the Taupo District, the South Waikato District and the southern Rotorua District) over the period 2008 to 2019. It is important to note that the 'within catchment' sample of farm sales is relatively limited.

The results of this analysis are shown in [Table 1](#) below.

Opportunity cost

An opportunity cost is the cost of the next best alternative forgone, which in the Taupo catchment context is the opportunity to convert land to a more intensive/more profitable use. Within the Taupo catchment there is an estimated 10,000 ha of existing pasture land that could be converted from sheep & beef into dairying.

The opportunity cost of not converting was estimated at an NPV of \$6,937/ha or, extrapolating over the total 10,000 ha, an NPV of \$69.4 million. This assumes that all the suitable land was converted in one year, which is very unlikely.

Also, discussion with the catchment farmers indicated that few were interested at the time in converting to dairying, while a few also potentially would have considered selling their farm to someone else who would convert. Overall, therefore, the \$69.4 million opportunity cost calculated would be considered a maximum figure.

The opportunity cost of not converting forestry to pasture is somewhat more problematic. The main production forestry owner within the catchment is Ngati Tuwharetoa who, at the time of the Variation, owned some forest area and were in the process of acquiring more from Crown Forestry as leases expired. This iwi also noted at the time that they were interested in converting some of this forestry land to other uses, but this was not an immediate consideration. Given their long-term view of land use, they had the expectation (prior to Variation 5) that at some stage in the future the land might be converted to some other use.

The development of the Emissions Trading Scheme (ETS) in 2007, and the subsequent considerable cost via the carbon charge of converting forests to pasture, now means that there is a significant economic barrier to conversion. This has effectively stopped most conversions, quite apart from the imposition of the N leaching cap. The opportunity cost of not converting forest is therefore now essentially nil.

The other area identified where there is a distinct opportunity cost is that many farmers are not fully utilising their Nitrogen Discharge Allowances (NDAs), due mainly to the concern that if they go over the NDA limit they will be prosecuted. This is particularly so given that the NDA

Table 1: Difference in land values

| | DIFFERENCE PER HA - WITHIN VERSUS WITHOUT | TOTAL LAND VALUE DIFFERENTIAL ACROSS THE CATCHMENT (\$M) |
|-------------------------|--|---|
| Sheep & beef >100 ha | \$2,749 | \$142.3 |
| Sheep & beef <100 ha | \$1,518 | \$2.0 |
| Dairy | \$2,415 | \$7.1 |
| Total | \$6,682 | \$151.4 |



A key concern raised by the farmers at the time of the implementation of Variation 5, and again at the farmer meetings, was the loss of the potential to intensify farms.

is accounted for retrospectively on an annual basis, rather than a rolling average. The result of this is most of the farmers endeavour to operate with a degree of 'freeboard' on their NDA (i.e. operate just below it so that they do not breach the limit). Overall, this adds up to several tonnes of N not being utilised, which carries an NPV opportunity cost of \$33.8 million.

Intensification of existing land use

A key concern raised by the farmers at the time of the implementation of Variation 5, and again at the farmer meetings, was the loss of the potential to intensify farms, The issues include increasing stock numbers via land development, coupled with the loss of flexibility to change

farming practices to meet market changes, grass surpluses or shortages, or to change stock types to reduce workload or achieve higher returns.

This loss of potential was assessed via two methodologies:

- Extrapolation of a case study carried out by AgResearch in 2016 on one of the Taupo catchment farms, across the whole catchment, which gave an NPV cost of \$144.5 million
- The second approach was to consider the level of de-intensification that has occurred as a result of the N cap, and the removal of the 20% of manageable N relative to the maximum potential number of stock units, and cost this using Beef + Lamb NZ Economic data. The end result gave an NPV value of \$143.7 million.

Economic theory would indicate that the opportunity cost of not being able to intensify production, or change land use, is a component of the land price.

Table 2: Summary of all impact costs

| | \$ MILLION (NPV) |
|--|------------------|
| Land value differential | 151.4 |
| Opportunity cost of: | |
| • not intensifying existing farming system | 144 |
| • no land use change | 69.4 |
| • not fully utilising NDA nitrogen | 33.8 |
| Increased compliance costs | 4.7 |

Table 3: Total N cap costs to Lake Taupo catchment farmers

| | \$ MILLION (NPV) |
|--|------------------|
| Land value differential | 151.4 |
| Opportunity cost of not fully utilising NDA nitrogen | 33.8 |
| Increased compliance costs | 4.7 |
| Total | 189.9 |

Summary

The overall summary of these costs is shown in *Table 2*.

It is important to note that all these costs are not necessarily cumulative. Economic theory would indicate that the opportunity cost of not being able to intensify production, or change land use, is a component of the land price. In essence, the theory indicates that a potential purchaser would take into account the lack of opportunity to intensify and/or change land use and adjust their purchase price accordingly. These costs are therefore incorporated as part of the differential in land values.

The overall estimated net cost of the N cap to farmers within the Taupo catchment is given in *Table 3*.

Other matters

Alternative farm systems

There are two aspects to this:

- Work carried out by AgResearch in 2005 and 2006 demonstrated that it is possible to improve the productivity of the farm (e.g. increase lambing percentage), which can improve farm profitability while maintaining the farm environmental impact regarding N leaching
- There are a number of small-scale horticultural enterprises (e.g. blueberries, grapes) operating within the catchment, demonstrating that some alternatives do exist. While most of the soils in the catchment are free-draining, the main disadvantage for horticulture in the area is the very cold winters and out-of-season frosts, which preclude many permanent horticultural crops.

Removal of the 20% of manageable nitrogen

A key aspect of the management plan for Lake Taupo was the reduction by 20% of the ‘manageable’ N flowing into the lake. Manageable was defined as what could be directly managed, essentially the N leaching from pastoral farming and wastewater discharges.

To achieve this 20% reduction, which equated to around 7% of total N inflow into the lake, \$81.5 million of public money was provided. This money funded the Lake Taupo Protection Trust, the main role of which was to buy out the manageable N.

While the \$81.5 million was a cost of the N cap, it was borne by the public in general, not by the individual farmers within the catchment (notwithstanding they are ratepayers to both Waikato Regional Council and Taupo District Councils, as well as taxpayers). If the reduction had to be made by the farmers, then on average their situation would be more tightly constrained compared to the current situation.

Nitrogen trading

N trading was an integral part of the Variation 5 regulations, particularly as it enabled the Lake Taupo Protection Trust to buy out the required 20% of manageable N. Trading started in 2009 and became fully operational in 2011 when Variation 5 became operative.

Essentially, the N market permits the transfer of NDAs around the Lake Taupo catchment by allowing any increases in N leaching on one farm to be offset by corresponding and equivalent reductions in N leaching on another farm within the catchment. The Lake Taupo N trading system is currently the only diffuse-discharge trading system in the world.

A key aspect of the management plan for Lake Taupo was the reduction by 20% of the ‘manageable’ N flowing into the lake. Manageable was defined as what could be directly managed, essentially the N leaching from pastoral farming and wastewater discharges.

The trading regime was discussed with the farmers, with the vast majority in favour of the concept, as they acknowledged it allowed for a greater degree of flexibility within the constraints of the cap.

Many of the farmers had traded N, either buying or selling (or both), whereas several had not traded and indicated that they probably never would. Some farmers indicated that at the start of the Variation they had perhaps not fully understood the implications of selling and now had some regrets, as the result has been a relatively low NDA which now restricts their farming options. Also, the need to complete a new resource consent and the costs associated with this have put a number of farmers off trading.

An increasing feature is the leasing of N over a relatively short period (i.e. one to three years). Again, this was seen as a means to improve the flexibility of the farming system, particularly allowing for a degree of opportunistic trading/finishing of stock. It is likely that the degree of leasing will increase on this basis, although as the farmers noted the economics of such leasing depends very much on the lease price.

Despite the restriction imposed by the cap, the Taupo farmers were lucky in two respects:

- The NDA was based on grandparenting, thereby minimising economic and social disruption
- The trading regime was introduced, which has significantly improved the flexibility of farming within the cap.

Impact on smaller farms

This aspect was discussed with the farmers, as to whether the N cap would have a greater impact on the smaller farms (i.e. less than 200 ha). In the absence of quantifiable data, the feeling was that the smaller farms would struggle more, as the impact of the loss of flexibility would be greater, particularly as they are more affected by the general cost/price squeeze on farms. The end result of this latter factor is the amalgamation of smaller farms into bigger units as farmers endeavour to chase economies of scale.

In the absence of any technological breakthrough, it is very likely that this trend will continue. Within the catchment the most likely result is amalgamation of the smaller farms into bigger units, or land use change to a yet-to-be-identified higher profitability/low N leaching activity, or possible subdivision.

Acknowledgements

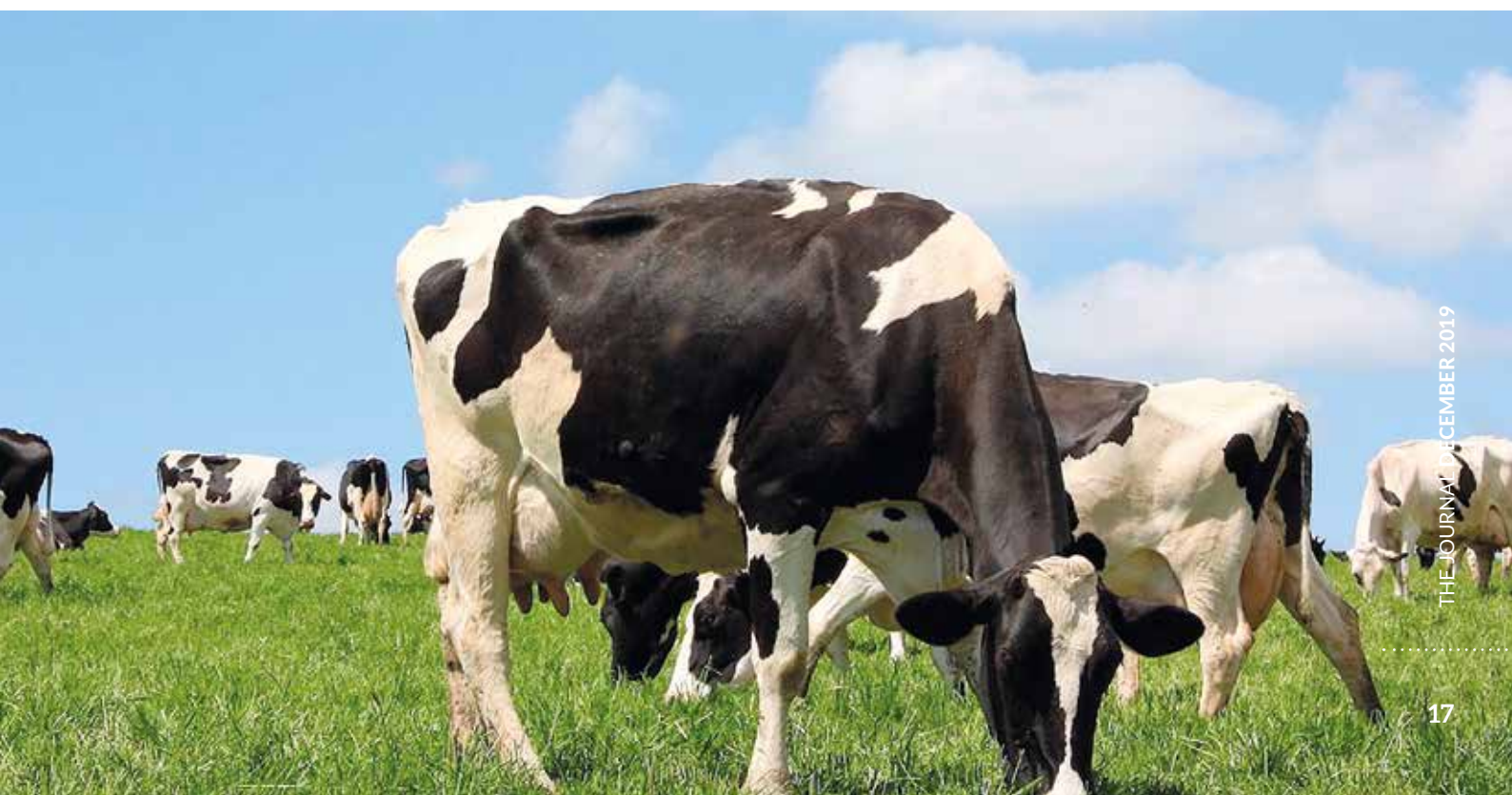
Thanks are due to colleagues Darren McNae and James Allen who were also involved in the study.

Full report

The full report can be found at:

www.waikatoregion.govt.nz/assets/WRC/Services/publications/technical-reports/2019/TR201924.pdf

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ON-FARM TECHNOLOGY - RURAL PROFESSIONALS VITAL TO AN AGRITECH FUTURE

The future for agriculture will be driven by technology and data but there are currently significant roadblocks. Rural professionals increasingly hold the keys to unlocking more value from agritech for farmers.

Transformation through agritech?

When moving to Melbourne in 2004 to study the uptake of precision dairy technologies, I flew direct from Palmerston North on Freedom Air, carrying my Nokia 3310 and a map of the city. The dairy technologies we were looking at included milk meters, heat detection, automated drafting and individualised feeding. Tools like GPS and electronic identification had created many opportunities to measure and monitor and a revolution in farm decision-making seemed around the corner.

Fifteen years later, I now visit farmers in New Zealand using navigation on my smartphone, we create virtual discussion groups using Facebook or WhatsApp, but sometimes I wonder what became of the data-driven revolution (and Freedom Air). On the surface, dairy sheds look much the same and most farms continue to manage well without the assistance of sophisticated sensors. All the while, the drums signalling an agritech future seem to be beating louder than ever.

In this article, I will try to dig a little deeper into the studies we have conducted on dairy technology to show the current status and to suggest that evolution, rather than revolution, is our immediate future. I will also outline why rural professionals will be vital in this future to help guide the use of technology, but also for identifying areas for potential technological improvement.

Current agritech adoption

Internationally, technologies focused on automating tasks are currently most popular with farmers. In Europe (and more recently North America) robotic milking has gained popularity, but there has not been wide adoption to date in the pasture-grazed systems of Australia and New Zealand. In these countries, devices to automate part of the milking process have begun to be used, particularly in rotary sheds.

DairyNZ conducts five-yearly technology surveys to keep a track of adoption. This survey provides us with representative data and has been highlighting some interesting trends (Figure 1).

In New Zealand, around 40% of rotary dairy sheds had installed automatic cup removers, automatic drafting and

automatic teat spraying. Our research has shown that a combination of these technologies can reduce repetitive tasks and help to offset a person at the cups off position in rotary sheds. Reducing repetition and overall hours of work through increased labour efficiency can help attract and retain staff.

While automation devices have seen adoption in different parts of the dairy world, the use of data-capture technologies (e.g. sensors that collect data on animal health, production, reproduction and feed availability) have had lower uptake. In New Zealand, sensors such as milk meters, walk-over weighing, mastitis detection and heat detection are more commonly used in rotary-based systems, but the numbers remain low (Figure 1).

It is technologically challenging to develop affordable and accurate sensor-based systems that are robust enough for on-farm use. To have value, the subsequent data collected must lead to improved decisions, which often requires additional skill and time by the farm team to interpret.

Farmers surveyed indicate continued investment in the commonly used automation technologies is likely as is a gradual increase in information technologies. Recently launched innovations for automated pasture measurement, as well as new farm-wide low-cost battery-powered sensors and networks, may also make an impact in our next five-yearly survey. Overall, the value (financial and intangible) and practicality of technology will determine farmers' enthusiasm for embracing any new technologies on-farm.

While the use of sensors on-farm is still limited, there has been a significant shift in software to the cloud. This has multiple benefits: developers can more easily upgrade their systems, data is automatically backed up, it can be shared between platforms, and it is easier to implement benchmarking between similar users.

Moving to the cloud also has other benefits. Our work around grazing decision support software highlighted the value of mobility for farmers and their teams. The smartphone has become a great way to communicate on-farm through apps such as WhatsApp. Other apps can

Which automation technologies are farmers using?

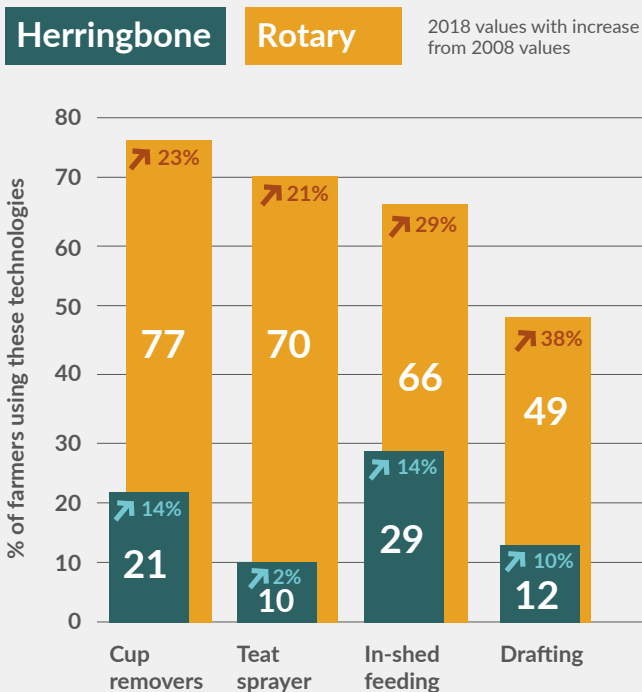
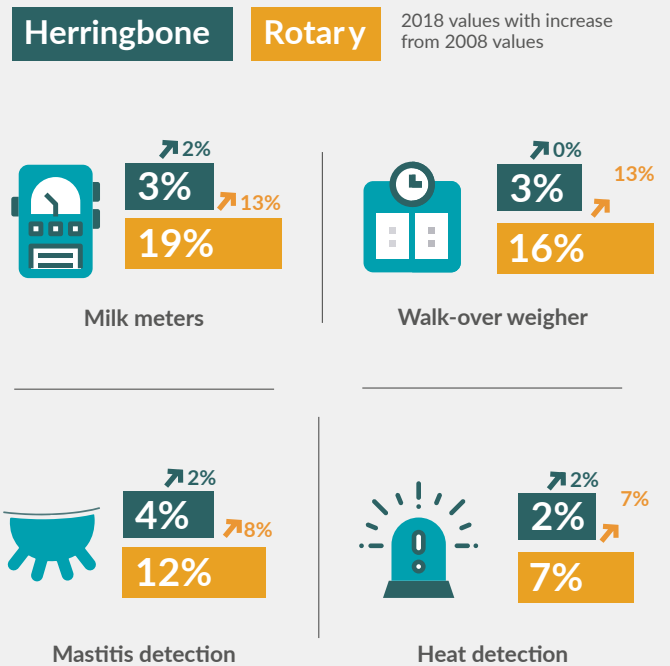


Figure 1: Technology used in New Zealand dairies

Source: Inside Dairy September (2018)

Which information technologies are farmers using?



In Europe (and more recently North America) robotic milking has gained popularity, but there has not been wide adoption to date in the pasture-grazed systems of Australia and New Zealand.

help to measure paddocks, record body condition scores, or improve machinery maintenance tracking. Cloud-based technologies rely on whole-farm connectivity, which is still problematic for many farmers.

Future agritech trends

The fun part about working in technology adoption is that there is always something interesting on the horizon. Technology that has caught our eye lately at DairyNZ includes virtual fencing, augmented reality, artificial intelligence (AI) and robotics.

Virtual fencing (VF), or the ability to manage individual animal movements through GPS rather than physical barriers (fences), has been researched for decades. As with most technologies, VF only became feasible when the right worlds collided. In this case that is technology miniaturisation, enhanced battery capability, and improvements in real-time location and communication technology.

Two of the main players here are Australian-based Agersons (with their eShepherd device) and New

Zealand-based Halter. Agersons, part-owned by Gallagher Group Ltd, have been the first to get their devices in pre-commercial trials on farms, including some in New Zealand. The impact of VF devices is still uncertain, but their greatest potential seems to be in excluding animals from riparian or sensitive areas on-farm without the need for expensive physical fences.

Virtual reality and augmented reality (VR and AR) is another interesting technology making its way into agriculture. We are seeing proof of concept VR (e.g. to deliver health and safety training). The benefits of these technologies include:

- An engaging way to deliver training to younger generations
- The ability to recreate rare or dangerous situations in a training scenario
- The capacity to train from a distance (the tutor connects remotely to watch) and to assess performance in real-time.



Farmers will still need to work with rural professionals to solve complex environmental and social challenges

In an increasingly dynamic, connected and data-driven agricultural sector, the skills of rural professionals are vital.

AR seems to have more potential for application in real-life dynamic situations. This technology allows you to overlay information on something you are looking at (e.g. Google Glass), and is already being used in engineering, construction and safety, and building inspections.

New Zealand companies like Company X are applying Realware™ technology, a head-mounted AR device using voice-control to deliver services such as remote mentoring, document navigation and visualisation, and hands-free voice activated data entry. Such technology could enable a farmer to enter mastitis treatment information on the go, to access and view that animal's records through the AR visualisation, call an off-farm expert who can see what the farmer is looking at, and provide real-time advice. It is like FaceTime with no hands.

For decades we have struggled with making the most from digital farm data. For example, while some cow 'wearables' now combine data from activity sensors with rumination and temperature, there is generally limited integration of data sources occurring. A large opportunity therefore exists to pull different types of data together to predict events such as health concerns, oestrus, or changes in feed demand.

We then need to be smarter with how these data are analysed, through tools such as AI. To date, AI has made only small inroads into agriculture, but its potential to support 'smart farming' more broadly is well recognised and there is little doubt it will be deployed extensively in the future.

Finally, robotics appears to be making headway in some primary sectors. One example is the work by RoboticsPlus in the kiwifruit, apple and forestry sectors. Attracting skilled people is a challenge for most parts of the primary sector, and robotics offers opportunities to lessen the pressure by automating some of the drudgery. Done right, this may have flow-on effects for the image and attractiveness of agricultural workplaces.

What is holding agritech back?

Farmers are generally making logical decisions not to invest in many agritech offerings. Where there is a real value proposition, farmers have invested in technologies (e.g. automated cup removers in rotaries, auto steering on tractors). Value proposition depends on whether technology delivers enough to surpass current practices. Often there are hidden costs such as double data entry and learning costs/time, or unacceptable business risk (devices are not proven, or standards/devices may change rapidly). There needs to be a focus on ensuring technology has a clear payback for farmers.

Before we can leverage the potential of multiple data sources, we need to enable data to move more freely between devices, from devices to software, or from database to database. This is not easy, as it is an area dominated by commercial companies who often do not see easy data exchange as a priority and/or in their commercial interests. Many farmers have told us of the frustration associated with the double entry of data, or not being able to easily transfer historical data to a new software they have purchased.



Decision support software is moving to the cloud

Data and technology will have an increasing impact on the advisor-farmer relationship.

Data standards and interoperability needs to be a focus for the Government, industry organisations, and NGOs such as Precision Agriculture Association NZ (PAANZ) and Agritech New Zealand. The Government's current focus on agritech, through the Agritech Industry Transformation Plan, would ideally have interoperability as a main pillar. Farm Data Standards (farmdatastandards.org.nz) and Datalinker (datalinker.org.nz) have started us down this path, but more momentum is required, possibly through international efforts such as AgGateway (aggateway.org).

Rural professionals and an agritech future

In an increasingly dynamic, connected and data-driven agricultural sector, the skills of rural professionals are vital. These skills will extend from existing specialist and farm systems knowledge, through to knowledge on technology options and analysis of the data, both with and on behalf of farmers. Roles are also emerging for technology suppliers themselves as specialist advisors at the technology and farm management interface.

Greater data capture, sophisticated decision-support platforms and AI could be seen as a challenge to the role of farm advisors. However, the highly complex issues we face now, particularly around environmental and social issues, are beyond the capability of decision support and AI tools.

The value from collecting data through technology comes from making more accurate and more timely decisions. A major issue is then who has the time to spend

hours at the computer analysing data? Currently not many farmers, so for all this data to become useful on-farm we need to put more work into smart computing systems that do the donkey work and suggest management options, or free up time. For example, intelligent systems that look at grazing patterns, stock feed requirements, predicted pasture growth rates and short-term weather forecasts to adjust the grazing plan.

We will also need farm advisors who are comfortable using computers and other technology, and who can rapidly find the important information farmers need among the variety of devices and software platforms available.

Advisory service models, which have changed significantly in countries such as Australia and New Zealand in the past two decades, will need to evolve to incorporate the transformation to data-driven smart farming. We already see this, with advisors providing services around Overseer and nutrient decision-making.

In some of our research, we see rural professionals positioning themselves in a data analysis role and as expert users of software tools. They were also combining their knowledge of farming contexts with the data collected via smart technologies in a 'hybrid' knowledge. An example of this was farm consultants viewing client animal and pasture data via online platforms without visiting the farm, then using their experience to suggest management changes between physical farm visits.



*Virtual fencing is a developing area
(eShepherd collar pictured)*

In the short term, major drivers for on-farm technology adoption will be related to proof of practice, compliance and improving the workplace, rather than productivity gains.

Data and technology will have an increasing impact on the advisor-farmer relationship. However, we cannot ignore the need to equally focus on building leadership in land management, empowering the innovation and autonomy of our farm teams, and building the value for farmers in the external advice.

Helping farmers make good tech investment decisions

Rural professionals can play a role in helping farmers select systems that will fit with their farming operation and staff competencies, and which will add value to their business. When discussing this area with farmers, we suggest a four-step process:

1. Assess current performance first, to identify what works well and where improvements could be made before thinking of technology investments (i.e. ensure technology would be solving a real problem).
2. Consider your goals for this particular area of the farm system – what is the end result you are looking for?

3. Assess the options available for meeting those goals. A technology investment may be one option, but changing basic processes on-farm or staff training can often prove a more cost-effective solution.
4. The final step, if new technology appears to fit your farm and goals, is to spend time investigating the different technology options for their performance, the data they capture and what decisions you will use that data for, along with other important factors such as its usability for you and your staff.

There are many technology options out there for farmers, and rural professionals are also ideally placed to feed back what is working and what isn't. These insights are needed for technology developers to target their designs to the areas of greatest need and value.

Keeping up with technological change and the ever-expanding options can be a challenge. There are a few places you can go for a start. At DairyNZ, we are always



Investment in dairy sensors has been relatively low to date

happy to provide insights and advice, Beef + Lamb NZ have just initiated a Future Farm project (www.futurefarm.co.nz), and there is an Internet of Things (IoT) trial at FAR's Kowhai Farm. Joining PAANZ gives access to email updates on agritech-related initiatives.

There are also some good overseas resources online, including the European project 'Data Driven Dairy Decisions for Farmers' (www.4d4f.eu). Most valuable are your discussions with farmers using tech. Use these discussions to dig deeper and understand where investment has led to better decisions, time savings or better farm team wellbeing.

Many questions remain

Questions exist about how to turn the potential of technology into reality for farmers, including:

- How can multiple data sources and smart data analysis best enable farmers to perform more effectively in a rapidly changing future?
- How can we do better with data and internet connectivity (transferring data between devices, databases, platforms)?
- What are the technology gaps (e.g. animal location, automated data collection of certain tasks)?
- Where is the value proposition for farmers and how can this be made clearer?

- What are the skills farmers need from their advisors and the broader service sector?
- Will consumers have a positive or negative view of the use of data, automation and AI in their food chain?

Conclusions

While some great ideas, much like Freedom Air and Nokia, will come and go, the future for agriculture is going to be technology and data-driven. In the short term, major drivers for on-farm technology adoption will be related to proof of practice, compliance and improving the workplace, rather than productivity gains. Significant reductions in the cost of technologies (or an increase in the cost of labour) will also have an impact.

Some game-changing technology may still be over the horizon, but a lot of smart farming options are already available, and it is hard to imagine milking won't be further automated on most farms in the future. Expect to also see more technologies around virtual fencing, pasture measurement and miniaturised sensors networked across the farm.

There are significant opportunities for rural professionals in the technological evolution. It is not feasible for farmers to understand all the technology options, the true return on investment, and to have advanced data analysis skills in their farm team. They will look to independent external advisors for this service. This independence is also vital to help the agritech industry gather farm-grounded feedback on future technology needs.

Further reading

DairyNZ information about technology performance and investment decisions: www.dairynz.co.nz/milking/new-dairies-and-technology/

A summary of the latest DairyNZ technology survey in 2018: www.dairynz.co.nz/news/latest-news/value-determines-technology-uptake/

Agritech in New Zealand: Towards an Industry Transformation Plan - Draft Strategy for the Agritech Sector. Available at: www.mbie.govt.nz/dmsdocument/5878-growing-innovative-industries-in-new-zealand-agritech-in-new-zealand-towards-an-industry-transformation-plan

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PETER FLANNERY



A NEW NORM – RURAL BANKING IN NEW ZEALAND 1980s-PRESENT

This article is a reflection by Peter Flannery, a former rural banker, on over three decades of rural banking in New Zealand. The pre-1990 period in New Zealand is discussed, then the advent of ‘relationship banking’ which predated the 2008 global financial crisis (GFC). It also outlines his views on the effect of international regulation on the New Zealand banking system and the current climate for rural lenders.

Pre-1990

Prior to 1984, banking, foreign exchange and capital allocation were heavily regulated, as were transport and exports. During this period, the Government at varying times and to varying degrees regulated the amount banks could lend and had a heavy hand in setting deposit and lending interest rates. The five trading banks were more heavily regulated than non-financial institutions such as savings banks and finance companies. Banks at one time had no ability to source overseas funds and their lending was confined to industries favoured by the Government.

Non-financial institutions were able to more easily compete for deposit funds and, as a result, trading banks had limited access to capital. Over time, the Government realised that this created an unfair playing field and, rather than easing the restrictions on the trading banks, they increased the restrictions on non-financial institutions.

The Rural Bank, a government agency, was created to provide funding for the various aspects of the agricultural sector, including various government initiatives such as Land Development Encouragement Loans and Livestock Incentive schemes. In essence, the Bank was

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an administrator and allocator of government policy and capital. It was almost entirely funded by the Government and was focused on:

- Helping sharemilkers get a start
- Settling young farmers onto the land
- On-farm development and infrastructure for established farmers.

The Rural Bank was certainly not set up to allow for the growth and expansion of farming businesses, nor did it provide seasonal overdraft facilities. Once the Bank had lent its annual allocation of capital, new loans had to wait for the next financial year. There was no need for the Bank to respond quickly to loan applications as they had a captive market and a limited source of funds, so there was no need to make any hasty or rash decisions.

Likewise, the same thing was happening at the trading banks, although to a lesser extent. There was absolutely no need to compete on any level, whether on interest rates, client service or market share. As a result, access to capital was tight and it was not uncommon for farmers to have up to four mortgages from four different lenders.

The most common scenario would be for the Rural Bank to have the first mortgage to secure term lending, and a trading bank would most likely be in the mix somewhere to secure seasonal funding. Stock firms, solicitor trustee account mortgages, insurance company mortgages, and vendor or family mortgages would also likely be in the mix.

However, 1984 ushered in a new Labour Government led by David Lange and assisted by Roger Douglas he removed farming subsidies and re-wrote the workings of the Rural Bank. Product prices plummeted and interest rates soared to mid-20%. However, these were only some of the reforms. Foreign exchange markets were deregulated, the New Zealand dollar was floated, and the transport sector was also deregulated.

Among the furore about the change to a free market economy the deregulation of the banking industry largely went unnoticed. Following 1984 banks were given access to foreign capital, could set their own interest rates, and were free to lend to whichever sector they chose to. In other words, they were free to compete.

However, even though the banking doors of competition were flung wide open nothing happened. Well, not in the agriculture sector because banks could not see any great future in rural lending. Profitability and equity were non-existent, and land and stock values were down. With no profitability and a lack of security, farming

did not make for an overly attractive lending proposition. Farming was a sunset industry, or so it seemed, for many in the non-rural sector.

For banks and financiers there were many more changes occurring:

- Commercial property prices increased by 150% from 1984 to 1987, becoming an attractive place to lend money into
- The sharemarket trebled in value over the same time. Again, it was another good place to lend money into – until the sharemarket crash of October 1987
- The BNZ, which was largely government-owned, had to be bailed out twice in the 1980s before finally being sold to National Australia Bank (NAB)
- Rural lending discounting was introduced – a scheme where, on a case-by-case basis, individual farmers and their lenders met to restructure loans. This involved a write down, particularly of Rural Bank debt, and subsequent mortgagees agreeing not to take action to recover their lending for a period of time. With the write down of loans, negative equity was turned to positive equity, giving the seasonal financier security and confidence to continue to provide seasonal funding. The downside for the farmer was the Rural Bank concessionary interest rates of around 7.5% being increased to commercial rates.

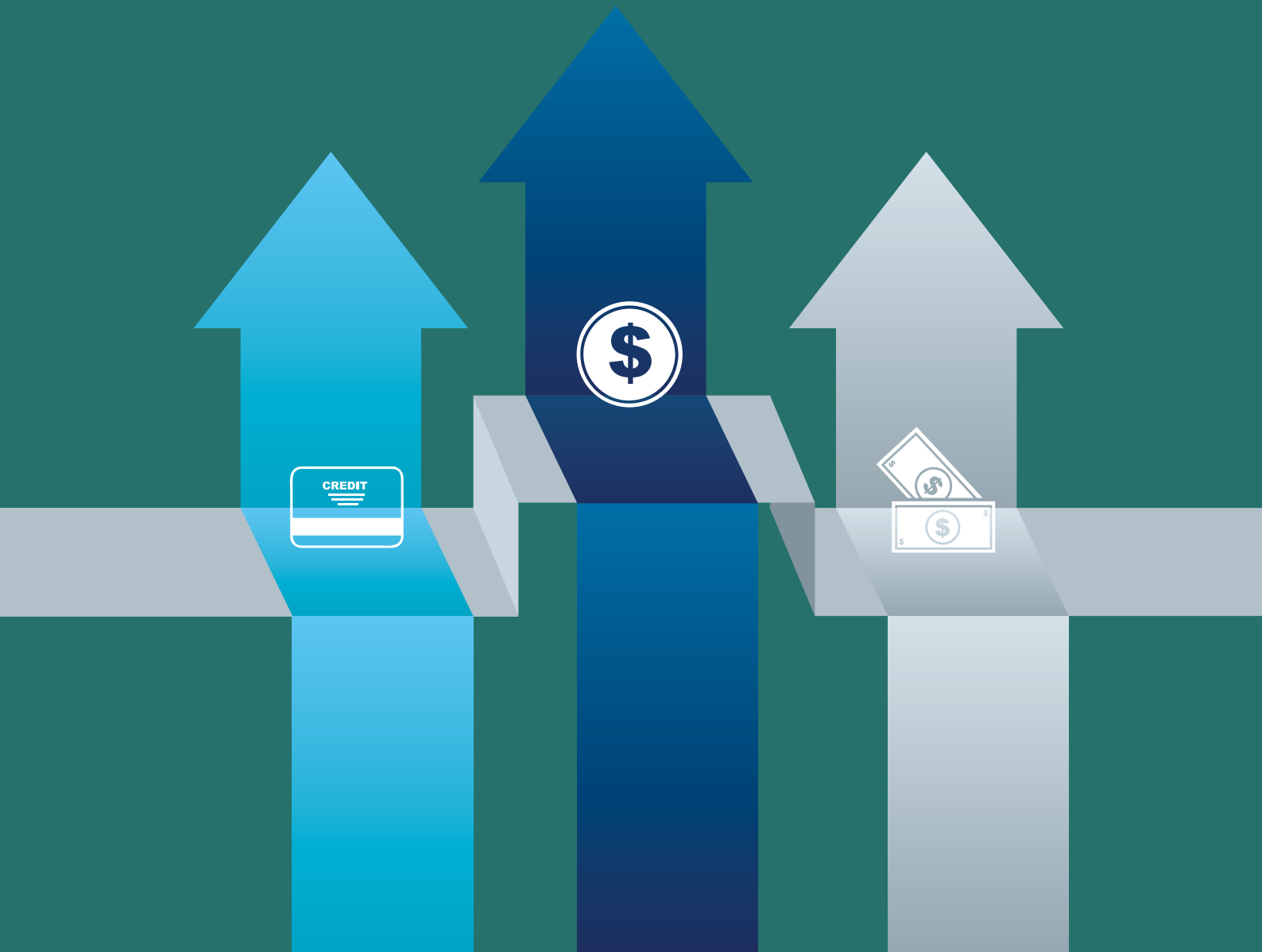
So, with all of this going on, combined with the conservative nature of bankers, money was to be made by lending into any industry other than farming.

The arrival of relationship banking – 1990 to 2008

By around 1990 things had started to change as the Government had sold the Rural Bank to Fletcher Challenge in 1989. The Bank, having previously been a state-owned enterprise, held just under 50% of the on-farm debt. The bad times of the 1980s were starting to come to an end and bankers slowly awoke to the largely untapped rural lending market.

It was around this time that the trading banks started employing specialised rural lenders. In 1990, the Rural Bank loan portfolio was around \$1.8 billion and accounted for close to 45% of the total farm debt of \$4 billion. According to Reserve Bank of New Zealand (RBNZ) figures, the total farm debt in New Zealand is now \$62.8 billion, a staggering 15-fold increase over 29 years.

Why has it increased so much? The short answer is the virtually unlimited bank access to funding, mostly from offshore. With a seemingly unlimited supply of funds and



an untapped rural market it was time to compete. One of the first out of the blocks was the National Bank, and in early 1990 they introduced a market-leading five-year fixed rate loan at 14.75%.

However, lending growth for them and the other banks was slow. When Fletcher Challenge decided rural banking wasn't for them, they put the Rural Bank up for sale and in 1994 the National Bank purchased it. At the same time, ASB left its Auckland roots and entered the rural banking market, then Westpac and BNZ soon followed (ANZ was much less involved).

PIBA (Primary Bank of Australia), the Australian version of the Rural Bank, opened up shop in 1989. They then morphed into Rabobank when the Australian parent was purchased by them. Rabobank later purchased Wrightson Farmers Finance and have since gone on to become a significant rural lender.

There were several ways to compete, and lower interest rates and lower credit quality standards were two ways to grow market share. However, the most effective long-term approach was to deliver a standard of client service and build strong relationships that no-one could touch. It was

the start of what was called 'relationship banking', and it was hard to take good business off good bankers. As a result, rural managers became very close to their clients and almost unwittingly became advocates more than risk assessors. As we progressed into the 2000s, we measured client satisfaction levels and strove to be the client's 'most trusted advisor'.

All the while, with almost unlimited access to funds, farming businesses grew and with this so did bank portfolios and land values. What was considered to be a tight deal at the time turned into a sweet deal two years later as ever-increasing land values masked inconsistent profitability and kept adding securable value to loans. In one case, land in Central Southland that sold for \$2,500/ha in 1990 sold again in 2008 for \$38,000/ha. It was not uncommon to bank someone into a new property with less than 35% equity on completion. Two years later, the equity position would have improved to well over 50%.

Timeframes for getting loans approved shortened, and if you didn't do it someone else would. Not that we always said yes. It took courage to say no, but when you did it was more often than not the right call. However, competition

The RBNZ started auditing New Zealand banks, looking at the quality of their lending. One of their conclusions was that there was too much farm debt and they were not sure it was sustainable.

tightened up timeframes to get credit approval and the closer we got to 2008 the worse it became. In some instances, there were only 24 to 48 hours to get approval, not because the clients were being unreasonable but because of the state of the land market.

Properties were being bought and sold before they were advertised to the market so there was no time for due diligence on behalf of the buyer or the banker. Major investment and lending decisions were made in the blink of an eye. Most new lending proposals involved multi-million dollars of assets, funded by multi-million dollars of new debt, so 48 hours of due diligence was not prudent business practice.

In this climate it was necessary to build a strong relationship with a client. The problem this strong relationship caused was that clients became increasingly reliant on their Rural Manager, who was an employee of the bank, but whose main role was to assess credit risk on its behalf. A definite conflict of interest therefore existed, and while it was generally well managed and carried out with integrity it was still very real.

The banks and the clients walked hand-in-hand down the beach towards a brewing storm that unfortunately wasn't forecast, but with the benefit of hindsight was inevitable. Nearly 20 years of lending conditions created by free market forces of supply and demand shaped everyone's thinking. What we were experiencing became the norm and it is only with hindsight can we see the flaw in the plan. By 2008, the last question on anyone's mind was whether there was enough money to lend.

2008, the GFC and beyond

In 2007, Fonterra's milk price was \$3.87. The following year it jumped to \$7.79/kgMS. This encouraged one last mad scramble for land and one last surge in bank lending. However, things were slowly unwinding, particularly in the US. At this stage, the world was literally awash with funds that had to find a home. In the US this had led to dodgy lending and creative accounting, leading to easy credit on the back of weak borrower and bank balance sheets. Banks bundled up loans and on-sold them to investment banks, other banks and superannuation companies, thereby avoiding capital adequacy ratios.

Because the loans were created through easy credit, they were not quality loans. They were less than prime, in fact, they were subprime. Inevitably, the loan defaults started and the biggest problem was that because the subprime loans had been bundled up and sold, no-one

new exactly where they originated from. Banks therefore found it difficult to gain a clear idea about the size of their impaired loans.

Banks and investment companies lend to other banks and it is this flow of funds that keeps the financial markets liquid and businesses operating. To allow this to happen, banks need to have confidence in each other, but they started to fail due to the sub-prime crisis and no-one knew which bank would fail next. Confidence disappeared and banks stopped lending to each other. Without this flow of funds, credit freezes and this is what happened. The world was still awash with funds, but no-one was prepared to lend for fear of not getting their money back. The money go round stopped.

Businesses face many risks, but the one that ultimately causes failure in any business is a lack of liquidity. This liquidity becomes an issue when a bank does not have enough funding to either cover depositors withdrawing their cash from the bank or meet impending loan drawdown commitments. When either of these two happen, the market loses confidence and there is a run on the bank.

How did the banks respond? They scrambled for funds and quickly turned their attention to liquidity. Seemingly overnight within all banks the rules changed. No longer was it about credit – it was all about liquidity. In this environment, before a loan application could be submitted to credit it might first go to a funding committee to see if the funds were actually available to make the loan. For 18 months, for some banks this meant no new funding to clients.

Not only was funding liquidity tight, but the banks' cost of funding increased. Interest rate margins which had been in steady decline since 1990 suddenly jolted up. There were difficult conversations to be had with clients, particularly if an interest rate swap was involved.

It was stressful for all concerned during this period with tight liquidity, increasing margins, the swap issue and dropping commodity prices. After that things improved and commodity prices, particularly milk, had a good run. For many, the GFC was a big deal about nothing. The Australian-owned banks and their New Zealand subsidiaries all came through pretty much unscathed, as did the European-based Rabobank. Many thought there was nil impact of the GFC on their business.

But not all was calm in the halls of regulatory powers. Central Banks around the world were very nervous and the RBNZ was no different. The RBNZ started auditing

The GFC could be argued to be less than a one-in-100-year event and the New Zealand banking system handled that. Our banks (with mostly Australian owners) are currently pushing back hard on this, but it seems they will have to significantly increase the level of capital they hold.

New Zealand banks, looking at the quality of their lending. One of their conclusions was that there was too much farm debt and they were not sure it was sustainable. Some very hard questions were starting to be asked of bank executive and governors.

The first thing the RBNZ did was to severely reduce banks' access to offshore funding. Very quickly they required banks to source at least 80% of their funding from domestic-based depositors rather than the 'on-tap' offshore funding. This was done to help isolate New Zealand from future international credit freezes. While this was a prudent move, it did start to limit funding lines so there wasn't as much money to lend as before. It could not be called scarcity of supply, but certainly it wasn't unlimited supply.

As discussed, banking stability and trust within the industry is vital to ensure banks have confidence to lend to each other and this is what creates liquidity. Stability is created by ensuring banks do not fail and for this they need a strong balance sheet. To prevent failure, banks need enough capital of their own to be able to handle financial shocks such as the GFC.

The measure of capital a bank should hold in relation to its assets is known as the capital adequacy ratio. Like any business, banks have assets and liabilities. The difference between the two is the equity within the business, or in other words its capital. A minimum level of capital is required to ensure a bank's assets (in simple terms its loans to customers) are not totally funded by liabilities (deposits from customers). The more capital a bank holds on its balance sheet the more protection depositors have from credit risk.

Effect of international regulations - Basel Committee

The Basel Committee of Bank Supervision in Switzerland is made up of representatives from the Central Banks of 45 countries. Their purpose is to improve the quality of banking supervision worldwide, and while they have no legislative power they do make a series of recommendations or Accords. Since 1988 they have released three Accords, with Basel III being released in 2009. Part of the committee's recommendations to the world's Central Banks (including the RBNZ) is that they require them to hold a minimum level of capital. Basel II recommended a minimum capital adequacy ratio of 2%. The GFC clearly showed that was not enough, and under Basel III this has now been lifted to 7%.

However, the RBNZ are now wanting to go well beyond the minimum and are requiring banks to have a capital ratio of 17%. It is their view the New Zealand banking system needs to be able to withstand a one-in-200-year event, but the Bank cannot say what such an event would look like. The GFC could be argued to be less than a one-in-100-year event and the New Zealand banking system handled that. Our banks (with mostly Australian owners) are currently pushing back hard on this, but it seems they will have to significantly increase the level of capital they hold.

Summary

There is now a new norm in rural banking, but what will help agribusinesses? Those that are operating at their optimum level and are constantly looking for increases in efficiencies and/or productivity (not to be confused with increasing production), will have a much better chance of success than those who just accept the default outcome.

Farming businesses must have a strong focus on profit, sufficient enough to allow debt to be repaid over 20 years. At current interest rates, that is likely to mean at least 3% of total debt being repaid per year. For example, a business with \$5 million of debt will need to generate a cash surplus of \$150,000 after tax, personal drawings and capital expenditure. This is do-able when nearly all product prices are currently above their long-term average, but what happens when they are not? Now, more than ever, these businesses will need to have strong clarity around values, purpose, vision and a plan to achieve the vision.

Meanwhile, banks will need to have a clear strategy about how they intend to adapt to an environment of increased regulation. They will also need to understand they are dealing with people and families who may be under enormous stress, and not just financial. The banks that get this right will come out with enhanced reputations. The banking and farming relationship has always been a long-term game. There needs to be self-responsibility and a plan to find a long-term solution to whatever changes arise over time for farming businesses.

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NEW ZEALAND-GROWN PORK ON AN UNEVEN INTERNATIONAL PLAYING FIELD

Facing increased competition from low-price, low-welfare imported products and heightened risk of disease, the New Zealand pork industry is grappling with the challenges of globalised trade by reinforcing the environmental, animal welfare and food quality advantages of local products from Kiwi farmers.

A decade of transformation

It has been 10 years since the New Zealand pork industry set itself the goal of creating a sector-leading standard in animal welfare. This standard is one that not only gave farmers the tools to measure their performance against a range of legislation and industry-driven standards, but provided consumers with a clear understanding about how the industry was performing.

NZ Pork's PigCare™ programme has been a significant success, establishing the only whole-of-industry standard of its kind in New Zealand. The move has been welcomed by the public, and widely adopted by retailers as a means of promoting the value of born and raised in New Zealand pork.

However, in the decade since PigCare™ was introduced, the industry that worked very hard to establish and adhere to consistently high welfare standards has found itself competing more often against products that would fail to meet them.

A flood of imported pork products from over 25 countries has put unprecedented pressure on local pig farmers. Over the last 10 years, the proportion of imported pork consumed locally has risen from 45% in 2009 to over 60% in 2019, as farmers facing higher compliance costs at home are forced to compete against products that are produced at a much lower cost under very different welfare standards.

An uneven playing field

In a globalised market, farmers understand only too well the impact of market forces on the competitiveness of their business. They recognise the importance of reciprocal international agreements in underpinning New Zealand's export economy, but they do take issue with the lack of fairness in the trading system.

The causes of that inequality stem from the complexities of international trade agreements. To sell a food product



Outdoor pigs in Canterbury



Industry training development

in New Zealand it must meet standards set by the Food Act 2014 to ensure it is safe and suitable for Kiwis to consume. Where applicable, it must also meet an import health standard set under the Biosecurity Act 1993 to reduce biosecurity or animal health risks associated with the importation of the product. There are reciprocal standards that New Zealand's products must also meet overseas.

Although animal welfare is a strong focus of consumers and legislators here, setting welfare standards for other trading nations is considered far too complex to agree and administer. Any change to the regime is also unlikely to be a serious consideration without a sea change in the rules underpinning international trading.

Not that the public are well acquainted with the impact of these rules on the local industry and on the animal products they choose to consume. For the New Zealand pork industry, the outcome has been particularly perverse. Currently, while being held to some of the world's most stringent animal welfare standards New Zealand pork is competing with a wide range of imported pork products, most of which come from countries with production standards that would be illegal in some or a number of respects under our welfare system.

A recent review of international standards in pork production by Dr Kirsty Chidgey, a NZ Pork animal welfare scientist, highlighted how large the difference is between production standards in this country and those of our major trading partners. Almost all of the countries importing pork into New Zealand can use gestation stalls (banned here in 2015) to confine sows for all or part of their pregnancy. Furthermore, the surgical castration of male piglets is a common practice in many of these

countries, and some are not required to provide any pain relief or anaesthetic during the procedure. New Zealand farmers do not surgically castrate piglets.

Helping consumers back New Zealand pork

The situation the New Zealand pork industry finds itself in was best summed up from a perhaps unlikely source. Last year, Green Party MP Gareth Hughes told Radio New Zealand that:

As we've slowly ratcheted up our animal welfare standards in the pork industry, their sales have declined and we're seeing a massive increase in imports of really low-quality animal welfare pork. That's a double whammy for them.

How Gareth Hughes came to be (as he described) 'risking his vegetarian credibility' in support of the pork industry was through his sponsorship of the Consumer's Right to Know (Country of Origin of Food) Bill. The Green Party MP took up the cause after bacon was excluded from the Bill during its development. This would have meant that one of the more confusing categories in the pork cabinet would have been exempted from displaying country of origin information, an outcome the industry and numerous supporters fought hard against.

The legislation, now including 'cured pork' and due to come into effect over the next 18 months, has been a positive development for the under-pressure industry. The New Zealand pork industry is still anxiously waiting to see if the wide range of 'cured' or processed products that imported pork is used in are all covered in the legislation. It is an area desperately in need of clear labelling because many consumers have assumed that being a farming

Total consumption of pork now sits at nearly 23 kg per capita annually, up almost a kilogram in the last decade.

nation with a healthy range of successful agricultural sectors, New Zealand would fulfil the local demand for pork with its home-grown production.

In reality, the industry has not met local demand for many years. Total consumption of pork now sits at nearly 23 kg per capita annually, up almost a kilogram in the last decade. Accepting imports to meet local demand, particularly for processed pork products, has led to the flood of low-price, low-welfare products.

Biosecurity risks

Greater quantities of imported pork have significantly increased another risk, one that could be potentially devastating to the local pork industry. As well as operating under some of the highest welfare standards in the world, the New Zealand pork industry also has a very high animal health status. It is free of a number of diseases that are widespread in pigs throughout the world, which is a key welfare issue in its own right. Commercial farmers are acutely biosecurity aware, and by applying strict on-farm biosecurity and good practice they can maintain the health status of animals on their own farms.

The industry has also taken a proactive approach to carefully managing the use of the medicines required to keep pigs healthy. Antibiotics are more commonly required overseas to help maintain productivity and treat a wide range of diseases, which has led to concerns about the

growing threat of antibiotic resistance. In New Zealand, the high health status of the pig herd has enabled the industry to commit to restricting the use of certain classes of antibiotics that are critically important to human health.

However, while the New Zealand pork industry's approach to animal health and welfare has kept the country free of some of the major diseases seen offshore, in a globalised economy and a country dependent on international tourism the threat is never far away.

A global pandemic

Of particular concern is African Swine Fever (ASF), a viral pig disease that is currently sweeping the globe. While it is no risk to humans, ASF is deadly to pigs and currently has no effective treatment or vaccine. Although there have been no detections of the disease in New Zealand, a number of countries exporting pork products to New Zealand have been battling major ASF outbreaks, including China, Poland and Belgium.

The virus is exceptionally hardy and can survive almost indefinitely in frozen meat, which represents the vast majority of imported product. It can also be carried on clothing, footwear, equipment and vehicles. The industry is concerned that the disease could be brought into this country through infected pork, pig feed and feed ingredients (or even on an item of clothing or equipment) and transmitted to the local pig population.

Indoor pig farm



For greenhouse gases, monogastric pigs are considerably lower emitters than their red meat counterparts, beef and lamb.

As a result of the continued spread of the disease, including the reported ASF outbreak in the Philippines, NZ Pork has been reminding farmers of the need to review their biosecurity precautions. In particular, farmers have been urged to look at arrangements for no-contact time and staff stand-down periods after overseas travel. International recommendations for preventing the spread of ASF from the World Organisation for Animal Health (OIE) are that staff and visitors should stay away from pigs for at least five days after returning from overseas. Also, no pork products of any kind (local or imported) should be brought onto a pig farm.

NZ Pork is also concerned about the risk of the disease reaching New Zealand through the illegal importation of infected meat. Highlighting the risk, Australia has just completed its latest round of testing of illegally imported pork products seized at the border. In this new round of testing, on products seized between 2 and 15 September 2019, ASF virus fragments were found in 49% of all samples, which is a significant jump from the 15% found in early February this year and 5% in December 2018.

Between 5 November 2018 and 31 August 2019, over 27 tonnes of illegally imported pork were intercepted on air travellers entering Australia, including 11 tonnes at Sydney Airport and 7.7 tonnes in Melbourne. Australia has very similar tourist profiles to New Zealand, so it is likely that this country faces the same level of risk.

In Europe, it was reported that discarded food was responsible for at least one infection of the wild boar population. The industry's fear is the same thing could happen here as someone could throw away a piece of meat they brought with them into New Zealand, which is then consumed by a wild pig, infecting the feral pig population.

For this reason, NZ Pork is also emphasising the importance of not feeding untreated meat scraps to pigs. In New Zealand, it is illegal to feed meat, including scraps that have come into contact with meat, to pigs unless it has been cooked at 100°C (essentially boiled) for one hour. A major risk to the industry is a scenario whereby ASF gets into the lifestyle or para-commercial pig population through the feeding of untreated food scraps, and from there into the commercial herd. A recent study of infection pathways in China showed that feeding meat scraps accounted for 38% of new ASF infections.

A global impact

While the threat of the ASF pandemic is being taken very seriously by the industry, its effect on global trade has released some of the pressure on local prices, driven by

the cost of imports. The effect is mainly being driven by the impact of the disease in China, which produces half of the world's pigs. According to a recent Rabobank estimate, the Chinese pig herd will drop by 50% this year and production will fall by 25%, with analysts expecting the world supply to take years to recover from the disruption.

While New Zealand remains free from the disease it means that prices for pork here are on the rise, with recent improvements in farm-gate prices for local farmers. Also, with continued uncertainty in the international market and little real progress on a vaccine, global pork prices are likely to reflect a supply shortage for some time.


A strong story

The industry has also been focusing on building the awareness of its key advantages amongst local consumers. From regular research, NZ Pork has identified that Kiwi consumers prefer to buy 100% New Zealand pork, bacon and ham. They just need help identifying it, which mandatory country of origin labelling and promotion of a unique local brand will make considerably easier.

The sector also has a good environmental story that it is just beginning to tell. For greenhouse gases, monogastric pigs are considerably lower emitters than their red meat counterparts, beef and lamb. Production methods, waste management programmes and recovery initiatives all have an additional role to play in what is being increasingly recognised as an environmentally efficient industry.

With this in mind, local farmers know their product is highly attractive. This country has some of the highest welfare standards in the world and consumers quite rightly expect farmers to live up to them, which is why the introduction of PigCare™ has been so important. Being recognised as a product of New Zealand has a real value, in both the local and international market. New Zealand's pig farmers have also made real gains in production efficiency, driven by both competition and the need to find improvements without compromising welfare.

Overall, the New Zealand pork industry story is a very strong one, driven by the resilience and innovation local farmers are world renowned for. To meet the challenges of low-price, low-welfare imports, the industry is now focused on ensuring local consumers (and the supply chain that serves them) can do their part by seeking out and paying a small premium for the values (animal welfare, environmental efficiency and eating quality) they have demanded in the production of their food.

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Farmer promoters in Rwanda with a maize demonstration plot

THE RWANDA MFAT PROJECT

Working offshore is both challenging and rewarding. This article looks at the experiences of a New Zealand team working in Africa, and reflects on what has worked in this extension programme.

Background to the project

The US-based Clinton Health Access Initiative (CHAI) supports a Complementary Foods programme in Ethiopia and Rwanda to combat the effects of inadequate nutrition in pregnant mothers and infants. In Rwanda a state-of-the-art processing factory, Africa Improved Foods (AIF), was built to commercially produce these foods. As part of their aid programme, the New Zealand Ministry for Foreign Affairs and Trade (MFAT) funded the CHAI Agronomy Team, along with technical assistance from New Zealand.

DAI, a UK-based project management firm, was contracted to provide a two-person Technical Assistance Team from New Zealand comprised of myself, James Allen from AgFirst (Team Leader), and Dave Blackwell from Harvest Farm Advisory (Agronomist). The purpose was to increase farmers' income through gains in yield, quality, post-harvest loss mitigation, and marketing through supplying high-quality maize and soya bean grain to the AIF factory.



Weighing and loading maize on the cob for transport to Kigali

Rwanda

Rwanda is a relatively small country located in east-central Africa. The land mass is 26,000 sqm, one-tenth of the size of New Zealand. With a population of over 12 million there is pressure to feed the nation. Known as the 'land of a thousand hills', the contour is often challenging. A lot of the hill country land has been terraced, aiming to utilise as much of the land as possible for productive use, but mechanisation for cropping is very low.

Rwanda is unfortunately often best known for the genocide in 1994, but the country is now united and prospering, with one of the highest GDP growth rates in Africa. Farm sizes are small, typically 1-4 ha, and there are over 100,000 farmers. One of the challenges, therefore, with an agricultural extension programme is the sheer number of farmers to connect with.

Maize

Being equatorial, Rwanda has two rainy seasons, allowing them to grow two crops per annum (typically maize followed by beans/soya beans), but unlike countries further north and south it has a very small window to dry grain and harvest the crop. Despite the agronomic challenges, the Technical Assistance Team noted that even when grain was harvested, the moisture content and the ambient humidity was too high. This resulted in very high mycotoxin levels, specifically aflatoxins, rendering the grain unsuitable for consumption.

Also, the time from field to factory was too long, resulting in further losses. Most of the harvested grain was too wet to be stored, even if storage was available. At the start of the project more than 95% of all maize grain delivered to AIF was being rejected due to excessive moisture content and other quality issues.

Soya beans

Soya beans contain all the essential amino acids required in a human diet. Initially farmers were not keen to even grow soya beans, citing input availability, lack of markets, poor seed, and a perception of it being difficult to grow. It could also not compete with the existing practice of growing and consuming common bush beans, for which there was a vibrant local and national market.

Thinking outside the square

The Technical Assistance Team focused first on the maize value chain, and it was found to be taking 6-10 weeks to move from farmer to factory. A new and completely innovative 'total supply chain' approach was adopted. Given the lack of grain-handling infrastructure in the target areas, the team started to investigate the possibility of buying relatively moist grain still on the cob, and transporting it back to Kigali for shelling, drying and subsequent delivery to AIF. The team met with Cyril Khamsi, the CEO of a local logistics company, Kumwe Logistics. This meeting concluded that the concept had to be tested and, if successful, scaled up. The 'cob-to-factory model' was born.

The maize cob model collected 2,300 tonnes in Season A 2018 (the first of the two seasons per annum). The logistics company Kumwe are planning to process 15,000 tonnes of maize in Season A 2019.

The cob-to-factory model

Starting with a modest pilot project of mobile shellers, farmers initially brought their cobs to a central location near their homes for mechanical shelling. Cash payments were made and demand for this system rose. The Technical Assistance Team then decided that they had to get unshelled maize to the capital (Kigali) and shell and dry it there, using stationary shellers near the AIF factory. CHAI agronomists doubled up as procurement agents, and with real-time data from Kumwe the plan progressed.

The maize cob model collected 2,300 tonnes in Season A 2018 (the first of the two seasons per annum). The logistics company Kumwe are planning to process 15,000 tonnes of maize in Season A 2019. The CHAI Agronomy Team estimates they will be supplying 10,000 tonnes to Kumwe in Season A 2019. The cob model has the potential to supply the entire maize requirement of the factory (20,000 tonnes) in the medium term. However, there are still challenges to resolve, including the best options for handling the cob waste.

AIF gain grain and farmers empowered

The acceptance level at the AIF factory gate has gone from 90% rejection to over 90% acceptance. Maize supply to the factory has increased from 277 tonnes in 2017 to in excess of 8,000 tonnes in 2019. Post-harvest losses in the project area have come down from being in excess of 20% to under 5%, which translates as a two-thirds reduction in the cost of that loss to the farmer.

Kumwe have calculated that gross income for farmers from maize sales has jumped by 48%. Also, the farmers' post-harvest handling costs have been all but eliminated, with them enjoying over a 300% increase in disposable income from their maize crop. Yield has also increased. Farmers have been empowered to the point that they are adding to the success with their own innovations.

Significant positive changes in farmers' perceptions have also been achieved. There is now a growing understanding of quality and food safety issues. The Technical Assistance Team initiated a successful participative series of training sessions on how to prepare and include soya beans in household diets, which positively influenced behaviour.

Setting the standard

This collaborative effort, and a true value chain approach from agronomy to grain delivery, has raised the bar. There is now significant competition for locally grown maize. Buyers are now convinced maize of significant quality can be sourced locally. There have been buyers with

similar models emerging from alternative fields drying and shelling, and trying to reproduce the model, indicating that a dynamic, vibrant, healthy market is evolving.

Farmers are much more aware of unfair practices and are demanding a higher trading standard. They are also more appreciative of quality obligations, which augers well for a nation aspiring to increase its agricultural exports.

Growing better crops

Improving the post-harvest management process was only one component of the New Zealand aid project. The Technical Assistance Team have worked closely for three years with a team of dedicated agronomists from CHAI. After developing an extension plan that was aligned with the Government of Rwanda's Twigirire Muhizni model, the CHAI agronomists worked closely with farmers and agronomists to improve agronomic practices. The agronomists lived where they worked, and were adequately resourced, enabling them to visit farmers and make a real difference. Maize and soya bean demonstration plots were established, allowing farmers to compare and learn new techniques.

The agronomic intervention has made a difference as the maize yields of the farmers involved in the programme are, on average, 1.5 t/ha (30%) greater than the average yield from their area. The demonstration plots convinced farmers that soya beans can be successfully grown, and this has resulted in them committing to grow 500 ha in the project area in Season B 2019. The skills passed on by the CHAI Agronomy Team to the farmers is now embedded, also ensuring continued gains.

Similarly, in Ethiopia, the CHAI Agronomy Team worked with the Bako and Jimma research stations, 'SIL Ethiopia' and government extension staff to produce a maize post-harvest management manual and a soya bean extension manual. The soya bean manual later formed the basis of the one accepted by CHAI and adopted by the Rwandan Agriculture Board (RAB). CHAI Ethiopia also facilitated soya bean demonstration plots, which has resulted in significant behavioural change amongst farmers.

Where to from here?

The New Zealand aid programme is due to conclude in August 2019, but the initiatives will continue in a variety of ways:

- The cob-to-factory model is well established in Rwanda
- Kumwe Harvest is now a leader in post-harvest management and logistics, and competition with Kumwe has begun, which should be seen as a mark of success



Demonstrating soya food preparation in Oromia, Ethiopia

- Information and knowledge from the project has been transferred to the Rwandan Agriculture Board to strengthen agronomic extension resources created throughout the programme
- The CHAI agronomists are looking to create their own private extension business, to work in collaboration with the Rwandan Agriculture Board and other partners (the development of private sector extension models is encouraged by the Government of Rwanda)
- Most importantly, smallholder farmers have increased skills and incomes, making a difference to their lives: 'I found gold on my farm, and that gold is maize' (quote from a Rwandan farmer).

Learnings for extension in New Zealand

Although there have certainly been some challenges with the project, its Rwandan phase has had some good successes. While reflecting on the reasons for success, the following points come to mind:

- **Understanding the full extent of the issues**
Considerable time was spent understanding the problems, context, various stakeholder perspectives, and a range of possible solutions before designing the extension programme. Understanding the full extent of the issues right across the value chain enabled much more targeted solutions.
- **Collaboration**
No extension programme can work in isolation. A key factor of success has been to ensure all of the key stakeholders have been involved in the design and development of the project. In particular, this includes the government agencies (Ministry of Agriculture), input providers, farmers and the processors/grain factory.
- **Farmers learning from farmers**
Given the sheer number of farmers to communicate with, the Government of Rwanda has (as noted)

developed the Twigire Muhinzi model, where extension agents work with farmer leaders who in turn train the farmers. This cascaded approach provides the ability to connect with all farmers and it also enforces the mantra that 'farmers learn from farmers'.

- **An experienced extension team**

While the support from the New Zealand Technical Assistance Team was important, the project would not have been possible without a highly experienced and respected CHAI Agronomy Team who were located in the field. Living within the farming community ensured high levels of acceptance from the farmers, along with responsive communication. Ensuring the extension team were properly equipped to do the job was also a critical, if often overlooked, key to success.

- **Adaptive approach**

It is rare that any extension programme is perfectly designed. An adaptive approach to the design and implementation of the extension programme was an important success factor, allowing the project to learn from its own successes and failures, thus improving the outcomes on the project after each season.

- **A value chain approach**

This project worked right across the value chain (i.e. input management, agronomy, harvest and post-harvest management). One of the key success factors was to re-design the post-harvest process, which led to increases in grain quality and reductions in post-harvest losses. This part of the value chain was not the original focus of the project, but by taking an entire value chain perspective it highlighted the issues in post-harvest management and the potential to make a significant impact.

Many of the points above may seem to be obvious, but it does not mean they are always applied in New Zealand extension programmes. While technology is changing the face of farming, our business is about people – and working out their motivations for change.

Working offshore

Working offshore is both challenging and immensely rewarding. While the political climate and context may all be a world away from what we are used to, the fundamental principles of farm management that most of us were taught at Lincoln or Massey still apply. That is, assess the physical resources at your disposal, and understand the people and their motivations before jumping to conclusions about the solutions.

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THE POST-QUAKE FARMING PROJECT - LESSONS LEARNED FOR THE HILL AND HIGH COUNTRY LAND RESOURCE

Adaptations required of the primary sector and the resources available to support change mean project management will become a part of life for many rural professionals. It is hoped that lessons learned from the Post-Quake Farming (PQF) project are helpful to anyone involved in government or sector funded projects to support a better outcome.

The PQF project

The PQF project was established to help the North Canterbury hill and high country farming community to get back on their feet following the November 2016 earthquake event. The PQF project, and the way in which it has evolved, raises many questions about how we develop, implement and monitor projects of this type. For instance:

- How do we achieve the best outcomes for communities with limited resources available?
- How do we get things right with project establishment and governance?
- How do we design and develop workstreams that are actually going to make a difference to people's lives and businesses?

An outlook over part of the Project Area



There was extensive land damage on some farms

Much of the work being done in the project is simply sharing ideas, informed by technical input. For example, we have run a series of ‘forestry integration field days’ where we have demonstrated how harvest or permanent carbon forestry can be integrated into and complement a grazing operation.

The primary sector faces numerous challenges, and the rural professional community (with their connections and skills) have and will play a key role in helping farmers adapt to a new reality of constant change. It is hoped the story of the PQF project and the various insights and lessons learned are helpful to anyone involved in projects to help farmers become more prosperous and resilient and adapt to a business climate of constant change.

November 2016 earthquake and genesis of PQF project

At midnight on 16 November 2016 a Magnitude 8 earthquake event occurred in North Canterbury and South Marlborough. It severely affected hill and high country farmland, with very significant damage to land and farm infrastructure. There was substantial and wide-ranging land damage, as well as damage to farm houses and buildings, and large-scale loss of fences, water systems and access tracks.

While some farms were very badly affected by damage to land and infrastructure, less visually obvious factors (such as the intense stress caused by the sudden unexpected loss of rural water schemes in the last two weeks of spring and the loss of major road access for several months) impacted virtually all farmers in the area.

Also very significant was the way in which friends, families, former employees, local councils, MPI staff, NGOs and rural professionals familiar with the area pulled together in the days after the event. The generosity and community spirit which was apparent was a humbling illustration of how established communities (rural or otherwise) behave when subject to an adverse event.

It became clear to community leaders and locally-based agency staff that a longer-term support package would be required. This package would need to recognise the skills and understanding that farmers have to manage land and complex land use decisions, and support information transfer and actions to achieve a workable outcome. Further discussions involving the industry and MPI led to the establishment of the Earthquake Recovery Fund. PQF was one of several projects set up under this fund.

Challenges with establishment

PQF was set up at the beginning of 2018 by Beef + Lamb NZ with support from Environment Canterbury. The local farming community is a key component with seven farmers on the project’s Governance Group. The PQF project was very challenging to set up for a number of reasons:

- The variety of community actors (agencies and rural community leaders) involved



- Constant change in the community situation and community needs (e.g. as road access was restored and insurance claims settled)
- Difficulty aligning project objectives with activities that could actually be of use in helping farmers move forward, many of whom were not ready to engage with a project of this type so soon after the event.

In spring 2018, the project was revised to be much more about assisting adaptation to the future in the context of a physically, economically and socially complex hill and high country farming environment that had been the subject of numerous pressures. For the PQF project to be beneficial it had to go well beyond the direct effect of the earthquakes.

A revised project objective was developed to anchor PQF activities:

- Build a prosperous, ethical, and enduring regional economy around multiple land-based enterprises across the PQF Project Area:

Optimisation – optimal returns from land resources in the immediate term

Farm future – develop new enterprises to optimise use of land resources in the long term

Promotion – effectively link the story of our land and our people to our markets

Wellbeing – look after our people so they can have a prosperous future.

Within the constraints of funding criteria, work areas were developed to make progress on these objectives. Much of the work being done in the project is simply sharing ideas, informed by technical input. For example, we have run a series of ‘forestry integration field days’ where we have demonstrated how harvest or permanent carbon forestry can be integrated into and complement a grazing operation. These are being followed with focused workshops on identifying and developing opportunities, and by a publication series presenting each field day as a financial case study.

Recognising the large amount of cultivatable land in the Project Area, a horticulture suitability assessment has been done, with ongoing work to integrate the planned Flaxbourne Irrigation Scheme and potential Ngai Tahu Farming apple orchard development in Amuri Basin.

PQF is also undertaking work to help farmers work with native resources on their property. We have developed a Farm Environment Plan template for biodiversity. We are doing site descriptions and trial work to demonstrate what could be achieved for conservation and carbon sequestration with native ‘forest’ on private land if there were incentives to support positive intervention at a



At a recent forestry integration field day we explored using regenerating natives and poplar poles in the ETS

The PQF project has evolved to help the farming community look to the future of their land-based resource, the emergence of forestry as a competing land use for grazing, and the future implications of biodiversity regulation.

regional scale. Other workstreams are also underway to support the development of agri-tourism and to tell the story of the region and its products in a way that is meaningful to customers.

As part of project support activities, a formal impact assessment process is being undertaken to provide information on project effectiveness and accountability. Feedback from farmers on the ground has been very important in developing activities that are likely to result in positive change. Structured interviews were done with 50 farmers in the Project Area during the winter of 2018. Since then we have continued to monitor community needs and perceptions, with surveys following project events and formal or informal interviews ongoing. The Project Governance Group, while important, is not relied upon to inform development.

The overall result has been a project which, rather than simply focusing on the earthquake and trying to 'take things back to the way they were', seeks to actively assist the community of interest to prepare for the future and enable them to meet the various challenges that arise as they interact with the land resource which they control.

Keys to successful project management and lessons learned

While the battle is by no means over, PQF is now much better positioned to achieve successful results than it was

a year ago. Much of what has been learned will be of no surprise to experienced practitioners of project management. However, it is hoped that it will be useful to anyone involved in a project to support a more prosperous or resilient primary sector.

The project has had to be adaptive. After nine months, the project was recognised to be not on track to deliver the desired results and major corrective action was taken with good leadership from the Governance Group. As part of this action it has been implemented in a community-centric manner, with ongoing assessment and response through the delivery process.

Open communication between the project manager, the community of interest and the governance/project sponsor has been a key element, as has been managing stakeholder and agency interests. There has also been a willingness to acknowledge problems or mistakes and actively manage them to develop better solutions.

Specific lessons learned through the PQF project include:

- **Set an objective to anchor project activity.** A well thought out objective is absolutely essential to the success of any project. Without it, major problems with project focus and stakeholder communications



The Waiau Rural Water Scheme was very badly damaged

are almost certain to result in missed opportunities or project failure. A good objective will help determine if project work has been successful or is on track to success.

- **Effective communication with project governance is fundamental.** Frequent project updates and phone calls are very helpful. The project manager must have a good rapport with the Governance Group Chair and communicate with them often. Ensure this communication is allowed for in resources allocation and contractual agreements.
- **Conflicts of interest.** There will always be conflicts of interest because almost everyone involved in project delivery will have something to gain beyond what they are immediately paid. Failure to identify and control these conflicts is a very common cause of project failure. As with so many problems, the ultimate solution is reflecting carefully on what will be of most benefit to the project. While we cannot ignore conflicts of interest, we should not allow an inability to deal with them effectively to paralyse activity or result in a loss of access to the best people. The relationship with the Governance Group and project sponsors is essential to managing this issue.
- **Board-only time.** A key way to manage conflicts of interest is to have board-only time at the start of any Governance Group meeting. The first question asked

should be, 'Are we completely confident in the project management?' If the answer is no, they should be looking for a new project manager.

- **Base project activities on what the community want and see as useful.** Constantly refresh and update this information with surveys at events and formal and informal feedback from community members.
- **Be adaptive.** Be ready to go back to square one or make major changes in response to challenges or opportunities. For example, the PQF project has evolved to help the farming community look to the future of their land-based resource, the emergence of forestry as a competing land use for grazing, and the future implications of biodiversity regulation.
- **Ensure you have the right people involved.** You need people who understand and buy into the overall vision of what the project is trying to achieve at all levels. From the project manager, Governance Group, and the project sponsors to contractors, all need to have the capacity to listen and understand that the project activity is all about orientating actions towards project objectives.
- **Look locally for key connecting roles.** Do not underestimate how hard it will be for someone not already known to a rural community to make effective progress with communicating and pulling people together to attend forums or events.



Exploring the potential of the native forest resource has been a major focus of PQF

- **Be brave – there is no winning without ambition.** Some of what we have set out to do in the PQF project is very ambitious, but we have done it because the potential outcome justifies it and the community support is there.
- **Beware of 'difficult people'.** Be very careful of governance or community people, or team members, who display an entitlement to be difficult. Difficult behaviour or negativity can be very damaging to project pace and community buy-in and must be managed through effective communication.
- **The power of positive thinking.** There is simply so much to do and so much dynamism and potential in our rural communities that positive thinking becomes very powerful.
- **Don't forget your friends.** With the PQF project, the agencies and funders who have been involved couldn't have been more helpful. While often criticised as being somewhat distant from the communities whose decisions they affect, our experience in the project is that regulatory organisations like MPI and regional councils, as well as Beef + Lamb NZ, are full of people who want to help if they can within the remit of

If the management and governance of projects is done well, rural communities will be better supported to remain prosperous.

their role. The risk averse tendency of these groups is almost always balanced by a great desire to support real outcomes for communities – do not hamstring them through poor communication or lack of discussion about outcomes.

Implications for rural professionals

With unprecedented pressure on farmers to adapt and change, and increased funding support to help achieve this (e.g. initiatives such as the MPI Extension and Sustainable Food and Fibre Futures Funds), the skills of rural professionals are likely to be in demand in the project management space. All of us understand the economic and social aspects of farm systems, and have the fundamental skills of a project manager, which is to help communities develop activities that can actually assist them to make progress towards objectives as well as fitting within funding criteria.

To make effective use of available resources, and make real progress for communities, many of us will need to learn to effectively align our needs with that of the community and treat our successes as their own. Doing this will require an enlightened approach to self-interest and a belief that the skills and community connections, and connections with agencies developed during a successful project (as well as confidence that 'a rising tide will float all boats'), will make up for the perceived benefits to competitors.

Commercial self-interest remains. However, the difference between a project which is poorly conceived and one that really flies and delivers great long-term benefits to communities (and lifts the prosperity of whole regions) will often be the ability of various actors to think about self-interest in more of a community sense. The ability to identify and effectively manage conflicts of interest through good communication and effective governance is also really important. We cannot pretend there is no conflict, but it must be watched out for and dealt with through proper governance processes.

If the management and governance of projects is done well, rural communities will be better supported to remain prosperous. Those responsible will also not be forgotten by a community of people who tend to think of relationships, community and business plans in terms of decades rather than years or months.

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TIM CRAIG

This Profile looks at the life and career of Tim Craig, Agribusiness Associate at Rabobank in Ashburton, and a longstanding NZIPIM branch committee member.

Early life

Tim grew up on an egg, poultry and cropping farm in North Otago. There was always something to do on the farm, with school holidays spent with the chooks or in the packing shed, and after school joining in with the harvest or sowing. As he got older he took on more responsibility and learnt a number of important life lessons, such as a good work ethic, leadership and decision-making.

Growing up working and living on the family farm was as much of a lifestyle as it was a way of life, but Tim was able to see that farms need to be run as a business. The farm produced feed for the chickens, reared chicks from one day old, produced eggs, packaged, and transported and merchandised eggs on the shelves of supermarkets under its own brands in a competitive domestic market.

Luck is where opportunity (such as a job) meets preparation. Preparing to apply for a job doesn't happen a month or two beforehand; it starts well before in your last years at high school or first year of university.

For any business to succeed it needs each component to run efficiently, continually adapt and innovate to stay competitive. Realising this, he decided to go to Lincoln to further understand how businesses function and to then seek work in the agricultural industry. Tim completed a Bachelor of Agricultural Science (Hons) in 2018, initially focusing on soil science, plant science, animal health and farm management, to understand the engine room of New Zealand agricultural farming businesses.

Indonesian experience

However, it was the extra opportunities Lincoln provided that made an impact on Tim. He enjoyed meeting a vast network of people, all with their own interesting and unique backgrounds, but also creative ideas. It was here that he was first introduced to NZIPIM, which welcomed students into its mix.

At Lincoln he had a six-week opportunity to visit Indonesia as part of the Prime Minister's Scholarships for Asia in 2018. The aim was to understand Indonesian culture, business and consumer habits. With 140 million people on the island of Java (about the same size as the South Island) it made business extremely competitive and adaptive.

Tim was particularly impressed by the business degree at the Bogor Agricultural University in West Java, which required students to create a start-up business in order to graduate. This example gave him the confidence to start his own venture in New Zealand, purchasing reject eggs that were perfectly fine on the inside but had an ugly shell (or were too large or too small for the standard market) and selling them to students. His experience in this business gave him an insight into managing supply and demand and forming customer relationships.

Indonesia also showed Tim how critical it is to understand the consumer. The diet and consumer product preferences in Indonesia are very different to New Zealand. Food safety and trust in a brand are key attributes that their consumers look for, whereas generally New Zealanders are in the fortunate position of not having to consider these very often. This showed Tim how important it is to pitch New Zealand food to our overseas customers, and it also led him to undertake his final Honours year studying egg consumer behaviour trends in different chicken housing systems, which he achieved first class.

One trend that he noted in Indonesia was the UHT-dominated milk market. There is now a very fast-

emerging fresh milk market with the development of better refrigeration in this country, and households are earning more so they can afford fridges. Tim believes being customer-centric is capturing these trends and aligning with what the consumer wants, not what we think they want.

Work leading to Rabobank role

During his time at university Tim worked on sheep, beef, cropping and dairy farms to practically understand how they are run. Between his third and final year of study, he worked briefly on a 4,000 ha corporate dairy farm (Purata in Darfield) as a Business Support Group Assistant with 13,000 cows, 14 dairy platforms and 85 team members. His role was to audit the irrigation and effluent systems, as well as health and safety and farm compliance.

Tim enjoyed this role because it was also fulfilling components of the Lead With Pride programme with Synlait. The farms were financially rewarded as the production processes of the milk lined up with the values of Synlait's customers. He also enjoyed working with the managers of each farm to improve the efficiency of irrigators, making sure they were applying the correct amount of water in an even pattern. Making a 1-5% improvement quickly adds up when multiplied by the millions of dollars in capital invested in the irrigators and land.

Soon after finishing his final year at Lincoln, Tim joined the team at Rabobank in Ashburton as an Agribusiness Analyst. He wanted to become involved in agri-finance to gain knowledge about all aspects of a farming business and how this financially impacts them. More importantly, Rabobank lined up with Tim's values – a client-centric agri-bank that has no shareholders and forms solid and long-term lasting relationships with farmers to grow their businesses. Through this role he supported bank managers with their clients and analysed farms' financial and business performance.

As with his parent's property, he notes that farms are often a lifestyle as well as a business, and have a strong connection to the community. Working for a farming bank, this means that he sees both people's personal and business lives, which he feels is a privilege and a responsibility. Tim has recently started in a new role at Rabobank in Ashburton as an Agribusiness Associate, which will develop into a bank manager role. In this new role he is partnered with an experienced bank manager, providing more value to their existing clients, and he will take on some of his own.

Tim believes there is an opportunity to get the farming sector to be more proactive about the changes ahead, and not to just act when they feel backed into a corner about them.

Tim's advice for others who wish to enter the rural profession is to first understand what career path someone wants and why they want to do it. A good way to find out can be to ask current professionals what they do, and why they like it, as people are fairly willing to share this. He believes that to be successful there needs to be a passion for whatever someone does, rather than just chasing the next pay packet.

He says he didn't come up with the quote, but something he believes in is that luck is where opportunity (such as a job) meets preparation. Preparing to apply for a job doesn't happen a month or two beforehand; it starts well before in your last years at high school or first year of university. He says you should be creating a story that you can sell to employers that shows your development so that they want to employ you. The story might show how you have learnt, overcome challenges, succeeded and given back.

When Tim looks back to when he applied for the job at Rabobank he fondly remembers that he had almost none of the specific banking requirements for the job other than being able to roughly understand how farms work. He hadn't studied a lot of banking papers at Lincoln, and didn't have any bank-related work experience or understand how the banking process worked. Tim thinks in his case what he relied on was his 'story' – how he showed what he could bring to the table. He also believes that a good attitude plays a big part, as well as showing you have the ability to learn and actually provide value to the employer. Now that he is in his job he says he hasn't 'made it.' He still needs to work hard, learn and provide more and more value for both the clients and Rabobank.

Achievements and NZIPIM involvement

Tim started on the committee of the Canterbury/Westland NZ branch of NZIPIM as the Lincoln student representative, helping to provide insight to the team on how to make events attractive for students to attend. Along with fellow students he received huge value from existing members and the advice that they provided, even receiving job offers through the networks made. He continues to be on the NZIPIM committee, wanting to give a little back from a group he received so much from.

Tim is also on the committee of the Mid-Canterbury Young Professionals. The group aims to connect young professionals, socially and for personal development, such as first home buying, investments or career progression. He believes these kinds of groups are very important to be involved in when young professionals are moving to a new town and don't know many people.

He sees NZIPIM as a useful tool working in the rural professional space, with great networking opportunities and presenting the latest up-to-date information on a range of topics. He says the key is to collaborate with a range of rural professionals. Bringing their own specialist knowledge and working together as a team will be much more effective than being individuals on their own.

Future of agriculture

Tim also says there is no doubt that New Zealand agriculture is facing a number of changes at once, such as issues around greenhouse gases, healthy waterways, biodiversity and even public perceptions. For him, the frustrating part of these changes is that there are so many uncertainties surrounding them.

Tim believes there is an opportunity to get the farming sector to be more proactive about the changes ahead, and not to just act when they feel backed into a corner about them. Pressure is also being applied by low business confidence and uncertainty, but he notes that farming performance has recently been quite exceptional in general with good commodity prices. He also believes that agriculture will continue to be a long-term career option that significantly contributes to the New Zealand economy, with both on and off-farm roles.

While Tim says that he feels removed from consumers of New Zealand agricultural production because most of his product is exported overseas, he still thinks it is important to continually stay in touch with global trends. Consumer sentiment continually changes, and the marketplace is highly competitive, so a point of difference needs to be created. He notes that it is all well and good to say New Zealand needs to create more value in its products, which could be from increased efficiencies of production, but if this country wants to 'demand' a premium for them then the thought process should be centred around the question, 'Why should consumers pay more for our products?'

New Zealand is on the path to becoming net carbon neutral, which some might rightly think will have a negative effect on their businesses. However, if the thinking changed to how do we adapt to this change, and then how do we use this to our advantage, opportunities can be created. There are already food and beverage businesses using a 'carbon neutral' brand as a point of difference in the marketplace, and Tim asks why can't the whole country achieve this kind of branding?

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