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

NZ'S NICHE IN GLOBAL FOOD VALUE CHAIN BANKING REGULATION AND FARM LENDING
FUTURE OF CROPPING IN NZ CERTIFICATION WITHIN THE RURAL PROFESSION

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NZ Institute of Primary Industry Management

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STEPHEN MACAULAY CEO

Lack of national strategy and scale undermines the potential to develop world class agriculture and food innovation hubs

It seems that every district and city council in New Zealand has an innovation hub or is at least thinking about one to help stimulate economic activity in their region. Similarly universities and research institutions all appear to have developed various innovation hubs, cores or centres (either on their own or in partnership with one another) to leverage upon their respective strengths, particularly in fields of related or local research endeavour.

A quick search of the internet shows over a dozen innovation hubs or clusters focused on food and agriculture in New Zealand. The fact that they exist is certainly better than not having them, or is it? Do disparate objectives, motivations and egos associated with the establishment of innovative hubs across the country necessarily increase the profitability and productivity base of New Zealand's primary industries and the wider economy?

As part of my Winston Churchill Memorial Fellowship I was fortunate enough to visit a number of innovation hubs and clusters in the US, Canada and Europe. This included visits to the University of Illinois Research Park, MaRS based in Toronto, Food Valley Wageningen in the Netherlands, and the Agro Food Park in Denmark.

The main purpose of my visits was to investigate emerging disruptive technologies on the horizon that are likely to impact the way in which food is produced and processed for consumption, and to consider how New Zealand might respond to associated structural shifts on-farm and along the supply chain to market.

I was also interested in understanding how innovation hubs and clusters can boost the performance, speed and effectiveness of agribusiness and research institutions involved, and it is this area I wish to delve into further.

So what does a successful innovation hub within the food and agriculture sector look like? Having reflected upon this, there seem to be a number of common elements that have contributed toward the success of the innovation hubs I visited, including:

- **Location:** Innovation hubs have greater success when centred in places where entrepreneurs, commercial companies, investors and talented individuals want to work, live and play. By way of an example, MaRS is based in a newly-renovated campus in downtown Toronto, next door to the highly-rated University of Toronto, the commercial district, numerous cafés and access to central transport routes. They noted that it's a place that everyone wants to be and attribute their location as being a key factor in their success.
- **Industry involvement:** Strong industry engagement is critical to ensure relevancy in testing innovative ideas and concepts, and in providing pathways to market. Both Food Valley and Agro Food Park are largely industry owned and led with a strong focus on speeding up and coordinating the innovative performance of the companies involved.
- **Business development:** Rather than just providing office space and using this as a measure of success, the innovation hubs visited are very active in assisting and guiding entrepreneurs and new start-ups in building business competency through access to advisors, mentoring services and facilitating networking opportunities with aligned businesses and investors. But their focus was not just on start-ups. There was also a willingness to embrace established businesses in scaling up opportunities, including new technology platforms.
- **Access to capital:** Providing a platform for entrepreneurs and new start-ups to meet with investors to explore funding opportunities to take ideas and concepts to market. The location of innovation hubs is therefore important to facilitate such arrangements easily. In the case of MaRS they also have a venture capital fund to invest in start-ups.
- **Research:** Strong alignment and access to research institutions undertaking world-leading research, with the ability to test ideas and prototype concepts. A key reason for organisations like John Deere, Caterpillar and Dow being located at the University of Illinois Research Park is to have access to talented and motivated researchers and students at the agriculture and engineering faculties.
- **Partnerships**: For innovation hubs to be successful a truly collaborative partnership needs to exist between industry, research institutions and government that is committed to a vision and strategy.

So how well do New Zealand's innovation hubs compare with the points listed above, and what is the primary industries' and funding agencies' measure of success for innovation hubs normally launched with so much fanfare and promise?

It is simply not enough to think that being in the business of leasing out spare office space, or allocating time to use a dryer or some other manufacturing equipment, is sufficient to warrant being an innovation hub.

Unfortunately New Zealand lacks scale, is resource constrained and distant from our international markets, which in some respects reflects what we see with innovation hubs spread across the country.

If we are serious about establishing a high-performing, world-leading and flourishing innovation ecosystem within the food and agriculture sectors, it is time for industry, research institutions and government to step up and have the debate to develop a national vision and strategy on what this could look like and resource it accordingly. J

IAN PROUDFOOT

RECALIBRATING FARMING SYSTEMS TO SECURE AN ARTISAN NICHE IN THE GLOBAL AGRI-FOOD VALUE CHAIN

Rapid change is coming to the agri-food sector. Some of it is being driven by regulatory change, but much of it is about adapting to technological evolution and changes in consumer preferences. Every day spent watching puts the industry a day further behind.

Agri-food sector entering period of unprecedented change

Change is nothing new. The world has always evolved driven by innovation, natural events (such as floods, droughts and disasters), social pressure and political shifts. The last year has seen more surprises than we have experienced in recent years; think the Executive Orders of President Trump, the lack of a plan for Brexit, the exponential rate of acceleration of artificial intelligence-based technologies, and the declaration of the first drought in Africa in many years in South Sudan. The reality is that in a volatile world those who flourish are those with the greatest ability to detect and respond to change.

The agri-food sector globally is not immune from change. Innovative people and businesses are shaping new types of farms and new ways of farming. They are growing and processing new types of foods and finding fast, more direct ways to distribute the resulting products to better fit into the day-to-day lives of their consumers. The sector globally has been a relatively slow adopter of new technologies, with large regions of the world still using predominantly feudal, subsistence farming systems. At the same time many farmers in developed regions are still producing the same products on the same land, in largely the same way, that their parents and grandparents did.

It is reasonable to assume that we will see greater change in the agri-food sector than at any point in history, as the industry lends itself to solutions that can be generated by fusing digital, biological and physical technologies (the technology solutions that are underlying the fourth industrial revolution). As a consequence, I believe that the agri-food sector has just passed the start line of the first global agrarian revolution.

Complacency – the greatest threat to the future

The major threat to New Zealand's primary sector is complacency. A belief that because we are good at growing high-quality food, fibre and timber products all we need to do is to keep on doing what we have always done and it will generate sufficient wealth to pay for our schools, hospitals and roads. Such a belief is comforting, but built on an erroneous belief that change will exist around us but not materially impact the markets we sell to or the preferences of the consumers who eat our food.

In this article I set out to explain why I consider primary sector complacency is the greatest threat to New Zealand's economic future. I also articulate some ideas around how identifying and responding to the signals of change we are detecting could create a significantly more prosperous future for our country for generations to come.

We are successful… aren't we?

Determining whether the primary sector is successful really depends on the metrics that you choose to measure success by. Exposing the industry to market forces and removing subsidies, despite the initial pain many experienced, encouraged farmers to focus on improving productivity and on working to find markets for the products they grow. As a consequence, export revenues have grown, land values have risen and the primary sector has out-performed the wider economy on productivity. The traditional metrics used to measure the primary sector tell a good news story.

There are though other metrics that raise fundamental questions about the industry's *prima facie* success that should not be ignored. The environmental outcomes the primary sector has delivered, particularly the degradation of waterways and native ecosystems, is of significant concern to the wider community. The disparities in access to key social infrastructure, unemployment challenges and income differentials in rural areas suggest the benefits of primary sector growth have not been widely distributed. This has created issues with economic inequality and contributed to increasing levels of rural de-population.

We are a tiny cog in the global food system. It is widely accepted that we produce enough food to feed around about 40 million people.

Issues with animal welfare and labour exploitation present ethical challenges that are inspiring innovators to explore the commercialisation of alternative proteins that offer solutions to these problems.

The challenge facing the industry is that these metrics create a far more compelling story and have therefore dominated the mainstream narrative surrounding the primary sector in recent years. This has raised fundamental questions about whether farmers are the best custodians of the environment.

Success can be viewed through an alternative lens as a story of deprivation and destruction. This difference in perspective presents a major threat to the industry and its ability to maximise the contribution it makes to the long-term prosperity of New Zealand. It places the ability of the industry to farm at risk, but also has the potential to turn away the premium consumers that farmers need to be building strong links with. The drivers of historic success will not deliver for us the future we desire.

Now is the time to recognise that change is no longer 'nice to have', but 'absolutely necessary', if the industry is going to prosper into the future as an economic force.

Putting today's primary sector into context

We are a tiny cog in the global food system. It is widely accepted that we produce enough food to feed around about 40 million people. Around five million of these people make up the domestic market in New Zealand, including visitors and tourists at any point in time, which means we export enough food to feed around 35 million consumers their full diet. We must therefore be clear in a global food system trying to feed over seven billion people that New Zealand's primary sector (even dairy) is an artisan food-producing sector.

New Zealand's game is not, and must never be in future, unfettered volume. KPMG's analysis suggests that, contrary to popular belief, we grow products that are very effective in creating value. We estimate that the $38 billion of primary sector exports this country currently sends to the world are finally invoiced to their ultimate consumer, be that through the retail checkout, hotel invoice or restaurant bill, for at least $250 billion (i.e. a quarter of a trillion dollars). We are growing the value. Our focus must be on capturing a greater share of the value we grow.

The key determinant of whether an organisation captures a fair share of the value its products create are the positions that it chooses to take along that value chain. Our analysis clearly indicates that organisations that seek to build strong partnerships from input providers through their value chain to the ultimate consumer of their product are more effective in capturing a greater share of the value they create.

Historically, in New Zealand supply chains have been drawn together from the farm forward. They have been created to ensure that the products grown are pushed out to international markets with the hope that someone will buy them at a reasonable price. They have been supply driven, reactive and opportunistic; driven by metrics such as productivity improvement and volume growth. These supply chains have served us well in establishing export-focused sectors, but have left incomes vulnerable to commodity price shifts. They have also encouraged some farmers to test the boundaries of their licence to operate, putting profit in front of their obligations to their environment, animals and community.

A limited future for the good of all

We have in past KPMG *Agribusiness Agenda's* suggested that many farmers feel they are increasingly operating in a fishbowl where their actions are monitored, commented on and used to justify ever tighter regulations. The wider community is becoming increasingly interested in where its food comes from and, as a consequence, is expecting more from farmers each and every day.

Whether the industry likes it or not, the reality is that the wider community no longer trusts farmers to act as guardians of our natural environment. Whether this is based on media-fuelled perceptions or reality is irrelevant; the implicit trust that existed in the past has broken down and regulation is filling the gap. Farmers need to expect that limits will be imposed on many aspects of their farming operations to reduce the intensity of their impact on the natural environment and deliver the outcomes that the wider community seeks, like swimmable rivers and the regeneration of our native flora and fauna.

If you accept New Zealand is in reality an artisan food producer on a global scale, it logically follows we must focus on positioning ourselves as the home of the world's farmers' market – a provedore of premium food to the most affluent global consumers.

If the traditional measures of success are applied to farms operating under new regulatory regimes, it is easy to conclude that the imposition of limits is negative and will impact the long-term success of the industry. The need to mitigate nutrient run-off and fence waterways will impact the productive capacity of a farm and likely drive a reduction in stocking rates and production.
When success is primarily measured by volume growth, rules that limit growth are seen as unwelcome and a constraint on long-term profitability.

This perspective ignores the artisan nature of New Zealand's primary production sector. We cannot and should not be trying to feed the world; our role is to provide premium products that make up a small component of the diet of the world's most affluent consumers. I generally suggest we should be aiming to deliver 5% of the diet to the 800 million richest consumers in the world and in so doing secure a disproportionately large share of their food and beverage expenditure.

As an aside, it should be noted that although it is not our role to feed the world we do have a role to play in applying our intellectual property and skill in helping the world to feed itself. The global food system and the businesses operating within it cannot be considered to be truly successful until the impacts of under-nutrition across the world are addressed. Part of the positioning of New Zealand's artisan agri-food sector must be that the industry is good not only for direct stakeholders and the wider community, but also good for the world.

Farmers are critical participants in their product value chain. They need to recognise that consumers are focused on what is happening inside the farm gate and have expectations about how they manage all aspects of their operations. It is therefore critical that farmers are connected to the consumers of their products. In reality, it is consumer requirements that will establish the true standards that need to be adopted and applied on-farm, not the government, the regulators or the community. Ultimately, consumers will pay for products grown to meet their expectations.

If you accept New Zealand is in reality an artisan food producer on a global scale, it logically follows we must focus on positioning ourselves as the home of the world's farmers' market – a provedore of premium food to the most affluent global consumers. Premium consumers want to understand who produces their food, its provenance and efficacy. With this lens the idea of producing less by choice, but doing it in a way that is better for the community and the environment, makes a lot of sense.

As a consequence, there is a need to design the next generation of farm-to-consumer value chain models. If we are to ever capture the value inherent in our primary sector the design needs to include:

- Unique and controlled intellectual property
- Extensive adoption of emerging technologies
- A balanced, and at times regenerative, use of natural resources
- Open acknowledgement of success and recognition of challenges
- Deep collaboration with carefully selected value chain partners
- Robust authenticity checks to verify product integrity along the supply chain
- Direct consumer connection.

Our traditional animal protein sectors face significant disruption in the near future from emergent technologies that offer alternatives to traditional meat, milk and eggs.

Clues to the future

There are already some clues as to what next generation business models could look like. The Zespri model was intentionally designed 20 years ago to encompass many attributes expected to drive future success. In particular, the foundation of the industry on controlled intellectual property, integrity assurance embedded into the supply chain, long-term business relationships with value chain partners, and a deep understanding of regular and occasional consumers of kiwifruit have helped to drive grower returns.

As a consequence of the business model adopted by Zespri, kiwifruit growers consistently capture a higher percentage of the retail value of their fruit at the orchard gate than other farmers and growers achieve (Zespri estimate about 23% of retail value is returned to the orchard gate for gold growers). However, disruption creates opportunities for Zespri to lift its game, particularly in how digital technology is integrated into its value chain and how environmental standards that orchardists are expected to meet are continuously enhanced.

Other companies integrate elements of next generation requirements into their business models:

- New Zealand Merino has taken a lead in customer engagement and worked very hard to connect farmers to consumers, using this to create a premium for their growers
- Greenlea Premier Meats has focused on how it can use technology to enhance operating efficiency and deliver more tailored product specifications to its consumers
- Synlait Milk has created farm verification systems that provide assurance to consumers about how milk is produced and incentivise farmers to achieve continuous improvement in how they run their business
- There are also many farmers who recognise the need to manage their land sustainably and who have continuous investment programmes to improve their performance in a variety of areas, including environmental management, water and employment standards.

To date, we have yet to come across a value chain that has been designed to deliver on all aspects of a next generation farm-to-consumer operating model. It raises a question of whether it is possible to adopt such a system and still be sustainable. I question whether it will be possible to retain long-term economic sustainability if such initiatives are not pursued.

A next generation system will be higher cost, something that can seem unnecessary when in the long run most producers have regular, albeit at times marginal, profitability and enough customers to sell their products to.

The key question is whether these customers will continue to seek out our products as the agri-food sector experiences unprecedented disruption delivering a plethora of new choices to traditional customers. It is reasonable to expect that a significant number of these customers will substitute for better, cheaper or more sustainable alternative products, leaving our farmers competing in lower-value and increasingly commoditised markets (think the coarse wool industry over the last 40 years).

What might this mean for our animal protein sectors?

There is no question in my mind that our traditional animal protein sectors face significant disruption in the near future from emergent technologies that offer alternatives to traditional meat, milk and eggs. To date, these new forms of food are being targeted at premium consumers. However, their future is more likely to be directed at providing 'animal-like' proteins to those who cannot afford or source the constrained supplies of natural products

available. The natural products that are produced will increasingly be directed towards premium consumers who are prepared to pay for storied experiences, proven health benefits and absolute efficacy in production.

This vision of the future undoubtedly presents some challenges to our animal protein sector, but also suggests it could have an exciting and vibrant future if it is prepared to start changing. If natural protein is substituted in its lower-value applications by alternative forms of food, but becomes more valuable to premium consumers, it is sensible to take steps now to secure a niche in key high-value markets. In such a world, quality will be more important than volume. For the dairy sector, this may mean rewarding farmers based on the quality of the milk they supply rather than the volume to ensure a product is delivered that could be sold in liquid form.

The changes from a shift to liquid milk are significant. A focus on selling liquid milk will challenge the industry to address an installed capital asset base of dryers and processing equipment that becomes redundant. It will demand the development of new supply chain solutions to handle very different product formats. Work would be needed to digitally connect a product from the farmer who grew it, while brands will need to evolve to tell the story of New Zealand's artisan farmed, grass-fed, 'free-from' milk.

Such a world also presents opportunities for farmers who wish to connect directly with consumers. We have identified farmers in the US who are using technology to connect with customers and, as a consequence, are growing products to meet specific orders. This model is delivering significant price premiums to the farmer for the food they produce. The premium reflects the tight alignment of the product offer to consumer need and the provision of total visibility around the authenticity of their products.

The future starts now

The only certainty is that the future for each and every farmer in New Zealand will be different to the realities they face today. Markets will evolve as innovation brings new product options to consumers.

However, embracing change, recognising New Zealand's niche, artisan role in the global food system, and focusing on the reality that we produce food eaten by real people around the world means that the next 20 years have the potential to be consistently more prosperous than the last few decades. Realising the inherent potential will take hard work, investment and focus on all aspects of the value chain. That work needs to start today. Every day you delay change puts you a day further behind your competitors.

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nzipim NZ Institute of Primary Industry Management

NZIPIM 2017 NATIONAL CONFERENCE

LINCOLN, CANTERBURY, MONDAY 7TH AND TUESDAY 8TH OF AUGUST

This year we have brought together a great range of speakers covering a diverse number of topics from across the primary industry.

We will be looking at disruption technologies and innovations likely to impact upon New Zealand's primary industry. Ian Proudfoot, KPMG and Christine Pitt of Meat and Livestock Australia will be cutting through the noise and sharing their insights about how the farming community, industry and rural professionals can respond to new challenges on the horizon.

As farm environmental plans begin to be rolled out across the country, we will be looking at what this means in practice for the farming community. We will also be looking at the latest research on mitigation strategies for N loss through animal breeding and plant science with presentations by Phil Beatson and Grant Edwards, as well as assessing the economic impact of operating under nutrient limits.

Hamish Gow will lead a discussion on the application of design thinking to create better engagement with farmers, followed by a panel discussion by industry representatives on what this looks like in practice. Once again we have two concurrent streams on Business & Governance and Technical & Extension, which includes a presentation by Peter Allen on sparking change in stale governance boardrooms.

The conference closing session includes presentations and a panel discussion on life after Primary Growth Partnerships, and the future role and opportunities for rural professionals post-PGP.

For more information on conference, please check out NZIPIM's website (www.nzipim.co.nz) or contact admin@nzipim.co.nz | 04 939 9134

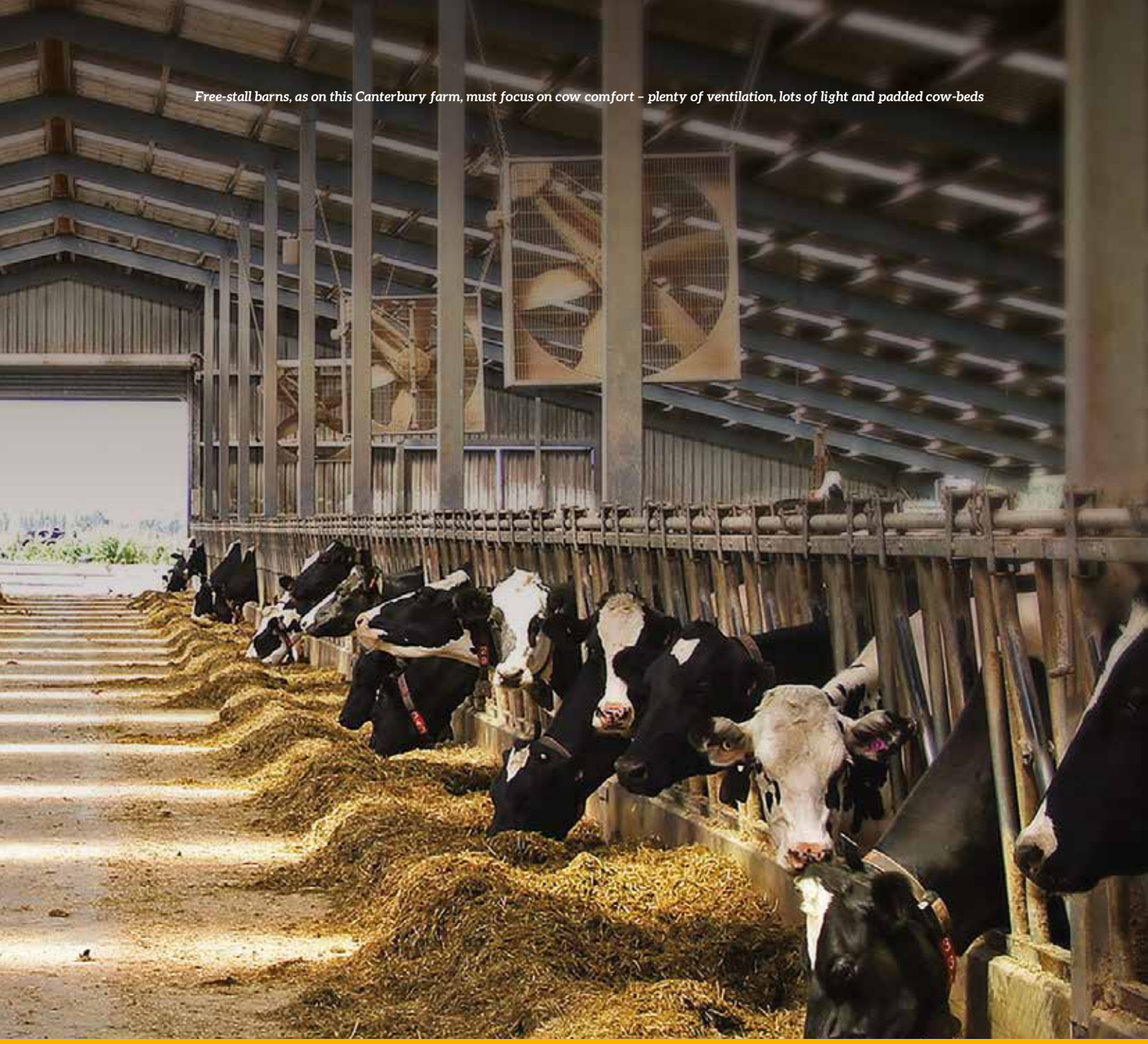
KEITH WOODFORD

THE RULES OF THE GAME ARE CHANGING

New Zealand agriculture is suffering from a crisis of confidence. It no longer has a social licence to do as it pleases. The 'rules of the game' have changed and will continue to do so. The challenge for New Zealand agriculture is how to adapt to those new rules while remaining vibrant and profitable. The challenge is particularly severe for dairying, which is this country's most important agricultural industry.

It was way back in 1963 that Bob Dylan wrote the song 'The times they are a-changing'. So surely there is nothing new about change – we hear about it all the time. But for New Zealand agriculture, and dairying in particular, something is currently occurring that goes beyond normal change; it is the fundamental rules of the game that are changing.

The New Zealand agricultural industry became accustomed during the first 15 years of this century to an economic environment where product prices were volatile but generally increasing. After being labelled in the late 1990s by then Prime Minister Lange and others as a 'sunset industry', New Zealand agriculture rose again. Agriculture has been contributing more and more to New Zealand's export income despite much of the so-called 'smart thinking' within urban New Zealand still being that agriculture is more about New Zealand's past than its future.



Free-stall barns, as on this Canterbury farm, must focus on cow comfort – plenty of ventilation, lots of light and padded cow-beds

Particularly in the last 10 years, New Zealand agriculture has become accustomed to increasing but manageable environmental regulations. Pastoral farmers have invested in fencing of waterways, dairy farmers have invested in effluent management systems, and both crop and dairy farmers have invested in more efficient irrigation systems. They were able to do this without change to their fundamental farming systems.

Urban attitudes are changing

New Zealand agriculture has also become accustomed to living with an urban community that is increasingly divorced from an understanding of what farmers do and why. That has been an ongoing process for more than 50 years. However, it is not only the urban perspectives that have been changing; so too has the nature of farming itself. The image of the outdoor bloke and the family farm, which the industry itself still loves to portray in its TV advertising, no longer matches the apparent reality (as perceived by urban folk) of large-scale capital-intensive industrial farming. Consequently, the urban community has changed from being poorly informed and ambivalent about agriculture to still being poorly informed but increasingly hostile.

How did all of this happen? Where is it leading? What can be done about it? And in the broader New Zealand context, does it really matter?

The importance of exports

Yes, it does all matter to New Zealand. This is because New Zealand has an export-led economy. Exports comprise about 28% of the New Zealand economy (World Bank data as at 2014), down from 36% back in 2000. In the short and even the medium term the economy can manage this decline through trade deficits and balancing capital inflows, but in the long term, if exports go down, then the rest of the economy also has to adjust. So, if New Zealand agriculture were to fall into decline, then other

Pivot irrigation and in-ground soil-moisture metering are fundamental to water use efficiency and reducing nitrogen leaching for future farming. Both water use and leaching can be halved relative to old-style surface irrigation

export industries would need to step up or else the whole economy would go into decline. And what would those new export industries be?

It certainly won't be a car assembly industry and it is highly unlikely to be a mineral-led industry that will carry New Zealand forward. That is not where our comparative advantage lies. It is also not likely to be a major digital technology industry. There are plenty of digital niche opportunities 'out there' waiting to be captured, but for anything mainstream, the evidence, once again, is that we lack comparative advantage. Successful mainstream digital industries inevitably migrate to the bigger countries. So, if it is not going to be our primary industries, then it will have to be tourism and international education that step up. They are and can be great earners, but they also bring their own problems. Both are 'fair weather' volatile industries.

The traditional way of measuring industry contribution, beyond GDP and exports, has been to look at the multipliers from what are called input-output analyses. For example, back in 2009, and using this approach, the NZIER calculated that for every additional dollar of income earned directly by the New Zealand wine industry, there was an additional $1.76 earned elsewhere in the economy (NZIER, 2009). Similarly, for each job created within the industry itself, there were an additional 1.79 full-time equivalent jobs created elsewhere.

More recently, there has been a shift within the economics profession to move away from simple input-output models to more complex CGE (computable general equilibrium) models. In line with this, in 2010 the NZIER undertook a CGE analysis of New Zealand dairying for Fonterra and DairyNZ (NZIER, 2010) and a further study was undertaken in 2016 for DCANZ (NZIER, 2017). The results do not make great headline reading. There are no longer any simple multipliers that an extra dollar of export income will produce several times that amount throughout the economy, or that for every job created within the industry there will be several additional jobs created elsewhere. Instead, there are general statements, apparently shaped for the clients, that dairy is big and important to the economy. However, the associated numbers are complex, much smaller than previously, and not well-suited for headlines. Accordingly, an urban New Zealander might well interpret this report as showing that New Zealand could manage without dairy.

I learned a long time ago that within complex models there can be major shaping assumptions that are invisible to those who do not understand the calculus. Models are therefore great for bringing structure to what would otherwise be an unstructured mess, but the outputs are only as good as those hidden assumptions. In relation to dairying, the inherent assumptions within the NZIER dairy reports include that the resources can be successfully reallocated elsewhere.

My own interpretations are that in the absence of a buoyant agriculture industry, New Zealand does indeed face tough times ahead with negative impacts that will flow strongly throughout the economy. However, I do not expect those views to be mainstream within the urban community.

The industries have grown up in an environment where it was implicitly assumed that the environment could carry the wastes. Farmers thought they could do things by right which they can no longer do, and that creates anger.

Changing rural attitudes

One thing for sure is that mainstream urban thinking will impact on the social licence that agriculture has to operate under. Accordingly, a key issue is how the agricultural industry will respond to the new environmental rules that society will impose.

Within the agricultural community, I sense a strong perspective that somehow it is only urban attitudes that have to change. That is important, and some of us are working away at that. The way to do it is to stick to the issues and never take on the protagonists in a way that is personal. But that will not be enough.

The agricultural industry also has to recognise that it too has to change its attitudes. That includes not defending the indefensible. It also includes shedding bully-boy actions such as those recently undertaken by major agricultural companies who have put their urban service suppliers onto payment terms of up to 91 days. It also includes thinking again about PR-led communications that are widely considered by the urban folk to be nothing more than self-interested propaganda coming from rural elites. If it is always 'other people' who have to change their attitudes, then we will not get far.

The pastoral challenge

Clearly, it is pastoral agriculture and dairying in particular that is currently 'in the gun'. In contrast, I expect that kiwifruit will continue to prosper as the agronomic boundaries extend out more widely from the Bay of Plenty. Wine also has opportunities, although locations outside Marlborough will be increasingly needed. There are also opportunities for apples, underpinned by ongoing development of new protected plant varieties. I also have hopes for a greatly expanded mussel industry from offshore (not in-shore) locations.

The particular challenge for pastoral agriculture is that the current farming systems are shaped by history. The industries have grown up in an environment where it was implicitly assumed that the environment could carry the wastes. Farmers thought they could do things by right which they can no longer do, and that creates anger. An associated issue is that farmers are learning that freehold title is actually a restricted licence in regard to land use, increasingly constrained by the need to meet nitrogen leaching limits, phosphorus run-off limits and, in some cases, changing water use rights. Although dairying has been the first to feel these new constraints, they are now increasingly affecting other pastoral farmers.

A key problem is the dairy cow of which there are more than five million. Our dairy systems are based on high protein pastures, and this exacerbates the nitrogen problem in the cow urine. There is an irony in that when urban people think of 'dirty dairying' they think of intensive systems, but do not recognise that it is our nitrogen-fed ryegrass pastures plus nitrogen-fed winter fodder crops that are the fundamental source of nitrogen leaching, albeit via concentrated cow urine.

Part of the solution lies in more use of high-energy low-protein crops, both to balance the cow diet and also to mop up excess excreted nitrogen in the soil. Aligned to this, and even more important, is that dairy cows need to spend late autumn and winter resting off-paddock where effluent can be collected, then stored and taken back to the land in spring. These suggested solutions, although mainstream in the rest of the developed world, inevitably bring forth hostility from the local dairy industry. It is a social issue and we are seeing a social response. It is a normal behaviour in times of change when traditional industries are going through a stage of denial. All sorts of reasons are brought forward, both practical and economic, as to why it cannot happen. My response is that is all okay as long as the industry does not mind going into decline.

Reshaping of the dairy industry

For the last four years, I have been pondering as to how our future dairy industry might look. Given the freedom that goes with being a former academic, now an independent consultant in the so-called later years of life, I have been seeking out (and have been sought out by) those who have decided to step forward on the journey of exploration. I seek to learn from those farmers who are looking over the horizons to the new promised land, and sharing in that process, with all its ups and downs.

The big picture of that future dairy industry is of a unique New Zealand hybrid system, where cows are housed indoors during winter with matting or similar beds for lying on, and going outdoors for up to six hours per day for grazing. The dominant feed over the 12-month period will still be pasture, but supplemented by a range of crops, which in at least some cases can be grown on-farm as 'nitrogen soaks'. Nutrients will be closely monitored across the system (plant, animal and soil). Milk will be produced 12 months of the year and cows will calve evenly throughout the year. Effluent will be stored over winter and may also be removed from the system via methane digesters (currently being trialled in New Zealand on-farm) and also through the transference of effluent nutrients in solid form to other farms as fertiliser.

With this new system, the cows will lactate for about 320 days on average (compared to 260 currently) followed by a 45-day dry period. They will produce at least 1.1 kg of milksolids per annum for every kg of cow liveweight and

Our sheep industry will also continue to evolve, and may get even smaller as it becomes increasingly squeezed by environmental forestry and beef.

this ratio will be a key performance indicator (KPI). The better farms will produce more than 1.2 kg of milksolids per kg liveweight. Within this system, and when properly fed, the cows will be happy to milk for a little longer in return for not being quite so rushed to get back into calf.

The key constraint for this new system is the additional infrastructure capital of $6 to $10 for every kg of milksolids. However, the overall capital investment per kg of milksolids can be less for these systems than for our current pastoral systems, because overall capital is spread across more production. With this system, a greater proportion of feed goes into production rather than animal maintenance, with associated reduction in greenhouse gases per kg of milksolids.

I am monitoring a number of farmers who have been implementing these systems, and with modest winter milk premiums, and in some cases even without these premiums, the economics are sound. This is irrespective of value being placed on the environmental benefits. However, the biggest constraint is sometimes the farmer; if a barn is built without fundamental rejigging of the farming system, then the economics are indeed doubtful, and environmental benefits may also not be achieved.

Beef and sheep farming will also change

The pastoral journey in New Zealand will need to involve rethinking that goes well beyond dairy. In particular, if dairy shifts away from seasonal calving, then profound opportunities arise to make use of all the surplus calves born to dairy cows. It may initially seem surprising, but the key issue for beef is sex-selected semen within the dairy industry. This technology already works well overseas in association with 12-month dairy systems. However, it does not work well in New Zealand with seasonal calving, where even a very minor reduction in conception rates places an unacceptable additional stress on of the overall system. Of course, there will be challenges, with a need to focus on beef sires that produce small beef calves, but this is all very manageable once we shed the notion that big is always best. In terms of system energetics, being big is not a key requirement. Nutrient management within beef farming will become an increasing issue.

Our sheep industry will also continue to evolve, and may get even smaller as it becomes increasingly squeezed by environmental forestry and beef. A lot will depend on market positioning. In our family, we are doing our bit to help the industry by wearing more than our share of wool clothing and also having a partiality for lamb meat, but we do not represent the mainstream. The key markets are the Muslim countries, including more than 25 million Muslim Chinese.

Whole-of-system innovation

In this article, I have focused on production-related issues, but paradigm shifts are also required in relation to whole-of-chain food systems. We don't like foreign investment but we ourselves do not invest sufficiently beyond the farm gate. We talk a lot about 'value-adding' as if it were easy and a 'no-brainer', but then don't embrace the key concepts associated with having a 'consumer focus'. Our words and our actions do not align. There is also a lingering perception that because a commodity focus associated with low-cost production has served us well in the past, that low-cost commodities can still be the mainstream path going forward. I call that the 'shrivel plan'.

If our agricultural industry is to prosper in the new emerging world, then it is going to require strong leadership, including much more forward-looking 'innovation systems' (the new term that encompasses but also goes beyond traditional R&D systems). Strong leaders do not seek popularity; rather, they lead boldly from a forward-thinking perspective, based on evidence-based positions as to the opportunities and the constraints that need to be addressed. By definition, they attract criticism. Currently, I see insufficient leadership and too much thinking that is grounded in the defence of traditional paradigms, and which nibbles away at the edges of the problems. I see almost no formal R&D leading towards the paths I have suggested here. Much of it is populist stuff that meets the self-interested short-term objectives of the research institutions. It is time for a lot more new thinking.

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DAVID TRIPE

Banking regulation and farm lending

This article reviews changes in New Zealand banking regulation, particularly around compulsory capital requirements, and the effect these have had on the cost and availability of lending to farming.

Basel Committee guidelines

One of the major setters of rules in banking internationally is the Basel Committee on Banking Supervision, based at the Bank for International Settlements in the Swiss city of Basel. It acquired this role in the aftermath of some bank failures in the 1970s, and its remit has steadily expanded since it promulgated its first set of guidelines in 1975.

Except for those countries which are direct participants in the Basel Committee's processes, where stronger commitments are expected, the guidelines that it promulgates are not binding. The globalisation of banking encourages adherence to the rules, however, in that many large banks are domiciled in countries which are represented on the Basel Committee. Moreover, if countries want their banking regulations to be recognised internationally, adherence to the Basel Committee guidelines is more or less a *sine qua non*. The overall effect is that most countries globally acknowledge the Basel Committee's guidelines and New Zealand is no exception.

The focus of the Basel Committee's activities is on bank safety and soundness, and in attempting to limit the damage that can arise from financial system weakness in one country's banking system spreading elsewhere. The initial focus was on banking supervision and regulation, but since the 1980s increasing attention has been given to bank capital as a cushion to absorb shocks, and thus to limit the harm that banking weakness can cause by spreading internationally.

The first set of capital rules that the Basel Committee promulgated in 1988 were relatively crude and simple. The cushion against borrower default for banks was defined as a percentage of the amount lent in a limited range of categories:

- Lending to governments, public bodies and banks
- Lending on housing
- All other lending such as to farmers and other businesses.

In the mid-1990s, the capital rules were extended to cover some of the banks' exposure to market risk, with a particular focus on interest rate risk.

New Zealand bank models

The original 1988 rules were not particularly sensitive to the risks in bank lending, and by the late 1990s a redevelopment process had commenced, which came to be known as Basel II. A larger number of categories were applied to bank loan portfolios, with a stronger relationship to the risks of different types of lending. More sophisticated banks that could demonstrate a more detailed analysis of their loan portfolios were allowed to estimate capital requirements according to that more detailed record of loan performance. The New Zealand banks which were authorised by the Reserve Bank of New Zealand (RBNZ) to use internal models are the big four: ANZ, ASB, BNZ and Westpac. Other banks in New Zealand were left to determine their required capital using a standardised model.

2008 was the year of the global financial crisis, which led to a major reconsideration of bank risk, its supervision and capital to absorb that risk.

There was a validation process required by the RBNZ before it approved the internal models for the large banks. During the period leading up to the approval of the models in 2007/08, bank loan losses had been relatively minor. Farm property prices had risen strongly on the back of high rates of loan growth since 2001, and low loan losses also reflected generally felicitous economic conditions since the early 1990s. The RBNZ took account of this, and insisted that banks apply rather higher loan loss assumptions to their housing and farm lending in particular.

When this happened in 2008, there was no particular necessary negative pass through to bank interest rates for these types of lending. Because the required capital levels for banks were reducing anyway with Basel II, the cost of providing and maintaining that capital was decreasing, even if the reduction was not as much as it might have been in the absence of regulatory intervention.

Effect of global financial crisis

2008 was the year of the global financial crisis, which led to a major reconsideration of bank risk, its supervision and capital to absorb that risk. At the same time there was downward pressure on commodity prices and thus on farm prices, which made the outlook for farm lending look somewhat less promising. This led the RBNZ to undertake a further review of bank lending to farmers, which in

Further concerns about bank farm lending were raised following the downturn in dairy prices in 2014 and 2015, with the RBNZ requiring the banks with the five largest dairy portfolios to undertake stress testing of their rural portfolios.

turn led to a further increase in capital requirements, particularly for higher-risk farm loans (where loans were a higher proportion of the value of the security). The RBNZ's concerns and the background to them were discussed in two articles in the June 2011 issue of the Reserve Bank of New Zealand Bulletin.

Capital levels for advanced bank farm lending were pushed back up close to those required before the adoption of Basel II, with the RBNZ estimating the effect of this as requiring banks increase their loan spreads by 16 basis points (one hundredth of a percentage point). This had the effect of increasing New Zealand bank capital for farm lending to levels significantly higher than would be typical in other countries. There was no particular effect for the (smaller) banks which were using the standardised model.

In 2010, and subsequently, in response to the global financial crisis there were further moves by the Basel Committee to strengthen bank capital levels, this time by increasing the ratio of required capital to risk-weighted assets. The RBNZ adjusted the required capital levels for New Zealand banks accordingly in 2013. Although farm lending was not highlighted for change as part of this process, the increased capital levels would have put upward pressure on bank interest margins overall, as they sought to compensate shareholders for the additional capital they were required to maintain. However, interestingly, their overall interest margins have generally reduced over the last five years.

Farm lending

Farm lending got a further mention by the RBNZ in the discussion papers that initiated the macro-prudential restrictions in 2013. The concern expressed by the RBNZ was that an excessive run-up in farm prices, based on the over-optimistic assessments of the state of farming by the banks, could lead in due course to a farm price bust. Because of the significance of farm lending to New Zealand banks, a crash could weaken the banks financially, leaving them unable to support the financing requirements of the economy as a whole.

Further concerns about bank farm lending were raised following the downturn in dairy prices in 2014 and 2015, with the RBNZ requiring the banks with the five largest dairy portfolios to undertake stress testing of their rural portfolios. In the aftermath of this, the RBNZ expressed concern about the risks involved in farm lending, but did not increase required capital levels. However, banks may still have increased the interest rates charged to riskier borrowers during this period, as they became concerned about the risk levels of individual borrowers.

The level of farm lending by banks in New Zealand is distinctive, in that at more than 15% of total credit (15.2% as at 31 December 2016) it is much higher than in many other countries. It makes a marked contrast with Australia, where farm lending was only 2.9% of total bank lending as at 30 June 2016. This is why the RBNZ pays much more attention to farm lending than do many other central banks around the world. Within this, particular attention is applied to the dairy sector as it accounts for around two-thirds of overall farm lending. Farm lending is sometimes identified as a political issue in Australia, but it is not a financial stability issue in Australia in the way that it is in New Zealand.

Bank capital levels

Issues around bank capital were raised again in a speech by RBNZ Deputy Governor Grant Spencer in March 2017. This announced that a review of bank capital levels would be undertaken, with the implication that these would be increased as the RBNZ sought to reduce scope for banks to interpret capital rules in ways which would reduce the amounts of capital required. It is not obvious that any changes would have any particular implications for the farming sector, apart from the general proposition that increased capital should be expected to flow through to increased bank lending rates.

For all these challenges, bank lending to the farming sector has kept on growing in recent years, even if the growth rate has not been as high as that for lending on housing. Banks have generally found farm lending to be sufficiently profitable to sustain their willingness to lend to the sector. There is no obvious indication that this will change unless and until banks suffer serious losses on farm lending, something that they have so far avoided. A greater challenge in practice is likely to be for the banks to obtain sufficient funds to sustain ongoing growth in lending, with pressure coming on from the Australian regulators to limit Australian bank funding of New Zealand banks and higher funding costs in international markets.

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NICK PYKE

THE FUTURE OF CROPPING IN NEW ZEALAND

The arable industry produces a range of grains and seeds, many of which are commodity crops. Looking forward, the industry needs to capitalise on future advantages and opportunities to grow new crops that maximise returns to growers in a sustainable industry.

Cropping today

Good soil, plentiful water, skilled farmers and ongoing technological developments put the cropping industry in an excellent position to produce new high-value foods for international markets, and provide an economically and environmentally sustainable alternative to intensive pastoral farming in New Zealand.

The total area in arable crops in this country is relatively small, but the average yields of many of our crops (e.g. wheat, barley, ryegrass seed and potatoes) are among the highest of any countries in the world. New Zealand has significant exports of herbage and vegetable seeds to the value of $170 million (2014-15 NZGSTA), and is the number one producer of radish seed in the world. Much of the crop production is for domestic use and most of it is for animal consumption. Annual cropping is an integral component of all farming systems with pasture seed, forage and feed for pastoral farming originating on crop farms. The largest crop by area is forage brassicas at approximately 300,000 ha.

National and international cropping trends

Internationally the yields and total production of the four major crops has increased in recent decades (***Table 1***). This is mostly due to improved yield, but also to increased land area used for individual crops. The large increase in the production of maize is partially due to the use of this crop for ethanol production. The area of cropped land rose from 9.7% of the world land area in 1961 to 11% in 1990 and has fluctuated around that level since then. This means the area of arable land per person has dropped from 0.37 ha/person in 1961 to 0.19 in 2014 (www.data.worldbank.org). Recent increases in arable land from deforestation are balanced with losses of areas of degraded soils.

In New Zealand the cropped area, excluding forage crops, has been near static at approximately 150,000 ha for the last 10 years, although there are fluctuations in relation to demand. However, increasing yields mean that production has risen markedly (***Figure 1***). This can be clearly seen for wheat and barley where yields in cultivar performance trials have increased by 90 or 125 kg/ha per year, respectively (***Figure 2***). These increases in yield are due primarily to improved agronomic management, but also to improved genetics. Unfortunately not all crops have shown such increases in grain yield, with those such as peas and maize (***Figure 3*** *[see page 18]*) showing no or little increase in yield, but there have been improvements in agronomic traits such as disease resistance and lodging resistance.

Maize	483	592	851	1,016
Rice	518	599	702	746
Wheat	592	585	649	713
Potatoes	266	328	334	368

Table 1: World production (millions of metric tonnes) of the four major crops grown

Source: www.geohive.com

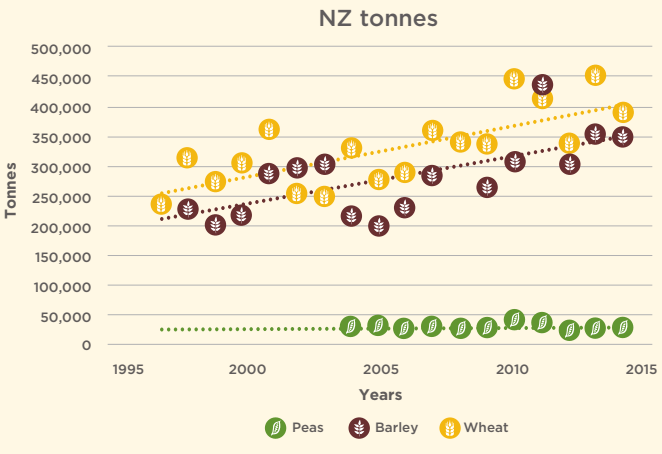

Figure 1: Production of wheat, barley and peas in New Zealand

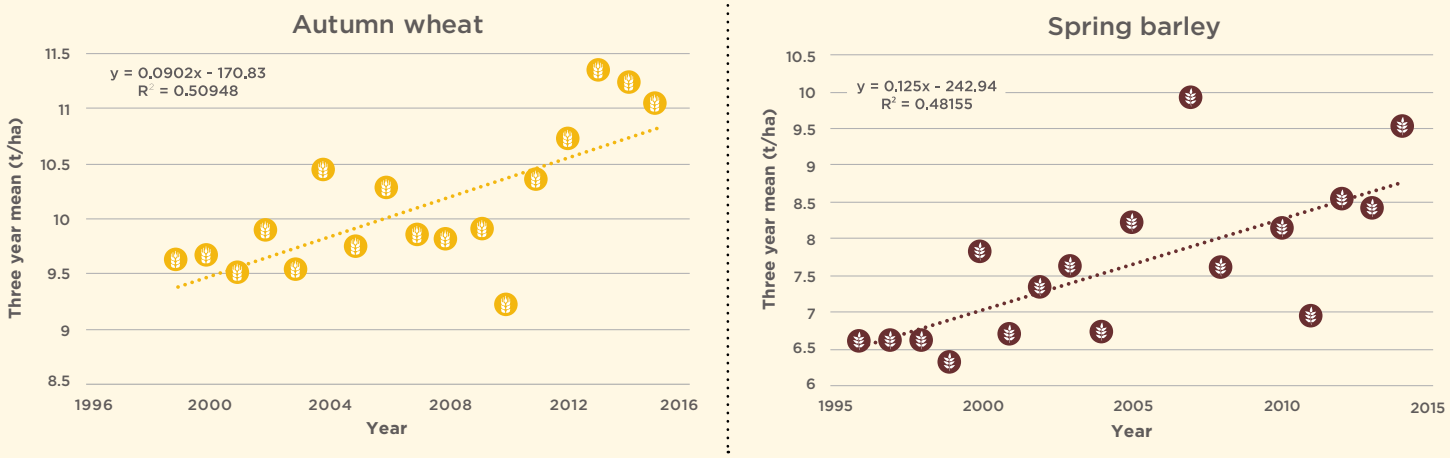

Figure 2: Increase in autumn sown wheat and spring-sown barley yields in cultivar performance trials

Recent yield trends show a reduced annual yield increase in wheat as agronomic gains diminish. Future productivity increases will require careful evaluation of the potential to increase yields or reduce costs through the use of different genetic material and modern genetic techniques.

Although there is significant media coverage of water quality and quantity issues in New Zealand, and some concerns about degradation in soil quality, as a cropping industry we are significantly better positioned than almost all other countries. Information on water supply and demand indicates that this is one of only a few countries where supply exceeds demand and the climate is suitable for cropping.

Further, most countries are suffering significant degradation in soil quality and, again, New Zealand is one of a limited number of countries where soil quality is not degrading. Combine these two fundamental resources to crop production, and include other factors such as a suitable climate and skilled personnel, then (on a country scale) New Zealand holds a near unique position in the world.

Land values and impacts of land value

Cropping land values are determined by New Zealand land values. Good quality irrigated land is currently valued at around $50,000 per ha, while debt servicing, rates, insurance and depreciation on capital can equate to approximately $3,200/ha/year. Thus, a crop option needs to be producing good yields with a good gross margin to be part of a viable cropping farm. This further increases the need to capitalise on the unique features of cropping in this country, such as our ability to grow a wide range of crops, including high-value vegetable seed crops, and our ability to produce yields well in excess of the world average.

Most crops are considered in relation to the yield potential and selection of cultivar or inputs to crops is made on their potential to produce yield. While yield is a major component of gross margin for a particular crop,

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the profitability of a unit of land over a period of time is a more important measure. In most areas of New Zealand crop growth can occur on every day of the year, so it is not only about the gross margin of the crop but how crops fit together over a two (or longer) year timeframe.

A more important measure of the performance of a crop is therefore the gross margin/ha/day. Using this, criteria crops that are short duration may have a poor gross margin when compared to a long season crop. However, in $/ha/day a crop with a relatively poor gross margin/crop, such as peas, has a high gross margin/day and one that has a higher gross margin/crop, such as winter wheat, has a poor gross margin/day. Increasingly, farmers need to select crops and crop sequences that maximise not yield or gross margin/crop, but gross margin/ha/day.

Nutrients and irrigation

The major nutrient used to manipulate crop yield and quality is nitrogen (N). The nutrient requirement differs by crop and in relation to expected yield, but farmers can calculate how much N is required based on the expected yield, the amount of N available in the soil, and an estimate of how much N will be mineralised during the growing season and become available to the crop. Fortunately, for most crops, nutrients can then be accurately applied in relation to crop needs and the economic driver (the cost of fertiliser) helps minimise excess use.

Access to water from irrigation is essential to produce a range of crops, particularly seed crops, and to optimise

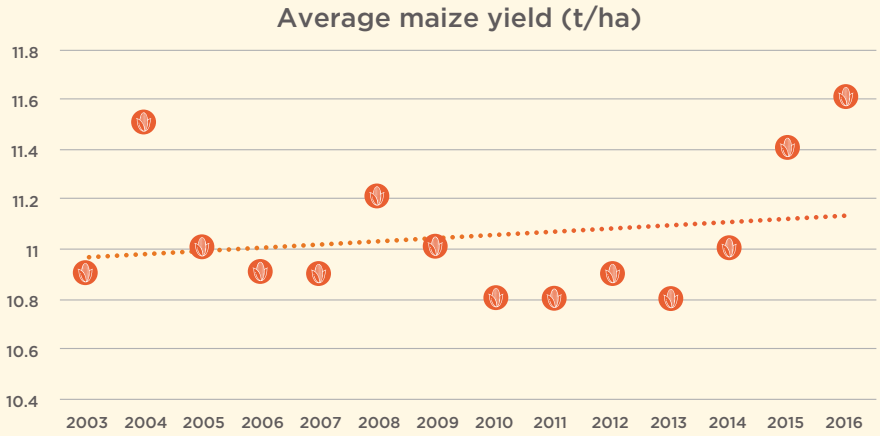

Figure 3: Average New Zealand maize grain yields

Source: Statistics NZ agricultural production statistics

	Dryland yield (kg/ha)	Irrigated yield (kg/ha)
Perennial ryegrass	980	1,900
Italian ryegrass	670	1,880

Table 2: Average seed yields for perennial and Italian ryegrass with and without irrigation in New Zealand

Good quality irrigated land is currently valued at around $50,000 per ha, while debt servicing, rates, insurance and depreciation on capital can equate to approximately $3,200/ha/year.

yield and quality, e.g. average ryegrass seed yields increase significantly with irrigation (***Table 2***).

Irrigation of cropped land is also a very effective way to mitigate nutrient losses as it helps to ensure the crop is actively growing and effectively utilising nutrients. In an unirrigated scenario the nutrients are applied based on the same criteria, but the ability for use by the plant or loss to leaching is largely dependent on the timing and quantum of rainfall.

FAR research has shown that 7 kg more N is needed per tonne of wheat produced to maximise yield and quality in the dryland scenario than in an irrigated crop. This extra 7 kg is required to overcome uncertainty of supply. Thus, for an average yielding dryland wheat crop of 7.5 t/ha there would be just over 50 kg of extra N/ha unutilised, which could be leached compared to the irrigated crop. The same principle applies to well-managed irrigated pasture where irrigation will also mitigate nutrient or even urine N loss. However, as pasture is shallower rooting the risk of leaching below the root zone is increased.

Irrigation timings for arable crops are also compatible with water availability as most key crops require little water through the peak summer period, when demand is high from pastoral farming systems, as they are starting to senesce prior to harvest.

From a policy perspective, the National Policy Statement for Fresh Water states that limits must be in place for both water quality and quantity. The responsibility for establishing appropriate limits and ensuring landowners are operating within limits lies with the regional councils. The regional councils need some framework to not only define how the practices of land managers will impact on these limits, but also some way of attributing a nutrient loss value to an area of land, and often they are relying on or plan to rely on OVERSEER® to estimate losses.

The best management practices will occur when farmers are actively involved in defining and documenting on-farm practices and how these impact on productivity, profitability and losses to the environment. These practices include developing Farm Environment Plans templates, paddock recording systems and adhering to good management practices.

FAR recently coordinated an expert panel to review the OVERSEER® model, and from this review worked with other groups to evaluate its fitness for purpose for cropping. This work has identified a number of areas where further improvements are required if OVERSEER® is to be used to estimate losses from cropping. It has resulted in Environment Canterbury developing an interim simple system, N Check, which can be used by cropping farmers in some zones to estimate N loss. Losses are most likely to be highest from those crops with shallow rooting systems and high nutrient inputs or from crops that are grown for forage and are intensively grazed. All of this work shows that standard good farming practices will result in minimal N losses and that most cropping practices are unlikely to exceed environmental limits.

In the future, sustainable cropping in New Zealand will rely on the effective use of improved irrigation systems and scheduling to minimise nutrient loss to ground water. Further research to quantify N mineralisation during a cropping season will help farmers more accurately estimate N inputs and prevent these losses.

Food trends and opportunities

Significant food trends around the world provide New Zealand growers with opportunities to grow new crops or to find new end uses for existing crops. Key trends to be aware of include the increased consumption of fresh produce, new food products, and shifts in food consumption such as more Easternisation of Western diets and vice versa.

Protein production and consumption are also changing. Approximately 49% of protein consumed by humans is from grains (40% from cereals) and 44% from animals and fish (see www.riddet.ac.nz). Plants are a very efficient way to produce protein. In New Zealand, values for protein production from beef, milk and wholemeal flour are 85, 540 and 882 kg/ha/year, respectively.

Globally, per ton of product, animal products generally have a larger water footprint than crop products. When we look at the water requirements for protein, it has been found that the water footprint per gram of protein for milk, eggs and chicken meat is about one-and-a-half times larger than for pulses (e.g. chickpeas, lentils or beans). For beef, the water footprint per gram of protein is six times larger than for pulses and the efficiency of protein production per litre of water for pulses is slightly better than for cereals (see http://waterfootprint.org/media/downloads/Report-48-WaterFootprint-AnimalProducts-Vol1_1.pdf). In New Zealand, with our climate and animal farming systems, it is expected that water use per kilogram of protein would be lower than the global average, but cropping could provide an option for more environmentally acceptable protein production with a considerably smaller water use footprint.

Food processing is changing rapidly and plant-based proteins have been developed into processed meat look-alike and taste-alike products, with the Impossible Burger now available at a few restaurants in the US (see www.impossiblefoods.com). Within New Zealand, Sunfed Meats (see www.sunfedfoods.com) is producing plant-based meat products and plans to have them available later this year. These developments may provide new opportunities for this country to produce plant protein.

New crops are another option. Sixty percent of the plant-based food consumed in the world comes from just

The best management practices will occur when farmers are actively involved in defining and documenting on-farm practices and how these impact on productivity, profitability and losses to the environment.

four plant species – wheat, corn, potatoes and rice. This is despite the existence of an estimated 30,000 edible species. Identifying agronomically suitable, new to New Zealand, food crops with good export potential is another option to be explored.

Water also provides the potentially major crop growing opportunity of exporting water in durable fresh food products. The challenge here will be to identify higher-value products that can be readily freighted to water poor countries or regions. Some of these countries or regions are close to New Zealand, e.g. Sydney has one of the largest fresh fruit and vegetable produce markets in the southern hemisphere and is only four hours away. Currently there are limited supplies of New Zealand water containing fresh food products in the Sydney market, but the population of Australia is increasing by 300,000 per year and most of these people are on the East Coast. It is predicted that climate change will reduce rainfall and impact on Australia's ability to grow crops in some regions and New Zealand is ideally placed to fill these gaps. Some Asian countries are facing similar constraints, potentially providing further new opportunities for our cropping farmers.

The sorts of food or food products suitable for these markets could include durable green fresh products, and non-European root and bulb crops. It could even include the development of new innovative food hubs, such as a beverage hub, which can supply any animal or plant-based beverage that a consumer wants from a single phone call.

Crop management

Other key changes influencing food production and marketing are consumer expectations that food:

- Will be safe
- Can be traced back to the producer
- Is produced sustainably
- Has no or low levels of residues, and
- Increasingly will be produced locally.

These expectations also provide significant opportunities for New Zealand cropping farmers who are isolated from many internationally common crop pests, have the benefit of a stringent biosecurity system, and use grazing animals in cropping rotations to remove weeds, pests and diseases. The use of Grow Safe to help provide confidence in relation to agrichemical use will provide consumers with the confidence that food has been produced to high standards. However, it is expected that a number of agrichemicals will become unacceptable and be withdrawn from use or have greater restrictions placed on their use due to chemical residues or resistance of the target pest. This will increase the demand for pest management solutions based on crop management or using biological controls.

Crop management solutions based on integrated farming systems, crop rotation, cover crops, cultivation and management of crop stubbles will increasingly be important tools in managing pests, weeds and diseases. For example, stubble burning is viewed as a negative practice by many people due to smoke pollution, whereas it is a very valuable tool for sustainable farming practices as it reduces the use of agrichemicals to control pests and diseases. This in turn reduces cultivation as seed beds can be created more easily and the amount of CO_2 entering the environment is the same as incorporating stubble – with burning it just occurs more rapidly.

New Zealand is a world leader in developing unique solutions to manage pests and diseases, with endophyte technology to manage pests and diseases expected to move beyond pasture species to cereals and other crops in the near future. These technologies will provide new opportunities to reduce the use of synthetic pesticides. However, the introduction of these new control approaches will also have to meet standards in relation to safety and sustainability and be supported by excellent data that can be used to address public perception.

Cropping in New Zealand has a very promising future. We have all the right ingredients to be able to produce a wide range of crops in a sustainable manner to meet the needs of future consumers and food trends in key locations throughout the world. Changes will need to be made in relation to the crops grown and how they are grown to deliver quality products using sustainable growing practices. These changes will create new opportunities for consumers, processors and food producers, and particularly food producers who can capitalise on the benefits of water, soil, suitable climates and a skilled farmer base.

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GRAEME AUSTIN

MAIZE IN NEW ZEALAND

— *product of the past or saviour for the future?*

Over the last 30 years we have seen the rise and plateau of maize hectares used for silage and grain in New Zealand farming systems. The first decade of the new millennium saw the rapid rise of maize for silage on dairy farms in this country. Increased demand came with an associated new understanding about where maize could grow in New Zealand and when and how it could be used as a supplement to improve profitability.

A brief history of maize in New Zealand

The history of maize in New Zealand goes back almost 250 years when it was first recorded as being introduced in 1772. Records show that maize was grown throughout the 18th and 19th centuries and was mostly developed through Māori agriculture as they produced it for domestic consumption. Māori selected and maintained open-pollinated varieties in different regions. There may have been some cross-pollination in the formation of these varieties, but it was not until the 1940s that hybrid maize was first brought to New Zealand. With the associated increase in yield of maize due to hybrid vigour the NZ Department of Agriculture began to take an interest and started testing hybrids out of the US.

At this time, Thomas (Tan) Corson had established a number of companies on the East Coast around Gisborne, one of these being a seed company. Corson's were involved in the initial development of hybrid maize testing and commercialisation of seed in the 1950s. During the 1960s and the following decades the production, testing and marketing of seed moved away from the Department of Agriculture and was influenced by private companies, namely, Dalgety Crown who had aligned with DeKalb out of the US, Corson's with Northrup King and Arthur Yates & Co with Pioneer. The only seed company that remains under its original control today is Genetic Technologies Ltd, which is still owned by the Yates family who still test hybrids, produce seed in Gisborne and market the Pioneer brand of maize seed throughout New Zealand.

Development of maize for grain

Yields of maize grain have increased over the years and the changes are well documented. ***Figure 1*** shows how low the yields were in the early 1900s, with single pollination varieties and the increase in yield once new hybridised varieties were introduced. During this time, the area grown in maize also increased from 2,000 to 5,000 ha (2.8 to 3.9t/ha yield) between 1900 and 1960, increasing to a peak in the 1976/77 season of 29,000 ha, with an average yield of 7.9 t/ha. The following seasons were cooler and maize as a crop declined temporarily in popularity. Most maize was grown for grain, but a small amount was

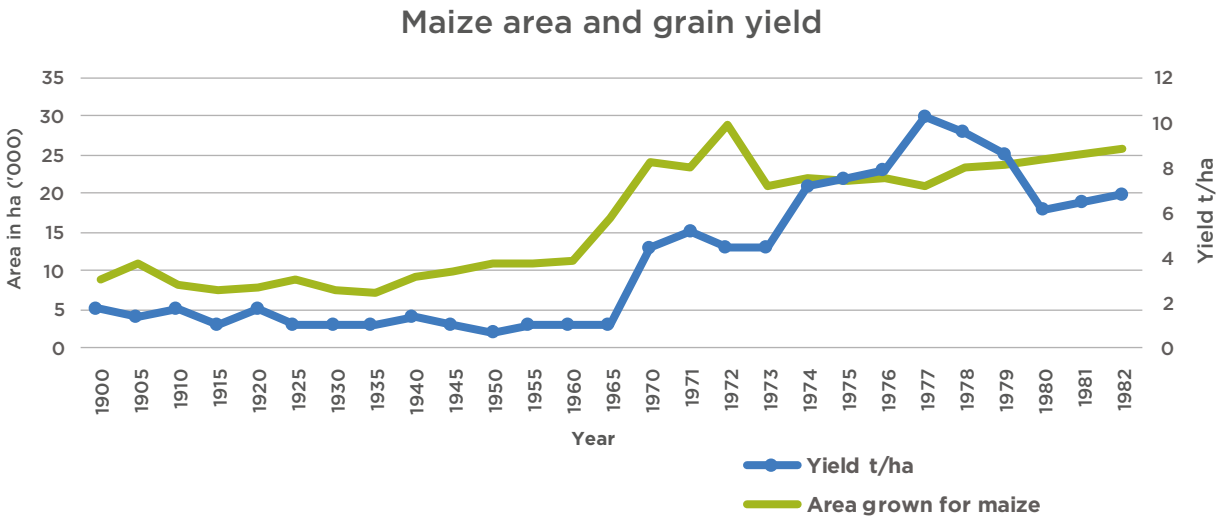

Figure 1: Area and yield of maize for the period 1901-1982 (five-yearly intervals to 1970, yearly thereafter)

Source: Department of Statistics (1983), Agricultural Statistics 1981-82, Wellington, NZ

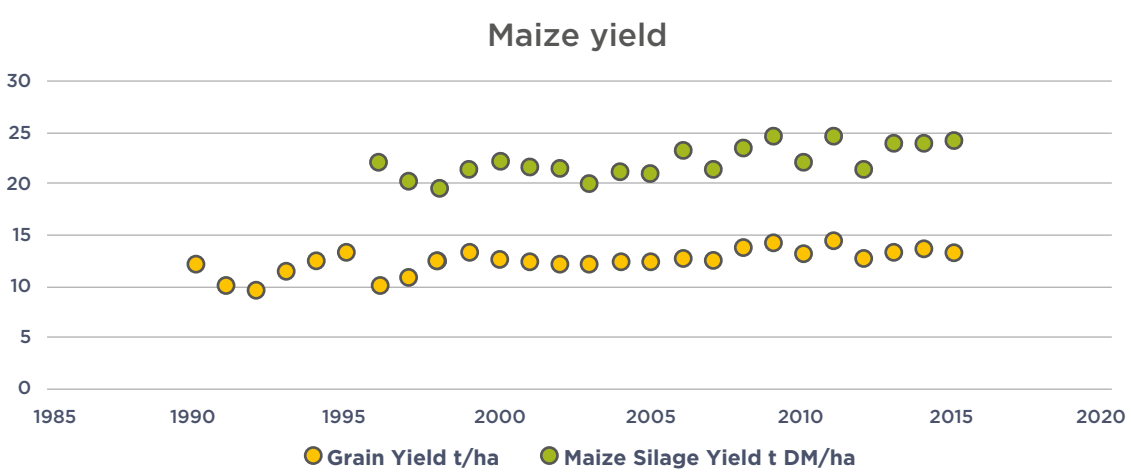

Figure 2: Grasslands (Morris (2016), Journal of New Zealand Grasslands 78: 157-162), NZ maize grain (t/ha based on 14% moisture content) (1991-2015), and maize silage (1996-2015) strip trial yields

Data derived from Pioneer strip trials (1991-2015). Grain y=0.104x-196.04, R^2=0.501, Silage y=0.166x-310.76, R^2=0.467

starting to be grown as a fodder/forage crop. In 1983, 3,800 ha was recorded as being grown for forage in the North Island.

Since the 1970s, the maize grain industry has fluctuated producing around 200,000 t/grain/year. Since then there has been little change to the total production, and today the maize grain industry is still producing around this quantity each year. End users for this market comprise stock feed (dairy, chicken and pork approximately 58%), with the remainder being used in corn starch manufacturing and human food production.

In the last decade, the highs in terms of area for maize grain from the 1970s have not been achieved and the reported area grown for grain has been closer to 17,000 to 18,000 ha each year. Even with the reduced areas, the level of grain production has increased to maintain the annual production of approximately 200,000 t/year. However, the area grown in maize for silage has taken a different path and is now almost two-and-a-half times that of maize for grain.

Commercial yields of maize grain have increased slowly in the last decade. Statistics NZ in its agriculture production statistics show that yields have increased on average from 10.9 to 11.2t/ha. One might question how this can be, considering national trial results show increases of 104 kg/ha/yr for grain and 166 kg/ha/yr for silage, as shown in ***Figure 2***.

Unfortunately, the averages do not necessarily reflect the gains that are being made on some farms. Commercial yields have continued to increase in favourable conditions where yields are now being recorded across large areas greater than 17 t/ha on a regular basis, with the highest yields in New Zealand achieving 20 t+/ha. This is reflected in the trials conducted throughout the country, with yields in the high teens and over 20 t/ha regularly being recorded.

There is a general belief within the maize industry that the disparity between average commercial yields and trial results can be explained by a number of reasons. First, climatic extremes of very dry and very wet continue to occur at a greater frequency, limiting potential yields. Secondly, agronomic factors such as poor weed control, poor cultivation (due to the dry and wet at times of planting and harvest), lack of nutrients and challenges from disease and insects continue to be widely prevalent. Finally, and probably most importantly, the expansion of the dairy footprint throughout New Zealand over the last 10 years has seen high productive cropping areas replaced with cows, which has pushed these areas to more extreme and challenging soils, therefore limiting harvest yields.

Maize grown for silage

Maize for silage is relatively new on the scene compared to maize for grain. As mentioned, there have been small areas grown for fodder (grazed) or silage (harvested and fed out) in the past in New Zealand. It was not until the mid-1990s that Genetic Technologies Ltd saw the opportunity to bring some of the feeding technology from overseas to focus on using maize to 'balance' the New Zealand all pasture diet with the input of starch from maize silage.

This message was received and accepted by a few in the dairy industry as new technology, but there was significant push back from the consultancy community. At this time, introducing a product like maize was seen as inefficient to the farm system as it detracted from the efficient use of pasture as the primary feed. The fear was that by adding another feed or supplement into the system it wasted the cheap pasture that was already available.

Through the late 1990s, Genetic Technologies Ltd did further research work in conjunction with the Waimate West Research Station in Taranaki. This identified that

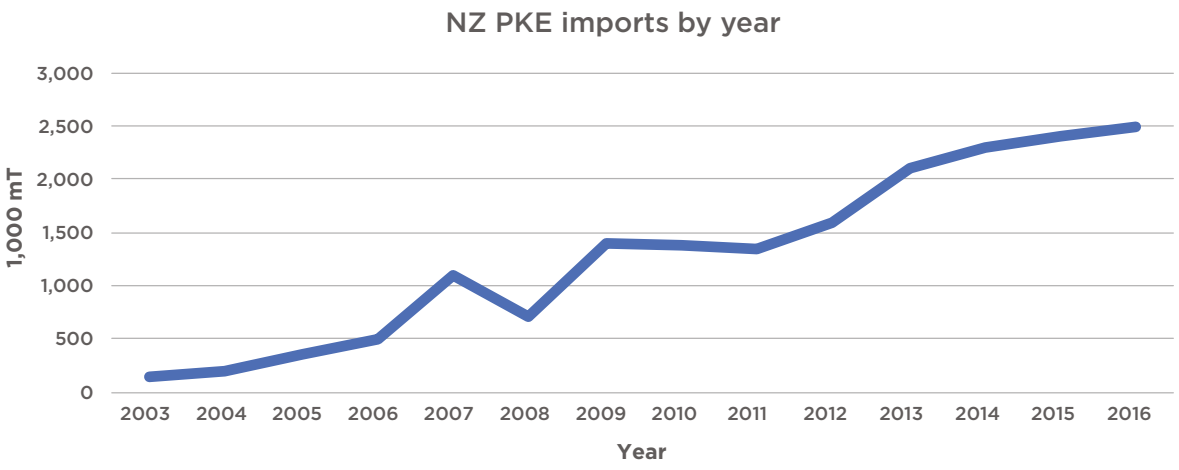

Figure 3: New Zealand PKE imports by year
Source: www.indexmundi.com/agriculture/?country=nz&commodity=palm-kernel-meal&graph=imports

maize for silage, rather than being a 'feed balancer' could be utilised in dairying situations as a product to fill feed gaps, increase stocking rate and extend lactation to increase whole farm system profitability.

Once this message was received and adopted by farmers, and with the agronomic support provided by merchant and seed companies, there was a rapid increase in the maize for silage areas grown throughout the North Island and the upper South Island. Not only did dairy farmers seize the opportunity, but a number of beef farmers also incorporated maize silage into their feeding regimes.

Over the next eight years the maize area grown for silage increased from approximately 15,000 ha to a peak of 60,000 ha. After the 2008/2009 season, which coincided with the global financial crisis, levels fell quickly to below 40,000 ha and subsequently have increased to current levels at between 45,000 and 55,000 ha.

At the same time of the rapid growth in maize sales there was a slowly increasing adoption of palm kernel expeller (PKE) throughout the country. PKE had been available since the 1990s, but it was not until the next decade (2000s) that the price dropped through increased availability and competition. Due to the mostly cheap price, and the ease of ordering and quick delivery, PKE quickly displaced some of the area grown for maize. In some ways, maize for silage and PKE were being used for the same purpose and acted as competitors with each other for the supplementary feed market. In 2016, 2.5 million tonnes (Mt) of PKE was imported into New Zealand (Figure 2). This is the equivalent of 125,000 ha of maize grown for silage.

Most farmers actually continued to use both, finding that they complemented each other through de-risking their exposure to the price fluctuations of both products at different times of the year. Both feeds also have different nutritional components. PKE is higher in protein (range of 12-20%, average 14%), with maize silage at 8%. Maize silage is higher in soluble sugars (starch) at 35% compared to PKE's 5% (see DairyNZ –www.dairynz.co.nz/feed/supplements/feed-values/). Both feeds are high in energy – 10.5 to 11.0 MJME/kgDM.

Around the end of the first decade of this millennia another forage product started to make headway. Fodder beat was the answer to maize silage for the lower South Island. Maize had been grown as far south as Invercargill in the past, but never seemed to flourish in the cooler conditions. Fodder beet became the answer to filling feed gaps with a bulk feed that could be grown in the south, stored and then fed out as required. As fodder beet spread north, this also started to have a limiting factor on the size of the area grown for maize.

So, with the alternative feeds that are now present within New Zealand has the area grown for maize reached a plateau? For those of us that have experienced the last 25+ years in agriculture we know that there is nothing more certain than constant change. We also know that if nothing else New Zealand farmers are very strong at adapting and surviving through times of challenge and adversity. Yes some struggle to survive but, by and large, these farmers have the strength, adaptability and wherewithal to carry on.

The future of maize

What are the main issues currently facing farmers today?

- Environmental improvement standards for farms, healthy rivers and waterways
- Limitations on PKE being fed to dairy cows by Fonterra
- Continuing increase in weather extremes, dry and wet.

Maize will not be the answer to all aspects of these challenges, but there are some key attributes that this crop can offer to assist in mitigating these issues moving forward.

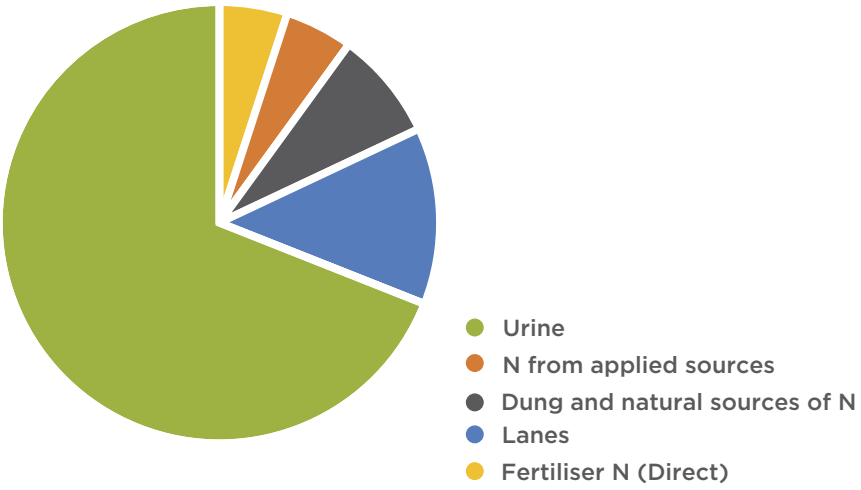

Figure 4: Sources of N loss on a typical dairy farm

(Environment Waikato, 2008)

Environmental improvement standards for farms, healthy rivers and waterways

The environmental concerns in New Zealand focus on excess nutrients leaching into waterways, in particular, nitrogen from dairy cow urine (see ***Table 1***) and phosphate from soil run-off. Greenhouse gases (GHGs) are also an issue that will need to be addressed if we are to achieve meeting the targets for the Paris Accord of 2015. In reducing the impact of nitrogen, we either need to apply less or capture excess levels and redistribute them to moderate their impact.

Dairy cows urinate at levels up to 1,000 kg/N/ha, which can move quickly through the soil out of the reach of pasture rooting depths. Due to the greater rooting depth of maize (30 to 100 cm) it can easily capture much of these nutrients. FAR (Foundation for Arable Research) research has shown a heavy simulated rainfall event after a large amount of N has been applied – this will move very little of the applied N outside the rooting zone of maize (see FAR Maize Arable Update No. 44 (2017) at www.far.org.nz).

Maize silage, due to its low protein content, has less impact on urinary nitrogen compared with other high protein feeds which add to this nitrogen, rather than in the case of maize silage displacing nitrogen from pasture when included in the diet.

Maize is able to assist in reducing the environmental footprint on-farm. Consideration will need to be given to having ongoing cropping areas with minimal or no tillage. When a paddock is initially cultivated out of pasture for cropping significant levels of mineralisation occur and large levels of N are made available and can be leached. When an area has been cultivated in following seasons this mineralisation does not occur to the same degree. It is therefore important to consider that instead of rotating cropping areas around a farm a permanent cropping block be established.

Ideally in a dairying situation the areas where effluent is applied are the best areas to crop as the applied effluent can be utilised by the maize crop and be removed to feed cows, reducing leaching. In most cases fertiliser will not be required to grow the maize crop as sufficient nutrient will be available (but always soil test to verify).

Other options include having specific cropping blocks or run-offs where crops can be grown and cows grazed over winter. These blocks can also receive the effluent solids from the milking platform and/or feed-pad or cow housing as the fertiliser for the following crop, therefore reducing the nutrient loading on the milking area and efficiently utilising the nutrient to grow crops. Many of these systems have already been implemented by farmers.

The fodder beet mentioned earlier as a new fodder crop has rapidly grown in adoption throughout New Zealand. It produces excellent yields and provides high energy feed and can be used to fill feed gaps as required. In the past it has been grazed as well as harvested, and along with other fodder crops farmers will find limitations to grazing in order to meet environmental regulations. Due to the impact of intensive grazing, and the damage to the soil

TYPE OF SILAGE	N INTAKE[A]	N OUTPUT (KGN/COW) (% INTAKE)		
	(kgN/cow)	Milk	Dung	Urine
Lucerne	37	6 (16)	8 (22)	23 (62)
Pasture	24	6 (25)	7 (29)	11 (46)
Cereal	26	6 (38)	5 (31)	5 (31)
Maize	12	6 (50)	3 (25)	3 (25)

[a]Based on 1 t DM/cow

Table 1: Effect of feed source on N output in milk, dung and urine in absolute and relative terms (in parentheses)

Source: Ledgard (2006), Proc. 2006 Dairy3 Conference 4: 22-31

There is a significant focus throughout the world on creating more efficient maize plants. These hybrids are being designed to use less nitrogen and water and grow increased yields in weather-limiting conditions.

and increased leaching, the practice of grazing these crops will be limited in the future. The concentration of nutrients in one area, namely intensive nitrogen application through urine and the run-off of soil particles in heavy rainfall events, will not be allowed to continue.

In areas where maize can be grown, it will once again become more of a favoured crop compared to those forage crops requiring grazing.

Limitations on PKE being fed to dairy cows by Fonterra

Fonterra have announced that PKE should be restricted to 3 kg per cow per day. Other dairy companies have also restricted its use. There have been a number of reasons why these changes are being implemented, including empathy with the issues from the areas where PKE originates. The destruction of rainforests is difficult to accept and the associated public outcry needs to be listened to. The milk component issues, with PKE altering the fatty acid profile of milk and limiting the products that can be made from it, are also a major consideration for change. Other companies, both milk production and farming, have introduced the reduction and phasing out of PKE (Miraka, Landcorp and Synlait to name a few).

Can maize silage make up the difference with a reduction in PKE? As mentioned, the current level of importation of PKE equates to an additional 125,000 ha of maize grown for silage. Although this sounds a significant number, and means tripling the current area grown, it is not outside the realms of possibility.

The 2008/2009 season showed that significant areas can be grown for maize (total maize area approximately 80,000 ha). If in the next few years there is a gradual reduction in the use of PKE, say about a third of current use, an additional 37,000 ha would be required to replace this feed. Total maize area would then be not too dissimilar to the 2008/2009 season and would therefore be very achievable.

Continuing increase in weather extremes, dry and wet

As weather becomes more extreme, maize breeders continue to look for traits that will enhance or improve hybrid performance in challenging conditions. There is a significant focus throughout the world on creating more efficient maize plants. These hybrids are being designed to use less nitrogen and water and grow increased yields in weather-limiting conditions.

In the last few years hybrids have become available commercially in New Zealand and have been selected for increased water efficiency traits and tolerance to dry conditions. We also know that maize (C4) has at least double the water use efficiency of perennial ryegrass (C3) (see www.pioneer.co.nz/content/file.php?file=ODM), i.e. it requires half the amount of water to grow the same amount of dry matter. Even though it is already more efficient, due to it being a C4 plant, significant work continues to be done to make maize better at utilising water and surviving in drier conditions.

To put the amount of global research on maize into perspective, the three largest seed companies currently spend $3 billion on this research alone, which equates to New Zealand's total R&D budget in all sectors (1.2% GDP – $250 billion, 2016).

Conclusion

Does maize have a place in New Zealand farming in the future? Absolutely, but will it solve all our problems and be our saviour? Probably not, but with the features that have been outlined in this article it is a product that continues to stand up and will go a long way in providing solutions for the key issues farmers will be facing in the next few decades.

Maize can assist in mitigating environmental issues on-farm and it is a product that can replace PKE. Farmers will need to start thinking now about alternatives to PKE and planning their farm systems to adapt to the changes that will be required. These changes are coming quickly, and significant support from rural professionals will be required to make this as seamless as possible and assist farmers negotiate through the options that will be available to them.

We are all in this together and we have a responsibility to not look after just the farmers and their families. We must therefore find solutions that protect and enhance our environment and the profitability for all New Zealanders.

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ALISON BAILEY

IDENTIFYING FARMERS' OBJECTIVES AND PREFERENCES ABOUT LAND MANAGEMENT AND THE ENVIRONMENT – LESSONS FROM EUROPE

Agriculture occupies a substantial land area globally and there has been increasing intensification of agricultural systems with the continued growth in population and demand for food. This has included an increased land area under productive activity as it became worthwhile to produce on marginal lands, a need for increased productivity from that and existing land, an increase in monoculture in both crop and livestock systems, and greater use of chemicals in the form of inorganic fertilisers and pesticides.

This intensification has led to a number of concerns including those related to:

- Environmental management and the loss of soil through erosion and the pollution from sediment, nutrients and pesticides that results
- Water availability and water quality
- The impact of agriculture on wildlife habitat and species diversity.

As a result of these concerns, our understanding of agricultural land use has changed in emphasis to one that now recognises the multi-functional nature of farming. In addition to the demand for food, fibre and energy, the maintenance of soil, water and air quality, the conservation of semi-natural habitats and the provision of recreational spaces are now all important aspects of modern agricultural practice and policy. Policies that encompass both the continued demand for food production alongside the desire to protect the environment also need to be compatible with the motivations of the farming population to be successful.

It has long been established that the behaviour of farmers is not driven solely by the economics of profit maximisation and that many different values, beliefs and objectives influence their decisions. Put simply, farmers also make land use decisions in response to a variety of non-profit objectives. These decisions at the farm level are then key determinants affecting changes in land use.

One aspect of understanding and predicting land management decisions and land use change is to increase our understanding of farmers' responses to economic, technological and policy signals and our knowledge of the ways in which farmers move from values, beliefs, attitudes and objectives to observable operational behaviour. This is to better identify and develop sustainable agricultural practices for the future.

Study of lowland arable farmers in England

In a study of lowland arable farmers in England, objectives related to land use managemewnt were identified and structured. The approach used a combination of previously identified farmers' objectives from the literature and exploratory pilot interviews to develop an objective hierarchy. For the pilot interviews, participants were deliberately chosen to reflect differences in age and circumstance.

There is a substantial amount of academic literature examining farmers' objectives. Much of the emphasis appears to be on the reasons for being a farmer and/or for generating income. While such high-end objectives as independence, personal achievement and quality of life are important reasons for deciding to be a farmer, little information is provided on how preferences translate into observable land use management. In a decision framing exercise, all the objectives identified from the previous literature were classified as either strategic, fundamental or means objectives. An arable farmer's strategic objectives, influenced by their circumstances and values, relate to more than their land use decision-making, as they can also be used to generate a set of fundamental objectives for the specific decision context.

Lincoln students farm management analysis visit

The pilot interviews then enabled the decision-making context to be structured in a manner that drilled down from fundamental land management objectives (e.g. maximising disposable income) to the means by which these fundamentals were realised (e.g. maximising farm profit) and the way such means-ends objectives were measured (e.g. optimising crop production). The hierarchy of objectives was then presented to 12 individuals with farming experience in a focus group discussion. Measurement scales for each objective criterion were proposed and discussed, identifying the units of measurement that they felt were most appropriate. Interviews were then conducted with 48 farmers from the eastern counties of England to give their individual weightings to the differing objectives provided. Upon viewing the results, including a graphical representation of their weights, the farmer was given the opportunity to revise their estimates until satisfied that the weights reflected their preferences.

In total, 44 objective statements were generated through the literature review stage. As many were about the reasons for being a farmer, e.g. lifestyle, rather than land management goals, these were dropped. With arable land management as the decision context, seven fundamental objectives were derived based on their emphasis in the literature and the pilot phase of the study. These were income generation, autonomy, management innovation, recreational land use, appearance, environmental protection and time spent farming. A range of means-end objectives for each of these were then derived, culminating in the development of 15 criteria measures to be used in the farmer interview stage.

Our understanding of agricultural land use has changed in emphasis to one that now recognises the multi-functional nature of farming. In addition to the demand for food, fibre and energy, the maintenance of soil, water and air quality, the conservation of semi-natural habitats and the provision of recreational spaces are now all important aspects of modern agricultural practice and policy.

Two criterion measures were used for the first fundamental objective of income generation – farming income and risk. Farming income (£ year^{-1}) was defined as annual income generated through land management consisting of crop enterprise output, Single Farm Payment (made to farmers on a per hectare basis to support income), agri-environment payments, and other land-based income after both fixed and variable costs were accounted for. Farmers were asked to identify the best and

European farmers' business objectives are focused on profit, business growth and, at product level, yield. Wider considerations relate to lifestyle, status and legacy, and leaving the land in good condition for future generations. In only one country, the UK, is the environment mentioned.

worst case scenarios for income levels. Risk was linked to absolute deviation in arable farming income. Some farmers are prepared to cope with a widely varying income on the chance that some years will be very good. Others would rather have an income that is more constant across years but potentially lower. Farmers were asked to provide the best possible and worst possible amount their farming income could vary by over a five-year period.

The second fundamental objective was autonomy and was associated with regulatory constraints. Farmers had to meet cross-compliance requirements to gain access to what was then the Single Farm Payment and meet statutory regulations related to fertiliser use if the land they farm is within a designated Nitrate Vulnerable Zone. Their participation in other agricultural land-based schemes is not mandatory. These non-mandatory schemes each come with an administrative burden and a set of rules and regulations to abide by. Farmers were asked to consider whether they would not sign up to these schemes because of the number of additional regulatory constraints.

The third fundamental objective was management innovation. When asked about their innovativeness, farmers stated that they would consider anything that could have a positive effect on their business, but that there was a limit on the number of things they were prepared to cope with at one time because each new addition to their management load added a layer of complexity. The number and variety of crops, the level of agri-environmental management and the use of new equipment and techniques were all mentioned. The criterion measure used to measure innovation was management complexity, i.e. the amount of difficulty associated with running a number of different enterprises and operations simultaneously within the farming year. For this objective, farmers were asked to consider two different land management criteria: the number of different crops grown; and the number of different environmental stewardship options managed.

The fourth fundamental objective was recreation with the main recreational use of land identified as game shooting. Participants stated that this had a direct influence on management, as they felt that game bird populations could be sustained by planting cover crops and providing grain. This also had an indirect influence on management, as they were more likely to be interested in the development of non-cropped areas as wildlife habitat to provide food and shelter. Two criterion measures were used to distinguish between land management for recreational shooting and land management for commercial shooting. In the second case, the management required to generate income from shooting may run counter to the management required for optimal arable output, resulting in a trade-off between income sources. This is less likely to be the case for recreational shooting. Satisfaction with recreational shooting was expressed in terms of the time that could be spent on the activity – the days per season. The utility of a commercial shoot was expressed as the number of paid for birds shot per season.

Environmental concerns were split into two fundamental objectives: those that had an effect on the appearance and atmosphere of the farm; and those that influenced natural resources such as soil, water and air. During exploratory interviews, natural resource concerns were either seen as subject to regulation or as part of the optimisation of inputs associated with generating income. The criteria identified in relation to the environmental concerns were thus concentrated on appearance and atmosphere rather than environmental protection. The appearance of the farm was the most complex objective with seven criteria identified. These were landscape structure (length of hedgerow, area of woodland), biodiversity (bird species diversity and population size) and the appearance of cropped areas (number of tall weeds that appear above the crop canopy, number of other weeds and number of skylark plots, i.e. patches of bare soil within the crop that are beneficial to skylarks).

The final fundamental objective was that linked to lifestyle and time spent farming. The personal circumstances of farmers vary widely and the time available for farming can vary for a number of reasons, from semi-retirement, through running a diversified business, to having a full-time job elsewhere. The criterion to measure this was the time required for the non-farming activity, including both holidays and other work.

Using these criterion common and diverse directions of preferences and weightings for the objectives were identified, starting from the identification of the most important objective with every other objective scored relative to this. In most, but not all cases, income was the most important objective with an average preference weight of 24%, with a range between 10% and 50%. The next most important objectives were free time (12%, range 0% to 29%), risk minimisation (9%, range 0% to 20%), crop management complexity (8%, range 0% to 22%) and number of stewardship options (8%, range 0% to 18%). Combining these criterion into their fundamental level objective categories provides the following average preference weights for income including risk management (34%), farm appearance (29%), management complexity (16%), and time spent farming (12%), with autonomy (6%), and recreation (3%) making up the remainder.

Generating land-based income as the respondents' most important objective was heavily reliant upon market prices. Risk, in terms of variation in income, was important. However, the nature of farmers' orientation towards risk varied between individuals. A subset of farmers was less risk averse, preferring greater variability for the chance of making a high profit in some years. The ability to spend time away from core farming activities was very important, but the time required varied widely. A separate but additional component is the objective linked to recreational shooting.

In terms of management complexity, it was extremely important for some farmers to keep crop management complexity as simple as possible. Rather than this consistently translating into as few crops as possible, which was the case for some farmers, utility was often maximised at median crop numbers for crop protection and labour management reasons. There were also farmers who preferred greater crop complexity. This was also the case for the number of stewardship options. In terms of farm appearance, biodiversity as measured by farmland bird diversity and population generated a marginally higher objective weight (11%) than landscape attributes such as hedges and woodland (9%). The latter was also marginally higher than the appearance of cropped areas (9%), with greater weight given to tall weeds that can be more easily seen within a crop when compared to other weeds.

It is evident from these preference weightings that income and risk management are important objectives, but farm appearance (incorporating some elements of concern for the environment) is also important to farmers.

Study of arable farmers across Europe

In a second study of European farmers, business and personal objectives, and perspectives on attitudes towards and ranking of different environmental concerns and management practices within their agricultural system were established. This allowed a more detailed examination of habitat and biodiversity, crop protection, and soil and water issues.

The interviews were conducted with 85 farmers across seven representative countries in Europe, Germany, Hungary, Italy, the Netherlands, Poland, Sweden and the UK growing the major European crops including wheat, maize, oilseed rape and sunflower. The interviews were based on a structured questionnaire with a combination of both closed and open questions to provide both quantitative and qualitative data for analysis.

When asked about the objectives they had for their business and for themselves personally they were also asked to rank both of these in terms of importance. They were also asked to identify the key influences on their business.

Table 1 highlights each farmer's business and personal objectives. It is evident that European farmers' business objectives are focused on profit, business growth and, at product level, yield (put simply, productivity). Moving beyond these business objectives, however, there is also evidence that wider considerations relate to lifestyle, status and legacy, and leaving the land in good condition for future generations. In only one country, the UK, is the environment mentioned.

The key influence for all countries is climate with most also mentioning politics, soil and then economics. Government is given as the key organisation that influences the business the most. In two countries, environmental agencies/institutions are also mentioned. Other organisations and individuals given as influencing the business include the owner, family, the bank and business partners.

In terms of environmental management, the farmers were asked a number of questions around three key areas:

- Their attitudes towards certain management practices
- Their perspectives on the advantages and disadvantages of certain practices most relevant to them
- The relative importance of various factors in producing a satisfactory crop.

Table 1: Farmers' objectives and influences listed in order of importance

Country	Business objectives	Personal objectives
Germany	Business growth Profit	Lifestyle Personal earning Happiness Recreation Social status Health
Hungary	Increase farming area	Retirement
Italy	Profit Expand business Switch enterprise Turnover	Lifestyle Status Free time Healthy
Netherlands	Increase profit Increase yield Expand activities Shrinking Switch activities	Lifestyle Status Leisure Pensions
Poland	Profit Expand Switch enterprise	Lifestyle Childcare Family Free time Social status
Sweden	Turnover Profit Expand farm area Expand enterprises For next generation	Lifestyle Become an owner Family Free time Health Pension Next generation
UK	Increase profit Expand business	Lifestyle Legacy Free time Environment

Table 2: Attitudes towards management practices

Management practice	Like		Indifferent		Dislike		Unfamiliar	
	No.	%	No.	%	No.	%	No.	%
Rotation	77	91.7	2	2.4	5	6.0	0	0.0
Ditch management	43	57.3	16	21.3	12	16.0	4	5.3
Woodland edge management	31	55.4	15	26.8	5	8.9	5	8.9
In-field trees	31	50.8	17	27.9	10	16.4	3	4.9
Hedge management	30	50.0	9	15.0	18	30.0	3	5.0
Buffer strips	30	49.2	12	19.7	15	24.6	4	6.6
Erosion management	25	45.5	7	12.7	1	1.8	22	40.0
Grass margins	33	45.2	15	20.5	18	24.7	7	9.6
Mixed cropping	30	39.0	16	20.8	17	22.1	14	18.2
Field corner management	29	38.7	17	22.7	14	18.7	15	20.0
Set aside	25	30.9	8	9.9	46	56.8	2	2.5
Cover crop	18	30.0	22	36.7	16	26.7	4	6.7
Wildflower strips	21	27.3	17	22.1	32	41.6	7	9.1
Beetle banks	15	26.8	16	28.6	19	33.9	6	10.7
Conservation headlands	21	26.6	16	20.3	31	39.2	11	13.9
Overwinter stubbles	14	23.7	15	25.4	28	47.5	2	3.4
Undersown spring cereals	14	23.3	11	18.3	28	46.7	7	11.7

Note: numbers do not add up to the same for each practice as some respondents did not specify an answer for all practices

Table 2 presents the responses about the broad range of practices presented to all farmers. A scale from 'like', through 'indifferent', to 'dislike' was used to indicate their response. They were also given the opportunity to say they were unfamiliar with a particular option. The data presented is both the number of responses for each practice and also the percentage in relation to all responses given.

Most frequently there is a definitive like/dislike response, although there were indifferent responses to a range of options, including crop management, in-field and edge of field practices for some respondents, and more indifferent responses from those farmers in Hungary. Some respondents were unfamiliar with certain practices, primarily erosion management.

In terms of preferences for land management practices, the options receiving positive responses were those that most farmers across Europe would be more familiar with and already undertake, such as rotations, ditch and hedge management. The practices which take land out of production and/or were perceived as potentially contributing to increased weed, pest and disease presence were disliked, whether in-field or edge of field. Similarly, those practices that required some form of additional management, and which could also be seen as perhaps having greater environmental potential (again whether in-field or edge of field), were also disliked.

Table 3 presents all of the comments about the advantages and disadvantages of various practices. It is evident from the responses that there is a reasonable understanding in the European farming community of the relationship between land use and management and its impact on the environment and, in turn, the impact of the environment on productivity.

Frequent reference is made to productivity, with comments on both the physical in terms of yields and the economic in terms of both profit and costs. Impacts, both positive and negative, about soil, and weed, pest and disease management, were also highlighted. The benefits for the habitat, wildlife and aesthetics were mentioned, but the translation into the provision of ecosystem services were not explicitly seen. For a number of practices there was a divergence in opinion, and in some cases something that is seen as leading to an advantage for production and the environment can also be simultaneously seen as leading to a disadvantage.

Despite this there is awareness of the services provided by the environment that emerged more explicitly from the final set of interview questions. ***Table 4a*** provides the overall summary of responses in relation to the relative importance of various factors in producing, or not, a satisfactory crop. ***Table 4b*** highlights the differences between countries, to some extent a reflection of the climate and crops grown.

The appropriate management of soil, specifically soil fertility, as a productive asset provided by the natural environment is of particular concern. Water availability is also important. In the breakdown by country pollination is then important for some, but not all. Weed, pest and disease management are of less concern, perhaps because it is felt that these can more easily be managed (and have been adequately managed) through mechanical and chemical means. Pest regulation by natural enemies is ranked towards the lower end for most countries.

Following on from the ranking question, the farmers were then asked a series of questions about the issues they faced and how they managed these, covering soil, weeds, disease, pests and also pollination.

Soil structure issues were evident in the responses from the farmers in Hungary and the Netherlands, but not in the majority of responses from the UK, Germany, Poland and Italy.

Most farmers thought that healthy soil biology could improve productivity and thus tried to facilitate this. Responses differed by country, but generally covered organic matter, compost and manures, cover crops, reduced pesticide use and tillage practices. Problems with water storage with 'too little' capacity were evident in the UK, Germany and Poland, and both 'too little' and 'too much' were evident in Hungary.

To control disease incidence most respondents used agrochemicals, with some exceptions in Italy, Poland and Hungary. All respondents also used other forms of control. These differed by country, but in all countries crop variety as an approach was mentioned and, except for Hungary, also crop rotations. In Germany, the Netherlands and the UK the farmers referred to a much wider range of practices than the farmers from other countries.

Table 3: Perspectives on management practices listed in order of frequency of mention

Intervention (country)	Advantages	Disadvantages
Diverse crop rotation (Germany, Italy, Poland, Sweden, UK)	Soil structure and biology Prevents erosion Increases organic matter Water retention Adds nutrient Weed management Reduced pesticide Less disease pressure Less input Increases yield Workload Economics	No advantage Complexity Spring cropping Reduced yield Fluctuation yield Water requirement More work Cost Fluctuation profit
Mixed cropping (Germany, Poland)	Better land quality Soil Maybe pest and weed reduction Ecological	No advantages Weed control Reduced yield Unable to sell No market Economic loss
Set aside: whole field (Hungary, Sweden)	Habitat Wildlife Forage Soil	No advantage Financial Base for pests Weed build-up Low quality forage
Set aside: field margin (Hungary, Netherlands)	Machinery rotations Access to ditches Source of natural enemies Less use pesticides Habitats, invertebrates, wildlife Less use fertiliser Public opinion	Economic loss Loss of land Source of weeds Encourages public access
Reduced tillage (Germany, Italy, Sweden)	Improves soil Water retention Less fuel Reduced time Reduced workload Reduced costs	No advantage Impossible Compaction Increases weeds Increases herbicides Reduced yields
Hedge management (Italy, UK)	Wildlife Host fauna useful Aesthetics Firewood Windbreak	Management Shade Pest refuge Reduction in yield

To prevent pest damage most farmers again used agrochemicals, but also saw pest regulation by natural enemies as important and made efforts to encourage their presence, although this is less evident in Poland and also Hungary. Methods to encourage natural enemies fall into two categories – those related to pesticide use and those for habitat management.

Most farmers also used agrochemicals to control weeds, with some exceptions in Poland and Germany. All of the farmers also used other forms of control. These generally referred to crop rotations, some form of mechanical weeding and cultivation methods.

In all countries, farmers saw pollination as important for influencing yield and undertook measures to encourage pollinators. These tend to fall into three areas: renting or owning a beehive, restricting pesticide application in some way, or providing a suitable habitat. German and UK farmers provided a range of responses. In the Netherlands and Poland pesticide use is referred to, and then reference is made to one further measure (flower strips and owning beehives, respectively). Italy mentions just restricting pesticides, and Hungary just renting beehives.

What is evident from the responses about the services provided by the environment is that in all countries there is some awareness within the farming community of these services and a positive attitude towards them. However, for productive agricultural activity there is continued reliance on traditional management practices, such as the use of agrochemicals, crop rotation and cultivations, with the management of the wider environment perhaps seen as of lesser importance.

Implications for New Zealand

In the New Zealand context, it is suggested that similar business and personal objectives are likely. In a sector more exposed to global markets and with less government intervention, farming income, risk avoidance, management complexity and autonomy are likely to feature highly. On a more personal note, lifestyle and recreation will be important to most, as will the appearance of the farm.

In terms of environmental management, soil will always feature strongly. In New Zealand, with its pasture-based system and reliance on irrigation for both the dairy and horticultural sectors, water availability will be important. A related concern is that of nutrient management and water quality. In the long term, concerns over biosecurity, pest management and pollination will also be important.

In managing the farm system and the wider environment, it is evident that there is a good understanding in the global farming community of the benefits of a healthy environment. This does not necessarily always translate into integration into agricultural practice. The adoption of new or alternative practices requires a good understanding of the how of implementation, as well as the detail on the benefits that can be derived, and not just the financial. There is a need for awareness creation and education through advice and demonstration, and although familiarity with management practices is the key to their adoption, perhaps more important is understanding the motivations of the potential adopter.

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Table 4a: Ranking of the provision of services by the natural environment – overall

Service	Very important	Important	Not as important	Relatively unimportant	Rank
Soil fertility	76	8	0	0	1
Water availability	63	14	6	0	2
Disease damage	43	34	4	2	3
Pest damage	34	37	9	1	4
Weed presence	37	32	6	6	5
Pollination	45	19	1	2	6
Pest regulation	24	29	19	11	7

Table 4b: Ranking of the provision of services by the natural environment – by country

Service	Germany	Hungary	Italy	Netherlands	Poland	Sweden	UK
Soil fertility	=1	1	1	1	1	=3	1
Water availability	=1	2	3	2	=2	=1	5
Disease damage	4	4	6	3	=2	=1	3
Pest damage	5	3	7	5	=4	-3	4
Weed presence	7	5	=4	4	6	=3	6
Pollination	3	6	2	7	=4	7	2
Pest regulation	6	7	=4	6	7	6	7

STEPHEN MACAULAY
NZIPIM CHIEF EXECUTIVE

DAIRY FARM SYSTEMS

An inaugural group of farm consultants recently became qualified under the NZIPIM's Dairy Farm Systems Certification Scheme. In this article we look at the background of the scheme, its purpose and what is involved in becoming certified.

Background

New Zealand is internationally regarded as a high-quality producer of safe and nutritious food products. Once this would have been enough to secure market access and our place in the world, but this is no longer the case as other food-producing nations have become more globally competitive.

Consumers are demanding greater levels of assurance and transparency in the manner in which their food is produced. In the case of agriculturally-related food products this now extends into areas such as animal health and welfare, sustainable management of our natural resources, management of people, and operating best on-farm management practices.

To keep ahead of our competitors and to ensure the integrity of our high-quality food and fibre products in the marketplace, we must provide consumers with greater levels of assurance and transparency throughout the whole supply chain, which starts from behind the farm gate.

The impact of farm management practices on water quality is facing increased scrutiny by regulators and the New Zealand public, further challenging the farmer's ability to increase the production and profitability of their farming business.

To prepare the farming community to meet these future challenges, and to build capability within the primary industry, a number of certification schemes have been developed through the Transforming the Dairy Value Chain Primary Growth Partnership, a seven-year $170 million innovation programme led by DairyNZ and Fonterra and partnered by the Ministry for Primary Industries.

Under this programme, the New Zealand Institute of Primary Industry Management (NZIPIM) and DairyNZ

CERTIFICATION SCHEME

have been involved in the establishment of the Dairy Farm Systems and People Management Certification Schemes. In future, NZIPIM will run the schemes and be responsible for setting standards, facilitating assessment requirements and certifying individuals.

For the purposes of this article, the focus will be on the Dairy Farm Systems Certification Scheme, principally: an overview of the scheme, its purpose, what is involved in becoming certified, and the governance structure.

Overview of the Dairy Farm Systems Certification Scheme

The development work of the Dairy Farm Systems Certification represents a collaborative partnership between NZIPIM, DairyNZ and leading dairy farm systems consultants, who continue to be involved in developing and testing the assessments and associated training to ensure the material they use is kept current and relevant to the rural profession. The scheme was officially launched at NZIPIM's National Conference in August 2015.

The purpose of the Dairy Farm Systems Certification Scheme is to provide the farming community, and potentially regulators, with assurance and confidence that individuals certified and recognised under the scheme are competent and have skills and knowledge in the provision of professional advice about dairy farm systems.

In consultation with subject matter experts in dairy farm systems, the scheme has been designed to ensure it is relevant and reflects best on-farm practices. It also supports the professional development and training opportunities of individuals where knowledge gaps have been identified for the purposes of providing an improved service to farming clients.

As part of the development of the scheme, Assessment Criteria were developed to determine benchmark standards to evaluate an individual's competency and knowledge base in dairy farm systems. This is also aligned with standard good practices for dairy farm systems consultants, as well as keeping pace with emerging industry needs such as the increased emphasis on sustainable environmental management.

The Assessment Criteria for the Dairy Farm Systems Certification Scheme include nine topic areas:

1. **Consultant Skills** Professionalism, communication, ethics and extension skills.
2. **Financial Management** Assessing ability to use appropriate tools and data to determine the financial position of a farm business, including the identification of financial and productivity strengths and weaknesses against benchmarks, forecasting the potential impact of changes to liquidity, profitability and overall financial position.
3. **Dairy Production Systems and Grazing Management** Assessing knowledge of production system and grazing management principles and practices, and ability to provide context specific recommendations to farmers which achieve profitable and sustainable outcomes.
4. **Reproductive Performance, Growing Young Stock and Animal Evaluation** Assessing ability to apply reproduction principles and processes to correctly interpret data and provide recommendations for improvements to herd fertility.
5. **Animal Husbandry Health and Welfare** Assessing awareness of good management practices for the prevention and treatment of major diseases; rules and procedures in relation to animal welfare; and managing body condition to optimise performance.
6. **Environmental Management and Regulations** Assessing knowledge of good environmental management practices and regulatory requirements, being able to identify adverse environmental risks, and facilitating agreed actions for improved environmental outcomes.
7. **Milking Cows** Assessing awareness of good design principles in a dairy and are capable of identifying common design faults and basic strategies for improvement to milking efficiency.
8. **Farm People Management, Health and Safety** Assessing awareness of the requirements associated with the employment of staff and understanding of the impact of people management practices.
9. **Whole Farm Assessment and Planning** Demonstrating skills in information gathering; analysis; synthesis; planning; recommendations; and written and verbal communication.

To assess whether an individual meets the required benchmark against the topic areas contained in the Assessment Criteria, a range of assessment tools have been developed which include a series of online assessment tests (via the newly developed NZIPIM online profession development platform), completing and submitting a Whole Farm Assessment report and action plan, and completion of a client survey.

The Assessment Criteria will continue to evolve to reflect changing practices and the latest research, which is part of a continuous improvement approach adopted by the scheme to keep it relevant and up-to-date.

What is the value proposition in becoming certified?

In future, we see increasing emphasis around the credentials of individuals providing professional services to their clients – requirements for financial advisers to comply under the Financial Advisers Act 2008 being a case in point. Early indications suggest that regional councils may also seek farm environment plans developed or verified by 'recognised' individuals or firms. DairyNZ is already embedding the use of certified rural professionals into new and existing projects, and in the referral of farmers to services such as the interpretation of DairyBase reports and Whole Farm Assessments.

While still relatively new, feedback from individuals who have gone through the process note the following prospective benefits from becoming a Certified Dairy Farm Systems Consultant:

- By being certified individuals can demonstrate to their farming clients the currency of their knowledge in dairy farm systems through an independent assessment that is recognised by the industry's professional body (NZIPIM) and DairyNZ.
- Providing an opportunity to assess individual's knowledge base against a nationally developed standard, as well as a mechanism to explore professional development opportunities where skill gaps have been identified.
- Keeping up-to-date as a practising dairy farm systems consultant through continuing professional development (CPD) and relevant training.
- Providing junior farm systems consultants and individuals entering the profession with a pathway to build their knowledge base in dairy farm systems, and once certified they can demonstrate competency in building a client base.
- Creating opportunities to leverage credentials as a Certified Dairy Farm Systems Consultant into new and expanding business areas within the primary industry.
- Establishing a referral network (including preferential contracting arrangements) with NZIPIM, DairyNZ, regional councils and other groups seeking farm systems expertise.

An inaugural group of 13 farm consultants have recently completed certification requirements. With over 60 people from across the country now enrolled with the scheme, we expect to see a steady stream of consultants complete certification requirements over the next 12 months.

The process to become a Certified Dairy Farm Systems Consultant

To become a Certified Dairy Farm Systems Consultant, applicants are required to undertake the following process:

1. Be a member of NZIPIM and completed its Ethics Module;
2. Confirm that they are delivering at least 600 hours per year of client work as a farm systems consultant;
3. Successfully complete an online assessment test to assess the applicant's technical competency in farm systems components as prescribed in the Assessment Criteria for Farm Systems Certification;
4. Submit one Whole Farm Assessment report for review; and
5. Receive satisfactory feedback from a group of five farmer clients (including the Whole Farm Assessment client).

Upon successfully completing all of the above requirements, the applicant will be recognised by NZIPIM as a Certified Dairy Farm Systems Consultant. At this point they will be listed on NZIPIM's website, as well as links driven from DairyNZ's we bsite where farmers are seeking certified individuals.

Once an applicant becomes a Certified Dairy Farm Systems Consultant, they will be required to complete CPD requirements of 20 hours of structured learning annually and at least 20 hours of unstructured learning each year, which is aligned with the current requirements for NZIPIM's members.

Governance of the scheme

NZIPIM's certification schemes shall be operated by the Certification Subcommittee that reports directly to the NZIPIM Board. The role of the Certification Subcommittee is to oversee the management of the assessment process and, in certifying applicants, ensure certified individuals' CPD is up-to-date, appoint assessors and receive complaints should there be any.

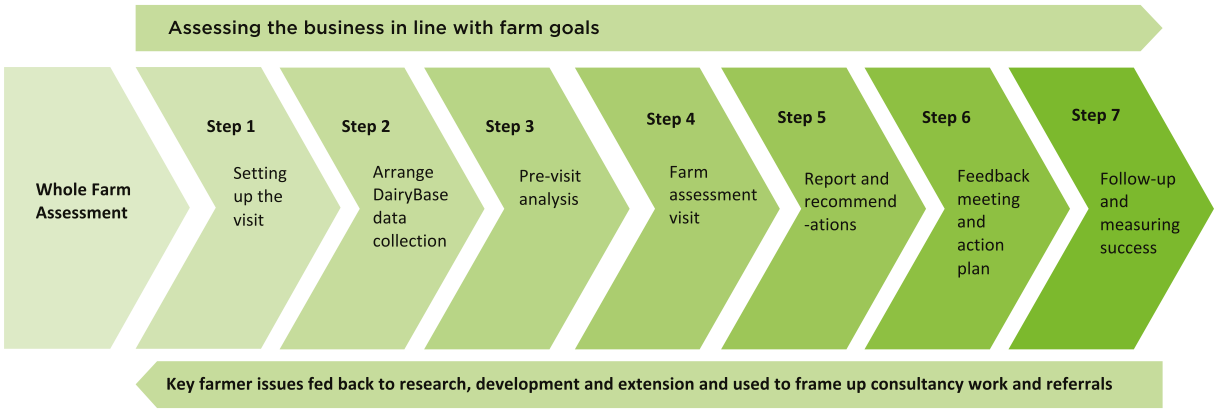
The Certification Subcommittee will be made up of five members comprising of two representatives from the NZIPIM Board, one from DairyNZ, and two independent members. The independent members will be selected on the basis of the different skills and expertise they can bring to the Certification Subcommittee for a term of two years.

There is a strong commitment that certification schemes held by NZIPIM will be run in a cost-effective manner relative to the size of demand, whilst ensuring that the integrity and credibility of the schemes are valued by rural professionals and held in high regard by the farming community.

For more information

For further information on the Dairy Farm Systems Certification Scheme, refer to the Certification page on NZIPIM's website www.nzipim.co.nz , or alternatively contact NZIPIM on 04 939 9134 or admin@nzipim.co.nz

WHOLE FARM ASSESSMENT



The Whole Farm Assessment provides a process for analysing a whole farm system to identify and prioritise key issues, opportunities and options for change in line with the business strategy.

The assessment combines analysis of physical and financial benchmarking data (through DairyBase) with on-farm observation and a structured discussion with the farm team covering the business objectives and management practices.

Strengths, weaknesses, risks and opportunities across all components of the business are assessed including strategy, finance, governance, people, pasture, feed, environment, animals, reproduction and infrastructure. The end result is a comprehensive report and succinct action plan providing a pathway for the farm business team.

The Whole Farm Assessment can be used to understand the business and establish clear areas of focus for new clients, as well as taking a step back to determine where to next for existing clients. Where the farmer is faced with a specific issue (e.g. a need to reduce nutrient leaching), the Whole Farm Assessment can be used to understand the farm context and identify where efficiencies can be achieved in the existing system before considering a system change. J

MIKE HEDLEY

BECOMING A CERTIFIED NUTRIENT MANAGEMENT ADVISER

Why is the number of certified nutrient management advisers growing, what is expected of a highly skilled adviser, and why do we need more people training in this field?

Exponential growth in advisers

Last time I looked on the Nutrient Management Adviser Certification Programme (NMACP) website (www.nmacertification.org.nz/) there were 150 rural professionals certified and another 65 in the pipeline. Of those in the pipeline to complete the certification in the next six months, half were independent consultants and half were account managers for our two large farmer cooperative fertiliser companies (Ravensdown and Ballance).

What is the cause of this exponential growth? Well, at the moment in New Zealand we have two giants on a collision path that frequently ends in confrontation, compromise and stalemate. Skilled nutrient management advisers taking instructions from both giants are required in facilitated discussions and consultations to find a way forward:

- Giant one, which is a more familiar character with farming goals, is the government's Business Growth Agenda (BGA), which targets a doubling of primary sector exports by 2025
- Giant two is the National Policy Statement for Freshwater Management (NPSFM) 2014 and the National Objectives Framework for Freshwater Management (NOFFM).

Statements and frameworks

The NPSFM and NOFFM have birthed from recommendations of the National Land and Water Forum to the Ministry for the Environment. The Forum (consisting of responsible citizens, industry bodies and non-government organisations) recommended that the Ministry for the Environment release a national policy statement on water quality management (NPSFM),

At the moment in New Zealand we have two giants on a collision path that frequently ends in confrontation, compromise and stalemate. Skilled nutrient management advisers taking instructions from both giants are required in facilitated discussions and consultations to find a way forward.

which included national water quality standards. The Forum also recommended that a framework be provided that outlined the process by which water quality assessments would be considered in appropriate freshwater management zones (catchments and sub-catchments).

If after assessment improvement in water quality was necessary, the change to land or water management required to promulgate the improvement could be evaluated using different modelled scenarios (objectives, limits, methods and timelines). The assessment and scenario testing should provide a clear understanding of the costs, benefits and consequences of each of the management change options. A National Objectives Framework Reference Group (NOFRG), consisting of expert science panels and officials (in discussion with the Iwi Leaders Group), developed the outline of the NOFFM.

The NPSFM and NOFFM are instruments of the Resource Management Act 1991, which was introduced 'to promote the sustainable management of natural and physical resources.' It requires 'every person' to recognise their duty to avoid, remedy or mitigate any adverse effect on the environment that could arise from their activity. Most people 'elect' to have their responsibilities to the Act implemented by their custodians of land and water resources the regional councils. While the Act is not prescriptive in any way about the measures that should be used to assess land or water quality or achieve regional sustainability, the NPSFM and the NOFFM are.

There are national bottom lines in terms of water quality measures (e.g. indicator faecal coliform numbers and nutrient levels such as nitrogen). In addition, regional councils are required to establish community catchment comittees (e.g. Canterbury Regional Council's 10 Freshwater Zone Committees) to discuss the state of water quality and decide on the water quality level that meets the community's water use aspirations. If the level is lower than that which meets their aspirations then they decide which, if any, land or water management steps need to be taken to improve water quality.

Critical role for nutrient management advisers

Regional and district councils therefore have two roles: (i) to develop plans for land management and water quality; while (ii) maintaining or improving the social and economic fabric of the regions. So both giants are promoted and implemented, respectively, by regional councils. A schizophrenic migraine, if ever there was one.

Central government, primary industries and regional councils hope that we have in place the skill set, capabilities and infrastructure to find the sweet spot where triple bottom line (social, environmental (or ecological) and financial) improvement can be achieved. Who is expected to find the sweet spot? You have guessed it – the skilled nutrient management adviser. Finding the sweet spot – whether it is finding headroom for more milk, meat and wool production for a client constrained by ground or freshwater quality nitrate leaching limits (increased economic growth within limits) or developing the regional councils' models of nitrogen load transfer from farm, or catchment, to water – is not a job for the unskilled. It's a job that carries significant responsibilities for future generations and significant liabilities if it is done incorrectly.

Need for OVERSEER skills

The skills required to undertake such a task require a full understanding of nutrient cycling and water movement through agricultural landscapes and knowledge of the assessment of nutrient requirements of a range of agricultural systems. The trainee adviser needs to know how these nutrient cycles are simulated by the nutrient budgeting software programme, OVERSEER.

The development of OVERSEER skills is aided if the trainee is already a graduate in agricultural science and understands the operation and production of New Zealand farm systems. If not, then an understanding has to be developed of how a farm's land and soil resource, supplementary feed and animal, pasture and crop production information is accurately transformed and inputted into OVERSEER. With the correct information for farm management blocks, OVERSEER is able to simulate the nutrient inputs and transformations and flows within and losses from the farm. Once these skills are obtained, then the trainee can use nutrient budgeting to test scenarios of best management practices for environmental protection.

Intermediate and Advanced SNM courses

The Sustainable Nutrient Management in New Zealand Agriculture course (termed 'the Intermediate course') offered by the Fertilizer and Lime Research Centre at Massey University provides a gateway to this knowledge and early development of nutrient budgeting skills for either pastoral agriculture or orchard and arable production. Since 2002, the number of people who have taken the Intermediate SNM course is 1,862.

The course comprises 40 hours of pre-course reading on New Zealand's soils and landscapes, nutrient cycles in

Certification is encouraged both by primary product processers, such as meat and milk companies aspiring to global good agricultural practice assurance schemes, and regional councils wishing to benchmark nutrient loss from farms to water in sensitive catchments.

New Zealand's farming systems, soil and plant testing, fertiliser materials, the hydrological cycle, and the processes and pathways for loss of nutrients from farms to surface and ground waters. This is followed by a three-day residential course that reinforces the reading material and provides a hands-on introduction to the use of OVERSEER nutrient budgeting software.

The trainee nutrient adviser is then ready to undertake farm case study nutrient budget evaluations. This experience is provided by the next course in the series, Advanced Sustainable Nutrient Management (ASNM). Since 2005, the number of people who have successfully completed the ASNM course is 698.

The normal prequalification for the ASNM course is the Intermediate SNM course, but students may be granted entry into it based on prior equivalent learning (i.e. B+ achievement in specific papers at either Massey or Lincoln Universities within the last three years and/or an in-depth knowledge of sustainable agricultural practices including extensive use of the OVERSEER Nutrient Budgets software).

For the ASNM course, participants must complete four assignments over a five-month period, attend a three-day contact course and pass a two-hour examination. The assignments are case studies using the latest version of OVERSEER Nutrient Budgets software and include both pastoral and arable farm case study examples. These are intended to assist participants to develop nutrient management plans that meet production goals for actual farm enterprises, while minimising the negative effects of nutrient losses on the environment.

The three-day contact course involves a mixture of workshops in which the case studies are discussed, and there is presentation of leading edge research into farm nutrient management, as well as lectures on nutrient trading and the management of trace elements on farms. After completing the ASNM course, it is advised that at least six months' experience is gained in completing farm nutrient budgets and working with farm consultants to develop farm nutrient management plans. This experience is important, because although a correctly constructed nutrient budget is important and is the basis for planning alternative nutrient management scenarios required to reduce nutrient loss from a farm, the farm consultant will have other skills and tools (e.g FARMAX modelling experience) that will allow a cost-benefit analysis of the alternative farm management scenarios.

Final certification

With the successful completion of the ASNM course and practical experience under their belt, the nutrient adviser can enrol with the NMACP to become 'certified'. Certification involves an online competency assessment during which the candidate demonstrates that their skills and knowledge meet the required standards. The certification programme aims to establish a recognised set of industry standards for nutrient management advisers to meet. This gives assurance that a certified nutrient adviser will provide the highest quality of advice to farmers and regional councils. Once certified, the programme provides ongoing professional development for the adviser with instruction and evaluation modules on topics relevant to changes in the version of OVERSEER and hot topics such as irrigation and fertiliser borne contaminants.

Summary

A wide range of farm consultants, veterinarians and fertiliser company account managers are becoming certified nutrient management advisers. Once certified, an adviser is listed on the NMACP website. Farmers and the public are able to view the list of certified advisers. Certification is encouraged both by primary product processers, such as meat and milk companies aspiring to global good agricultural practice assurance schemes, and regional councils wishing to benchmark nutrient loss from farms to water in sensitive catchments. Both require evidence that farm nutrient management plans have been prepared to the highest standard. The demand for high quality nutrient management plans is increasing as regional councils in New Zealand embrace the NOFFM. In the near future, certified nutrient management advisers may also be called upon to use OVERSEER to estimate a farm's greenhouse gas emissions and provide management scenarios showing how these can be reduced.

For those thinking about becoming a certified nutrient management adviser, a new round of the Massey Intermediate and Advanced courses in Sustainable Nutrient Management in New Zealand Agriculture begins in early 2017 (see www.massey.ac.nz/~flrc/). J

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GAVIN AND KENDALL MCEWEN

BEST BUSINESS PRACTICE FARM MANAGEMENT

Farm businesses in New Zealand now have substantial amounts of capital invested. Yet there seems to be a disparity in how many farms use information and metrics to assess and control business performance compared to what can be considered best practice in other industries.

Lack of farm business metrics

Rural professionals (RPs) in New Zealand cover a wide range of vocations and specialities, and many of those roles exist in other industries. However, RPs are bound by a strong common objective – to see the agricultural industry prosper and be more productive and profitable. Being involved in an industry that is prosperous, and working with farmers and families of the land who enjoy and take pride in what they do, often leads to great job satisfaction.

However, making a living from the land nowadays is complex and there are greater pressures to perform than ever before. Farming businesses need support in various forms, not because they are not capable in their own right but because to face and conquer these complexities specific and technical advice is often required.

Most farm businesses in New Zealand do not have a board of directors, but increasingly we are seeing the creation of 'a trusted circle of advisors'. This is a team of individuals selected by the landowner in who they confide, share information and make decisions to guide the business forward. RPs, i.e. rural bankers, accountants, consultants, agronomists etc, are essential components of these teams. There is no 'bible of best practice' for these often informal teams. But to be effective there is an essential ingredient that is often lacking – reliable, consistent information on the performance of the farm business on a regular basis, in other words, farm metrics.

In today's world the role of RPs is to add value not only in their area of expertise, but to have an understanding of how that contributes to and affects the bigger picture and the overall direction and performance of the rural business. RPs not only have a significant role to play in encouraging and promoting the collection of data required to generate performance metrics, but also in helping to understand the different elements and how they contribute to the common goal of profitable, sustainable rural businesses.

Many platforms exist through industries initiatives like DairyBase, Beef + Lamb NZ's Economic Service and other private sector examples such as DSM (Dairy Systems Monitoring), Horizons Benchmarking in Northland and AgFirst's benchmarking surveys. All have relatively limited uptake yet we know those farms that participate are often in the upper quartile of performance. The challenge is to encourage non-participants to adopt the practices increasingly being considered as best practice to achieve business performance goals.

In this context 'best practice' means those common elements, practices and attitudes of high-performance land-based businesses. The ANZ *Agri Focus* article, 'The Secrets to Top Performing Red Meat Farmers' (December 2014), details several of these factors:

- Vision and drive; well-defined personal and business goals
- Having the right skill set and a talented team, as well as using specialist advice when required
- Above-average execution of key farm management practices and mitigation of risk
- Having a good fundamental understanding of the key drivers of profitability and keeping track of them.

Consider this encounter below as a real example of the dynamics and attitudes that currently exist around what is considered best practice in regard to performance metrics.

The story goes like this: the audience consisted of farmers, consultants, levy-funded extension people and scientists. It was a conference focused on maximising grass utilisation in pastoral farming systems. The presenter asked a farmer sitting towards the front, 'If you don't mind, how much is your farm worth?' 'Probably about $6 million,' came the reply. 'Quite a bit,' the presenter retorted. 'Yeah I guess so,' said the farmer with typical Kiwi modesty.

Speaking to the entire audience the presenter continued, 'Tell me, if you took that $6 million and invested it in a manufacturing business in Auckland then what, as the owner, would you want to know about the performance of that business?' Answers came thick and fast: the return on asset; the amount of raw material required each day; planning for continuity of supply; the efficiency of conversion from raw to finished product; how much finished product is produced each day and how much it costs to produce; how efficient my business is compared to others so I can remain competitive; and so on.

At least another dozen answers were given, all reflecting what appeared to be best business practice for managing a business with that amount of money invested. Not wanting to embarrass the original quizzed farmer, but interested to know, the presenter turned back to him and asked, 'Do you know all those types of metrics about your farm business?' The sheepish reply was, 'No, not really.'

What is stifling the success of farm businesses?

'Why not?' Why don't the majority of New Zealand's 25,000 professional (larger than 100 ha) pastoral farmers really know the key performance indicators (KPIs) required to run an efficient, profitable enterprise when they have substantial amounts of capital tied up in their businesses?

We don't always think of farms as businesses. We see the grass, the cows, the sheep, the gumboots and the swannies, but it is difficult to perceive them as a more nature-based equivalent of a factory, shop or organisation. To stay ahead of the curve, it is essential that we treat farms as businesses and apply the same principles that other high-performing business do. Having the necessary financial, production, environmental and legal information about the rural business is paramount, because no business can make smart and profitable decisions if there is limited or inaccurate background information. Farm business metrics will (and do!) drive overall business performance.

While the lack of awareness about the performance metrics in some farm businesses is concerning, we know why it exists to an extent. Operators of land-based businesses are an intuitive and resourceful group, but knowing intuitively how your farm is operating does not always match the actual results. The reality of running a land-based business nowadays is that it is impossible to be across everything in the detail required to perform to the potential of a farming business. It is impossible to compute all possible variations and options in making timely decisions in one person's head.

Another factor leading toward this general apathy of 'she'll be right, I've got a handle on this' is that there is the assumption by many that land values will continue to increase, meaning the farm business does not necessarily need to be profitable.

The last and perhaps most prolific reason for a lack of farm business metrics is because the data required is too hard to collect and interpret. Also the collection of the information required to monitor performance is not the favourite task of many. There is always something better or more urgent to do on-farm. That is the challenge to overcome, and the best way to do it is to ensure the data is transformed into compelling, valuable information that necessitates it becoming a discipline.

We need to know and understand these barriers so that they can be overcome. RPs have an integral and important role to play in helping farmers realise that data is worth collecting and that the generation of business metrics enables a crucial understanding of their farm's business performance. To be successful, it takes time, effort and understanding, and in modern farming is every bit as important as the physical aspects of the operation.

Defining the indefinable – best practice

Defining best practice for a farm business can be complex and open to interpretation and opinion. But for New Zealand farmers overall, best practice should result in a profitable and sustainable business by way of carefully balancing environmental, biological and financial feasibility.

Best practice is an oxymoron – vague yet specific at the same time. There are precise best practices that individual farmers should focus on tailored best to the needs, goals and challenges of their individual farms. There are also general best practice guides which all farm businesses should follow to keep up with changes and challenges in technology, legislation, consumer demands and economics. It is these general best practice policies that provide an overarching framework that allow farms to achieve the ultimate goal of being profitable *and* sustainable.

Information overload

How do we know what best practice is? The easiest way to learn more about best practice is data collection on-farm and this in itself is best practice. All farmers can benefit by collating financial, physical and environmental information about their farms. This data, once analysed, often leads to better and more informed decision-making which can be fed back into the operation of the business. It is a virtuous cycle: a two-way street. Farmers need to gather or acquire the information (not always that easy) for themselves or RPs to understand the farm business and enable timely, relevant decisions to be made. It is an ongoing iterative feedback loop (see ***Figure 1***).

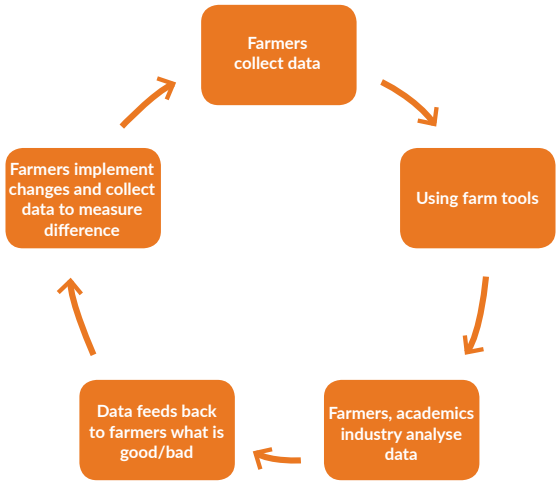

Figure 1: The virtuous cycle, the better the data, the better the decision

Our definition of what is best practice is constantly evolving thanks to the constant flow of new information we gather and analyse, which is why continued and regular data collection is essential.

The hard part is that sometimes there is just too much information thrown at farmers, and they do not have the time to wade through it in deciding what is useful and what is not. A great deal of the technology that farmers need to run a profitable and sustainable enterprise already exists, but so often we seem to be reinventing the wheel which ends up confusing the very people it is trying to help. Companies with applications like Cashmanager Rural, FarmIQ, MINDA, Farmax and Overseer, to name a few, need to pursue greater integration so farmers can better benefit from the tools we already have. For instance, manual data entry and even worse, entering data twice, is the number one turn-off for many users.

All farming businesses should be as equipped with knowledge and insight as in any other type of business. Measurements of KPIs are essential points of understanding that farm owners need because how do they know where they are going if they don't know where they are? KPIs and benchmarking gives reference and insight into the successes, challenges, goals and failures of the farm enterprise. For those of an inquisitive and competitive nature, comparing between similar farm businesses further confirms good and bad aspects and allows for trends and patterns to be identified and improved upon.

For best practice policies to be created in the first place a great deal of data is first required. A myriad of data can be obtained from a single farm, but without context the information can be meaningless. We therefore need information from (ideally and impossibly?) all New Zealand farms to identify patterns and trends, areas for growth, necessary changes and successful practices.

Relying on technology

The utilisation of agricultural technology is the best way to gather and analyse farm data, but it is important that this information is reliable. Agricultural decision-making and data collection tools therefore need to be of a high standard, trustworthy and ever-evolving. These tools must perform to their own standards of best practice. In turn, the educational institutes, industry good organisations and RPs that dissect and interpret this data must follow their own best practice when analysing and communicating this data back to farmers.

There are many intelligent tools to support farmers in managing their businesses, yet uptake is relatively low considering the benefits they offer. In the 2015 ANZ privately-owned business barometer for the dairy industry, business modelling software was identified as one of the pieces of technology 'helping farmers look at different scenarios and optimise their farming system.' It went on to say. 'The relationship between inputs and outputs is complex, and many farmers put formal analysis in the too hard basket. However, resources such as DairyBase, and planning and business modelling software such as Farmax and Udder, provide agri-industries with very effective tools to support business optimisation and efficiency decisions.'

Why then is the uptake of these software based tools on-farm so low compared to other industries? One of the reasons is that it is too hard to operate these tools successfully and achieve a tangible value proposition for farmers. They tend to be time-poor, particularly at critical times of the year like mating, calving and lambing, so data collection takes a back seat.

How do we make it easier? Agricultural technology is going a long way in furthering the sharing of farm data for industry good by developing practices that ensure its transferability, security and utilisation.

Developed by DairyNZ, the Ministry for Primary Industries and the Red Meat Profit Partnership, the Farm Data Code of Practice has been a positive step forward in the safeguarding of farm data and giving farmers assurance that it is being used appropriately and responsibly. Accredited companies agree to be transparent about how they store, protect, process and share the data of their farmer clients. Currently only a small number of companies are accredited, so it is imperative that more get involved as their way of adhering to best practice in agricultural data security.

Keeping people power alive

Although the reliance on technology is far greater than it ever has been, and the dependence will only increase, we cannot completely forgo people power in favour of computers. No technology can yet mirror the intuition and emotion that humans possess and this is still important as a buffer and counter to technology and data. RPs also have a role in testing and working through the data, and if warranted exercise caution, which in itself is another best practice that farmers can adopt.

The old proud attitude of 'I don't need any help' still exists but borrowing the skills, knowledge and experience of RPs is invaluable. It has been observed by many bankers and accountants that their most profitable and successful clients often have a trusted support networks of staff and experts to help them get the most out of their farm business.

Benchmarking – show me yours, I'll show you mine?

Essentially, best practice is often first about knowing and second about doing. Knowing what is best for the farm and then doing it. However, being proactive to new knowledge and discoveries is also important because what is considered good practice does not remain stable over time. It evolves and progresses because there is always something better, which is why benchmarking is such a valuable tool for farmers to track their individual progress and for the industry to track overall gains over the years.

There are a variety of systems that provide benchmarking reports for their clients, with variables including farm system, land type and location, and giving farmers in-depth information on the three main pillars of successful farming (biological, environmental and financial). They allow farmers to not only compare their current performance against previous years, but judge their successes and challenges against other farm businesses as well. Knowing what works well, what could be improved on, and the areas of opportunity abound in benchmarking information.

Simple steps

Remember best practice is only a concept – there is no rule book to follow. Every business is different, every landowner unique, and all have different motivators and reasons for being on the land. The process of getting the best possible results out of a business, in line with the owner's aspirations and needs, can be achieved by following some basic guidelines. Once these are established more detailed management principles can be implemented.

1. Ask the questions and be honest and realistic – This applies to everyone involved in the farm business, but you need to start with the owner as they have the capital at risk. What are their goals? Are they achievable with the resources available? Sometimes the goal might be as simple as giving their children a good education, so work out if the business can generate the cash required. While the percentage of farmers doing budgets is on the increase, the accuracy of those budgets can be poor. Many can't be achieved and the farm system won't work. Make sure the financial budget is based on a feasible physical budget. Farm system modelling tools can greatly assist in providing a biologically sound platform for a feasible financial budget.

2. Monitor, monitor, monitor – Creating a budget for the year, breathing a sigh of relief when the bank approves it, and putting it on the shelf is poor practice. The budget (financial) and plan (physical) are the navigation charts of the business. They need to be constantly referred to and compared against. There's no crime in changing the plan in response to factors influencing the farm (a drought, a flood, better than expected prices). All provide challenges and opportunities that can be best meet by being proactive. Changes to the physical plan will influence the financial budget, and knowing during the season what the likely end result will be, then discussing that with RPs, adds immense value to the business. Perhaps, more importantly, it gives peace of mind to the owners.

3. Data collection is not real farm work! – In modern farming it is becoming one of the most important aspects of farming. It is becoming harder and harder to 'farm off the grid', if not impossible. Relevant, timely data not only informs the business operation, it is also essential for ethical, environmental, legislative and many other reasons. Figure out what is essential, then decide on the most efficient and effective ways to collect it.

4. Get around the kitchen table – A problem shared is a problem solved, an old saying with a great deal of relevance and truth for land-based businesses. Here's a different variation: 'an opportunity lost is less likely with many eyes'. No-one has all the answers and sometimes we are blinded by the obvious: surround the business owner with good people who look at things from different angles. It can make all the difference.

An opportunity lost is less likely with many eyes

Overall

For the primary industry to keep progressing and remain competitive under increasing local and global pressures we need the ability for land-based businesses to truly understand their business performance. This not only involves internal comparisons, but local, national and even global comparisons based on relevant KPIs or metrics. The interpretation of that information to inform good decision-making needs to be a team effort, with RPs playing an integral part.

The data required to create these metrics needs to be easily collectable and, if held by other sources, easily accessible. It needs to be standardised and metrics derived in a consistent way.

Lastly, the stigma around 'collecting data and being in the office isn't real farming' needs to go. These are large businesses generating employment, local and national prosperity, and producing high-quality products in global demand. We need to help ensure they are sustainable and profitable into the future.

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Chris Garland

The health of the recreational fishery off Castlepoint, the safety of cyclists on the road, and how to keep yourself mentally fit are the main things on Chris Garland's mind these days. On an industry level, what concerns him most is the lack of connection between urban kids and the countryside, the challenge of a social licence to farm, the lack of succession in the consultancy industry and the risk of data overload clogging up good decision-making.

A brief history

Lack of connection with the countryside stems back to Chris's introduction to the primary industry. He grew up on the outskirts of Karori in Wellington, and his father was in shipping but farming was in the family. Chris's grandfather had been a regional manager for Dalgety and he had two uncles farming. Holidays spent on those farms were enough to convince him that animals, people and open spaces were a 'bloody good combination'. A brochure provided by a careers advisor at Wellington College titled 'Advisory Careers in Agriculture' set a course to Massey where Chris completed a Bachelor of Agricultural Science in 1979 with First Class Honours and a Massey Scholarship.

The first six years in the industry was spent with the advisory services of MAF in Masterton as a Farm Advisory Officer (FAO). The advice was free and it was a licence to learn. Chris's first boss was the larger than life Terry Donaldson. One of the most valuable pieces of advice that he gave him was, 'They don't care what you know, until they know that you care.' That is, until you build a rapport with people and they have some trust in you, they're not interested in what you might have to tell them.

Chris says, 'The cold winds of change blasted the industry with the new Labour government elected in 1984. This heralded the end of free advisory services provided by the government, and indeed most of the subsidies and support until then available to the industry.'

BakerAg

A little after this, David Baker, then a consultant with the Wairarapa Farm Improvement Club, asked Chris if he would like to join him in private practice. In July 1986, D.O. Baker & Associates was formed (with one associate), later to become Baker & Associates and now BakerAg.

Chris notes that the late 1980s and early 1990s were tough years in the industry. Prices were poor, interest rates peaked at 25%, and there wasn't a lot of equity or profitability in farming. It was not easy for a fledgling self-employed consultant to find work. Fortunately the government provided consultancy packages for farmers which included investigating the discounting of debt held with the Rural Bank. For him, 'This work not only kept the wolf from the door, but helped to forge Baker & Associates' reputation in the industry.

Each report prepared for farmers under this scheme had to be audited by an independent expert. This person told us that our reports were the best he saw, from the point of view of empathy with clients and helpfulness of information. This gave me a huge confidence boost.'

The first employee that David and Chris took on was a young graduate from Massey, Nicky Orbell, and this was a great success. Further additions to the team came along, to the point where today BakerAg staff comprises five sheep and beef consultants, three dairy consultants, two valuers, a health and safety manager, a human resources manager, two business analysts, four on the administration team, and the company has offices in Masterton and Feilding.

What is BakerAg's point of difference? Chris believes that BakerAg consultants have a reputation for giving honest, well-supported advice. The quality of that advice comes from taking the time to understand the client and from getting the analysis right. Benchmarking has always been a cornerstone of the company's service to clients. Started by David Baker in the Wairarapa Farm Improvement Club, the Financial Analysis Bureau (FAB) has nationwide recognition and is used extensively by BakerAg consultants to provide clear analysis of farm businesses and key performance indicators to aspire to.

BakerAg has always been big in farm business groups. It still operates nine sheep and beef and three dairy groups throughout the southern North Island and nationally. This is where benchmarking is most powerful – where farmers see successful farming practices being translated into bottom-line profit. Joining those dots, and having that connection reinforced every month, is a powerful motivator.

AgLetter

Another important event in 1986 was the development by Chris of a weekly publication, the *AgLetter*. This modest document was designed to fill a need of providing independent market price information and topical management advice. It seemed to hit a mark, and subscription numbers gradually grew to the point where 30 years later it has a national subscription base and a dedicated following. *AgLetter's* uniqueness is that it is written in a familiar, punchy style that is informative and easily read. It tries to nail the most topical issues – recent subjects include a review of rural internet services and farm insurance cover in the event of natural disasters. Some say that the best feature of the *AgLetter* is its weekly joke and Chris feels that humour is a key ingredient in making something readable.

The industry looking forward

In 2005, Chris completed the Kellogg Rural Leadership course at Lincoln and his thesis for it was 'Rural Consultancy in 2025'. Many of the trends and issues identified by this paper are coming to fruition: lack of succession in rural consultancy businesses, the impact of environmental concerns around farming practice, the amalgamation of farming businesses and the impact of information technology.

He notes that a survey of rural consultancy businesses in 2008 suggested that over 60% were one-man bands. Those operators had no succession plan and they are now in the process of retiring. BakerAg has found that the first step in business growth is the hardest – taking someone else into the business. Thereafter, it is a matter of 'biting the bullet' and accepting some short-term monetary loss for long-term gain. He says, 'That moment when you can delegate that job and know with confidence that it's going to be done well is an epiphany.'

Chris believes the rural consultancy business model is flawed. Income is capped by the numbers of hours you can work and by how much you can charge per hour. Successful businesses need to have a leverage component (e.g. publications, services not related to hourly rate, junior staff to leverage off or outside business interests). Four of BakerAg's team have farming businesses outside of consultancy and others have built an asset base outside of their consultancy business funded from that business.

Chris also feels the social licence to farm has become a reality. The New Zealand public and various lobby groups are putting huge pressure on the primary industry to front up to its responsibility around environmental health, principally water quality, greenhouse gases and soil health. Although the industry might feel that it is being unfairly singled out, much of this criticism is valid. Consultants have a key role in helping their farming clients to develop mitigating practices (e.g. cost-effective methods of *measuring* water quality coming out of a farm's catchment). If farmers can measure it, they will change it. So far this information has not been available (e.g. developing farming practices that improve feed conversion efficiency, which automatically reduces the greenhouse gas emissions per kilogram of live weight gain).

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He also notes that, 'The amalgamation of farming businesses is a natural response to marginal profitability. Although larger corporate businesses tend to capture attention, especially those overseas-owned, most large-scale farming businesses in New Zealand are still family-owned and these are often the most successful. Agribusiness consultants have a critical role to play in these larger businesses and that is around governance. Small family businesses that grow into large ones often fail to develop governance skills to match, i.e. they are still run as a dictatorship. There's the challenge.

'Information is power. Not sure. Certainly, knowledge is power. Too much information can be debilitating. With broadband available to most farms now, our clients don't need consultants to bring them information. They need us to filter and package that information and use it to add value to their businesses.

'Another important role that rural professionals have is to find and create "heroes" in the industry. Farmers are generally kinaesthetic learners. If they can see, touch and feel a success story, they'll grab it with both hands. Farmer of the Year competitions are a great example, along with the Ballance Environmental Awards and the Ahuwhenua Trophy.'

The next few years

Chris is now, as he says, in the 'senior' years of his career. He believes that having been in the game for over 37 years, there's probably only another 8-10 years of working life left in the old dog. There's a bit of a succession plan schemed up, and some value in the business to be sold at the end. For him, it is encouraging to have a number of young, keen and competent colleagues in the business to keep him on his toes and to ensure that it is enduring. Married to Cheryll for 34 years, he has three adult children. He's also a keen road cyclist and fisherman, has a private pilot's licence and is a self-confessed foodie.

Affiliations

Chris is a Director of BakerAg. He is a Registered Farm Management Consultant, a Past-Councillor of the NZ Society of Farm Management (the precursor to the NZIPIM) and a Fellow of the NZIPIM. He is also a Kellogg Scholar, was awarded the Landcorp Communicator of the Year in 2015 and the Grassland Farm Consultant of the Year that same year. Chris is a past-President of the Masterton South Rotary Club, a Paul Harris Fellow and Chairman of the Castlepoint Ratepayers' Association. J

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