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Primary Industry Management

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nzipim NZ Institute of Primary Industry Management

NZ Institute of Primary Industry Management

National Office
Level 2
Johnston Street
Wellington
PO Box 25-603, Wellington 6146
Phone 04 939 9134
Facsimile 04 939 9135
Website www.nzipim.co.nz
Email admin@nzipim.co.nz

President Hilton Collier
Chief Executive Stephen Macaulay

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Editor
Julian Bateson
Email: bateson.publish@xtra.co.nz

Assitant Editor
Helen Greatrex

Editorial Office
Bateson Publishing Limited
PO Box 2002, Wellington
Telephone 04 385 9705

Advertising Enquiries
Bateson Publishing Limited
Telephone 04 385 9705

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Julian Bateson

Potential conflict and change

The main feature in this of *Primary Industry Management* is about water storage schemes for irrigation. I do have a personal interest to declare in any concern I have about such schemes. I live in the Wairarapa on land which would be affected by one of the suggested plans for a number of irrigation dams. I would not lose any land, but my access would change. However, my closest neighbours would suffer severely. One would lose around half his farm land as well as his house. Others would lose all their land and homes.

The concern I see it is that the government will effectively compulsorily buy the land for such schemes at current market prices. I may have been misled, but as these are privately funded projects, with some government and council support, and for which agriculture would benefit and not the general public, I would have expected that market forces would be used. In other words the money offered to compensate landowners for their loss should reflect the value of the project of those involved in making money from the venture.

These irrigation schemes are becoming bigger and bigger projects affecting many people. Some will benefit significantly, others will lose a lot. There needs to be a better balance and more understanding of the effects on those who will not benefit if conflict is to be avoided and intensification of agriculture is not to get all the blame.

Water storage and irrigation

The feature on water storage and irrigation involves dams which have been completed, as well as one still in the planning stage and waiting for approval. The most recent news on this project, the Ruataniwha in Hawkes' Bay, is that another month has been added by Hawke's Bay Regional Council's response to the draft decision. It has also just been reported that the second of the two major funders has now withdrawn, putting the whole scheme in doubt.

The board of enquiry has granted resource consent but with very strict limits on water quality. These limits are imposed to ensure that aquatic life in the river will survive in spite of the agricultural intensification expected. It is a bold and far-sighted decision which will hopefully set the water quality standards for many decades.

Barry Ridler, in his article, looks at the comparative costs of using irrigated water supplied by dams compared with the alternatives. This view is backed up by comments from Fonterra and Dairy NZ as well as Beef and Lamb. Jock Webster presents an insight into the North Otago irrigation scheme which combines irrigation and hydro-power, but took around 24 years from conception to completion.

David Caygill has a more conventional look at irrigation in Canterbury and the increasing nitrate levels in the drinking water. New rules are now in place which directly limit the amount of nitrate which can be leached from the land. These rules now need to be tested.

Change and more change

The rate of change seems to be increasing in most aspects of life. Primary industry is well used to change and the article by Philippa Rawlinson et al outlines the social influence of dairying in Southland. This part of New Zealand has been transformed over a period of 20 years from having around eight million sheep and 100,000 cows to having half as many sheep but six times as many cows, and with dairying still on the increase. Rates of change are a concern to any business and coping with the increasing speed of change is going to be difficult. Southland is now managing this in the community, but it has not been easy.

Andrew West considers our time in the sun and how food and fibre have been the mainstay of the export economy for over 150 years. But the author questions how long this will last and suggests New Zealand needs to plan for significant change within the next 50 years. Nic Lees continues this theme, looking at New Zealand's past competitive advantages and leading the world in efficient agriculture. However, he suggests that selling milk powder as a commodity is only a short-term gain, and to reach long-term sustainable profitability there will be pain before the gain.

Change is part of the concern which Jacqueline Rowarth has in her article on agricultural education and employment. We need many more graduates in agriculture but they will have to cope with more change, particularly over the next few years as farming gets more complicated. Higher education needs to change and adapt or students will look to other areas of employment.

The United States is moving into more intensive dairying which David McCall and Sam Howard explain in their article, following Keith Woodford's description of the industry in the March issue of this journal. The United States dairy industry is firmly focussed on export markets. New Zealand still has a slight edge in the cost of production but will need to change to avoid losing competitiveness.

Change is also the focus for the NZ Institute of Primary Industry Management. In his article Stephen Macaulay, appointed Chief Executive just over a year ago, outlines changes in strategy and focus for the coming years.

Barrie Ridler

The icebergs in proposed irrigation schemes

Farms are relatively complex systems. In Deep Survival, ***Laurence Gonzales cautioned that the more complex a system becomes, the more difficult it is to manage to full efficiency and the greater the chance for catastrophic failure. Contemplating any change to a complex system requires thorough analysis and persistent attention to identify probable constraints and therefore avoid such failure.***

However in *Thinking, Fast and Slow*, Daniel Kahneman observed that the human brain has a natural desire to form immediate pictures of problems and rely intuitively on the obvious solution. Compounding this tendency is that when humans become enthusiastic about an idea, there is far less rigour applied to analysis and fewer or no alternatives are considered.

This awareness of human tendencies provides an insight into the current clamour to intensify farm systems using irrigation. The two projects closest to the starting blocks are the Ruataniwha Water Supply Scheme and the Hurunui Water Project. Both have had considerable favourable publicity from self-promotional press releases extolling their virtues, but seem designed to increase farm production at any cost rather than actually provide any economic gain for the farm.

When contemplating any change at farm level, a partial budget provides a way of assessing costs and benefits of a current production system and those of proposed change. This works for a simple change, but irrigation entails too many inter-related and interacting components to provide optimum resource allocation.

Farmers contemplating using an irrigation scheme should require full comparative farm systems analysis, and not the simplistic economic analyses generated from programmes where operators select inputs which then remain fixed for the duration of the analysis. This method of using selected and fixed resources will have only a very small chance of providing a comparison of the best solutions between different resource allocation options.



The bias of the optimistic operator will be reflected in the data and responses used, and is unlikely to provide a realistic reflection of actual farm level results.

Accurate and unbiased data

The use of accurate and unbiased data is paramount given the new complexity being added to what may have been a simple farm system, but such data is difficult to source. Previous irrigation systems relied mainly on river run systems where flow rates were greater than requirements for irrigation and secondary to the hydro-electricity generated. Both the Ruataniwha Water Supply Scheme and the Hurunui Water Project require high dams built on rivers which will not or may not be able to supply sufficient irrigation water as well as normal flows for environmental river conditions in summer.

The Makaroro river flow has not actually been measured at the dam site in the five years since the dam was originally considered. The synthetic flow rates used in the preparation of this regional irrigation proposal are open to considerable debate, yet are pivotal to determining the area that can be irrigated and the reliability of supply.

Who supplies the data?

Depending on who submitted to the debate on this matter, the synthetic Makaroro water flows may be as much as 35 per cent over-stated, and the response to added water varied between a plausible 10 kilograms additional dry matter per added millimetre of water per hectare, a ratio of 10:1 to as much as 35:1. Most research data favours response figures of between 7:1 and 12:1, providing that additional phosphate and nitrogen are also applied. However, even this data is open to debate due to the detail that is lost in all the averaging.

Dry summers provide a better response to water than damper summers and this relates to the percentage water deficit in the soil at irrigation time. Therefore consistently dry conditions can be managed and provide better results than would the Ruataniwha area which averages between 1,000 and 1,200 millimetres of rain and whose monthly spread is quite uniform throughout the year. Summer rainfall may be erratic but can also be very intense, coming as it does from the edges of sub-tropical cyclones and thunderstorms.

Analysis of the data

The Ruataniwha Water Supply Scheme is also based upon a contracted 'take or pay' system of 35 years, yet apparently without compensation if water supply is insufficient. This makes analysis of the viability of such a scheme extremely difficult. Any comparative analysis requires all the costs and benefits before any change to be compared to those after the change. There should also be a comparison of what other alternative systems are possible, rather than costing only an irrigation alternative. This step seems to be overlooked in the rush to use irrigation as the only way to improve profits.

Why not compare the farm before and after implementing improved management practices, such as better per cow performance from more precise feeding and lower replacement rates, and better use of resources by improving pasture, stock and staff management? Such an analysis may well reveal substantial improvements to sustainability and profit with little or no additional cost, yet provide a more balanced system less likely to suffer breakdown.

For the Ruataniwha Water Supply Scheme area, applying known principles of farm management and more efficient resource allocation has been shown to lift profits by between 25 and 40 per cent, and provide a reliable system that will withstand dry seasons with relative ease and little decrease in profits. Depending on the input data used for an irrigation option, the improved non-irrigated system may prove far more profitable, if not quite as production rich, as the irrigated option.

Data use

The decisions on data use therefore hinge on a number of factors –

- Accurate daily rainfall data from the water catchment over at least 20 to 35 years
- Amount of irrigation water required on a contracted 35-year supply 'take or pay' to ensure increased stock numbers and performance can be maintained
- Frequency of non-supply
- Cost of water yearly charge increasing with CPI and full intensification costs, noting that any additional cost compared to the improved current system must be charged against the irrigation.
- Additional running costs such as interest, percentage charged, insurances, power, repairs and maintenance, and depreciation
- The need to pump water to the farm or pay 26 cents a cubic metre compared to 23 cents contracted for one millimetre per hectare
- The cost of pipeline to the farm



- Allowable nutrient loads which may be reviewed downwards, as in the Selwyn region, which will limit future production.

With irrigation in marginal climatic areas comes a less balanced pasture production pattern. Much greater quantities of bought-in feed for spring and early summer shoulder period feeding, as well as additional winter grazing off, will be required to match the increased feed demand from perhaps 80 per cent more milking cows than farmed before the system change. This additional feed must be attributed wholly to the additional cows, not averaged across the herd. In addition, to achieve high per cow production in regions with low growth outside the irrigation period, cheaper feeds may not be energy dense enough to allow high production per cow.

Other irrigation-related factors

Then other main factors related to irrigation are –

- What pasture response rate to water should be used for the area and soil type?
- What is the effect on longer-term profit if more water than is normally required in an average year is purchased and not used or is purchased, with cost of pumping included, but is not available in dry years due to insufficient river flows?
- What improvements to production per cow can realistically be assumed?
- The intensification costs are large and it could be argued that it would be less risky to buy a dairy farm in an area with adequate rainfall. It would certainly be cheaper to buy an existing dairy farm in another region than to purchase dryland and convert to irrigated dairy in the Ruataniwha Water Supply Scheme area.

These factors all create a formidable challenge when attempting to assess the worth of irrigation in general. They may be complicated further when applied to a particular farm where shape, contour and variable soil type require costly customisation of the actual irrigation system. To build a list of all additional changes, costs, likely depreciation, interest costs, insurances, and repairs and maintenance is not difficult as most of these inputs are known and annotated.

The assumptions involving additional pasture production, animal performance, water use and variability of seasonal requirements, along with availability of water when required, become more fraught. The urge to assume that large increases in pasture and milk production will inevitably result from adding water, and that this will equate to higher profit and increasing capital gain, is unlikely to equate to reality.

Possible scenario

For the Ruataniwha Water Supply Scheme area, let us assume a water price of 26 cents a cubic metre, or about $1,100 to $1,600 per hectare per year for 35 years whether used or not, a price of $7 per kilogram of milk solids and current costs for farm inputs and charges.

- If a 10:1 response to water is used rather than a 20:1, irrigation is not as profitable as the improved existing system
- If per cow productions of 380 to 425 kilograms of milk solids are achieved rather than 450 to 476, irrigation is not as profitable as the improved existing system
- If the average rainfall year occurs 50 per cent of the time, above average 25 per cent, dry years 20 per cent, and droughts five per cent, then irrigation is far less profitable than the existing system
- If water is not sufficient for full irrigation from the Ruataniwha Water Supply Scheme dam for one in six years, rather than one in 20 years, then irrigation is not profitable at all
- If input prices increase faster than output prices, and the trend has always been this way, irrigation will become increasingly difficult to afford unless water is virtually free.

If any one of the above factors cannot meet or exceed the expectations of the Ruataniwha Water Supply Scheme promoters as stated, it will render irrigation less profitable than an improved non-irrigated existing system. If more than one of these factors occurs within the year, the total economics of the farm may be at risk. The complex system which has been created from intensification using water has become vulnerable to only small variations in any of a number of critical assumptions. If all these are added together, the resulting economic loss will be sufficient to reduce equity at an unsustainable rate.

Alternative options

Do we use intuitive analysis and false causal relationships – more water means more grass which means more production and more profit – or is there a need to run some alternative options and test a number of response functions to provide a more reliable analytical risk analysis? Does this depend on how the project is viewed,

which may in turn depend on how actively the scheme has been promoted? Analysis of a complex production system needs to overcome the legacy of prior learning or experience.

The following is suggested –

- Document the current base system
- Look at improvements that can be made to current management practices?
- Use this improved system for comparison, not the pre-improved system
- Carefully annotate all the costs that will alter with this change
- Use realistic production improvement figures based on research and data from similar farms, not unproven anecdotal figures from another region
- Use sound predictive figures for additional costs, interest, depreciation, insurances, repairs and maintenance
- Assess the real cost of contracted water, allowing for years where irrigation will add little additional value, and the probability of having water stopped in drought conditions when it is most needed in the higher stocked intensified system.

Water in the Ruataniwha Water Supply Scheme will be on a first-come first-served basis, and no provision has yet been discussed about priority for specialist crops or long-term survival of vineyards or orchards. The possibility of several dry years in sequence may require a management strategy which removes the risk of withdrawal of water at critical times. This should provide the incentive to look for options which allow improved performances with current conditions before jumping into irrigation as the only cure-all for better farm financial performance. Otherwise irrational exuberance will evaporate even before the water does.

Submitter's views

Some submissions to the Ruataniwha Water Supply Scheme Board of Enquiry process may be of interest.

Beef and Lamb NZ

> The plan assumes that irrigation is essential to increased production from dryland sheep and beef farming. This is not altogether correct as the recent development of lucerne grazing and other novel forages and feed sources has demonstrated. Recent work in this area has shown that equivalent levels of production can be achieved on dryland lucerne as are achieved from irrigated pasture. Increased stocking rates achievable on dryland lucerne are likely to trigger the current definition of change with respect to nitrogen leaching rates. (Beef and Lamb NZ)

Fonterra and Dairy NZ

> In cash terms, it costs an average dairy farm $4 per kilogram of milk solids for 'farm working expenses' and another $1.70 per kilogram of milk solids in interest and tax (DairyNZ Economic Survey 2011-12). That is $5.70 per kilogram of milk solids in total. By assuming a $7 per kilogram of milk solids price, the profit margin available for a return on the additional capital and annual running cost of irrigation is $1.30 per kilogram of milk solids. For new centre pivot irrigation systems, a 2012 estimate of the cost to get water on a property was $9,000 a hectare with $35 a hectare annual maintenance and running costs.
>
> By using these figures and assuming seven per cent interest rate on the capital, the annual cost of irrigation, in interest and the $35 a hectare running costs, is $665 a hectare. The break-even milk production response required from irrigation for a $7 per kilogram of milk solids price is therefore 512 kilogram of milk solids per hectare ($665/$1.30). To achieve a break-even pasture response in a fully, continuously irrigated situation and at a $7 milk price requires a 5.6 tonnes of dry matter per hectare of pasture response over non-irrigated pasture production. The break-even pasture production response where summer irrigation is irregular is 6.6 tonnes of dry matter per hectare. (Fonterra/DairyNZ)

This calculation does not include the cost of water. If water is added at 26 cents a cubic metre at a contracted use of 450 millimetres per hectare each year, the pasture response required becomes $665 per hectare plus a water charge of $1,170 per hectare. This is a total of $1,835 per hectare per year at $1.30 irrigation cost per kilogram of milk solids. From the above formula this is $1,835/$1.30 which equals 1,400 kilograms of milk solids.

It requires 15.5 tonnes of dry matter per hectare additional pasture from 450 millimetres of water, a response of 35:1. If calculated for the break-even price of milk solids, this formula indicates a price of at least $9.30 per kilogram of milk solids is required.

The break-even analysis above also fails to separate fixed farm running costs and those that vary with the analysis. For this method to be reliable, the effect of these costs must be evaluated separately within the equation and not bundled as this submitter has done.

Barrie Ridler is an independent agricultural analyst who owned a drystock farm after leaving the Agricultural Economics and Farm Management Department at Massey University. Warren Anderson of Massey University and Roy McCallum of Grazing Systems Ltd helped research this article.

Jock Webster

North Otago irrigation scheme

North Otago has always been ravaged by droughts with rainfall varying from 325 millimetres to over a metre. With its naturally high fertile soils the region's farming is either a feast or a famine. When the government announced that after many years of study the Waiareka-Kakanui irrigation scheme was not to be continued, local community leaders called a meeting of interested people to find their own way ahead.

From that first meeting in 1992 the local committee was formed and worked hard for years. Finally, in 2006 the North Otago Irrigation Company's piped and pumped irrigation scheme was opened and was capable of watering 20,000 hectares. In between, there were many meetings of the committee and later a board, which I chaired, made up of a group selected from farmers, business people and local politicians.

Lower Waitaki example

One thing stood out, the committee were all passionate about changing the crippling North Otago environment. We had all seen the change that the Lower Waitaki irrigation scheme had made to the 16,000 hectares of dusty and stony soils in the Waitaki Valley. By then 25,000 sheep had been replaced by the same number of dairy cows, and the soils in the Waiareka and Kakanui valleys were much better that the riverbeds on the Waitaki plains. Many studies had been started, some completed, on ways of irrigating these two valleys. However, the rolling topography made the task difficult and even more so because of the loess soils which were not suitable for the construction of canals as these soils are almost soluble themselves.

When I was a Lincoln student in the late 1960s Jim Mitchell was chairman of the Waiareka–Kakanui valleys investigation group, along with the Ministry of Works, the Department of Agriculture and other locals. He asked me to check with the Agriculture Engineering Institute at



Lincoln about piped irrigation schemes throughout the world. I researched this, but always thought these schemes would be too expensive to work. Little did I know that long after Jim had died his dream would become a reality.

Grant Ludemann, a committee member, and I also led a group which looked at underground water in the early 1980s. This culminated in him drilling a deep well into the artesian Papakaio aquifer which allowed him to irrigate his first farm. Following more work the Otago Regional Council spent nearly a million dollars in the 1980s on a comprehensive underground water investigation under the North Otago downlands.

The conclusion was that there was not enough water in the aquifers in these two valleys for very much large-scale irrigation, and in some cases the quality of the water made it unusable on a sustainable basis. The Chinese market gardeners had used water from the Deborah aquifer to a limited degree, and several other wells were drilled into the Papakaio aquifer, but this water was very high in iron and sulphur.

Kakanui river dams

George Berry, a local lawyer and landowner at Totara, looked at opportunities to dam the Kakanui river and run water to storage dams. Finding that these options were too expensive or unreliable, following some encouragement from Dave Finlay, a board member, in 1998 he suggested that we go back and look at bringing water from the Waitaki river. This has an average flow of 360 cubic metres per second, which is as much as all of the other Canterbury rivers to the north.

The river already had nine hydro-electric generation dams on it, which made the supply 100 per cent reliable at that time. The Waitaki valley catchment is in my view an example of a river system that can be used for hydro-generation, irrigation, recreational activities and environmentalists. It has everything from glaciers and a natural lake to man-made dams and wide braided rivers.

Meetings and irrigation loans

Our committee had by this time become a board of a limited liability company and John Shirley, a Beca engineer who lived in North Otago, attended all the meetings. He drew up his vision of how we could pump water from the Waitaki river and distribute it via pipes throughout the two valleys. Even then it seemed like a big project, but that was only the tip of the iceberg.

We formed pods throughout the district. These were groups of eight to 12 farmers from each respective area. Our thought was that small groups would give everyone a chance of speaking up and giving their opinion. These meetings were held in sheds, workshops or woolsheds. Over the years we had many pod meetings to keep farmers informed of progress and changes in engineering plans. Many farmers attended more than 20 pod meetings before the completion of the scheme.

Another drought year was in 1998. We called pod group meetings and asked every farmer how many hectares of their farm was irrigable and how much they wanted to irrigate. For each irrigable hectare we asked for a loan of $5.50 to fund investigative work, with the likelihood that we would ask for more as studies progressed. Farmers signed up for over 17,000 hectares, with 9,000 hectares to be irrigated in the near future.

Beca's two-stage scheme

Beca drew up more detailed plans of a two-stage scheme, each of 10,000 hectares, and attempted to estimate costs for the first stage. Dave Finlay had looked over the Waitaki river at farmer Tom Allen's property. He had recently irrigated by pumping water over 100 metres from the Waitaki river on his farm and Dave wondered why we could not do the same.

The Lower Waitaki Irrigation Company had an irrigation intake opposite this farm on the south bank of the Waitaki river feeding into a large holding pond. The company was happy to share this with us for no cost, so Beca made this the starting point for the design of the scheme. The plan had a one kilometre canal taking water to a pumping station which pumped water 75 metres up the first terrace to another three kilometre canal. A second pumping station pumped it another 70 metres to a holding pond. From there water was piped via gravity and pumped pressure throughout the valleys.

George Berry organised easement options to allow pipelines to be buried beneath farmers' properties, with no compensation to them. There was a feeling of community spirit and goodwill towards the scheme among most of the community and many were passionate about irrigation and seeing improvement. Several farmers applied to the Lower Waitaki Irrigation Company for


shares to water their properties from that scheme. Since these farmers were in the North Otago Irrigation Company command area, Lower Waitaki refused to supply them, causing much consternation.

Water consent application and appeals

By this time the board was meeting every week and we began the process of applying for a water consent for eight cubic metres a second. An additional 440 litres a second was applied for to service a small irrigation scheme on a plateau near the river involving three farmers. We worked through all aspects of the consent application and asked ourselves where the problems might be. This was a big task as we were dealing with two regional councils, Environment Canterbury where the water take was and the Otago Regional Council where most of the irrigation would take place. There were many problems including –

- Fish screens required by Fish & Game
- Mixing of waters, and discharges into the Waiareka creek and the Hokonui river, a Moeraki runanga area
- Take conditions for Environment Canterbury
- Water use conditions for Otago Regional Council.

We then went to the respective groups to investigate their concerns. The Moeraki runanga members came on a tour for a day, a carefully planned event covering all aspects and advantages of the scheme. Once we had heard their concerns we worked out how we could overcome them. Solutions included a rock bund which acted as a fish screen, a minimum flow maintained by water releases into the Waiareka creek, and environmental farm plans to be maintained by all irrigators and audited annually by an independent party.

By the time of the joint hearing with Environment Canterbury and the Otago Regional Council in 2003 we had many more supporters than objectors. However, when we were awarded the consent Fish & Game and Ngai Tahu appealed it, but this was duly settled with legal assistance. Meanwhile, planning the scheme continued with Beca and options and ownerships structures were discussed at board level and by groups.

More money was collected from prospective irrigators early in the formative stages, including from the Sustainable Farming Fund. The Franklin pod group had a number of investors who were interested in buying land in the area for dairying and some was purchased in the year 2000 for as little as $2,400 a hectare. These investors set up dairy farms, but some had a long wait until water arrived in the spring of 2006.

Rising costs

Scheme costs had risen to nearly $60 million and some board members thought this was a large amount and that it would be impossible to raise. However, as Grant Ludemann stated, 'It is only six decent dairy farms – surely we can fund that.' We continually kept farmers informed, discussing options with anyone whether they were very large or very small. We wanted it to be a scheme that was built from the ground up.

Evening sessions were held on more than one occasion outlining the economics and benefits of the scheme and irrigation using independent farm consultants. Comparisons were made with other schemes, especially deep water wells in Canterbury and the emphasis on water reliability from the Waitaki.

Meridian began taking an interest in the scheme in 2001 and we were enthusiastic about them wanting to create a joint venture. After many meetings they asked for a 19.5 per cent return, which meant that joint venture was finished.

In 2002 Meridian announced Project Aqua, which involved putting over half of the Waitaki river in canals with six generation stations. They really wanted to be part of the scheme and many more meetings folllowed. Finally, the scheme was put out for tender, with Meridian wanting tenders for the infrastructure from the river to the buffer dam at the highest point. The North Otago Irrigation Company sought tenders on a design and build basis for the distribution side of the scheme. I was involved in a group reviewing the design work along with many Meridian staff and other consultants.

At the same time, Gravity Irrigation opposed the North Otago Irrigation Company going ahead with the scheme. They were another local group who believed that North Otago should be served by a gravity scheme from Kurow covering 60,000 hectares. They had not received much financial support from farmers, but had gained enough traction to stop our progess for over a year. Another group, Irrigation North Otago, was set up which also met often in its attempt to mediate between the two schemes. Eventually an accord was reached under the facilitation of Peter Townsend after many previous attempts to do so.



Prospectus issued

The North Otago Irrigation Company was finally able to continue with Stage 1. However, as we were about to finalise tenders Meridian decided that they would abandon Project Aqua but still support the scheme by underwriting up to 2,500 hectares if we obtained farmer uptake for 7,500 hectares. The prospectus was issued with farmers asked to fund $1,850 per share. This entitled an irrigator to the supply of 0.4 litres per second for the whole irrigation season delivered to the farm boundary at a pressure of 50 bars, or 72 pounds a square inch.

The remaining funding came from an ASB loan of $37.5 milllion and a $10 million loan from the Waitaki District Council. Getting all the details correct in the prospectus, negotiating with the banks for the best deal, and settling on conditions for the council loan demanded many meetings. At the close of the prospectus in 2004 we had subscriptions for over 7,600 shares. Finally we could start.

Construction and setbacks

Construction began in early 2005 and I was appointed executive chairman, in effect project managing the contruction with three contractors involved. Beca employed a resident engineer who managed the detail. However, there were many challenges.

Transpower said it would take 18 months to obtain a transformer of the size required. Network Waitaki sent their engineer to India to oversee the construction of the transformer following pricing and we eventually had it in six months.

Transpower also had to swing lines over the Waitaki river. They thought they had the consents covered, but did not, and this looked like holding up the project. Ross Cleveland and I brokered a deal with a South Canterbury farmer and the lines crossed his property. They were constructed in time, only to be completely wrecked in a heavy snowstorm in 2006.

When we were nearly ready to commission the scheme, didymo was found in the Waitaki river. The contractors were running behind time, and because it would have been a significant cost to them they refused to allow the water to be pumped into another catchment. This meant further high-level negotiations.

In October 2006 the scheme was finally opened and celebrated with an event called The Big Splash. It was a formal dinner for all shareholders and contractors, and a grand gala opening with Waitaki water being spread by pivot, irrigator plane and helicopter. This was all at no cost to shareholders – they even received back the $60 they had contributed to the feasibility studies. It was a community celebration.

Lessons learned

Prospective shareholders need to put in money if they are committed to the cause. Just because your company has a good story do not expect immediate acceptance. Some people are not receptive to change immediately and it can take a surprisingly long time, so be prepared to give them space to make their decision. Farmer-to-farmer talk is critical. Call in and use professionals, but farmers are sceptical of 'shiney-shoed' professionals. Farmer-to-farmer speak is the catalyst for success.

You do need specialised and experienced people in the team behind the dream. Gather a good group of people with expertise in the various areas required. Be positive and energetic – get some excitement about the project. Work from the ground up, involving prospective shareholders as early as possible, and keep educating and informing them about irrigation in the project. The leadership team and how they go about their job will have a significant effect on results and the success of any prospectus. Working with small groups creates an even bigger job, but does have very real advantages.

Identify problems early or deal with them as soon as they come up, preferably before they go public. Go straight to the top of whatever organisation you are working with to get decisions. Do not mess with people at the bottom of the ladder. Use everyone's networks and create positive relationships. Communication needs to be inclusive, sometimes diplomatic, sometimes very much to the point. Confidence on the phone or in personal contact is critically important.

Do not underestimate the size of the job, it is not just an evening one. It will probably take much longer than you anticipated. Ask questions of other existing schemes as someone has probably had a similar problem before. Finally, no matter how hard you try, there will be someone who makes getting things in place extremely difficult.

Jock Webster is managing director of Mitchell & Webster Group based near Oamaru. Mitchell & Webster Ltd farm 1,350 hectares, Topflite Limited markets bird and small animal feed, and Rosedale Ventures is an investment company. He is also a director of the Waitaki Irrigation Collective.

Andrew Newman

A case for water storage in Hawke's Bay

The year 2014 is set to be a defining year for Hawke's Bay with the anticipated decision on whether or not to build a multi-million dollar water storage scheme in central Hawke's Bay. The Ruataniwha Water Storage Scheme is a proposed long-term sustainable water storage solution for the Tukituki catchment, one of the larger catchments in Hawke's Bay.

By constructing a dam on the upper Makaroro River and associated distribution system, the scheme will store higher winter flows for irrigation during summer when pressure on the water resource in the Tukituki catchment is the greatest, as well as generating renewable electricity. In doing so, the scheme would help mitigate environmental degradation of the Tukituki catchment, while unlocking a significant regional economic opportunity with the provision of water for more productive and higher value farming on the Ruataniwha plains.

The Hawke's Bay Regional Investment Company Ltd has to bring the project to a 'go – no go' point. This company has now presented a business case to the council recommending it invest up to $80 million in the scheme. A final decision is due no later than the end of September 2014.

Integrated management

The current environmental problems associated with this catchment occur during the summer months when river flows are lowest. Generally, there is a nutrient imbalance in the system with excessive phosphorus causing the production of slime and algal growth. Current water allocation also exceeds regional plan limits contributing to frequent very low flows during summer. Combined with the braided nature of the river bed, this leads to warming river water with accelerating slime and algal growth. The low flows reduce habitat for trout and various taonga species such as longfin eel, koaro and bluegill bully, with the slime and algal growth affecting the recreational value of the river.

Increasing minimum flows and setting appropriate nutrient levels will improve environmental and cultural results. The Tukituki catchment, known as Plan Change 6, a land and water management plan, has been developed to achieve these benefits. It is currently subject to a decision via a board of inquiry process under the management of the Environmental Protection Authority. To improve the flows water user allocation limits will need to be adjusted, resulting in existing irrigators having significantly reduced security of supply. Given water allocation and quality problems, there is also little or no prospect of substantial additional irrigation development in the Tukituki catchment from groundwater abstraction or surface water.

Working with Plan Change 6, the Ruataniwha Water

Storage Scheme will allow the council to improve water quality and minimum flows while offsetting the economic effects of this plan. In addition, the scheme will unlock the significant agricultural potential of the Tukituki catchment by providing high reliability water for irrigation.

This is particularly important for the future of the Hawke's Bay economy where the temperate climate and high sunshine hours offer an important competitive advantage for the region for primary production and processing food for export. The region contributes 3.4 per cent of national gross domestic product, with primary production and processing more than double this at over 7.0 per cent.

Should the scheme not go ahead, a decision on Plan Change 6 will proceed, with the detail to be determined by the board of inquiry. It is reasonable to assume that the environmental requirements will be more stringent than those prevailing today.

Potential benefits of scheme

The motivation behind the development of the Ruataniwha Water Storage Scheme has been firmly focused on its environmental, economic and social value. The scheme has the potential to increase farm productivity and allow higher value farming by irrigating approximately 25,000 hectares, and an additional 17,000 hectare direct area of influence, on the Ruataniwha plains and further down the Tukituki catchment. It will also introduce environmental flows into this catchment with associated environmental value.

The net present value of the regional economic effects attributable to the scheme is estimated to be around $4 billion and the creation of 2,520 full-time equivalent jobs. Farming and farm support industries make up a large contribution, but processing and processing support industries make an almost equal contribution. Just over half of the employment and added value, excluding processing, occur within agriculture.

The balance is spread across rural contracting, wholesale and retail trade, transport and storage, services and local government. The increase in farming production and processing is expected to go almost entirely for export, increasing shipping through the Napier port. As well as the economic benefits, environmental benefits associated with the scheme are estimated to be between $51 million and $78 million. These fall into two groups –

- The direct environmental benefits brought about by proposed flushing flows which flush part of the river, removing slime and algae, along with increased river flows in summer, resulting from irrigation return flows
- The ability for the scheme to offset the economic cost to the Hawke's Bay economy which would result from the implementation of the new minimum flow.

In addition to quantifiable benefits, others include improvement of the extreme low flows in the Waipawa and lower Tukituki rivers. There would also be greater ability to introduce and align farm management practices with good environmental stewardship by implementing farm environmental management plans for all landowners who receive scheme water.

Development of the scheme

The development of the Ruataniwha Water Storage Scheme has taken approximately four years. It has been jointly funded by the Hawke's Bay Regional Council, the Hawke's Bay Regional Investment Company Ltd, the Ministry for Primary Industries and institutional investors. The MPI alone has committed $6 million, reflecting the scale and complexity of the scheme, and it sees it as a potential blueprint for future irrigation development around New Zealand.

The need for large-scale water storage as part of the Tukituki catchment management was initially identified in 2009. Following pre-feasibility analysis, the council decided to pursue full feasibility in December 2010. This second phase involved investigations into the technical, economic, environmental, social and cultural aspects of the scheme.

The council has also worked with a large number of community and interest groups, sharing scheme information and receiving feedback to help inform processes over time. For the scheme to be feasible and proceed, it needs to achieve a wide range of council-defined criteria.

Technical feasibility

From extensive geotechnical, environmental and economic assessment, a total of 18 potential water storage sites were narrowed down to the current site on the Makaroro river. An additional complexity is that dam engineering is hampered by the fractured and unstable nature of foundation materials. Ten off-river dams were discounted as they were found to be less economic than dams on the river, due to the need for refilling from other catchments and the fact that storage volumes were generally smaller with lower economies of scale. Geotechnical and broader environmental problems were considered as part of this site option selection process.

The scheme design was taken forward as the application design in the resource consent applications lodged with the Environmental Protection Authority in May 2013. Further optimisation of dam, distribution and associated infrastructure will be undertaken during the detailed design phase by the design and construction provider.

Environmental, social and cultural feasibility

A number of environmental studies were carried out as part of the feasibility phase of investigations. These provided a comprehensive analysis of the environmental, social and cultural concerns. They are grouped into five distinct areas –

- Modelling studies of land use intensification, water

Before the proposed dam

The same place after the proposed dam is constructed

quality, groundwater and surface water
- Aquatic and terrestrial ecology assessments
- Cultural effects assessments
- Other effects such as road infrastructure and traffic, noise, archaeological, social, recreation, landscape and visual
- Integrated mitigation and offset options.

Overall the scheme was considered to be feasible from an environmental perspective. The feasibility studies, along with more work mainly associated with further catchment modelling, improved environmental flow opportunities. A Mana Whenua working party also contributed to the development of an assessment of environmental effects, which accompanied the resource consent applications.

Economic feasibility

On-farm and off-farm investment feasibility analysis demonstrated that there is a range of water distribution prices for which the scheme is financially feasible. Potential returns to investment on the farm in irrigation vary across farming types. The future agricultural make-up of the Ruataniwha plains may therefore differ under varying water distribution price scenarios.

BNZ advisory's on-farm analysis demonstrated that at the feasible water distribution price range of 20 to 30 cents a cubic metre, a variety of potential land conversions or intensifications are financially viable from returns and financing perspective. This price range has now been refined to 25 to 27 cents a cubic metre as infrastructure and other project costs are finalised.

Underpinning the economics are a series of farming budgets produced by Macfarlane Rural Business. Among other assumptions, they believe that farm productivity can be similar to the top 20 per cent of farmers across New Zealand. This is on the basis that newly irrigated farms will use the newest technology, attract top performing and highly motivated farmers, and that high water reliability will help them to maximise outputs so they can farm with confidence.

This assumption could be conservative, looking out on the 35-year investment horizon, with technology and farming method improvements pushing future average productivity up past current top performers. Today's average was the top 10 per cent five years ago, and the top one per cent 10 years ago, with the catalyst for change increased farmer confidence to invest and innovate being achieved through higher water reliability.

Current state of applications

The board of inquiry hearing finished on Tuesday 21 January, with an updated set of proposed resource consent and designation conditions submitted for consideration by the board. During the six weeks of the hearing the board received evidence from 131 expert witnesses and also representations from 74 submitters.

The board of inquiry has now adjourned to consider all the evidence and submissions. The Minister for the Environment has granted a month extension to ensure the board has time to assess all the evidence before releasing its draft Plan Change 6 and the scheme's consent decisions. There will then be an opportunity for comments on some of the details of the draft decision before a final decision is released no later than the end of September 2014.

Proposed resource consent conditions

Over the course of the hearing, the scheme's resource consent conditions evolved and a number of new conditions were added in response to specific matters raised by some of the submitters. The proposed scheme consent conditions suite is governed by environmental

bottom lines locking in the council's proposed Plan Change 6 water quality policies and rules, such as to provide a constant residual flow from the dam and ensure existing consent holder takes are not compromised.

A feature of the proposed scheme consent conditions is the provision of a number of management and monitoring plans to govern the construction and future operation of the dam and distribution system, including land use initiatives and good practice management on farms. The management plans are required to meet set objectives and performance standards. Together the range of management plans will guide the detailed design, construction and operation of the scheme through a project management and reporting framework.

Water contracts with farmers complement the regulatory regime of Plan Change 6 and resource consent condition requirements by implementing standards, rules and policies to ensure environmental bottom lines are protected. The Integrated Mitigation Offset Agreement provides the mechanism for comprehensive environmental compensation for a number of effects, underpinned by a philosophy of 'like for like' mitigation and offset. A Kaitiaki Runanga will be formed to ensure information flow to tangata whenua and identify any problems before, during and after construction.

Procurement process

The Hawke's Bay Regional Investment Company Ltd invited expressions of interest from design and construction providers in February 2013. It also undertook a comprehensive expression of interest process which resulted in five international and New Zealand based consortia registering interest. Respondents were then shortlisted, with a request for proposal extended to two of them to participate in a competitive tender process to design and construct the storage scheme. The successful shortlisted candidates were –

- Bouygues Construction Australia Pty Ltd, the Australian subsidiary of Bouygues SA, a listed global construction company with headquarters in France
- OHL-Hawkins, a joint venture with OHL, a Spanish construction company with international operations, and Hawkins Infrastructure Ltd New Zealand's largest privately owned construction company.

Submissions for the request for proposal closed on 19 August 2013. At this time an initial high level review of price and scope of the two submissions was completed, recommending that both submissions proceed to full evaluation. Review and scoring for each of the respondents' submissions was undertaken by an expert evaluation team. The panel was carefully chosen to ensure a range of expert experience in dam and large construction projects, financing, irrigation and distribution and was supported by a further 35 specific subject matter experts. The selection panel recommended the OHL-Hawkins joint venture to the Hawke's Bay Regional Investment Company Ltd and institutional investors.

At the completion of the value engineering phase in late February 2014, the scheme's capital cost was refined to a range between $240 and $245 million, with a further capital cost covering development costs, land acquisition costs and carry costs during construction of $30 million. This was a substantial reduction from the initial estimate for a fully pressurised network. A fixed cost will not be known until the final scheme design. All other facets of the scheme are based on a fixed price amount.

Access to water

There has been much debate over the affordability of the scheme's water and the volumetric charge using a take-or-pay pricing mechanism. However, the pricing structure is necessary for determining affordability of construction, the required blend of private and public funding, and the assessment of a viable level of water uptake. The scheme's water price is also comparable to new and upgraded schemes in New Zealand. The price internalises the environmental benefits and costs of the scheme.

There has also been some public comment that the water price range of 25 to 27 cents a cubic metre will only make water affordable for dairy farming. Conversely, other opponents of the scheme have stated that the water price renders dairy unaffordable. Based on expressions of interest from farmers who are interested in contracting the scheme's water, neither view is accurate. Indications suggest a result of a blend of land uses including arable, mixed arable, red meat and dairy.

In time, horticultural land use options are likely to emerge as the scheme will be able to move additional water down the Tukituki main stem. The water price has a consumer price index inflator mechanism to ensure the capital investment at the outset achieves real returns.

Mix of public and private investment

Developments of large-scale water storage similar to the Ruataniwha Water Storage Scheme have been rare over the past 30 years, with many previous schemes government-funded and built using the former Ministry of Works. Irrigation expansion using groundwater abstraction and surface water has continued throughout New Zealand, but there has been an environmental cost and clear limits to water availability from these water sources.

As a result, large-scale storage is required to continue irrigation expansion. However, it is comparatively expensive to build in the short or medium term and beyond the means of most irrigator cooperatives or the private sector alone. To accelerate new water storage developments, central government initiated a series of measures to develop and fund regional schemes and in doing so encouraged third party investment. The government's motivation to invest in irrigation schemes is to realise the economic benefits, including national gross domestic product growth and employment.

A major problem with new schemes is achieving a level of water uptake which justifies the infrastructure. This water uptake hurdle is often proving insurmountable for promoters. Combining a strategy of government investment via Crown Irrigation Investments Ltd at a sub-commercial return to ensure the scheme is bankable, while reducing demand risk, creates an opportunity to solve the viability gap.

In late March the Hawke's Bay Regional Investment Company Ltd received formal notification from Trustpower that it was withdrawing from investing in the scheme. Negotiations are continuing on a confidential basis with others considering investment in the scheme, either as equity or debt, and the final capital structure should become clear as water user agreements with irrigators are consolidated.

The optimal capital structure for the scheme is therefore a blend of public and private capital with each investor's value proposition identified where relevant in economic, environmental, financial and risk allocation terms. A modified 'build own operate transfer' project structure allows for this, including transfer back to public and regional ownership in the long term.

This structure should reward the public sector for the initial development risk and initial sub-commercial returns. It is a new investment model for this type of infrastructure, but may be applicable more broadly in New Zealand for greenfield developments, especially where locally sourced public funds are used.

The next steps

A business case on potential investment in the Ruataniwha Water Storage Scheme has been presented to the council. It aims to highlight the value for the council and the community while identifying the risks and risk mitigation strategies of a large-scale investment. The final investment decision by the council will be subject to further community consultation before proceeding. Other investors will also need to obtain their shareholder approvals as required.

The following conditions must be met before the council agrees to release any funds –

- Granting resource consent for the scheme, which is recommended as being workable by all investors
- Subscription of a minimum of 40 million cubic metres of water contracts
- Securing the private and public funding required to build scheme infrastructure
- A bankable construction contract with construction risk allocation adequately addressed in a fixed time and fixed cost arrangement.

The Hawke's Bay Regional Investment Company recommended that the council's investment approval be obtained no later than the end of June 2014. In the meantime, the company will continue to develop the scheme. This includes –

- Receipt of the resource consent application draft in mid-April and final decision by the end of May
- Continuing negotiations between Crown Irrigation Investments Ltd and private investors to ensure good alignment
- Finalising the construction agreement
- Securing water user agreements with farmers
- Refining and implementing the limited partnership capital structure
- Establishing an appropriate operating structure for the construction phase should this proceed
- Securing conditional land purchase agreements, both adjacent to the reservoir and on the canal headrace.

Andrew Newman is Chief Executive of Hawke's Bay Regional Council based in the head office at Napier.

More waiting

Since this article was written, the Board of Inquiry into the dam placed strict water quality conditions on the resource consents because the irrigation project is expected to encourage more intensive agriculture. The council says that some fundamental hurdles still need to be cleared before it can decide whether the $600 million project remains viable. The final decision has now been delayed another month. In addition, the two major financial backers, Trustpower and Ngai Tahu, have recently withdrawn from the project. *Editor.*

David Caygill

Irrigation in Canterbury

In December 2013 this journal focused on nutrient management, a concern of significance across the country, but especially in Canterbury. For at least the past ten years, levels of nitrate in water have been rising there, reflecting the steady conversion of farming from sheep and beef to dairying and dairy support.

In parts of Canterbury measured nitrate levels already exceed the New Zealand national drinking water standard of 11.3 mg per litre. Much of Canterbury exceeds the warning threshold of half this maximum acceptable value, which provides room for fluctuations between seasons as conditions such as rainfall vary. In addition, 40 per cent of the freshwater bathing sites which Environment Canterbury monitors regularly are no longer suitable for contact recreation.

Canterbury's response to rising nutrient levels has been strategic. That is, many of those concerned have stood back and examined the range of problems to which rising nutrient levels relate and the potential responses. Nutrient management is obviously a significant environmental challenge. It has been created and exacerbated by an economic opportunity – the potential gain from farming more intensively made possible by the expansion of irrigation. Of the part of Canterbury which is irrigable, given slope and soil type, roughly half has so far been irrigated. This means the region has the potential to significantly increase the area under irrigation, leading to further economic gains and environmental pressure. Clearly these gains and harms need to be managed.

Irrigation has the potential to provide benefits on both sides of the economic and environmental ledger. Irrigation holds the key to considerable economic gain, but it also has the potential to contribute to addressing the environmental consequences of more intensive land uses. One example is that efficient irrigation, such as from centre pivots with the ability to vary the amount of water applied in response to soil moisture, is likely to use much less water than traditional border dyke methods. This might reduce the amount that a farmer needs to pump from groundwater. In turn, however, this might also reduce the amount of water available for groundwater recharge.

Many Cantabrians believe that increasing the reliability of water, in the form of the number of days a year when water is available from an irrigation scheme, is likely to reduce the amount used in that particular scheme. That may free up water to be used elsewhere, either in further irrigation or by way of return to the river or ground from which it came. To the extent that irrigation schemes involve the storage of alpine water, as a number in Canterbury do, they can be seen as supplementing surface or groundwater with water originating from nearer the Alps where rainfall is often higher.

The framework

New Zealand is fortunate that it does not face an absolute shortage of water and we have enough rainfall to meet all our needs. This is simply a matter of conveying the water to where we need it, although the cost of doing so is relevant. Many people look at water travelling unused to the coast as a wasted resource. Others see that is precisely what a river is – the means by which water is conveyed across the land. To divert its use may be to diminish the river.

Such competing perspectives help to explain why irrigation is important and contentious. Since 2009 discussions about water in the region have taken place in the context of the Canterbury Water Management Strategy. This strategy and the agreement it reflects resulted from a collaboration between farming, irrigation, Ngai Tahu, environment and recreation, and all the units of local and regional government in Canterbury. The resulting agreement considered 10 target areas and set specific aims over four timeframes.

Some targets

For example, there was agreement in respect of drinking water that from 2010 'for communities that currently have access to untreated and safe drinking water, (to) implement actions to ensure source water quality remains high enough to meet current New Zealand drinking water standards without treatment.' With respect to recreation and amenity opportunities they agreed that by 2015 'at least 80 per cent of river bathing sites (should be) graded as suitable for contact recreation.' In addition, they also agreed by 2015 to 'set environmental flows for surface streams, rivers and groundwater consistent with the Strategy, so that flows are consistent with ecosystem health and biodiversity targets' and to 'set catchment load limits for nutrients for each water management zone consistent with the fundamental principles of the Strategy.'

In practice these targets have proved almost identical in language and obligation to the requirements imposed on regional councils by the requirements of the National Policy Statement on Freshwater Management promulgated by the government in 2011. Significantly the strategy also suggests that by 2040 there will be 'a substantial increase in the reliability of supply and the area of irrigated land, which has high standards of riparian, nutrient, and water-use management. … An indicative target is 850,000 hectares of irrigated land with 95 per cent reliability.'

Problems vary

An obvious question, left generally but understandably unanswered by the strategy, is exactly how all these fine aims and objectives are to be met. All those involved were clear that the essential mechanism was the continuation of the collaboration which had brought them to agreement. They also agreed that those interested would need to be involved catchment-by-catchment as the problems varied from one part of Canterbury to another. For example, Banks Peninsula has very few dairy farms but faces the challenge of rapid run-off from the volcanic hills to the harbours of Lyttelton and Akaroa. Kaikoura also sees a strong link between what happens on the land and the sea.

In some areas phosphorus is an important concern, but for most the main nutrient is nitrate. The area between the Waimakariri and the Rakaia is probably the most challenging in Canterbury in terms of land use and water management. Most of this area drains into Te Waihora-Lake Ellesmere, a shallow lake which empties only intermittently to the sea. Years of sediment built up in the lake and years of run-off from agriculture have percolated that sediment with levels of nutrients which now cause it to be hypertrophic. It is frequently described as New Zealand's most polluted lake.

Nutrient management by catchment

Different catchments show different features and face different challenges suggesting that a region-wide approach would not work. Common regional objectives and an overall strategy provide a spur to action and a sense of direction, but detailed objectives and work programmes need to be developed catchment-by-catchment. Therefore Environment Canterbury, in partnership with the 10 district councils in Canterbury and with Ngai Tahu, began in 2010 to set up 10 water management zone committees. In formal terms these are joint committees established under the Local Government Act, which means that the Local Government Official Information and Meetings Act applies to their proceedings. In other words, their formal business is transacted in public and their minutes and other documents are readily available.

First was the Hurunui-Waiau zone committee. For 10 years or more a group of local farmers had planned an irrigation scheme for the Culverden basin, and their idea was to take water from the south branch of the Hurunui river and perhaps also from Lake Sumner. Around 60,000 hectares of land could be irrigated. The problem was that many saw a threat to the local environment and to recreational opportunities, such as kayaking. At the time the zone committee was established, no less than four separate legal proceedings were under way or in prospect.

Riparian planting and stock exclusion are vital to reduce the amount of sediment and phosphorus as well as other nutrients entering waterways

A compromise

The committee members took the first year to explore options and develop trust in each other. Then they recommended a compromise in the form of a less environmentally disruptive proposal which was to use the Waitohi, a tributary of the Hurunui, for a series of smaller storage dams. This proposal is likely to be more expensive than the original scheme in terms of capital cost, and therefore final cost of water, but having widespread support it has now been granted planning permission. A set of rules has been put in place, based on the recommendations of the zone committee, setting a total nutrient load for the Hurunui river. These rules provided the context for the Hurunui Water Project's consent and will equally influence future land use and irrigation storage in this catchment.

This success, as it seemed to the participants, has influenced the work of the other nine Canterbury zone committees. For example last year the Selwyn-Waihora committee recommended rules designed to address the mauri or lifeforce, but equally state of well-being, of Te Waihora/Lake Ellesmere. This is a long-term challenge. Even in the event that all farming between the Waimakariri and the Rakaia were suddenly to stop, the level of nutrients in the lake would go on increasing for some decades to come. Leaching will continue from agricultural land into the aquifers and streams which feed the lake.

However, the challenge as for other regions in New Zealand is to simultaneously do right by our environment and to realise our development aspirations, to live in good health, enhance our recreational opportunities, and meet varying cultural needs. These diverse and competing aims require complex and long-lived responses.

Selwyn-Waihora a test case

Later this year the recommendations of the Selwyn-Waihora zone committee will be tested via the public hearing process required by the Resource Management Act. What is unusual here is that the proposals drawn up by Environment Canterbury are not the professional judgement of the council's technical staff. They are the result of two years of consultation with the local community, a process which has been led by the dozen or so members of the zone committee.

Each of the Ngai Tahu runanga with historic affiliation to the lake is represented on the committee. Environment Canterbury along with the relevant two district councils Christchurch City and Selwyn District, are also represented. The remaining members were chosen by the council appointors to reflect a cross-section of community interests. As a whole, the group has sought to meet all the various demands and targets of the strategy.

The zone committee's recommendations will require a gradual improvement in farming practices. These will be measured by Overseer, the software developed by

the fertiliser industry, the Ministry for Primary Industries and Landcare. Farm environment plans will be required so that detailed methods of reducing nutrient leaching can be developed and monitored.

Compatible uses

Crucial to this zone is the contribution to be made by the Central Plains irrigation scheme. As with Hurunui, this is not a new development. For more than 10 years local farmers have tried to advance this multi-million dollar scheme to irrigate the land between the Waimakariri and the Rakaia. In the drawn-out hearings which eventually resulted in their consent to take and distribute water from these two alpine rivers, they lost the crucial storage element which would have improved the scheme's reliability.

Fortunately Trustpower has emerged as a new irrigation partner. It has the rights to generate electricity from Lake Coleridge on the north side of the Rakaia river just upstream from the Rakaia Gorge. It has developed a clever way of using the lake for irrigation storage and generating electricity. These two uses are broadly compatible. The low point in terms of hydro-electricity storage is usually in September, before the spring snow melt has topped up the hydro storage lakes. The point of greatest irrigation demand is usually February, at the end of summer. Not many farmers want to irrigate in August or September. Hydro generators are usually fairly relaxed about water in February and March. Trustpower and Central Plains now have a commercial agreement to work together.

There are even plans to supplement some of the lowland streams which feed Te Waihora-Lake Ellesmere with the direct injection of alpine water from the Central Plains network of distribution pipes. The scheme may also allow for the retirement of some groundwater consents near the coast, in turn reducing pressure on the extraction of groundwater. Many steps lie ahead, including this year's public examination of the proposed Selwyn-Waihora catchment rules. However, a consensual basis has already been achieved. Similar packages of measures are being discussed in the Hinds catchment south of Ashburton, further south in the coastal area north on the Waitaki river, and in the Mackenzie basin.

Storage can make a difference

In November last year the Parliamentary Commissioner for the Environment published a second report on water quality in New Zealand. In March 2012 an earlier report had addressed the basic science behind assessing water quality. Last year's report considered the effect of land use on the quality of water. Having looked at the pattern of land use in 1996 and 2008, and then projected forward a further 12 years, the report concluded that 'if we continue to see large-scale conversion of land to more intensive uses, it is difficult to see how water quality will not continue to decline in the next few years.'

The report rightly acknowledges that a great deal of effort is going into mitigation on dairy farms – decreasing the loss of nitrogen and phosphorus by such measures as keeping cattle out of streams and planting riparian strips. But it concluded that mitigation cannot offset the increase in nutrients which comes from large-scale change to more intensive land uses. While a timely and useful call for attention, I believe this conclusion is too pessimistic. The Parliamentary Commissioner's report acknowledges that it does not take account of two other potential responses – the first is from regulatory authorities such as the regional councils, and the second is the effect of water storage. Both have been the subject of this article because both are occurring in Canterbury.

New rules

Gradually rules are being put in place which will require changes in farming practices, not just in physical steps such as fencing and riparian planting. These were the subject of industry agreements and action in recent years and are acknowledged by the Parliamentary Commissioner. But in addition in Canterbury we now have rules which directly limit the amount of nitrate that farmers may leach from their land. Across much of the region these rules limit farmers to the average they were leaching between 2009 and 2013, as calculated using Overseer. These rules are new, having emerged from the public hearing process at the end of 2013. They will need to be tested and made the subject of education and training. But they are in place.

Large-scale storage, on the other hand, is taking longer to build but a start has also been made. Lake Coleridge is already built. The lake level is not being altered. Instead a canal is planned to link the lake to the Central Plains distribution network. That network, although not the canal, is now consented, finance is being finalised and construction is due to begin this year. Similarly, to the north of Canterbury in the Hurunui catchment, the Hurunui Water Project has permission to store water from the Waitohi and detailed engineering design is now under way. At the southern end of the region, the Meridian's Hunter Downs project has consent to take water from the Waitaki river. Again, detailed engineering design is currently exploring the options for bringing water north towards Timaru.

Between them these large-scale developments will bring to life the vision of the Canterbury Water Management Strategy. It is not simply or even principally an irrigation strategy, much less a dairying strategy. It is a scheme whereby Canterbury's environment can be honoured and improved at the same time as its economic, social and cultural potential is realised. At times this is proving challenging to realise, but being so broad-based and bold it is well worth the effort.

David Caygill is Deputy Chair of the Commissioners at Environment Canterbury. He has particular responsibility for water management.

Philippa Rawlinson, Jill Greenhalgh and Rupert Tipples

The social influence of dairying in Southland in the last twenty years

In the space of 20 years, Southland has been transformed. Then it was home to 7.8 million sheep and 114,000 dairy cows, now it is home to 4.3 million sheep and 671,000 dairy cows. This change has had a significant influence on the social dynamic in Southland as dairy farmers have brought with them new cultural and farming practices.

A research project in 2013, funded by DairyNZ, sought to understand how Southlanders have been affected by this transformation. In the March 2014 issue of this journal, we provided a broad overview of the development of dairying. This article will delve further into the wider social changes associated with the growth of dairying, with a focus on local community relationships and rural schools. With the continuing high milk payout and the lower returns to sheep farmers, the growth of dairying, accompanied by further social change, is likely to continue with Matt Newman predicting there could be another 50 new dairy farms by the 2014/15 dairy season.

The land of milk and money

Dairying has a long history in Southland. The scattered remains of dairy factory buildings are testament to this. After World War II cows were traded for sheep – now it is the reverse. The need to upgrade the aging Edendale dairy factory initiated the modern development of dairying in Southland, and more recently successive high dairy payout years have encouraged sheep farmers to convert or sell for conversion.

The new dairy farmers brought with them unanticipated social changes, altering relationships with the wider local communities they live and work in, as well as with their sheep farming neighbours. In addition, as schools tend to be the hub of small rural communities, the arrival of younger farmers and farm workers has resulted in considerable changes for local schools, particularly as English is a second language for a number of the new students.

Rural community change

The Southland rural community was characteristic of rural communities throughout New Zealand. Families would grow up with the children of the neighbouring farmers and then farm alongside them for the rest of their lives. There was no reason to leave Southland, as sons married and inherited the farm while daughters were educated and often married a farmer. Southlanders created a safe and accepted way of life, one which was unchallenged until the advent of dairy farming.

The arrival of the North Island dairy farmers began to change the community dynamics. They arrived with high levels of debt and worked hard to make their farming businesses successful. Milking cows twice a day meant dairy farmers and their employees did not have time to participate in school or community activities, unlike the sheep farmers they had replaced. Unlike sheep farmers, dairy farmers could move with little warning. A family with four children, good for the small rural school, might move and be replaced by a single farm worker.

Once the pattern of dairying life was recognised by locals, the reception of dairy farmers in some areas of Southland altered. The energy involved in developing strong friendships was not worthwhile if the friends moved on every couple of years, so some sheep farmers stopped making the effort. The more traditional dairying areas continued to be welcoming of the newcomers, providing them with a load of firewood or baking, whereas those moving into new dairying areas were not welcomed into the community or even initially accepted on to school or other community boards. Excluded from these organisations and needing social interaction, one dairy farmer in northern Southland reported talking to 'paid friends' at the checkout of the local supermarket.

Sense of community

The fracturing of the community creates the perception that a sense of community has disappeared in Southland. In some places schools, halls and pubs – once the hub of rural communities – are no longer places of interaction. Some rural halls have been knocked down as they have aged and are used less. Finding a hall committee to oversee the maintenance has become increasingly difficult in recent times.

With the long hours associated with dairy farming there is no longer the time or energy to socialise down at the pub or after a game of rugby or netball. In some cases, even if farm employees wanted to participate in a sporting team, rosters made attendance at both games and practices impractical, while the consequences of injury also needed to be considered. Because of falling membership some rural golf clubs have found it difficult to keep afloat.

Farm clearing sales are an opportunity for older farmers to gather and socialise, maintaining a sense of community and connection to the past, but they also mean another generational farming family is selling up and leaving the district. Many Southland farmers have benefited from the growth of dairying with an increase in land values and equity in their land. However it makes it difficult for the next generation of the family to inherit or purchase a slice of Southland farm land.

Some farmers have sold up, but others have converted to dairying with the hope that the dairy career pathway will provide the opportunity for children to work their way into farm ownership and maintain a familial connection to the land and community. Migrant dairy workers have the same drive to work their way up the dairy career ladder as do New Zealanders. But their long term future in this country depends on satisfying Immigration New Zealand's requirements to continue to qualify for a work visa or residence visa.

Negative perceptions

Maintaining the sense of community has not been helped by the distinctively different farming practices of modern dairying in comparison to sheep farming. Converting to dairy removes all traces of the farm's familiar past as sheep, shearing sheds and sheep fences are replaced by herds of cows, laneways, dairy sheds and wintering barns. Some dairy farmers do not have any consideration for their neighbours and their farming practices.

We were told of boundary fences being ripped out and replaced with smaller fences which dairy cows then knocked over, of dairy cows grazing roadsides and damaging sheep fences and muddying sheep farm accessways. Community relationships were not helped by the behaviour of some early dairy farmers who commented that they were here to make money and not friends. Farmers who provided dairy support cited examples of dairy farmers pulling out of grazing agreements when they found a better deal elsewhere.

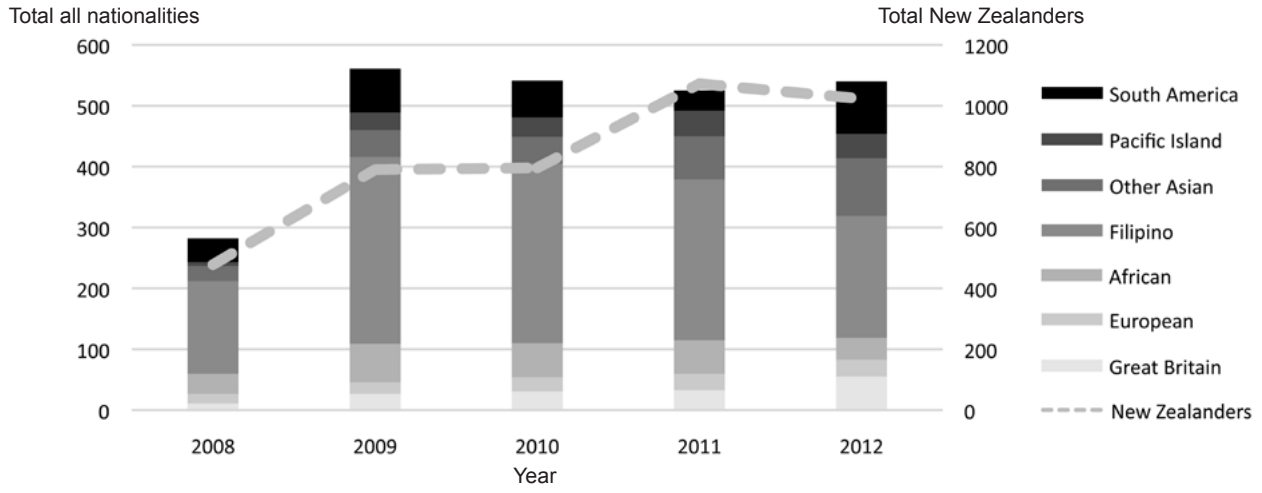
These few negative examples of un-neighbourly behaviour of dairy farmers become community folklore and it is therefore difficult to change negative perceptions. Consistent media attention relating to the success of dairying, or to poor environmental or employment practices, do not help maintain or foster a positive sense of community towards the dairy industry or dairy farmers. Previous research found that while sheep farmers tend to build long-term relationships with their contractors, dairy farmers are more focused on prices. For example, the requirement for a contract milker to get three quotes for any contractual work suggests the transactional relationship is still a feature of Southland dairying.

Some dairy farmers do recognise the importance of maintaining links in the community. We were told of a dairy farmer who held a barbeque at the nearest community hall around Gypsy Day. All community members were invited to meet any newcomers to the district and they were provided with a book detailing the history of the area. Yet there were other instances where dairy farmers were invited to special community events in their honour but failed to turn up.

Migrant dairy farm employees

The introduction of waves of migrant dairy farm employees are adding a new cultural dimension to the formerly mono-cultural Southland community. Dutch farmers purchasing farms in the late 1980s and 1990s represented one wave of migrant dairy workers in Southland. The Dutch landowners have been joined by a growing number

Ethnicity and total students undertaking Primary ITO training



of migrant dairy workers from the Philippines, South America, Africa and western European countries.

The varied nationalities have tended to concentrate in different areas of Southland, for example, Filipinos around Winton and South Africans around Dipton and West Hillend. They invite their friends and relatives to their area and form their own communities. Filipino workers make up a significant proportion of students undertaking AgITO, now Primary ITO.

Filipinos have formed their own social groups, as well as basketball and soccer leagues to help them maintain a sense of community in New Zealand, but some are also involved with integrated community events. The Filipino groups exist because of strong leadership. When these leaders leave to move to other areas, as occurred in northern Southland, the groups break up.

These strong community groups have meant it has been difficult for some rural community leaders to become involved with the migrant workers and integrate them into the wider community. For example, an initiative on teaching migrant women to drive did not receive the desired response and was cancelled, despite isolation being a migrant issue.

Schools

Schools are the centre of small rural communities as they provide a focus and create a sense of identity for them. Newcomers with children have an advantage in using the social networks a school creates to become integrated into the local community more rapidly than those without them. Southland has many rural schools with small rolls and it had previously felt the effect of school closures. Of the 186 schools which were closed throughout New Zealand between 1989 and 2000 a third were in Otago and Southland.

From 1992 to 2012, individual rural school rolls showed no particular patterns with apparently random rises and falls. Some of the rises could be attributed to the closure of nearby schools, but the growth of dairying has brought with it a higher degree of roll instability. However, when individual school rolls are amalgamated it appears that rural secondary school rolls are still dropping, but generally the decline in the primary sector has been arrested.

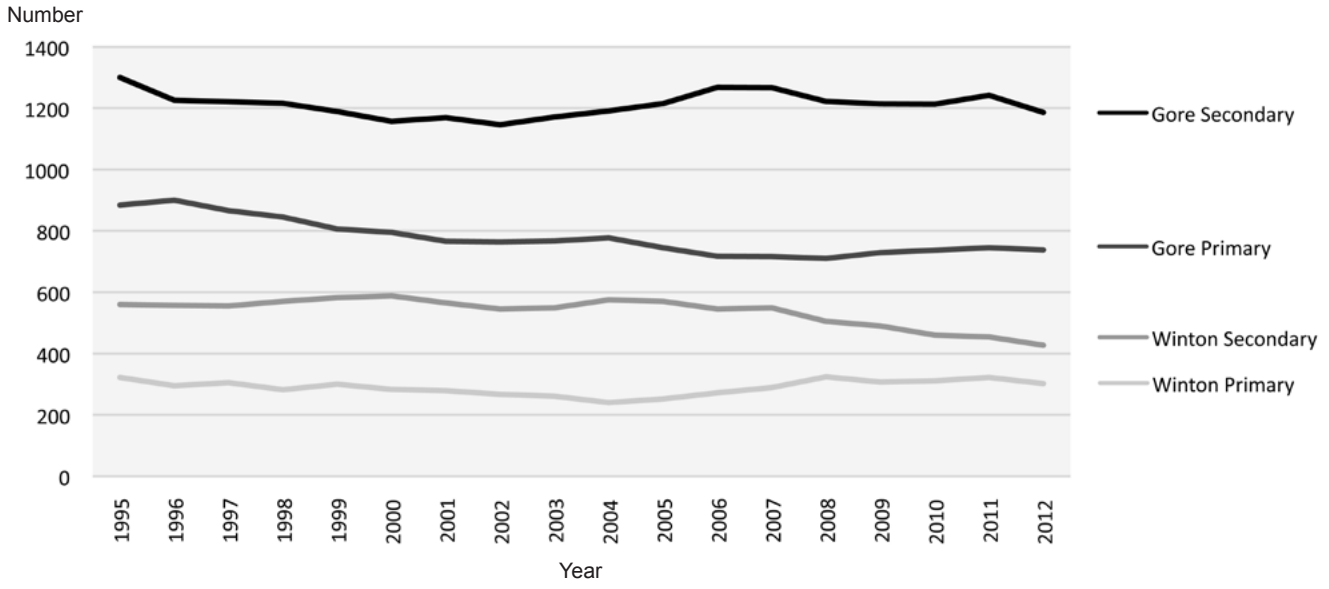
Within individual schools, roll volatility can be due to the movement of those within dairying, particularly around Gypsy Day, as well as changing parental preferences for particular schools. It may be that the influx of younger farmers has affected the primary schools, but their children have not yet reached secondary age.

Transience

The maintenance of rolls has come at a cost. With dairying based on a June year, the movement of families at this time has created a high level of transience in primary schools. The New Zealand Educational Institute defines a student as transient if they attend 'two or more schools in a year.' One medium-sized primary school experienced student movement, into and out of the school, of between 20 and 30 per cent of its roll every year over a five-year period. Several new children in a class create social upheaval as the children and classroom teacher adjust to new relationships. Another small rural school lost a third of its roll last Gypsy Day, and with no new pupils its existence became jeopardised.

This transience creates problems in resourcing rural schools. More importantly it hinders learning and socialisation of both the new and existing students as class relationships have to be re-established. This has been exacerbated by the more recent trend for the timing of Gypsy Day-related school moves to be extended out until calving at the start of August. The problems relating to transience have been well researched.

Primary and secondary school rolls in Southland





Students who are highly mobile are more likely to have special educational, behavioural and social needs, with up to 41 per cent of them being low achievers. The date of 1 July was chosen by the Ministry of Education as a resourcing allocation date based on supposed stability in schools at this time of the year. In reality it is the most unstable time of the year for rural schools in dairying areas.

The local resource Teachers of Learning and Behaviour have been working towards ameliorating the effects of transience on primary schools. There are two possible solutions –

- That rural schools could base their core topics on a July-to-July year with greater interschool collaboration
- To encourage the dairy industry to have a less seasonal approach to employment and de-emphasise Gypsy Day, so that straight employment changes occur in the summer.

A sticking plaster method is for schools and their dairying families to make a greater effort to track student movements before they actually occur. This would allow schools to prepare for the potential June influxes of students.

Primary schools have welcomed the growth of overseas migrants into their schools as an opportunity to broaden the experiences and interactions of the existing children from more conservative backgrounds. Migrants made up over a third of the roll of one Catholic school, while another reported having students of 10 different ethnicities. Some schools have struggled to build strong relationships with their Filipino communities while others have been very successful. Employing a Filipino leader ensured a very strong link to that community in one school.

Secondary schools and dairying

The previous literature does not appear to have investigated the effect of dairying on secondary schools. Schools with predominantly rural catchments experience the effects of transience without the benefits of any noticeable growth in their rolls. Overseas migrants form a lower proportion of their rolls, but a growing concern is that migrant school leavers from families without residency must pay international fees for further education.

Most of the Southland schools outside Invercargill offer agriculture and the Gateway programme. It appears that there is an increased awareness of dairy careers amongst the students. This translates into a small increase in interest in university education but not into students leaving school to enter dairying. The growth of dairying has created a wider range of career options in the dairy services sectors such as engineering and mechanics, which are attractive to some students.

Parental input to schools varied. Dairy farmers' high level of financial expertise is valuable to boards of trustees. Previous research suggested that dairy people are not as supportive of schools as sheep farmers, but this study found that opinions varied across the schools. The composition of school board of trustees indicated that there were proportionally fewer dairy farmers than expected, yet some schools felt their communities were highly supportive. Maybe this depends upon both community and school leadership.

Conclusion

Rural Southland is still evolving as dairying continues to expand. Eventually dairy farming will become an accepted Southland institution. Already some respondents noted that as time passes their communities are adjusting. Dairy farm owners are putting more time into their communities. However, for those actively milking the cows there is limited time available for regular sport and recreational activities.

Good leadership within the industry will ensure that dairying takes its social responsibilities seriously as the support and acceptance of all Southlanders is vital to a harmonious community. Rural schools will continue to benefit from dairying's need for young families, but the issue of transience requires serious consideration so that future generations of Southlanders – sheep and dairy children alike – have the best possible education.

Philippa Rawlinson is a Research Associate working with Lincoln University. Jill Greenhalgh is a Research Officer at the Department of Agricultural Management and Property Studies, Centre of Excellence in Farm Business Management at Lincoln. Rupert Tipples is Associate Professor, lecturing in employment relations in the Department of Agricultural Management and Property Studies.

Sandra Barns and Justine Young

The Taupo cap-and-trade scheme Market update

In the late 1990s scientific monitoring of water quality in Lake Taupo revealed deterioration of water quality and clarity, mostly due to nitrogen emissions from pastoral farming. The policy process that ensued resulted in the Taupo cap-and-trade scheme. This is part of the raft of policies in the Waikato Regional Plan designed to mitigate the effects of nutrient discharges in the Lake Taupo catchment. The wider policy includes the upgrade of sewage systems, but this is not part of the cap-and-trade programme.

The environmental target set for Lake Taupo is to return the lake to 2001 levels of water quality and clarity by 2080. There is a lag between what happens on the land and its effect on the lake. Scientific research shows mean residence times of 20 to 180 years for groundwater in the northern and western areas in the catchment. The long timeframe for the environmental target takes into account the load of nitrogen already in the groundwater system feeding slowly into the lake.

Capping and reducing nitrogen emissions

As mentioned above, under the cap-and-trade scheme nitrogen emissions from pastoral farming were capped at 2001 levels. The rights to emit nitrogen were allocated to qualifying landowners in the form of nitrogen discharge allowances, based on historical emissions from their property. This method of allocating initial rights is also referred to as grandparenting. Forestry and lifestyle block land leaches low amounts of nitrogen below the root zone and must comply with rules in the regional plan. If owners wish to change to higher nitrogen leaching land uses, such as that leached from farming businesses, they must apply for a resource consent.

A resource consent is granted to pastoral farmers, with the farm's allowable nitrogen discharge given in kilograms per hectare per year across the whole farm and as a tonnage – total annual nitrogen discharge for the farm. Farm information is put into the Overseer nutrient

budgets model, which is a registered trademark of the Overseer owners, the Ministry for Primary Industries, the Fertiliser Association of NZ and AgResearch. Overseer calculates an annual nutrient budget representing the long-term annual average nutrient flows for farm systems, including off-farm losses.

A 20 per cent cut needed

Version 5.4.3 of Overseer is specified in the regional plan. To ensure each farm is complying with their nitrogen cap, the consent specifies that the holder undertakes farming according to their nitrogen management plan at all times. This plan is the parameter report from the specified version of Overseer. To provide confidence that the nitrogen management plan is up to date and reflects what is happening on the farm, the consent holder is required to keep records of stock numbers and stock type, fertiliser and bought-in feed.

Scientific research indicates that to achieve the environmental target, at least 20 per cent of the manageable annual nitrogen emissions would need to be taken out of the system. The regional plans aim to maintain the overall cap on non-point sources of nitrogen from all land uses which discharge nitrogen in the catchment. During the policy development process, the political decision made was that the reduction was to be achieved from a buy-back of nitrogen from pastoral land.

The buy-back was estimated to cost around $81.5 million and was funded jointly by central, regional and local government. Administration expenses and research funding was also included in this amount. The Lake Taupo Protection Trust was set up in February 2007 to administer the public fund and achieve the 20 per cent reduction of manageable nitrogen.

The Lake Taupo Protection Trust

The Trust's strategic plan involved three main operations –

- Purchasing farms within the catchment to be then permanently converted to a low nitrogen use
- Buying nitrogen discharge allowances from owners who opted to stay on their land but reduce their nitrogen output
- Investing in research to find cost-efficient ways of using farmland differently to reduce nitrogen outputs.

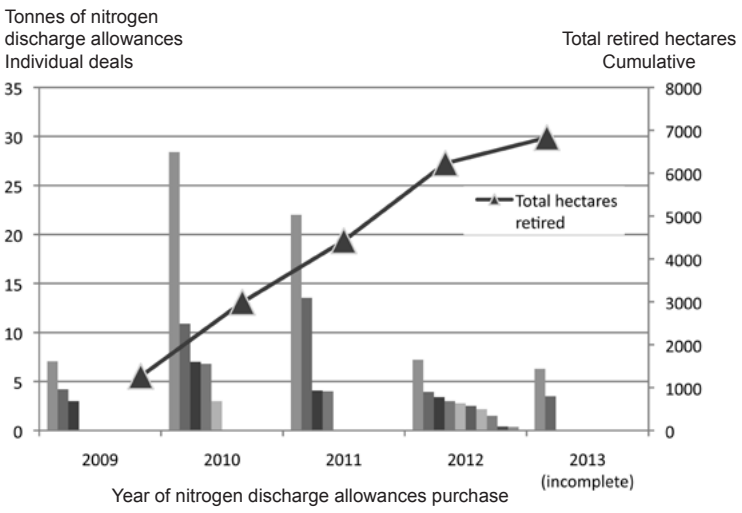
The trust started out buying land, converting it to a low nitrogen use, and then selling the land. The land purchase proved a risky strategy as the trust was exposed to movements in farm values. Therefore it took a strategic decision to be more involved in purchasing nitrogen discharge allowances from owners staying on the land. These deals generally involved land use change from traditional farming to forestry, but several deals have concerned reducing stocking numbers by changes to farming practices or by moving stock outside the catchment.

Buying allowances

Ideally markets are large, and market size is important for competition. The Taupo cap-and-trade market is small with 93 pastoral farms, six of these dairy, in 2000. From 2009 the trust was the major player in the market and there was little information on price. The trust had a limited amount of funding and needed to buy a fixed amount of nitrogen discharge allowances. This determined the price that the trust was able to pay.

Fortuitous timing meant that the New Zealand Emissions Trading Scheme played an important role in the success of the activities. The trust actively helped with agreements between nitrogen discharge allowance sellers and firms wanting to pay for forestry planting to offset carbon emissions. The Emissions Trading Scheme increased the attractiveness of taking land out of pastoral farming and putting it into forestry.

Total hectares retired using trades by the trust



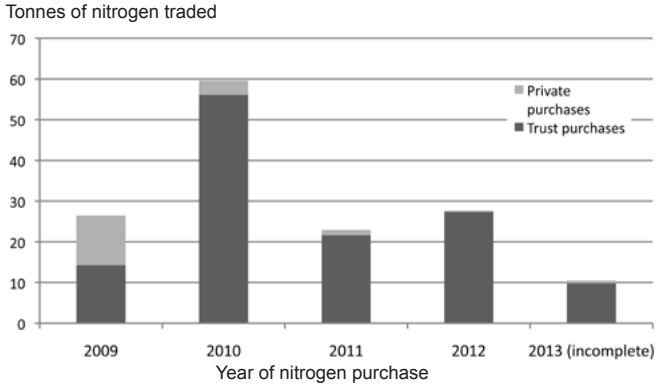
The operations have continued, and contractual agreements for the initial target of 153 tonnes of nitrogen discharge reductions by 2018 has been achieved around five years before the estimated completion date and on budget. Around 7,000 hectares of pastoral farming land in the Lake Taupo catchment has been retired. The initial target of 153 tonnes was revised upwards to 170 tonnes as a result of Environment Court negotiations and benchmarking of farms. In 2013 the three funding groups agreed to provide additional funds to meet the revised reduction target.

Trading

For farmers under the cap-and-trade scheme, the resource consent sets the property level nitrogen limit in the form of a nitrogen discharge allowance. A farmer wanting to increase nitrogen emitting activities, such as raising livestock intensity or changing land use, must buy or lease additional allowances. Similarly a farmer can sell excess nitrogen discharge allowances, which are tradable in full or in part, with other qualifying landowners in the Taupo catchment. After trading, these changes are recorded on the resource consent and the farmer must update their national management plan. Monitoring and enforcement is the responsibility of the Waikato Regional Council as the regulatory authority. The rights provided by the nitrogen discharge allowances allow farmers the flexibility to farm within their specified nitrogen emission limit but regional rules such as those for fertiliser application still apply.

High transaction costs are a concern in a market. Nitrogen discharge allowance trades incur costs to those trading. However, sales and leases have taken place, some of them relatively small, and so it appears that the level of transaction costs does not inhibit trading. Most of the trades to date have involved the trust but private trades have also taken place, as shown in the next graph.

Nitrogen discharge trading by year



The benefits of the formal process include trading and monitoring costs sitting with the resource users, and the requirement on resource users to supply relevant information to the council for monitoring purposes. Effective monitoring and enforcement is necessary to maintain the exclusivity and quality of the right accorded with the nitrogen discharge allowance.

All resource consents are subject to changes which may occur as a result of the planned 2018 review of the nitrogen removal target and the way it has been achieved. They also have a common expiry date of 2034, the lifetime of a resource consent under the Resource Management Act 1991.

Overall summary

A cap-and-trade scheme was seen as an effective and efficient policy response to the deterioration of water quality. Benefits included providing certainty of achieving the environmental limit, allowing farmers the flexibility to make farm business decisions within the bounds of their resource consent, and encouraging farmers to make emission reductions. At the time of writing –

- All farms in the catchment have been benchmarked, nitrogen discharge allowances have been allocated, and farms are now under a resource consenting system
- The cap-and-trade scheme has had the benefit of allowing farmers to maintain flexibility to make on-farm decisions, providing they stay within their resource consent conditions
- The 20 per cent reduction target has been met on budget and well within the time limit specified
- The policy is on-track to achieving the environmental target of 2001 levels of water quality and clarity by 2080
- The 2018 review will review the 20 per cent nitrogen removal target, if changes are required they will be negotiated at that time
- The market appears to be operating efficiently – private trades have occurred during the time the trust was dominant in the market and are expected to continue to do so.

Sandra Barns is an Environmental Economist and Justine Young a Senior Policy Advisor with the Waikato Regional Council based in Hamilton.

Andrew West

Our time in the sun

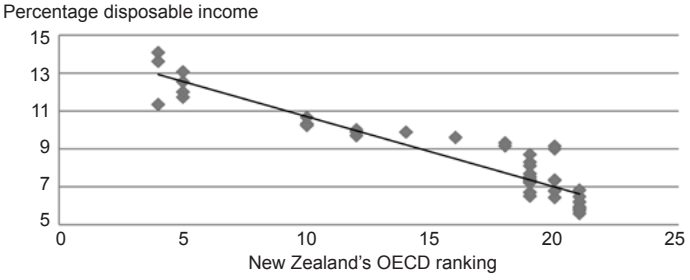
Food and fibre have been the mainstays of our export economy for over 150 years. New Zealand's inherited advantages in food and fibre production are many. They include high rates of soil formation due indirectly to tectonic activity, high luminosity, high average rainfall from being in the middle of vast oceans, a temperate climate and remoteness which has sheltered us from many serious pests, weeds and diseases.

Historically New Zealand has had an export-led economy. In the mid-1800s wool fibre constituted 75 per cent of exports. The advent of refrigerated shipping in 1882 saw meat and dairy products join wool as main exports. Biological exports diversified into apples, kiwifruit, wine, timber and fisheries during the 20th century. Overseas tourists came to marvel at our productive landscapes, or at least enjoy views of mountains due to the removal of trees and the creation of verdant pastoral lowlands. In 2009 food, beverages and fibre still comprised 71 per cent of our merchandise exports and 54 per cent of our total foreign exchange earnings. In other words, our economy has been slow to diversify from biological products and related landscape-driven tourism.

Diversification is a sensible tactic as it mitigates risk, in this case as much from climate, pests and disease as from market variability, leading to increased productivity. Our comparative lack of diversity may well have contributed to the steady diminution in our relative prosperity. In 1960 New Zealand was ranked fourth in the OECD in gross domestic product per head of population, yet had fallen to 21st in 2008, with substantial erosion in the 1960s from fourth to 10th and the 1970s from 10th to 20th.

Expenditure on food

Excellence in production has not been enough to mitigate the serious challenge posed to our primary producers by the decrease in food expenditure as a percentage of income. In the United States food consumed 23 per cent of disposable income in 1929, 18 per cent in 1960 and 10 per cent in 2008.



New Zealand's OECD ranking versus the US expenditure on food as a percentage of disposable income 1960 to 2008

New Zealand's decline in relative prosperity correlates strongly with a steady decline in the real price of food, discounted by the increase in real gross domestic product per person, this correlation being 93 per cent in the United States and 86 per cent in New Zealand. It is unlikely to be a coincidence.

As people have become wealthier the proportion of their disposable income spent on food has declined. Put another way, their increasing wealth has proportionately been spent on products from other countries rather than our own. Our failure to retain our claim on a steady proportion of consumers' real growth in incomes has contributed to the erosion of New Zealand's relative position in the prosperity rankings.

This is not the only reason. Another, for example, has been the dramatic change in the distribution and sale of food in our traditional markets over the past century, most notably the concentration of power in global supermarket chains. With New Zealand companies predominantly operating at the base of food and fibre value chains, they have increasingly received a residual sum after supermarkets themselves have claimed a growing and significant portion of the total value created.

Yet perhaps our time in the sun has come again. We know that the correlation between New Zealand's relative prosperity and food prices as a percentage of disposable income is strong in decline. Might it also be strong in ascent? Encouragingly, initial data suggests that it might be. Between 2008 and 2009 our relative prosperity ranking rose from 21st to 18th while domestic real food prices rose 8.2 per cent.

Global population and wealth rise

Rabobank provisionally estimates that by 2020, unless every farmed hectare on this planet increases its productivity by a third, or nearly 80 per cent of all remaining available, unexploited land is brought into production, then real food prices will start to steadily rise. Demand will rise faster than supply, implying that food producers will be in a stronger negotiating position with global supermarket chains or at least the intermediaries on value chains.

As food prices rise, if the correlation between our relative prosperity and consumers' expenditure on food as a proportion of disposable income is as tight as 93 per cent, then New Zealand's economic future looks positive. Global population will rise by only about 25 per cent in the next 50 years, from a little over seven billion to between nine and 10 billion. However, some estimates place the growth in wealth in India and China relative to that in the United States between now and 2030 at 200 and 300 per cent respectively.

A world population growing in size and in new-found affluence at a rate in excess of productivity growth in food production is placing upward pressure on real food prices. In a nutshell we are living through the greatest single accumulation of mammalian biomass this planet will witness. This is due to the application of intelligence in the discovery and use of high-density energy, the subsequent synthesis of nitrogenous fertilisers, the consequential breeding of plants to exploit this and, at the same time, the widespread human consumption of antibiotics.

Tastes change

As consumers' wealth rises so does the propensity to consume animal-derived foods, in the form of fats and proteins. Close to half the world's humans live on roughly two US dollars a day and subsist on diets mainly consisting of plant carbohydrates and proteins. As this sum increases to over $10 a day, individuals introduce animal-derived foods.

Annual meat consumption has peaked at 110 kilograms per person each year in the United States and some South American countries. It is far below that in India, China and other developing countries. Therefore demand growth will be massive even if it peaks at 80 kilograms of meat per person as it has done in Taiwan. The planet's human population is gaining affluence much faster than farming and fishing can produce an appropriate volume and mix of food. In other words, humanity is capable of applying inanimate technologies much faster than it can adapt and apply animate ones – at least to food production. This bodes well for New Zealand, masters of the land, so to speak.

Biological industries to the fore again

Calls and action to diversify the New Zealand economy are sensible and efforts should be increased. However this should not be at the expense of our biological industries which are starting to blossom and will continue to do so into the future. Our time in the sun may well be about to come again. But if it comes it will be in a different world from the 1950s.

A sharp rise in real food prices in the mid-2000s may well have kicked-off the Arab Spring. Sustained rises in the real price of food are unlikely to occur without significant social responses across the planet. Of course this is happening as global climatic patterns are starting to change substantially, affecting food production in complex ways. Therefore while New Zealand's time in the sun may be about to come again, that sun is likely to be shining on a very different geography of humanity.

Calorifically, given its present volume and mix of food production, New Zealand can feed about 20 million people – one in 500 in a world of 10 billion. This could be viewed as irrelevant, except that our dairy industry probably meets the dairy component of the dietary preference of 100 million consumers, and our specific reach is greater. Even so this country is not going to be a United States, Brazil or eastern European grain basket to the world. As supply responses meet unsatiated demand for food, it might be wise to lay the foundations for New Zealand to track differently.

Feed the wealthy and teach the rest

Perhaps it really is time to create the base from which New Zealand can differentiate its food products by genuinely and durably targeting wealthy consumers anywhere in the world. This argument has been rehearsed many times. Perhaps eventually as a strategy it will be comprehensively pursued. Feeding the wealthy with New Zealand-produced foods soon hits the wall of biological, geographic and regulatory-imposed limits.

The complementary option is to export New Zealand food production systems overseas, adapted to meet the requirements of sub-tropical and tropical environments. There are some examples of success here, yet probably more examples of failure. We have yet to see a coherent, deliberate and determined approach to the export of farming systems and associated education and training.

Our time in the sun?

Rising demand to feed more people is only going to last so long, perhaps just 50 years, before global human population starts to recede. Given all the factors at long last going this country's way, is it going to be our time in the sun? Or are we going to continue selling to the not so rich? Are we also going to continue extemporising a narrow niche in extensive, temperate food production which is of limited global interest?

Large sums of capital will now flow into global expansion of food production, including in the sub-tropics and tropics. We need to think global defence industry levels of capital mobilisation and then treble or quadruple it. Does New Zealand have the wisdom to board that train? This country's land-based skills and knowledge can be applied so much more widely. We face a genuine, once-in-humanity's history of opportunity. That is the thinking which now strategically occupies Lincoln University.

Andrew West is Vice-Chancellor of Lincoln University. All views expressed here are personal ones of the author.

Nic Lees

What is New Zealand's competitive advantage – efficient farming or customer value?

For most of the last century New Zealand led the world in efficient agricultural production. This began in the late 1800s with exports of wool, meat and dairy products, and relied on a competitive advantage based on this country's unique resources and capabilities. The availability of low cost land with a small population enabled New Zealand to produce a large food surplus for export to the world. A temperate maritime climate, freedom from animal and plant diseases, skilled and innovative farmers, combined with investment in farm management research enabled this country to out-compete local producers in nearly every market it had access to. By the 1950s, New Zealand had one of the highest standards of living in the world.

This comfortable existence was shaken by the rise of agricultural protectionism and support mechanisms in the 1970s. New Zealand was shut out from traditional markets and needed to compete with subsidised exports which drove down international commodity prices. This began a long decline in agriculture, highlighted by Prime Minister David Lange's famous statement that, 'Agriculture in New Zealand is a sunset industry and manufacturing and tourism will take over.' A generation of farmers' children were told, 'Whatever you do, do not go farming; you will never make money, get a degree in commerce or computing.'

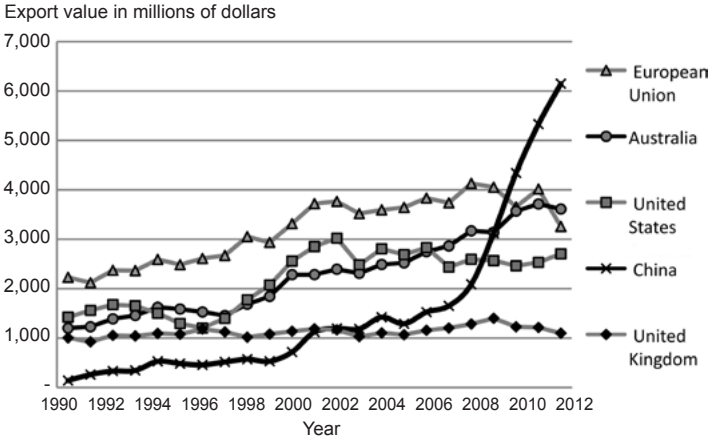
Despite significant attempts to diversify, the economy has remained highly dependent on food exports. New Zealand is unique among the world's developed economies, with nearly two-thirds of exports coming from the agricultural sector. Denmark and the Netherlands are the nearest comparable developed economies with significant agricultural export sectors, yet their agricultural exports represent only about 20 per cent of their total exports. Fortunately for New Zealand the demand for our agricultural products is increasing. The rapid urbanisation and economic growth in Asia has seen unprecedented growth in a middle class which is driving demand for our meat and dairy products.

Edge of a new golden era

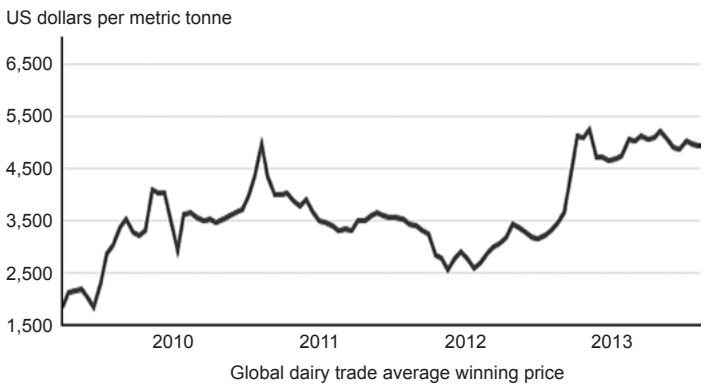
New Zealand may be on the edge of a new golden era in agriculture, with the Asia Pacific middle class expected to grow from the current population of fewer than one billion to more than three billion by 2030, according to OECD data. New Zealand is emerging as one of the first economies to reach significant growth following the global financial crisis of 2009. Already it is outperforming all but four of the world's advanced economies, with a growth rate expected to increase to 2.9 per cent next year, according to the International Monetary Fund. This will be exceeded only by Israel, Singapore, Hong Kong, South Korea and Taiwan. It is expected that in 2014 New Zealand will outperform the average advanced economies by two per cent.

This exceptional growth is due to record prices for dairy products. International whole milk powder prices have exceeded US$5,000 a tonne. As a result Fonterra forecast a payout, including dividends, of $8.75 per kilogram of milk solids for the June 2013 to May 2014 season.

New Zealand's primary product exports



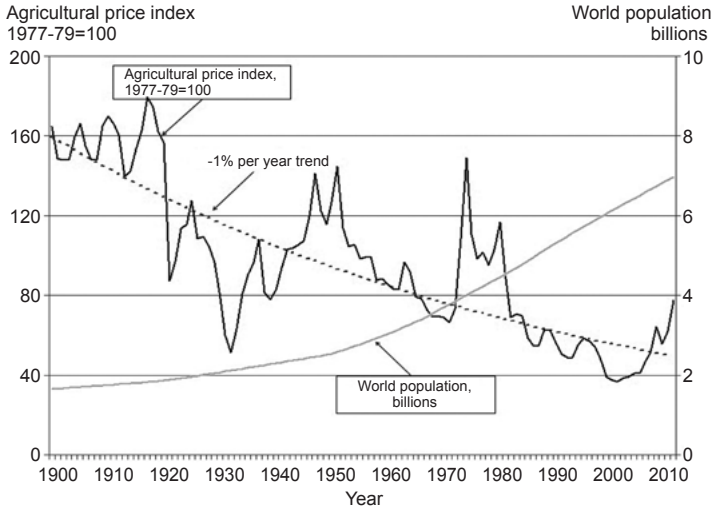
International whole milk prices



Sustainable long-term prosperity

While this is good news, it also presents a significant challenge. How can New Zealand turn this period of high agricultural commodity prices into sustainable long-term prosperity? This country potentially risks becoming dependent on China in the same way it was on Great Britain for most of the 20th century. Once again we may become vulnerable to volatile international commodity prices and changes in the agricultural policies of foreign countries.

Long-term agricultural commodity price trend



There have been many cycles of international agricultural commodity prices, as shown in the graph. At some point high prices stimulate increases in production and then inevitably, growth in demand declines. In the long term there is a consistent decline in price of about one per cent a year. To pass on a sustainable prosperous economy to the next generation, New Zealand must do something different.

There are other significant challenges which must also be addressed. The dairy sector in this country is severely indebted, carrying 65 per cent of the total agricultural sector debt of more than $50 billion. A third of dairy farms are carrying two-thirds of this debt. These highly indebted farmers have less than 50 per cent equity and some have as low as 10 per cent. They are very vulnerable to the inevitable rise in interest rates.

Each one percentage point rise in the official cash rate adds $50,000 a year in interest costs to these heavily indebted dairy farms. The Reserve Bank has recently warned that dairy debt is more of a risk than before 2008 and that 64 per cent of in-debt farms would be losing money at a payout $5 a kilogram of milk solids. The current model relies on high commodity prices continuing.

Environmental issues

Another challenge is mounting public concern about the effect on the environment from intensive farming practices. This is leading to the introduction of nutrient limits which may require lower stocking rates and reduced fertiliser applications, potentially reducing production and profitability. The 2013 Ministry for the Environment's report on the state of New Zealand's rivers shows that over 25 per cent of sites monitored have rising nitrate concentrations.

Environment Canterbury figures show the effects on groundwater, with nitrate levels increasing in about 30 per cent of wells tested and many exceeding drinking water standards. The November 2013 report by Dr Jan Wright, the Parliamentary Commissioner for the Environment, concluded that there was a clear link between expanding dairy farming and deteriorating water quality. She stated that even with best practice mitigation, the large-scale conversion of more land to dairy farming will generally result in more degradation of fresh water.

The vulnerability of New Zealand's reputation was highlighted with recent food safety problems. In January 2013, the *Wall Street Journal* published an article with the headline 'Is New Zealand Milk Safe to Drink' following the announcement that low levels of the chemical dicyandiamide had been found in New Zealand dairy products. This was followed in August 2013 by the false botulism scare and in January 2014 by contamination of *E. coli* bacteria in fresh cream. These scares have significantly damaged our 100 per cent pure clean green image.

Falling cost competitiveness

These challenges are further compounded by the fact that New Zealand is rapidly losing its competitive advantage as a low cost producer of agricultural products. Argentina, Chile, Peru, Indonesia, Pakistan, and several countries in central Africa, all produce milk at a lower cost than here. The cost of milk production in in this country is now similar to South Africa, India and eastern European countries. New Zealand has also lost its advantage of low cost land as it now has some of the highest land prices in the world.

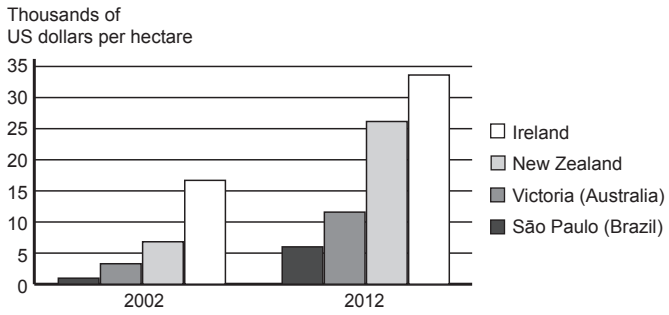
All this leads to a fundamental question. What is New Zealand's future long-term competitive advantage in agriculture? For over a century farmers in this country

have focused on pushing up productivity with higher stocking rates, improved animal genetics, use of fertilisers, irrigation, improved nutrition and other technology. They have all been aimed at improving efficiency and outputs. The potential to maintain these gains has become limited as environmental effects place constraints on future intensification. High land and labour costs also push up production costs and make increases in scale more costly.

Alternative to the present model

There is an alternative to the present model. Instead of continually chasing higher production per unit of input, the emphasis can instead be on increasing the value of the product. This requires a fundamental change in the focus of agriculture in New Zealand. Instead of an emphasis on farm production, the focus should be on selected consumers and their needs. These consumers are demanding greater variety and quality in the food they eat. They require a consistent year-round supply of high quality safe food. They also want food which aligns with their own personal values and includes, for example, environmental sustainability, animal welfare and fair trade, as well as local and organic production.

Dairy land prices in selected pasture-based countries



These customers need more than an adaptation of the existing system. They require a new model that moves beyond efficient production systems to provide higher value products to selected premium customers. New Zealand needs only about 30 to 40 million selected high value customers for its agricultural production, which represents less than 0.5 per cent of the world's population.

High quality safe food

The first task is identifying these high value customers and understanding what is important to them. When New Zealand exported its products mainly to Europe it faced the barrier of the large geographical distance but benefited from close cultural links. The Asian markets are significantly closer geographically but this is exchanged for a larger cultural distance. These customers are usually young, urban and Asian.

Few New Zealanders speak Asian languages, let alone understand the culture and concerns of these customers. There is a belief that these customers do not value attributes such as environmental sustainability, animal welfare and food safety as much as European consumers. However, recent research by the Lincoln Agribusiness and Economics Research Unit showed that these attributes are more important in China and India, and they are willing to pay a greater premium than European customers for this.

Once these customers are identified, the next step is to develop innovative production systems for a consistent year-round supply of high quality safe food which addresses their concerns for animal welfare and environmental stewardship. This is not easy within the constraints of a seasonal pasture-based system. New Zealand has traditionally targeted research investment to maximise the production of meat, wool or milk per kilogram of grass. There also needs to be research into systems for maximising long-term customer value per kilo of grass. Investment in market innovation and knowledge about how to communicate with customers is also required.

Value creation

Creating value requires moving beyond meeting minimum standards for sustainability, animal welfare and food safety to leading the market in these standards. These need no longer be seen as compliance problems but as providing a valuable competitive advantage. Value creation also involves building collaborative supply chain partnerships beyond the farm gate with distribution channels which give access to these selected customers. There needs to be long-term co-investment in market development with these partners.

This is difficult for many companies as most farmers want to see any premiums achieved in the market retained and paid back through the farm gate price, which limits their funds for long-term market development. There are already some companies attempting to move in this direction, for example, Zespri, Merino New Zealand, Synlait Milk, Westland Milk Products, ANZCO Foods, Silver Fern Farms and Firstlight Foods. However the majority of New Zealand agricultural exports remain in 25 kilogram brown paper bags.

Developing this new model will be hard work and take time and capital. It needs a long-term perspective, and a willingness to take risks and accept that some things will fail. It also requires sacrificing short-term gain for long-term profitability. When there are high agricultural prices it is always easier to be a commodity seller. However, this will not provide the long-term sustainable prosperity for New Zealand that we desire. Only the future will tell if we have learnt from past mistakes.

Nic Lees is a Senior Lecturer in Agribusiness Management at Lincoln University. He is currently involved in a Ministry of Business Innovation and Employment research project entitled 'Maximising Export Returns for New Zealand's Biological Industries'.

Jacqueline Rowarth

Agricultural education and employment for the future

There are great people in agriculture, and we have some terrific younger generation members who are bright and motivated to achieve, coming through the pipeline from school into the workforce. However, they are very few in number in comparison with others in their age group. Anybody in agriculture now is clearly unusual. Our challenge is to understand the majority mentality to be able to attract a greater proportion of the younger generation into the industry which provides the foundation for existence.

Top people feel encouraged in the workplace, and they spread the word to others about the influence they have in making the world a better place, as well as the personal benefits. 'Come this way' is the message. Recruitment increases from the schools and tertiary education, with training institutions creates a vibrant, well-informed and capable workforce that leads New Zealand primary production and processing forwards.

As discussed in a previous article in this journal, money is the ignition for the vision. Research since 1966 by the University of California Los Angeles and in 1975 by the University of Michigan has shown that the proportion of students for whom being wealthy was very important changed from 45 per cent for baby boomers, born between 1946 and 1964, to 75 per cent for Generation Y, born between the early 1980s and the early 2000s. In contrast, 'developing a meaningful philosophy of life' decreased from 73 per cent for baby boomers to 21 per cent for Generation Y members. It seems clear that the reasons for choosing a career are quite different for current generations than in the past.

The current state of play in terms of graduate numbers was outlined in the last article. Some initiatives to increase involvement at the tertiary level were proposed. This article discusses what other other countries are doing to address tertiary studies, attempting to make them more attractive to students while still meeting the requirements of employers. It also considers what employers might do to ensure that graduates feel valued in their chosen career.

The challenge in tertiary education

Almost all tertiary institutions, from the University of Melbourne ranking highly in any global assessment to a college somewhere obscure, face the same challenge of where to draw the line between quantity and quality in their student recruits. Increasing enrolment numbers without decreasing standards is difficult unless the degree has high kudos, such as veterinary or medical studies. For graduates in general, salary and benefits, security, career growth, location, leadership and brand are the top factors in job consideration. Getting the message to school students that these factors are found in the primary sector is vital. The industry employers also need to ensure that the message is true.

Countries overseas are already making changes to the interaction between education and employment, and some of these could be effective for New Zealand's primary sector. The changes are beyond the common approach of asking what the industry wants in graduates and whether industry agrees with the proposed changes. The first has been studied extensively and the second tends to result in agreement because industry feels the academics should know what they are doing.

Laying the foundation

A 2011 report from the SCRE Centre for Research in Education at the University of Glasgow found a 'broad understanding of what qualities, characteristics, skills and knowledge constitute employability both in general, and specifically, for graduates.' The list of expectations was founded on technical and discipline competencies from the completed degrees and included teamwork, communication, leadership, critical thinking, problem-solving and managerial abilities.

A 2013 report for the Association of American Colleges and Universities highlighted the need for 'skills that would enable employees to contribute to innovation in the workplace.' Critical thinking, communicating clearly and solving complex problems were also skills considered to be more important than the actual major of the degree. Conducting research, using evidence-based analysis and applying learning in real-world settings were advocated.

Last year results from a web survey by California Polytechnic State University researchers involving agribusiness graduate employers put 'creativity' into the list as well. Creativity was suggested to be increasingly

important to the future because of the 'unlimited horizons it may open through multi-disciplinary creative processes and innovation.'

In these reports from the United Kingdom and United States, and in those from McKinsey examining education to employment, the same refrain is clear. Technical knowledge lays the foundation but more is required – not instead, but as well. This conflicts with the attraction to students of a three-year rather than four-year degree. A fourth year of study has an opportunity cost that might not be recouped from higher starting salaries in eventual employment.

Workloads for students

Of equal concern to current students are the expectations in terms of academic contact hours and workloads associated with degrees. Contact hours have been reduced in some degrees on the basis that more self-directed study is undertaken, but students still make choices that allow them to work while doing their studies.

In 2010, Professors Babcock and Marks from the University of California reported that full-time students allocated 40 hours a week towards class and studying in 1961. By 2003, the time allocation was down to 27 hours. More recently, Professor Richard Arum of New York University led research which surveyed over 2,300 students in four-year college courses. On average students in a typical semester spent between 12 and 14 hours a week studying, but one-third of the time studying was with peers in social settings 'which are not generally conducive to learning.' Combining the hours studying with the hours in classes and laboratories, students spent only 16 per cent of their time each week studying. Over a third of students reported that they spent five or fewer hours a week studying alone.

In 2013, Universities Australia released its report on university student finances in 2012. Almost 12,000 students responded to the survey request. Main findings were that the average income of full-time students in 2012 was substantially higher than in 2006, but that reliance on income from family and government student allowances had increased. Despite this, students indicated that they were experiencing far greater financial stress in 2012 than in 2006 and reported higher debt. Expenditure for undergraduates increased from A$27,319 in 2006, adjusted for the consumer price index, to A$37,020 in 2012, which is greater than the minimum wage for full-time work.

To allow for this expenditure over 80 per cent of students worked, and the average employment for undergraduates was 16 hours a week, with a quarter of the employed undergraduate full-time students working over 20 hours. Over 50 per cent of full-time undergraduate students reported that increased hours of work affected their performance at university, and 33 per cent of domestic students reported missing classes regularly because of work commitments.

Overseas initiatives

Practical work experience is significant in the sandwich courses that used to be offered by polytechnics in the United Kingdom – a year of post-school study in what was termed a vocational course was followed by a year in work and then another year of study. The result was a diploma not a degree, but gave work-ready mature candidates for employment. When the polytechnics were accepted into the university system the sandwich course survived as a degree, but enrolments in sandwich degrees have been decreasing. This is despite the apparent advantages of experience, salary and improved job prospects once the qualification has been achieved. A possible reason for the decreasing enrolment is fees. Universities can charge as much as £4,500 for a sandwich year – a guideline of £1,000 has been proposed.

Bucking the norm is Leicester University, which has seen the benefits of internships to students as a recruitment opportunity and has launched a paid internship scheme for 2014. Up to 500 interns will be selected for up to 12 weeks of paid work at a pro rata yearly rate between £12,000 and £16,000. The aim is not only to give students an insight into what employers want from recruits, but also to showcase the talent in undergraduates.

Work placements

Another initiative announced last year addresses the skills gap in food engineering. The industry itself has commissioned a new degree at Sheffield Hallam University in the United Kingdom. The mechanical engineering food engineering degree includes 50 weeks of work placements with food manufacturers, during which they will be expected to display core skills including planning, organisation and financial management. The degree has been designed to increase the pipeline of graduates who are engineers, know the food sector, have relevant practical experiment, and are employment-ready the moment they graduate.

The benefits of internships to the companies which offer them are significant. Research by Ithaka for Innovate+Educate suggests that –

- Previous performance in work is twice as effective a predictor of future performance as an academic degree
- A job try-out is four times as effective
- A cognitive skills assessment is five times as effective.

Using skills-based hiring techniques Ithaka reports a 25 per cent to 75 per cent reduction in staff turnover, 40 to 70 per cent in time to hire, 70 per cent in cost to hire, and a 50 per cent reduction in time to train. High Fliers research in the United Kingdom released in January 2014 reported that a record 37 per cent of this year's entry-level positions are expected to be filled by graduates who have already worked for their organisations in paid internships, industrial placements or vacation work.

More involvement for agriculture

The New Zealand website www.NZgradconnection.com has graduate vacancies of various types from a large number of companies. For agriculture there were only four companies listed in February 2014 for graduate positions and only one for internships. In contrast, for accountancy there were 18 companies listed for graduate positions and 12 for internships and for engineering there were 35 companies with jobs and 16 with internships. Pew Research in the United States reported in February 2014 that 50 per cent of graduates wished they had gained more work experience during their education.

Clearly agriculture could be more involved in broadcasting the opportunities the industry has, and in thinking more about what could be done in the way of formal internships and placements. Student work is formalised in agriculture in some cases in New Zealand. Massey and Lincoln Universities have practical work requirements of 26 and 39 weeks respectively.

Reports of the enterprise are required as part of completion, but do not contribute to academic credits and are not supervised formally by the employer or university. At the University of Waikato, agribusiness students can take internships for academic credits as part of their four-year degree. Supervision is in the workplace and from the university and so requires goodwill and time from employers, noting that internships as part of credits are not formally associated with pay. Posting vacancies on the website would allow a greater range of students to learn about the opportunities available in agriculture from paddock to palate, soil to saliva.

Employment

Once in the workforce the younger generations have attitudes and expectations which differ from previous ones. McCrindle Research results published in 2008 suggest the major contrasts as shown in the table.

Traditional employers	New employees
Work ethic live to work	Work-life balance work to live
Task focus	Team focus
Commitment	Enjoyment
Authority	Empowerment
Independence	Support
Structure	Flexibility
Tell them	Involve us
Conformity	Creativity
Tradition	Innovation
Regional	Global
Long careers	Many jobs
Learn then earn	Lifelong learning
Loyalty	Variety

Hudson Research results indicate that baby boomers and Generation Y have a strong work ethic. However Peter Sheahan, Generation Y member and author of *Generation Y: Thriving and Surviving With Generation Y at Work*, points out that there is a 30 hour a week difference in what that work ethic means to them. This may be because the Generation Y members were forming their worldview during the 1990s when their parents were being urged to 'work smarter not harder.'

The urging was supposed to stop baby boomers working even longer hours. Generation Y members who, in Sheahan's words, 'are manipulative, and will twist and distort information to get what they want, exploiting any loophole they can't, work smarter so that they can go home early, having ticked all the boxes or at least enough for a pass on their job list.'

Sheahan identifies motivators for Generation Y employees as culture, team, management style, flexibility, conditions and salary. Inclusion is vital. McCrindle Research reported that 97 per cent of the Generation Y members surveyed valued a leadership style which involved empowerment, consultation and partnership and would leave if they did not get it. Similarly, Robert Half International in 2008 put working with good people at the top of the list, followed by work-life balance.

Requirement	Score out of 10
Working with good manager	8.74
Fun people	8.69
Work-life balance	8.63
Short commute	7.55
Green company	7.42
Nice office	7.14
Technology	6.89

Research by Massey University reported in 2007 that common features in top workplaces were excellence in leadership, focus on performance and results including performance-based rewards, recognition systems and formal management structures, allowing employees to feel they are making a difference, and ensuring that they are acknowledged for their contribution.

A keynote paper given by Martin Thorley of Merston Peters Ltd, a recruitment and human resources management company, at the Oxford Farming Conference in 2013 gave the following summary –

- Work on the quality of your management
- Become world class
- Be flexible in how you attract and reward people
- Show that you care
- Be prepared to invest in success through training and development.

Thorley warned that there is a talent shortage which is getting worse, competition is getting stronger for good people, and that the best people are wanted by everyone – they have choices. He also warned that, 'growing new people is a long-term strategy.' Robert Half International research suggests that in recruiting people, emphasise the competitive salary being offered, as well as the benefits,

the stability of your operation and its reputation. Support the employees' professional goals and create opportunities for training and career development. Do salary reviews regularly, perhaps more than annually, and award bonuses.

Rural employers must also ensure they have the six dimensions of high-performance work systems –

- A fair promotion process
- Few status differences
- Accurate performance appraisals
- Regular constructive feedback on performance
- Information sharing
- Inclusion in decision-making.

Creating such a system has been reported to lift job satisfaction, commitment, trust in leadership, and ultimately performance, for the business.

In times of economic uncertainty, which applies to agriculture all the time, past history shows that benefits exist for employers prepared to invest in good people. Under-performing companies die, and there is release of capital from fading sectors to new industries, as well as movement of high-quality skilled workers toward stronger employers.

Perhaps of most importance for the new generations is inspirational leadership which creates a shared vision. In a project surveying tens of thousands of workers globally, over 70 per cent of respondents want forward thinking in their leaders and this must reflect the aspirations of the workers. They want to know how their dreams will come true and their hopes fulfilled.

This suggests that the best way to lead is to connect with the followers in the present – the visions that will take hold are those which are shared. Sharing results and an involved workforce is productive, reflecting positively in the bottom line. The human resource challenge in the agricultural industry can be met by intelligent people observing the human condition, that is, the fundamental need to be creative and be valued.

Developing leadership

Inspirational leadership must also be developed in the young, and being given leadership development opportunities is becoming important in employment. Deloitte's research released in January 2014 reported that over a quarter of people in the workforce born in 1983 or later are already asking for a chance to show their leadership skills. Also 75 per cent believe their organisations could do more to develop future leaders.

Another factor for almost 80 per cent of the 7,800 respondents in 26 countries in the survey was working for an innovative company. Most felt that their current employer does not encourage them to think creatively.

At school Generation Y students have been given leadership opportunities, as two-thirds of them believe that they are leaders, and high grades because in the United States 43 per cent of grades are As. Sheahan explains that they have also been encouraged to evaluate and challenge other people's ideas and decisions, and are inclined to argue if they do not like what is being said or done whether or not they have taken the time to inform their opinion. This has resulted in an education system with more focus on 'teaching to the exam', mastery tests where students can have repeated attempts at passing, and multi-choice and internal assessment, so that teachers can justify the assessment.

In New Zealand research has shown that this style of education has suppressed motivation as well as innovation and creativity. Similar observations have been made about the A level system in the United Kingdom which has 'become more standardised, prescriptive and a question of the boxes that need to be ticked.' People who are not motivated do not become inspirational leaders.

Conclusion

Creating the workplace of choice for the younger generations will benefit all generations. It means developing a creative and personal work environment where employees are treated and developed as individuals. The cost of 'backing off' on accountability, while increasing coaching and mentoring efforts, will be more than covered by increased productivity.

In his crystal ball gazing Pita Alexander, specialist farm consultant and author, has suggested that there will be more volatility in the next seven years than there has been in the past seven – on all fronts. Farming is going to get more complicated. So will business, and preparing students to be able to adapt to change and challenge is part of the role of education. Headlines such as 'The degree is doomed' may be overstating the case, but certainly higher education is in the midst of disruptive change.

For the primary sector land and labour will continue to be of great importance, but in order to go on creating wealth we need new thinking. Mercer, a global leader in human resource consulting, published *Nine Rules for Leading Creative People* earlier this year. They state, 'The art of leading creative people is particularly intriguing because they have certain attributes that run counter to various aspects of corporate life, yet when that paradox is managed effectively, it is precisely what unleashes the power of their contributions to their organisations.'

New ways are required to cope with what is becoming an old problem. If we do not adapt and respond, the students will continue their path to other employment areas. For the younger generations, talking about the country's or the world's needs is irrelevant. Offering them opportunities where their education moves seamlessly into holiday jobs and then internships and employment, and where employment conditions meet their expectations about personal development and rewards, is fundamental to achieving the vision of a vibrant workforce.

Jaqueline Rowarth is Professor of Agribusiness at the Waikato Management School, University of Waikato in Hamilton.

Sally Peel, Marvin Pangborn, Guy Trafford and Keith Woodford

Integration of crop and dairy farms

The growth of the Canterbury dairy industry has been well documented. Research from the Lincoln University Agricultural Management Group has shown that this growth occurred in three successive waves roughly covering the 1980s, 1990s and 2000s. The first wave of the 1980s was mainly entrepreneurs drawn by lower-priced land and irrigation water. Then in the 1990s, the second wave was dominated by corporate farmers in search of capital gains but also containing a number of traditional sheep farms which converted in search of increased profits. By wave three, cropping farmers with some sheep were drawn to the industry. Further research has shown an increase in high input systems in the 2000s, and that when use of supplements is combined with efficient use of pasture these more intensive farms can be highly profitable.

In this article we report on case study investigations in 2012 of seven farm businesses in mid-Canterbury. These are part of a further evolution within some of the region's dairy industry towards the integration of crop and dairy. The purpose of the project was to establish the reasons for the land use change from crop to crop and dairy, together with the benefits of integration for both crop and dairy systems.

All the crop systems for the seven farm businesses included cash crops and dairy support. The cash crops included milling wheat, vegetable and ryegrass seed, peas, potatoes, Asian brassicas, malting barley, hemp and oats. All the dairy farms fed supplementary feed at 600 to 1,200 kilograms per cow per lactation, or between two and five kilograms a cow daily, mainly grains, placing them within systems three to five of the DairyNZ Five production systems. The table shows that, in comparison to the production averages in the Ashburton district, all integrated dairy farms had above average stocking rate and production per cow.

Case study farms compared to Ashburton district farms

	Averages for the Ashburton district 2011 to 2012	Average and range for the case study farms
Stocking rate in cows per hectare	3.5	3.9 with a range 3.5 to 4.5
Cow herd size	859	881 with a range 500 to 1900
Milking platform in effective hectares	243	247 with a range 138 to 420
Milk solid production in kilograms of milk solids per cow	406	485 with a range 457 to 550
Milk solid production in kilograms per hectare	1421	1892 with a range 1600 to 2182

Adopting and developing the system

The development process was from intensive crop to crop with dairy. Previously the crop farmers had incorporated sheep, and in some cases dairy, support within their cropping system. All the case study farmers had specialist skills in crop farming before the introduction of dairying. Dairy was adopted into the system in three ways –

- Conversion of one cropping farm into separate but contiguous crop and dairy farms
- Conversion of one cropping farm into crop and dairy units with flexible boundaries between them
- Conversion, in some cases following purchase, of a separate non-contiguous parcel of land to dairy to create complementary units.

The search for profitability was a main reason for land use change for six of the seven farmers. Four of these farmers also talked about lifestyle improvements as a reason for converting. These farmers recognised dairying as being a simple system in comparison to cropping, with less stress and workload for the owner. They partially converted to dairy to recapture the enjoyment of farming and to increase their recreational time. Yet the same farmers did not want to fully convert because they had a personal preference for cropping and therefore wished to continue working on the cropping farm.

All the case study farmers employed a lower order sharemilker or manager, which removed them from the role of managing labour, allowing them to meet their personal work preferences, reduce problems and increase recreational time. This management strategy also removed some land from the case study farmer's direct care, further reducing workload. In all cases the cropping area was reduced.

Risk management

Spreading risk by diversifying income was regarded as an important factor in six of the case studies. Dairy conversion was seen to reduce the climatic, market and price risks associated with cropping. The security of the dairy farm led a number of the case study farmers to change their personal risk position within the cropping

enterprise. They substituted their perceived low-risk, low paying crops with higher-risk and higher paying crops. Risk management was also a primary reason the case study farmers chose not to fully convert to dairy.

Two farmers chose to convert as a method of making the farm more easily divisible for succession. One said the irrigation scheme and scattered trees made his property better suited to dairy than crop and this helped his decision to convert. Another said an important reason for his conversion was the excitement of entering a new industry and learning new skills.

Only one farmer mentioned without prompting the creation of synergistic relationships between enterprises as a reason for partially converting to dairy. All the other case studies needed prompting into a discussion. The use of land itself created synergies on one farm.

This farmer chose not to have a fully fixed area selected for the dairy platform. Instead paddocks could be switched between crop and dairy, usually with crop being incorporated into the dairy platform when re-grassing was required. This allowed for more rapid pasture renewal on the dairy farm. Having crop and dairy land adjoining without fixed boundaries also allowed the milking platform to be expanded when additional grazing was required.

Wintering

All of the case study farmers had full or partial dairy herd wintering on their crop farms. Some farmers used their crop farms for grazing milking cows at the beginning or end of the season. In some cases cut-and-carry feed was transferred to the milking platform. Given the proximity of the farms they also practised individual drying-off cows in autumn so that they could milk cows for longer.

Some of the case study farmers kept cows on the crop and winter grazing longer in spring, bringing them on to the milking platform in small groups at or after calving. Cows could also be moved across to the crop farm to graze ryegrass seed crops. In some cases farmers justified their self-wintering practices as providing security and guaranteeing cropping profit. Other farmers said wintering cows allowed their intensive cropping rotations to work. One farmer noted that maize following winter feed in a rotation benefited from the manure and required less fertiliser.

Supplementary feed

All of the case study farmers identified synergies involving supplementary feed. Some farmers bought all supplements for cows from their cropping farm regardless of the market while others based their decision on the comparative costs of other feeds. All farmers mentioned the benefit of reduced transaction costs when they traded feed internally. One farmer grew grain on his crop farm, but did not sell it to his dairy platform as the land was not adjoining and he could buy grain from dairy platform neighbours at a lower cost.

All of the case study farmers sold silage or baleage made on their cropping farm to their dairy farms. Other products the farmers sold to the dairy platform included pea and barley straw. The grazing of their seed crops of ryegrass and clover with cows could be considered a supplement. The case study crop farms did not subsidise the cost of feed for the dairy platform, but information sharing allowed the appropriate quantity and quality of feed to be supplied to the dairy farm with reduced transaction costs.

Information and knowledge

Although each farming enterprise tended to have its own machinery, the specialised machinery on each farm was used on the other. Information and farmer knowledge was important. The case study farmers felt they had greater knowledge than single enterprise dairy farmers about crop markets and the value of feed. The case study farmers generally felt this helped them make more informed decisions about feed costs.

Potential environmental benefits were discussed but not quantified. Evidence of the sustainability of these farms from a whole-system approach is a gap requiring further research to determine environmental footprints. The ability to reduce the potential environmental problems surrounding dairy farming by incorporating cropping land could have important implications for industry growth.

The future

It remains unclear whether the current levels of integration will continue in the long term. It is notable that all farmers had previous expertise in cropping before starting their dairy operation, and that all of the transition has been away from crop towards dairy. Six of the seven case study farmers plan to keep cropping as part of their operation as it is their preferred on-farm role. They are also developing crop rotation on these properties for dairy support and to take advantage of the higher value crops such as vegetable seed.

In the seven case studies, the reasons for land-use change were a combination of profitability, risk management by diversifying income, and personal lifestyle preferences. Dairy farming was attractive because it was a simple system with a reduced workload compared to the cropping systems.

The synergistic relationships between crop and dairy included shared land, wintering systems, supplementary feed systems and an associated reduction in transaction costs. Given the specific skills associated with cropping, it remains unclear whether the integrated systems will continue through to successive generations of farm ownership.

Sally Peel is a recent Lincoln University Master of Commerce (Agriculture) graduate now working for DairyNZ. Marvin Pangborn, Guy Trafford and Keith Woodford are members of the Agricultural Management Group at Lincoln University.

David McCall and Sam Howard

The United States competitive threat to New Zealand dairying

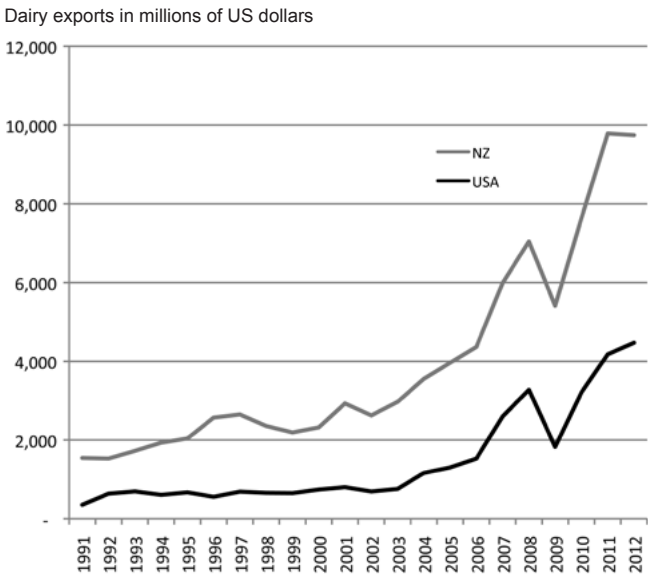
The United States is New Zealand dairying's greatest competitor in traded products. With changes in the United States industry to a greater export focus, better product mix and productive mega-dairies, the competition is intensifying.

Keith Woodford and Marvin Pangborn provided an excellent description of the production sector of the United States dairy industry in the previous issue of this journal. Like them, we are studying United States dairy production with an interest in the competitive comparison. A November 2013 trip to Idaho, California, New Mexico and Texas produced many of the same facts about mega-dairies as reported by Woodford and Pangborn. We have also tried to derive business financial comparisons and to describe the speed with which the United States industry can respond to fill unmet market demand.

Dairy exports

The United States is the world's largest cow milk producer and third largest exporter, behind New Zealand and the European Union block. Their dairy industry produces 3.7 times more milk than ours. The trend in United States dairy exports mirrors that of New Zealand, although with a slight comparative lag in the last three years, as shown in the graph on the next page. The reason for the lag comes down to three factors which are now adjusting in the US market.

New Zealand and US dairy exports from 1991 to 2012



The first factor is the fall-out from the global financial crisis, where since 2009 many under-capitalised dairy operations in the west went out of business. The second, which added to the first, has been the supply and cost of feed. In the two seasons following 2009 the United States suffered drought which reduced corn yields. The mandated demand for corn to supply the subsidised biofuel industry has also added to demand for corn feed-stocks.

The third factor is the legacy of a strong history of government price support and the associated disconnection with market forces. This has led to a processing sector with a product mix which is United States market-centric rather than world market focused.

Unwinding from the current situation

Change is now under way. Dairy assets which are stand-alone on relatively small plots of land, of around 40 hectares for a 3,000 cow dairy, and cannot be used for other purposes have been idle since 2009 and 2010. Now that market conditions are more favourable these can be re-colonised at costs as low as 25 cents to the dollar of asset value. Feed costs have also dropped from their peak, due to the resumption of normal crop yields this year and United States government pull-back from increasing allocation of corn for biofuels beyond the current 45 per cent. Corn grain prices are back to US$4.50 a bushel from a peak of eight dollars.

While it will take longer to turn around, new processing capability is being developed. Dairy Farmers of America is opening a large milk powder plant in Felon, Nevada. There is also new growth occurring in the mega-dairies. The mood of owners is positive, as a result of higher income over feed-cost margins. A margin of US$8.00 per hundred pounds of milk is break even for the average dairy. The margin has not been significantly greater than this since 2008, but farm economists predict it will be comfortably above this level for 2014. These phenomena will help speed the recovery of United States production and drive the export growth targets that we heard about.

Business comparisons

While we were in the United States we were keen to get an understanding of business performance to allow comparisons with New Zealand dairy operations. This was to understand the relative susceptibility of each industry's suppliers to milk price volatility, because more susceptible businesses will suffer more viability problems at low milk prices.

In very broad terms, the United States industry is segmented into east and west. The eastern states still service mainly internal markets while the western states are increasingly focused on being competitive in the same export markets which New Zealand service. The western states are home to the mega-dairies and our benchmarking focus was on these states.

We made contact with an accounting firm which runs a financial benchmarking service, widely regarded as the most comprehensive in the country. By working with them and using DairyBase we obtained our comparisons. For the United States we used the 2012 year because their financial year ends on 31 December. For New Zealand we used the financial year ending 31 May 2012. All comparisons are in New Zealand dollars and on a per kilogram of milk solids basis. We used an exchange rate of US 80 cents to one New Zealand dollar.

Price variability

Milk prices can vary considerably depending on local supply and demand, due to whether or not there is surplus processing capacity, as with New Zealand's sheep and beef industry. They also vary based on the class of milk supplied. The local United States milk price variability is evident in our comparison. Californian and upper mid-west dairy farmers received higher prices on average than New Zealand dairy farmers in the financial year ending 2012. Those in the upper mid-west states attracted a significant premium over Californian and New Zealand suppliers, as shown in the table on the next page.

Significant differences occur in feed costs per kilogram of milk solids. In New Zealand all costs associated with producing feed such as stock grazing, fertiliser, irrigation, re-grassing, weed control, conservation and off-farm feed purchases totalled $1.96 per kilogram of milk solids. In the United States feed costs ranged between $5.30 and $5.91.

Other farm working expenses were more similar. For New Zealand, they were around $2.00 a kilogram of milk solids compared with $1.85 to $2.79 in United States regions. The upshot was a significant advantage in cash operating surplus on New Zealand dairy farms of nearly $3.00 a kilogram of milk solids. In contrast, United

Comparison of Californian 2012, upper mid-west 2012 and New Zealand 2011-12 financial models in New Zealand dollars per kilogram of milk solids

		California	Mid-west	New Zealand
Income				
	Milk	7.17	8.42	6.69
	Total	7.42	8.71	7.09
Costs				
	Feed	5.91	5.30	1.96
	Other	1.85	2.79	1.99
	Total	7.76	8.09	3.95
Cash operating surplus		-0.34	0.61	3.14
Interest and rent		0.33	0.40	1.31
Surplus after interest and rent		-0.67	0.21	1.83

States producers had advantages in the efficiency of capital use as measured by interest and rent costs per kilogram of milk solids. Compared with New Zealand, United States dairies operate a high production, low margin business and their advantage is their capital spend is diluted over more production than in New Zealand.

New Zealand dairy businesses are characterised by a relatively high margin per kilogram of milk solids and low production. Despite the higher interest and rent cost, cash surpluses after interest and rent remain higher. While we hold this position, New Zealand dairy farmers are, on average, more resilient to milk price volatility.

Of interest in understanding where an industry is heading is the performance of the top 25 per cent of business performers. United States benchmark data shows that the top 25 per cent of western United States dairy costs are 90 per cent of the average and production per cow is six per cent higher. This equates to another 80 cents a kilogram of mild solids to the margins of the top 25 per cent. These top 25 per cent suppliers achieved cash surpluses after interest and rent in 2012 which were within 50 cents a kilogram of mild solids of the average New Zealand dairy farm. With feed prices in the United States lower than in 2012, many of the top 25 per cent are now likely to be on a par with average New Zealand margins.

Expansion capability

One of the features of United States dairy systems is their ability to expand and contract production within a season. They operate year-round calving systems where replacement rates are between 40 and 45 per cent a year. Much of this turnover is due to cows which do not get in-calf within a reasonable time period. These cows are culled when their daily production falls below a break-even point determined by milk price. As milk price increases, break-even production decreases and cows are milked for longer, increasing average lactation length.

Similarly, first lactation heifers may be culled before breeding if their production does not meet a benchmark. These benchmarks vary with milk price. Additional cows are accommodated by increasing stocking density in the free stall or open lot facilities. A sustained desire to increase milk production will require facility expansion.

With this knowledge of the ability of United States dairy farmers to expand production relatively quickly, we conducted a time-series analysis spanning 2000 to 2013 of quarterly United States milk volumes to reveal factors which stimulate expansion and the time lags involved.

Export production predictions

Of all variables, the income over feed cost margin received by United States dairy farmers is the significant reason for milk production responses. The margin is influenced by milk price and feed cost. A margin of $8 per hundred pounds of milk is considered break-even.

The lag in response from our analysis is six months. Our estimate is that an increase in the income over feed cost margin of one dollar per hundred pounds of milk results in an increase of exports of 350 million pounds in the third quarter after the income over feed cost margin change. This provides evidence of the United States dairy industry's ability to respond within the season. In contrast, our seasonal dairy systems mean fewer levers are available to increase production within a season.

Conclusions

A significant segment of the United States dairy industry is now firmly focused on export markets for their businesses. This contrasts with the historical position where exporting, while significant, was still conducted within the dominating context of domestic market needs and government price supports.

Our analysis shows that New Zealand dairying retains a slight edge in cost of production, and milk price margin, but the once-held belief of the security of our position cannot be taken for granted. The mega-dairies of the western United States are highly efficient operations. While we have no direct data in support, they appear to be making significant productivity gains in scale, use of technology, quality of management, continued access to low cost labour and efficient use of capital.

New Zealand dairying's response needs to hone in on our competitive advantage and regain the rates of productivity gain we experienced nearly 10 years ago. It is a time to carefully navigate our industry by changes required to manage environmental problems so we do not to lose our competitiveness. Competition from United States mega-dairies is intensifying.

David McCall is the General Manager of Development and Extension at DairyNZ. Sam Howard is a DairyNZ economist.

Stephen Macaulay

NZIPIM strategy and focus

This is my first article for the journal Primary Industry Management*, a rather daunting prospect given the calibre of contributors and topic areas explored in previous issues. In this contribution I outline the NZIPIM's strategy in becoming the vital knowledge network for rural professionals and highlight main areas of focus in the year ahead.*

The NZIPIM has gone through significant changes since the board implemented its three-year strategic plan in January 2013 to revitalise the organisation and redefine its role to its members and within New Zealand's primary industry. The strategic plan has provided the direction necessary to build the capability of the NZIPIM and been the catalyst to enable the organisation to expand its reach and resource base within the primary industry.

It is pleasing to see the high level of acceptance of the vision and strategy by members and industry stakeholders to developing the capability of the rural profession at such a pivotal time for primary industry. This renewed relationship with industry stakeholders has allowed the NZIPIM to accelerate our rate of progress to achieve shared aims for the rural profession.

To recap, the NZIPIM's strategic plan is built on five platforms –

- **Relevancy** To grow the NZIPIM and to become influential in New Zealand's primary industry and the membership itself
- **Professionalism** Creating a culture of professionalism within the primary industry and its members by continuing professional development, implementation of accreditation schemes and other targeted events
- **Constructive partnerships** Collaborating with other stakeholders within the wider primary industry to achieve common aims
- **Careers** Promoting these within primary industry and developing career pathways for rural professionals
- **Resourcing** Securing resources to enable the NZIPIM to become a vibrant and effective professional body.

We are working through a programme under each of our five strategic platforms. However, in this article I will focus on professionalism, accreditation, facilitating the adoption of research and innovative practices, and the development of career pathways for rural professionals.

Professionalism

Maintaining and building professional standards within the membership and the rural profession is very much at the heart of the NZIPIM. To understand this further and provide some context, the word professional is often used to describe the quality of behaviour that can be expected of a person. The behaviour of professionals needs to be predictable, of high quality and value, can be repeated many times, and is exhibited regardless of the recipient of the advice provided.

Professional conduct is also underpinned by the Code of Ethics. This provides confidence to clients and the public that our members are committed to ethical guidelines in the course of their work and will produce client services to a high standard. Increasingly clients and the public at large are acutely aware of their right to challenge judgements and actions should they find these unacceptable, whether warranted or not. The NZIPIM has been at the sharp end of this change in attitude, having received four formal complaints against members over the last two years where none had been received in the decade before this. This is the environment in which rural professionals now operate and they need to be more aware in future.

To help members develop a deeper understanding of their professional and ethical obligations to their clients, the public and other members, we have launched an online ethics module which takes between 30 to 45 minutes to complete. Operating alongside the module, we also intend to provide members with an opportunity to work through and examine independent case studies in groups based in the branches.

Continuing professional development

For all professionals, whether in the medical, accounting or rural areas, there is an expectation that they will keep up to date with developments and advancements within their respective professions. The NZIPIM has similar expectations of its members to ensure that they maintain their own professional development so that the reputation of the rural profession is protected.

In maintaining and meeting the professional development requirements, members and registered members are required to undertake a planned programme of continuing professional development. This is a systematic and structured education and training programme

undertaken by a member to continually improve their skills, knowledge and competency to maintain their personal and professional status. Maintaining continuing professional development records can appear to be difficult, particularly if this is done on an annual basis. However, by regularly updating your records on the website you can keep up to date with this requirement relatively easily.

Professional passport

The NZIPIM intends to implement and support relevant and effective professional development programmes which build the competency of rural professionals. This includes the development of a Professional Passport which recognises the skills and competency of an individual over their career as a rural professional.

With the increased and ever-changing career opportunities within the primary industry, we expect greater mobility of rural professionals during their working career. A Professional Passport will allow an individual to demonstrate to their clients, employers and the farming community the currency of their knowledge and skills during their career.

Leadership Development Forum

We are very aware of the need to expand the breadth of professional development opportunities available to members where skill gaps are identified. With the funding support of Agmardt, we held the inaugural Leadership Development Forum in Hamilton last year to develop the leadership capability and governance skills of participants. The objective of the forum is to develop the leadership capability and skills of our members so that they can become more influential and provide greater leadership on many important issues affecting New Zealand's primary industry at a high level.

The forum has been designed to provide participants with the methods and confidence to help them realise their leadership and governance potential. We believe that building this capability within the rural profession will become even more important in the future, particularly with the roll-out of regional council water and land plans, and investment decisions associated with locally-based irrigation projects. Although the programme has only been run for one year, it is pleasing to see the forum being acknowledged by the wider primary industry as an important one in building the leadership capabilities of rural professionals.

Accreditation

To maintain New Zealand's competitive advantage in the market place, we must provide consumers with greater levels of assurance and transparency throughout the whole of the supply chain, which starts from behind the farm gate. We are also faced with increased scrutiny by government regulators and the public on the environmental effect of farm management practices on water quality. This will intensify over the coming years, which requires primary industry to consider the fine balance of farming in an environmentally sustainable way while ensuring the growth and profitability of farming.

To meet these future challenges, and to build capability within the primary industry, a suite of accreditation schemes have been developed with the support of DairyNZ's Primary Growth Partnership funding. As part of this programme, the NZIPIM will run two accreditation schemes –

- Dairy farm systems
- Farm people management.

The purpose of these schemes is to provide the farming community with the assurance and confidence that rural professionals with NZIPIM certification have the required skills and knowledge to provide professional advice for which they have been certified. In the medium term we expect that individuals certified in Dairy Farm Systems or Farm People Management will be identified within the NZIPIM and websites of other aligned organisations, be more likely to have clients referred to them by other rural professionals, and be better placed to earn a higher effective hourly rate in their consultancy work.

In designing the accreditation schemes, rural professionals with the relative expertise have been involved in developing the assessments for both schemes to ensure they are relevant and reflect best practice. This also includes determining the benchmark standard that applicants are expected to achieve to gain certification under each accreditation scheme. To become certified, the applicant will be required to complete an online assessment to demonstrate their knowledge, provide client feedback which assesses their effectiveness in the field, and actively work in the area.

Understanding the difference between accreditation and certification can be confusing. In general, accreditation means the programme and structure of the scheme as a whole, while certification relates to the individual who wishes to become certified under the accreditation scheme.

I was recently asked where registered members fit under the accreditation schemes. The registered membership status is a stand-alone membership category contained within the NZIPIM rules. As such it should be treated separately from the accreditation schemes, unless the registered member wishes to become certified under a particular scheme. In this case, the individual who successfully completes certification requirements could be regarded as a 'registered member certified in Dairy Farm Systems'. The accreditation schemes are currently being tested and are expected to be available to members in mid-2014.

Research and innovative practices

The uptake of new practices and technology advancements will be critically important to improving the productivity and profitability of primary industry if we are to remain ahead of international competitors, particularly those who share similar climate and farming systems. If we are to meet these challenges we need to be able to speed up and aid a greater information flow between research institutions and primary producers using a range of creative methods which improve the uptake and adoption of new and innovative ideas. However, this is often easier said than done.

Currently the funding models of research institutions are still heavily tilted toward securing research contracts rather than disseminating the results to potential end users. This was also highlighted as a problem area within the CRI Taskforce's report to the government in February 2010.

In my view, the rural profession can play a greater role in helping the interchange of information between research institutions and primary producers to increase the uptake of research and technological developments on-farm. This is not a linear process, as rural professionals are also ideally placed to provide feedback on promising innovative techniques being tested by progressive farmers back into the research institutions. In future, the NZIPIM intends to take on a greater leadership role in establishing stronger collaborative relationships with research institutions to develop greater linkages with the rural profession.

Careers pathways for rural professionals

Promoting careers within primary industry and developing pathways for rural professionals will be a main aim over the coming years as we look to expand the talent pool of individuals considering careers in the rural profession. Career opportunities within the rural profession are very bright, yet primary industry continues to have difficulty in selling the message to secondary school students to continue their studies in agriculture. I thought that Jaime Thomson, Student Liaison Manager at Lincoln University, illustrated this point well in the December 2013 issue of *Primary Industry Management* when it was noted there were negative perception problems when speaking to students from urban areas.

It is interesting to see the success the engineering profession has had in highlighting and elevating their importance following the devastating earthquakes in Christchurch. In 2012 the government increased the level of funding available to universities to encourage students into the engineering field. As an economic priority for the government, this extra funding is intended to address future skill shortages, as well as reflecting probable future earnings of students.

Increasing the number of individuals studying agriculture, horticulture and other related studies within our universities should also become an economic priority for the country. This is necessary if we are to implement and optimise an ever-expanding range of technological developments within farming enterprises, cope with the increased scrutiny over the management of our natural resources and achieve the government's economic aims.

More often than not we get lost in all the other noise occurring in the same space. Considering the success of the engineers, the rural profession, the main industry groups and aligned tertiary providers need to work together and become more strategic if we are to grow the support base and capacity of the rural profession.

More information

The NZIPIM has gone through significant changes over the last 18 months since the implementation of its strategic plan. We appreciate the support received from our members and industry stakeholders on the strategic direction of the NZIPIM. If you would like more information on the areas discussed in this article, or wish to comment further, please call Stephen on 027 226 3331 or email stephen@nzipim.co.nz.

Stephen Macaulay is Chief Executive of the New Zealand Institute of Primary Industry Management based in Wellington.

Guidelines for authors

Articles for the journal *Primary Industry Management* all need to be written to suit the audience – text to be comprehensive and authoritative without being difficult to read. The articles should contain high quality professional information worthy of a good journal, but must also be readable and understood by someone who is not necessarily totally familiar with the subject. The editor will make every effort ensure the articles end up like this, but it is easier if authors start with the same aim and it will save a lot of time.

Articles should be approximately between 2,000 and 4,000 words. They can be longer, but we do not want shorter versions. Text should be supplied in Word and sent as an email attachment.

Photographs and illustrations

Text should be sent along with photographs and other illustrations, such as figures and tables, carefully labelled. Authors should not attempt to lay out an article to make it look like the printed version.

Photographs should be sent as separate jpgs correctly labelled and each at least 500 Kb in size, preferably larger. The use of photographs taken with mobile phones is becoming more prevalent and this is a concern as the quality can be very poor. Please use a camera.

Figures and tables should be placed in the document as a guide so that the editor can see where they are meant to be. However, they should also sent as separate Excel files or similar. Do not convert tables and charts to a jpg as quality is severely reduced. Charts or tables copied from a website are usually unusable, as are photographs copied from websites. This is apart from the copyright problems.

If in doubt about any of these guidelines, please ask first.

References

Most of the *Primary Industry Management* journal articles are not refereed or academic treatise, although they are expected to be authoritative, accurate and professional. The articles need to be understood by literate professionals who, in general, are not practising academics and do not usually read or want to read referenced articles.

In a referenced journal, an author might want to explain that Smith discovered something. The correct way to reference in an academic journal would be '... it seems the world is flat (Smith 1999) ...', with the full reference details at the end.

It will read a lot better if you can say '... In 1999 John Smith discovered that the world is flat ...' Remember, the aim is that you want people to read all the way through. The article can be professional and accurate and also quite readable, even if the subject is complex. Stephen Hawkins can manage it with very complex physics.

An academic trend for students is for every sentence or paragraph to have a reference applied. This is to ensure that students are not copying other people's work without making sure that this is properly recorded, or referenced. This habit is gradually being transferred to the non-academic world. However, it makes reading articles in journals virtually impossible and the habit should be avoided – because you want people to read your article.

If there is an overwhelming urge to mention a website, this urge should be curbed. If the desire continues, do not use a long convoluted link that no one will copy correctly. For example do not use something like –

'... see http//www.worldisflat/what-not%tolookat/but_willmake-a/_***spelling/mistake/and=fail/'

with the underlining left in. For some reason there are those people who still think that you can click on a link when it is in a printed publication.

If it is very important to mention a website it should be simple. For example just write '...You may find it interesting to look at the website www.worldisflat.com.'

Style

Throughout any article do not use emphasis in the form of italics, underlining, bold or block capitals. These will not be carried through to the final product in the journal, so they are best left out in the first place.

Jargon words should also be avoided, and there are lots to avoid. Examples include engage, deliver, staircasing, wraparound, key performance indicators, front-ended, stakeholders, datasets etc. There are hundreds more which are similarly unnecessary and irritating to the reader. Use plain English, it makes more sense.

Do not assume that everyone reading your article knows as much as you do. If they did, why are you

writing it? They are learning or reinforcing some of what they already know. If you use a word which you are not sure will be understood by the reader, use an alternative. The other option is to explain what it means. For example you might be very familiar with the word 'tomo', but it will help to explain that it is a sink-hole, but using the word sink-hole is better in the first place.

Avoid acronyms as much as possible, especially when they are totally unnecessary. For acronyms, the convention is that if, for example, you write Ministry for Primary Industries, then (MPI) is put in brackets immediately afterwards. From then on it is always MPI, obviously without brackets. However, if MPI is never used again in the text, there is no point in putting MPI in brackets in the first place.

Do not create pointless acronyms, such as 'steering group management for pointless acronyms with lots of others' (SGMPAWLO). This sort of problem occurs a lot and is to be seriously avoided.

A lot of acronyms start to litter the text even when correctly used. Authors should find a better way wherever possible. It often just requires a little more thought.

Avoid other capital letters for words which do not need it. For example 'farm management consultant' should not have capitals. If the phrase is used two or three times in a paper, all the words are perfectly acceptable and 'FMC' is not the solution. Remember what the aim is. You want people to read the article all the way through and understand what they read. That is why you spent time writing it.

Use brief headings where appropriate and keep sentences and paragraphs to a sensible length. Avoid too much and too little. As a rule, try to keep sentence length below 45 words. In addition, do not have every sentence as a new paragraph, which is becoming a habit in many places. The better it is written the more likely the article will be used and read.

Biographic notes about the author

It is very useful to have a brief understanding about the author of an article. For that reason we ask for a short biographical note which will appear at the very end of the article. We do not want a life history, however eminent this life may be.

Please supply a one sentence, approximately 25 word maximum, biographic note. A good example would be – 'James McCartney is Managing Director of Manawai Agricultural Consultants Ltd in Whangarei. Before this he spent 15 years as Agriculture Officer on the *USS Enterprise*'.

Deadlines

Getting the articles in on time is really important. We ask for them to be in by a certain date which will be significantly before publication. We need them by the dates required as there is a lot of work to do between receipt and publication. The sooner they arrive before a deadline, the better. If, for any reason, an author is likely to be a day or two late please let us know in advance and we will help where we can.

It is understood that problems will occasionally crop up and authors will suddenly find they cannot supply what they promised. We hope this is rare, but it happens. Please let us know well beforehand rather than just not producing anything. We are aware of time problems and understand that things can go wrong. All we ask is that you let us know in good time and we can adopt a new plan.

Finally

If you have any doubt about part or parts of the above guidelines, please ask for clarification. The editor is always happy to offer help and ideas to authors who would like their text to be better.

The main advice is to write simply and clearly for the target audience you have in mind. There are many different levels to aim for, but it is best to assume some intelligence and knowledge, but not to assume too much.

When you think your paper or article is complete, read the text again from a printed copy, not on a computer screen, and make any corrections. As a final stage, go and do something else for a day or two, return and read again what you have written, correcting and improving as you go. Then you are ready to send it away to be published.

Good luck, and enjoy your writing.