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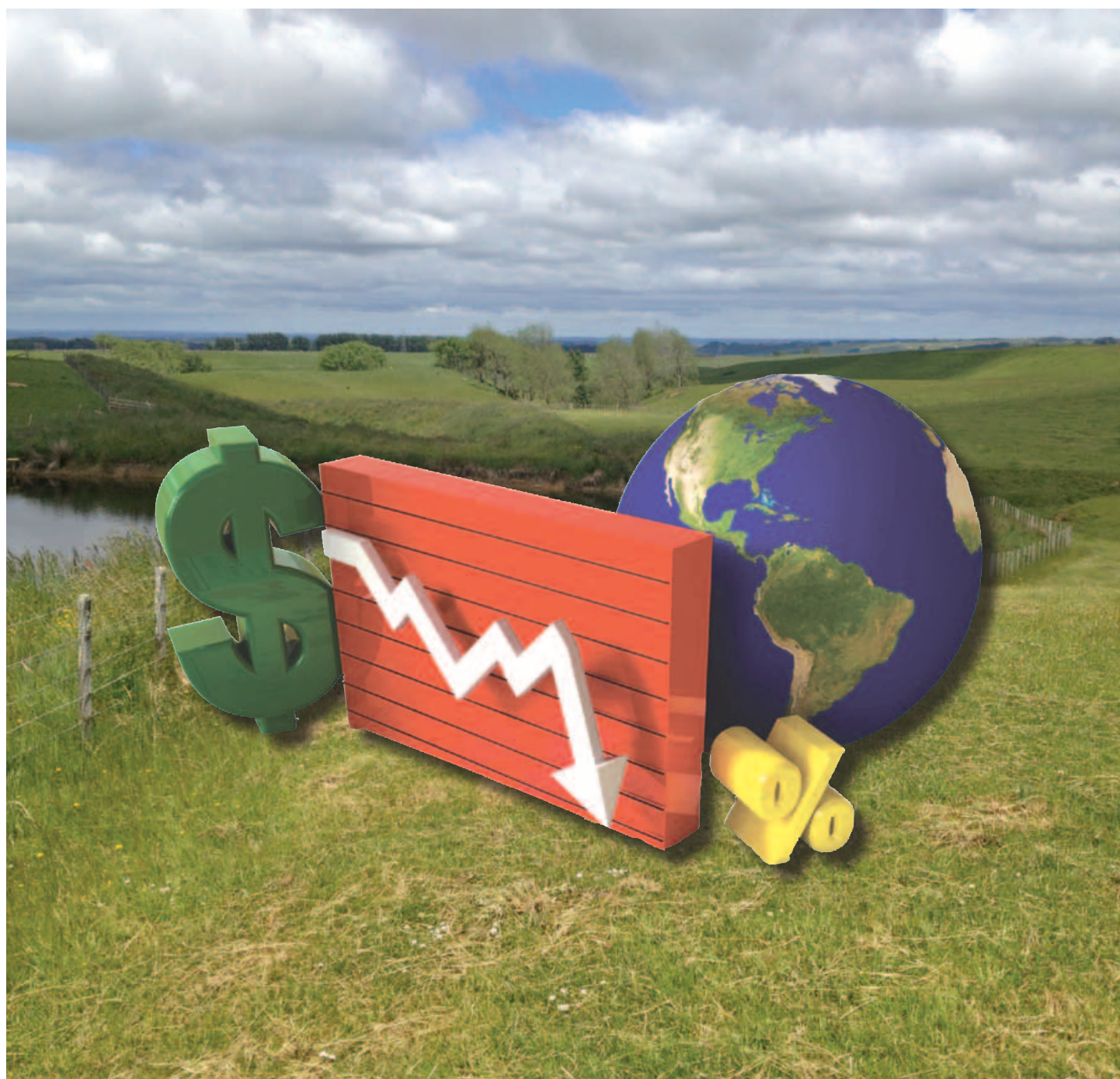
Dairy opportunities in China

Lake Taupo water quality

People skills on dairy farms

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Quality, quality and quality

It is difficult to know where to start the editorial. This issue of *Primary Industry Management* was being put together as the worst of the Fonterra problems in China were playing out across the world stage. As we got closer to publication, the Sri Lankan Fonterra problems hit the news, and just as we went to print there were more problems, this time with wrongly-labelled manuka honey sold in the United Kingdom. It seems that significantly more manuka honey is being sold than is actually being produced in New Zealand. Some manuka honey is not genuine.

New Zealand depends heavily on primary production as we all know and our reputation for quality is vital. The use of the term 100 per cent pure, purloined from the tourism industry, was quite a risk as it implied total purity. The phrase was originally meant as a tourism draw-card, not a claim. We have not been 100 per cent pure since the first human set foot here, and as soon as Europeans arrived I am sure it became significantly less than the mythical 100 per cent.

New Zealand primary producers cannot expect to compete on volume, it has to be quality. We have to retain high quality of food standards. At the moment the world wants New Zealand dairy products, or they did until recently. The article by Keith Woodford and Xiaomeng Lucock outlines how China has been underpinning dairy prices for New Zealand, in spite of the increasing production from China and the United States. Chinese consumers want brands they can rely on for quality, and until now New Zealand has maintained consumer confidence.

If confidence in the quality of New Zealand milk and other dairy products is lost, the market will be lost. China are already aiming for some of their farming businesses to have up to 250,000 cows producing 250 million litres a year, compared to an average New Zealand dairy business of 400 cows producing around 1.5 million litres a year. China has the opportunity to produce the volume, but New Zealand can and should produce the quality.

Water quality is a growing concern with increased nitrate run-off from farms and local authorities. It is quite depressing to hear one side frequently blaming the other when water quality is being discussed. Both sides need to improve their act. Not every dairy farm is squeaky clean, not all streams are fenced from stock and planted with trees, and not all nitrogen is retained on every farm. Similarly, not every local authority makes sure rivers or streams have no sewage or sewage effluent running into them.

The two articles about water quality and Lake Taupo nitrogen, by Bill Vant and Keith Betteridge, indicate that farmers in the Lake Taupo catchment are leaders – the lake is very clean. But a lot of work is needed to make sure the lake stays clean. Dairy intensification to keep ahead of rising costs is not a long term solution for New Zealand if water quality is to be improved to an acceptable level, and then maintained at that level. We have to be better, smarter and improve the standards.

We often try to have articles on primary industry other than dairying, which can tend to dominate. This issue of the journal has an overview of the horticulture industry by Boyd Gross, and two articles on the wine industry, one by Philip Gregan and the other by Mike Brown.

The rest of this journal contains articles covering a variety of topics. They include John Paul-Praat and Nicola Waugh looking forward to the way rural professionals may have to work in 2025. Alistair Polson looks ahead in a different way, noting how the Ballance Farm Environment Awards are vital in helping farmers produce the goods and try to become sustainable. Phil Journeaux considers the ups and downs of rural land value and Paul Dalziel et al look at how the profitability of dairy farms is linked to the skills of the managers and employees.

I hope you get good value from reading the articles. You may even be stimulated to submit articles for future issues of *Primary Industry Management*.



Bill Vant

Recent changes in the water quality of Lake Taupo and its inflowing streams



More than 10 years ago, the Waikato Regional Council became concerned about the likely effects of changes to land use in the catchment of Lake Taupo on the water quality of the lake. Conversions of sheep and beef farms to dairying, and of pine plantations to farms, together with a steady intensification of farming, were all considered to be probable causes of the observed increases in nitrogen concentrations in rivers and streams in parts of the region and New Zealand in general.

Previous studies had shown that the algae in Lake Taupo were frequently nitrogen deficient, and that the experimental addition of nitrogen increased the amount of algae present in the lake's water. As a result, increases in the loads of nitrogen entering Lake Taupo were identified as a threat to lake water quality. Calculations showed that over 90 per cent of the manageable nitrogen entering the lake came from areas of pasture in the catchment.

The plan variation

Over the following years the Council proposed that the Waikato Regional Plan be changed so that nitrogen loads from the catchment could be managed to ensure that the lake's water quality was protected. A variation to the plan, widely known as RPV5, was developed and finally confirmed by the Environment Court in 2011. The plan aims to maintain the current water quality of Lake Taupo well into the future by managing emissions of nitrogen in the catchment. It aims to do this by –

- Capping all sources of manageable nitrogen at their 2001 levels
- Offsetting much of the load of nitrogen which is still in transit to the lake by reducing some of the manageable sources.

Much of the rain falling on the Taupo catchment area of 2,800 square kilometres percolates through the soil and is stored underground as ground water, in some cases for many years, before finally entering the streams and then the lake. The groundwater therefore contains some of the nitrogen which was leached from historic land use practices but which has not yet entered the streams or the lake.

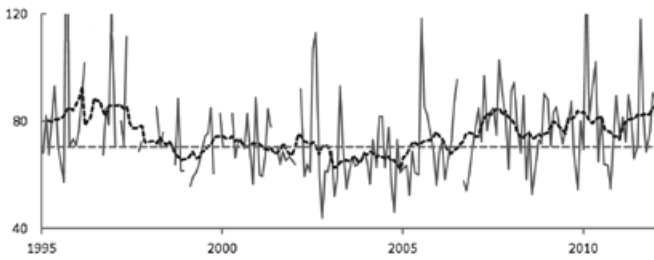
When the variation was developed it was anticipated that, despite capping, the loads of nitrogen entering the lake, its inflows would continue to increase until the offsetting began to take effect. It was expected that it would take several decades or more before the full effects of intervention would be seen in the lake.

While emissions of nitrogen are regarded as being of the greatest importance to the current condition of the lake, phosphorus is also important. The plan therefore requires that the amount of phosphorus entering the lake be closely watched. It aims to manage the nitrogen to monitor the phosphorus.

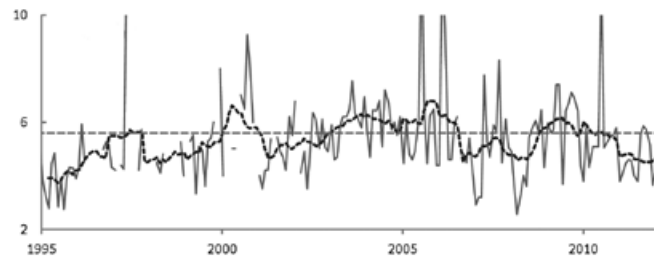
Current lake water quality

The Council has operated a water-quality monitoring programme at Lake Taupo since 1994. A deep water site near the middle of the lake is visited every two to four weeks, and water samples are collected and field measurements made. The

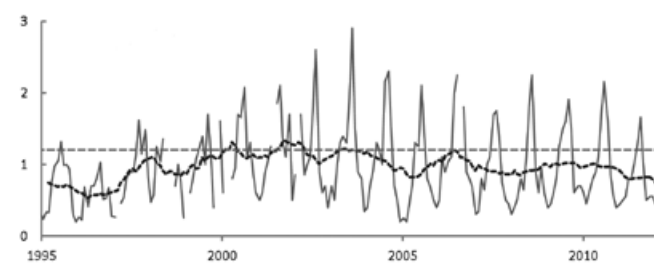
Total nitrogen in milligrams per cubic metre



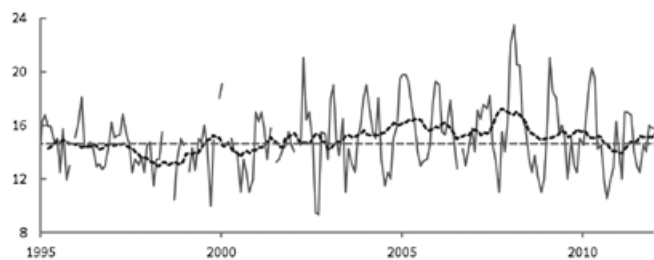
Total phosphorus in milligrams per cubic metre



Chlorophyll a in milligrams per cubic metre



Secchi depth in metres



Changes in water quality in Lake Taupo, 1995-2011. Dashed wavy line is the 12-month running-average, the dashed straight line is the Waikato Regional Plan water quality objective.

graphs above show the monthly changes in water quality between 1995 and 2011.

The water quality of Lake Taupo is generally excellent. Concentrations of the plant nutrients nitrogen and phosphorus are low, and so are the levels of microscopic algae whose growth they support, as indicated by the low concentrations of the plant pigment chlorophyll *a*. As a result, the water is clear and blue. In addition the bottom waters of the lake are mostly well oxygenated.

Although blooms of potentially harmful blue-green algae have occasionally been observed in the lake, for example in March 2003, so far these have not been common. The table at the bottom of the page lists the Waikato Regional Plan water quality objectives for Lake Taupo. These were the average values which occurred in the lake between 1999 and 2003.

The table also shows the average water quality during the five years from 2007 to 2011. Average values for total phosphorus, chlorophyll *a* and Secchi depth were all slightly better than the plan's objectives, while the average value for total nitrogen was somewhat poorer. The results of our analysis of changes in water quality over the past 10 years show that –

- Average concentrations of total nitrogen have increased at a rate of 2.6 per cent a year
- Concentrations of total phosphorus and chlorophyll *a* have decreased at rates of 1.5 per cent a year and 2.8 per cent a year, respectively
- Average water clarity – Secchi disc depth – has been stable.

Nutrient loads in inflowing streams

Concentrations of nitrogen and phosphorus are currently routinely monitored in 14 streams that flow into Lake Taupo. The Regional Council monitors conditions in 11 of these, while the others are monitored by NIWA, NZ Forest Managers and the Taupo District Council. The table on the next page lists the contribution of each of the inflows to the combined nutrient loads from surface streams in the Taupo catchment.

It also shows the results of our analysis of the changes in the loads transported by each of these over the past 10 years. The graph on the next page shows the monthly changes in nitrogen concentration in two of the streams. One of these Tauranga-Taupo has been monitored since 1993 while in the Whareroa records did not begin until the end of 2000.

Altogether the 14 inflows carry about 80 per cent of the riverine loads of nitrogen and phosphorus which enter Lake Taupo. They therefore provide a reasonably good indication of the combined loads from all the surface inflows. Over the past 10 years the combined load of nitrogen carried by the 14 inflows has increased by more than one per cent a year, while the combined load of phosphorus has decreased by slightly less than one per cent.

During this period there has been a moderate-sized increase in the amount of nitrogen entering the lake and a moderate-sized decrease in the amount of phosphorus. These

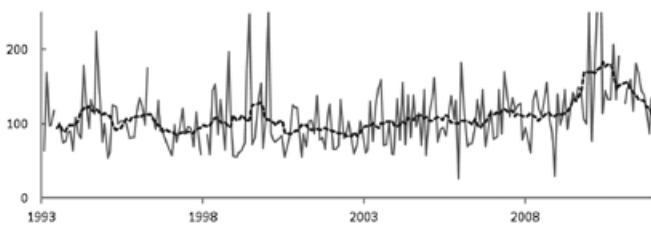
Water quality of Lake Taupo where the average values of indicators are shown, italic indicates a deterioration.

	Total nitrogen mg per cubic metre	Total phosphorus mg per cubic metre	Chlorophyll <i>a</i> mg per cubic metre	Secchi depth metres
Objectives for 2080	<70.3	<5.6	<1.2	>14.6
Currently 2007-2011	79.8	5.2	0.9	15.6
Changes, 2002-2011 percentage per year	+2.6	-1.5	-2.8	Stable

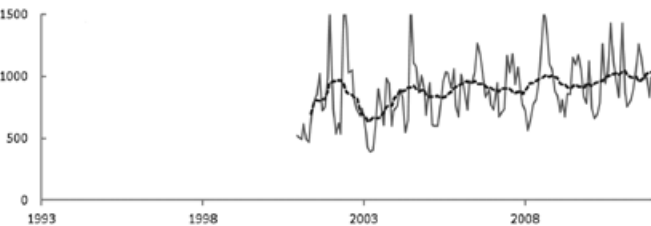
Nitrogen and phosphorus transported by 14 inflows to Lake Taupo showing the changes that occurred between 2002 and 2011, italic indicates a deterioration

	Total nitrogen		Total phosphorus	
	Proportion of combined load	Change Per cent each year	Proportion of combined load	Change Per cent each year
Tokaanu Tailrace	27.5%	0	19.1%	0
Tongariro River	11.3%	0	10.6%	0
Kuratau River	8.8%	+2.8	7.0%	0
Waihaha River	6.9%	0	5.0%	0
Tauranga-Taupo River	6.0%	+5.6	6.3%	-2.6
Waitahanui River	5.4%	+2.7	17.1%	-2.0
Hinemaiaia River	3.4%	+2.4	3.1%	0
Whareroa Stream	3.4%	+2.9	2.1%	-2.8
Tokaanu Stream	2.9%	+1.3	2.2%	-1.3
Whanganui Stream	2.5%	-2.7	2.6%	0
Waimarino River	1.6%	+8.7	1.5%	-3.3
Whangamata Stream	1.1%	+4.9	2.1%	-2.2
Omori Stream	1.1%	+4.0	-	-
Mapara Stream	0.1%	+0.8	0.2%	-1.9
All 14 inflows	82%	+1.4	79%	-0.9

Nitrogen in milligrams per cubic metre



Nitrogen in milligrams per cubic metre



Changes in total nitrogen concentration in the Tauranga-Taupo River and the Whareroa Stream, 1993 to 2011, the dashed line is the 12-month running-average.

changes are consistent with those described above for the lake itself, namely the increase in nitrogen and decrease in phosphorus over the past 10 years.

Historic land use and old water

A few of the changes shown are somewhat unexpected. In particular, more than half of the overall increase in nitrogen between 2002 and 2011 was carried by four inflows that drain undeveloped and pine catchments on the eastern side of the lake, the Hinemaiaia, Tauranga-Taupo, Waimarino and Waitahanui Rivers. When the variation to the Waikato Regional Plan was being developed, it was assumed that the

nitrogen loads from undeveloped and forested catchments would remain stable.

Recently we commissioned a preliminary analysis of historic 1958 to 1965 aerial photographs of the south-eastern part of the Taupo catchment, including part of the Tauranga-Taupo sub-catchment. The area photographed currently contains about 159 square kilometres of pine plantation, or about a third of the combined area of plantation in this part of the lake's catchment.

Of this area of pine forest nearly half is growing on land where pasture was present during the period 1958 to 1965. It is probable that the pre-plantation history of land use in this area is at least partly responsible for the recently observed increases in the nitrogen concentration in the streams which drain from it.

As noted above, the plan anticipated that there would be a delay between the capping of manageable sources of nitrogen in the catchment and the levelling-off of the nitrogen loads entering the lake. This was based on our findings that the water in some of the inflows to the lake had an average age of several decades. It is probably the resulting storage and release of pre-Waikato Regional Plan nitrogen in groundwater is responsible for the increases shown.

We have recently undertaken a further survey of the age of the water in some of the streams entering the lake, including the Waitahanui River, where about 80 per cent of the 197 square kilometre catchment is currently in pine forest. In this case, the average age of the water in the stream was found to be 38 years. It now seems reasonable to conclude that the nearby Hinemaiaia, Tauranga-Taupo and Waimarino Rivers also contain similarly old water, and that their land use before planting in pine forest 30 to 40 years ago partly determines the nitrogen they carry into Lake Taupo.

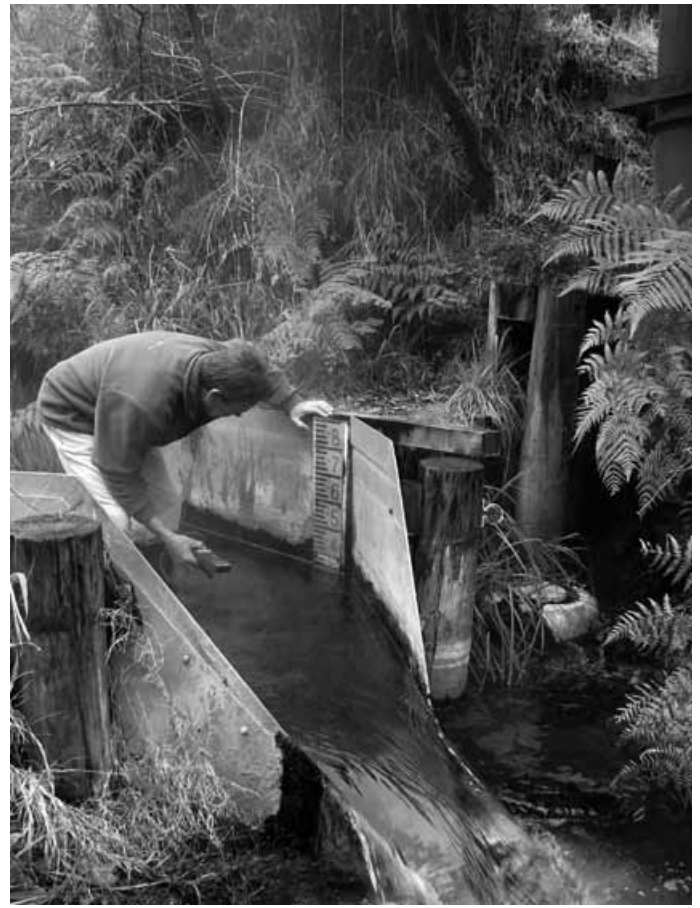


The reduction in the phosphorus carried by the streams between 2002 and 2011 is also interesting. A major soil conservation programme was initiated in the Taupo catchment in the 1970s, involving fencing and planting sensitive riparian areas and eroding hillsides. Implemented between 1976 and 1989, this means most of the main tributaries of the streams in pastoral areas have now been fenced and planted.

Regular monitoring of the Whangamata sub-catchment to the north of the lake since the 1970s has documented the development of dense vegetation on the stream banks, covering the previous scars of erosion of the pumice soils. The reduction in erosion in such areas may mean that particulate forms of phosphorus, associated with soils carried by the streams, have also reduced, as seen during the period 2002 to 2011 in the Whangamata Stream.

Conclusions

The water quality of the open waters of Lake Taupo is currently excellent. Over the past 10 years there has been a moderate-sized increase in the concentration of nitrogen in the lake, and moderate-sized decreases in the concentrations of phosphorus and algae. Over the same period there has been a moderate increase in the amount of nitrogen entering the lake from the catchment and a moderate decrease in the amount of phosphorus. These changes are unlikely to be



connected with the recent implementation of the variation to the Waikato Regional Plan.

Initial increases in the nitrogen were anticipated in the variation and are consistent with our understanding of the storage of pre-Waikato Regional Plan nitrogen in groundwater in the catchment. However, the recently-observed increases in nitrogen concentrations in streams draining areas in native and pine forest were not anticipated during the development of the variation. These increases suggest that the nitrogen, which was leached from historic land use practices and has been stored underground, is likely to be larger than previously predicted.

Bill Vant is a Scientist at Waikato Regional Council in Hamilton.

Keith Betteridge

Nitrogen leaching in the Lake Taupo catchment



New Zealand prides itself on being clean and green – a brand which is worth many millions of dollars. By world standards I am sure we are right up there, but we all know we need to work hard to maintain and improve on this standard. Farmers in the Lake Taupo catchment in most respects are leaders, as Lake Taupo is very clean. In addition, with mainly sheep, beef and deer farming enterprises in this area, large leaching losses are not normally expected.

With farmland occupying less than 20 per cent of the catchment, the animal-generated nitrogen from this small proportion of the catchment causes 95 per cent of the manageable nitrogen, being sufficient to reduce lake water quality. Farmland in most farmed catchments occupies closer to 80 per cent of the total catchment area and farming intensity is higher than in the Lake Taupo catchment.

Reduction in nitrogen

Waikato Regional Council have a requirement that a 20 per cent reduction in nitrogen leaching from farmland is needed to improve water quality. This was equivalent to removing 170 tonnes of nitrogen, mainly from animal urine. In addition to taking 20 per cent of land out of farming, livestock farmers remaining in the catchment in 2011 had their stocking rates effectively capped in perpetuity.

Under Variation 5 of the Waikato Regional Council regional plan, farmers in the Lake Taupo catchment must have a resource consent to farm. To achieve this, a farmer must develop a nutrient management plan showing that the farm will not leach more nitrogen than that permitted in the farm's nitrogen discharge allowance. Using an \$81 million budget from national, regional and local government, funding the Lake Taupo Protection Trust has virtually purchased all the required nitrogen from farmers. The land relinquishing this nitrogen has been retired grazing and most has been converted to forestry.

The Resource Management Amendment Act and the National Policy Statement for Fresh Water Management 2011 direct all regional councils to set limits and policies for all water bodies within their region with a plan for how to improve water allocation and water quality by 2030. Lake Taupo and Lake Rotorua catchment farmers are no longer alone.

Change is therefore required from everyone, including urban communities who discharge or emit contaminants to water bodies. There is little chance that the Variation 5 approach used in the Lake Taupo catchment to clean up waterways will be used anywhere else in New Zealand.

However buying up nitrogen from some farmers does not make the problem go away – the nitrogen discharge allowance, phosphate cap, or whatever is what farmers need to be concerned about. One Taupo farmer has the allowance set at 2004 emissions, but since then farm costs have risen 45 per cent and now he cannot increase his farming intensity to cover these costs. Farmers need options which increase their income from the same level of output of milk per kilogram of nitrogen leached per hectare, or meat per kilogram of nitrogen leached.

Taupo research

AgResearch has conducted 10 years of research in the Lake Taupo catchment to provide data on which to base public policies, and by which farmers can make informed management choices to optimise returns from existing resources. Initial studies were based on a cut-and-carry farming system which avoided animal urine deposition within the paddock, as urine was considered to be the biggest threat to nitrogen leaching. Resident pasture was cultivated and sown, either with permanent ryegrass-based pasture or lucerne.



Maize silage grown under plastic

In contrast, annual crops of triticale and annual ryegrass were sown in each of three years, while maize silage under plastic and a winter annual was grown in one year and nitrogen leaching was measured over three years. Surprisingly, annual crops leached between 80 and 220 kilograms of nitrogen per hectare per year. This is four to five times more nitrogen than perennial crops at 10 to 20 kilograms of nitrogen per hectare per year, with the highest annual leaching being in a year with a very wet summer. We learned from this that crops following pasture rarely need nitrogen fertiliser in the first year.

At the same time, a beef grazing study showed that nitrogen leaching losses could be reduced from about 12 kilograms of nitrogen per hectare per year to between five and six kilograms if cattle were removed for five months over winter. But no buying and selling strategy allows this to be a viable mitigation option. Sending cattle out of the catchment over winter has been possible until now, but when water quality limits are imposed more widely, this method will be closed.

Using different animals

A possible nitrogen mitigation option arises from the research which showed sheep and deer leach only 60 per cent of that leached by cattle, when all these species consumed the same

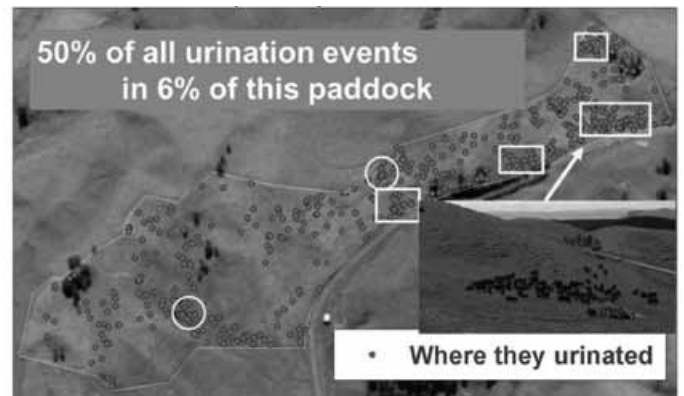
dry matter intake per stock unit equivalent. This is explained by the lower frequency of urination by cows than by sheep such that urine patches of cows are substantially bigger than of sheep.

But did this lowland result also apply in hill country? We do not know if smaller cattle emulate sheep in urination frequency, but because of their size there will be several calves needed to equate to one cow on a stock unit basis. This means there will be many more urine patches in pastures grazed by young rather than old cattle. Animal species and classes within species can therefore be manipulated by farmers to reduce nitrogen leaching.



Cows with urine sensors

With unique urine sensors for sheep and cows, and locally made GPS units, we showed that in steep hill country cows stayed on the flat areas, usually at the bottom of the hill. By contrast, sheep preferred to be near the top of the hills, often on steeper slopes. In two studies we found that cows excreted 50 per cent of their urine on six to 12 per cent of the paddock area. In similar paddocks, sheep excreted 50 per cent of their urine on 30 to 40 per cent of the paddock area.



Urination events by 15 cows over four days in a paddock of steep country at Motere Station

This finding led to research into targeted mitigation. Because cows create the largest nitrogen leaching problem

we worked with beef cows. At that time dicyandiamide, a nitrification inhibitor known as DCD, was being used to reduce nitrogen leaching. Our modelling showed that an economically feasible increase in stock rate could be achieved by applying DCD to the 10 per cent of flat area in a hill paddock without exceeding the nitrogen discharge allowance. This mitigation was something a farmer could do from the ground, whereas aerial application was prohibitively expensive. Areas to be targeted can be mapped from farm contour maps.

However, winter crop and autumn-saved pasture areas will be the most easily targeted sites using a mitigation product, whether it is a hill or lowland farm. This land possibly receives 80 to 100 per cent of the urine excreted by the stock grazing these areas over the two to three most critical leaching months. But we must now await the return of DCD to the market, or some similar substitute, before farmers can capitalise on this strategy.

Barton grazing study

From 2006 a large grazing study with cattle was conducted on the farm of Sharon and Mike Barton on the western shore of Lake Taupo. This trial aimed to quantify nitrogen leaching reductions using four methods compared to a control.

Salt given during winter was expected to act as a diuretic, with cows increasing the number of daily urination events and decreasing the urinary nitrogen concentration. The inhibitor DCD given by mouth was predicted to reduce nitrogen leaching from each urine patch. A high sugar ryegrass was going to improve nitrogen retention by the animal so that less was excreted in urine. Male cattle were expected to leach less nitrogen than females because of anatomical differences.



Salt added to baleage

The only clear message from this study was that renovating a pasture with a pasture or crop species resulted in substantially more nitrogen leaching than that arising from normal annual grazing activities. Therefore, farmers and plant breeders must work to ensure permanent pastures last longer than five to 10 years, as this will reduce nitrogen leaching

averaged across the farm.

No differences amongst the mitigation treatments were demonstrated due to difficulties with the measurement technique used. However, a concurrent lysimeter study at the site showed a large reduction in nitrogen leaching where DCD mixed with urine leached 157 kilograms of nitrogen per hectare compared to 332 kilograms of nitrogen leached per hectare from the control. In a modelling study, urine diluted by salt supplement was predicted to leach 48 per cent less urinary nitrogen than cows not fed salt.

However, even with these mitigation measures it is most unlikely that these alone would solve the water quality problems faced by farmers. At the very least a suite of mitigation activities will be needed for farmers to meet community-set water quality standards. Hopefully, the large grazing studies funded by the Pastoral 21 programme, looking at a range of other mitigation strategies to reduce nutrient and greenhouse gas emissions to the environment, will provide new options for farmers. Landcare Research is taking a new look at nitrogen leaching under lucerne in a Taupo pumice soil, with and without biochar in the soil profile.

Cow urine sensor

A new line of work involves the use of a new cow urine sensor. For the first time, we are now able to quantify the volume of urine and the urinary nitrogen concentration of each urination event as it is excreted. No urine is collected, and in winter the cow has the benefit of a cow cover.

This cover would have been much appreciated by the Pastoral 21 trial cows during the extremely cold winter weather at Invermay. Early results show a high variability in both volume and urinary nitrogen concentration during a 24 hour period. This shows that average urine is a misnomer and probably should not be used in nitrogen loss model predictions.

A flawed model

The present New Zealand farming economic model relies on intensification to keep ahead of rising costs. The reality is that this model is flawed, unless we want to end up with the northern hemisphere system of indoor housing of livestock. Our grazed pastures have an upper limit to stocking intensity, even without water quality problems.

Adding value to what is sent through the farm gate has to be the aim of farmers and producer organisations, while food processors also need to add value, with at least some of this added value being returned to the farmer. The Barton's Taupo Beef experiment, where consumers pay a premium for beef grown locally and sustainably, is one promising example of how a new model can work. The challenge is to get all 26,000 New Zealand farmers making changes like this within the next 20 years if farming is to remain a viable industry and the backbone of this country's economy.

Keith Betteridge is a Senior Scientist at AgResearch Grasslands in Palmerston North.

Paul Dalziel, Mark Paine, Matthew Newman and Geoff Taylor

Valuing the skills of people on dairy farms

A great deal of attention has been given in recent years to how business profitability can be increased by investing in developing skills among managers and employees. This is reflected in The Strategy for New Zealand Dairy Farming launched by DairyNZ in 2009, which adopts as its first two aims increasing farm profitability and attracting talented and skilled people to be retained by the industry.

This article reports the main results from a study commissioned by DairyNZ to look at connections between farm profitability and the skills of farm managers and employees. The study was between DairyNZ and the Agribusiness and Economic Research Unit at Lincoln University. It was based on a face-to-face survey in 2012 of managers of owner-operated dairy farms in the Waikato and Canterbury regions. Farms had to have a minimum of 450 cows or involve at least three people on the farm.

In total, 150 farms agreed to an interview but 11 surveys were not completed. The survey recognised that farms might be jointly managed by two managers so that the number of farm managers was higher. The financial analysis could not be completed for 17 of the 139 participating farms. These farms were removed from the profitability analysis, which therefore covered 122 farms.

The managers were asked to arrange for their farm employees to be given the opportunity to fill out forms detailing their education and experience. In total, 127 of the 139 returned at least one of these forms, covering 370 employees.

The participants

The sample was balanced between the two regions – 71 farms were from Waikato and 68 from Canterbury. The farms were usually operated by three to six people, including one or two farm managers, accounting for 83 per cent of the sample. Most farm managers were aged between 40 and 60 years. The estimated average age in the sample was 46 years.

Employees were classified as production managers, assistant managers, herd managers and farm assistants. Over half of the employees were aged below 30 years. The youthfulness of the workforce was even more pronounced among farm assistants. Nearly a fifth of the farm assistants were aged between 15 and 19 and nearly a third between 20 and 24.

The employees were asked if they were working in New Zealand on a temporary visa. One in four employees in Canterbury were on temporary visas with only one in 10 on Waikato dairy farms. One in four herd managers were on temporary work visas compared to one in 20 production managers.

Experience, qualifications and training

Farm managers had high levels of experience. More than three-quarters of the sample had over 10 years and 51 per cent had more than 20 years in dairying. Experience on the current farm showed more variation. More than a third indicated they had



been on their current farm for less than five years, while for just under a fifth it had been more than 20 years. More than half of the farm managers reported spending more than five years on a dairy farm while at school.

Nearly two-thirds had completed post-school qualifications. The table shows a strong division among the farm managers. About 40 per cent have no more than a school-level qualification specifically related to either business or dairy production compared with a similar sized group qualified at Level 4 – national certificate or above, in both areas.

Highest qualifications of farm managers

None		Business qualifications				
		None	Levels 1-3	Levels 4-6	Bachelor degree	Total
Production qualifications	None	78 35.5%	4 1.8%	5 2.3%	9 4.1%	96 43.6%
	Levels 1-3	9 4.1%	3 1.4%	0 0.0%	1 0.5%	13 5.9%
	Levels 4-6	23 10.5%	2 0.9%	53 24.1%	5 2.3%	83 37.7%
	Bachelor degree	4 1.8%	1 0.5%	1 0.5%	22 10.0%	28 12.7%
	Total	114 51.8%	10 4.5%	59 26.8%	37 16.8%	220 100%

Only eight per cent of the managers reported current involvement in formal training, although a larger number had been enrolled in a formal course at some time in the previous five years. Almost all managers indicated participation in informal training during the current season. The most common option was reading industry journals, followed by farmer field days and DairyNZ discussion groups.

Farm assistants had considerably less experience. More than a third had been in dairying for less than two years and more than half had been on their current farm for less than one year. Most had been on their current farm for less than two years, suggesting a high level of turnover in the sector. In their answers about qualifications, 75 per cent of farm assistants reported having no qualifications beyond Level 3 at school, compared to 48 per cent of herd managers, 50 per cent of assistant managers and 47 per cent of production managers.

More than a quarter of the farm assistants were currently in formal training and over half had some formal training in the previous five years. The most frequently mentioned option was AgITO programmes with 70 per cent of those currently enrolled. Employees also made extensive use of informal training with 41 per cent of farm assistants and well over half among the manager roles.

The production managers were more likely to have participated in farmer field days, while the assistant managers were more likely to have read industry journals. Herd managers and the farm assistants were more heavily weighted towards DairyNZ discussion groups.

Profitability and manager skills

Profit was measured as operating profit per hectare allowing for differences in the average financial performance between the Waikato and Canterbury regions in the 2010/11 season. The analysis divided the sample into three groups – the low-profit quartile, the middle-profit half and the high-profit quartile.

The farms in the high quartile were predominantly described as established and in the low quartile as developing. The milking sheds of the high quartile were more likely to be described as more up-to-date and the higher profit farms tended to report a lower average milking time.

The farms in the high-quartile group were more likely to be managed by a couple than the low-quartile group. Participants were asked to indicate on an 11-point scale whether they agreed or disagreed with 34 statements about dairy farm management. The strongest difference was that the high-quartile farm managers had a much higher average for the statement ‘we benchmark our farm performance against other businesses’.

Six other questions involved a difference between the high-quartile and the middle half. All of these were statements that the high-quartile considered to be less agreeable –

- Loyalty to suppliers is important
- We prefer not to push the farm to its maximum in case something goes wrong
- We always seem to be fixing something on the farm
- We spend time with new staff until we are sure they understand their job
- We encourage staff to develop their skills and participate in training
- We find planning difficult because the future is so uncertain.

More similarities and differences

High-quartile managers were more likely to manage to a budget and to check actual expenditure against expected levels at least once a month. The low-quartile group of farms was less likely to have written production and financial targets, but there was little difference among the groups in their use of medium-term strategic plans.

There was no evidence that the high-quartile group of farm managers were more qualified, on average, than the low-quartile group. This was true whether the managers were analysed individually or as a team when the farm was managed by a couple. Some experience on the current farm appeared to be important – top managers tended to have five or more years of experience. A family background in dairying also appeared advantageous for farm managers.

The farm managers in the high-quartile group were less likely than the other groups to have been involved in formal training over the previous five years. They were more likely, however, to be involved in informal training. In fact, all of the top quartile reported involvement in some informal training compared to 87 per cent of the low quartile middle groups.

Profitability and employee skills

The relationship between profitability and employees varied in terms of farm assistant and manager roles. Farm assistants on the more profitable farms were more likely to have post-school qualifications, but there was no evidence that a dairy background while at school helped them. The farm assistants with more than 10 years of experience were more common in the high-profit group. In addition it was more common for this group to have farm assistants with at least four years of experience in their role, or on their current farm, compared to lower-profit groups.

Farm assistants on the high-quartile farms compared to low-quartile farms were more likely to have enrolled in formal training over the previous five years and to be involved in informal training. There was a positive relationship between performance and participating in DairyNZ discussion groups where 38 per cent of the high-quartile group reported this type of informal training compared to 10 per cent of the low-quartile group.

Employed managers tended to be older than farm assistants in the general sample, but those on the high-profit farms tended to be younger than on the low-quartile farms. Otherwise, no pattern emerged regarding higher profitability and a background in dairy farming while at school or the qualifications of employed managers. Nor was there any evidence to indicate higher-profit farms were more likely to have their employed managers enrolled in formal or informal training.

Employee ability and career progression

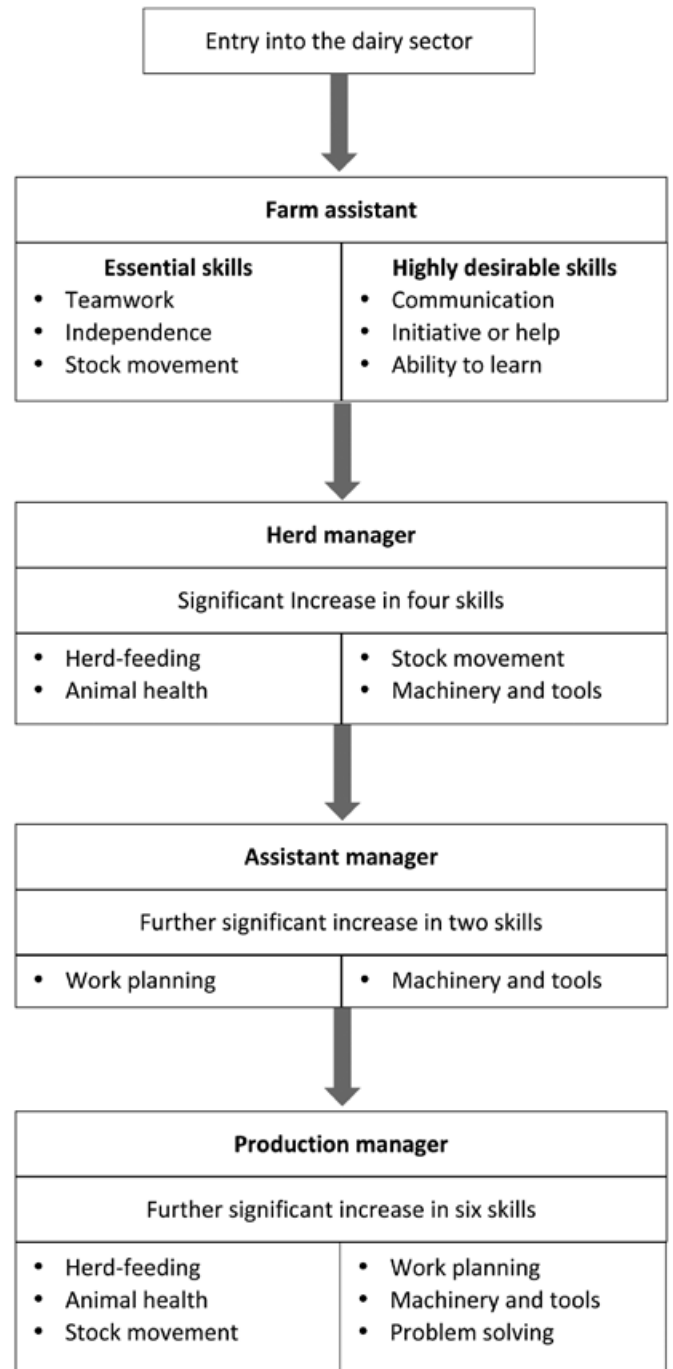
The managers who participated in the survey were asked to complete a form for each of their employees. In this they could describe each employee's ability on a five-point scale from low ability to high ability in 12 areas of ability to –

- Handle movements of stock in paddock and yard
- Recognise and deal with animal health problems
- Allocate feed to the herd effectively
- Use and service farm machinery and tools
- Communicate well with other people
- Work well with other people in the team
- Recognise and solve problems as they arise
- Show initiative and seek help when required
- Plan and organise work that must be done
- Work without close supervision independently
- Learn new skills or new tasks
- Use computer and cell phone technologies.

The first four of these areas covered core skills needed for the day-to-day operation of a successful dairy farm. The remaining eight skills were taken from the Employability Skills Framework endorsed by the National Quality Council in Australia for use in all its training packages. Farm assistants received the lowest average rating of overall skills, and the highest average rating was for the production managers.

Following an analysis of the responses to these questions, the research team constructed a model of career progression in the dairy industry based on acquiring higher skill levels

valued by employers in each of the production, assistant and herd manager positions.



Model of skill development and career progression

Entry into the industry appears to require three essential skills including the ability to –

- Work well with other people in the team
- Work independently without close supervision
- Handle movements of stock in paddock and yard.

These skills score highly in all four occupation groups. Entry also seems to be helped by three highly desirable skills with the ability to –

- Communicate well with other people
- Show initiative and seek help when required
- Learn new skills or new tasks.

Based on this model, career progression to herd manager requires a significant increase in skill levels compared to the farm assistant position in four areas – the ability to allocate feed to the herd effectively, to recognise and deal with animal health, to handle movements of stock in paddock and yard, and to use and service farm machinery and tools.

Further career progression to assistant manager requires still higher skills involving the ability to use and service farm machinery and tools, but also a significant increase in skill levels in the ability to plan and organise work that must be done. Finally, career progression to production manager requires further development of skill levels in all the areas mentioned above, along with a significant increase in skill levels in the ability to recognise and solve problems as they arise.

Relative skill ratings

The analysis used the survey data to construct perceived relative skill ratings. These were calculated as the percentage increase in average perceived skill ratings of the production managers, assistant managers or herd managers, relative to the average perceived skill ratings of the farm assistant.

Perceived relative skill ratings by position in each farm profitability group

	Increase in average rating relative to farm assistants		
	Production managers	Assistant managers	Herd managers
High profit	40%	19%	25%
Middle profit	22%	21%	13%
Low profit	24%	-3%	5%

Each of the data columns in the table provides strong evidence that perceived skills are important for profitability. The case of herd managers was the most straightforward. On low-profit farms, herd managers were rated as five per cent more skilled than farm assistants on those farms, whereas the rating was 13 per cent for the middle-profit farms and 25 per cent for the high-profit farms.

In the data for assistant managers, the relative ratings for the high-profit farms and middle-profit farms were similar at 19 and 21 per cent respectively, but the figure for the low-profit farms was minus three per cent. The implication of the negative sign is that the managers of these farms rated the skills of their assistant managers as lower than the skills of their farm assistants.

Based on this approach, it is possible to repeat the analysis for each of the 12 skill areas covered in the survey. The most striking differences include the following observations.

- Herd managers and assistant managers on the low-profit farms had perceived skill levels which were little or no better than their farm assistants communication, teamwork, problem solving, initiative, work planning, independence and ability to learn

- There was no correlation between farm profitability and skills in the ability to use computer and cell phone technologies.
- The herd, assistant and production managers on the high-profit farms had considerably higher perceived skill levels in the four core areas of stock movement, animal health, herd-feeding and machinery.

This suggests that low-profit farms, compared to high-profit, pay attention to a narrower range of skills in their employed managers. They also tend to under-use or under-invest in the depth of their employed manager core skills related to stock movement, animal health, herd-feeding and ability to use and service farm machinery and tools.

These results strongly support the connection made by the Valuing People Productivity project between the first two desired results of *The Strategy for New Zealand Dairy Farming*. These are increasing farm profitability along with attracting talented and skilled people to be retained by the industry. The study has therefore provided strong evidence supporting the hypothesis that with more highly skilled farm employees at every level, with those skills recognised and used, it leads to more profitable farm businesses.

Conclusion

This research has discovered that farm assistants on high-profit farms were older, more experienced, more qualified and more involved in both formal and informal training than their counterparts on low-profit farms. It also found that low-profit farms paid attention to a narrower range of skills in their employed managers.

The analysis identified seven skill characteristics of farm management which appear to contribute to farm profitability –

- Use of benchmarking
- Reliable plant and equipment
- Budgeting practice
- Networking with other farms
- Self confidence in decision-making
- Background in dairying when at school
- Couples as managers.

The study also found that younger farm managers, under 40 years of age, are more likely to have Level 6 or higher qualifications in both production and business and to be involved in formal training. This difference among younger managers provides some evidence that education may accelerate skills development which is achieved from experience. The ranking of skills as the person progresses through the job roles may also provide a good framework for auditing industry training and in assisting employers to develop the relevant skills in their staff.

Professor Paul Dalziel is based at the Agribusiness and Economic Research Unit (AERU) at Lincoln University. Dr Mark Paine, Matthew Newman and Geoff Taylor are at DairyNZ in Hamilton.

Phil Journeaux

Land values – which way is up?

Land is the single biggest investment farmers usually make in their farming business and the value of this constitutes a major proportion of most balance sheets. Over recent decades the value of land has generally trended in one direction – up. But in the immediate past land prices have dropped, reminding farmers that they can also go down.

What determines land prices? There are three fundamental reasons –

- Productive value – the value relative to the rent, or profits, obtainable
- Consumptive value – the intangibles such as the countryside being a nice place to live, a good place to bring up children and farming a good lifestyle
- Speculative value – the ability of an asset to retain its value and the return on the asset as an investment

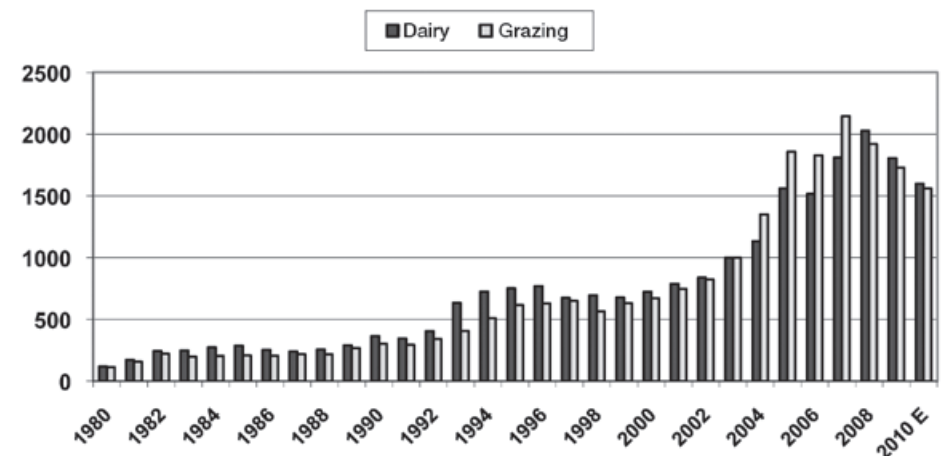
There is also a fourth factor that often directly affects farm prices. It is the transactional component. This includes aspects such as special financing, forced sales, sales to relatives, the size of the operation and the value of improvements.

Of these factors, productive value could be considered the most important. The relationship between profitability and land price is not the greatest, as discussed later. In a pure economic sense, the price of an asset such as a farm is the discounted present value of its future net income stream.

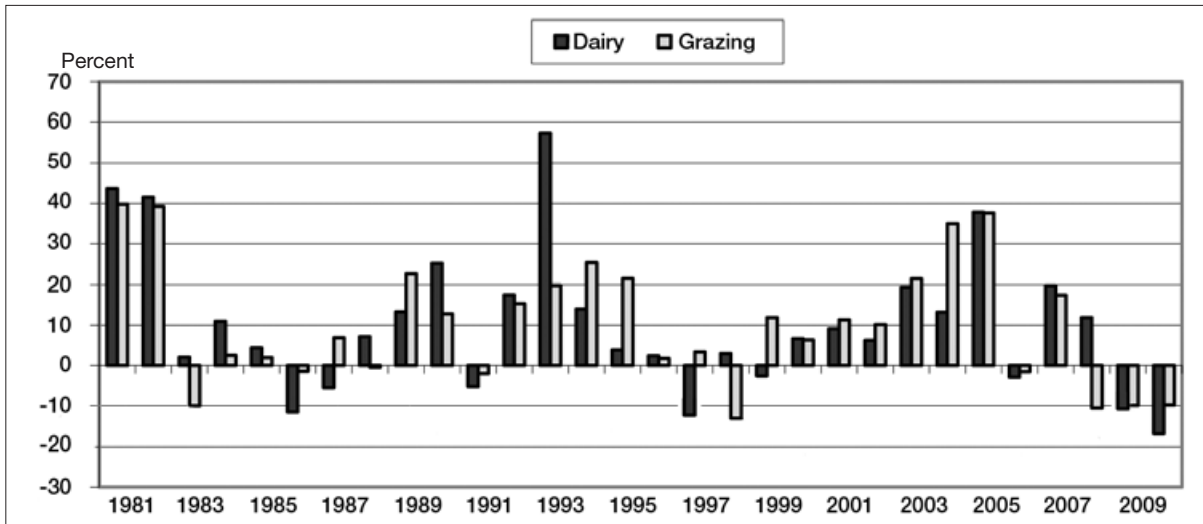
The average economic farm surplus per hectare for dairying for the last five years 2008/09 to 2011/12 is \$2,400 a hectare. If we assume it is an annuity in perpetuity and that there is a 10 per cent return, not unreasonable given the risk profile of farming, the present value equals \$24,000 a hectare.

In theory, this is the value of the business as a going concern. As current dairy farm businesses are selling at values twice as much as this, we could conclude that not many farmers are using this approach, or perhaps are but using a much lower return on capital. This reinforces that, while productive value is important, it certainly is not the only driving force behind land values.

Land values over the last 30 years in New Zealand have followed the pattern outlined in the graph. Note that the left hand axis is an index, not a dollar per



Land price index



Percentage changes in land values

hectare figure, and that the series finishes in 2010, which is when QuotableValue stopped reporting its rural index.

The compound growth rate from 1980 to 2008 is 10 per cent for dairy farms and 11 per cent for grazing hill country sheep and beef farms. This is not a bad investment if you bought in 1980 and sold in 2008, especially as it was tax-free. If you bought in 2008 then it is another story. You are probably currently sitting on a capital loss. However it was not necessarily an all uphill gain as shown in the graph above.

This demonstrates that there can be some significant swings in land prices. However, in general, speculative value seems to have been an important component of farm values over recent decades, up to around 2008. While capital gains have been somewhat quiescent recently, they are not dead by any means. Just look at Auckland house prices recently.

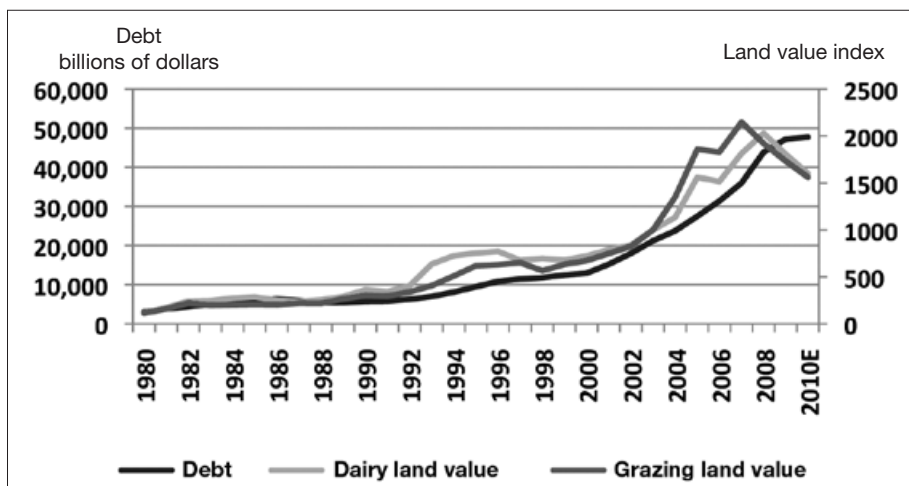
There are also a number of intangibles which affect the speculative component of land prices, such as scarcity. They are not making any more land and the supply is diminishing due to urban sprawl, lifestyle blocks and forestry. Land does not disappear in the same way as cash has done in many finance companies. This all helps to maintain the value of land regardless of its productive capacity.

One factor which has a close correlation with land prices is debt. This shows a good correlation between debt and land values through to 2008, after which they have parted company. Agricultural debt is \$50 billion and climbing, while land values are around 25 per cent down on their 2008 peak. Access to cheap credit was probably a major factor in lifting farm processes through the mid-2000s.

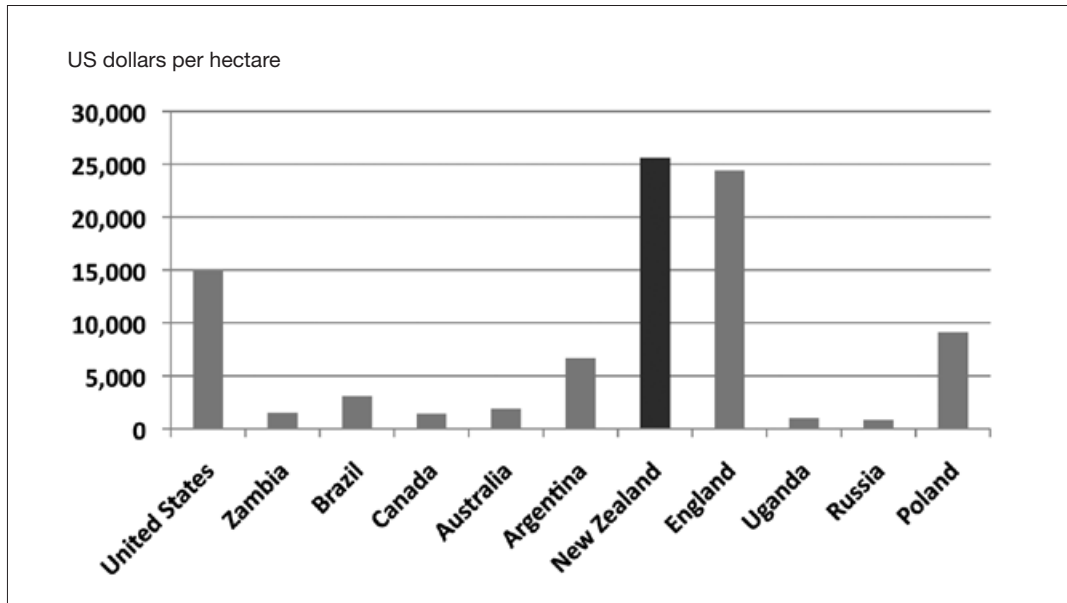
The current level of debt relative to land prices would tend to suggest that, at an aggregate level, farmers will be less enthusiastic in bidding up land prices on the basis of access to credit. The level of debt is also something of a danger as well. If interest rates rise, a number of heavily indebted farms will be under severe pressure and a rush of mortgagee sales is likely to depress land prices.

Compared with other countries

Where does New Zealand fit in the world relative to rural land prices? Not that well, as shown by recent figures in *The Economist*. This is an area in which we would prefer not to lead. I am not familiar with farming profitability around the world, but it cannot be all that bad relative to New Zealand.



Land prices versus aggregate debt



International land prices

Return on capital in farming excluding capital gain has never been very good on average, at around two to three per cent. This is a direct reflection of land prices, and would again tend to indicate that farmers do not necessarily put much emphasis on the productive value of the land when looking to buy it. The relationship between profitability, as measured by the correlation between economic farm surplus and land values, has always been relatively weak at around 0.5.

Lagging prices relative to changes in profitability do not improve this correlation. For a period through the early-mid 2000s the relationship for sheep and beef farms was weakly negative. This meant that as profitability decreased, prices increased. In defence of sheep and beef farmers this was mainly due to demand for the better land for dairy conversions and the harder hill country for forestry. Interestingly, for dairy farms there is a reasonable correlation between the pay out in dollars per kilogram of milk solids and the price of farms in that year.

Part of the issue around this relatively weak correlation is the 'stickiness' of farms sales. As discussed in a recent article in this journal by Kevin Wilson, if the profitability of farms decreases then the turnover of farms generally drops off quite steeply as farmers wait for an upturn in prices before selling.

Farmers buy farms

Who the buyers of land are can also influence land prices, but good data on this is scarce. In general the main buyers of New Zealand farm land are farmers, and the trend is now for farm amalgamation as farms grow bigger in an attempt to gain economies of scale. At the margin, equity partnerships and corporate buyers, and possibly overseas buyers, may be having an effect, but this is hard to discern.

While the relationship between currently profitability and farm prices appears weak, productive value is still an important component. It would appear, anecdotally, that

farmers incorporate an expectation of future prices into their buying decisions. This then leads into consumptive value. It is very difficult to quantify, given that it is driven by a wide range of personal factors. In the current situation with moderate to poor profitability, no capital appreciation and high debt levels, you could argue that farmers obviously put quite a high value on the vocation of farming.

Sometimes up, sometimes down

Where to for farm prices? In a previous article I wrote about the increase in on-farm inflation, which is not being matched by either market returns or productivity gains. This means, in theory, that this would be putting downward pressure on land prices. Similarly, farmers are under increasing pressure to reduce their environmental footprint. To do so means implementing a range of mitigation measures such as fencing off streams with riparian buffers, installing effluent disposal systems and constructing wetlands. All of this costs money and adds to the financial pressure on farms, again in theory putting downward pressure on prices.

For farmers looking to buy and convert sheep and beef farms into dairy, if faced with a range of environmental restrictions, theory would again indicate that they will look to deduct this cost from the price of land. In addition, as noted earlier, the debt loading on a significant minority of farms means that when interest rates rise the squeeze will again come on, playing into the transactional component of pricing.

Which way are farm prices heading? Well sometimes they will go up, and sometimes they will go down. The only tricky part is picking the turning point.

Phil Journeaux is an agricultural consultant at AgFirst Waikato.

John-Paul Praat and Nicola Waugh

Rural professionals in 2025 Thriving or surviving?

What will the headlines of the farming press read in 2025? How much progress will we have made on dealing with the big problems facing the farming community? What will the businesses of rural professionals look like? Will there be enough of us? Will our businesses be thriving or surviving?

The answer to the last question is most important. Given the environmental, market and economic challenges facing the business of farming, rural professionals should be thriving as there will be a huge demand for their services. The stakes are getting higher with rising debt levels, questions over demonstrable sustainability, an increasing role for technology, and a dwindling pool of on-farm expertise to help with tackling the problems on a practical level. This is par for the course, there are no silver bullets, no quick fixes.

A recent series of workshops for rural professionals described some of the challenges and useful methods and techniques which may help. The central theme was business resilience as it applied to farm businesses. AgFirst were joined by the New Zealand Institute for Primary Industry Management in taking stock of the businesses which rural professionals operate.

Future challenges

Sediment tax, one man 500-cow dairy farms, Australian vegetable growers in New Zealand, wrangles over water rights, droughts, floods, new crops and breakthroughs in animal science were suggested as potentially making the headlines in 2025. Some of our customers overseas want to see action on reducing the level of greenhouse gas emissions associated with agricultural products. Action in this area will improve the efficiency with which feed energy is converted into products such as meat, milk and wool, which should result in increased profitability and improved environmental performance.

Developing and demonstrating this type of action is supported by the work of the NZ Agricultural Greenhouse Gas Research Centre and the Pastoral Greenhouse Gas Research Centre. The pastoral sector contributes to funding and management of this research, with partners such as Beef + Lamb, Fonterra, DairyNZ, Landcorp and DEEResearch, along with AgResearch who add to significant government funding of \$5.4 million annually.

Development of a suite of ready-made methods is targeted for the agricultural industry. These will reduce greenhouse gases by 30 per cent by the year 2030, while supporting growth targets of two per cent each year. Achieving these targets will rely heavily on rural professionals. Against this background are the projected effects of climate change.

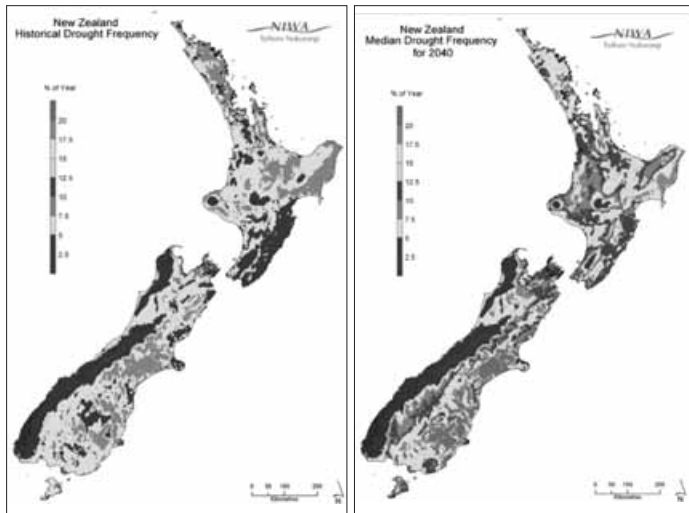
Overall, New Zealand stands to benefit from the effects of climate change, with warmer temperatures set to boost productivity across all our land-based primary sectors. These warmer temperatures also create opportunity to grow different crops and cultivars not previously viable in a region – maize in Southland? It is starting to



happen. However, warmer temperatures increase the ability of the atmosphere to hold moisture so more is available as rain. Heavy rainfall is therefore more likely in the future.

On the flip side, droughts are likely to be more prolonged. This extreme weather is projected to occur more frequently in the future. By about 2040, drought is projected to occur on average twice as often as it does now. This will be especially tough for regions such as Central Otago, Marlborough and the east coast of the North Island which already experience drought more often than they would like to. The maps show how an increase in drought frequency is expected to play out in 2040.

The information on the graphs shows the percentage of time in drought. This translates to years in 10, that is, 10 per cent drought frequency equates to an average of one drought every 10 years. Most of eastern Northland is currently in this category, but in 2040 some areas may get a drought in two years out of every 10. Drought is defined on soil moisture balance when soil moisture levels are only 10 per cent of the 30-year average



Comparison of drought frequency between 1980 and 1990 with that expected around 2040

Assessing farm business resilience

Business resilience was a focus for the workshops for farms and rural professionals. Resilience describes the ability to recover from a shock. Typical shocks to a farm business may be –

- Financial, such as market collapse or sharp interest rate rises
- Climatic with floods or droughts
- Structural, such as divorce, death or disease.

Shocks are likely to be combinations of these. For example, droughts necessitate extra or early stock sales which may depress market returns. Shocks are also inevitable, and not if but when. Climatic shocks are projected to increase in frequency and severity. Operating a resilient farm business is vital to maintaining viability in the face of shocks and ensuring farming is rewarding. The topic of resilience is very broad and assessment needs to

consider economic, cultural and environmental aspects as well as the ability to adapt.

The greater the shock, the more the adaptation is required. The diagram shows how changes in the operating environment relate to the level of adaptation needed. The challenge for many rural professionals is to move from advising at the –

- Buffer or tactical level where factors such as farm animal mating date are addressed
- Adaptive or strategic sphere where aspects such as farm animal new crops might be considered
- To the transformational stage where land use or even location changes might be considered.

Amount of change in tactics and strategies required to suit the environment

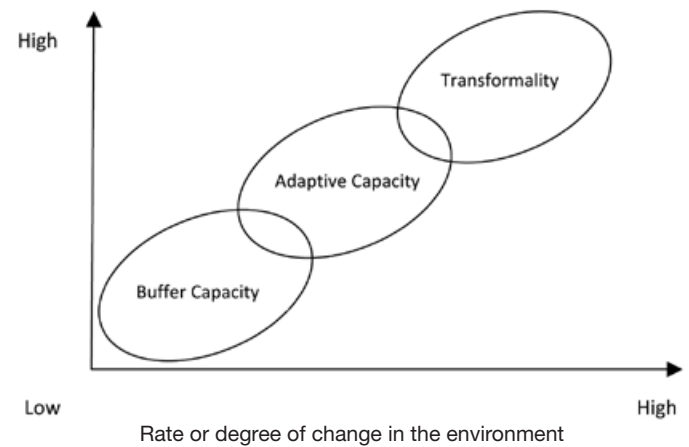


Illustration of the continuum of change, buffer capacity, adaptive capacity and transformability

What farmers can do in response to changing climate

The latest projections for the effects of climate change on-farm have been usefully detailed in the 2012 *Sustainable Land Management and Climate Change* report produced by the Ministry for Primary Industries. The report summarises how the dairy, sheep and beef, arable, horticulture and forestry sectors will be affected by climate change. It also has suggested strategies about how to adapt to the change and cope with its effects.

It is well worth a read and was given to those who attended the workshops. The report contains regional level data on the projections of the frequency of drought and heavy rainfall. It also has some suggestions of buffer, structural and transformational changes which could be made in each sector, as well as practical suggestions for dealing with, and preparing for, increasing drought frequency.

There are a range of options which rural professionals and their clients can use to help plan a farm-based response from buffering to transformation. An example is the Climate-Smart Farmers website which makes access easy to NIWA’s virtual climate station network. Here the latest soil moisture can be found in relation to a 30-year rolling

average to determine if current conditions are wetter or drier than normal. The data can be used to indicate changes to farm management such as selling cull cows and contracting summer feed supply.

For longer-term strategic or transformational adaptation, detailed farm-based analysis and benchmarking should form part of a strategy in building a resilient farm business. Biologically-based models should be used as these will provide more detail than analysis using spreadsheet. This is an area where rural professionals are lacking.

While half of rural professionals are using Overseer to assess farm productivity and environmental indicators, only 21 per cent are using systems such as like Farmax and Udder to model farm energy and system profitability. Similarly there is only limited use of databases such as Red Sky and Dairybase for detailed benchmarking.

Measuring

A case study of a relatively homogenous catchment of North Island east coast sheep and beef farmers was used to describe farm business financial measurements or key performance indicators. This was a random selection of farms with similar resources – land, climate and markets. Participants were asked what range for operating profit and return on assets they would expect over a three-year period for these farms.

Most rural professionals understood the large variation which might occur with an operating profit of minus \$100 to plus \$500 a hectare. Fewer rural professionals, just over 20 per cent, appreciated that return on assets can range from being significantly negative at minus 1.5 per cent to significantly positive for a similar group of farms.

This indicates real wealth generation or underlying returns on investment are not being regularly calculated and assessed in relation to other investment opportunities. Getting the right results for these measures of resilience is very important for the long-term viability of farming businesses.

Participants were also asked what the current cost of production is as a percentage of gross farm income and what the current equity is. They were also asked what levels would indicate that a farm business was in either a risky or resilient position. They were asked to answer this for the sector of the industry they were involved in.

For dairy and sheep and beef farms the limits shown in the table were mainly confirmed by audience response. It was recognised that in order to grow or invest in strategies for growth, the cost of production may be higher than for the status quo.

Resilient	Mix for Growth	Risky
40 to 60 (best = 50%)	50 to 75%?	75 to 100%?

Effect of the cost of production as a percentage of gross farm income on farm business resilience

For horticultural crops, cost of production relative to gross farm income would be expected to be higher as costs are recognised or borne up to the wharf, so include onshore processing and transport. This is generally not the case for milk, meat or wool.

The next table indicates where percentage equity should lie for resilient and at-risk businesses. These bands were found to be sensible for dairy farms but not for sheep and beef farms where equity was higher, for example, up to 92 per cent equity for Southland hill country, with a country average sheep and beef 85 per cent. This highlighted the fact that, as for other measurements, useful assessment of resilience relies on appropriate benchmarking.

Resilient	Mix for Growth	Risky
50 to 75%	40 to 60%	20 to 40%

Effect of percentage equity on farm business resilience

The workshop also looked at sustainability measures such as levels of fertiliser application in relation to maintenance and productivity measures such as lambing percentages and wastage. Again, a large variation was observed. The aspect of environmental performance, such as erosion control, was also acknowledged as an important performance indicator.

Climate change and cash flow

Current and future drought maps are a feature of the *Sustainable Land Management and Climate Change* report and show that their frequency is projected to double in many areas of New Zealand by 2040. This will have significant effects on profitability, cash flow and in some cases the viability of businesses. A study of the financial effects of the 2009/10 drought on sheep and beef farmers in Northland quantified the cost of the drought at \$50,000 a year for the year of the drought and the subsequent year of recovery.

Losses in the year after the drought related to rebuilding capital stock numbers. Long-time Northland farmers recall earlier droughts, which equated to a drought every 22 years. Since then we have experienced the 2013 drought, so frequency could be recalculated to one in 17 years. That anecdotal evidence indicates an increasing drought frequency.

Based on NIWA data, current drought frequency for Northland is around one in 17 years. In 2040, it is projected that drought frequency in this region will be one in eight years. This will have a significant effect on the farms studied, given the carryover effect drought has on cash flow. Without adaptation these farms will cease to be viable when drought frequency doubles as a \$50,000 loss cannot be sustained for two out of every eight years.

This was the second year these workshops have been run and a significant set of resources have been established. There is a planner for drawing up an action plan for an individual farm, a document summarising useful websites, and a workshop resource for technology transfer. These can all be found on the Agfirst website www.agfirst.co.nz.

Resilience of rural professionals

The government has identified rural professionals as having a critical role in helping farmers adapt to future challenges, their businesses face a number of challenges. A recent survey described the risks to rural professionals as –

- Age
- Succession arrangements
- Difficulty in establishing career pathways
- Lack of depth and development in sectors other than dairy
- Falling behind in keeping pace with advances in technology
- The divide between research institutions and rural professionals
- Inability to communicate the value proposition to the farming community
- Increasing demands of consumers.

Improving skills and succession within their own businesses were seen as the two biggest risks by the rural professionals who attended the workshops across the country. Staffing, competition from non-qualified advisors with vested interests, and regulatory requirements such as the Financial Advisors Act 2008 were also seen as significant risks to their business.

These risks have been recognised at government level. The NZIPIM is working with the Ministry for Primary Industries and others to solve these problems by raising the profile of registered or certified practitioners and establishing cadetships to increase recruitment and training. The NZIPIM has put forward its views on how they see rural professional businesses in the future.

They include having bigger consultancy practices, greater emphasis on governance and structures, public and private relationships to help develop new professionals, and increased connectivity between rural professionals and research institutes. Building stronger branches is also seen as necessary to support rural professionals, along with improving networking and efficiencies as specialisation in work areas increases.

Magnitude of the challenge

It is clear that there are significant challenges ahead for the rural community. An example of the magnitude of these was highlighted in these workshops. Participants were asked to recall lambing percentages and production per cow 30 years ago. They were also asked where it is today and where it might be in 30 years' time.

Aside from being a mental challenge this exercise showed that lambing percentages have increased about one per cent a year from 100 to 129 per cent, and milk production per cow by about 1.3 per cent per year in the last 30 years from 256 to 364 kg milk solids per hectare per year. This has been achieved by significant changes, including the loss of around 30 million ewes and an increase in the use of nitrogen fertiliser, supplementary feed and stocking rate in the dairy industry.

When posed with the question of where they see these

productivity measures in 30 years' time, a range of responses followed. Challenges such as increasing environmental performance, and input costs and variability in product prices, were considered. The general view was that per cow production is likely to increase at a similar rate, with per cow production estimated to rise from the current 364 kg milk solids per cow to between 425 and 525 kg milk solids per cow in 2043.

Lambing percentages are predicted to increase at a slightly lower rate than they have in the past 30 years. Participants predicted these percentages to increase from the current 129 per cent to between 135 and 155 per cent in 2043. Given that the high level aims in industry research programmes exceed this, significant research and technology transfer will be needed. There is no doubt that rural professionals will be essential in helping to realise this promise at the farm level.

Conclusion

One of the big challenges facing New Zealand agriculture and rural professionals over the next 30 years is the changing climate. The changes are not isolated to the physical climate, but also include the business climate that rural professional businesses operate in. This workshop was designed to inform these professionals about the regional changes to the climatic environment over the next 30 to 50 years, in particular drought and heavy rainfall frequency.

The participants were challenged to think about the area of their client's business that they currently advise on, and whether they need to be changing their focus towards the longer-term, structural or transformational level of the business. There were discussions about what a resilient farm business should look like, and what a satisfactory level of debt is, and what the cost structure should be. The target by the industry of two per cent year-on-year productivity gains was challenged.

The next 30 years will bring about a changing business environment, with major concerns to rural professionals being the continued requirement to improve skills and succession within their own businesses. There are a number of opportunities out there for them, with the *Sustainable Land Management and Climate Change* report stating that major players within the industry see rural professionals as vital to helping farmers and the primary sector take up new technology and adapt to the changing climate in the future.

The challenge for rural professionals is to take the time to develop a strategy to realise these opportunities and ensure there is the capacity and capability within the industry for this to happen. The material from these workshops can be extended to other gatherings of rural professionals and their client groups. Please contact the corresponding author to arrange this.

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Bill Malcolm

Case studies and whole farm economics used to analyse change in farm systems

Farms are very different and very similar. Farmers manage farms and they also study them. They study their own farm closely and look over the farms of their competitors. This information is used to help them make decisions about what to do and how and when to do it, to achieve what they aim for themselves and their family.

Every farmer and farm business is unique. Each farm business owner and manager has their own set of skills, attitudes to taking risks, history, stage of life, family situation and aims. Each has under their control physical resources of soils, pastures, water, infrastructure, capital improvements, equipment, working capital, access to finance, labour and management skills. These are combined into a system, each with its own business and operating uniquely, located relative to complementary off-farm facilities and infrastructure. Each farm business will have a unique debt-to-equity and net worth.

Every farm has similarities. Farming as an activity, still has much in common with farming 4,000 years ago. Farms in the same region running the same activities will have similar soil mixes and experience much the same weather conditions over the years. They will face similar natural phenomena, such as risk of disease and pest outbreaks. Farmers in the same region with the same products will buy and sell in the same markets, or markets in which prices received are related. Farmers will therefore face many similar risks.

Farm management economics

What do the 'different but same' characteristics of farm businesses mean for agricultural researchers and extension workers who want to study how farm systems operate in order to understand them and to provide information for the people who run them? More precisely, how can researchers reconcile the 'same and different' characteristics of farm businesses sufficiently to say sensible things about how farm systems perform and how they might perform with change? The answer is to apply the whole farm approach, also known as farm management economics.

Professor John Dillon defined farm management as 'the process by which resources and situations are manipulated over time by the manager of the farm system in trying, with less than full information, to achieve his or her goals'. Research and extension workers studying this process should use the discipline of farm management economics because its essence is the whole farm approach.

Farm management economics recognises that the performance of a farm business in meeting the aims of the owner is a result of the combined effects of everything put into the system, including management. The contribution of any single input alone, called partial analysis, cannot explain the performance of the whole.

Despite this, a marked phenomenon in Australia and New Zealand is for disciplinary specialist trained agricultural researchers and extension workers to carry on explaining the whole by knowing a lot about a part of the system. This leads to nonsense explanations, such as relating whole farm profit to the level of use of a single input such as nitrogen, stocking rate or land area.

Compounding this, the level of a single input on a number of farms and the associated profit of those farms will be calculated. Then the implication is drawn that a low-profit farm with a particular level of use of the input in question could become a higher-profit farm by using more of that input. The reason is that, in the sample of farms where higher levels of the input in question were used, these farms showed a higher profit.

This approach of attributing differences in farm profit to different usage of a single input, and drawing conclusions about particular farms, is very common despite being fundamentally flawed. Each farm business operates its own unique mix of input-output production with its own whole farm production. There is a limit to how much you can say about what to do on any one farm by having a good hard look at parts of lots of other farms.

Analysing farm performance

The way a farm business has performed, or is likely to perform, can be analysed from which sound lessons and conclusions can be drawn. A method of doing this is by using a case study based on the discipline of farm management economics. This involves looking deeply into a small number of real farm businesses to gain an understanding about causes and effects, accounting for all aims, and the relationships between all benefits and costs. It includes broad and deep

consideration of risk including business risk such as markets and weather, and financial risk such as debt-to-equity and debt servicing requirement.

Carrying out a small number of case studies to acquire information at depth about the farm system is the opposite approach to the more common way of 'survey a farmer'. This is based on getting shallow information from a large enough sample of a population to say something statistically significant or representative about that population. You cannot generalise findings to a population if your sample is small.

The strength of the detailed real farm case study is that, if carried out properly, it is grounded in farm economic theory and the results are used to test it. The findings will either be consistent with the current best explanations of how things work in a farm business, or they will not. Findings from detailed real farm case analysis can confirm farm economic theory or disprove and improve it.

Case study analysis is about generalising to theory, not to populations. Information about the merit or otherwise of a change in a particular real farm case cannot be totally applicable to another case, nor is it totally inapplicable.

Real farm case study research

An example of farm management economics real farm case study research and extension is the Dairy Directions and Lamb Directions farm economics research carried out in the Future Farm Systems research division of the Victorian Department of Primary Industries. It is detailed fully in the *Australasian Agribusiness Review 2012* available at www.agrifood.info.

The example involves working with a group of farmers in a region to use real case study farms to analyse and answer questions which the farmers are asking. This is in contrast to answering questions which no-one is asking.

The farm management economics real farm case study way of answering research questions is to incorporate time, risk and change into analysis of the potential future performance of farm systems. The perspective is the future, not the past. Once the current balance sheet is established, the aim is to budget how the whole farm system currently works based on good recent information from recent years. Using input and output responses, future within-year and annual feed supply and demand budgets can be constructed.

These form the basis of future whole farm financial budgets including all inputs and outputs. The farm system is then test run using computer simulation on spreadsheets over a few years. Once a good working representation of the farm system is constructed and calibrated, reflecting the external natural and economic environment possibilities, and passing the tests of common sense, then questions can be asked and answered.

Three main criteria are used to represent some of the aims of the farmers and judge performance over the relevant planning period – return, risk and change in net worth. The planning horizon is in the medium term of five to eight years, subject to a continuing cost price squeeze and volatile

natural and economic circumstances.

Questions asked are about the implications for return and risk and end net worth of potential innovations to the system. Is the change more or less attractive in terms of risk and return and end net worth compared to trying the impossible of maintaining the status quo in a changing world? How does this change compare to some other technically feasible option for change?

The risk of running the case study farm systems on paper over the medium-term future is included using risk budgeting tools which enable probabilities to be placed on volatile determinants of farm performance such as rainfall, output prices and interest rates.

Risk budgeting

Risk budgeting enables estimates of ranges of farm performance to be made, putting the decision-maker in the position of weighing up how they feel. For example, one change could produce a profit of around \$300,000 in perhaps five years out of 10, a loss of around \$200,000 in three years out of 10, and perhaps two years in 10 a profit could be \$500,000.

This is more valuable information than the more common version which could say that on average, over 10 years, this farm plan will produce annual profit of \$190,000. Risk matters as much as return, so spelling out risk and return is really helpful. Farmers, who well know that risk creates return, appreciate this extra information about the extra risk associated with potential extra returns.

The lack of certainty about the technical response which may apply in the system can be put into the budget in probabilistic terms. It could be that there is a 60 per cent chance it will be one option, a 30 per cent chance it will be another, and 10 per cent chance it could even be something else. The potential futures are better obtained in this way, so that implicit assumptions are explicit bets about main values in the budgets which critically determine the ultimate performance of the system being budgeted.

In this way, with full recognition that any real case study farm budget or model is still a caricature of the complex reality, research questions about the operation and change to the farm system are answered. But there is more. The answers for a particular case study farm represent information which adds to a farmer's prior information and intuition. This makes possible a better, informed judgement about the question at hand, first for the case study studied, then for another different but similar situation.

The information from the analysis may be sufficient to reject an innovation in a different situation for many good reasons. Alternatively, the new information may provide a number of good reasons to explore the merit of the innovation because it could work in another farm system.

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Keith Woodford and Xiaomeng (Sharon) Lucock

New Zealand's dairy opportunities in China

This article was written just before the recent problems with Fonterra protein contamination emerged. Editor

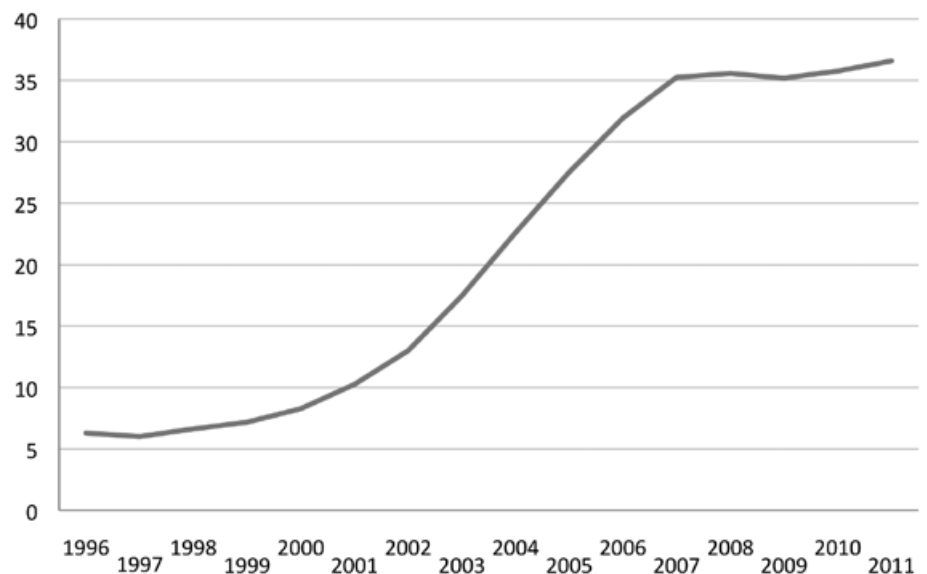
Increasing demand from China for internationally sourced milk powder has, in recent years, been underpinning prices for New Zealand dairy products. China is now by far the most important destination for these products. Without the increase in Chinese demand, international markets could not have absorbed the increased volumes coming out of New Zealand and the United States.

The main reason for the large increase in demand can be traced back to the widely publicised melamine disaster of 2008. This, together with a raft of other food scandals less publicised in the west but well known to the Chinese, led to Chinese consumers losing confidence in their own food industries. However, it was not only consumers. The Chinese government also lost confidence in the existing dairy industry and it has directed that there must be major change. Specifically, the dairy industry is now moving to an industrialised model based on dairy herds of 3,000 to 5,000 cows, with individual companies owning multiple herds of this scale. In this article we discuss the implications for New Zealand of this change, together with the other changes occurring in China which will continue to influence Chinese demand for imported dairy products.

Changes in China's dairy industry

According to the National Bureau of Statistics of China, total dairy production increased from 6.3 million tonnes in 1996 to 36.6 million tonnes in 2011. This

Million tonnes



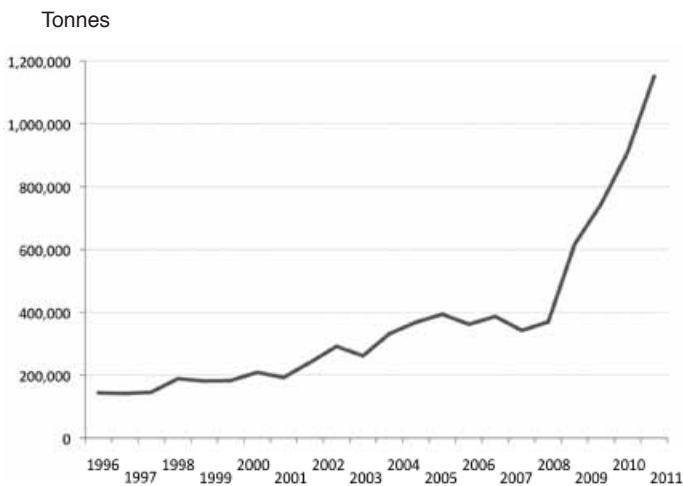
Total dairy production in China 1996 to 2011

Source: National Bureau of Statistics of China



was nearly a six-fold increase over a period of only 15 years. However, production has plateaued since 2008, linked to lower prices for local produce and new regulations requiring companies to control the total supply chain.

In contrast, the consumer demand for safe products has led to a rapid increase in dairy imports. Between 2008 and 2012, the total dairy imports have more than trebled. Data for the first half of 2013 suggests that, given no unforeseen shocks, always a possibility in international food industries, a further 30 per cent growth is likely for 2013.



Total dairy product imports to China 1991 to 2012

Source: FAOSTAT for 1991 to 2010, China Customs for 2011 and 2012

The traditional Chinese dairy model was of farmers owning up to 10 cows, fed mainly on crop wastes, which were either hand-milked or brought twice a day to a milking station. Regardless of specific variations in this system, the common elements included low production per cow, low milk quality in terms of bacteria and somatic cell counts, and then a long supply chain from milking stations to sub-collectors before the eventual arrival at the processing factory.

Opportunities for mishaps within the supply chain were numerous, and accountability back to the source of any problem was virtually non-existent. That system had to be improved.

The changes in the dairy industry are just one part of the big change throughout Chinese agriculture, with capital and modern technology replacing traditional ways. Linked to this, there is a move to the cities of 12 to 15 million people a year. This internal migration out of agriculture and rural lifestyles can be expected to continue for the next 30 years.

It is in the pig and dairy industries where the changing structure of Chinese agriculture is most evident and spectacular. In these industries the new model is not one of expansion and aggregation of existing farms, but rather the initiation of new large-scale corporate entities.

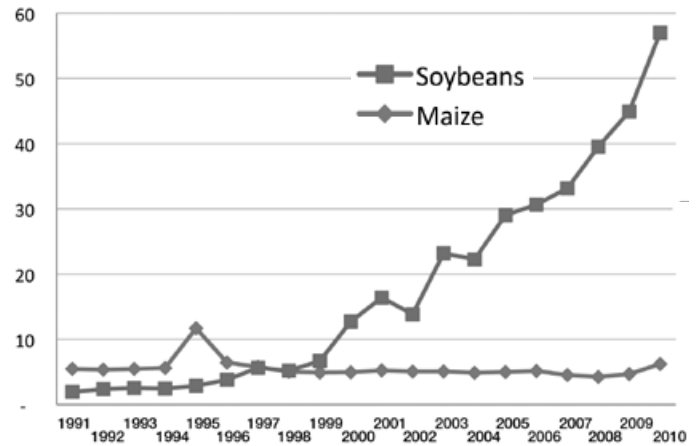
The big dairy players are all moving to businesses of between 100,000 and 250,000 cows, with annual milk production of 80 million to 250 million litres. To put that in perspective, on an average New Zealand dairy farm there are about 400 cows producing about 1.5 million litres a year.

Not the New Zealand system

The new dairy farms in China are based on total mixed rations supplied to housed animals. The New Zealand system of pastoral farming is simply not a realistic option. The new dairy production entities are nearly all in the north of China, particularly in Manchuria and Inner Mongolia. It is these regions where mechanisation of the feed production is easiest. In southern China most of the land is hilly and the majority of production comes off terraced land where it is very difficult, and in some cases impossible, to implement large-scale mechanisation.

Despite the increased feed production by mechanisation, the feed and fodder coming off the northern lands is insufficient to feed the new pig and dairy farms. China is already importing large amounts of soybean and maize, with much of the soybean coming from Brazil and Argentina, and the maize coming from both South and North America.

Million tonnes



Maize and soybeans imports to China 1991 to 2010

Source: FAOSTAT

Imports of soybean to China have increased nearly 10-fold between 2000 to 2009. Unofficial trade data indicates there have been further increases since then, with Chinese imports of soybean likely to consist of 25 per cent of total global soybean production in 2013, and totally dominating international trade in this area.

New Zealanders might question whether this production model is profitable or sustainable. However, the answer to the profitability question is that currently it undoubtedly can be. Part of the evidence for that comes from Fonterra's own operations in China.

Fonterra in China

Fonterra does not provide data on the profitability of its China-based farms but the overall message is clear – the company would not be expanding its operations if they were not profitable. Fonterra is currently developing its fourth and fifth farms and this will give them about 15,000 cows in milk at any one time and annual production of about 150 million litres. This is just the first step towards a projected 100,000 cows and a billion litres of milk a year by 2020.

In broad terms, the cows taken to China from New

Zealand produce 9,000 to 10,000 litres per lactation under Fonterra's management system. This is more than double the production under New Zealand conditions. The milk sells for about four RMB a litre at the farm gate, equivalent to 80 New Zealand cents. Currently Fonterra's milk is being collected by other processors who pay a premium over other locally produced milk due to the low bacteria and somatic cell counts.

The milk solids percentage on Fonterra's China farms will be lower than under New Zealand conditions, but this still works out at about NZ\$10 a kilogram of milk solids. For many dairy operations in China, there is less incentive than in New Zealand to increase the milk solids percentage, as milk is paid by the litre. This lack of emphasis on increasing milk solids could change if Fonterra were to build its own processing plant and create a fully integrated supply chain for its China operations.

Occupying strategic space

Currently the feed costs probably use about 50 per cent or more of income on the Fonterra farms. Labour intensity is high, as milking is three times a day, and output is about 300,000 litres a year per worker, or perhaps a little less. However the overall economics stack up. The big question is what will happen if the big herds increase a great deal more. Where will the feed come from? Can it come from China and, if not, where will it be drawn from and at what cost?

In terms of the future for Fonterra's China operations, we often hear people in New Zealand asking what Fonterra's

strategy is for the China-based farms. However, we never hear that question in China. Chinese thinking is usually about occupying the strategic space and then seeing how the inevitable opportunities evolve. To many Chinese it is obvious that dairy production is a good space to be in. In addition, to the Chinese it is obvious that if Fonterra wants to be a long-term player in China, with milk products produced from New Zealand, then they will also need complementary production from within China.

Opportunities for New Zealand

So far, most of New Zealand's dairy exports to China have been commodity-based and predominantly whole milk powder. New Zealand totally dominates China's imports of whole milk powder but there are also major imports of whey from Europe and the United States, where it is a by-product of cheese making. Whey is particularly important for infant formula, given that most of the proteins in human milk are whey.

New Zealand has a free trade agreement with China, still the only OECD country to have such an agreement, but most of the dairy exports to China pay the same tariff as from elsewhere in the world. This is because when the agreement was negotiated, New Zealand officials did not expect the spectacular growth of exports which has subsequently occurred. With hindsight New Zealand should have pushed for higher quotas of tariff-free imports.

The reality remains that the free trade agreement with China has created a very favourable political environment



Fonterra's North American style dairy system at Yutian



Organic milk powder of unknown New Zealand provenance selling for \$86 per 800 gram can in Beijing



Organic milk from the USA selling at \$8.60 a litre in Beijing

under which all New Zealand exports have prospered. The agreement has been taken by Chinese companies as a signal from their government that New Zealand is a good country to do business with.

The big question is whether or not New Zealand could be doing a lot more to sell premium quality dairy products to China. There is no doubt that foreign-sourced production can sell at major premiums, often more than double the local price. Infant formula is the best known example, but there are also very substantial premiums for ultra-heat-treated milk and what are known in the trade as growing up milk products.

Fresh milk

Most of the fresh milk in China is ultra-heat-treated, which does not need to be refrigerated until opened and has a shelf-life before opening of at least six months. Given that the production base is in the north, but much of the population is in the middle and south, this Chinese reliance on ultra-heat-treated milk is unlikely to change.

Many New Zealanders do not like the taste, but much of the developed world, including European countries such as Spain, use it as their staple product. It seems the local prejudices against ultra-heat-treated milk have blinded the New Zealand companies to the opportunities. For a long time it seemed the only way forward was to dry the milk and export it in that form.



Anchor butter selling for \$3.60 for 100 grams in Xining supermarket in western China

Fonterra does now market ultra-heat-treated milk in China under two brands. For the food service industry they use the Anchor brand which is well known internationally. This is also known in China as a butter brand, and almost all western-type hotels have Anchor pats of butter. In the supermarkets Fonterra is now testing a brand called Country Goodness, but we have been less than impressed with this.

When we first saw it in a Xi'an supermarket we were convinced it was a fake, but when we sent pictures to Fonterra they told us it was the genuine article. We thought the packaging was inferior and a lot of it looked damaged. But the real problem is that this is an unknown brand. Potential Chinese consumers quickly go online looking for evidence that brands are sold in other countries, particularly the country of origin, and would be less than impressed by the absence of information.

We are not aware of any other New Zealand brands of ultra-heat-treated milk sold in China. It is easy to find milk from Australia and Europe in top-end speciality shops, but not from New Zealand.



Somewhat battered Country Goodness ultra-heat-treated milk in Xi'an supermarket

Infant formula and nutritional goods

The way that infant formula was stripped from supermarket shelves in New Zealand and Australia during 2011 and 2012, before export regulations to prevent this were enforced, is an indictment of how New Zealand firms have mismanaged the dairy supply chain. How is it that Chinese entrepreneurs could buy the product at retail prices from New Zealand supermarkets, assemble it into large pallets and containers, export it to China, repackage and still make money?

There is evidence that New Zealand is now trying to catch up. Currently there are a number of small-scale entrepreneurs who are attempting to export infant formula to China. However, what the Chinese want is well known brands. In April 2013, Fonterra announced that in future it will be marketing its own infant formula brand called Annum. A2 Corporation is also close to launching its own brand called A2 Platinum, with the product manufactured in New Zealand by Synlait and marketing in China handled by China State Farms.

Synlait also produces Canterbury Pure infant formula, which is marketed by Shanghai-based Bright Food. Westland Dairy Co-operative also has plans to enter the fast moving consumer goods nutritional market and its Easy-Yo product is already available online.

Integration and the future

In the same way that New Zealand companies are starting to integrate through to China, Chinese dairy companies are integrating back to New Zealand. In early April 2013, major processing investments by Chinese dairy companies Yili and Yashili were approved by the New Zealand Overseas

Investment Office. These companies see Fonterra, in particular, as a future competitor on the shelves in Chinese supermarkets and wish to have their own independent supply. It is all part of a global phenomenon towards integrated supply chains.

Looking into the future, no doubt there will be a few hiccups and not everyone will prosper. Food safety scares are always the big unknown, as happened just as this article went to press. But the overall prospects for New Zealand dairy products into China are strong. Even if overall growth of the Chinese economy slows, there will be increasing demand for consumer goods as the economy moves from investment to consumption.

Low risk or high risk

The big question is the extent to which the New Zealand dairy industry is satisfied with being a low-risk supplier of commodities. Do companies in this country want the higher risk entrepreneurial profits from further down the value chain? As well as the mainstream fast moving consumer goods there are opportunities for niche products such as yoghurt powder sachets and lactose-free products.

If New Zealand does want to have a stronger position with fast moving consumer goods, it will be necessary to find the right partners and manage the logistical complexities in a country where there are more than 150 cities with a population of more than a million people. Getting access on to supermarket shelves is not easy, and Chinese supermarkets do not have the centralised distribution centres which are found in most western countries.

There are growing opportunities for online selling directly to consumers and this is how Chinese are increasingly buying their food. The wide use of smart phones has also made online shopping more appealing to the Chinese. There are now about 320 million smart phone users in China who are capable of purchasing online almost anywhere and any time, including chilled and frozen products delivered direct to apartments.

There is no doubt New Zealand has been slow to recognise the unique opportunities which have arisen from Chinese consumers not trusting their local products, along with the rapid growth in the number of users of online shopping devices. Hopefully the market will be big enough for everyone, including the late entrants.

However, even if New Zealand companies decide that this is all too hard, there will be increasing competition for milk at the New Zealand farm gate as Chinese companies reach back to New Zealand for a contracted supply of milk. There is an inevitability that, over the next decade China, is going to want even further increases in dairy products from the international market.

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Boyd Gross

An overview of the New Zealand horticulture industry



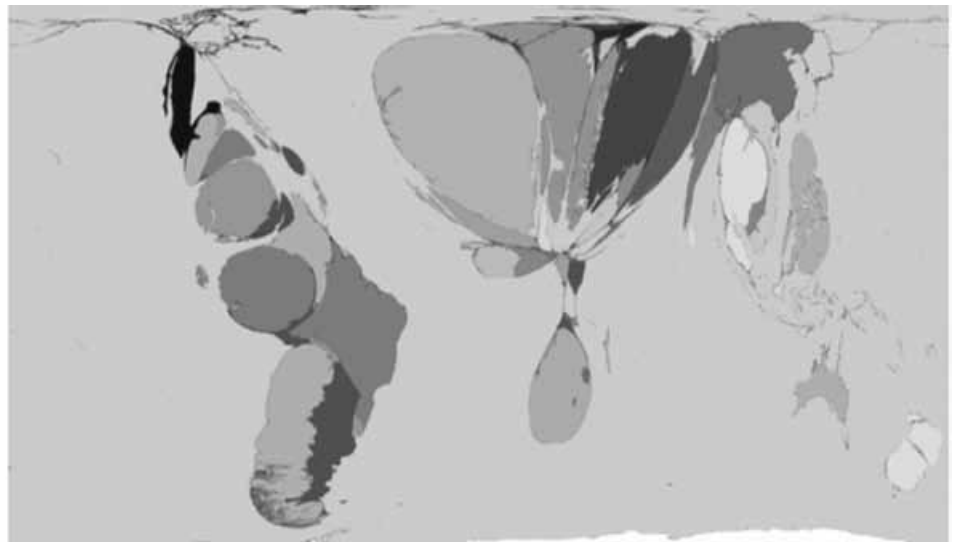
The New Zealand horticulture sector covers a wide range of crops – apples, kiwifruit, stonefruit, vineyards, avocados, berries, nuts, truffles, sphagnum moss and citrus. This article covers general problems which involve all horticulture sectors, but with the pipfruit sector being the main example.

Commercial horticulture in New Zealand has been around since the first occupation of New Zealand. Fruit, cuttings and seeds have travelled with everyone who has explored and occupied the country. Initially this use was solely for domestic consumption. The limited ability to store the majority of the perishable goods for any great period resulted in a seasonal supply and short growing windows.

As ethnic populations grew, the demand for specific food types increased and crops were grown to try and fill these needs. As part of globalisation people started observing different crop types and looked at introducing them to New Zealand, as well as seeing the opportunity to have counter-seasonal supply into larger northern hemisphere markets. This is a main feature of New Zealand's production.

The New Zealand pipfruit sector developed along similar lines as residents here wanted apples in varieties which they had in the home countries. The pipfruit sector has had a long exporting history, and like many of our early exports, was focussed on the United Kingdom and the connections retained from immigration. The exporting of pipfruit was for many years controlled the New Zealand Apple and Pear Marketing Board, established under statute as a single desk exporter. This statute was repealed in 1997 and the sector became an un-regulated free market.

Worldmapper.org is an application which allows you to view trends in the world around resources and population. It works by adjusting the countries size to reflect their position in the world relative to other countries. The diagram below illustrates where the world's fruit production is based. A number of factors need to be considered, including production, markets, political factors, economic factors, effect on value and outlook.



Production and climate

The main factors around production relate to consistency of supply and quality of products, and this consistency is part management and part natural inputs. Climate is a big factor in this equation. New Zealand generally has a benign climate suitable for a range of crops. But as experienced recently it can vary considerably from one year to the next.

This creates a challenge around securing a crop before you even think about crop specifications to meet market needs. Methods have been developed to try and mitigate the effects of some events, and these include hail netting, wind machines to reduce frost damage and cloth to reflect the sun.

With many of these climate problems the effects are potentially devastating at the time, but they are mostly short lived and flow-on affects production in following years. The long-term effect can be financial with seasonal debt required to be moved to term debt causing imbalances to equity ratios and resulting financial pressure.

Pests and diseases

Another natural factor is pests and disease. Unfortunately we now know far too well the devastation that can be caused by pest and disease within sectors. The PSA virus has caused significant damage to the gold kiwifruit sector. New Zealand has a very high and real risk. While biosecurity is in place there is the continual debate about whether it is enough or too much.

Where New Zealand risk is further exaggerated is that internationally we are relatively small and our areas of production tend to focus on specific geographical areas. Within these areas there is a dominance of monoculture environments. The biosecurity measures come at a high cost to producers and the public, yet many who live in urban areas do not fully appreciate the risk to the economy, with some only viewing biosecurity as an inconvenience at the borders.

Water resources and management inputs

Water is the final main factor which has significant influence on these sectors, but this topic is a whole article in itself.

The main factors relating to water with horticulture is that like many intensive uses, water is a critical ingredient in the production cycle. Yet there are ever-increasing water demands at certain times of the year, with much of this being conflicting demands. New Zealand has plenty of water, just not in the right spot at the right time.

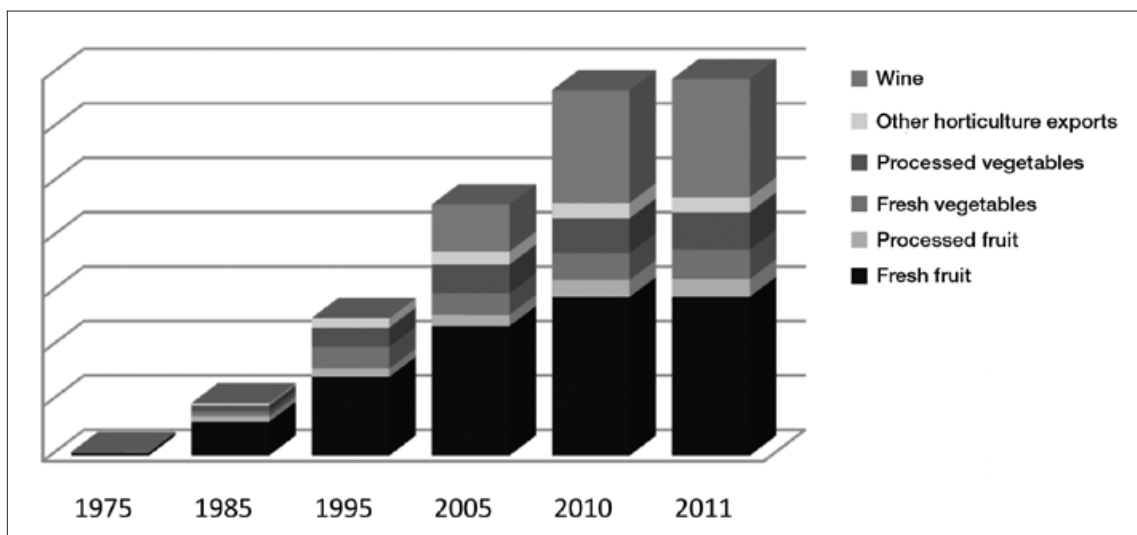
The remaining areas of production relate to the management inputs. New Zealand, as in many fields, is amongst the world leaders in its knowledge and technology. This places us in a good position, and due to continual pressure from other producing countries, ensures innovation is maintained.

Markets

Fruit, as with other primary sector products, is needed to supply the world's growing population. We are dealing with living things. This is obvious to most of us, but in some of the larger cities in the world this point is lost. Fruit and other food come from the supermarket and there is limited connection with the living environment. This growing disconnection and lack of understanding by consumers to where their food comes from, and why their preferred produce is not available or is expensive today, is a worrying trend. Unfortunately, this is also occurring in New Zealand.

Globalisation is also affecting food trends. Consumers are not satisfied with the same old fruit and vegetables. This is a result of multi-cultural societies and the ease of international travel which has caused consumers to broaden their tastes and demands for food. However, this has a positive side for countries which do not have the fruit produced in New Zealand and allows us to target these as new markets.

The negative is in the traditional markets of Europe, the United Kingdom and the United States. Buyers now have more choice, particularly for the tropical or more exotic fruits which are direct competition for us. This must be considered in conjunction with consumer buying trends where they only buy one or two pieces at any one time and the buying experience is more visual than taste-driven.



Horticulture exports

Supermarket survey

The main supermarkets in the United Kingdom were surveyed in 2012. As part of the consumer chain this highlighted the following as main factors in their produce purchase and the story they convey to consumers.

Carbon What is the carbon footprint to produce the item? New Zealand is at lower end of scale but needs to improve further. The big problem with this country is shipping to markets, which puts us at a real disadvantage when competing with European countries or even the Americas.

Water The problem around water is that the supermarkets want to be able to tell the story that, in the production of the food item, the use of water has not been detrimental to the surrounding environment. In addition, the water source should be renewable and exporting water in the form of food should not cause negative flow-on effects in the source area.

The quality of water from production areas is also a concern. Mostly New Zealand can satisfy this, but it requires work to improve and catch up to some countries. Harvesting water is increasing and consumers are becoming more aware of the effect their product choice could be having on the environment.

Packaging The refuse and waste created around food packaging, and the cost of collecting and disposing of this, is of increasing concern to retailers. Their focus is on reducing packaging generally, as well as the types and use of packaging which is sensitive to the environment. Food has to leave New Zealand in a form which the retailer can just place on the shelf. This obviously creates some challenges as different retailers pursue different methods of presentation as a point of difference.

Food waste Retailers only want saleable products and no waste. The other part to this is retailers are also trying to influence production and processing to show that any product sold through them is not creating a trail of waste food behind. New Zealand fruit is at the higher end of the scale of total use and limited waste.

Ethical Buyers only want to deal with countries and companies which operate under ethical practices. This is very wide-reaching including ethics around employees, business ethics, central government acting ethically in its dealings with other countries, its citizens and the environment. New Zealand is known to be one of the least corrupt countries with generally good employment and business ethics. Concerns around spray residues are taken as a done deal. If you are not complying, you do not even get to talk, and anything presented which does not comply is rejected and blacklisted.

Political factors

The political factors range from internal within the sectors and their governing bodies, to domestic and international politics. Structure is a major talking point within the agricultural and horticulture sectors. We have Zespri and Fonterra at one end of the scale and the apple and wine sectors at the other. Each has positives and negatives. The important point is that the buyer in the international markets knows which ones it can work with and which ones it cannot.

We continually hear that New Zealanders cannot find work. It is a sad indictment on this country because in many growing areas the horticultural sector has been unable to find sufficient staff who have the desire to work and learn the skills required. It is accepted that it as a manual job and at the lower end of the pay scale.

However, those who improve themselves and have the skills can earn good money. As a result the Recognised Seasonal Employment scheme was introduced and is working well, although the minimum wage applies equally to these employees. While it removes the risk around getting the crop picked and packed, it does not improve New Zealand's competitiveness.

Economic factors

As with many producers, and following the lead of the kiwifruit sector, there is a consolidation occurring in the pipfruit sector within New Zealand. Before deregulation the average size of orchards was considerably smaller. After deregulation we saw a rapid increase of exporters and fruit traders entering the sector. Fruit markets became more competitive, production and compliance costs increased and many exporters disappeared. These factors, combined with mediocre returns, have resulted in many orchards disappearing.

The trend still continuing is that we will end up with a very small number of major players controlling the bulk of the industry using integrated fruit companies which will further squeeze small growers. Although there is this change in the fundamental structure, and the planted area is reducing, the total volume of production has altered slightly. This is due to increased intensity of plantings and improved yields per hectare.

Many producers are price takers. There are very few forward contracts which fix a price. Most do not even start negotiating until very close to harvest. Price risk is a real problem with horticulture because many crops have long lead-in times and costs to set the crop up.

Most of the time this is based on the hope that someone will buy your fruit and offer a price which will cover costs and provide some reward for the risk and the capital employed. However, in many seasons this does not happen. This is part of the agriculture risk associated with horticulture anywhere in the world.

Other factors relating to this risk are climate and labour. The crops grown mostly suit the climates they are grown

in. The risk is about one-off events such as hail, frost, rain, wind or abnormal seasons, as experienced in the 2011/2012 summer. Growers can undertake some actions to try and reduce these effects including frost fans, heat pots, hail nets and wind breaks. These can only help in the management process. If you want full control you need to move into controlled environments such as glasshouses.

As discussed earlier labour is another risk. Not having staff when you need them, or not at the skills required to ensure your crop is handled to the level of care required, has been a major frustration. As an apple grower said when he was inducting staff – it has taken me 364 days to grow this apple, and what you do on the 365th day will determine whether I get any money and whether that money is good.

Effect on value

At a high-level consolidation of the sector, there have been modest financial returns and a higher level of general indebtedness, with transaction volume easing over the last few years. Some may suggest this is symptomatic of the sector and the general impression given. What needs to be considered is that the market is responding to different problems. The above scenario is accurate and representative of older low density plantings of well-known varieties with waning market appeal.

Many of these orchards are expensive to operate and some fruit quality struggles to survive the rigours of the export cool chain to the market. Therefore when these orchards appear on the property market there is limited demand from the integrated companies, and often alternate uses, such as cropping or lifestyle, determine the market.

What we are not seeing in the property market are the modern orchard units. This is due to them being tightly held by the integrated fruit companies who have developed them and are enjoying significantly improved returns. It is due to consistent volumes along with quality and size of fruit,

combined with improved management and the introduction of technology which is also removing labour cost.

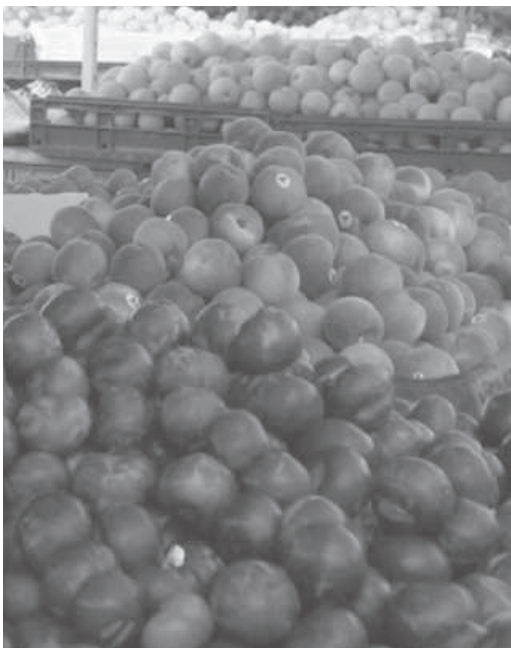
This creates a challenge for valuers because just using the sales approach could significantly under value the assets. The use of the sales, cost and income is paramount in these circumstances. Even then it is not fully including the ‘special value’ to the integrated fruit company, because a managed and known fruit supply is critical to the viability of these businesses. It also allows them to add value via the marketing chain to the consumer. The requirement for vertical integration will encourage the redevelopment of this sector by a small number of players.

The outlook

The horticulture sector is working through a repositioning phase. Over the next five to seven years there is going to be a further consolidation, with grower numbers decreasing and orchard size increasing. There is also going to be a definite change to the appearance of the orchards with shorter trees more intensively planted. The number of varieties on offer to the consumer will increase as will the size of fruit and flavours. Despite all this, the returns will still be subject to the vagaries of the international fruit market and the ultimate influencing factor, Mother nature.

Like anything in New Zealand agriculture and horticulture, everything has a future and could do very well. We have advantages that a lot of countries do not have such as water, climate and fertile lands. We have some challenges regarding supply volume, proximity to market and foreign exchange. We need the market to factor a return for the investment and risk involved. We also need to have structures in place to ensure that what we grow reflects its true value in the international markets – not a commodity value.

Boyd Gross is a Rural Valuer at LoganStone, Rural Valuers in Hastings.



New Zealand wine past and future



In 1981 the New Zealand grape and wine industry consisted of just over 100 wineries operating in a domestic market protected by a tariff quota system. The vineyard area was less than 6,000 hectares and the total value of sales around \$100 million, almost exclusively in the domestic market. Today the story is very different.

- There are more than 35,000 hectares of vineyards making wine grapes, New Zealand's largest horticultural crop
- There are 700 wine producers and more than 800 independent growers
- Total sales are estimated at \$1.6 billion
- Exports are valued at \$1.2 billion or 75 per cent of total sales
- New Zealand is recognised as the leading producer of sauvignon blanc, and we have an emerging reputation for pinot noir and other wine styles
- New Zealand is acknowledged as an innovator in wine styles and packaging and is often cited as an example of collaboration in this area
- New Zealand has the highest average selling price of any new world country, and in markets such as the United Kingdom, has the highest overall average selling price.

In the last 30 years, the New Zealand wine industry has transformed itself from a small domestically-oriented industry to a globally significant player, respected as one of the finest wine industries in the world. How did that happen?

Laying the foundations in the 1980s

The 1980s were a period of revolution in this country's wine sector. The signing of the Closer Economic Relations trade agreement between New Zealand and Australia forced big changes on the industry which were sometimes very painful. In 1986 the government sponsored a vine extraction scheme which saw 25 per cent of the vines pulled out. Fortunately the government placed no limitations on replanting, and extracted vines were quickly replaced with higher quality grape varieties such as chardonnay, merlot, pinot noir and sauvignon blanc.

The opening of the New Zealand market brought a new reality to the wine sector. Protection no longer determined the sector's success with the requirement to meet the needs of consumers. Fortunately a number of domestic producers were ready for this. They believed the future of the industry was in producing world class wines and selling these in other countries rather than locally.

That self-belief, combined with a willingness to move offshore, to test market reaction and respond to these market signals, was important in the success of the industry. Wineries also collaborated to promote their wines, a crucial step in maximising the funds available for promotional activity.

At the beginning of the 1980s, New Zealand had its first wine tasting offshore in London. By the end of 1980s the sauvignon blancs were consistently out-performing the competition in international wine tastings. The transformation in the industry between these events signals the revolution which the industry experienced in this decade.

The 1990s and the United Kingdom

If the 1980s were all about laying the foundations for later success, the 1990s were about turning these achievements into sales. The New Zealand Wine Guild was established in London by a group of wineries, with assistance from the Wine Institute and New Zealand Trade and Enterprise, to help the promotion and sale of wine in the United Kingdom. This formalised and put a structure around the collaborative efforts of exporting wineries. It was a success and a blueprint for activity in other markets.

The vision for the future direction of the industry was then set by the Wine Institute, which in 1992 published a strategy forecasting international sales of New Zealand wine by the year 2000 of \$100 million. At the time the strategy was produced, exports were less than \$20 million a year. Wine exports for 2000 were valued at \$169 million, with half of these being in the United Kingdom, a commercial success on a significant scale.

The importance of the United Kingdom in the 1990s to the New Zealand wine industry cannot be under-estimated. The market was important in its own right, but it was a market which had global power, particularly with its many high profile wine commentators. The influence of these writers in championing New Zealand wine was important in the growing success of the industry.

Growing into other markets in the 2000s

Success in the United Kingdom produced change in the industry. For some New Zealand wineries, the success confirmed their aspirations that they could build globally significant brands from a domestic production base. Growing brand recognition and sales success encouraged them to plant new vineyards for further sales growth.

The United Kingdom success also encouraged international wine companies to secure a supply of New Zealand wine, particularly Marlborough sauvignon blanc. There was a surge of overseas investment as a result.

The industry was already looking beyond the United Kingdom well before 2000. In 1996, leading industry players sat down to consider the future international direction. The aim was to build on the lessons learned in the United Kingdom and transfer these to other markets. This assessment identified Australia, the United States, Canada and Germany as priorities for the next phase of the industry's export development.

The 2000s saw major success in three of these four markets. Today Australia is the number one export market for New Zealand wine, the United States is number two and Canada is the fourth most important market. Only Germany failed to live up to the earlier expectations, but this is now back on the agenda.

Rising sales of New Zealand wine in the main markets sparked a rapid increase in vineyard plantings in the early to mid-2000s. These plantings should have led to rapid and sustained production increases, but was constrained by frosts and cool flowering in a number of years, notably 2001, 2003, 2005 and 2007. This weather masked the productive potential of the national vineyard, contributed to ever-rising grape prices, and prompted some vineyard investments which might be best characterised as speculative.

The lessons from 2008

The potential of all these new vineyards became all too apparent in 2008. Favourable weather and a record producing area of over 29,000 hectares of grapes led to a vintage nearly 40 per cent larger than the previous biggest harvest in 2007. The harvest created a significant supply imbalance in the industry which was not helped by the global financial crisis which came to a head in late 2008.

The effects of the difficulties of 2008 on the wine sector have been well documented. The last three to four years have been difficult for growers and wineries, but valuable lessons have been learned. These lessons were highlighted in the PricewaterhouseCoopers strategic review of the industry conducted in 2011.

Their report demonstrated that the supply imbalance



was not caused by any fall-off in demand, but rather by a surge in supply from all these new vineyards. It also identified the reputation of New Zealand wine as the main asset, and despite the difficulties after 2008, noted that its reputation was still mainly intact.

The New Zealand Winegrowers Board acted on the operational and structural suggestions contained in the report. These included the development of a vineyard register to accurately track New Zealand's vineyard area, increased emphasis on sustainability and social responsibility, and the need for New Zealand Winegrowers to be focused more on the future than the present.

The future

The PricewaterhouseCoopers review made it clear that the main asset of the wine industry was its international reputation as a quality wine producer. Providing that the industry continues to invest in that reputation, they forecast a positive future.

The New Zealand wine industry now has three well developed markets in New Zealand, Australia and the United Kingdom. Sales here are worth in excess of \$1 billion each year. Future growth is likely to be concentrated in other markets. In the short to medium term, North America is a major growth opportunity. The United States has recently overtaken the United Kingdom as the second most valuable market for New Zealand wine, while Canada continues to show strong growth. The prospect of wine sales reaching \$500 million in North America is now a possibility.

On a slightly longer time scale there are significant opportunities in Asia, notably China. New Zealand Trade and Enterprise, New Zealand Winegrowers and individual wineries are investing in a programme to increase knowledge about New Zealand wine by certain audiences, notably the all-important trade and media.

This programme in many respects mirrors the initiative which was successful in the United Kingdom in the early 1990s. New Zealand Winegrowers has opened an office in Hong Kong to ensure we are an active partner with New Zealand Trade and Enterprise and the exporting wineries. A similar programme is under way in Europe. Focus markets are the Netherlands, Germany and Sweden.

Quality, quality and quality

From a production perspective there is one major challenge looming on the horizon. Much of the sector's international success has been based on the global recognition for Marlborough sauvignon blanc. However, the land area in this region is limited and many industry participants can now see the day when there is little scope to develop any more vineyard land. This will lead to changes, not the least of which may be a greater emphasis on wine styles from other regions as opportunities for volume growth out of Marlborough become increasingly constrained.

The three strategies for the future success of the sector are often cited as quality, quality and quality. However there has been much more to the industry's success than just quality. The distinctiveness of our wines has been an important ingredient, as have winery innovations in wine styles and packaging. Building enduring partnerships with importers, distributors and retailers, and ensuring our wines are relevant to consumers have played into the current success of the New Zealand wine sector.

However, over-riding all this is the vision that the industry must have of its future. The sector must continue to have a belief that we are at the beginning of even greater success. In that sense, exports of \$1.2 billion are not an achievement but a new starting point.

Philip Gregan is Chief Executive Officer of New Zealand Winegrowers based in Wellington.



Mike Brown

The Nelson wine industry in the last decade



The following are some personal reflections on the Nelson wine industry after stepping down last year as Chair of the Nelson Winegrowers Association. Nelson is very much a boutique wine region, with around four per cent of national production and all vineyards and wineries still family-run.

Wine production is not the same scale as pipfruit as a horticultural industry, but a more similar size to berry fruit or hops. Nelson has a pedigree of horticultural production and several current grape growers came to the industry after moving out of other horticulture areas, in particular pipfruit. The modern era of wine production began in the mid-1970s with pioneering producers Seifried Estate and Neudorf Vineyards planting vineyards in the rolling hills of the Moutere valley. From the early 1990s there was expansion of the industry on to the Waimea Plains.

These two areas remain the twin axes of Nelson wine grape growing, although further sub-regions with specific characteristics can be identified within them. Especially noteworthy are the coastal Tasman area and inland around the township of Brightwater. The Motueka Plains have also seen orchards converted over to vineyards and there are small plantings in Golden Bay as well.

Suitable soils

Along with the topography, it is the soils of the two areas of the Moutere Hills and the Waimea Plains which make them substantially different. The heavier soils of Moutere generally produce weighty, complex wines, while the free-draining alluvial soils on the Waimea Plains produce wines with a bright fruit focus and a mineral edge to the palate. The conventional wisdom would be that the engine-room grape, sauvignon blanc, is best grown on the plains. In addition, the flat paddocks better lend themselves to the mechanised lower cost management of this variety.

In general, large-scale grape growing has been better suited to the flat parcels of land available on the plains, and most wineries located in Moutere valley obtain their sauvignon from vineyards on the plains. For pinot noir the differences between the hills and the plains is very evident. The Waimea pinot noirs are characteristically pretty and perfumed while those from Moutere are more savoury and have dried herb characters. With lower yields and costly hand-work, pinot noir has suited Moutere as a flagship variety for which higher prices can be obtained.

Weather influences

Some vital aspects of the weather would include the sunshine hours, diurnal temperature range, humidity levels, wind patterns with frost and drought risks. Nelson, more often than any other town, records the highest annual sunshine hours of New Zealand centres with 2,487 hours in 2011 compared to 2,343 in Blenheim and 2,216 in Gisborne. This is of significance to grape growers, but should also be seen in light of heat unit accumulation.

Nelson has a temperate climate where the diurnal range is smaller than on the east coast regions, and fewer growing degree days than Marlborough, so there is a

slow build-up of flavour and the grapes need a ‘hang-time’ to ripen. This is a main reason for the elegance of Nelson wines, compared to the exuberance of flavour in wines from the Wairau Valley.

With about a metre of rainfall a year, approximately 50 per cent more than Marlborough, growing problems are more humidity-related. Monitoring and prevention of powdery mildew, downy mildew and botrytis requires grower vigilance. The area is protected on three sides by a phalanx of hills, but late spring months can be windy and sometimes knock back fruit-set in the grapes.

Frost risk is not as problematic as in Marlborough, and only five frost fans have been erected. For most, the cost of installing the fans has not been justified due to the infrequency of early or late frosts causing problems. Irrigation infrastructure is more important, although once vines are established, the clay soils can allow dry farming. Waimea Plains vineyards need irrigation over the summer months, especially so in drought years, although vineyards are not as big users of water as pipfruit, kiwifruit or pastoral farming.

The regional debate about how the proposed Lee Valley dam is funded has caused grape growers some consternation. They feel that low water users would be subsidising high water users, and that there are not adequate mechanisms to encourage water conservation in the funding formula.

Pests and fungal diseases

Insect pests are not as significant a problem as in other parts of the country, although the root-dwelling phylloxera arrived around a decade ago. Since then most vines planted have been on resistant rootstock, the only way to prevent vine damage. Mealybugs as a vector for leafroll virus, along with grass grub or bronze beetle infestations have not yet been as problematic as in some other grape growing regions.

Birds are a concern and vineyards in Nelson must be netted to prevent the birds eating grapes, unlike in neighbouring Marlborough where much vineyard area is not netted. Bees and wasps are problematic at times, especially in dry years.

Insecticides are rarely required, but the control of fungal diseases means Nelson is not always the easiest place to grow organically. Despite this there is a growing trend



toward organic viticulture and the region has several organic wineries. Richmond Plains, Te Mania Wines, Kaimira Wines, Sunset Valley Vineyard, Woollaston Estates and Greenhough Vineyard are all established producers of organic wine.

There is a healthy network which has developed among younger viticulturists to share knowledge of organic vineyard practices. An annual scholarship funds a selected local grower to learn about organic production by placement with respected organic producers elsewhere in the country.

Growth in vineyards

In the last decade Nelson, as in the New Zealand industry as a whole, has seen significant growth in vineyard areas planted and wineries producing wine. However, as the table shows, after 2009 there was a sharp decline in grape grower numbers as the industry experienced a period of over supply. Nelson has never had many large growers. There have not been larger titles of agricultural land available which would attract bigger wine companies from outside the district.

Nelson Wineries 2003 to 2012				
Year	Wineries	Growers	Hectares	Tonnages
2003	26	37	485	3149
2004	24	28	548	4563
2005	29	40	646	2454
2006	29	46	695	5623
2007	28	58	782	5190
2008	32	57	794	7002
2009	34	62	813	7740
2010	36	39	842	5963
2011	38	38	861	7854
2012	36	–	880	6129

Growers who do not make wine but have vineyards over 20 hectares number only a handful. There have been many lifestyle vineyards of just a few hectares which have supplied local wineries. It was mainly these that disappeared from the landscape as wineries retrenched supply in the later 2000s.

About a quarter of Nelson grapes probably go to be subsumed in Marlborough blends. Marlborough wineries have historically sought Nelson supply, mainly due to the



price differential but also for the flavours that Nelson grapes can bring to the mix.

Throughout the last decade Nelson sauvignon blanc and pinot noir tonnage prices have been cheaper than Marlborough, especially with the latter variety, but in the last couple of years this gap has reduced. Yields are not naturally high in Nelson, so growers need to maximise pricing to offset their crop limitations. As can be seen from the decade's data, yields have not been high and in some years quite light.

Most Nelson wineries have quite small production, several just selling at their cellar door and to the local market. Small wineries whose winemakers have origins elsewhere, such as Rimu Grove from the United States and Blackenbrook of Switzerland, help create vibrancy in the local fraternity. There is a handful of wineries selling between 200,000 and four million litres annually and these are Waimea Estates, Seifried Estate, Kahurangi Estate and Spencer Hill Estate. Between them they crush well over half of the region's grape production.

These wineries are necessarily focussed on exports. They are joined by other quality smaller wineries such as Brightwater Vineyards, Greenhough Vineyard, Neudorf Vineyards and Woollaston Estate in leading awareness of Nelson's reputation for high quality wine in offshore markets.

Grape varieties

The Nelson vineyard is weighted to sauvignon blanc, which is usually about half of the production. While this is far less than the ratio in Marlborough, sauvignon remains the most marketable variety for growers to grow and for wineries to sell for export. Pinot noir is the main red variety, being more

suitable to the cooler South Island conditions than cabernet sauvignon, merlot or syrah.

There has been increasing recognition given to Nelson's aromatic varieties – riesling, pinot gris and gewürztraminer. This has encouraged planting, so that together the three varieties constitute about a fifth of production. The Nelson Winegrowers Association runs the Nelson Aromatics Symposium every three years, directly following the industry showcase for pinot noir held in Wellington. This has attracted many important wine media and trade to Nelson, enhanced knowledge of the wine region and its reputation for the aromatic varieties among international audiences.

Marketing

Collectively the Nelson wineries market under the Wineart banner, a brand developed 10 years ago to benefit from the local reputation for the arts. It also suggests the manner in which wines are grown here is an approach more artisan than technocratic and an image more personality-based than corporate. Nelson wineries have a strong collegiality of behaviour and common purpose. Along with the work of the Nelson Winegrowers Association much has been achieved with the limited resources available to a smaller industry body.

The New Zealand wine industry is dominated by Marlborough sauvignon blanc. However, the industry benefits from the colour and character that smaller regions such as Nelson, and less produced varieties such as the aromatics, bring to the way we market ourselves overseas as a national wine brand.

Mike Brown is now CEO Kono Beverages based in Nelson.



Alistair Polson

Ballance Farm Environmental Awards

Where tree huggers meet commercial farmers



There are many farming competitions for New Zealand farmers' achievements in a wide variety of areas ranging from the best hogget fleece to the tastiest beef steak. Most of these awards have a heavy production focus, but more recently farmers have started talking about the 'three legs of the stool'. Strange language for men and women of the land, but this is what is important to the current generation of farmers and non-farmers.

The three legs philosophy refers to the primary business having social, financial and environmental sustainability. It encapsulates the belief that the three elements are not mutually exclusive. In fact they are complementary and all must be present to stop the stool falling over.

Ballance Awards

The New Zealand Farm Environment Trust runs the Ballance Farm Environmental Awards every year in a nationwide coverage of farmed land which brings this modern appreciation of a fundamental age-old consideration of sustainability. The awards, open to all farming types, have grown in popularity so that they are arguably the most sought-after and best supported awards in the country.

The regional prizes are impressive, but the overseas study for two as part of the package for the national winners of the Gordon Stevenson Trophy is another step up. The national winners also prepare a report on their travels and make various presentations to sponsors and industry bodies and to the Primary Production Select Committee.

The *Good Morning Asia* report from last year's winners, Blair and Jane Smith, can be found at www.bfea.org.nz, and is a powerful insight into marketing our primary produce in Korea, Taiwan and China. Winning the top award can be life-changing, but for most competitors it is the prestige of this success and the chance to compare their farms with others that encourages them.

A balanced approach

What is behind this change from production at all costs in our farming community and sees the recognition of the balanced approach as the way forward? Yesterday's hero was the young farmer who cut down every standing tree on their property to make way for pasture and livestock. Today's heroes are the farmers, usually a farming couple, who plant trees, retire native bush, protect waterways and carry out nutrient budgets.

When the Ballance Farm Environmental Awards were started in the Waikato 20 years ago, the participants were regarded by some as tree huggers who could not make money from farming. Fortunately Gordon Stevenson, a visionary and a man with a thick skin, was not daunted by such criticism and pushed on and the wheel has turned. This year's nine regional winners exemplify what modern farming is about. Their farms are high producing, but at a level that can be sustained well

into the future. These operators also demonstrated strong stewardship of the land and high social commitment to their staff and community.

Judging process

The nine regional winners were from over 100 entries, and a quick tally of the last 10 years shows that nearly 1,000 farmers have put their land forward for judging. The judging process is at the heart of the success and credibility of the awards. The judges are independent and the make-up of the judging panels covers a broad spectrum of expertise to find the right winners, and to give valuable feedback to the contestants.

A highly respected judging process and good sponsorship has been a large part of the success of the awards, but there are more fundamental reasons for the change in thinking of our farming fraternity around the way they treat the environment. For example, with advances in science we can now measure and understand the effect we as farmers have on the ground and surface water, soils and landscape. Historically, farmers have tried to leave the land in better shape than they found it. It is only now that we can fully understand what 'better shape' means and are therefore compelled to pursue it.

Sustainability

With the advantage of good science we can begin to put some parameters around sustainability and measure them, but what does sustainability really mean? Gordon Stevenson asked the question 20 years ago – 'Can what is being done now still be working successfully in 100 years?' Professor Louise O Fresco of Amsterdam University also said, 'Sustainability is like love. It is a vague notion we recognise, but no-one knows exactly what it is.'

Gordon's test is a reasonably high hurdle, but achievable as demonstrated by award contestants. The underlying function of the trust is to identify the best sustainable operators and recognise them by awarding prizes, and also to highlight them as an example which can be followed by others. A total of 2,000 farmers attended the field-days that our regional winners held on their farms last year. The information transfer on these occasions is considerable – farmers learning from farmers is a proven recipe.

Why do farmers want to be sustainable? The Farm Environment Trust's main objective is to 'Promote sustainable farming practice to protect and enhance the environment'. Farmers accept this for a host of reasons. The stewardship ethic is strong, farmers and their families live in the community as well as farm in it, sustainable farms are more profitable, and markets pay premiums for sustainably produced products and regulators require it.

Global picture

On a global scale, we have little choice as a growing population is already consuming resources 50 per cent faster than the globe can regenerate them. Put another way, we are

using the equivalent of one-and-a-half planets to support our global activities. By 2030 we will need two planet Earths, and if we all lived like the average United States resident then four planets would hardly be enough. In 1960 there were 1.5 hectares of arable land for each person, now it is 0.8 hectares.

We need to produce more with less and the awards highlight farmers who are doing this. A simple technological method, such as variable rate irrigation employed by this year's national winners Craig and Roz Mackenzie, has seen savings of 50 per cent on one centre pivot they operate. However, there are no trees to hug on their 200 hectare cropping operation.

Organic farming has many features that conventional farmers are learning from, but scientists believe that moving massively to mainstream organic agriculture would require six times more land to feed the current world population. While it is sensible to take the best from organic systems, wholesale adoption will not secure our future, but neither will many of our conventional farming systems with their wasteful use of nitrogen and phosphate.

The answer lies in precision agriculture, genomics and bio-based technologies. The awards recognise farmers who are at the forefront of this science and promote their example for others to see, question, examine and hopefully adopt.

New Zealand

It is important to keep the global picture in mind, but farmers live in communities and need to make sustainable returns to raise the next generation. It is also true that the sons and daughters of most of today's farmers will end up living in urban New Zealand and will want clean water to swim in and pristine scenery to tramp through.

Quite apart from the regulatory pressure in which farmers operate, they and their farms are part of a community that requires the highest standard of environmental sustainability. Farmers do not live in a bubble and are not immune to the pressure from children and grandchildren whose level of environmental education is high.

Profit

Value creation is also very important for sustainability, so it should be no secret that it is actually profitable to use resources efficiently. The Institute for Business Values talks about corporate social responsibility. The idea is that companies manage their businesses to produce an overall positive effect on society by economic, environmental and social actions. For farmers this means moving away from compliance-based aversion to the risk of breaching environmental regulations, to where value is added by efficiency gains and creating new value.

Therefore at one end of the scale there are farmers who do the basic minimum to adhere to the law. This gives them a licence to produce, but increasingly we are seeing quality assurance programmes related to environmental results, animal welfare, or even social standards like minimum working conditions.

Enquiries today from our customers go far beyond legal behaviour in production and processing conditions. Farmers who go beyond these requirements find it saves on costs and enhances their brand in the long term. Correct fertiliser placement, nutrient budgets and efficient disposal systems all save money and allow the business to access new, mostly higher value, markets. This is of course where New Zealand's primary produce needs to be positioned in the market place.

Top end of the curve

In essence, the awards identify the farming operations nearing the top end of the curve and hold them up as an example for others to follow. It is not all leading by example, as many fellow farmers and contestants are already there. However, the awards promote rigorous interaction and ideas sharing which lift everyone's performance, even the winners.

If we think of our processing companies as an extension of our farm it easily follows that on-farm practice will either hamper or enhance the strength of the brand and therefore the revenue back to the business. The chart below, sourced from MIT Sloane Management and featured in Rabo Bank's new publication *The Future of Farming*, illustrates how sustainability efforts can influence all the levers that our industries use to create value.

The analogy around the three legs of the stool of social, environmental and financial sustainability is useful to visualise and it is easy to appreciate that if one leg is missing the stool falls over. Somehow we need to visualise a stool with intertwined legs, it becoming increasingly obvious that these problems cannot be separated but are closely interlinked.

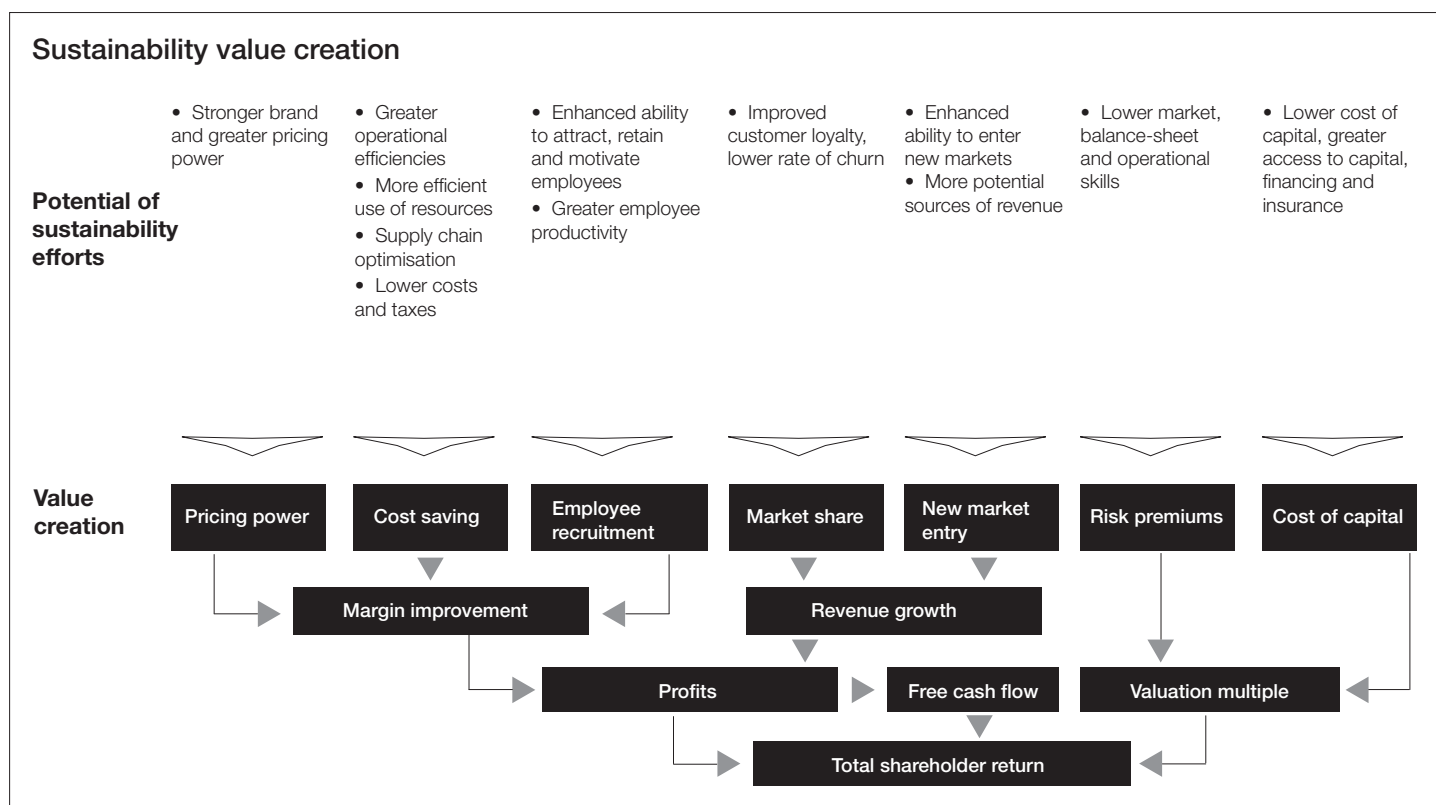
Farms which provide for and value good staff attract better staff and become more profitable.

The the regional competitions and the national awards showcase events are all part of a greater picture which is about continuous improvement in farming methods towards an unobtainable goal which will never be reached. However, every step towards it is valuable for the whole community. The Farm Environment Trust sits among its greatest asset, the nation's farmers. These are the people who are doing things now and will adopt new technologies in the future.

Future direction

Some areas remain outside the competition area. However, there is cause for optimism that they will come into the fold in the not too distant future. Another area of development under way is the formation of an alumni of past regional winners. These operators have undergone rigorous judging processes, passed the test, and are potentially a great resource which could be better used if they are not lost from the system. This alumni could, by working together, continue to very effectively move sustainable farming concepts forward and provide practical evidence for decision-makers and regulators as to what is possible.

This alumni could also perhaps be at the forefront of presenting to urban New Zealand the real face of farming, not the clichéd, generalised, politicised images personified by the 'dirty dairying' fiasco. The trick for the future will be bridging the communication gap between the people of the land and the city dwellers. We all know that the gap is understandably growing wider with every generation and neither side can let this happen.



Communications battle

Farmers need the support and trust of the community based on an informed and honest understanding of what needs to happen on the farm so they can get on with their business. City dwellers need to have good knowledge of farming activities so they can make balanced decisions on land use, or they will find that food will eventually cost them more than they could have thought possible.

We need to be conscious that farmers, at one or two per cent of the population, will not make the future decisions about land use, even current decisions. It is vital that farming shows what is possible to the 98 per cent of city based decision-makers so they make the correct choices. This is not about propaganda, but about science-based arguments demonstrating what technology and good practice combined can do. This communication battle is a work in progress, but

remains one of farming's most serious challenges in the future.

The Farm Environment Trust, through its Ballance Farm Environment Award programme and other activities, including running environment leadership courses helped by hundreds of volunteers and with the participation of the country's land managers, will be at the forefront of sustainable farming for the foreseeable future. Sustainability is never a problem solved, more an opportunity which stretches into the future. The award winners are brilliant at exploring these opportunities. The funding provided by the generous support of its sponsors ensures that the Farm Environment Trust is able to do its work and the whole community can enjoy the dividends.

Alistair Polson is a sheep and beef farmer as well as a kiwifruit grower.

National award winners of the Gordon Stevenson Trophy



Intensive land use can also be sustainable land use is the motto of Craige and Roz Mackenzie who are clearly comfortable with any scrutiny of farming practices on their mid-Canterbury properties. They operate an intensive irrigated arable operation in the Methven district using state-of-the-art technology to increase production in a sustainable manner. The Mackenzies have taken technology to the next step by using almost every available method to improve their production and cost-efficiency.

A cropping unit of 200 hectares is the home farm for Craige and Roz and the subject of their entry in these awards. They also have 50 per cent equity share in a neighbouring 330 hectare dairy unit which last year calved 1,240 cows. With their daughter Jemma they

co-own Agri Optics and they also own Mackenzie Research Group.

Specialist seed crops are mainly grown on Greenvale's flat contour, including radish, chicory, wheat, ryegrass, fescue, barley and faba beans. Electromagnetic soil mapping allows a clear picture of water-holding and productive capacity within specific zones. The introduction of variable rate irrigation on centre pivots on both the arable and dairy farms has increased productivity and saved up to 50 per cent of water use.

With Jemma they have established Agri Optics, a precision agriculture company, which offers agronomic support and technology and helps farmers make commercial sense of their field data. They are conscious of the credibility of their work, so Greenvale is frequently used for testing. Craige has developed a system of nitrogen application which they have patented internationally, calling it Smart-N. This can ensure application accuracy down to 30 centimetres, allowing a 30 per cent cost saving while virtually eliminating leaching.

Craige and Roz are passionate about sustainable food production and land use. Last October they attended the World Food Prize awards in Des Moines in Iowa. Craige was the first New Zealander to be invited to take part in a 15-seat global farmer roundtable discussion, a side event of the awards organised by the Truth About Trade and Technology Group.

Some of the Ballance Farm Environmental Award winning farms



Profile

Nicola Waugh



Nicola Waugh was born and bred in the village of Kimbolton in the Manawatu. Following high school she attended Massey University and studied a Bachelor of Applied Science degree with an agriculture and agribusiness major. During the last year of her undergraduate study she decided to look into a career in consultancy to put into practice her love of agriculture, problem solving and working with farmers.

She has found it a difficult career path to follow, with a lack of information about that part of the sector and very few consultancy practices taking on graduates. After meeting with a couple of consultancy businesses to work out specifically what skills and qualifications they would look for, she decided to stay for a postgraduate year.

Career to date

On completion of her postgraduate studies Nicola moved to the Waikato and approached AgFirst Waikato. This was in early 2008 and she has been working as a farm consultant with them since. Her role includes a variety of activities, with approximately 50 per cent of her time working one-on-one with dairy farmer clients helping them to clarify and obtain farm productivity, profitability and personal aims.

Alongside her one-on-one consultancy work her role also includes various industry projects. These have varied significantly over the years but involve working with a range of industry organisations such as DairyNZ, the Ministry for Primary Industries, the Waikato Regional Council and New Zealand Young Farmers. Nicola enjoys having the mix of on-farm work and industry projects as it provides an opportunity to be involved in some new thinking. She feels that working with farmers helps keep her grounded and always considering the practical aspects of this work.

Nuffield adventure

It was the involvement in a couple of industry projects in the south Waikato area which got Nicola thinking about the real problems and challenges facing farmers in the region over the next five to 10 years, especially around water quality and the environmental footprint of agriculture. She had identified it as a freight train on its way.

Most farmers at the time had very limited understanding of the extent of the challenge. The realisation of this, and a

desire to see agriculture in other parts of the world, prompted her to apply for a Nuffield scholarship. This was to investigate how other countries had reacted to similar problems, if they had taken the carrot or the stick approach and which would be appropriate in New Zealand? The main areas were to look at how the industry could help farmers adapt to these challenges and how it could influence the development of policy in this area.

In 2011 she embarked on her Nuffield adventure which took her to many corners of the globe including parts of the United States, Europe, the middle East and south east Asia. Anyone who has been fortunate to experience a Nuffield scholarship will tell you that it is an adventure of a lifetime, and for Nicola it was no different. It gave an opportunity to expand her horizons on the chosen topic, and provided a global perspective for where New Zealand sits.

After travelling and talking to a wide range of people including farmers, rural professionals, industry bodies, lawyers, government officials, and political bodies Nicola came back to New Zealand to consolidate her findings. The messages from her Nuffield are around collaboration and involvement. She believes that the Land and Water Forum is a good start, but that they also need to also be discussed at a local level.

Other countries which she visited have not succeeded well in collaboration. When the suggestion that New Zealand was trying to follow that path was posed to various people she interviewed, a common response was 'good luck'. However, she still believes that this is the way to go. Nicola says the path to success is never easy. It requires commitment, dedication and continued communication throughout the industry.

In her view what seems to be happening in many parts of this country is that there is collaboration with most of the industry, including the land management staff of the regional councils and some important innovative farmers, but in many areas the policy part of these councils do not sit around the table in the discussions. Nicola believes that the industry needs to have all parties involved in the debate about these problems.

She feels time and money needs to be spent in the development of the policy stage, not fighting a policy after it has come in. She is also advocating for everyone to be responsible for getting involved in the problems which can shape the future of agriculture.

Nicola Waugh

Nicola says the industry needs farmers throughout the country who are keen to test a proposed policy over a period of three to five years. They also need support in terms of advice, monitoring, and financial help to offset any drop in income. In her view, only then will we get a clear understanding of the implications of these regulations at a farm, district and community level.

However, she believes in every industry there are those who refuse to make changes, and that some of their actions are damaging our industry. These people will not change their beliefs or behaviour without some form of regulation. Nicola is therefore advocating for a combination of the carrot and the stick approach, with more emphasis put on the carrot and spending the time and resources concentration on using the carrot to help develop the stick.

Continual development

On her return from her Nuffield experience Nicola had been struggling with the task of using the results from her scholarship to create change in the industry and this led her to look for somewhere to learn some of these skills. She is therefore currently part of the way through completing the Agri-Womens Development Trust Escalator programme, which is about encouraging women in agriculture to take leadership roles within the industry.

The strong psychology basis of this course helps participants understand many aspects of leadership roles, such as how to deal with difficult people, how to put your views across and why people act and react the way they do. This has opened up new area of understanding which she says has already provided some benefits for her role as a consultant dealing with conflicts.

A main part of the course is also learning about governance and leadership. The Institute of Directors facilitate a three-day course on governance, strategy and finance to ensure participants are skilled in these areas, and to help provide the requirements for those wishing to take up roles on boards throughout the country.

Other roles

Outside her role as a consultant Nicola also has a direct farming interest. She is involved in a 50/50 sharemilking business with her fiancé, Harvey Kloeten, in the north King Country milking 500 cows. She enjoys the mix of her role during the week and being able to have a hands-on role on the farm in her spare time.

She has also been involved in the New Zealand Young Farmers at a club, district and regional level for the past five years. She was a founding member and chairperson of the Cambridge Young Farmers club in early 2010, which has developed into a successful club with a good mix of members from farmers, rural professionals and people in the equine sector. Nicola is currently the Waipa/Waitomo district chairperson, on the regional committee and the Waikato representative on the Waikato TB Free committee.

Earlier this year she took on a role as an independent board member of the NZIPIM. This was to provide a different perspective in the opportunities and challenges which face the NZIPIM, and looks forward to being involved during this time of change.

Future for the sector

In Nicola's view there are many challenges facing agriculture in New Zealand over the next decade and more. However, for her, challenges are also opportunities. The area facing the greatest challenge is the industry target of a two per cent increase in production each year, along with the increasing constraints of regulations and a rising frequency of extreme climatic events. The industry needs to be encouraging people to analyse the resilience of their business, and to have hardy businesses throughout the sector for a strong industry. There is also the need to have the capability and capacity within the rural professional sector to help support farmers. With less than 100 graduates year in agriculture this is a big challenge.

She also feels that farmers and the industry need to have a say on the future of the regulatory environment which we will all be required to work in. Farmers need to start understanding what their environmental footprint is and what the problems are in their district. The industry needs to take a lead in helping farmers to understand this aspect of their business and start assessing its resilience to deal with regulatory constraints in the future.

Nicola also believes that the NZIPIM has an increasingly important role, and that there is the opportunity for it to become an organisation which local and national government approach for advice and views on regulatory issues. However, for this to occur, she says we need to have a large pool of members to provide the assurance to them that it is a credible organisation to turn to for opinions and advice.

Nicola Waugh is an Agricultural Consultant based at AgFirst Waikato Ltd in Hamilton.



