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Primary Industry Management

THE OFFICIAL JOURNAL OF THE NEW ZEALAND INSTITUTE OF PRIMARY INDUSTRY MANAGEMENT INCORPORATED

NZ Institute of PRIMARY INDUSTRY MANAGEMENT

WARDLE'S NATIVE TREES OF NEW ZEALAND
and their story

Written by John Wardle
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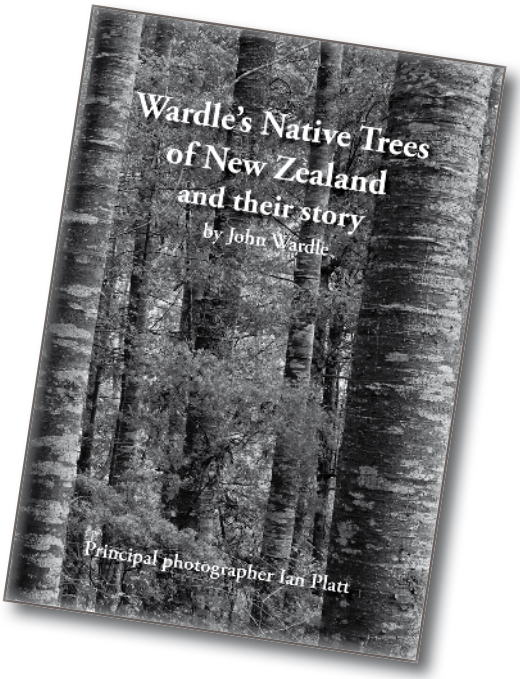

Wardle's Native Trees of New Zealand and their story is a book that anyone interested in trees will want to buy and read. There is no other similar book available on New Zealand native trees.

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The author of *Wardle's Native Trees of New Zealand and their story* is John Wardle who has spent many years working on the text. The majority of the photographs have been taken by Ian Platt who spent almost as many years travelling throughout New Zealand to find just the right specimens at the right time for the photographs.

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Primary Industry Management is dedicated to the publication of articles on all aspects of agricultural science and the management of primary industry resources. The opinions of the contributors are their own and not necessarily those of the publishers or editor.

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Sandy Scarrow

The debate on overseas farm ownership

I write this editorial as debate is continuing regarding the Overseas Investment Office's approval of the sale of the Crafar farms to a Chinese investor. The debate is centered on the 'foreign invaders' buying up New Zealand farmland. I am more used to writing factual articles rather than opinion pieces but I do question the views of those opposing this approval decision and have three main questions.

My first question is regarding the xenophobia of many of those who put it forward. Is it because the land is being sold into foreign hands or is it that the land is being sold to non-Europeans? I noted with interest a report in the *Sunday Star Times* stating that 10 times the area of land involved in the Crafar farms has recently been sold to investors from the small European principality of Liechtenstein. Who is going to the media about this? People with these concerns may well benefit from a review of the history of dairy exports from New Zealand. It is in fact a Chinese immigrant to New Zealand, Chew Chong, who is credited with beginning the dairy exports from here when he sent a trial shipment of butter to England from Eltham in 1885.

Another question I have is around what it means to purchase land. This land cannot be taken away to China or Lichtenstein. All that has been purchased is right of tenure. This land will remain in New Zealand with the cows, possibly owned by New Zealand sharemilkers, producing milk and progeny from these paddocks. The value added, because most of the value comes from the capturing of sunlight and carbon dioxide, is worth almost three times the actual value of the product at the farm gate. There will still be considerable dollars flowing around the regional and national economies despite this sale.

My third question relates to the people who object to this sale and what thought they have given to the sale of possibly more valuable assets into foreign hands. The investment of Agria into PGG Wrightson, buying just over a 50 per cent share in the company, means that now foreigners own majority rights in the intellectual property developed by years of research in New Zealand. An example of this intellectual property is the research and development into pastures at Kimiora.

We live in a world where value is created not by how hard we work, how fast, or how much we produce, but by how creatively we think. Our creativity, some of which is reflected in the intellectual property owned in public companies, is leaking out of New Zealand without comment.

While public debate centred on foreigners buying up New Zealand land continues, this country's primary production is being ravaged by other foreign invaders. I refer to the biosecurity incursions which have caused devastation to our primary industries. While pest and disease incursions into New Zealand are one of the risks associated with international trade, it seems we are not doing enough to prevent them from getting in and responding when they do.

A number of the articles in this issue refer to the effect of Psa on the kiwifruit industry along with pests and diseases on the honeybee industry, and the resulting downstream effects of the decline in honeybee health on the rest of agriculture. I read with interest the article that talks of the lengths MAF Biosecurity are going to ensure that palm kernel is subjected to rigorous processes to reduce the risk of pest or disease incursions. Various audits ensure the processes are being followed correctly and improved where necessary. This same level of thought needs to be given to all potential risks to ensure we adopt a precautionary approach to any activity. That is, if an activity has a suspected risk of causing harm in the absence of a consensus that the activity is harmful, the burden of proof that it is not harmful falls on those undertaking the activity.

We also need to be well prepared, armed with detailed knowledge not only of how a particular pest or disease may affect our primary industries or natural environment, but how they may affect cultivars and breeds within our respective industries. Armed with this knowledge we can plan and respond appropriately.

The penultimate article is one focused on the newly-opened dairy factory in Mokai, Miraka Ltd. This company is an alliance of a number of Maori trusts and incorporations who have developed a milk processing facility using geothermal power. I would like to suggest that it is examples such as this positive initiative we should focus on rather than the negatives of land being sold to foreigners. Too much energy can be focused on what we do not have and what we no longer control, when it is what we do with the resources we control that will influence our future.

Sandy Scarrow is a horticultural consultant for Fruition Horticulture

Mike Chapman

Psa solutions for kiwifruit

Psa is a bacteria which can result in the death of kiwifruit vines The Latin name of the type which is causing all the problems is Pseudomonas syringae *pv.* Actinidiae *but is generally referred to as Psa-V. At the time of writing the Psa-V statistics were are as shown in the table on the right.*

Orchards with Psa-V	961
Percentage of NZ orchards	29%
Hectares on orchards with Psa-V	5,155
Percenatge of NZ hectares	37%

The majority of orchards which have a Psa-V infection are concentrated in Te Puke. This is the largest growing area in New Zealand and where the Psa infection was discovered in November 2010. Since that discovery, Psa-V has spread throughout Te Puke and to adjoining growing areas. The main way in which Psa-V is transmitted is either by leaf material or weather in the form of heavy rain and wind.

Since the discovery of Psa in New Zealand testing has disclosed that there are two main types or isolates, which we have called Psa-V and Psa-LV. The V stands for virulent and the LV for less virulent. Our experience is that Psa-LV does not kill vines. Psa-V has the potential to kill vines, particularly Gold Hort 16A vines.

Currently orchards having a Psa-V infection are –

- 779 in Te Puke
- 77 in Tauranga
- 12 in Katikati
- 47 in Whakatane
- 12 in Waihi
- 29 in Opotiki
- 5 in South Auckland.

In Te Puke, 96 per cent of the Gold kiwifruit area and 71 per cent of the green kiwifruit area contain a Psa-V infection. The New Zealand kiwifruit industry is therefore facing a crisis.

Kiwifruit vine health

A month after the discovery of the problem Kiwifruit Vine Health, a non-profit incorporated society, was set up to lead the kiwifruit industry's response to Psa. It operates as an independent pan-industry organisation. It draws together exporters, post-harvest and growers in one organisation. Kiwifruit Vine Health's board has seven members on it, two appointed by Zespri, two appointed by post-harvest, two elected by NZ Kiwifruit Growers and one appointed by MAF.

Kiwifruit Vine Health's aim is to re-establish and maintain a thriving and profitable New Zealand kiwifruit industry. The objectives are in the table below.

Prevention	To use biosecurity measures to prevent the establishment of Psa-V in Psa-V-free areas
Readiness and response	Early detection of any new outbreaks of Psa-V and a rapid and effective response
Containment	To contain Psa-V by reducing and controlling inoculum through industry best practices
Solutions	To manage a world-class research and development programme and to capture grower innovation to result in effective solutions
Recovery	To enable orchards affected by Psa-V to return to viable production. To develop a pathway for the re-establishment and future growth of the New Zealand kiwifruit industry

To meet the Psa challenge Kiwifruit Vine Health has developed four main work streams for Psa-V control, management and the required solution. The first is biosecurity control to contain and limit the spread of Psa-V as much as is possible. A main part of this is the implementation of a national pest management strategy in the second half of 2012.

Secondly, research and development followed by grower extension and technology transfer passing on what has been discovered. This programme has seen new and effective sprays being developed which are making a difference. A total of $6 million has been committed to Psa-V research and development. Zespri's innovation team has been contracted by Kiwifruit Vine Health to manage the programme.

The third work stream is developing a pathway back to prosperity based on research and development and on-orchard observations. The first step here is to find resistant

and tolerant root stocks and varieties which will keep the industry functioning.

Finally there is grower support and welfare. This is to help those in need, to keep skills in the Bay of Plenty, and to enable us to have viable industry and community while kiwifruit recovers.

Grower and worker support

This article focuses on grower and worker support. Today, NZ Kiwifruit Growers is supporting growers who have or are about to harvest their last crop of Gold 16A. We are also supporting growers who are managing their way through Psa and who have no symptoms or signs of Psa. This is an anxious and stressful time for everyone in the industry.

At the end of 2011, support seminars were run throughout the Bay of Plenty providing advice and information on tax issues, financial decision making, the financial advocates' panel, an update on the work with banks, what support is on offer from Work and Income, and how to detect and manage stress. These meetings were open to everyone in the community.

In Katikati, for example, around 100 people attended the seminar, with about half that number being made up of people who do not grow kiwifruit. In addition, drop-in clinics and courses teaching techniques to deal with stress have been run. Community organisations and the local churches have provided support. These support networks are being strengthened, with courses and drop-in operations being expanded to provide a range of options to meet all needs.

Employment coordinator

Dealing with today's issues while building for the future is the creation of a new position in the Bay of Plenty with the appointment of a kiwifruit employment coordinator. The aim of this position is to retain skilled kiwifruit industry workers in the region as the effect of Psa begins to spread. The role, which is funded by the Ministry of Social Development, will focus on meeting the skill and labour needs of employers in the kiwifruit industry and matching those who have lost their jobs as a result of Psa to other employment opportunities in this industry. The emphasis is on providing quality employment opportunities to improve sustainable employment for people, and support skill retention in the kiwifruit industry.

As well as matching skilled worker with job opportunities, the kiwifruit employment coordinator will also have a training focus. The plan is to identify what training may be required to give those out of work the skills required to apply for jobs which are offer.

Continuous training needs analysis will be conducted. Where there are no courses on offer that fit what is required, development work will be undertaken. Training options can also be used to fill in gaps in employment. To do this we are working closely with the local trainer providers the polytechnic, the NZ Horticulture Industry Training Organisation and Fruition Horticulture.

Financial advocate service

In addition to the other support available, Kiwifruit Vine Health and NZ Kiwifruit Growers have also set up a financial advocate service. This is designed to help where growers are having difficult conversations with their banks due to valuation decreases or income effects of cutting out Psa-affected vines. The financial advocates service aims to –

- Provide financial advice to growers whose orchards are infected by Psa-V
- Help growers to continue in their orcharding business
- Help growers in making suitable arrangements with their banks.

All of the advocates are experienced in dealing with banks and are qualified in the finance field. Initially, the advocate will have a pre-involvement discussion with the grower to confirm that they can help them and will arrange for payment of the services by either the grower or the bank.

Dealing with stress

Within our communities we all need to be on the lookout for stress in ourselves and our friends and colleagues. There are some excellent leaflets, help lines and websites. Some of the signs of stress are –

- Loss of enjoyment and interest in activities usually enjoyed
- Loss of energy and constant tiredness
- Changes in sleeping patterns
- Sleeping difficulties
- Indigestion or stomach upsets
- Muscle tension and pains
- Frequent sickness
- Shortness of breath or shallow breathing
- Memory or concentration problems
- Loss of appetite or over-eating
- Isolation by avoiding people, places and events.

We are advising our growers and anyone needing assistance that if you are suffering any of these symptoms, or know someone who is, see your doctor. You can also contact NZ Kiwifruit Growers on 07 574 7139 or go to nzkgi.org.nz for a list of other support options. You can help reduce stress by talking about your worries, taking exercise, spending more time with friends and family, start to solve problems, get enough sleep and get some enjoyment back in your life.

There is also the Depression Helpline on 0800 111 757, Lifeline on 0800 543 354, and for growers the Rural Support Trust on 0800 787 254. Our priorities are our people and getting the kiwifruit industry back to prosperity.

Mike Chapman is the Chief Executive for NZ Kiwifruit Growers Inc and Director of Kiwifruit Vine Health

Simon Limmer

Effect of Psa-V on the kiwifruit industry

The statistics on the spread of Psa-V through the kiwifruit industry in the Bay of Plenty region make for alarming reading. However beyond the bald numbers is the multi-layered reality of an industry which, while under pressure, is making positive moves to overcome the threat it faces.

The effect of Psa-V

Undoubtedly, the effect of Psa-V is at its most destructive in the individual orchard. Growers with infected orchards have had to cut out some, or all, of their orchards and as a result have lost part or all of their livelihoods.

Even when growers have not lost vines as a result of Psa-V, the disease has caused increased costs and changes in orchard management practices. It has added yet another variable into the mix of factors they must balance to ensure their orchard remains viable. The disease has also flowed into the value of orchards with land values dropping in the Bay of Plenty.

Given the stress and anxiety caused by Psa-V on individual growers there is a significant effort underway by KiwifruitVine Health and New Zealand Kiwifruit Growers to coordinate community, local government and central government resources to support affected growers. Above grower level, Psa-V is having an effect on post-harvest operators and the industry marketer Zespri, as it becomes increasingly clear what the disease will do to 2012 volumes. Already some post-harvest operators and Zespri have tried to re-structure their businesses which has meant reduced spending and job losses.

Inevitably, as spending contracts at all levels of the kiwifruit industry, there will be a knock-on effect. This will affect contractors, suppliers and operators who rely directly on the industry for their business. The rural communities, such as Te Puke, where the kiwifruit industry is a cornerstone of the local economy, are also preparing for the economic and social effect of Psa-V. The Western Bay of Plenty District Council is considering the potential of the disease on the regional economy as it works on its 10 year plan.

The value of the kiwifruit industry

The true cost of Psa-V to the kiwifruit industry and the business and community which it supports is still being worked through. KiwifruitVine Health has commissioned a study by Lincoln University to understand in greater detail the economic effects of Psa-V.

However, in the meantime an insight into the size of the New Zealand kiwifruit industry gives an idea of its value and the potential effects of lost production. In 2010/11 the kiwifruit industry was New Zealand's largest horticultural exporter, returning $1 billion from a global revenue of $1.5 billion.

Over 3,000 kiwifruit growers supply fruit for export, and use approximately 15 post-harvest operators to pack and cool store their fruit before export. It is estimated that the industry employs more than 18,000 people at the seasonal peak, provides about 20 per cent of the Bay of Plenty GDP, and contributes a significant amount to local communities in other regions.

Industry statistics 2010/11

Zespri global kiwifruit sales	$1.511 billion
Export earnings for New Zealand grown kiwifruit	$1.014 billion
Registered orchards	3,134
Production hectares	12,825
Trays of NZ-grown kiwifruit sold	98.1 million
Export markets	60
Employment	Permanent 9,800 Seasonal 8,600

	Orchard gate return per hectare
Overall average	$41,830
Gold kiwifruit	$83,785
Green kiwifruit	$32,234
Green organic	$37,541

Better than dairy?

Psa-V has dampened the timeline for its long-term growth target of $3 billion from export earnings by 2025. This was set in 2010 and based on the stellar growth rate of the industry in the decade from 2000 to 2009. Then, the compound

annual growth rate was just under 10 per cent a year, higher than any other New Zealand primary industry including the dairy industry.

The commitment to the $3 billion target remains. Psa-V may cause the timeline to slip as the industry focuses in the short term on beating the disease. Zespri's confidence that it will reach its long term growth target comes from its focus on –

- Building on productivity gains from performance
- Broadening the Zespri product portfolio to offer new high value cultivars
- Continuing to invest in marketing and innovation
- Maintaining the current single point of entry industry structure
- A commitment to premium quality kiwifruit in response to consumer demand.

There are also global trends which underline Zespri's confidence in the future. With an ageing population, older consumers recognise the health attributes of kiwifruit and have more disposable income, and global demand for healthy and safe-to-eat food is increasing. The economic growth of Asia and the rise of the middle class means that these households are spending more money on food. Commodity prices are rising as increasing demand begins to out-pace finite global resources

Despite the recent pressures of the global recession, unfavourable foreign exchange rates and increasing freight costs, New Zealand's kiwifruit markets have continued to grow and achieve premium in prices. The potential for growth of the kiwifruit category remains good, given its consumer appeal and health attributes with growth in Asian markets a testament to this. Investment in the Zespri brand and New Zealand's reputation when it comes to food technology and productivity remain a significant asset.

Response to Psa-V

Since Psa-V was confirmed in November 2010, the destructive effect of the disease is obvious, both from the New Zealand industry experience, and from observing how the disease has rapidly spread in Italy and France. In fact Psa-V is a global kiwifruit problem, with much of the world looking to New Zealand to beat Psa-V. This is because the kiwifruit industry's integrated structure and long-standing commitment to research and development makes it well placed to have a coordinated, well-funded response.

These strengths show themselves in the jointly run Psa-V research and development programme. This is a global one, and calls on the best scientific minds in New Zealand and offshore to understand Psa-V, and then develop and produce the tools needed to operate in a Psa-V environment. The research and development is being overseen by a team of internationally recognised experts in biological sciences. They have specialist knowledge and skills in the *Pseudomonas* bacteria and overcoming significant disease outbreaks.

Research

There are over 80 research projects which aim to –

- Develop a diagnostic toolbox to test for Psa-V
- Understand more about the biology and epidemiology of Psa-V, including the characterisation of the bacteria, host and environment interactions
- Understand how to manage the bacteria.

Running parallel to the research projects is a product testing programme, which currently has over 300 products, to find new tools to help growers protect their orchards. Crucially, for the research and development efforts, the long-standing Plant & Food Research and Zespri kiwifruit breeding programme has provided a significant head start in finding what a long-term solution to Psa-V tolerant cultivars.

Already, two new Gold kiwifruit varieties released in 2010 are proving to be more tolerant to Psa-V than the original Gold variety Hort16A. These new varieties have been in development since 2000 and have already proved to have the necessary attributes to be a commercial success.

Any new variety which proves to have some tolerance toward Psa-V needs to have the commercial qualities of taste, yield and storage to be a viable commercial option for growers. Simply producing a Psa-V tolerant variety without these qualities would be of little use to the industry. Ultimately, the solution to Psa-V will be a combination of tolerant, commercially successful varieties combined with new orchard management techniques.

The future

Many in the industry are coming to the conclusion that in the Te Puke area, the future of the original Gold kiwifruit variety known as Hort16A is limited due to Psa-V. As a result many growers in the Te Puke area are considering cutting out their Hort16A either before or immediately after the 2012 harvest.

This will have a significant effect on the Gold kiwifruit volumes produced as the Te Puke area accounts for around half of the country's current Gold kiwifruit. It is therefore inevitable that Psa-V will have a significant effect on volumes in the short to medium term.

Based on observations it appears the original Hort16A Gold variety is particularly susceptible to Psa-V, and as such is a significant source of the bacteria. This may put other more tolerant kiwifruit varieties at greater risk of infection.

In other areas of the country with low Psa-V infection, or no detected infection, it is probable that growers will continue to farm. This will help Zespri meet the strong market demand for Gold kiwifruit.

Heading

A related development is that a newly commercialised Gold variety, known as Gold3, which was released by the industry last year, is showing that it seems to be more tolerant to Psa-V than the original Gold variety. As a result of these observations about the future of the original Gold, and the tolerance of the new Gold variety, the industry has begun discussions. These

>> Continued on page 10

Sandy Scarrow

The kiwifruit industry in the Bay of Plenty

Much has been written about the New Zealand kiwifruit industry which documents its rapid growth in the 1970s and 1980s through to the market collapse in 1987 and again in 1991. From this low point it grew to a place where industry participants were confident of the plan by Zespri of an annual turnover of $3 billion by 2025.

We are now all well aware of the position of the industry today with the incursion of Psa-V, a virulent strain of the bacteria *Pseudomonas syringae* pv *actinidia*. At the time of writing almost 1,000 orchards, mostly in the Bay of Plenty, are infected with the disease. Some are so badly infected that vines have been removed, rootstock and all. A significant effort is being directed into research to find a cure and support for growers and others to work through this devastation. This article looks at the kiwifruit industry, focussing on its position in the Bay of Plenty, and draws out some themes which may be relevant to other primary industries within New Zealand.

As much as 80 per cent of the New Zealand kiwifruit industry is based in the Bay of Plenty. This is a percentage of the area planted in kiwifruit, but possibly underestimates the volume of fruit packed and stored within the region and shipped from the Bay of Plenty. In export terms this is approximately $720 million of income, most of it accruing to the region.

In addition, much of the growth in the kiwifruit industry of plantings of the high value Gold cultivar, has been in the Bay of Plenty – plantings which generate considerable returns to the grower.

Kiwifruit is big locally. A report written in 2004 showed kiwifruit to be 19 per cent of the local economy in the Bay of Plenty. Since that time, as the building sector has taken a dip, it has possibly pushed kiwifruit up in relative value.

The beginnings

I have often wondered where the kiwifruit industry would have been without the interventionist policies of the Muldoon era. There are many aspects of his government's policies which helped the kiwifruit and other industries. Much of this was around taxation policy, both personal income tax rates, and the deductibility of capital expenditure on export focussed developments.

Tax deductibility

As a way of encouraging investment in export-focused industries, the government policies allowed for capital expenditure in things such as kiwifruit. As a result, for more than 20 years, most forms of land improvement were deductible against current income. This deductibility was phased out slowly, until in 1992 no amount of development expenditure was deductible.

From that period, capital expenditure was capitalised and depreciated over time. This deductibility encouraged a large rate of investment in the 1980s with the industry peaking at an unprecedented annual rate of 2,300 hectares in 1988. Since this time, no other horticultural industry, with the exception of grapes for wine, has seen such a rate of growth.

With the marginal income tax rate for high income earners – then over $38,001– being as high as 66 per cent, many professionals focused their attention on finding ways to minimise their taxable income. In doing this, investment in export-focused horticulture was seen as an option because capital expenditure could be deducted from taxable income. In addition, high inflation rates during that time resulted in large increases in the capital value of land. Opportunities therefore existed for developing the land and selling it, realising the increase in capital value.

The heady days

In the early days of the kiwifruit industry, people made money almost in spite of themselves. Orchards were established in the most unlikely places, often on unsuitable land, away from facilities such as packhouses and ports. Many orchards packed their own fruit and their neighbour's fruit, investing capital in the facilities required.

Industry lobbied for a degree of market regulation which meant that, under the New Zealand Kiwifruit Authority, exporters were licensed to export to markets offshore. Under this marketing system, up to nine exporters

competed annually for growers' fruit, often paying large advance payments to lure growers to switch from one exporter to another. Ironically, the exporter returning the highest payment was sometimes awarded the lowest proportion of crop in the following year, as deals on advance payments were negotiated before information on returns from the previous crop were finalised.

Income from exporters during these days were not that much related to the market price as the market price was masked to an extent by the value of the New Zealand dollar which was devalued substantially over that period. The market price was reducing while returns to New Zealand growers were either increasing or at least remaining fairly constant.

While focus was directed at managing the demand by attempting to control the marketing of fruit, little was done to control the supply. At its peak, there was a total of 19,320 hectares of kiwifruit planted throughout the North Island and in Nelson.

Most of the industry, as it is today, was concentrated in the Bay of Plenty. The supply of kiwifruit on to the market was difficult to manage because of the growth in volume, as well as the fluctuating supply caused by the yield influence of winter and spring temperatures. This effect was ameliorated towards the end of the 1980s with a bud break spray that made yield more reliable.

Market collapse

Market returns collapsed in 1987, resulting in some exporters asking that growers repay some of the advance that they had paid out to secure crops. This collapse in the market was blamed on the poor co-ordination and competitive behaviour of the various exporters of New Zealand kiwifruit.

The Coopers and Lybrand report, which reviewed the marketing of New Zealand kiwifruit, concluded, 'if the earnings potential of kiwifruit exporting is to be realised then there is an urgent requirement to restructure the industry'. A period of consultation led to the formation of the New Zealand Kiwifruit Marketing Board in September 1988. The Board was given the responsibility to market the fruit supplied by New Zealand growers, while Kiwifruit New Zealand held the statutory rights to market fruit.

Consolidation and diversification

Despite some extremely difficult times, including very poor market returns in the 1990s, the industry managed to claw its way out the low returns to consolidate into a strong and relatively cohesive industry. Important in achieving this has been the successful use of forums, such as New Zealand Kiwifruit Growers Incorporated, and internal committees to ensure that rigorous debate occurs internally involving all participants before decisions were made.

External threats may also have been a factor in the cohesion. The legal threats via the Waitangi Tribunal, and recently the Turners and Growers High Court action, may have caused growers to work together to fight what were seen as external threats. The recent Psa incursion has resulted in similar cohesion, albeit with a few cracks.

Major capital-intensive facilities of packhouses and coolstores are owned outside the marketing company, Zespri. This has created commercial tension, but also avoided building up bricks-and-mortar assets by the marketing company which has been fought over in other industries.

Progress payments

For some years the industry operated a promissory note scheme for retained earnings to provide industry capital. The notes were attributed to individual growers on a rolling basis, repaid several years later and a new promissory note drawn. This capital has been used to secure seasonal borrowings at industry level, one function of which has been to fund progress payments to growers when inventory levels are still high. These progress payments have been paced to fund much of the growing costs for the next crop, encouraging continued production even in the downturns.

Now that the marketing company Zespri is a corporate, only growers or former growers can hold shares, and only current growers can buy shares. Voting is pegged in proportion to production, which was introduced after kiwifruit growers saw the ENZA apple marketing company rapidly move into majority ownership by a small grower with other industry interests. The sale of ENZA shares occurred very rapidly, at a time when pipfruit growers' income was extremely low and the sale of shares was seen as a way of releasing some much needed cash.

Marketing and branding

Industry oversight is with a separate body, Kiwifuit New Zealand, the holder of the statutory rights in legislation. This gives growers somewhere to go with complaints, and Kiwifuit New Zealand also operates a collaborative marketing system where other exporters can apply to market New Zealand kiwifruit overseas for the benefit of New Zealand growers. The marketing process provides a mechanism to compare Zespri performance with other marketers and an outlet for those who have something to offer in exporting. For example, organic fruit, and fruit sold to Pacific Island markets, have been well represented in collaborative marketing programmes.

The kiwifruit industry has strong branding, and consumer advertising of the fruit, which is unusual in the fruit industry internationally. The branding has included strong environmental programmes and, more recently, robust research into the health attributes of the fruit.

An age problem looming

Product ownership has become a new frontier, with the development of distinct proprietary varieties bred in New Zealand important in capturing market returns. The strategy is to avoid variety proliferation and have a small number of varieties each with a substantial potential volume matching the supermarket practice of stocking a limited range of varieties. Apple growers suggest supermarkets will only stock a maximum of four varieties and theirs is a much larger sector

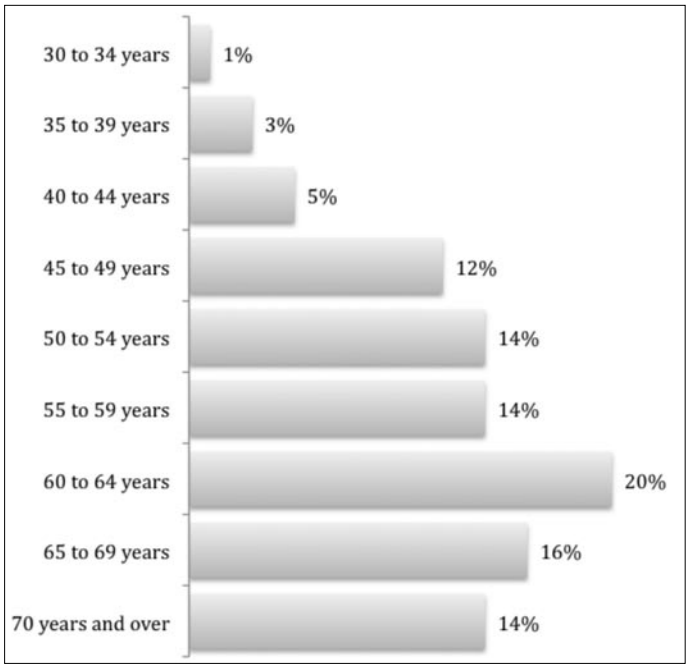
of the fruit business internationally than kiwifruit.

The world-wide reach of kiwifruit is unusual. In general, Asian markets are most attractive for returns but Europe is a substantial volume market. The United States has been difficult.

Much of the consolidation in the industry has occurred around the packhouse and coolstore facilities. These, fearful of reducing throughput, entered the market and have either bought outright, leased or managed orchard land. Leasing and managing initially allowed the owner to work off-orchard and, as time has progressed, retire from the day-to-day activities growing kiwifruit as the fruit growing population ages.

As the figure below shows, half of New Zealand kiwifruit growers are over 60 years of age. Today a considerable area of kiwifruit land is leased or managed, often with the performance of these corporately farmed properties ranking at the higher end of yield and income stakes.

Age and percentage of kiwifruit growers



The release of Hort16A, marketed as Zespri Gold had been hailed as a success until the incursion of Psa. As a protected cultivar Zespri has been able to restrict supply, keeping returns to growers high by undersupplying a growing market. For kiwi Gold growers, this has meant high orchard gate returns from their land.

Growth in new varieties

The strategy document first presented in 2010 set out the path for the industry to be generating $3 billion export dollars to New Zealand by 2025. Much of the returns were expected to come from the growth in the Gold category. The market growth achievable from the new cultivars recently released were targeted to extend the market window in which Gold fruit produced in New Zealand can be marketed.

The new Gold varieties were also seen as able to eventually replace Hort 16A, the cultivar which makes up the bulk of the Gold category at present. This cultivar is coming to the end of the period in which it is protected and so will soon be able to be grown and marketed outside of the control of Zespri.

While the Psa incursion has forced the industry to rethink how this growth in returns will occur, there is still commitment and belief within the Zespri board and management to work towards this growth. Despite the doom and gloom pervading the topic of Psa in the media, there is still confidence by people in the know in the industry, including myself, that the growth potential can be realised.

Psa and its effect

Plenty has been written about the effect of Psa and the previous two articles in this journal help paint the picture. Needless to say, Psa has been devastating. It now transpires that the Hort 16A cultivar is particularly susceptible to the disease. If the disease continues to progress as it has through the Bay of Plenty, it is likely that there will be no Hort 16A produced in Te Puke during the 2013 harvest.

Zespri are already estimating the harvest for 2012 to be 10 million fewer Gold trays. Some of this reduction is due to seasonal factors but most due to Psa. This is a reduction of a third of the 2011 production. Other cultivars, including Hayward, the traditional Green kiwifruit, and some of the newly commercialised Gold cultivars, appear to be relatively tolerant.

The establishment of Kiwifruit Vine Health has enabled some focussed effort on supporting growers and working to find management options for growing in the presence of this disease. Kiwifruit Vine Health are also working on developing a national pest management strategy to manage the disease long term. This strategy will possibly provide regional councils with more authority to remove untended or poorly tended vines, for example. It was targeted to have this completed within a year, but 15 months on the arduous consultation process is still in progress.

While there are few who would not acknowledge the achievements of Kiwifruit Vine Health in the past 15 months, there are significant timing issues that have affected growers' ability to manage this disease. Examples of this include the knowledge of the relative susceptibility of the various cultivars to the disease and the products available to growers to manage it.

Lessons for other industries

In reviewing a potted history of the kiwifruit industry what are some of the lessons that can be drawn to benefit other industries? The following is merely my opinion and does not reflect any views of organisations I am either employed by or contract to. Nor would it stand up to academic scrutiny.

Picking winners

Regulators have the ability to make it either very easy or very hard to get a viable business established. The regulatory framework which dictated taxation, interest rates, inflation

rates and so on heavily affected the development of the kiwifruit industry. While there are many who would shy away from tinkering too much with these frameworks now, there are other things that government could do to help industries which have promise.

Examples of this are research and development. What is in place to ensure that the Crown Research Institutes are focusing on those industries that are likely to contribute the most to economic growth in New Zealand? It is only quite recently that I have been able to discern a true spirit of co-operation between Plant and Food Research and the kiwifruit industry.

Economic fundamentals

Many of the economic fundamentals influencing business profitability are now relatively stable. The high inflation and high interest rate period of the 1980s has given way to a period of relatively stable and low levels of inflation and interest rates. The high employment levels experienced before the global financial crisis were overcome with the very successful Recognised Seasonal Employer scheme.

The one fundamental that causes significant problems for exporters is the value of the New Zealand dollar. For reasons well outside of the control of the New Zealand Reserve Bank this has fluctuated over the past two decades, affecting the return to exporters for their produce.

The New Zealand kiwifruit industry has been able to benefit from some very clever and often quite lucky hedging. The forward cover they have purchased has flattened out the effect of changes in currency value. For other industries without the scale to support the treasury function of Zespri or Fonterra, what is available to them for helping them in making decisions around foreign exchange?

Managing market supply and demand

Zespri is in the fortunate position of controlling the marketing of all kiwifruit produced in New Zealand which meets their grade standards for all markets other than New Zealand and Australia. Bcause they control the licensing for the Gold cultivar Hort 16A, they are able to control the amount of this which is planted and therefore control its supply volumes in general. What can other industries do to develop and then protect new cultivars?

The avocado industry also struggles with managing the marketing of fruit. This industry has problems with the biennial bearing that previously affected the kiwifruit market. As the avocado industry works towards its targeted 12 million trays by 2015/16, most of which will have to be exported, what can be done to manage the biennial nature of production?

This year is seeing the largest crop produced. With an export level of only 3.5 million trays, avocado industry participants are commenting publicly about the poor co-ordination in the market leading to the risk of poor returns to growers. More teeth are needed, either by regulation or the export marketing strategy agreed by the industry and enforced by the Horticultural Export Authority. .

Biosecurity risks

We know that biosecurity incursions happen. They are a risk factor associated with international trade and travel. But how prepared are we managing these risks?

While the kiwifruit industry was starting to plan for managing the Psa problem, there was a lot that was not known. What do other industries know, not just about the risk of a disease or pest to their industry, but also the relative susceptibility of their cultivar mix to main risks? What can be done to begin the consultation around a pest management strategy before a disease appears on our shores?

What is known about the various isolates of main diseases around the world? If the kiwifruit industry had known about the difference between the virulent strain known here as Psa-V, and the low virulence strains of Psa, the status of the MAF Biosecurity response may have remained at a higher level for longer.

A significant challenge

The kiwifruit industry has been through plenty of challenges and is facing a significant one now. Despite the devastation of Psa, there is a considerable amount about the kiwifruit industry which is positive. It contributes substantially to the Bay of Plenty economy and provides some useful lessons from which other industries could benefit.

Sandy Scarrow is a horticultural consultant for Fruition Horticulture

>> Effect of Psa-V on the kiwifruit industry continued from page 6

discussions are on ways to move the Gold kiwifruit category away from being mainly based on the original variety to being based on a combination of Gold varieties.

However, while it is positive to be talking about possible pathways out of Psa-V, there is still a very long way to go before any decisions can be made on how this could be achieved. The industry is still learning about the ability of our new Gold varieties to withstand Psa-V. In early 2012 it looks promising but this may change as the season progresses. It will not be until March that firm decisions can be made. Ultimately it will be for individual growers to decide what is best for their orchard. No-one can be made to either cut out their original Gold or to accept new varieties

Even if the new Gold kiwifruit varieties do prove to be a pathway out of Psa-V, it will be at least three years until the industry is again producing crop volumes at levels similar to those before Psa-V was detected. Even with more tolerant varieties a significant amount of work remains to be done within the research and development programme. This is to ensure the industry has all the tools and techniques to manage their orchards within a Psa-V environment.

Simon Limmer, Zespri GM Grower and Government Relations

Graeme Peters

The honeybee situation in New Zealand and the rest of the World

Claims of a global decline in the bee population have triggered international concern with good reason – humans have benefitted from honeybees for centuries. In addition to making honey and other useful products, bees help pollinate about a third of our crops.

Scientists around the world have turned their attention to exploring reasons for bee declines in some countries. To date most agree that there is no single explanation for colony losses, but interactions between multiple stressors are likely involved. Pests such as varroa and *Nosema ceranae,* along with other pathogens, are playing a significant role. Research must now determine why honeybees have become vulnerable to these stressors and how they can be protected.

Avoiding pesticides

Given the vital role honeybees play in agriculture, the crop protection industry is naturally concerned about this negative trend and making sure that use of pesticides does not harm bees. Some scientists suggest that pesticides are one of the factors making bees more susceptible to disease.

No-one disputes that some pesticides and adjuvants are hazardous to bees, so it is important that all involved in managing agrichemicals, especially the user, follow safe and responsible practices when applying them. As this article will explain, education and compliance are the main factors to reducing off-target application, such as spray drift, affecting bees.

There are also claims that pesticides applied to the seed to protect it during its early growth stage are weakening or wiping out hives. Significant research is underway in this area, but the crop protection industry believes that there are strong indications that so-called systemic pesticides are not a factor in bee die-offs. That said, interested groups are waiting the results of further research, particularly into the indirect and sub-lethal effects of neo-nicotinoids on bees and their link to other problems.

This article concerns the current situation with bees both internationally and in New Zealand, and looks at how pesticides interact with bees, and some of the work underway to manage bee health.

Population up and down

Media headlines suggest that honeybees are in danger of extinction. But is the managed bee population actually under threat? The answer is yes and no. According to the United Nations Food and Agriculture Organisation (FAO), the global stock of commercial honeybee colonies has actually increased by 45 per cent between 1961 and 2007.

The main exceptions to this global increase involve long-term declines in the United States and some European countries, but these are outweighed by rapid growth elsewhere. Therefore, despite variation among countries, the overall FAO data reveals that domesticated honeybees are not declining globally. That said, bee numbers are not keeping pace with expansion in agriculture requiring animal pollination, and it is indisputable that some areas are suffering from bee declines.

The decline

A United Nations Environment Programme report released in March 2011 said that a decrease in managed honeybee colony numbers in Europe has been noted since 1965, but the pattern is diverse. Since 1998, individual beekeepers have been reporting unusual weakening and mortality in some colonies.

In the United States, honey producing colonies have halved since 1950, when there were 5.5 million hives. Losses of honeybee colonies since 2004 have left the United States with fewer managed pollinators than at any time in the last 50 years.

In this region, honeybees pollinate nearly 95 kinds of fruit such as almonds, avocados, cranberries and apples, as well as crops like soybeans. In 2000, the value of crops pollinated by bees was estimated at US$14.6 billion in the United States alone.

In New Zealand, colony numbers were in slight decline from about the turn of the millenium – the year varroa was first detected. In 2005 there were 300,000 managed hives. However, more recently their number has been increasing, now there are about 390,000 hives. But the feral bee population has virtually disappeared, a bleak situation blamed on the devastating varroa parasite.

The evidence is that the number of hives globally is growing, albeit too slowly. But in some parts of the world the bee is facing threats to its survival, which is quite rightly flagged as a serious problem.

Reasons for bee declines

The United Nations Environment Programme report listed four main reasons for pollinator decline, but it placed most blame on a single creature. 'The external parasitic mite, *Varroa destructor*, is the most serious threat to apiculture globally,' About the size of a pin head, varroa feeds on the bee circulatory fluid and migrates from one hive to another, spreading viral diseases and bacteria. If left uncontrolled, it almost certainly leads to the premature death of colonies within three years. Discovered in south east Asia in 1904, today it has spread to nearly all countries including New Zealand.

Bee with varroa on its thorax

Varroa is devastating because it cannot be eradicated. It can be controlled by monitoring mite levels, regular treatment with pesticides, and possibly by selecting bees with tolerance to the mite. Other invasive species include the small hive beetle, which has been detected in New Zealand. It causes damage to honeycomb, stored honey and pollen. If a beetle infestation is sufficiently heavy it may cause bees to abandon their hive. Competition overseas from non-native insects is also having an effect, notably the Africanised bee in the United States and the Asian hornet in Europe.

One more parasite

Another parasite causing chaos is *Nosema ceranae,* which was first recognised as a distinct species in 1994 in China. A decade later it was detected in European honeybees in Taiwan and Spain and is now in many countries. During an investigation into hive illness in the Coromandel, the Ministry of Agriculture and Forestry discovered *Nosema ceranae* in New Zealand in September 2010.

The microscopic spore-forming parasite attacks the lining of the middle intestine of worker bees, queens and drones. Severe infections in a hive will cause it to die out, with lesser infections reducing honey yields and population build-up.

Other problems

A shortage of good quality food is also cited as one of the factors affecting bees. Good food is essential for successful larva development and also to optimise their activity cycle during the winter season. It is increasingly difficult for pollinators to obtain sufficient pollen sources for all their essential amino acids.

Consequently, this can weaken the insects' immune system, making them more vulnerable to various pathogens. Some researchers have observed that, where crops with low-protein pollens such as blueberries and sunflowers are grown, there is a correspondingly increased likelihood of colony collapse disorder.

Federated Farmers has taken a positive initiative to improve food variety by establishing a Trees for Bees programme to help give bees a greater opportunity to gather pollen and nectar. This provides the vitamins and minerals required to maintain optimum hive strength and a viable pollinated bee force. As the bee industry contributes at least $4.5 billion a year to the New Zealand economy, Federated Farmers has produced leaflets which make suggestions about what can be planted on a farm and along the riparian margins in order to support bee health.

Another factor affecting bee health is transport. Commercial beekeeping involves trucking bees to where they are needed at particular times of the year for pollination. In some countries, where large areas of land are planted in single crops, beekeepers must transport their hives long distances. Scientists say that prolonged confinement and temperature fluctuation is stressful to bees and can bolster bee disease in a colony.

Pesticides and bees

Pesticides are designed to treat particular pests and diseases on a target plant or organism. Along with new plant biotechnologies, crop protection helps farmers grow more food on less land by protecting crops from pests and disease as well as raising yields. This ensures the availability of a year-round, affordable supply of a wide variety of nutritious fresh produce.

In an ideal world, all pesticides would land on their intended target, usually plant foliage or soil, and stay on this target until it breaks down, without affecting other beneficial organisms such as bees. In practice, it is impossible to achieve perfect application, but modern methods of applying treatments can be extremely accurate. There is a whole science dedicated to perfecting on-target application with techniques such as varying the droplet size, nozzle

design and pump pressure. New types of spray applicators, which recapture chemicals and miss the leaf and recycle, are also starting to emerge.

Minimising spray problems

If a small quantity of pesticide strays from its intended target, this is called off-target application, and can occur by spraying in unfavourable conditions such as high winds or no wind. It may also occur if an aerial operator sprays the wrong field or pesticide dust particles that coat seeds are blown on to fields nearby. With the use of new technologies, such as GPS and polymer-based stickers which bind neonicotinoids to seeds, these failures are rare.

Everyone's goal is to minimise off-target application, and not just to help bees. It is also important to farmers and growers, neighbours especially those who are organic growers, and the general public.

New types of sprayer help reduce spray drift

There are two main ways of minimising off-target application. The first is with education of users. All regular users of spray equipment should complete a Growsafe training course. Growsafe is the leading training provider that bases its programme on a New Zealand NZS 8409:2004 and offers introductory and other courses, including advanced courses for aerial sprayers.

Growsafe training is recommended for sprayers because it covers the requirements of the two main laws on spraying – the Hazardous Substances and New Organisms Act 1996 and the Health and Safety in Employment Act 1992 – along with regional air plans overseen by regional authorities. Growsafe certification is required by orchardists and growers under the global Good Agricultural Practice quality assurance programmes. Another option for users is approved handler training, which is a requirement under the Hazardous Substances and New Organisms Act when you are purchasing certain agrichemicals.

Better compliance needed

Another way of minimising off-target application is effective compliance activity, meaning that reckless use of chemicals should be followed up in the same way that other dangerous activities are policed. Education and compliance would be the carrot and stick to reducing off target application. Compliance is the responsibility of the Department of Labour and regional authorities, none of which is adequately resourced or motivated to monitor and enforce spray activities in remote places such as the back of farms and in hill country.

Spray drift incidents are reported from time-to-time, but it is often very difficult to track the source of spray drift and prosecute the user who may be at fault. Effective compliance would create more of an incentive for the small minority of ignorant or reckless users to improve their practices.

Agcarm will lobby for greater compliance activity from the government's review of the HSNO Act expected in the current term of the new government. Meanwhile Agcarm, in partnership with the National Beekeepers' Association, Federated Farmers and Rural Contractors New Zealand, circulated 30,000 'Bee safe spray safe' stickers in recent months. Agcarm also provides information on bee safe spray practice in all Growsafe manuals and on its website.

An important part of responsible use is reading the label to look for bee safety warnings. Some sprays are harmful to bees so they must be used carefully. For example, insecticides should not be sprayed on flowering plants. However if application during flowering is absolutely necessary, spraying must take place after sunset when bees have stopped working. Another important aspect is the correct use of adjuvants, which help a pesticide work more effectively in some situations. Some adjuvants are harmful to bees so should not be applied to flowers when bees are working.

The over-riding message is that pesticides, especially those that are toxic to bees such as broad-spectrum insecticides must be used according to the label and in the right conditions. We cannot save every bee, but good spray practice should not lead to unacceptable bee deaths.

Systemic pesticides and bees

Systemic pesticides are coated on a seed, where they are absorbed and remain effective as an insecticide when the plant is in its early growth stage. One treatment option is a group of products called neo-nicotinoids, which have been helpful in protecting young crops and improving yields. Despite being hard to say, and even harder to spell, neo-nicotinoids have whipped up media debate over claims that tiny trace quantities may be picked up by bees, weakening colonies and causing premature bee deaths.

Representatives of the National Beekeepers' Association and the Green Party stood together at Parliament last year. They launched a petition asking the government to suspend the sale of neonicotinoids, and for regulators to hold a special inquiry, called a reassessment, into the seed protector. It is convenient to point the finger of blame for bee maladies at neo-nicotinoids, but this condemnation ignores the fact that international research does not support claims that tiny residues of neo-nicotinoids cause bee deaths.

More about neo-nicotinoids

Neo-nicotinoids are similar to the natural insecticide nicotine and are available as seed treatments and foliar sprays. First introduced to New Zealand in 1992, neo-nicotinoids are in about two dozen products containing one of four active ingredients – imidacloprid, thiacloprid, thiamethoxam and clothianidin. Sold by half a dozen companies, neo-nicotinoids are registered for use on cereals, forage brassicas, pasture, maize and sweetcorn, potatoes, pumpkins and winter squash.

Neo-nicotinoids are systemic pesticides which are absorbed by the seed and remain effective as an insecticide when the plant is in its early growth stage. As time passes and the plant grows, the presence of neo-nicotinoid falls to extremely low levels. Pollen from a mature plant may have traces of neo-nicotinoid measured in parts per billion, the equivalent of half a teaspoon of water in an Olympic-sized swimming pool. There is no dispute that neo-nicotinoids are toxic to bees, but not when used correctly and not at levels that are barely detectable.

It is important to know that the majority of neo-nicotinoids sold in New Zealand are used to treat seeds for crops which are wind pollinated, which means bees are unlikely to be in contact with their pollen. These are cereals, forage brassicas, maize, sweetcorn and pasture – New Zealand's biggest crop.

The United Nations report stated that laboratory research links neo-nicotinoids to loss of sense of direction and memory impairment, and use of neo-nicotinoids with certain fungicides increased the toxicity of the systemic insecticide. However, it also put a caveat on its commentary about neonicotinoids, saying, 'results obtained in laboratory conditions are hard to compare to field conditions.' Crucially, the conclusion in the report did not include recommendations about curbing or banning neonicotinoids.

A large study by food safety authority in France, one of a handful of European countries that temporarily suspended use of neonicotinoids on some crops, made it clear that a multitude of factors are responsible for persistent bee mortality. The authority expressly stated that there is no statistical correlation between bee deaths and neonicotinoid residues in pollen or applications of plant protection products. Denouncing seed treatments is a case of barking up the wrong tree, and is diverting the bee industry from tackling other more serious threats to bees that are looming large.

Looking forward

New Zealand beekeepers are right to be concerned about their bees, and to be alarmed about reports overseas that entire hives are mysteriously dying due to the unexplained colony collapse disorder. In total, the European Union budget already dedicated to research related to honeybee and other pollinators amounts to approximately €10 million. Current projects deal with the decline of both wild and domesticated pollinators, including honeybee colonies, and its potential causes, as well as the development of appropriate diagnostic tools.

Thankfully there have been no reports yet of colony collapse disorder in New Zealand. In most countries, New Zealand included, the varroa mite poses the biggest danger to the survival of bees. Varroa suck the blood of adult honeybees for sustenance leaving open wounds. The compromised adult bees are more prone to infections which the mites unwittingly spread.

The German Bee Research Institute outlined in a report that most of the colony collapses which have occurred in recent years were due directly or indirectly to severe varroa mite infestation. In addition, a study group considers the varroa situation to be extremely critical and sees an urgent need for action.

More research needed

After campaigning against neo-nicotinoids for much of 2011, the National Beekeepers Association has adopted the view that it should wait for more research into the various stressors on bees. Given the international attention on bee health, there is little point in lobbying New Zealand lawmakers and regulators to review neo-nicotinoids when bigger countries have research projects underway and will make better informed decisions.

In the meantime, urgent attention must focus on finding new ways to combat varroa. At present there are three animal health products available to treat varroa but resistance to the mites, which reproduce on a 10-day cycle and build up resistance quickly, has already been observed near Auckland.

Agcarm has been working with its member companies to bring forward new treatments for varroa. Work on introducing these miticides must begin now before beekeepers are left to struggle with infested bees and no way to treat them. Although varroa is the most significant influence, bee ill-health is a multi-factorial problem. Pointing the finger of blame and calling for quick fix solutions will not help beekeepers deal with their serious challenges ahead.

Graeme Peters is Chief Executive of Agcarm, the industry association for companies which manufacture and distribute crop protection and animal health products.

Barry Foster

The potential for rapid honeybee colony loss in New Zealand

Since the first establishment of honeybees in New Zealand in 1839, they have lived in a somewhat benign environment compared with the rest of the world, affected only by a smallish variety of pests and diseases. Honeybees have had good nutrition available, and have mainly been without the enhanced danger that a range of increasingly toxic pesticides now pose on their environment.

The varroa mite, first detected here in 2000, changed beekeeping in New Zealand for ever. The mite and has gradually spread throughout the country over the past 11 years, causing many beekeepers to give up beekeeping. It is now becoming resistant to some synthetic controls used. In addition, we have the constant threat of the inadvertent introduction of one or more new pests and diseases as a result of a biosecurity breach.

Greater risks

Over the last decade, the past beneficial factors of having few pests and diseases, good nutrition and a less toxic environment have gradually been compromised to a greater or lesser extent throughout the country. We are now moving further into an era of even greater risk of sudden large-scale losses occurring. This is due to the suite of contributing factors which have also been observed overseas and caused epidemics like colony collapse disorder.

It may only be a matter of time before these stressors acting together lead to some significant colony losses in New Zealand. We may be approaching the end stages of the process of continual weakening of our bee stocks, leading to the increasing risk to our pollination security, and by extrapolation our economic base, that large-scale colony

losses will bring. Because other countries have had these factors operating in combination for longer, New Zealand has the advantage and opportunity of learning from their mistakes and from their remedies. Another advantage for this country is its isolation from continental land masses. New Zealand therefore has greater capacity than most countries to protect honeybees from the arrival and spread of new diseases, and to eradicate some diseases completely.

This is the goal of the American Foul Brood Pest Management Strategy which is enacted under an Order in Council not unlike that for tuberculosis. However, New Zealand has the disadvantage of being more vulnerable to losses of honeybees because there are fewer alternative pollinators available should our honeybee health be compromised in any way.

Dangers for New Zealand

Public and government awareness of this looming crisis should form the first step in beginning to put in place effective remedies to mitigate large-scale colony losses from happening here. The tightening of import health standards for bee products using a precautionary principle, rather than simply judging known risk factors, should be an urgent second step to avoid the importation of further exotic pests of honeybees.

Psa in kiwifruit was a good example of its failure. If we fail to recognise and act on mitigating the factors leading to large-scale colony losses, then judging by the history of this overseas, we are almost assured of it happening in New Zealand.

The National Beekeepers Association over the past 10 years has been and remains in the forefront of lobbying, educating and highlighting the dangers to New Zealand from almost slavishly following the trends observed overseas. This continues to place our bees, and therefore extension our economy, biodiversity and food security, at considerable risk. How could we as a country begin to tackle the suite of problems that we and our bees face? There are four main areas that are of high priority to begin to reverse these trends.

Greater biosecurity protection

Any new introduced pests and diseases could cause our bee stocks to reach some tipping point that will lead to rapid colony losses. Varroa bee mites remain the major pest problem for our bees and any additions to this could well provide the straw that breaks the camel's back,. The National Beekeepers Association has been leading the opposition to the government's proposed importation of foreign honey from Australia since the late 1990s.

We see this as an enhanced biosecurity risk from bringing in new pests and diseases with honey imports. New Zealand honey compares favourably internationally with foreign honeys, and our opposition is not on the basis of any patch protection in trade, as we already compete very well internationally with most foreign honey.

Declining availability of good nutrition

Bees rely on honey for carbohydrates, energy and pollen. Its diversity is the major source of protein, fats and vital minerals they need for normal biological functions, including a quite different immune system to other insects. Bees rely on good hive hygiene, as well as elements from what they forage in their surroundings. Pollen availability and diversity is a major component of this to control pathogens which could enter the hive, and it also detoxifies harmful substances.

As agriculture becomes more intensive we clear areas of important pollen sources that have often been classed as weeds, such as gorse, and not replaced them. The National Beekeepers Association is working with Federated Farmers and Landcare research on a three-year Trees for Bees project. This aims aimed to identify the most suitable plants for location type, and nutritional values that could be planted as replacement sources of pollen, particularly during spring and autumn.

Agrichemicals and toxic effect on bees

New Zealand is on a global trend of using increasingly toxic pesticides to control an ever-evolving resistant range of pests and diseases that attack our food and farm crops. The downstream affect of this is either direct killing of our bees, but more common is an insidious compromising of the bees' immune systems. This in turn allows pathogens as mentioned above to have an enhanced affect on our bee stocks.

This is a contentious area that has and is still undergoing much research globally, except in New Zealand. Whatever the result, pesticides and their increasing toxicity are understood as being part of the matrix of cause and effect which is leading to global declines in pollinators.

Awareness of the need to reverse these trends

Nothing can be done without awareness of these trends and no action will be taken to reverse them until we begin to get substantial honeybee losses in New Zealand. This is the worst case scenario as there is no fallback position should the honeybees' health be compromised. There is no other efficient and widespread pollinator available which can do the work of the honeybee.

Bumble bees do alot of good but are not as numerous and it is difficult, if not impossible, to increase their numbers to the industrial scale necessary to effect any replacement for honeybees. Add to that, any insect pollinator will probably be affected by its own pests and diseases as well as poor nutrition and pesticides.

These are briefly some answers that need to be tackled. If they are not, then New Zealand at some point in the future, could see much of its pollination-reliant fruit and vegetables being imported from countries that look after their pollinators and have fallback pollinators for those that are compromised. That is not a prospect we wish to allow to happen.

Barry Foster is the President of the National Beekeepers Association

James Lockhart

Understanding vertical integration in agriculture

Vertical integration offers a sensible framework in which to add value. The benefits of vertical integration are well established and concern increased returns and reduced risks in both the short and long term. With organisational learning and effective management, the sources of long term returns and opportunities to reduce risk are often different from those identified in the short term. The vertically integrated firm, when successful, is unlikely to remain in a static state for long. However, too often the additional management costs are ignored, and the view that greater returns are available closer to the consumer is often misguided.

The skills, knowledge and competencies required for greater downstream activity appear to be discounted. Despite these observations, vertical integration in agriculture has advanced at a considerable rate over the last decade, as much in response to the increasing need for reassurance of food safety by consumers as in a genuine interest by consumers to understand where their food comes from.

Quite how this global trend can be captured by our export – dependent industries is a moot point, particularly those with perishable merchandise. The phenomenon of integration grows at a considerable rate, although common sources may come as a surprise. This article explores the motivation for vertical integration, and provides a brief synopsis of the contributing theory.

Residual variable income

Farmers as growers and producers of fruit, vegetables, animals, wool, trees, honey and flowers are recipients of a residual variable income. That is, the income they receive is what is left after all other intermediaries – those businesses between themselves and the end-consumer – have met their costs, hence the term residual. Income is also variable, not only in terms of seasonal variations in both demand and supply, but also in how much cost is withheld by other contributors to the value system.

The list of contributors is long, particularly in our export dependent industries such as wool, dairy, meat, logs, fish and some fruit. Almost without exception, all other contributors have a pre-set margin, commission, cost, levy or price they receive regardless of whether this is the local trucking firm, a freight forwarder, intermediate processor, exporter, retailer, distributor or international marketer.

The market response of farmers and growers is almost always the same – to pursue vertical integration. In New Zealand this also includes the view that the best size of the firm is something that encompasses nearly all of the respective industry. The aim of this article is to explore the theory behind vertical integration, identify critical attributes, and provide some compelling reasons for its success.

However, at the heart of the motivation for vertical integration lies discomfort, unease and contempt by farmers and growers This is aimed at the recipients of a residual variable income on the one hand, and a belief, sometimes ill founded, that those businesses downstream appear to be getting a disproportionate slice of income, especially that of farmers and growers.

Contributing theories

Agriculture has long ceased to be defined in terms of farm functions such as growing and storing food and fibre products. Despite increasing specialisation, on-farm growers and producers remain dependent on off-farm functions. In 1957, Harvard Business School's John Davis and Ray Goldberg observed that the interdependence of the agricultural sector and the business sector had increased. However, they noted that interdependence had increased 'without creating adequate machinery whereby these factors of the economy can plan and work together in formulating sound policies which are mutually beneficial to them and which further our national [US] economic goals'.

Note that this observation was made nearly 50 years ago. Cynics would argue that little has changed since. However, there is compelling evidence to suggest that much has changed over the last five decades, especially in New Zealand, but the motivation for much of this has come from a source not envisaged by Davis and Goldberg at the time.

Internalising transactions

Relationships between adjacent firms in a value system, such as a fruit grower and wholesaler, sheep farmer and meat

processing company, or dairy farmer and dairy company have traditionally been considered as either markets or hierarchies. The boundaries of a firm, in terms of economic theory, are supposedly determined by the relationship between transaction costs and management costs. The firm can reduce market costs by internalising transactions, and in doing so pursue some degree of vertical integration.

However, as the firm internalises transactions it is proposed that management costs increase. As the firm internalises transactions, for example, by moving from the market place, to contracts, to manufacturing or processing within the firm, transaction costs would decline and management costs to increase. Optimal firm size, in terms of the boundaries of the firm, occurs where the sum of transaction costs and management costs are minimised.

Transaction costs are high where there is uncertainty about the conditions under which exchange takes place, or problems relating to small numbers bargaining. This latter perspective is better discussed elsewhere. Transaction costs rise with uncertainty over price, quality or the availability of a good or service – seasonality, perishability, lumpiness in outputs, difficulties with specifications, and price rigidity in either input or output markets. In terms of economic theory, vertical integration will therefore be successful when the benefits of internalising a transaction outweigh the increased internal costs and competitive dangers of doing so.

Using contracts

To reduce their transaction costs with farmers, meat companies have sought reliable supply and strict quality standards by using contracts since the mid-1980s. Considerable management costs went into the development of such contracts, including the development of various incentives, advance and progress payments, linkages with the operating price, premiums, simplified carcass targets, and various provisions to change supply if climatic conditions changed.

Early contracts were not widely accepted by farmers, and breaches of those that were adopted were largely ignored by both sides. By contrast, much of the New Zealand dairy industry adopted an integrated cooperative form from the late 1880s. Transaction costs were minimised between the farmer and their local processor, and management costs absorbed by the cooperative, although to be fair these were passed back to the farmer in the form of various retentions and still are today.

However, much of the difference in response can be explained by the perishability of raw material. Across the agriculture and agribusiness industry the relationship between perishability and integration can be observed. As perishability increases, so too does the tendency for integration to overcome the transaction costs associated with perishability.

Increasing demand

The major departure between economics and business schools of thought concerns the role of management. Generally transactions are assumed to take place in the marketplace or in a hierarchy independent of human intervention.

Further economic theories assume that the firm faces a demand curve outside of its control. However an important objective for management is to increase the demand for its products by branding, marketing or inventing entirely new markets. Not only is management concerned with increasing demand, new age management is concerned with altering both the internal and external environments in which the firm operates.

From a managerial perspective therefore, vertical integration offers considerable advantages including –

- The improved coordination of activities which reduces inventory and other costs
- Avoidance of time-consuming costs, such as price shopping and communicating design
- Near immediate compliance with specification details
- Reduced negotiation of contracts.

Integration economies include cost reductions by eliminating steps in the firm's value chain, reducing duplicate overheads and cost cutting.

In terms of reducing duplicate overheads, the New Zealand electricity industry appears to be a classic case of regulatory dogma prevailing over common business sense. The pursuit of economic purity, by way of a near totally segmented industry, with multiple intermediaries all of which are entirely dependent on each other, suppresses any managerial effort for vertical integration. The benefits remain which are kept well away from consumers, for example lower power prices. The cumulative transaction costs are simply passed from the generator to the end-consumer.

The benefits

The general benefits of vertical integration appear to be equally comprehensive. They include the avoidance of the foreclosure of inputs, services or markets, improved market intelligence or technological intelligence, the opportunity for greater product differentiation, superior control of the market environment, greater ability to create new products and the synergies from better coordination.

Vertical integration is not without its dangers. In addition to the management costs prescribed by way of transaction costs economics these include –

- The potential burden of excess capacity
- Poor organisation
- Perpetuation of obsolete processes
- The creation of exit barriers
- The alignment of the firm to equally weak businesses
- The loss of access to information from suppliers or buyers.

Transactions take place between managed firms. Management not only manipulates the firm's resources, but also the marketplace. It is therefore management ability that is paramount to the success of the firm. Similarly, at farm level, the success of the firm is dependent on management ability, much of which appears to be directed at minimising risk.

An environment of change

The attributes of agricultural production are reasonably well understood. Farmers and growers are dependent on a nation's natural factor endowment. These resources, such as land, are geographically fixed, of which many have few alternate uses. Recently this dependency on New Zealand's natural resources has been overcome by farmers, for example, purchasing land offshore in Australia, America, Canada, Eastern Europe and South America. Further dependency has also been overcome by processors, such as Fonterra and now Silver Fern Farms acquiring either raw material or first stage product offshore.

New Zealand's outdoor livestock systems, with the exception of much of the pig and poultry industry, are influenced by biological and climatic variability. Before the mid-1980s farm systems were managed so that peak feed demand, such that which occurs during early lactation, coincided with spring pasture growth.

The feed supply curve is increasingly being supplemented by bought-in feed stocks and enhanced by the application of artificial nitrogen. Livestock farmers can anticipate variations in feed supply from that planned, but they are seldom entirely able to mitigate the effects of biological variability.

Orchardists and gardeners also attempt to reduce variability induced by annual variations in sunshine hours and, to a lesser extent, rainfall by managing crop load. Output volumes from land-based systems therefore at best fluctuate around expected levels, none of which is conducive to integration unless variability is overcome by scale or geographical spread. Conventional integration models, including the reallocation of capital, make little sense if the impact of variability in production cannot be overcome.

Seasonality

Output from pasture-based livestock and orchard systems is also mainly seasonal. The farmer enhances the natural biological system by attempting to maximise reproductive performance, controlling mating and plant fertilisation, and optimising subsequent growth. Nevertheless, in general lambs and calves are born in the spring and orchard crops are harvested in the summer and autumn. Farmers can shift lambing and calving dates, generally at some cost to output volume, in an effort to capture out-of season premiums. Orchardists appear to have even less flexibility in altering their crop cycles.

Seasonality of production ensures that industry processing capacity must meet peak output volumes. The option of simply failing to provide this seasonal capacity is unavailable at the industry level. However, the international consumer is not concerned with seasonality of output demanding food and fibre products 365 days of the year. Seasonality of demand is, however, expected during religious, cultural and ethnic festivals such as Thanksgiving, Christmas and the Hajj. Again, the motivation for vertical integration is at best mixed, and the disadvantages of seasonality have also to be overcome.

Price variation

Land-based output suffers from price variation. Only small quantities of global production in land-based commodities are traded. Most countries use foreign markets to absorb production beyond that destined for domestic consumption. As noted above, farmers receive a residual income from the sale of their land-based output. Fortunately they show a remarkable ability to absorb these price fluctuations. They can quickly reduce discretionary farm expenditure, usually fertiliser, and will freeze uncommitted personal income in the face of declining output prices.

Conversely, during periods of high output prices they will increase farm expenditure, usually fertiliser, development and drawings – notably expenditure on vehicles and home improvements. This is another important consideration. The phenomena of integration across international boundaries explains very little global agricultural production, processing and sale, with the exception of highly processed and refined foods and ingredients.

Most land-based industries including forestry are characterised by having many producers and comparatively few first stage processes. Large scale producers account for an increasing percentage by volume of farm gate output, a symptom of the structural problem commonly used to identify a collection of issues relating to land tenure, the size and the distribution of farms. Despite the increasingly bimodal distribution of farm size – part-time farmers on the one hand and large-scale units on the other – the individual farmer faces the classic horizontal demand curve in which the producer is unable to influence product price irrespective of output volume.

Few choices

Irrespective of the industry, there are rarely more than three or four first stage processors on a regional basis available to the farmer. Farmers are therefore confronted with a small numbers bargaining problem in that they have few choices available to them. The historic sanctuary of legislation to ease opportunism, perceived or otherwise, from few processors has now long gone, namely societal marketing boards. The small numbers bargaining problem is a source of motivation for vertical integration, especially to the producer looking downstream.

Agricultural export products attract trade barriers. With that go subsidies, tariffs, quotas, and government agencies. Across international borders this is expected to provide a significant deterrent to integration.

Farm output is often highly perishable. There are few products, either natural or man-made, more perishable than fresh whole milk. Livestock such as finished lambs and prime cattle should be processed when they reach appropriate grade standards as it is difficult to maintain them in this state. Carcass values decline if they slip outside preferred grading standards. Even newly-cut logs deteriorate unless adequately treated.

The only land-based output of exception is wool, which can be stored nearly indefinitely in dry conditions. Land-based farmers are therefore involved in the production of

perishable products which require some form of processing or cool storage to maintain value and enhance product life. The relationship between perishability of produce and integration has already been noted.

Easy subsititution

Land-based products are subject to coarse grading standards. Carcass traits of live animals are difficult to assess objectively and internal fruit blemishes are hard to identify without cutting to waste. Relatively low technology is employed in first stage processing, such as the production of essential commodities including milk powders, bulk butter and cheese, manufacturing beef, lamb carcasses, cross-bred wool and radiata pine logs.

Products can therefore be substituted easily between suppliers. For example, manufacturing beef is nearly indistinguishable in terms of country of origin, let alone processor or distributor. Substitution on the basis of raw product attributes has therefore not been expected until relatively recently. However, over the last decade, or possibly even less, the significance of country of origin in the food industry has grown at a dramatic rate. Note that country of origin is only one of a number behind the 'slow food' movement, which itself appears to be a reflection by consumers to better understand what they are eating.

However, growing consumer awareness towards the integrity of the value system is placing greater demands on traceability which may provide greater value to responsive farmers. Technological advantages based on product characteristics are also being pursued, especially new varieties in orchards. However, farm output, unlike much orchard and garden output, is often in a form unsuitable for end consumption. Land-based output commonly needs processing before sale.

Perishability

Only products suitable for consumption in their raw form such as fruit, and to a lesser extent whole milk, have any consumer value at the farm gate. Farmers and first stage processors are therefore mutually dependent, particularly in industries where output requires immediate processing. It is expected that alignment between producers and processors increases with increased need for processing. This point is not unrelated to perishability, as discussed earlier.

Producers' typical response has been to invest in the processing sector immediately downstream from the farm. Investment has occurred through retained earnings, for example, cooperatives such as in the dairy, sheep and beef, and kiwifruit industries although in the latter case this investment is relatively small compared with the dairy industry.

Output from biological production systems is inherently difficult to change despite farmers' apparent responsiveness to market demands. Breeding programmes are long term. Both land use decisions and enterprise choice decisions are of a long term nature.

Production cycles for forestry in New Zealand, while being some of the shortest in the world, are approximately 25 years. Pipfruit may take five to six years to reach break-even, the generation interval for sheep and dairy cattle is two years, and beef cattle more often three years.

Rates of genetic improvement are measurable in terms of specific traits being bred for, but such programmes are long term. Despite the slow supply response inertia implicit in biological production farmers, where possible, respond rapidly to market demand. For example, sheep farmers responded quickly to the acceptability of ram lambs in the 1980s – and orchardists have shown remarkable willingness to respond to the advent of new varieties. This is hardly the basis for integration, as the consumer is largely saddled with what is on offer. Contrast the rate of change in agricultural-based consumer products with those in the electronics or automobile industry.

Common reasons for change

An examination of farmers markets in New Zealand, of which there are currently 18 in the North Island, or abroad, demonstrates how rapidly farmers and growers have sought to vertically integrate their production systems – from pasture to plate. No longer are these markets the domain of fringe consumers or alternate producers. They have become a barometer of consumer choices and expectations. Some of this is from producers, but much is also from the consumer looking for reassurance on the source of their food.

On a larger scale this translates into traceability from an international market back to the farm gate, such as Silver Fern Farms' Farm IQ programme into Marks and Spencer. But whether or not the farmer or grower needs to own the entire value system, as has been conventionally pursued rather than owning and controlling critical parts, it will not be easily resolved. Of importance is the realisation that traceability, providing reassurance over food safety, genuine interest in food sources, environmentally sound production systems and animal welfare will only increase. These effects, not foreseen two decades ago, are likely to continue to stimulate the need for various forms of vertical integration. This may or may not result in ownership beyond the farm gate.

Greater awareness of food sources has spilled from first world middle classes to the emerging wealthy in developing countries, no doubt enhanced by food safety scandals of which New Zealand has not been entirely exempt. Coupling demand pull and supply push, in a manner that has not been seen before, is likely to result in an array of diverse responses in the future all of which will require various types and forms of vertical integration on behalf of farmers and growers.

The need to overcome many of the attributes of conventional pastoral agriculture and horticulture in New Zealand remain, especially variability, perishability and seasonality. The continued pursuit of vertical integration through investment, alliances or networks will also create failures to which the advocates of spot markets will, no doubt, gloat.

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Livestock procurement in New Zealand Current challenges

Procurement in any commodity supply chain is challenging and imbalances between supply and demand make it more so, assuming that there is genuine consumer demand or surplus capacity at an intermediary processing stage as in the meat industry today. The other aspect which brings challenges to procurement is behavioural, that is the behaviour of both buyers and sellers. In many cases, those behaviours are influenced by the level of supply relative to demand. This article describes these two factors, supply and behaviour, in the New Zealand meat industry.

Meat processors try to align to the needs of a multitude of markets, while individual producers follow flexible business strategies best suited to their farming properties and competencies. Therefore it is an industry with relatively weak, spot-market relationships, and the processing sector faces quite hostile conditions and is focused on competition, particularly at the procurement end.

Not surprisingly, trust within the industry is generally poor. As processors and producers struggle in this environment, there is a risk that their conduct could exacerbate the situation they are trying to overcome. Processors are trying to forge stronger relationships with customers and suppliers.

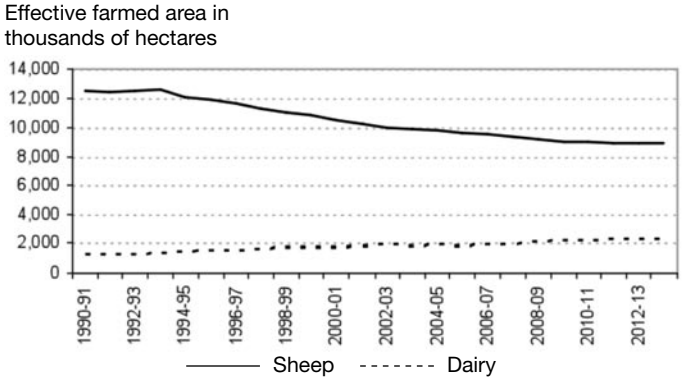
However, counter to this, many producers are unwilling to commit to processors, and behave more opportunistically. Processors may be at times forced into opportunistic behaviour to procure the livestock they require, which then weakens the relationships they would like to strengthen. The current over-capacity brought about by change in land use away from sheep and beef production is exacerbating the competition for livestock and encourages opportunistic and disloyal behaviour amongst producers. It also encourages processors to focus on processing market share to keep plants full, retain employees and manage costs.

The short-term power within the New Zealand meat industry moves up and down the supply chain depending on various external factors which affect supply and demand. The market power lies with the retailers because of the margins they add to the meat they sell, but they do not control the entire industry. The banks have also had considerable influence over the industry as they tended to have the most capital invested in the processing sector.

The real long-term power lies with producers because they control the supply of livestock and have the ability to change farm enterprise. This is where the power lies currently. It is producers' use of their power that determines whether meat processing companies make a profit and the future shape of this industry, particularly the procurement environment.

Changes in supply

New Zealand sheep and beef farms have been consolidating over a number of years. The current number of sheep and beef farms stands at about 13,600 with an average size of 664 hectares across all farm classes. The area under sheep and beef is declining as producers with the most versatile land and resources look for more profitable agricultural options such as dairying and dairy support, arable and the real estate options of housing and lifestyle blocks. Forestry is another potential land use change, particularly with the introduction of the Emissions Trading Scheme.



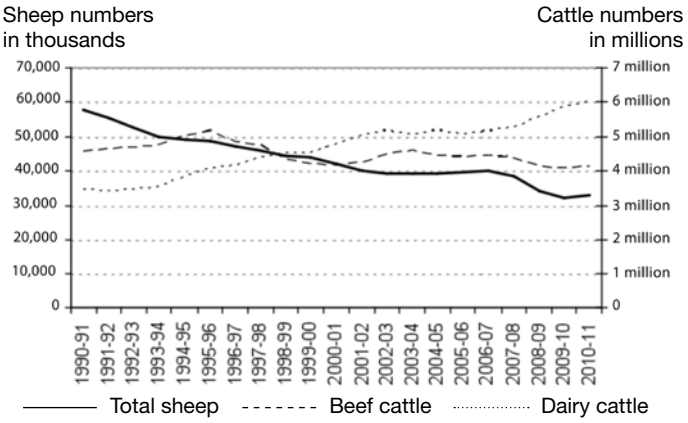
Land use change in New Zealand from 1990 with forecasts

Large areas of the South Island high country, which were farmed very extensively with sheep and some breeding cows, have been returned to the government for conservation. The graph shows changes in land use over the past 20 years. Water for irrigation is also encouraging land use change in areas such as North Otago, Canterbury and now potentially Hawke's Bay and Wairarapa.

Although sheep numbers in New Zealand have fallen significantly since the 1980s, and this decline has continued through the 1990s and 2000s, the level of lamb meat production has remained above or similar to the 1990

production level. For example, in 2009-2010, lamb meat production was only one per cent less than in 1990-1991 but from 43 per cent fewer sheep. This is because of widespread use of on-farm technologies, heavier carcass weights and the introduction of more fecund breeds leading to an increase in lambing percentages.

This increased lambing rate resulted in the number of lambs within the national flock remaining relatively constant although the number of sheep dropped. In addition, from the 1990s the use of scales, ultrasound and selective breeding practices has led to an increase in the average weight of the lambs being produced. Improved subdivision, pasture performance and quality have also contributed significantly.



Livestock numbers in New Zealand

Uncertainty of supply

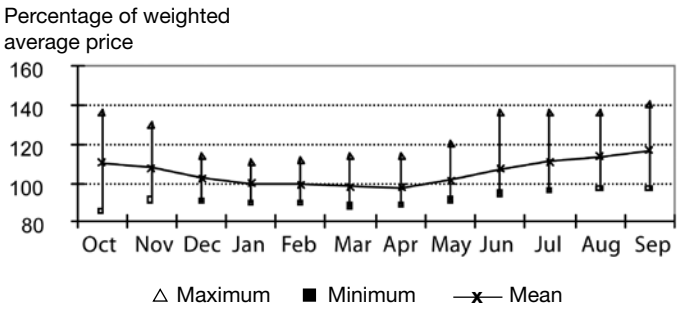
New Zealand's farming systems are seasonal, pasture-based production systems. These systems provide a comparative advantage of relatively low cost production which yield a natural product. In addition, the highly seasonal nature of these supply systems requires some excess processing capacity, with variation in weather adding to the uncertainty of supply and quality. This seasonality and uncertainty of lamb supply encourages processors to offer procurement premiums and engage in intense competition. When frozen carcasses were the predominant product, continuity of supply was not an issue. However, with the trend to chilled cuts, the need to reduce seasonality of supply has grown.

Processors have provided the signals to producers around this need for less seasonality. Producers have responded, and this is reflected in the pattern of supply of lambs being less seasonal in 2010-2011 than in the mid-1990s. The peak slaughter period has also moved forward slightly from April to March, reflecting improved on-farm efficiencies.

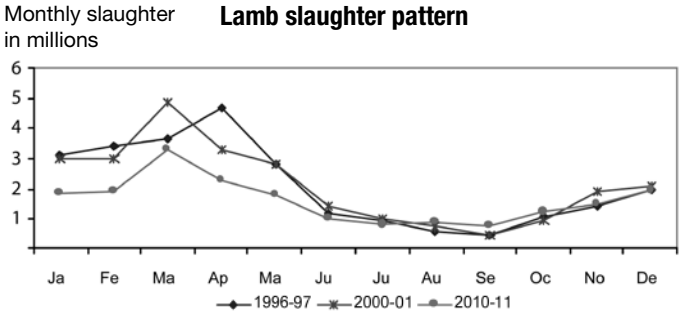
The challenge around seasonality could play out a number of ways.

- It may worsen as land use change pushes sheep and beef cattle further into the hills
- Producers may farm to improve efficiency and reduce cost of production creating a more seasonal supply
- Farm systems may change to produce forward store stock for short, rapid finishing on those remaining lowland farms

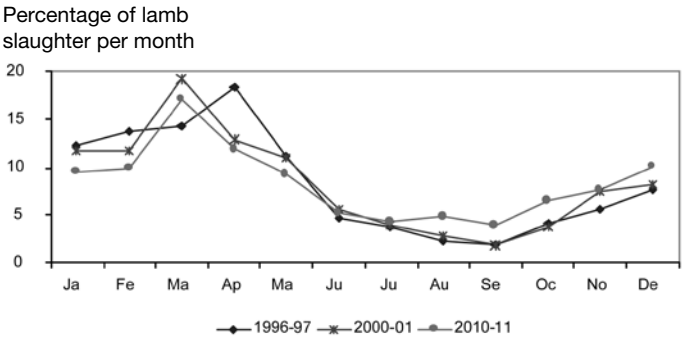
Seasonality and variation in farm gate prices for lamb



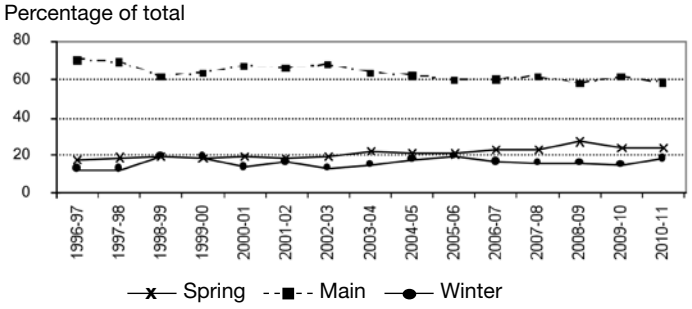
Lamb slaughter pattern



Lamb slaughter pattern for selected years

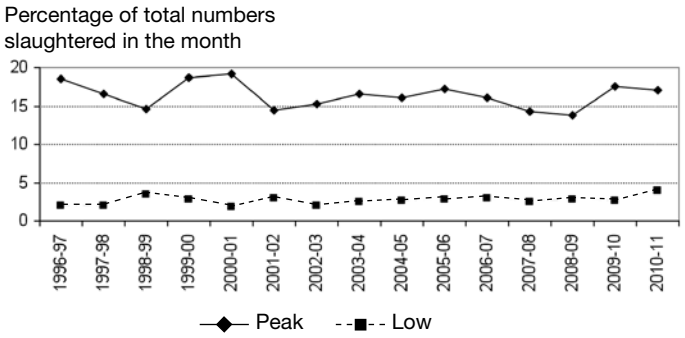


Percentage of lamb slaughter by season



- Hill farms may adapt to supply finished livestock, albeit at the cost of lower overall output.

Over the past 15 years lamb supply has become less seasonal and the total supply has fallen. However the peak processing requirement as a percentage of the total lamb slaughter numbers has remained fairly constant. This suggests that although there is considerable over capacity – 1.25 million peak capacity versus 844,000 peak slaughter in 2010-11, the processing capacity as a percentage of total slaughter numbers need to remain at about this level. It also suggests that a range of processing factor scales and configurations



Peak and low lamb slaughter percentage

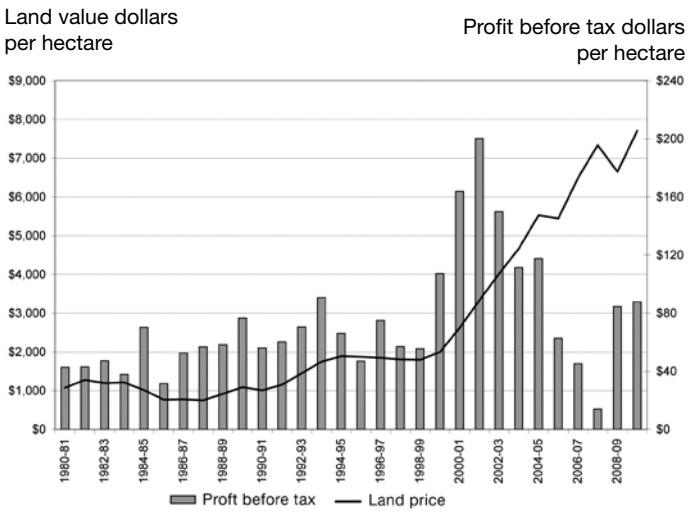
are required to manage the continuing peaks and variations in livestock supply.

There is often the comment that lamb farm gate prices have become less seasonal or less variable. This is not the case when price variance within a given season is calculated and divided by the weighted average price. The variation has averaged around 10 per cent, but has been as low as 5 per cent and as high as 18 per cent. The basic underlying price pattern has remained much the same for 30 years, with the only real deviations from this being during major shifts in the global protein market prices within a season.

What has changed however, is the variance in farm profit margin. In the last three years, the estimated profit margin has increased markedly, and the coefficient of variation in the margin has decreased. What this means is that producers are making a profit from lamb sold at all times of the year. This has historically not always been the case. It is the current high level of farm gates prices which is behind the perception that seasonal pricing signals have weakened, when in fact they have remained similar to the past.

Land price concern

Producers currently appear financially secure, but much of this recent gain in wealth could evaporate should land prices fall back to a level more reflective of productive worth. There is therefore a strong need for innovation in farm systems to provide a financial buffer against this scenario, and provide a sustainable source of profit increase rather than relying on favourable price rises due to demand exceeding supply.

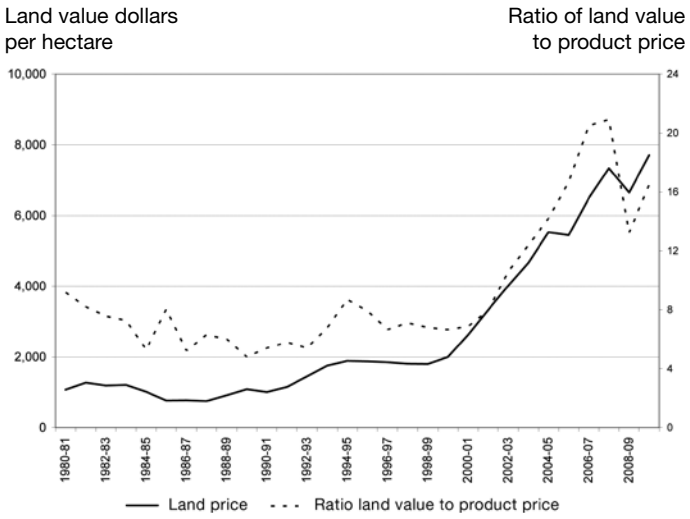


Farming comprises two businesses. The first is a real estate or land business and has been performing quite well. Land value appreciated strongly in response to sheep and beef farm profitability in the early 2000s. It continued to rise even though profitability went through a period of decline. The gap between land price and profit is likely to be narrower for 2010-11.

Much of this increase in land price is due to the opportunities available associated with dairying rather than underlying profitability of sheep and beef production. The second, and more important business in terms of generating a sustainable wealth stream, is the farming business. This business has been performing with less consistency.

The main concern is that the ratio of land value to product price has increased significantly, which suggests that land value has appreciated ahead of rises in product price, and also productivity. This is not a trend which can continue without serious effects on future profitability of sheep and beef farming relative to alternatives, and on the ability of the next generation to purchase farms and to then be able to service the associated debt.

The continued lack of balance around these ratios will encourage new producers to pursue less risky, and in many cases, less labour intensive systems such as dairy support. The threat of dairy support must not be overestimated although there will be limits to the extent of growth in dairying, either regulated or economic. Dairying may also be pressured by other land use options. This competition for dairying land will encourage expansion of dairying into non-traditional areas and land classes.



Land value per hectare and ratio of land price to lamb price

Behaviour of producers and processors

The current shape of the sheep meat industry in New Zealand is due to behaviour of producers and processors, and some of the fundamentals of pastoral farming. The main behaviour of producers that shape the industry are the prevalence of spot market relationships between many producers and processors, and the lack of investment in the

processing industry.

The spot market relationships, caused by the desire for flexibility and opportunism, mean that processors have no certainty of supply. Some producers have adopted contracts with processors to supply lambs at specific times and to specific customer requirements. However, producers, and very occasionally processors, have often historically treated contracts with a cavalier attitude depending upon the market conditions. Unfortunately, a number of producers continue to behave in such ways.

Independent livestock agents contribute to the lack of loyalty of some producers to a given processor, but it is the producers' choice to use the agent. However, what this suggests is that processing companies have work to do in demonstrating and offering a better proposition and relationship to those less loyal producers. There will always be a role for independent agents especially in times of variability when a processing company requires some additional lambs to meet a market obligation, or for procuring livestock from those uncommitted producers who really prefer to gamble. These agents also play an important role in helping with store stock transactions.

A fair penalty

Research on contracts with producers along the dairy beef supply chain in the mid-2000s showed that producers generally felt that a fair penalty for someone else breaking a contract with them would be about 20 per cent higher than if they themselves broke the contract. The most extreme case was one producer who felt execution was a suitable penalty while he himself deserved no penalty if he broke such a contract – clearly not an ideal contractor.

This illustrates the variety in human nature, and the perception that a loss caused by your own behaviour is less than one caused by someone else's, or there is a degree of want to have your cake and eat it. Winding the clock forward to today, livestock procurement contracts have become agreements or intentions to supply, and those that state a price will, regardless of the wording of the contract, be minimum price contracts. Companies have allowed this by not enforcing contracts. This comes down to –

- Excess processing capacity
- Producers having a range of competitive choices
- Processors lacking the intestinal fortitude to hold producers accountable for breaking contracts and forgoing some market share while establishing a reputation for being tough but fair.

It is interesting to note that in the arable sector very few contracts are broken. Those that are broken are penalised to reflect the cost of replacing the volume lost and it is certain that a contract will not be forthcoming the following year. This is an industry with little, if any, competition for supply than the meat processing sector, especially as the demand for grain in dairying grows. What this reflects is a difference in culture as to what is acceptable and what is not, and this must change. What is important to note is that the contract enforcement is actually carried out by independent agents or middlemen – a role that is not often fulfilled by livestock agents, but may be an opportunity.

Price breakers

Something that many livestock representatives have noticed in relating with producers is that producers have become more price-focused than in the past. This is even though the producer will be making a profit margin far higher than any other time in the past 30 years, almost regardless of what remotely competitive price is offered especially for lamb. There are frequent tales of producers breaking an agreement to supply for a few cents a kilogram. Just what is causing this behaviour is difficult to determine, but it is human nature. The reasons might include –

- The high level of producer debt that has built up over the past few years brought about by expansion or previous lack of profitability
- The need for producers to generate a more competitive return on investment and effort
- Producers may have become more analytical in considering their land use options or the performance of their farming business
- Support providers such as bankers, accountants, livestock agents or advisors are encouraging it
- Greed
- Producers exercising their power and perhaps 'getting even'.

Whatever the motivation, it is clear that some attitudes to business relationships have hardened. Unfortunately, the excess capacity and current strength of independent agents will allow this kind of attitude to flourish.

Controlling factors

A related concern is that discussions most sheep and beef producers have are around price, weather, government policies and post-farm gate industry performance. These are all variables they have little or no control over. Contrast this with the discussions that dairy producers have which revolve around factors they can and are influencing, such as feeding levels, costs, production levels and profitability.

Admittedly the industry models are different and dairy producers do not need to be directly concerned about marketing and pricing, and they receive daily feedback about production. However, there is a real need for producers to focus on productivity on-farm, which will actually go a long way towards resolving some of the post-farm gate challenges such as capacity use and matching supply with customer demands.

The processing companies were once regional companies so were not directly competing against each other for livestock to process and market. De-licensing in 1981 allowed processors to expand to areas in which they had previously not operated, bringing rise to competition for livestock. As an aside, this has contributed to lesser co-operation between companies in investing in market development, and in research and development.

The moving competition

The excess capacity in the processing sector has meant that responses to the behaviours of producers have been to become involved in intense price competition and encourage spot market relationships to the detriment of their individual and collective profitability. This has reinforced opportunistic behaviour in producers. Any differences in market prices are rapidly reflected in market share, and the ability to keep processing factories operating and customers supplied. The intense competition ensures that these differences are exploited by competitors, and those attempting to lead prices down will soon return to the pack.

In addition, the lack of livestock supply is encouraging processing companies to begin procuring livestock well in advance of when it is needed, by store stock contracting and ownership. This livestock is often grazed on the properties it was bred on, or may move on to a specialist finisher's property. This frees up capital for producers, but locks in supply volumes and to some extent timing of that supply for the processor. It does, however, tie up valuable working capital from the processors' balance sheets. In essence, processors have become some of New Zealand's largest livestock owners and farmers, and by default, industry body levy payers. The procurement battle has moved up the supply chain.

Better relationships

Some companies have been working very closely with specific retailers to supply livestock to them from specific producers. These relationships are partnerships between the producers, the processor and the retailer, involve contracts between processors, retailers and producers, and also involve information sharing and much goodwill built up over many years of business. The contracting of supply of meat products to customers adds further to the competitive pressures facing processing companies because they need a secure supply of often quite specific livestock to fulfil their contracted obligations.

However, the intense competition for livestock and the uncertainty of supply means that lower volumes of product are contracted to customers by processors than might be otherwise possible or desirable. Currently, many producers have lost sight of what it is that they are producing, who the ultimate consumer is and what they want, or can afford, to buy and eat. Just because there is a lot of feed around, or farm gate prices are not greatly different across the weight ranges, it does not mean that livestock should be grown to heavier weights or for longer.

Processing companies have to find a consumer for those products and they may end up being supplied after the consumer would normally want them, being too large for the household unit or too expensive. There are specific niches for heavier carcasses or larger cuts, but they are niches. Producers need to keep an eye on market signals – processing companies are generally continuing to provide these and they have not changed much in the past few years.

Procurement in the future

The recently completed Red Meat Sector Strategy highlighted weaknesses in the current procurement model, suggesting that it was inefficient and poorly aligned. This article also highlights some of the weaknesses and challenges in this part of the supply chain. Procurement is about a transaction, or a series of transactions. Therefore relationships and risk management are the main elements to success, along with a price which is competitive and comparable to other offers. The price needs to allow the producer to at least be profitable, if not to be as profitable as other land use options. Similarly, it must allow the processor to be profitable and to continue to invest and develop opportunities.

There is a need to increase the degree of contracting to supply. It is naïve and inappropriate to consider 100 per cent contracted supply, the production risks are just too great. However, it is not unreasonable to seek some agreed percentage of supply from a producer to maximise the return on the relationship.

Greater transparency

There is also a need to reintroduce price to the contracts, not just as a minimum price, but a fixed one, or pre-determined based on a basket of inputs as part of an agreed formula, under an enforced contract. This provides certainty for all involved, including producers, processors and customers. This is about farming for a margin, knowing what that is and being comfortable that a profit can be made at that price. It is about breaking opportunistic behaviours.

This greater transparency and certainty would provide the much needed confidence to invest at all stages along the supply chain with a focus on efficiencies to reduce costs from farm to market, and developing new opportunities to create more revenue from the market. This is how value is created within an industry, rather than arguing over how the existing value is allocated. Processors need to start enforcing these contracts, and perhaps independent agents can assist with this.

The uncontracted volume is also important in filling gaps caused by contract failure from disloyal or opportunistic behaviour or climatic events. This uncontracted livestock volume is required to take advantage of opportunities which emerge in the market, not from playing the internal livestock supply markets. These opportunities will always emerge more from chance and being prepared, and will often offer lucrative returns or simply the ability to mop up surpluses. These returns can benefit the industry if they add to an industry which has stable supply and contract-based procurement.

Alan McDermott is the Agricultural Manager of ANZCO Foods Ltd. The views expressed in this article are entirely those of the author.

Chris Kelly

Governance of corporate farms

Corporate governance is a well-accepted and established component of organisational bodies. It is an important part of the success of a wide range of organisations including co-operatives, corporates, public limited companies, family businesses and others. Effective corporate governance is essential to the success of an organisation, although formal corporate governance functions and activities are not common in agricultural enterprises. This is mainly because most farms are relatively small, are family-owned and controlled and generally there is not an owner and operator split.

The activity of corporate governance is, however, necessarily expanding in agricultural enterprises. This is at least in partly due to the well-known fact that New Zealand agriculture is undergoing a change, of having a smaller number of larger farms, an ageing farm ownership and management age profile and an increasing number of absentee owners. In addition is the penchant for offshore organisations wishing to invest in New Zealand agriculture as a source of safe, high quality food products.

I believe this trend will continue, and as a result we will see an increasing focus on corporate governance in New Zealand agricultural companies. It makes good business sense to ensure the activity of corporate governance is well embedded in organisations including small and medium enterprises, many of which are smaller in terms of revenue and assets than a significant number of our larger farms.

Corporate governance and why it is so important?

There are probably as many definitions of governance as there are farms in New Zealand. The New Zealand Institute of Directors describes corporate governance as – good governance is the effective separation, management and execution of the relationships, duties, obligations and accountabilities of an entity such that the entity is best able to fulfil its purpose.

Good governance exists to add value to an entity. At the heart of good governance is an effective governance culture. A company can theoretically have sound governance, structures and processes, but without an effective governance culture, a board can fail dismally. The central resource in governance is the wisdom with which the board members enter the boardroom. Eliciting this wisdom on the right issues, at the right time and in the right form is not easy.

An effective board with an effective governance culture can add immeasurable value to a company. It can literally mean the difference between an excellent or a mediocre company.

The effective separation of governance from management is a tried and true principle of company organisational structures. The logic of this separation is simple and compelling. Companies need checks and balances. Management, with their day-to-day activities of running companies, are often engrossed in the detail of the business. They can overlook longer-term matters such as strategic opportunities, risk management and potential problems which might put an enterprise at legal risk.

All this is better undertaken by people relatively independent of an organisation, both financially and personally. Independent scrutiny of financial and strategic performance brings necessary rigour in the success of any company.

At this stage, readers might say – That is fine for traditional, large companies but how does it apply to farming organisations? In my view, effective corporate governance is as important, or even more so, in large farming organisations than it is in many small and medium enterprises. I shall expand on my logic below.

Role of the board

In larger, more formal, organisations there are a number of well-known legal requirements of the board such as –

- Appointment of auditors
- Signing off on audited annual accounts
- Setting fees
- Ensuring risk policies are in place
- Appointment of the CEO
- Ensuring companies remain solvent
- Setting and monitoring budgets including capital expenditure.

It is, however, in the less tangible areas in which the board can add real value. As William W George, Director of Goldman Sachs, once said – 'avoiding prison should not be the objective of the board of directors'. It should be to build strong enterprises. Therefore the role of a board in ensuring best practice governance includes such things as involvement in management of the strategic plan of a company, and injecting more objective and alternative thinking into

management's view of the company.

Directors of a company represent the shareholders, whereas management often acts to protect the company and its staff. Companies with effective governance processes manage these sometimes conflicting views by ensuring there is a healthy tension between governance and management.

Why corporate governance is important

As the number of corporate farms and other ownership models such as equity farming continue to grow in New Zealand, there will be an increasing number of farms where the ownership is separated from management. This is no better illustrated than in Maori incorporations where owners can be measured in the hundreds. In these cases there are good, often legal, reasons why effective corporate governance is important. Despite this, I know a number of small and medium enterprises with revenues and assets of significantly less than $10 million, often family-owned, which benefit from effective corporate governance.

Why should particularly larger farms be any different? Just because a business or a farming enterprise is privately or family-owned does not mean it cannot benefit from effective corporate governance. In fact, small family-owned organisations can often benefit significantly from independent and objective input into the operations of a company.

Farmers tend to live and think day-to-day. They worry about the weather, they worry about whether they have enough or too much feed and about where they can get the best price for their products. The bigger more strategic issues, such as consideration of alternative land-use activities, better management of their assets and balance sheets tend to be lost in the day-to-day activities. It is these bigger issues which can make the difference between a mediocre and a successful organisation.

Case study – Landcorp Farming Ltd

Landcorp Farming is a reasonable sized company. It owns 122 farms, has an asset base of approximately $1.6 billion and revenue in excess of $200 million annually. It is a state owned enterprise and all the shares in the company are owned by the Crown. Despite this, a main platform of the State-Owned Enterprises Act 1986 is for state owned enterprises to '… be as commercial as if they were non-government owned.'

The board of directors have a number of legal requirements they undertake which include signing off on the annual accounts, ensuring the company remains solvent, declaring dividends and the like. I would like, to focus on the less formal benefits which sound corporate governance brings to Landcorp.

Background diversity

Landcorp Directors come from a wide diversity of backgrounds. Generally, they are appointed for a six-year term to ensure there is fresh blood from time-to-time. Of the eight directors, there is not one practising farmer. Their skills include financial, strategic, governance, iwi and Maori relationships and the like. Twice a year, the governors visit farms and experience the activities of the company's operations.

This diversity of backgrounds and experience has enabled Landcorp to operate far more effectively than without this over-arching governance role. Examples include the following

- **Safety** Landcorp has established a safety committee. One of the directors who has experience in this area is a member of that committee. Activities, such as the compulsory wearing of crash helmets on ATVs, ensure high levels of safety are maintained.
- **Training** Particularly in times of adversity, it is tempting to cut training budgets. As farming becomes more technical and objective, the need for technology transfer and uptake of new technologies with the aid of training is becoming more important. Directors provide a valuable input.
- **Internal audit** As opposed to the formalities of an external audit of the company, Landcorp has an audit committee which, amongst other things, scrutinises internal audit procedures. This is a valuable role the board plays to ensure processes are in place to minimise such things as fraud, and to ensure effective policies are in place.
- **Capital expenditure** The board's role in scrutinising capital expenditure to ensure it is used appropriately is extremely valuable.
- **Dividends** Understandably, management would like to minimise dividend payments and maximise retained earnings. The board, as representatives of the shareholder, has another view and the creative tension between these two views is vital to ensure a successful dividend policy.
- **Strategic planning** Once a year the board spends a full day examining the company's strategies and strategic planning. This is a very valuable activity for management and the result is often better for long-term interests of the company.
- **Annual approval of budget** Management benefits significantly from external scrutiny of budgets where both revenues and costs are challenged and debated.
- **Directors challenge management** They also ensure management does not talk itself into undertaking activities before sound analysis and thought.
- **Advice** Given the diversity of backgrounds of the directors, their advice and challenge on a wide range of smaller issues is very valuable.

Conclusion

Inevitably corporate farming will increase in New Zealand as more absentee owners become involved in agriculture. There are sound legal reasons why effective governance is important in corporate farming. Despite this, I suggest effective corporate governance can add significant value to many other, often family-owned, farming enterprises, the result of which is likely to be a more effective enterprise.

Chris Kelly is the Chief Executive of Landcorp.

Derek Moot

Perennial ryegrass – saint or sinner for New Zealand pastures?

Perennial ryegrass is the most commonly sown plant in New Zealand pastoral agriculture. It provides flexibility in grazing management and, in its vegetative state, can be a high quality feed for animal production. However, the ability to maintain high ryegrass yields depends on adequate summer rainfall or irrigation to minimise soil moisture deficits, a supply of nutrients and appropriate grazing management. Association with white clover has provided some of the nitrogen requirement and improved overall ryegrass-based pasture quality. Clover content of greater than 50 per cent has consistently been shown to maximise animal intake and production.

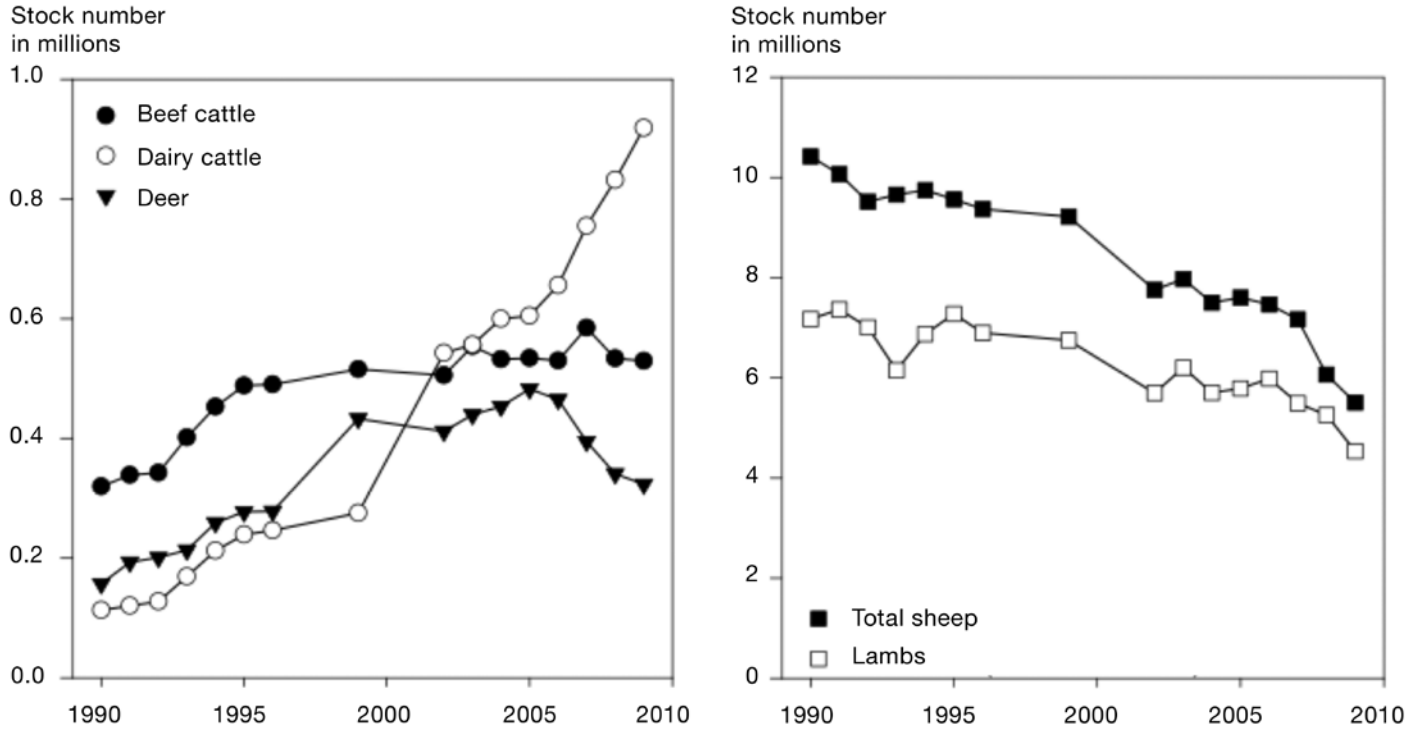
Long term domination

New Zealand grazing systems rely very heavily on the complementary nature of the relationship between perennial ryegrass *Lolium perenne* and white clover *Trifolium repens*. Perennial ryegrass is suited to intensive grazing systems and can easily be conserved as hay or silage. It is the basis for pastoral farming in New Zealand and is likely to remain so for some time to come.

This reliance on ryegrass and white clover means they have dominated agricultural research activity for the past 50 years and extension activity has been provided by a complicit agribusiness community. In addition, there is a continual release of new cultivars to meet farmer demands for improved pasture production, persistence and resistance to pests and diseases. The New Zealand dairy industry has been encouraging research and extension with the national herd expanding from 3.84 million cows in 1994 to 5.26 million in 2007.

Much of this expansion has come from the conversion of less profitable sheep and beef properties in the South Island. In Canterbury, livestock numbers over the last 20 years show an extra 800,000 dairy cows have displaced almost five million sheep.

Changes in the number of beef and dairy cattle, deer, sheep and lambs in Canterbury between 1990 and 2009

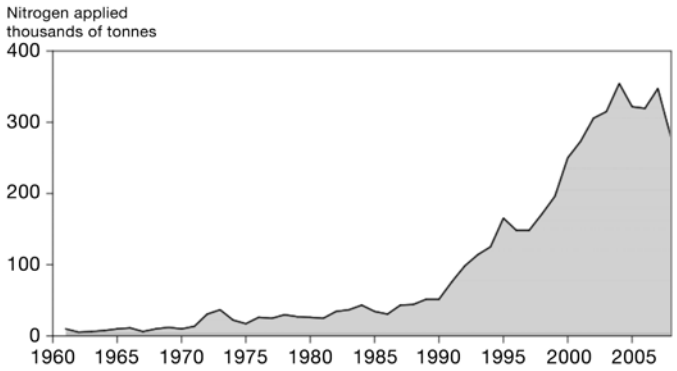


The low annual rainfall of around 600 mm and low water-holding capacity of the soils in the province has meant that dairy conversions are only possible in irrigated areas. Canterbury now has 364,000 hectares under irrigation which represents around 70 per cent of the nation's irrigated land. The province also has the largest average herd size of 700 cows, stocked at 3.3 cows per hectare on average pasture yields of 12 to 15 tonnes of dry matter a year.

Growth in nitrogen use

In most cases the sole grass sown on these farms is perennial ryegrass usually including white clover. However, regular nitrogen fertiliser applications used to maintain maximum pasture growth rates throughout the milking season inevitably led to low pasture clover content. Nationally this has led to the increased use of nitrogen fertiliser, from 50,000 tonnes of nitrogen applied in 1990/91 and 300,000 tonnes 10 years later. Alternatively, farmers may focus on pasture quality by grazing management and limit nitrogen applications to the shoulders of the season to encourage white clover content in summer.

Total nitrogen fertiliser applied in New Zealand



This article examines the role of perennial ryegrass and clover in sheep and dairy pastoral systems and highlights strategies to maximise clover content in pastures. The issue of ryegrass endophytes is not covered because it has been substantially reviewed in other publications. In short, selection of an appropriate ryegrass endophyte is usually more important than the individual cultivar used. Where insect challenges are large and linked with periodic water stress, endophytes are required. Where water and nutrients are always optimal, for example fully irrigated pastures, endophytes are less important.

Pasture production

At its simplest, pasture production is the product of the amount of light intercepted and the efficiency of its conversion into dry matter. The amount of light intercepted is quantified by the green area index which represents the canopy of green leaves. In a pasture, maximising light capture is inevitably compromised by grazing. This reduces the green area index to below the critical level at which 95 per cent of the light is captured. In practice, the targeted grazing residual in dairy systems reflects a balance between the conflicting needs to graze a pasture before green leaves begin to age, and the need to leave sufficient herbage for rapid re-establishment of the photosynthetic canopy.

For perennial ryegrass, grazing is suggested after the third green leaf on most tillers has fully expanded. Grazing management decisions including rotation length, the use of supplements and application of nitrogen fertiliser can then be linked to the development of these three green leaves.

Often forgotten is the effect of these decisions on the light-seeking clover growing within the sward. During the period in which the canopy is recovering, light not intercepted by green leaves is lost from the biological system. To maximise leaf expansion, adequate water and nutrients are required with temperatures in the optimum range for growth and development.

Efficient use of light

The efficiency of transforming light into dry matter reflects the rate of photosynthesis of plants. This is dependent on water, nutrients and temperature. At a fundamental level tropical grasses such as kikuyu are more efficient at light conversion than temperate grass species such as ryegrass, tall fescue and cocksfoot because of differences in their photosynthetic pathways. At a species level, the optimum temperatures for ryegrass are lower than for white clover, which is why pasture production in the winter, early spring and late autumn is predominantly from ryegrass.

Studies on ryegrass and other perennial grasses such as cocksfoot have shown that the results of water stress on photosynthesis were compounded by nitrogen deficiency or sub-optimal temperatures. Therefore whenever pastures are limited for water, nutrients or temperature, both leaf expansion and photosynthesis are reduced. Together they limit pasture production.

Recent research has quantified this for dryland pastures in New Zealand. Water use efficiency in spring of pure ryegrass was 13 kilograms of dry matter per hectare per millimetre of water compared with 20 for perennial ryegrass/white clover and 28 kilograms of dry matter per hectare per millimetre for lucerne.

The advantage for the pure legume lucerne was due to it never being deficient in nitrogen, compared with grasses which always require an external source of nitrogen, and are therefore frequently nitrogen deficient. The obvious urine patches throughout sheep and dairy pastures every spring highlights this chronic grass nitrogen deficiency. Despite their normal state of nitrogen deficiency, grasses use the available soil water at the same daily rate as more efficient legumes.

Conversion efficiency

Where water and nutrients are maintained at optimum levels, differences in total pasture production can only result from differences in either the amount of light intercepted or the conversion efficiency. Indeed, the biophysical environment at any given location is the major reason for total potential pasture production.

This biological limit also reduces the opportunity for

plant breeders to greatly increase pasture yields by plant selection. This is why only small incremental gains for perennial ryegrass have been achieved over the last 30 years. Seasonal differences in yield exist among cultivars, associated mainly with heading date, but gains in late winter or late spring production are largely offset by poorer early spring and autumn growth.

Results from an extensive national network of forage variety trials highlight the uniform yield among cultivars under optimum management. Averaged over all trials, the highest yielding new cultivars produced around one tonne per hectare per year more than the 35-year-old public cultivar Nui.

These results suggest that differences in seasonal growth rates of cultivars have mainly come from selection for genetic differences in plant development processes rather than growth attributes. However the physiological basis of gains are seldom reported if they are known. This constant demand by farmers for increased perennial ryegrass yield may actually be detrimental to overall animal production. More grass production is always likely to come at the expense of the less competitive, but higher quality, legume or herb components.

Pasture nutritive value

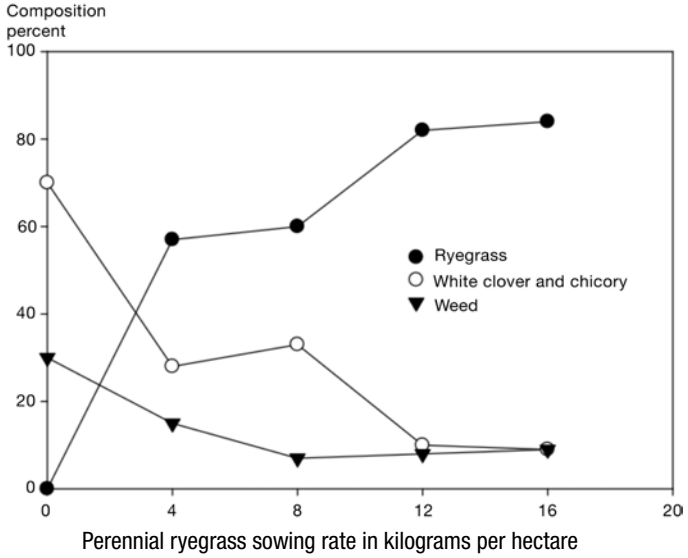
Pasture nutritive value is used as a relative term to describe the degree to which the nutritional requirements of animals may be met. The potential gains in pasture nutritive value from improved ryegrass cultivars also appear limited. The range of maturity dates available offers some opportunity to control the negative quality changes associated with flowering in ryegrasses. However, in a four-year dairy systems trial, no major benefit in terms of milk solids production or economic farm surplus was found from sowing different combinations of old versus modern cultivars. They did show differences in seasonal production patterns.

Equally, enthusiasm for high sugar grasses has been tempered by the inconsistency of trait expression, suggesting a genotype x environment interaction, and difficulty in confirming intake or animal performance gains. Plant breeders are currently developing white clover populations of high water soluble carbohydrates. These selections are at an early stage and unlikely to be commercially available for several years.

Their selections may actually increase the animal dietary preference for white clover and compound the problem of keeping white clover in a pasture. Evidence to support significant animal performance gains from the use of any individual cultivar of perennial ryegrass or white clover over any others also appears limited.

In contrast, the over-riding benefits of maximising legume and herb components within a pasture are well documented. In numerous grazing experiments, milk and meat production has been shown to be lowest on perennial ryegrass and significantly increased as the legume and herb content increases. These results are consistent with several studies for grazing preference that have shown ruminants prefer to eat a 70:30 clover to grass diet. The target for plant breeders is therefore to select for more competitive legumes and assess how current breeding strategies for perennial ryegrass have been detrimental to legume content within pastures.

Composition in the establishment year of pastures established with perennial ryegrass at five different sowing rates sown on four different dates in the year



Pasture establishment

Regardless of the cultivar combinations being used there are several viable strategies for establishing higher quality pastures within the initial 18 month establishment phase. As early as 1958 recommendations were that no more than 10 kilograms per hectare of ryegrass were required to establish a pasture that contained at least 20 per cent of other species such as legumes and herbs.

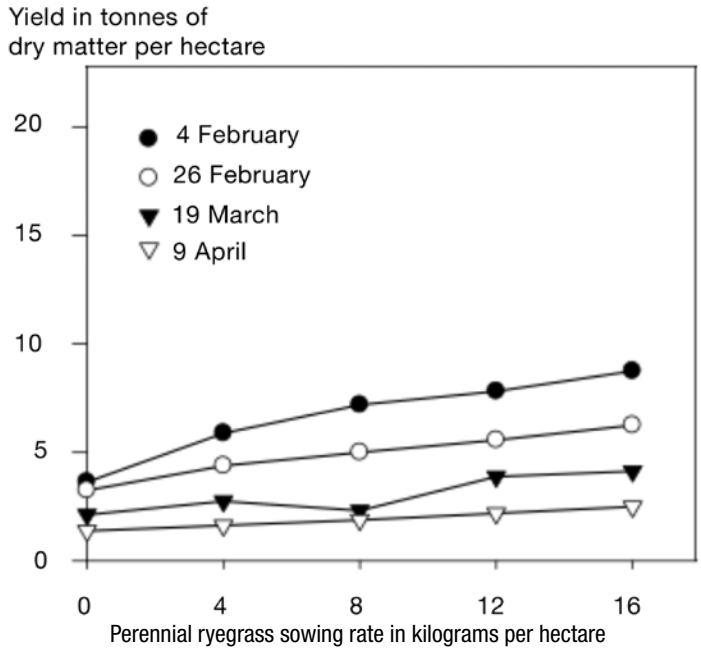
Extending this approach to include a range of spring and autumn sowing dates, white clover and chicory were successfully established at Lincoln University in pastures with four to eight kilograms per hectare of perennial ryegrass, provided the autumn soil temperature was above 14°C. Total dry matter production in the establishment phase was more dependent on the sowing date than the sowing rate of perennial ryegrass. In the second year the summer clover growth from pasture sown with four and eight kilograms per hectare produced the highest total dry matter yields.

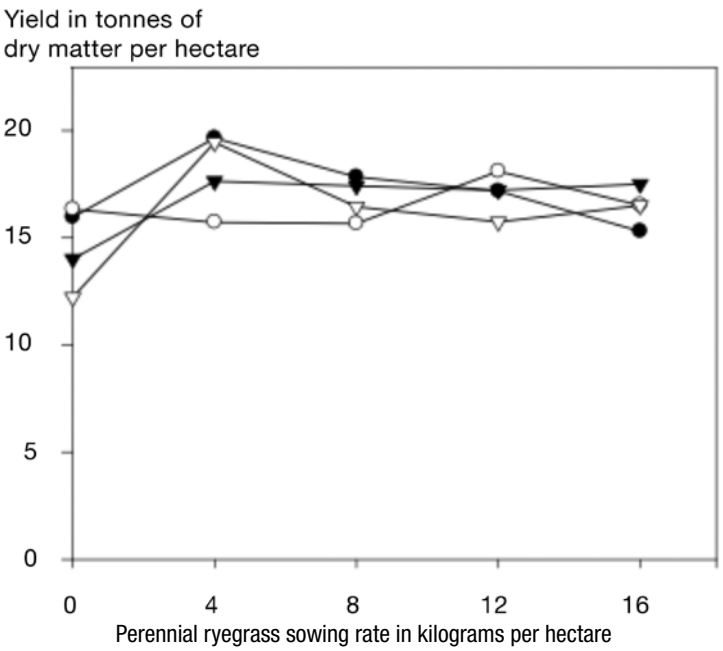
Clover competition

At a rate of 10 kilograms a hectare, about 500 perennial ryegrass seeds are sown per square metre and at least half are expected to establish when drilled. At emergence, light is usually the most limiting factor because nutrients and adequate soil moisture are expected in a well-prepared seed bed. Individual plants and species that emerge first and can display their leaf area early will then out-compete others.

White clover germinates rapidly and emerges relatively quickly, but it is a poor competitor with perennial ryegrass in terms of seedling growth. It is therefore not surprising that white clover establishment within pastures sown with 20 to

Total annual dry matter yields in below left, the establishment year to 25 September and below right, year two of pastures established with perennial ryegrass at five different sowing rates sown on four different dates





40 kilograms a hectare of perennial ryegrass is poor.

A problem is that the highly competitive perennial ryegrass does not recognise the fact that clover is not a weed. In an on-farm survey of 32 paddocks, poor white clover establishment was found to be compounded by poor direct drilling techniques, poor seed bed preparation and inappropriate early grazing management. To maximise clover establishment, soil nitrogen levels should be reduced, for example, using a cropping phase, a well-consolidated seed bed prepared to control sowing depth, phosphorous and sulphur but not nitrogen fertiliser used, along with frequent light grazing for the first six to nine months.

Separation

Research in the last 10 years has used spatial separation of grass and clover as an alternative strategy to remove the competitive advantage of the grass, provide ruminants with more legume, with mainly positive animal performance results. On-farm perception of difficulties in managing the separation in terms of weed, pest control and potential environmental problems have been highlighted as impediments to commercial adoption.

Successful dairy farm establishment has been attained with time separation of Caucasian clover from other pasture species. The Caucasian clover was sown in spring and the other species components over-drilled in autumn, or sown at low rates.

Until tried in a wider context, separation in spatially and in time remains viable in principle. Potentially the idea can be shrunk to micro levels with the use of alternate drill rows during establishment. By chance this strategy has been used successfully at a large paddock scale in summer dry environments. For example, the well-publicised planting of lucerne at Bonaveree farm in Marlborough provides a monoculture of legume surrounded by grass available on surrounding hill slopes, allowing animals to select their diet of choice. Similar landscape farming is now developing in other dryland regions.

Flexibility

Spatial separation and specialist pastures may also overcome a recent dilemma facing the introduction of herbs into multi-pasture perennial ryegrass-based species. The inclusion of chicory and plantain offer animal production gains, but unfortunately limit the ability to use cheap, effective broadleaf weed control chemicals during establishment. This adds to the need to ensure preparation before sowing is carried out properly. It also suggests we should look at pastures as dynamic components of livestock systems and not try to treat them all the same.

Having a range of mixed aged pastures across a farm adds flexibility and should allow higher quality feed to be provided. For example, a Southland farmer in a cool moist environment could sow a white clover, red clover and timothy-based pasture with the aim of finishing weaned lambs at 300 grams per head per day during summer as the initial phase of pasture establishment.

As the red clover begins to decline in years three and four, perennial ryegrass could be over-drilled directly into the sward. Fitting this higher quality pasture into a farm system may require an increased area of winter feed. Equally, undersowing legumes in spring beneath rape, cereal, maize or kale crops followed by direct drilling of grasses in autumn needs to be assessed to aid the slower establishing species.

The relative merits of these alternative strategies has to be determined, but until we start the conversation, poor quality perennial ryegrass-based pastures will continue to limit summer milk and meat production. The inevitable consequence of not making the change is greater reliance on imported supplementary feed and vulnerability to natural gas

prices which dictate the urea price. Alternatively we could use higher quality locally grown pastures, such as lucerne, and use other clover and grass species, such as tall fescue and cocksfoot.

Grazing management

A problem of a two species mix of ryegrass and white clover is the fluctuating nature of the dominance of each species. Stimulation of clover with phosphorous and sulphur fertilisers can lead to clover dominance which increases the nitrogen input from biological nitrogen fixation. In turn this leads to an increase in the grass component which then shades out the clover. This self-regulation has been defined as a predator/prey interaction. Maintaining the clover within the system was identified as difficult at a paddock scale due to the deposition of urine swamping the soil leading to grass dominant patches. This is maintained until the available nitrogen is used up and the advantage of the nitrogen-fixing species returned.

To maintain clover within a pasture beyond the establishment phase requires an understanding of the dynamics of competition between the two species. The basic principles to maintain white clover within dairy pastures were well developed by the 1960s. These can be listed as –

- Close grazing over winter when clover growth is low
- Frequent close grazing in spring, to control ryegrass seed head development and increase light levels to the base of the sward and to increase clover growing point density
- More lax grazing with a longer interval in summer to maximise clover growth and spread
- A hard autumn graze to promote ryegrass for winter
- Adequate supply of phosphorus and sulphur and limited use of nitrogen.

Dairy grazing systems that focus on pasture cover and grazing residuals to maximise light interception do not provide clover-friendly environments. These grass-based solutions raise the question of whether clover has any role in these systems. Those wanting to maintain clover within their system are encouraged to concentrate on spring management with limited nitrogen fertiliser, grazing to a low spring residual and development of a longer summer rotation.

Saint or sinner?

The dominance of perennial ryegrass in New Zealand pastoral systems is not an accident. It is the consequence of its unique ability to grow and persist in the majority of places where summer rainfall is adequate or irrigation available. The saint has frequently forgiven poor establishment techniques, inappropriate grazing management, erratic fertiliser application, and the diversity of climate and soil types that we have pushed it into. The saint has made the industry lazy, sloppy and lacking in innovation because it has served the New Zealand pastoral farmer so well. It has forgiven us our excesses and in the main it has recovered from most of them.

The sinner has commanded a high price. It has demanded attention from industry funders, researchers, extension consultants and the agribusiness community. It has created a large vested interest of inertia which has stopped asking fundamental questions. Is this plant the right one to be using?

Yes and no

The answer is invariably yes and no – but we need to ask the question. For many, perennial ryegrass will always be the grass species of choice. They will be on highly fertile, free-draining or well-irrigated summer safe land which can be cultivated and renewed at regular intervals. These environments are becoming fewer in number but we have not realised it yet.

The answer is definitely no on east coast dryland farms that I have worked with in the South Island. There are alternative grass and legume species which are more suited to different regions, soil types and locations that offer higher productivity.

Using them is more difficult. It frequently requires a change in fundamental mindset. Management practices must be modified to accommodate other pasture species. Farmers must acquire a new basic understanding of plant growth and agronomy. In general, farmers are animal people – they like their animals and make money with them – but that should not stop us having a conversation about their plants. That conversation is more difficult, needs to be part of industry strategies, and is fundamental to improving pasture productivity. Ceilings to current production levels, environment considerations and climate variability means the questions will need answers in the not-too-distant future.

Ignore and fail

There are three options to develop the answers for regionally specific solutions to improve quality of pastures. These are –

- An understanding of the biology of the legume or herb in question relative to the grass challenges
- Knowledge of how it interacts with the local soil moisture and temperature environment
- Appropriate back-up information on grazing management for successful integration into on-farm practices.

Ignoring any one of the three factors will lead to repeated failure of the most vulnerable species in the system, usually the highest quality because they are selectively grazed. It will also lead to a return to the status quo with an ever-increasing reliance on inorganic nitrogen fertiliser as farmers lose confidence with the latest silver bullet.

Conclusions

- Dry matter production is the product of light intercepted and photosynthesis. Both processes are affected by temperature, moisture and nutrient availability.
- Water use by plants is a physics-based process. The highest efficiency occurs when plants have adequate nitrogen to maximise photosynthetic rates. Grasses require an external

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Peter Kemp

Forage chicory

Forage chicory is an increasingly popular option for providing supplementary, high feeding value forage during summer. The decline in productivity and nutritive value of ryegrass in summer means that there is a need for alternative forages in the hotter and drier months. Chicory has a feeding value which places it in the top echelon of forage species, and a deep taproot that accesses soil moisture during dry periods.

Chicory is becoming more fashionable as summer forage. Therefore now is a good time to compare it to other commonly used summer forage species, to summarise our current knowledge on its establishment and grazing management, and to examine how it fits into livestock grazing systems.

Chicory – the early years

Chicory is a perennial forage herb which was a constituent of pastures in Europe for several hundred years before it was first bred as an improved forage species in New Zealand. Grasslands Puna chicory, released in 1985, was the first commercial forage cultivar of chicory in the world. It was bred by Bill Rumball at AgResearch, Palmerston North. Since 1985 the use of forage chicory has spread through temperate pastoral systems of the world, and there are now many cultivars.

Chicory cultivars available in New Zealand include Puna, Puna II, Choice, Chico, Grouse and SF Punter. Choice and Puna II are improved selections based on Puna. Choice

was bred for lower concentrations of sesquiterpene lactones to make it less likely to cause milk taint in dairy cows. However the milk taint potential has also been managed by limiting chicory to 25 per cent of daily intake.

Chicory cultivars have also been selected for a longer growing season or winter activity and greater tolerance of sclerotinia. Cultivars which are particularly winter active, or those that have a small taproot, are usually less persistent. Nearly all animal production research on chicory has been on Puna, Puna II and Choice. However, there have been no comparisons of cultivars that include animal production.

The main advantages of chicory are its high feeding values, reasonable yield, deep taproot and ease of establishment on acid soils. Feeding value is the animal production from forage when grazed intake is unrestricted by the quantity of forage on offer.

Feeding value

The feeding value of chicory is slightly less than that of white clover, similar to that of red clover and summer bulb turnips, and slightly higher than that of lucerne. All of the above forage species have a superior feeding value to all the ryegrasses over summer.

A Puna chicory and white clover pasture were compared with two pastures based on ryegrasses and clovers, and two pastures based on tall fescue and clovers. The milk production of cows more than 230 days into lactation was 18.8 litres per cow per day on chicory/clover and between 9.8 and 13.1 per cow per day on the other pastures.

Similarly, daily liveweight gains of lambs, deer and beef cattle over summer are typically 75 per cent greater on chicory than perennial ryegrass and white clover pastures. This difference equates to lamb liveweight gains greater than 250 grams per day for chicory compared with 120 to 160 grams per day for ryegrass/clover.

The high feeding value of chicory results from its high nutritive value and high voluntary intake by livestock. Chicory is very digestible, relatively high in energy and relatively low in fibre. The high voluntary feed intake results from the rapid breakdown of chicory in the rumen and its fast outflow resulting in livestock being able to eat more chicory during their grazing time.

Comparison of chicory with other species

The high feeding value and annual dry matter production of chicory is in the range of 8 to 15 tonnes per hectare. This results in animal production of milk or meat that is equivalent to, or better, than that of forages such as red clover, lucerne, plantain, leaf turnips and bulb turnips. It is worthwhile considering the reasons for choosing chicory over these alternative high feeding value forage species which also provide high dry matter production over summer.

Chicory and the other perennial forage species have an advantage over annual crop species. Establishment risk and cost are spread over the two to six year lifespan of the crop, and they offer regular grazing through spring, summer and autumn.

An advantage of annual crops is that their total yield can be accumulated for use at a predicted time of feed deficit. The persistence of perennial forage species depends on environmental conditions, management and the incidence of pests and diseases. However, normally chicory is more persistent than red clover with a two to five year lifespan, compared with two to three years for red clover. Lucerne has the potential to persist for greater than six years.

Acid soils no problem

Chicory establishes readily on the acid soils prevalent in New Zealand, whereas lucerne requires a minimum soil pH of 5.8. Lime incorporation is normally required before establishing lucerne which adds to the cost and period of establishment. Lucerne and red clover can cause bloat and are susceptible to more insect pests and diseases than chicory and plantain. Chicory persists longer than red clover, but not as long as lucerne when grown on free-draining soil and grazing management is appropriate.

Chicory is more tolerant of heavy, wet soils than red clover and lucerne, but they all suffer treading damage if grazed when the soil is saturated. Lucerne will out-yield chicory and red clover in dryland areas of New Zealand provided its taproot is able to access water deep in the soil profile. Although plantain compares well with chicory, lucerne and red clover for many attributes it has a lower feeding value. The growing season of plantain is August to June, whereas chicory only produces from September to May.

All species require Olsen P of 20 or more for optimum production, with chicory and plantain needing occasional applications of nitrogen fertiliser, particularly if grown without a legume. Chicory has a higher mineral concentration than the other species. Overall chicory is best suited to pastoral systems on acid soils where reliable production of high feeding value forage over the summer months is the main criterion when choosing a forage species.

Establishment of chicory

Chicory can be established in either autumn or spring. Autumn sowing is ideally in late February or early March. Later sowings run the risk of not being ready to graze before winter. As a rule of thumb, every week later chicory is sown from 1 March, the time of first grazing is extended by three weeks. Autumn sown chicory will be vernalised and will therefore develop reproductive stems in late spring, whereas spring sown chicory will remain vegetative through its first growing season and only become reproductive after its first winter.

Chicory has a small seed, 1,000 seeds weigh 1.5 grams, and is best sown no deeper than a centimetre into a weed-free seedbed. Whatever machinery is used for sowing, depth control is vital for good field emergence. The sowing rate for a pure chicory crop should be five to seven kilograms per hectare. Low sowing rates can decrease the lifespan of

the crop due to a low initial plant density and poor weed control. For chicory which is planned to persist for more than a year, three kilograms per hectare of white clover should be sown with chicory to provide nitrogen and to fill the gaps between the chicory plants.

Control the weeds

Good weed control before sowing chicory is essential because chicory is closely related to many weed species which limits the herbicides that can be used. Ideally, chicory should be sown after a short-term pasture such as Italian or hybrid ryegrass.

The main herbicides that can be used are Preside (flumetsulam) for control of a number of broadleaf weeds and Gallant (haloxyfop) for control of grass weeds. Weeds such as thistles and docks can be controlled by weed wiping glyphosate immediately after grazing.

Chicory taproots

Chicory is ready for its first grazing after sowing when the plants have a minimum of six leaves a plant. At this growth stage the chicory plants have sufficient reserves in their taproot for most of the plants to recover from defoliation. If chicory is grazed too soon after sowing then 30 per cent or more plants will die due to insufficient taproot reserves. As a result, the initial plant density will be low and the productive life of the chicory crop will be shortened.

Grazing management

The grazing management of chicory needs to maintain taproot reserves and to encourage leaf production by control of reproductive stems. Like all taprooted plants, chicory uses its root reserves to recover from defoliation and to survive winter dormancy. As a general principle the frequency of grazing is relatively more important to manage than the intensity of grazing. Provided grazing does not damage the buds on the crown, then the intensity of grazing is determined by the feed intake being provided to the grazing livestock and the need to control reproductive stems.

In practical terms chicory is ready to graze when it is 25 cm tall or approximately 3,000 kg dry matter per hectare. The post-grazing height depends on the livestock enterprise but a four to five centimetre residual protects the crown buds and gives high use of the leaves.

For maximum milk production or lamb growth rates the residual target should be eight to 10 centimetres. In spring and summer a 21 day rotation can be used while the growth rate is rapid, but this needs to be lengthened as growth slows over summer. The rotation length will generally be four or five weeks later in summer so that chicory can reach a minimum height of 25 cm and the taproot reserves replenished. One-year-old chicory should have a taproot diameter at its widest point of at least three centimetres.

Persistence in the pasture

The persistence of chicory can be increased by avoiding too frequent grazing in autumn – less than three weeks' grazing interval – not grazing while the plants are semi-dormant in winter, and always avoiding treading damage. When chicory is grazed too hard or frequently in autumn, then 30 per cent or more of the plants will die by the following spring. In addition plants grazed excessively in autumn will not produce new shoots from the crown which is important for chicory persistence.

As the number of plants per hectare declines, the number of shoots per plant needs to increase to maintain an adequate shoot density for forage production. A productive chicory crop has approximately 300 shoots per square metre whereas a run-out chicory crop has 150 shoots a square metre or fewer, and 25 plants a square metre. Well managed

Leaf chicory with secondary flowering stems

Chicory, plantain and clover mixture

chicory is fully productive for three to four years on heavy soils and longer on light free-draining soils.

When chicory is starting to bolt it must be grazed before the primary reproductive stems are 50 cm tall, otherwise the digestibility is too low for stock to graze the stems down to below 10 cm. Apart from the feeding value of the primary stems being very low at less than 60 per cent digestibility, the growth of the stems inhibits leaf production. The stems will not re-grow once grazed, but thin secondary flowering stems will continue to develop through summer. If these stems hinder grazing by livestock they can be mown, but otherwise they decay over winter.

Chicory in grazing systems

The animal production achieved from chicory over summer when it is grown by itself or with white clover is superior or equal to that of other forage species available in New Zealand. When chicory is used as a special purpose forage crop for livestock finishing or supplementing dairy cows it can be managed to maximise its production and persistence.

However, when used in this manner its growing season is shorter than for some other forage species. If the major objective for the grazing system is to have as long a growing season as possible from high feeding value species, then chicory can be mixed with other pasture species. The mixtures can be designed to have longer growing seasons with a similar performance to pure chicory by combining chicory, plantain, white clover and red clover.

These herb and clover mixtures are being used by farmers in both dairying and sheep and beef systems. Such mixtures are more complex to manage than chicory alone but can extend the growing season to 10 months. However, if a grass species is added to a mixture of chicory and other species, then the chicory will normally not make a productive contribution to the pasture for longer than two years.

Conclusion

Forage chicory supplies summer forage of superior feeding value which can be used for finishing livestock or supplementing dairy cows. The main advantages of chicory are its perenniality and tolerance of dry periods over summer. The lifespan of chicory depends on grazing management, particularly in late summer and autumn when it requires a sufficient grazing interval of four to five weeks to ensure both adequate taproot reserves for winter survival and development of new shoots from the crown.

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source of nitrogen to maintain high rates and canopy expansion. Legumes do not.

- The temperature and moisture regime of a location sets the potential dry matter yield limit and the effect of new ryegrass cultivars on annual yields at any given location has been small.
- Animal performance and dietary preferences indicate significant advantages with over 50 per cent clover/herb content. Current on-farm establishment and grazing management practices often restrict clover/herb content.
- An understanding of the interaction of clover species, temperature and moisture and on-farm management is required for successful integration of appropriate species in any given location.
- Inappropriate agronomic advice has led to repeated failure of alternative species and a default to perennial ryegrass-based pastures.

Derek J Moot Faculty of Agriculture & Life Sciences, Lincoln University

Nicky Watt

Biological versus conventional fertilisers

Andrew Watt and I have been Operation Managers at Cloverdale Holdings Ltd for almost six years and peak milk around 2,900 cows through two 80 bail rotary sheds with our 15 staff. The farm, situated in mid-Canterbury, is 731 hectares of stony Lismore soils, and is divided into two dairy units on Ferrimans and Maronan. The annual rainfall for the farm is around 500 mm and has been in dairying almost 10 years on Ferrimans, and seven years on Maronan.

Andrew and Nicky Watt

The apparent high incidence of ryegrass staggers was the major reason for looking at changing fertiliser use, with the aim of manipulating pasture before seed head development. We began an Abron fertiliser regime in October 2008. We started with a basic Abron soil corrective solid blend which included applications of calcium, magnesium, salt and trace elements. Nitrogen was applied as a foliar with the addition of fulvic acid on the Ferrimans half of Cloverdale. The Maronan side of the farm received urea along with NTS soluble humate granules. The whole farm received soluble humate granules with solid fertilisers in the spring and autumn.

The main focus on this farm is to continue to be a profitable operation, which is why the trial paddocks were set up – three on Maronan and three on Ferrimans – to monitor the effects of the fertiliser applications. Each trial paddock is divided in half with the left hand side receiving the Abron fertiliser programme and the right hand side receiving standard fertiliser treatments.

Trial set up

Paddock 12 Ferrimans and Paddock 5 Maronan are the main trial paddocks from which data has been collected. The trials have been running since October 2008 and data has been collected from Paddock 5 since December 2009 and Paddock 12 since January 2010.

Ferrimans has had a foliar nitrogen of 9 kilograms of nitrogen per hectare fertiliser programme applied to the left hand side of the trial paddock, and solid urea or nitrogen rich ammonium at 30 kilograms nitrogen per hectare on the right hand side. Maronan has had urea or nitrogen rich ammonium at a rate of 30 kilograms nitrogen per hectare on both sides, but the left hand side has had soluble humate granules at 1.75 kilograms per hectare included in the solid fertiliser. Soluble humate granules, which contain potassium humates, act as a carbon source for the soil micro-organisms to digest nitrogen and also chelates the soluble nitrogen to avoid or limit losses.

More of the details

For the rest of the farm, when applying solid fertiliser it is always accompanied by a three per cent addition of soluble humate granules on Ferrimans and Maronan except on the right hand side of trial paddocks. Each foliar has urea at 20 kilograms per hectare, fulvic acid condensed extract, Agri-Gro Ultra as a biostimulant, magnesium sulphate, Solubor, sugar-chelated molybdenum and NTS shuttle providing trace minerals.

Each of the foliar nitrogen applications also has small amounts of other nutrients included. These are phosphorus and sulphur added to the foliar sprays in the cooler months of May to August. Potassium and phosphorus is added to the foliar sprays in the warmer months of January, February and March. The foliar nitrogen application has a calcium fertiliser added for the spring when the pasture begins to run to seed.

Data collection

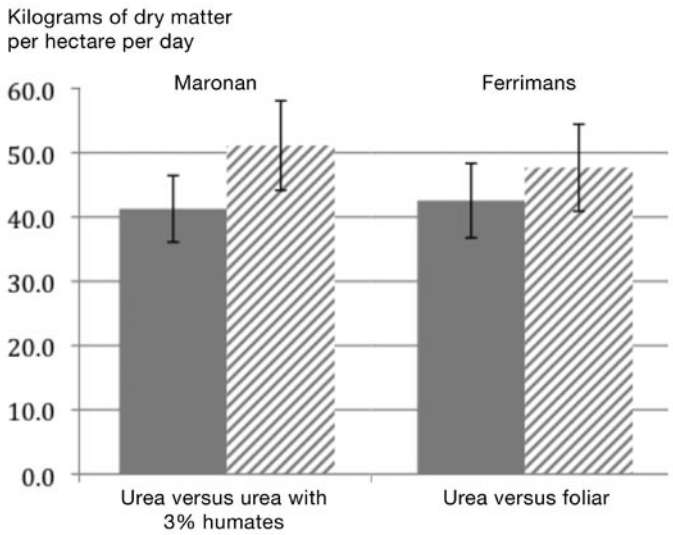
Each side of the paddock has four replicated, evenly spaced cage cuts completed down the length of the paddock. Each cut was weighed and a sub-sample from these four cuts


Paddock 12 trial area with cage

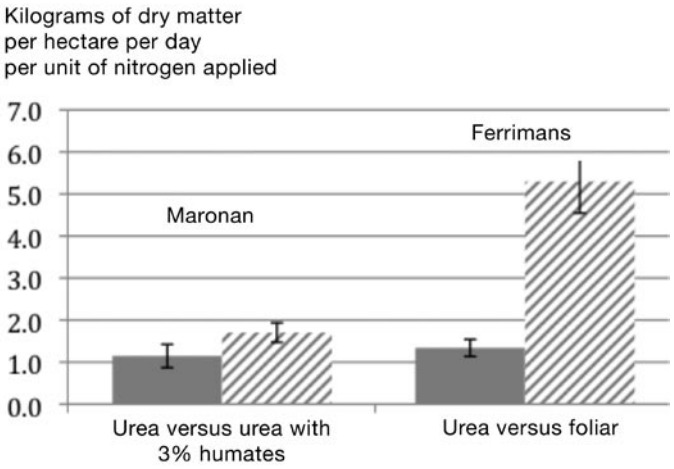
taken and sent away to Hill Laboratories for a complete pasture analysis and a standard pasture test. Once dry matter results came back, the dry matter yield differences for each side were calculated. The detailed nutrient results were also monitored to ensure there are adequate nutrients for plants and the soil.

Results

Data collected from five separate periods of growth between December 2009 through to November 2011 at the Maronan site shows that we were growing 24 per cent more dry matter when we mixed humates with the solid urea applications. Each of the five pasture harvests followed a similar trend with more pasture grown where the humates were included with the urea.



At Ferrimans, total dry matter production in the treatment using foliar nitrogen at 9 kilograms per hectare also out-performed solid urea, applied at 30 kilograms of nitrogen per hectare, by 12 per cent. This data is a summary from nine pasture harvests for the treated sites between June 2010 and November 2011. Again, all nine harvests showed a similar trend so the total data is summarised here. The average growth rates compare solid urea – black column – versus urea with three per cent humates – the hatched column.



Efficiency estimate

The information summarised in the graphs uses the same pasture harvest data collected from the trial sites, but standardises the daily dry matter yield from each plot according to the amount of nitrogen applied to that plot. This allows us to compare the amount of pasture production, the

Cows grazing clover-dense pastures

daily dry matter production per hectare on each treatment per unit of nitrogen applied to that treatment. This data is therefore an estimate of the efficiency with which the pasture has used applied nitrogen to increase production.

At the Maronan site there was 49 per cent more dry matter production per hectare from granular urea applications of 30 units of nitrogen per hectare with humates than where we applied the urea by itself without the humates. At the Ferrimans site it is evident that the efficiency of nitrogen use increases three-fold with the application of nitrogen in a foliar programme with the addition of biological stimulants when compared to a solid urea application.

Reducing nitrogen use

This information allows us to confidently reduce overall nitrogen use while maintaining or increasing total pasture production. We have been able to reduce the nitrogen use on Cloverdale from 280 kilograms of nitrogen per hectare to 80 kilograms of nitrogen per hectare which is forecast for this 2011/12 season. The effect of this has been important for the environment, reducing our nitrogen leaching to 21 kilograms of nitrogen per hectare.

The clover content and clover size in the pasture has

Soil profile

increased as a result of this programme. The health of the animals has also improved as a result of feeding them better quality, nutrient-dense pastures.

Animal health costs have reduced by 22 per cent, supplements costs have decreased by 13 per cent, pasture harvest has increased by 8 per cent and farm profitability has increased 24 per cent when comparing before the 2008 season to today. In addition to these changes we have also recorded other improvements in the soil's characteristics.

We have six sites that record temperature and soil moisture levels using moisture meters. These indicate there has been a significant improvement in water-holding capacity, which means better production in dry conditions and less irrigation requirements. The soil drainage on the farm has also appeared to have improved due to improved soil permeability.

The future

The change in fertiliser programme has resulted in increased fertiliser efficiency, improvements in clover contents in the pasture, improved soil properties, reduced animal health costs and most importantly an increase in farm profitability. Our plan is to continue to trial the application of the Abron soil corrective programme.

Since October 2011 we have adopted the foliar application of dissolved urea to the whole farm with the exception of the trial areas. We are also experimenting with the use of liquid nitrogen applications with and without the addition of microbial stimulants and humates. We believe that this programme has improved the ability of the soil to hold nutrients and has reduced nitrate leaching. The plan is to set up a trial to test this.

Nicky Watt is a shareholder and consultant with Intelact Ltd and is the Operations Manager at Cloverdale Holding Ltd.

Ministry of Agriculture and Forestry

The biosecurity perspective of palm kernel meal

MAF has begun the same approach with suppliers of livestock feed as it does with importers of used cards, because increasing volumes of feedstock are coming in to meet demand from the farming sector. A particular challenge is to ensure that insects do not get into containers of feed while in transit. An example of one particular product is palm kernel meal.

What is palm kernel meal?

Palm kernel meal is a by-product left over when palm oil is extracted from the seeds and fruit of the oil palm, *Elaeis guineensis*. The oil itself is used for a wide variety of purposes from cosmetics to cooking and food manufacture.

The growth of the palm oil industry has been fuelled by demand for the main product, palm oil. Palm kernel meal is only a by-product and there is no evidence that sales make a significant difference to profitability of palm oil production.

The meal by-product has proved useful as a supplementary feed for livestock and has been imported into New Zealand for more than a decade, mainly for dairy cows. Supplementary feed is a relatively small component of overall feed for cows in New Zealand and is used to ensure cows receive an adequate level of feed at times when there is insufficient grass growth. In recent years imported quantities have increased dramatically – from approximately 60,000 tonnes in 2004 to more than a million tonnes in 2010.

Palm kernel meal being loaded on to a vessel in Malaysia

Biosecurity risk

Some advocacy groups have raised questions around the biosecurity risk associated with the importation of palm kernel meal. The process of oil extraction entails crushing the kernels and heating the product to high temperatures, sufficient to ensure minimal risk of transmission of pests and diseases from the by-product when it leaves the production chain.

Palm kernel meal is one of several processed animal feeds imported into New Zealand under section 7.3 of the Import Health Standard BNZ-PAFP-IMPRT Importation of Processed Animal Feeds of Plant Origin. A permit to import is not required, but the products must be clean and accompanied by required documentation. Fumigation with phosphine before export is mandatory to safeguard against the presence of hitch-hiker insects, and all consignments are inspected on arrival.

MAF's Import Health Standard specifies the rules and requirements around the risk of imported goods. It means that all consignments of palm kernel are accompanied by certification by the exporting country's national plant protection organisation that the product has been processed in a premise dedicated to the production of plant-based products and kept free of exposure to animal products. In addition, an official agency must verify that the product is free from regulated pests and contamination with any unprocessed plant material, vermin, birds, faecal material and other animal products, and conforms with New Zealand's import requirements.

Negligible risk of foot-and-mouth

During the development of the Import Health Standard, MAF considered the risk of palm kernel imports introducing foot-and-mouth disease, as well as other potentially significant diseases. The foot-and-mouth risk is considered negligible because of the requirements that –

- The heat treatment carried out as part of the production process is more than sufficient to inactivate any foot-and-mouth disease virus which might be present
- Processing must only be in a facility dedicated to the production of plant-based products
- After processing, palm kernel is stored in indoor facilities used exclusively for this purpose to ensure that it cannot be contaminated.

Fumigation

Of the 264 consignments which were imported into New Zealand between May 2008 and April 2010, a total of 40 required fumigation with methyl bromide on arrival, including those with pest interceptions or other contamination. Pest contamination problems leading to consignments requiring treatment are known to exist more often in containers where moisture has built-up around the doors. This is compounded by the ability of some insects to find their way into insufficiently sealed containers during storage and transport. The preferred choice of the larger importers is to transport product in bulk in ship holds, but these are not always available.

Only two regulated pests, both likely to be *Megaselia scalaris* and commonly known as coffin flies, have been intercepted on palm kernel meal imports, resulting in fumigation of the entire consignments. The usual situation when an insect interception occurs is for importers to request fumigation without pest identification to avoid the costs and possible time delay involved.

Reviews, audits and surveys

MAF conducts reviews of pathways, interceptions, treatments and measures for providing quality assurance of products in the source countries. Import regulations are amended where necessary. For example, the pest interceptions which have occurred, combined with two post-border interceptions from other animal feed products, led MAF to conduct a survey to inspect all containers of stock feed over an approximate four-week period in February and March 2009.

Because no products were arriving in containers during this period, inspections of the storage facilities associated with the major ports in Auckland, Tauranga, Christchurch and Invercargill were initiated. The facility inspections resulted in 106 identifications, representing 52 pests, all of which are already present in New Zealand and are non-regulated organisms.

Audits of palm kernel facilities carried out by MAF biosecurity officials over the past several years in Malaysia and Indonesia have not revealed any significant risks of palm kernel being contaminated through contact with soil or animal material. No pests, birds or vermin were observed in the facilities visited. The surrounding areas were concreted and contained sea containers and industrial buildings.

A further MAF survey completed last year focused on assessing any possible contamination associated with processed animal feeds, such as palm kernel meal being imported into New Zealand. The goal was to identify the frequency and intensity of any contamination in stock feed arriving at the border, and propose possible improvements to the current system. A very small number of organisms were found on arrival in New Zealand.

Importantly, no slippage was identified in assessing the activities undertaken by MAF inspectors on arrival. Some improvements have been recommended for the sampling activities undertaken at the border for processed animal feeds to account for the different types of feed, sizes of consignments and the likely sites of infestation.

All information to date suggests that any interceptions of live insects found during mandatory inspection by MAF on arrival in New Zealand have been dealt with appropriately using methyl bromide fumigation. No reports of regulated pests have been found in palm kernel meal consignments after biosecurity clearance has been given. Reports of pests being found by importers and farmers after biosecurity clearance are more likely to be common pests of stored products.

The Ministry of Agriculture and Forestry did not specify an author or authors for this article.

Richard Wyeth

Miraka Ltd a new independent dairy processor

Miraka Ltd, New Zealand's first majority Maori owned whole milk powder processing plant at Mokai west of Taupo, is the country's newest independent dairy processor. Miraka is an alliance of Maori trusts and incorporations with a state-of-the-art $90 million dollar milk powder factory at Mokai. The factory uses renewable steam for electricity from the nearby Tuaropaki power station to operate.

Since processing began in August 2011, the small enterprise has met supply and production targets for the first year within the first six months of operation. The plant is currently operating at more than 80 per cent capacity, producing 25,500 tonnes of milk powder for overseas markets.

The beginnings

Miraka, Maori for milk, is the result of a group of Maori trusts and incorporations with land and dairy holdings in the central plateau. They were looking to add value to their farming enterprises beyond the farm gate by investing in the manufacture and marketing of the end product.

The two major shareholders are the Tuaropaki Trust, which owns the land where the plant is sited, and Wairarapa Moana Incorporation, which runs 10,000 dairy cows on land it owns at Pouakani near Mangakino. Other shareholder suppliers include Waipapa 9 Trust, Hauhungaroa Partnership, Tauhara Moana Trust and Huiarau Farms.

Brand and logo

The Miraka brand – nurturing our world – and its logo reflect the company's commitment to whanau family and environmental values, sustainable business practice and production of a quality product for the world market. Miraka went to its shareholders rather than a commercial agency to develop a brand and logo which represented what the company was about.

The branding evolved as a result of a lot of input from shareholders and reflects the vision of everyone involved with Miraka from board members, shareholders and suppliers to staff members. The logo features a waka prow linking back to the first group of Maori adventurers who arrived in New Zealand. It also symbolises the aspirations of the company to lead the way in establishing business opportunities and new markets on a global scale.

The Miraka brand and logo is represented by the face of a kaitiaki or guardian, body of Papatuanuku the earth mother and Ranginui the sky father. The statement of intent puts emphasis on commercial success built on strong relationships that focus on quality products and the nurturing of our people linking with the branding.

Suppliers

As a small enterprise in a competitive market, a strength of Miraka has been its ability to secure a solid base of milk suppliers. In the first season of operation the company secured 120 million litres of its own supply from 28,000 cows allowing the plant to operate to its target figure of 80

per cent capacity. Milk supply from shareholders accounted for around 60 per cent of the total milk collection, with a further 30 suppliers signing up with Miraka in the first year of operation. They were attracted by guaranteed competitive returns and the fact they are not required to take up shares in the company.

Milk supply manager Denis Collins says that the high quality milk which has been collected has enabled the factory to produce a premium milk powder. The raw material from suppliers is some of the best in the country thanks to a combination of good farm management from suppliers committed to Miraka and a great season. The quality of the milk is reflected in a low somatic cell count reading averaging 180,000 and a very good APC count.

The Miraka model, which does not require suppliers to take up shares in the company, has been a big draw card. It has allowed suppliers the opportunity to reduce debt and invest in further infrastructural development. The net effect is that suppliers are using the opportunity to build resilience into their businesses and improve their productivity.

Within the company's supplier base there have been seven new dairy conversions. This is because the Miraka model allows for significant savings in conversion costs. On average the capital savings for each conversion has been $960,000, which in some cases would have made the cost of converting prohibitive.

Plant and environment

The Miraka plant uses renewable steam and electricity from the nearby Tuaropaki geothermal power station to operate and recycle up to 60 gigajoules of waste heat a day. Facilities include a milk reception area, evaporator, spray drying facility and warehouse. The plant is capable of processing 210 million litres of milk a year, turning out eight tonnes of whole milk powder an hour.

Initial earthworks started in May 2010 and the plant was completed in July 2011. The waste water treatment plant for the milk powder plant incorporates an effluent sump and pump station, treatment tanks, a dissolved air flotation unit and overall control system and separately treats waste water and condensate produced by the factory. The treated waste water is irrigated on to farmland owned by the Tuaropaki Trust and waste solids are disposed of on to the trust's worm farm.

Staff

Miraka has a team of four executives overseeing operations, finance and milk supply along with three administrative staff working out of offices in Taupo. A team of 20 factory staff work a three-shift roster system at the milk powder plant. During the peak period from September through to December the plant operates around the clock to process the milk flow.

The milk collection contractor for Miraka, Whanganui-based Dairy Fresh, operates five tankers from a depot at the Mokai factory around the clock during the season. All scheduling and dispatch for the milk collection is coordinated from Whanganui. An operations manager is based on-site at Miraka overseeing and monitoring the collection process and liaising with the Whanganui depot, farmers and factory staff. Dairy Fresh Manager, Nick Walker, says the company places significant emphasis on customer service, which fits well with the Miraka philosophy.

Marketing

Sales and marketing company Global Dairy Network is responsible for selling and marketing powdered milk from Miraka to the world. The company, which was set up five years ago by former Fonterra executives, Colin Jones and John Shaskey, also has a shareholding in Miraka.

During his 40-year career, Colin Jones developed the New Zealand Dairy Board global sourcing strategy and was chosen to find global markets for New Zealand whole milk powder. He says the decision to come on board as a strategic investor partner with Miraka reflects Global Dairy Network's faith in the company and the high quality of its product. The main point is that Miraka is Maori owned which means it will never be sold and international customers understand the security of long term supply.

Global Dairy Network was responsible for introducing Vietnamese manufacturer, Vinamilk, to Miraka. Vinamilk supplies milk products to a population of around 86 million, liked what it saw and became a strategic investor, the first time it has invested offshore. Vinamilk is currently taking a third of the milk powder produced at the company and has indicated that it would be happy to take all the production.

Markets for Miraka milk powder have also been sourced

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Profile

Kerry Ryan

Previous careers

The foundation for Kerry Ryan's consulting career was laid over various corporate roles. Working for the Rural Bank in Canterbury after graduating from Lincoln University in the late 1970s help consolidate learned disciplines in financing, valuation and assessment of business propositions. This was enhanced by an extended period in fertiliser sales ranging from hands-on technical sales advice to managing sales teams and eventual promotion to a senior sales role in a leading fertiliser cooperative.

During those years the primary sector experienced significant rationalisation as part of great change in the New Zealand economy. This meant Kerry was involved in numerous corporate restructures which demonstrated the vulnerabilities of employed roles. With this in mind, he chose to establish his own business and increase potential for autonomy which would mean opportunities for himself and his family.

Before university, Kerry spent some years in practical farming roles. This mainly involved South Island high country work such as shepherding, shearing and general farmhand roles. This, along with his corporate experience, still influences his perspectives on what it takes to succeed in a rural business – planning, determination, respect for people and the environment, as well as plain hard work.

Setting up the company

The year 1987 was a turbulent one for national and international economies. In that environment Kerry established Kerry Ryan & Associates to provide specialist independent fertiliser advice to Waikato and Bay of Plenty farming and horticultural operations. He soon realised there were other opportunities to help his clients improve their effectiveness – especially budgeting and monitoring, people management and strategic planning.

As demand for the company's services grew, it expanded to a team of specialist consultants and administration personnel in various locations. Natural progression saw key people branch out and develop their own operations.

Kerry's preference remained to grow his consulting skills. A strategy to support this was to upskill his clients so they could manage the basics and he could target a higher level in their business. This enabled him to develop the sole practitioner role he enjoys today without compromising cost-effectiveness.

To complement this, along with his wife Christine he has developed extensive business interests in pre-school education. This means ample opportunities to test his ability as a business owner and ensure a delegated operation with trading and property development dimensions that secure passive income and build succession opportunities.

Agribusiness advice

Kerry's work now involves agribusiness advice to mainly larger-scale pastoral enterprises with a focus on strategic planning and implementation. Specialist areas include one-off projects and feasibility studies, budgeting, monitoring, motivation, leadership, governance and communication. There is increasing involvement and succession planning in helping businesses implement best practice across the operations. His activities are local, national and international so he enjoys variety and continued professional growth in his work. He finds being offshore regularly is critical to fully understanding what New Zealand agribusiness has to offer.

Development of a media profile by writing regular columns in leading farming journals published in New Zealand and Australia is a part of his marketing and branding strategy. This has included publishing audio and handbook material to enable clients to get a full understanding of technical aspects of his role, especially in staff selection, relationship management and business planning. He says, 'The ability to package generic ideas, systems and expertise saves time, increases client understanding and provides a ready resource to upskill those I am working with.'

International experience

Invitations for conference presentations internationally has provided significant professional opportunity while enabling Kerry to gain a deeper understanding of the international primary sector. It has resulted in ideas and insights which have brought significant advantage to his New Zealand clients. There is also a focus on discussion groups which enable his main clients to network and collectively access the latest ideas and expertise to raise their awareness of best practice and, with Kerry's help, apply this in their business.

He aims for a collaborative approach, and is fortunate to have access to a wide range of proven professionals he can call on to provide specialist input. This ranges from agronomy

to accounting through to psychological, marketing and technical professionals who can contribute to the projects he leads. He believes the long-term strategy of growing passive business income outside the consultancy offers variety and real life experience that is pivotal to his effectiveness as a professional.

Pros and cons of a consultancy career

He says that without doubt the satisfaction of this role comes from the people he works with. Kerry never ceases to be impressed by the achievements of ordinary people with a passion for their personal, family and business goals. The challenge and growth by partnering with smart and creative professionals by other disciplines for him means continual growth and challenge. He has concentrated on expanding his expertise, which has meant deliberate strategies to avoid comfort zones and pursue targeted professional growth. His international consulting, conference speaking and publishing activities along with online technology means he can be available to anyone, anywhere.

Kerry has learnt that professional growth with new challenges is important for maintaining enthusiasm. Without this he feels there is a risk of complacency and boredom which inevitably risks diminished value and reward. He believes that working as a specialist sole operator has the potential to limit the accountability of working in a larger team and opportunities to contribute to the growth of new entrants to the profession. He finds external accountability and involvement in industry initiatives and professional associations such as NZIPIM has offset that. He says that without doubt, access to a mentor who to this day challenges, encourages and ensures He is aligned with his goals and vision which are critical to job satisfaction, sustainability and effectiveness.

Advice for new entrants

Academic training and professional experience form an important foundation for a successful career and business. However Kerry believes there is no substitute for the more subtle skills of communication, understanding marketing and effective negotiation, along with the ability to read and lead people. He says professionals whose self-awareness enables them to combine an understanding of their own personality, leadership and work style are able to position themselves in a sweet spot which offers unlimited opportunity.

Kerry also believes that fundamental to selecting the right career and business pathway is development of self-awareness. This is based on understanding how you are wired and the type of work that will enable you to synergise your natural talents with your technical interests and expertise. Individuals must take responsibility for maximising their job satisfaction, rather than leaving it to others to provide an environment that will do this.

Proactively managing your client base to ensure challenges must be balanced with early recognition of false opportunity. Client selection is a two-way process, and quality results are as much from what the professional has to offer as the characteristics, competence and integrity of clients they service. Knowing when to walk away is fundamental to protecting professional and personal job satisfaction.

A high standard of time management, professional discipline and planning is fundamental to sustainability. This must be accompanied by a structured approach to lifestyle, fitness, mental and physical health management which are all important for success. Understanding the risk of burnout and balancing time in the business versus time on the business underpins an effective self-management strategy.

In Kerry's view, success is all about linking values and vision to day-to-day action so you grow to enjoy your role to a point where it is no longer about work. For him, it is about his company's mission 'to make the world a better place'.

Kerry Ryan is a Tauranga-based agribusiness consultant available to farming businesses face-to-face or online for advice and ideas. You can contact him at www.kerryryan.co.nz

>> **Miraka Ltd a new independent dairy processor** continued from page 43

in China, south east Asia, the Middle East and the Pacific. The big question for Miraka, when it was being established, was whether it would be able to sell all of its product. However, they have committed sales orders for the 25,000 tonnes of milk powder they will produce in the first year.

The future

Moving into 2012, Miraka has a new set of targets to meet. The short term focus is to recruit new suppliers and bring an additional 10,000 cows into the milk collection pool. The objective is to attaining full production – increasing milk powder production from 25,000 to 32,000 tonnes. Existing customers have already indicated they will pick up the additional milk powder which is produced.

Closer to home, in line with its kaitiaki values, Miraka is also developing strategies to promote good on-farm environmental practices. That involves working with farmers to benchmark what is being done in terms of effluent management systems and look at requirements for riparian planting around streams and waterways to lessen nitrogen outflows to make sure on farm practices are environmentally sound. Part of that work is to encourage them to buy into our vision and show them the benefits of improving their own environmental footprint.

The land owned by Miraska can never be sold and will provide long term returns, offering financial security for suppliers, shareholders and staff while providing for current and future generations. Miraka has been designed to allow for further expansion, but the focus for now is on processing top quality milk powder and building a solid foundation of suppliers and customers.