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Inside

The New Zealand Institute of Agricultural & Horticultural Science Inc

A Glimmer of Hope

Summer holidays provide me with the opportunity to read something other than student essays and theses, although far from putting my feet up, I use the occasion to catch up on science politics in New Zealand. Like most people I look at the year gone, take stock of the year ahead and set some resolutions.

It was great to see several notable New Zealanders with links to agriculture making the New Year's Honours list. Notable among theme was NZIAHS Honorary Fellow Professor Ian Warrington (Companion of the NZ Order of Merit), along with Sir William Gallagher (Knight's Companion NZOM), Murray Sherwin (Companion NZOM), Peter Egan (Officer NZOM), Bernard Card, John McKenzie, David Meares and Richard Nanson (Members NZOM) and Heugh Chappell (QSM), a Lincoln alumnus and veteran rural journalist. Congratulations to them all.

In December I attended a Wellington symposium, "Inside Innovation", which was planned to coincide with the release of the OECD report on New Zealand innovation. Among the speakers (including Dr Wayne Mapp and Sir Peter Gluckman) was the Prime Minister, John Key. He hinted that the current public spend on RS&T (around 0.5% of GDP) was too low and that he felt it should be lifted to 0.7% to stimulate economic growth. These were positive words from our leader, although it was 16 years ago that the Government proposed a 'Path to 2010' target of 0.8% of GDP by 2010. We didn't get there, although the 2010 budget decision to put an additional $321 million into science was generous given the economic challenges facing the country.

The Crown Research Institutes now have Statements of Core Purpose. While the Taskforce Report of early last year heralded change and was generally well received, some commentators felt it did not go far enough in addressing the many problems created by the reforms of 20 years ago.

I was disappointed to still see some phrases: The Operating Principles section of AgResearch's Statement of Core Purpose, for example, includes a declaration to "operate in accordance with a statement of corporate intent and business plan that describes how AgResearch will deliver against this statement of core purpose, and describes what the shareholders will receive for their investment" and to "meet its obligations as a Crown Company and remain financially viable, delivering an appropriate rate of return on equity". A similar statement appears in the Plant & Food Research Statement and doubtless that of the other CRIs. It seems we are still not bold enough to let scientists "run their business" with performances measured against scientific principles and value systems. This may still leave a "house divided", to quote one of our members, as the CRIs try both to seek profit and deliver public good. We may not have the best model for science yet.

In this vein it was interesting to read the words of one of our imminent retiring scientists, Professor A.R. (Dick) Bellamy of the University of Auckland. He feels we have too many CRIs, given the country's size, and should look at models like those in the United States where public science facilities are closely aligned with universities. We might have got this in New Zealand if Lincoln and AgResearch had merged, but that is now history. Bellamy also believes that the dissolution of the University of New Zealand may not have been a good thing, because of our size and the competition for limited resources that occurs in the tertiary sector. He cites potential benefit in the University of California model and the sharing of limited resources, something I have contemplated in the last few years as well.

I read with interest in the rural media that Nick Pyke, CEO of the highly effective Foundation for Arable Research, believes "creativity" is missing in science today. He believes funding mechanisms dictate that the outcomes are determined before the science has even began and that scientists "cannot afford to go off on tangents or explore other areas".

And – I hear some of you cry – why should they be able to? Isn't that just pandering to the indulgence of out-of-touch scientists?

Yet as we are reminded time and time again, serendipity is critical in research. Quoting NZIAHS Honorary Fellow Dr Rod Bieleski, one of Nick Pyke's mentors, scientists need "whimsy time" which is the unhindered thinking time vital to the formation of new and innovative ideas. Will we ever get unhindered creativity from our scientists and innovators if we don't unshackle them from the current millstones of needless bureaucracy, reporting and accountability?

Finally, in this issue of *AgScience*, we include summary papers from last year's NZIAHS Forum, "Where do we want the dairy industry to be in 20 years time?" I believe the vision is there in this hugely important industry, but we cannot be shy in talking about its strengths and weaknesses – often – to ensure its pride of place in the country's future.

Jon Hickford
President

NZIAHS held a forum last year to examine where the dairy industry will be in 20 years time. This issue of AgScience features edited versions of the presentations.

The Dairy Sector in 20 years

By Hon David Carter
Minister of Agriculture

In many ways the dairy industry is at a crossroads. With an ever-growing and increasingly prosperous world population, there will be huge demand in the future for the protein that our dairy farmers are simply the best at producing. At the same time, the environment in which we farm is changing. Consumers are increasingly expecting the sector to practice the highest standards of environmental management, animal welfare and food safety.

This pressure to deliver on those expectations will only increase over the next two decades.

The challenge for our dairy industry is clear: is it able to expand production, and with it profit, to meet the growing surge of demand, while at the same time reducing its environmental footprint and maintaining the integrity that consumers expect?

The world's population is six billion people. Most commentators agree that over the next 20 years this important number will grow to around eight billion. We know it will be a huge challenge to feed that many mouths, so while we grapple with the issue of climate change, it is food security that will become the world's biggest challenge.

So how will New Zealand fit into the global picture in 2030?

First, we have to focus on economic growth. New Zealand's tradeable sector went into recession in late 2004, a full five years before the global economic crisis. The Prime Minister has charged all Ministers with economic portfolios to reverse this trend and deliver growth.

Our primary sector can, and must, perform better. It is responsible for 67% of our export earnings and therefore is the engine room of our economy.

The fact we are very much an export-dependent nation won't change. We will continue to produce far more food than our population requires. But that doesn't mean we will be offloading this excess food as a low-value commodity product as we have done in the past. We are no longer a low-cost producer, and we never will be again.

Instead we produce a premium product, backed by integrity and commanding a top price. This premium position is underpinned by strict environment regulations, food safety standards, and animal welfare codes. These are the three components we trade on, and the three things that guarantee our international reputation.

New Zealand's reputation around food safety – one of the best in the world – is the result of years of science, systems, and international negotiation. The SanLu incident in China taught us a lot. Young mums in China no longer trust domestic production. They continue to buy infant formula, but from countries like New Zealand and Denmark at a higher price because they know it is safe.

Equally, when we are asking our customers to pay more, we must take seriously their concerns about the environmental impact of our food production systems. New Zealand's position around climate change and the Emissions Trading Scheme is part of this story. Repeatedly, when travelling overseas, I am reminded by people – from politicians to retailers to farmers – that New Zealand is well regarded and respected for its Emissions Trading Scheme and our stance in general on climate change.

The other component of the integrity story is animal welfare. It is an emotive issue. The majority of New Zealand farmers do a great job but any animal welfare incident has the potential to do huge damage to our reputation. We must be mindful that practices that are acceptable now, may definitely not be in 2030.

Fundamentally, we must concentrate on markets where we can get a premium for our high quality and reputable products.

Responding to the Government's goal of growth as Minister of Agriculture, I want to get the primary sector performing better. Water is one of the levers we can use to achieve this. It is an obvious creator of wealth, growth and productivity for the primary sector, and therefore for the country's economy.

New Zealand irrigates 600,000 hectares, but there is potential to irrigate more than a million hectares if we can find a way to use our water resource more wisely. The Government wants better allocation, efficient distribution, and – most importantly – water storage. A huge amount of work is going on in collaboration with local government, with iwi, with electricity generators, and with other users to find solutions.

It will not be irrigation at all cost. A careful balance must be struck, and there must be benefits for all water users: irrigators, environmentalists, recreational users, and the community.

That's why the challenge of how to best manage New Zealand's freshwater resources was put to the Land and Water Forum, a group of around 60 stakeholder representatives who talked through the issues and potential solutions over the past year and come up with a raft of proposals in their report.

Innovation is the second lever to delivering growth in the primary sector. Farmers have been able to increase on-farm productivity around three to four times higher than the rest of the economy over the past 15 to 20 years, but much of the research that has led to these gains is decades old.

We needed a substantial commitment from both government and industry to research and development which is why last year we announced the Primary Growth Partnership, an innovation fund specifically for agriculture, horticulture, aquaculture, and forestry. So far a combined total of $366 million has been committed for projects over the next five to seven years. The dairy industry's successful $170 million bid was led by DairyNZ and Fonterra. With the involvement of DairyNZ, the entire industry will benefit as all farmers will have open access to the on-farm developments of this programme.

Funding from the Primary Growth Partnership is also being used for research and innovation focused on emissions research in the agricultural sector. Short of reducing stock numbers, few options are now available to reducing emissions, so we have established the New Zealand Agricultural Greenhouse Gas Research Centre. This is a partnership between all scientific organisations in New Zealand, both public and private, with an interest in agriculture. It is critical farmers have access to technology that reduces greenhouse gas emissions but doesn't compromise productivity.

The Government has also led the formation of the Global Research Alliance, an international research effort on agricultural greenhouse gases.

The Government has committed funding to these programmes because – second to food security – a major challenge the world faces is producing more food with less emissions.

The third lever is trade. New Zealand exports to 233 countries. More important, we have repositioned our export industries to the next generation of powerhouse economies. China is now our second largest trading partner and offers so much opportunity. Of China's 1.3 billion people, 250 million are earning the same or more than the average New Zealander. These people can afford our premium products. We just need to make sure they get a taste for our cheese, our wine, and our lamb.

The Government is also striving to develop free trade agreements with Korea, Russia, the Gulf States, India, and we are in negotiations for the Trans-Pacific Partnership, which includes better access to the United States. But when it comes to agriculture, free trade negotiation is never easy. In particular, dairy is one of the most heavily subsidised and protected sectors in the world. But we must continue the march forward, gaining access to new markets and improving the quality of access we have to existing markets.

Again, this is where our environmental credentials, our biosecurity system, our food safety and our animal welfare standards stand us in good stead.

New Zealand's future is primary production The primary sectors are critical to our economy in terms of exports, the number of people they employ and the domestic businesses they support.

Long term, we have good reason to be confident about the future outlook for dairy prices. The development of emerging markets is expected to continue to provide strong demand and healthy prices. But in a world where competition is intensifying, we also need greater productivity. We need to increase the number of farmers and growers achieving best practice, and to increase the value of the products and services that we sell internationally. Every New Zealand producer should be looking at how they can add to our reputation – not free-ride on it.

This Government is putting in place a long-term plan for growth and economic prosperity. The dairy industry is a big part of this plan. But I don't want to see our export economy overly dependent on dairy. Remember, a significant part of the industry is dairy beef. We all have more to gain if every primary sector is booming and the meat sector in particular can, and must, do better.

And while our dairy sector is world-leading, let's not be complacent. New competitors, new consumers, new expectations and new regulations are all challenges the sector faces over next 20 years. The industry will need to be smart, innovative and flexible to retain its world-leading status and take advantage of the opportunities on offer. The Government stands ready to help.

Contradictory Goals

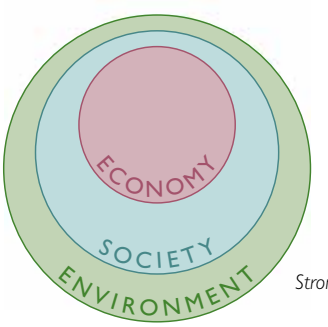
Is the dairy industry sustainable with respect to the impact on the environment?

By Chrissie Williams, Christchurch City Councillor

Sustainable development is much more than environmentalism. An accepted definition says development is sustainable when 'all people have their basic needs satisfied, so they can live in dignity, while ensuring the minimum adverse impact on nature, now and in the future'. It requires behavioural change to ensure the maintenance of biodiversity, ecological integrity, natural capital, social integrity and economic viability.

In a strong sustainability model the economy is a subset of society, and society is wholly dependent on the natural environment (see Figure 1). A smart dairy strategy accordingly must make dairying sustainable so we sell dairy produce internationally knowing it has environmental integrity.

The intensification and rapid growth of dairying have contributed many environmental problems. Among them, the primary sector has become heavily dependent on a continued supply of water. In



Strong Sustainability Model

Canterbury most irrigation water comes from groundwater with some zones over-allocated. Water abstraction from rivers reduces flows, negatively affecting braided rivers and coastal dynamics. Animal waste and fertilisers result in pollution of groundwater and surface waters. Destruction of wetlands and forest for farm development causes a loss of native biodiversity.

Greenhouse gas emissions from agriculture contribute nearly half of New Zealand's total emissions. Dairying has high energy consumption for irrigation, collection, transportation and processing of milk. As a result, the dairy industry receives public criticism of its environmental impacts, while community expectations for environmental standards, animal welfare and food safety rise.

Future plans put annual dairy production growth at 4% with a rise in cow numbers, a greater demand for irrigation and fertiliser, and an increased growth in animal waste and greenhouse gas volumes. There is a contradiction between ambitious industry production goals and the need to reduce the environmental footprint of dairying.

Farmers, industry, regional councils and government have instigated many plans to mitigate these impacts. These include the Dairying and Clean Streams Accord, the Farm EnviroWalk checklist, and industry programmes to support farmers to improve compliance. On-farm practices include more efficient water use; nutrient budgeting, nitrification inhibitors and effluent controls to reduce the loss of nutrients to water; bridges, fencing, and riparian planting to protect streams from contamination, and biodigesters to process nutrients and reduce electricity demand. At the catchment level integrated plans increase understanding of cumulative effects and can lead to nutrient or water abstraction caps.

Recent collaborative approaches include the Canterbury Dairy Effluent Group, Canterbury Water Management Strategy, Primary Sector Water Partnership, Land and Water Forum, and Pastoral Greenhouse Gases Consortium.

Only two of the five targets of the Clean Streams Accord have been met. Less progress has been made towards compliance with dairy effluent consents, although there was some improvement in Canterbury in 2009/10. There has generally been a continuing decline of water quality in areas used for dairying, particularly in lowland streams. Encouragement of best practice voluntarily is clearly not working with some farmers ignoring environmental standards.

An option of a more stringent regulatory approach would require costly monitoring and reporting. Proving the source of a problem can be difficult because of diffuse and cumulative effects and the time lag until impacts are observed. There is a risk with regulation that environmental sustainability is seen as merely an issue of compliance, rather than an integral part of farm practice. Best environmental management will occur if farmers realise the value in efficiency gains in water, nutrient and energy use.

Temptation to off-set efficiency gains with intensification of production, which negate environmental benefits, must be resisted. An option of financial incentives is provided through biodiversity funds and support for landcare groups, and disincentives affecting payouts are being considered by industry. Lower-intensity farming systems with lower capital outlay, less financial risk, and improved return on investment should be investigated further.

Even if every farm complied with best practice we do not know if environmental trends would reverse, and dairying could become truly sustainable.

The benefits of dairy exports to the national economy are large, providing 25% of total merchandise export earnings. They are worth $10 billion a year. Embedded in these exports is a high content of New Zealand's available energy and water, and production of 20% of our greenhouse gas emissions. Is this the best use of these national resources? What are the alternative uses for these precious resources? Do we spend the export dollars earned sensibly when we use them to import palm kernel, Italian tomatoes and large flat screen TVs?

To sum up, it is difficult to weigh the national economic benefits of dairying against the environmental costs because they impact at a local or regional level. If the dairy industry can find ways to internalise its environmental costs then the benefits compared with the real costs of dairying could be reassessed.

Strategy for New Zealand Dairy Farming

Mapping the course for our country's dairy farming industry

Are we meeting the imperatives of the framework for New Zealand's future dairy farming & industry 2005-2015?

By Dr Tim Mackle, CEO, DairyNZ Limited

DairyNZ was created in November 2007 through the merger of Dairy InSight and Dexcel and has three key investment areas: productivity (feed, animals and farm systems); sustainability (environmental management, biosecurity, animal welfare and community impact); and people and business (farm business and human capability).

I joined Dexcel in 2005, a year after it mapped out a pathway for dealing with issues considered important for the industry from 2004-2014.

The main productivity target was 4% total factor productivity growth, a classic economic term that makes sense to economists but not at all to farmers. The industry has been achieving just over 1% total factor productivity growth, which is a measure of the gain in outputs over inputs. It may not seem a lot but the 4% was a target McKinsey believed the Dairy Board should adopt. They believed 2% was a good target for any commodity business and they wanted to add 2% to make up for a predicted decline in commodity prices which hasn't happened.

But to be able to get a 1% increase in efficiency while increasing our outputs during that period is quite impressive.

At a research level the results are mixed. We have had some wins around being able to harvest an optimum amount of pasture in an all-pasture completely automated milking system. Now three AMS farms operate in the South Island and two new ones are being set up in the North Island.

We had an ambitious target – 25 tonnes of grown pasture per hectare – and haven't reached it. I wasn't around at the time but it was plucked out of the air as a good thing to aim for. I don't think much thought went into how we would achieve it. We need to put realistic targets in place, mapping out the timeframe in which we want to reach them and how we are going to achieve them. The crop target at the time was 45 tonnes per hectare. We have achieved that in the Waikato – we got 49 tonnes last year on our own research farm from a mixture of cropping approaches. Thus our results have been mixed.

For sustainability, too, we set lofty targets. Some good progress has been made with the Clean Streams Accord, keeping stock out of waterways, but we still have a way to go. There has been progress around nutrient budgets but we want to get into milk production plans and nutrient management now and go to the next level.

Non-compliance levels for effluent are still unacceptably high in certain areas. But we have made good progress in Canterbury in the last 12 months, dropping from 19% to 8% for serious non-compliance. The rate of total compliance for farmers has been pleasing and much of the non-compliance involves petty issues, such as a failure to have a certificate on the wall. But we haven't made the progress we needed nationally and again we probably set targets with not enough thought to how we would achieve them. All of them are five to seven year targets rather than things that

should be done now.

With regard to People in Business, the over-arching goal was to create an environment where dairying – and being near dairying – would become a career path of choice. Some progress has been made, particularly around leadership, but we probably haven't improved the work environment enough.

Capability around business needs to improve. A big effort through the Primary Growth Partnership is going into forming a centre of excellence for farm management. That will help address the capability we all know has been in decline. We have got to reverse this trend to deal with the complexities of farming over the next 20 years and beyond.

Just after DairyNZ was formed we refreshed the industry strategy in partnership with dairy farmers. Five main objectives were set. The first is about profit, not from the milk price but from being more efficient. Attracting talented and skilled people is our second objective. We don't want New Zealand to be a one-trick pony and we want other industries to do well. But – our third objective – we must make sure we are competitive vis-à-vis other land uses and overseas dairy industries. At the moment we export about a third of the world's traded dairy products and we enjoy about two thirds of the world's dairy profits on that traded market.

Fourth, we want our industry's reputation to be enhanced both locally and globally. The way our dairy companies are positioning themselves overseas is excellent. But we must further enhance our reputation at home.

Fifth, we must strive to achieve success in partnerships – whatever the goal – between the industry and the regulators, with government and with the community more broadly. This means determining which issues should be handled at a national level and at a regional level so the industry survives and everyone benefits. Greenhouse gases are an example of such an issue, along with nutrient issues and water.

The philosophy underpinning the strategy is that we have to take a farming-systems approach. Cows and grass are at the centre – farm-production and resource-use efficiency is intertwined closely with the people who run and support the business. But farms don't operate only within a boundary fence – they operate in the big wide world and there are many other drivers. Consumers are the people who ultimately support the industry.

Milksolids production over the past 20 years has increased two and a half times from about 570 million kg of milksolids to almost 1.5 billion kg, an impressive performance. But at the same time our environmental footprint has become bigger – water use, fertiliser use, nutrients, greenhouse gases and so on. We can't keep on the pathway we have come down.

At DairyNZ we argue strongly that we need to push on in the next 10 years to increase the contribution we are making to New Zealand exports, both in value and volume terms. But because we cannot continue on the same path, some key issues must be addressed. Among them, we have to produce our milk to higher standards and keep positioning our milk above everybody else's globally.

We must be mindful that our share of world dairy profit is under threat. We are no longer the lowest-cost producer, Argentina and Ukraine have that honour. We are the lowest-cost producer in terms of scale, or profit compared with volumes exported, but the gap between world prices and our costs is closing. Our concern must not simply be more value for our milk or more volume; we must be cost-competitive.

But we must address the issue of the environmental footprint while we are trying to generate more value for milk and more milk volumes in regions where it is appropriate, producing to higher standards and being more cost-competitive.

I often hear the question "can the dairy industry continue to grow?" But that is not the right question. We should be asking "how can New Zealanders continue to benefit from growth in the dairy industry and how do you do that?" The opportunity globally is huge. In countries like China and India hundreds of millions more people can now afford to buy our products. We can capture that opportunity.

But effluent is our Achilles' heel and we have to grapple quickly with it over the next couple of years to resolve the issues it raises.

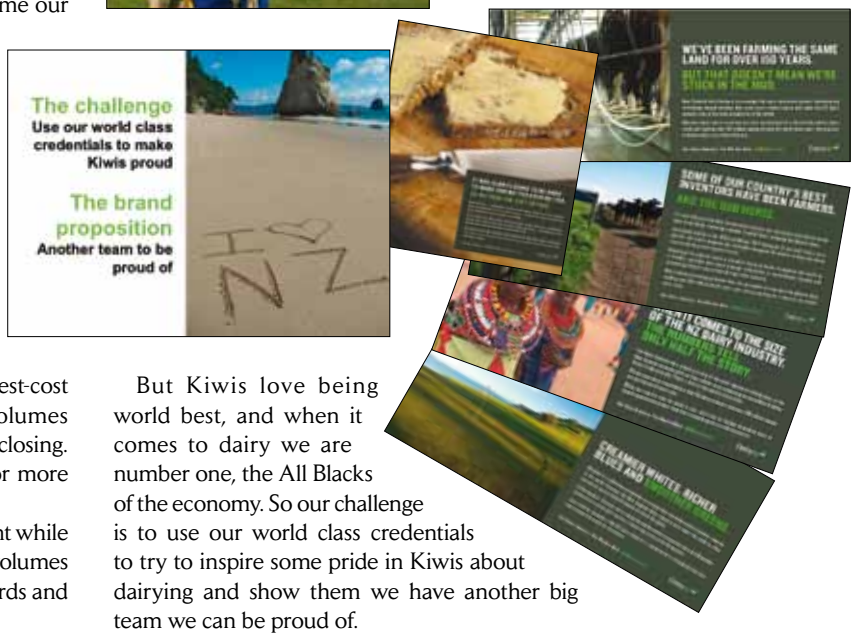
Another challenge is to connect better with the New Zealand public. We have initiatives such as Fonterra's Kickstart programme in low-decile schools in conjunction with Santitarium. Federated Farmers' farm days are another great initiative, although there have to be results on farm as well. We are developing a warrant of fitness concept for dealing with effluent and we are working with Environment Canterbury on the issue of land-use intensification.

Research will be the key to our future, which is where science and scientists come in. Gene work is going to be vital for us, finding productivity traits and traits that help us with sustainability. And farm-systems research will be crucial.

We have a gap to close with the adoption of new technologies, a gap between the best operators and the average ones. This is significant. Take pasture harvest for example: if all farmers could optimise their pasture harvest we would probably get at least 100 kg more milksolids per hectare from existing farms. That would fetch more than $1 billion, under the current payout.

Significantly, our research through the Go Dairy project has found 71% of New Zealanders surveyed had a generally favourable or very favourable view towards dairying. Moreover, 91% believe our export industry is critical to our economy although a lesser 70% believe the success of our exporting industries affects their standard of living and 57% believe the success of the dairy industry affects their standard of living. So a disconnection is forming in terms of what dairy means to people and their lives.

A smaller percentage – 47% – believe New Zealand dairy farms strike a good balance between economic success and environmental responsibility (compared with 56% for general New Zealand businesses. There is an issue there.

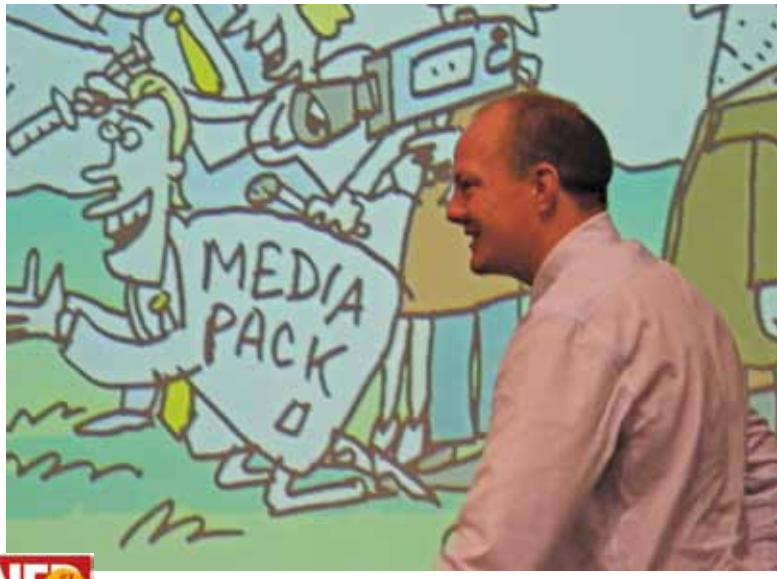


But Kiwis love being world best, and when it comes to dairy we are number one, the All Blacks of the economy. So our challenge is to use our world class credentials to try to inspire some pride in Kiwis about dairying and show them we have another big team we can be proud of.

Media Recognition

Why don't the mainstream media recognise the importance of our biggest industry?

by Tim Fulton, Editor, NZX Farmers' Weekly



Inductions have been on the dairy farming consciousness for 10 to 15 years but only this year did we have an explosive public debate on the issue and the news media sniffing at the cow's backsides for their latest droppings of controversy. I will start with that to frame my discussion.

I did have qualms about my contribution because by implication I was being asked to criticise some of my colleagues in the mainstream media and their treatment of the dairy industry. For those who are not familiar with the dynamics of how New Zealand journalism works, we have daily media, such as the *Dominion Post* and *The Press*, we have magazines like the *New Zealand Listener* and *North & South*, and we have publications with which farmers are well familiar, such as *Straight Furrow* and *NZ Farmers Weekly*, that land accessibly in rural mail boxes every week.

A recent letter to the editor of *Straight Furrow* summed up some of the criticism that the media attract. "Information is no longer a requisite for reporting. That standard has been replaced by opinion, inference, comment, supposition and increasing sensationalism." You can almost feel the blood boiling.

"Consequently the written media word is steadily losing the stability and credibility enjoyed by the readers of past decades. Indeed most but not necessarily all publications in the rural mailbox will not be bothered with if they required a subscription for their placement in the mailbox." That is the sort of thing that really gets an editor excited. Sometimes we reply and in the spirit of fairness, we publish and let ourselves be damned.

Farmers Weekly columnist Steve Wood-Harris recently ran his ruler over a *New Zealand Listener* feature on dairying that jumped at us with the headline "Milk is export gold but the damage to our land and waterways is causing alarm". He said the article was thoughtful, balanced and managed to avoid sensationalising the industry's impact on the environment, no doubt barricading his house against militant dairy farming neighbours soon after emailing the editor. The *New Zealand Listener* left the inescapable feeling that people who are inclined to see dairying as a polluting, money-grubbing industry would be unlikely to see past the emotive writing, although – as Wood-Harris pointed out – New Zealand is ranked 15th as the cleanest country on an environmental index published by Harvard University.

My own view is that the *New Zealand Listener* article will have been driven by journalism's requirement for a hook, or an angle, which is code for a sensational attention grabber. Detail followed dutifully behind. The formula works well enough for media with regular deadlines. If their stories are found wanting, journalists can soon add a variety of further comments and perspectives. But when it comes to complex subjects like agriculture, demand for the sensational hook tends to pitch-fork coverage from one colourful viewpoint to the next, putting more emphasis on commentary than on investigation. Important detail is no longer just secondary, it is lost altogether.

I can cite another example, *The Press* a year or so ago published an article on the Central Plains water scheme. That story, more than any other, has shaped the views of the Canterbury constituency. It raises the question: how many people's opinions on dairying integrity have been shaped by a single article referring to unsubstantiated research, or to one thread of research, or one particular person cited in one particular story?

The reality is that reporting multi-layered stories like these require time, money and an intense amount of experience. Unfortunately for editors and publishers there is often no guarantee the readers or viewers will be appropriately captivated by the effort invested. As a consequence mainstream media coverage of New Zealand farming is perpetuating a gulf of misunderstanding between farmers who consume specialist media and non-farmers who see agriculture through a prism of the dairy cow. We are all the poorer for this.

Until about May 2008 *New Zealand Farmers Weekly* was published by a small publishing company, CountryWide, in Fielding. The stable includes the *Dairy Exporter,* which came on board around the same time as NZX became our new owner, *Young Country,* which deserves a plug for presenting a positive upbeat magazine-style view of New Zealand agriculture, and the *Deer Farmer.* The stable includes Agrifax, and other information services that help provide us with a credible source of data and analysis to feed into our stories. In more recent times, NZX has added Clear Grain Exchange, an outlet for farmers to readily and easily sell their arable products on what is still a developing market, and similar farm information businesses, such as ProFarmer, a weekly briefing service, Australian Crop Forecasters and Callum Downs, which also serves the arable sector.

The mainstream daily landscape is covered by the *New Zealand Herald* and Fairfax newspapers and then there are other rural media. So we operate in a diverse field. But it doesn't matter what sort of masthead or title journalists are working for, they need to publish a

balanced range of views, opinions and analysis. Analysis is critical and for credible analysis we need to be able to back up our statements.

Some of the statements made at this forum have been unreferenced and unsubstantiated. It is important to present credible information because we have people here from various bodies who can wield enormous clout in political and business circles. So these messages must be accurate and timely and they must be balanced. We deserve to know where information is coming from and whether it is correct.

More generally, regarding the town/country divide, we have talked about the lack of understanding about how agriculture actually operates. Some information was presented by DairyNZ showing the typical understanding and empathy towards agriculture. The work they are doing in and around promoting dairy farming is interesting. I quote a comment from a former colleague, Andrea Fox, who is now working for the Fairfax group. She was talking to Tim Mackle, of DairyNZ, and his colleague, Rick Treadmore, and asked if the promotion was a pushback against growing public criticism of dirty dairying and the practice of inducing pregnant cows to bring on calving. Dr Mackle said a cynical response was to be expected, but planning had started a year earlier. The industry was seeking a social licence to operate.

That is a very telling phrase because the environment in which the media operate is very much a community one. We are influenced by every conference we go to, by every presentation made to us, and by every representation made to us by people in the community.

If the dairy industry can't be successful and secure a social licence, then it doesn't matter how many powerpoint presentations are put up or how much complex data are presented to show the economic benefits of dairying to the community. Dairy just won't be accepted, particularly intensive dairy farming as it is called.

Dr Mackle said the promotion is trying to build tolerance in the community. I think the only way to build tolerance in the community is to build understanding and we in the media have to do our darnedest to make sure we present the relevant information in a fair, responsible and accurate way.

EMERITUS PROFESSOR T.W. (TOM) WALKER

By Dr Craig Ross

New Zealand has lost one of its founding fathers in soil science and vegetable gardeners have lost one of their most compelling advocates with the death of Emeritus Professor Thomas William Walker (known affectionately by his many Lincoln students as "The Prof") aged 94.

Born in Leicestershire, England, topped that country's scholarship exams in chemistry, he went on to graduate PhD in Agricultural Chemistry from the Royal College of Science, London. After spending the war years working on the British Government's national food production programme, he emigrated to New Zealand with his wife, Edna, and three daughters (a fourth was born in New Zealand) in 1952.

He was appointed New Zealand's first Professor of Soil Science at Lincoln Agricultural College of the University of Canterbury (now Lincoln University) from 1952 – 58 and again in 1960 – 1979. In the intervening years he returned to the UK as Professor of Agriculture at Kings College, Newcastle-on-Tyne.

Professor Walker followed his early research at Rothamsted Soil Research Station on phosphate fertilisers with correcting nutrient deficiencies in New Zealand pastures, starting with field trials with Heck Orchiston, Berny Elphick and Arthur Adams assessing the effects of phosphorus, molybdenum, and sulphur on biological nitrogen fixation in clover. This led to a wide variety of research on soil fertility issues involving a long list of post-graduate students in the Lincoln Soils Department.

Adopting the writings of Hans Jenny's *The Factors of Soil Formation* on quantitative pedology, another world-leading research theme led by The Prof was soil sequences, particularly chronosequences, climosequences, and lithosequences, the most well known being the Franz Josef chronosequence. These studies incorporated understanding from soil survey (pedology) with soil fertility by employing soil chemistry and mineralogy.

Professor Walker was a superb orator and communicator with an engaging and humorous personality, perhaps encouraged by the great preachers of his day when, as a youth, he was a layman in the Methodist Church. According to his granddaughter, Jessica Halliday, his tips for oratory success were to "use Anglo-Saxon words before all others, no jargon, and plenty of jokes." His lectures on the nitrogen cycle and benefits of clover in pastures were legendary to a generation of Lincoln students. He had an inspirational enthusiasm for grassland farming and soils. His sharp intellect made him the fastest completer of the daily newspaper crossword puzzle I have known.

A humble man who did not seek accolades, he nevertheless received plenty. A Fellow of NZIAHS, NZSSS, and NZ Inst. Chem., in 1997 Prof Walker was awarded Lincoln University's top award, the Bledisloe Medal, and the Royal Society of New Zealand's top award for scientific distinction, the Rutherford Gold Medal. He also received the New Zealand Order of Merit in 2000. In 1994 he was awarded the NZ Grassland Association's Ray Brougham Trophy for his outstanding ability to communicate Grassland's farming information to farmers, industry, and researchers. In 2003 he was the first recipient of the NZIAHS Jubilee Medal for his very significant contributions to agricultural science.

He was a past-president of the NZ Society of Soil Sciences and New Zealand Grassland Association and has a soil science award named in his honour for the best student oral and poster papers at New Zealand soil science conferences. He was a Foundation Member of the NZIAHS and founded the New Zealand Grassland Trust in memory of Peter Sears.

Retirement in 1979 allowed him more time for his hobbies of vegetable gardening and salmon fishing but he gained national prominence in the 1990s Maggie Barry Garden Show, where his segment on growing vegetables was filmed in his home garden on Christchurch's Port Hills. For many years he wrote a gardening column for Christchurch's *The Press* and was a popular speaker travelling the country giving talks to farmer groups, gardeners, and at the Mystery Creek Field Days.

— Dr Craig Ross was Professor Walker's first Honours student

Milk & Water

The dairy industry can be sustainable with its resource demands – but only if there are big changes

By Dr Bryan Jenkins, former CEO, Environment Canterbury

Water is the critical resource in the Canterbury region for the dairy sector and the sustainability of water supplies is absolutely crucial. We are at the stage where our river takes are restricted, raising the issue of reliability of supply for farmers. We also are at the stage where many of our ground-water zones have reached their sustainability limits for supply purposes.

Another crucial consideration is the cumulative effects of water use – the impacts on water quality of land-use intensification and the ecological health particularly of our lowland streams.

Pastoral land use accounts for around three million hectares in Canterbury. Dairying has lifted its share from around 60,000 hectares in 1995 to 240,000 hectares in 2009. Lifestyle blocks have doubled from around 60,000 hectares to 120,000 hectares.

The non-irrigated arable area has declined while the irrigated arable area has increased, even though there was significant conversion from arable to dairying.

Our snow-fed alpine rivers provide the greatest volume – 88% – of our water. Lowland streams are the most sensitive to any catchment change.

Figures from January 2006, typical of a dry summer in Canterbury, show about half the flow in our lowland streams were on partial or full restriction. Restrictions applied to about a third of foothill rivers and a quarter of our alpine rivers. The pressure clearly is greatest on lowland streams in relation to water availability.

Our groundwater systems are under pressure too. Allocation limits have been reached in several zones.

Around 21% of the 222 wells we use for monitoring showed a significant increase in nitrates levels from 2000 to 2009. Decreases were showing in about eight wells.

The most sensitive part of the system is the aquatic health of our lowland streams. Measures from 1999 to 2009 show about 30% are in very poor health. One of the major challenges we face with water management is the impact of a combination of climate variability and increased extraction. In 2005 we had our driest winter at the end of one of an especially dry five-year period of winter rainfall, so we had the least amount of groundwater recharge and the least amount of ebb and flow in those streams.

Projections for climate change point to further decreases in winter rainfall as part of the conditions predicted for the east coast of the South Island.

The growth in demand for water is one of the significant changes in Canterbury. Back in 1985 about 150,000 hectares were covered by consents for irrigation. That has risen to around 560,000 hectares, an increase of about 6.5% a year.

Not only has the irrigated area increased from around 200,000 ha to 560,000 ha from 1990 up to 2008 but there has been a dramatic increase in use of groundwater, particularly in the past decade. Dairy cattle numbers have burgeoned, too.

Water management in Canterbury above all needs a paradigm change. We need a system in terms of water allocation and availability which addresses sustainability limits and climate variability. We also need a system able to manage the cumulative effects of water takes and land use intensification. Key components of Canterbury's strategy accordingly looks at a shift from the fixed-based management of individual consents to integrated management based on water zones. This will be at the catchment level but needs to be of finer scales.

The strategic alternatives were put through a sustainability appraisal that addressed the environmental and economic impacts along with the social and cultural aspects.

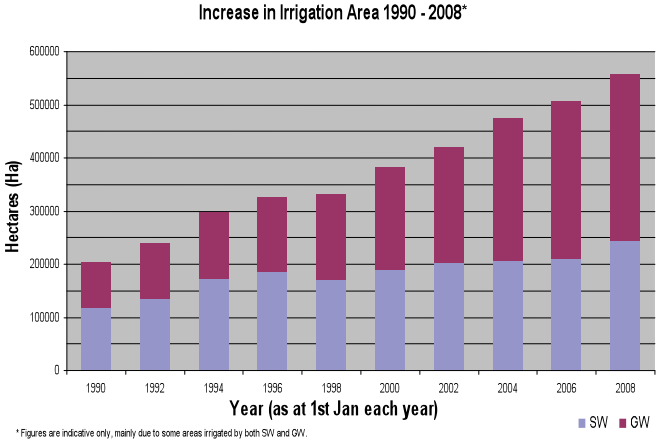
OPTION A was business as usual, the current Resource Management Act approach which is effects-based and applicant-driven. But the sustainability appraisal found it did not meet the well-being test for any of the four categories. This suggests what we are now doing is not going to be sustainable in the long term.

OPTION B looked at stopping development and advancing environmental protection, then proceeding with any infrastructure development that was still within environmental limits.

OPTION C looked at reconfiguring consents to incorporate not just new projects, but also existing development to improve the reliability of water supply and enhance the environment. It amounts to a re-distribution for integrative water management.

OPTION D introduced storage and mitigation associated with that storage.

Only the third option delivers sustainability across all four points of consideration.



* Figures are indicative only, mainly due to some areas irrigated by both SW and GW.

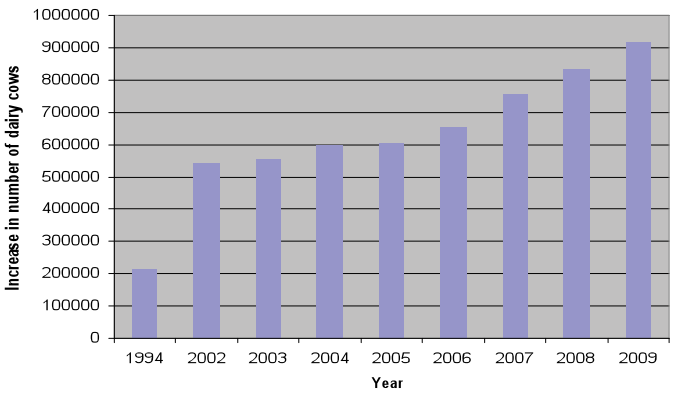
One of the strategic investigations undertaken was in relation to the impact of further land use intensification and water quality. But clearly we are at the limits now in many areas in terms of water quality criteria and in the case of groundwater for nitrates. Groundwater is still the dominant source of drinking water in rural Canterbury. One of the first tasks of our zone communities will be developing a biodiversity programme and finding the storage options that are most likely to be sustainable. We have looked at

about 600 different options as part of that process and for further evaluation have identified seven with the greatest potential for offering sustainable forms of storage. We also have looked at efficiency and ecological enhancements through integrated water management and the integration of water for energy security and irrigation availability. Canterbury has 65% of New Zealand's hydro storage and is a major contributor to energy but summer peaks in energy demand have been coming from irrigation and must be reduced. Economic modeling of both production and ecosystem services is continuing and we have looked at some of the governance structures for achieving sustainable management.

With further intensification of land use, our studies show, a substantial area of Canterbury groundwater could not be used for supplying drinking water. We would need to get a 40% reduction in the nitrate leaching now occurring because of land-use practices if we were to achieve acceptable groundwater standards. Practices that may be acceptable now may not be acceptable in the future. This is one of the critical issues to be addressed in terms of contaminants leeching into the Canterbury groundwater systems.

Water-use efficiency was another key issue we looked at, to determine if we are getting the best return – or resource productivity – from our water. An area between the Rangatata and the Raikaia was among those we looked at, to find what it would take to irrigate all of the potentially irrigable land. Initial studies in early 2000 on the volume of storage that would be needed showed that water-use efficiency could halve the volume of storage required for further irrigation development, but an integrated management approach should be taken. There are certainly improvements that can be made to on-farm efficiency. Even high application sprays result in a lot of water seeping through without benefit for added production. By introducing piped distribution systems you could have increased water availability. For the most efficient forms of irrigation you would want to irrigate every three days, if there was a soil moisture demand but with low application rate systems. Integrative water management with water use efficiency to improve current practices, and a different paradigm for irrigation, could give you a much greater return from the existing allocation. This would halve the volume of storage that would be needed to irrigate the entire area.

Total dairy cattle numbers in Canterbury by year



The dairy industry is not alone in placing pressure on our water resources and the solutions will require agricultural and other water users to work together. Some improvements in water management are being made at the small-scale level and we are now moving to the larger-scale level with our zone communities and region committees. But we have been able to get agreements with the farming community which have facilitated improvements in minimum flows.

We have also set up living streams catchments and working with groundwater clusters, involving people with similar types of groundwater hydrology, trying to get an agreement on how they can maintain the sustainability of their water supply in the face of increasing demands for withdrawals in their groundwater zone.

At the larger scale we are establishing zone committees and region committees.

Algal blooms had occurred in the Hurunui mouth in the late 1990s. Surveys were undertaken to check on the causes. The Pahau catchment was the major contributor to bacterial, phosphorous and nitrate contamination.

We have been working with people in the sub-catchment and have had a good response from individual farmers, many have installed barriers to stop surface water running into the Pahau directly. We also have had farmers working along stream reaches putting in filter strips, reducing stock access and establishing stock controls. The irrigation company has changed several of its irrigation scheduling practices and other components so better use is being made of the available water.

From 2005 to 2008 a three-fold reduction in the bacterial contamination levels were recorded in the Pahau catchment. For phosphorous the decrease is around about two-fold but because the nitrate is associated with groundwater rather than surface water, we have not seen any changes in nitrate at this stage. We still anticipate some reductions will be achieved, because it takes longer to get improvements in groundwater results. But clearly working together as a group in a particular catchment has been important to get these improvements. We are now moving on to St Leonard Stream and Dry Stream with similar approaches in those farming communities to try and reduce the total load on the overall system.

If you are looking 20 years ahead we need a new paradigm for water management in Canterbury for the dairy industry to be sustained. This certainly means integrated water management and reconfiguring existing uses as well as looking at future uses.

When we are talking about integrated water management there is a need for parallel development, not only of the production use of water but also of the environmental use, the recreational use and the cultural use. This has been incorporated into the Canterbury water management strategy.

One of the key findings from the strategy work is the incredible contribution that can be made in the mid-Canterbury area, in particular, from water-use efficiency gains from existing water allocations. That is our cheapest accessible water. Storage is very expensive water, although there is still the need to look at sustainable forms of storage, particularly in relation to the issues of reliability that come from climate variability and projections of where climate change is going. But we also need to have lower water quality impacts from existing and future land use practices. Some major initiatives are going on with industry trying to develop paradigms that can achieve this.

Another key consideration is the way in which we manage water. We see the need for collaborative governance at multiple levels. It has to be at the individual farm property, it has to be at the small scale, it has to be at the catchment scale, it has to be at the regional scale and some matters need to be dealt with at the national level.

There are ways forward, although they require changes in behaviour from many people. And if this happens, then in 20 years we can still have a viable dairy industry and a viable environment. But it will not occur without significant change.

The Health Message

Is the production and consumption of dairy products ultimately to our detriment dietetically?

By Lea Stening, Dietitian

Before we look to the future of the dairy industry it may be helpful to consider the past. Take for instance the free school milk scheme that operated in New Zealand between 1937-67. Many people may prefer to forget it. At a time of milk surplus half-pint bottles of whole milk were distributed to school children each day. Studies at the time *(Turbott & Roland 1932; Bell 1955)* reported improvements in the height and weight of New Zealand children, but at a time in their lives now when they should be drinking milk for stronger bones, many of our baby boomers (now in their 50s and 60s) report being put off drinking milk as a child. They recall being forced to drink warm, fatty milk that tasted like cardboard after being left too long at the school gate.

Should we ever be bold enough to try school milk schemes again then let us hope we choose low-fat, calcium-enriched milks that have at least been chilled on delivery. We should also offer non-dairy options for those with milk allergies and intolerances.

There are several barriers to drinking milk. Some dislike the taste; some have bad childhood memories; some fear it is fattening; some worry about their cholesterol levels; some have concerns about food allergies or lactose intolerance; some suffer from headaches if they drink it; some are concerned about the cost and some are confused by too much choice. Many people are unaware of its importance while others are confused by mixed messages in the media saying it is good for one thing and not another.

It is time for some consistent health messages about milk.

DAIRY AND BONE HEALTH

Osteoporosis affects more than half of all women and nearly a third of all men over the age of 60. More than 3,000 New Zealanders break a hip each year, a number expected to rise to 4,800 in ten years time *(IOF 2007)*. The Ministry of Health recommends that to maintain strong bones and teeth New Zealanders need to consume at least two servings of calcium-rich food each day, one serving being 250mls milk, two slices of cheese or one (150ml) pottle of yoghurt.

Unlike calcium supplements which can increase blood levels of calcium – endangering heart health, the protein in low-fat milk aids calcium uptake by bones, making the drinking of low-fat, calcium-enriched milk a better health alternative.

From a "bone health" point of view, perhaps we should be asking: Where would we be in 20 years without the dairy industry?

CALCIUM INTAKES ARE POOR

The National Nutrition Survey in 1997 found the calcium status of New Zealand men and women was poor, which is no doubt contributing to our osteoporosis statistics. Men in the 15-44 age group were not meeting their daily recommended allowances. This problem for men appears to resolve itself later in life because the respiratory disturbance index (RDI) scores decline for men after the age of 45 years.

Sadly, this is not the case for women who appear to be calcium-deficient for most of their lives. Rather than declining in later years the calcium requirements for women increase after menopause as oestrogen levels fall. Pregnant and breast-feeding women in the 15-44 age group are also at risk of falling bone density as their intakes of calcium generally fall well below the 1200mg recommended intake level.

Because milk and milk products are such good sources of dietary calcium, dairy industry efforts over the next 20 years should address some of the barriers that prevent people from drinking milk. Families should be encouraged to make milkshakes after work and school that include fresh fruit such as bananas and berries, without the need for extra sugar or flavourings. This would also contribute valuable dietary folate that is also in short supply.

THE CALCIUM STATUS OF NEW ZEALAND CHILDREN

The National Nutrition Survey in 2002 found that only boys aged 7-10 years manage to consume sufficient calcium to meet their RDIs. The remaining age groups are deficient. This is particularly evident as they enter their adolescent years. Girls appear to be deficient at every stage of their lives.

Young people are always looking for new beverages these days. This is one group of the population that the dairy industry needs to focus on with plenty of scope to develop new products.

The calcium intakes of NZ children
(Ref-National Nutritional Survey 2002)

Age/Gender	Diet	RDI's
Males	mgs	Mgs
5-6yrs	698	800
7-10yrs	806	800
11-14yrs	921	1200
Females		
5-6yrs	651	800
7-10yrs	653	900
11-14yrs	757	1000

THE RELEVANCE OF MILK TODAY

Milk should not be hard to sell. Humans have always relied on it for sustenance. Babies drink breast milk ideally for their first year before being weaned onto modified milks that are whey or casein dominant and then on to follow on formulas. Several modified milks, moreover, are available for babies born prematurely or suffering from allergies, reflux, lactose intolerance or congenital abnormality.

Very few natural foods are available that provide the main macronutrients protein (casein and whey) fat and carbohydrate (lactose) people need for good health. For this reason milk can be considered a 'complete food'. While not high in iron, it is a good source of B group vitamins, minerals and water.

MILK IS CONSIDERABLY ADAPTABLE

In New Zealand dairy products are manufactured mainly into various milk types – milk powder, butter, cheese, yoghurts/custards, and

The calcium status of NZ adults (ref: National Nutrition Survey 1997)		
Gender	Diet (mg)	RDI (mg)
Men		
15-44	957 – 938	1000
24-44	959	
45-60	864	800
65+	799	800
Women		
15-44	783 – 760	1000
24-44	759	
45-60	712	1500
65+	670	1500
Preg/Breast		1200

pharmaceuticals (such as special milk formulae). Milk is also used for commercial products such as biscuits, sauces, soups. It is now being produced to suit the tastes and needs of various sectors of the community from the weight to the calcium conscious.

Not all milks are dairy-based. Rice, soy and goats' milk share supermarket shelf space and a great number of products are labeled organic. Many modern milks are flavoured and fortified with extra calcium, Vitamins and omega3 essential fatty acids. With so many milks on the market consumers are complaining that they are unsure which ones to buy.

The Ministry of Health recommends the following:

- 0-2 years – Breast milk or whole milks or modified milks for babies that are premature or allergic. Babies are normally weaned on to either casein or whey dominant-based formula and then on to follow-on formula.
- 2-5yrs – Junior or Mega milk offers more protein and calcium with less fat than whole milk, which is important for growth.
- 5yrs and over – Trim or Calci-Trim for all the same reasons as listed above.

If we are to be crystal-ball gazers, then dietitians would recommend that rather than widening the milk market by developing more varieties of milk, the dairy industry should acknowledge the existence of non-dairy milks and encourage everyone to drink more low-fat milks.

CONSUMER ACCEPTANCE – could dietetic concerns limit industrial growth?

New Zealand is the world's largest exporter of dairy products, which account for 27% of our export income. With good management of its technology, costs, reputation, efficiency and collective spirit within the dairy industry there is huge potential for growth. How we manage any domestic threats to the industry will be important. The industry will need to juggle not only environmental issues of water, land use, nitrogen emissions and animal rights, but also how the public perceive the impact of dairy products on their health (Mackle 2010).

The industry needs to be mindful of food security and the impact of cost on consumption. For many families drinking soft drinks has become a cheaper fluid option for their children.

Dietitians as a profession are well placed to listen to people's fears and concerns about the use of dairy products in their diets. They can assess, educate and (where necessary) alter the use of milk and milk products in the pursuit of good health and the treatment of disease.

HEART HEALTH

Diseases of the circulatory system (heart and stroke) are the main cause of death in New Zealand, accounting for 37% of all deaths in 2005-6. While cardiovascular disease is multi-factorial disease associated with issues such as lifestyle, cigarette smoking, obesity and so on, the effects of saturated fat on heart disease as well as other diseases such as liver and gall bladder disease, some forms of cancer, diabetes and so on are well documented *(NZDA Position Paper 2000, USDA 2010)*.

Despite efforts by groups such as the National Heart Foundation to reduce saturated fat in the diet by promoting polyunsaturated margarines and low-fat dairy products, we still consume large quantities of full-fat dairy products such as milk, butter and cheese. In 2006 on a per capita basis New Zealand ranked 14th out of 21 countries for consumption of milk and milk products *(Int Dairy Fed Bulletin 2007)*.

Butter is a major contributor of saturated fat in the diet with a 61% saturated fat content compared to other fats such as rice bran oil 19.7%, olive oil 15%, avocado oil 11.5%, flaxseed oil 9% and canola oil 7%.

Too much saturated fat slows brain function, impairing learning acquisition and memory, whereas unsaturated fat aids discrimination learning and decreases depression *(Morris 2003)*. These health factors have led many to wonder whether New Zealand, on moral grounds, should be exporting its saturated fats to other parts of the world so readily.

THE COMPOSITION OF VARIOUS MILKS PER 100MLS								
Milk Type	Energy	Protein	Fat	Sat Fat	Carbo	Calcium	Sodium	Cost
	(g)	(g)	(%)	(g)	(g)	(kJ)	(mg)	($)
DAIRY								
Standard	260	3.2	3.3	2.2	4.9	116	43	0.22
A2	260	3.3	3.3	2.4	4.7	115	40	0.34
ReduceFat/Lite	200	3.5	1.5	0.5	5.0	125	44	0.25
Trim	168	3.7	0.5	0.4	5.1	132	45	0.25
Calci-trim	192	5.8	0.2	0.1	4.7	200	45	0.22
Junior	255	3.2	3.3	2.1	4.7	115	40	0.25
Mega	234	4.5	2	1.4	4.9	160	45	0.25
NON-DAIRY								
Goats	195	3.6	1.5	0.9	4.7	120	69	0.25
Rice Milk	210	0.4	1.1	0.1	9.5	120	55	0.38
Soy Milk	159	3.0	1.5	0.3	3.0	115	90	0.37
Oat Milk	250	1.0	1.8	0.2	9.1	120	40	0.38

Over the next 20 years it will be interesting to follow the dairy research directed at altering the fat content of butter by feeding extra fibre and fat supplements to the diet of dairy cattle to increase the polyunsaturated fats in milk and milk yield *(Gurr 2007)*. Also the production of milk with higher bioactive component levels of conjugated linoleic acid (CLA) should open plenty of areas for new product development *(Mackle 2000)*.

WEIGHT GAIN

Despite the advent of low-fat dairy products, there is a strong public perception that milk and milk products contribute to weight gain. But Michael Zemel, a researcher in Tennessee, found that milk aids weight loss. In randomised studies of overweight people fed a calorie-restricted diet for 24 weeks, those given a low-dose calcium supplement lost 6.4% of their body weight. A high-calcium supplement group lost 7.7%. Those fed the equivalent amount of calcium in dairy foods, lost 10.9% of their body weight; two-thirds of the loss was in the abdomen.

When the body isn't getting enough calcium, Zemel found, it releases the hormone calcitriol, which constricts blood vessels. It also acts as a metabolic switch in fat cells, signaling cells to hold fat and make more (from sugar). High calcium levels, however, suppress calcitriol.

While Zemel was sponsored by the dairy industry, his study group was small and critiques of his methodology research from more reputable groups are gaining pace, especially with regard to sports nutrition.

Along with calcium, milk and yoghurt contain whey. This is rich in Leucine which stimulates the building of muscle, which acts as a furnace to burn fat. It also contains peptides that suppress fat synthesis.

METABOLIC SYNDROME

Metabolic syndrome is a combination of disorders that increase the risk of developing cardiovascular disease and diabetes. Welsh researchers involved in the Caerphilly prospective study of 2,375 men without diabetes collected data on fasting blood glucose, plasma insulin, fasting plasma triglycerides and high-density lipoprotein cholesterol. Body mass index and blood pressure were used to define metabolic syndrome.

The prevalence of metabolic syndrome was found to be 15%. The relationship between milk and dairy products was examined using food frequency questionnaires and from a seven-day weighed intake record. The consumption of one pint or more of milk/day and dairy products was found to markedly reduce metabolic syndrome.

DIABETES MELLITUS

Recent concern regarding milk consumption has centered on the protein in milk, around 25-30% of which is ß-casein which comes in many forms depending on the genetic make-up of the cows. One of these forms is called A1 ß-casein and it has been suggested that this may cause or aggravate Type 1 diabetes (the type most commonly seen in children), heart disease, autism and schizophrenia.

This hypothesis stems from a comparison of 20 countries. Those countries with the highest consumption of A1 ß-casein also had the highest rates of Type 1 diabetes and heart disease. Changing the dairy herd in New Zealand to more A2-producing cows is one option under consideration. However, as the cause of these diseases is multi-factorial, the New Zealand Food Safety Authority is monitoring the situation and has cautioned about making major dietary changes before more conclusive evidence is available.

The evidence relating to ß-casein, schizophrenia and autism is much less robust. Some individuals with autism have shown improvement with other dietary modifications such as the inclusion of fish oils and removal of gluten as well as casein *(NZFSA 2004)*.

Researchers at Tufts University have found there was nearly a 15% lower risk for Type 2 diabetes among individuals with the highest dairy intake (3-5 servings per day) compared to those getting less than 1.5 servings/day. The researchers hypothesise that calcium and vitamin D may affect the body's ability to generate or utilise insulin, the hormone responsible for the processing of sugar in the body which is impaired in those with diabetes *(Pittas 2007)*.

Along with calcium and vitamin D, milk is an important source of magnesium which researchers have also found decreases the risk of developing Type 2 diabetes. The analysis concludes that for every 100 milligram increase in magnesium up to the recommended dietary intake, the risk of developing Type 2 diabetes decreases by 15% *(Larsson 2007)*.

MILK IS THE NEW SPORTS DRINK

Sports science is hailing low fat milk as the latest "sports drink" aiding performance in the following ways:

- Following resistance exercise drinking milk aids muscle building and recovery.
- Research in endurance sports suggest low-fat milk may be more effective than commercially available sports drinks as a re-hydration beverage by lowering urine output after exercise.
- The protein in milk aids the growth and repair of tissue during recovery.
- The whey in milk is rich in the amino acid leucine which stimulates the building of muscle.
- Low-fat milks aid weight control and helps to build lean body mass *(Roy 2008)*.
- Milk is suitable for school children and developing athletes.

Now that milk and water are being promoted as the preferred drink in schools, encouraging children to associate milk with improvements in sporting performance should be a very easy exercise.

It is time that the dairy industry re-styled milk as a healthy lifestyle choice for all those New Zealanders wanting to improve their health and fitness.

SUPPORTING INCREASED PRODUCTIVITY IS A FOOD SAFETY ISSUE

Good nutrition is about a balance of all nutrients and so dietitians do have concerns about the impact of increased dairy production on other food groups. For instance:

- What other food groups will be endangered if land use for dairy increases?
- Will cropping area be swapped for pasture to feed dairy?
- What effect will changing water patterns have on existing crops?
- What effects will farm run-off into rivers and streams have on other foods sources such as our salmon and whitebait?
- Will land use swap for dairying reduce availability of other meats such as sheep, deer, llama and free range chicken?
- In our rush to improve pasture growth will pesticides and chemicals use increase and how will this affect our food chain?

But if the dairy industry is able to recognise the many health benefits of drinking milk and develop ways of improving nutrition education across the country and off shore, then the future of the New Zealand dairy industry looks very bright indeed.

Dairying and Irrigation

Is there a better use for our flat, irrigable land?

By Andrew Curtis, Chief Executive, Irrigation New Zealand

Irrigation New Zealand is about sustainable water management. We are known for our advocacy and we do a lot around education, training, and research and development. We are putting a package together for the irrigation industry, recognising that to get irrigation you need design, installation, operation and maintenance.

A question often asked about dairy taking over so much land in the South Island is whether dairy is the only farming on irrigated land. Dairying in the South Island has surged from 17% of farming in 2002/2003 to 34% in 2008/2009. Growth in Canterbury has gone from 117,000 hectares to 188,000 hectares.

It is harder to get irrigation statistics. Ministry for the Environment reports say major problems are posed because of the way regional councils record surface-water and ground-water takes. This can be double-counted on the same property.

But the statistics say the South Island takes up about 80% of the irrigation (it hasn't changed that much) and 60% or so is in Canterbury. The first set of figures comes from a MAF report on the economic value of irrigation. The second set comes from the Agriculture Statistics Survey.

I have made some critical assumptions and say 100% of the dairy area in Canterbury is irrigated. I am not so sure about the Otago figures. But if we accept the Canterbury figures, the dairying area has increased in hectare terms, while it has declined as a ratio to irrigable land.

In short, dairy production does occupy a significant amount of New Zealand's irrigated land area but it is not the only land use. A challenge for the irrigation industry is to dispel the myth that irrigation equals dairy farming. If we are going to move forward with irrigation it means all land uses – it is an enabling tool.

Whether dairy makes the best use of irrigable land is a key question. I have randomly gone to an economic analysis of one of the schemes, the Huranui project. Dairying is a significant land use but so is horticulture. Data from the NZ Institute of Economic Research as part of a research project for Environment Waikato looked at the flow-on benefits of irrigation. Again it showed horticulture doing well and dairy doing reasonably well, but the arable results were not so good.

But water isn't everything and there are many other drivers around resource potential, such as labour, the market, climate, soils and the crops being grown.

Determining the best use for irrigable land is more complex than deciding whether you should have irrigation, basically involving how much water is available and the reliability of the supply. Pastoral systems can work quite well with low reliability: farmers are getting constant returns and can bring in feed or can decide to move stock elsewhere. With arable farming and horticulture, however, low reliability impedes high-value cropping.

Reliability requires multi-purpose water infrastructure. Development of this is not being delayed by Resource Management Act regulatory process as much as it is by people's approach to it. A collaborative approach probably would be helpful.

Overcoming the misinformation and misunderstanding about water irrigation is another challenge. Irrigation can be highly beneficial when it comes to improving the environmental picture.

Farmer uptake was easy in the days when government funding was available and basically 75% of farmer support was enough to develop a scheme. Nowadays 100% support is needed. Otherwise supporters have to carry extra costs.

The other aspect of reliability is that it deals marvelously well with the externalities. Management systems improve when you have reliability. If you have uncertainty you tend to take a "just-in-case" approach because you never know when you will be turned off or where your next water is coming from. You are always topping up, taking a risk-management approach. But when you are certain you can turn the tap on whenever you want, you can maximise your use of rainfall, enabling you to do some really intelligent things. Optimal water use means optimal environmental performance, which means you need less water per hectare and your use of rainfall means you need less storage in the first place. If you are minimising your losses from the rooting zone then you obviously will get less leaching, which all contributes to improved water quality and coping with those externalities.

There are two aspects of allocation. Setting the allocations calls for value judgements to be made and translating them into objectives and goals and into standards and limits. The important bit is transferability. Many people are talking about the need to re-allocate water, but in my view it is already allocated and we have lots of infrastructure in which investment already has been made. What now is needed is transferability, to enable the movement of water to the best use. This brings technical efficiency, allocated efficiency and economic efficiency into considerations.

First thing to do is set limits, without these you will end up with major problems. The other scenario to be managed is a community-based process, working with those involved where you have an over-allocation. You will find that most farmers, when a problem is put to them, will find a solution.

There is a range of ways of giving effect to transferability. I doubt a market trading system will work in most places in New Zealand. For a market to operate volume and depth are needed in terms of numbers of people to create demand and resource scarcity. The Canterbury Plains is an exception: you have a good market place potentially for storage systems.

Water-take permits need splitting into take and use components, something likely to happen soon. The "use" bit will be for use on the land; the "take" bit requires clear definitions of the areas in which transfers can freely take place. Part permit transfers need to be considered, too, and are likely to be introduced.

In summary, to answer whether dairying is the best use of irrigable land, probably it is at the moment. But the future will involve creating an enabling environment and letting the market operate. It also will involve setting limits, making value judgments, ensuring reliability and introducing transferability. The best use then will look after itself.

Getting the right balance

The issues for dairy farmers in 20 years

By Conor English, Chief Executive, Federated Farmers of New Zealand

New Zealand's farm export story is straightforward. We have some dirt and water and we grow some grass. We convert these into protein that we sell around the world, earning export dollars and paying our bills back here at home. The dairy industry contributes significantly to this and is on a growth path.

Farming viability is one of two important areas of focus for Federated Farmers when it considers how to improve our farm exports. Essentially, this focuses on anything that affects income and expenses and tries to ensure the former is greater than the latter. Issues around input costs, compliance, rates, employment, farm gate returns, the supply chain, trade access, market structures and the impact of government monetary and fiscal policies (locally or globally) will always have an impact and will matter 20 years hence, as they did 20 years ago. Profit will still matter.

The second area of focus can be summed up as "our ability to farm for generations" and embraces strategic issues we must get right so we can continue to farm for another century, whether viably or not.

Environmental sustainability is critical. As custodians of the land and water we need to leave it better than we found it. We have set up and support the Landcare Trust and the QE2 Trust to do practical stuff, and farmers contribute millions of dollars to DairyNZ to work on practical solutions in the field. We also celebrate environmental success through our support of the Balance Farm Environment Awards Trust and of Jeanette Fitzsimons and her www.goodfarmingstories.co.nz website.

Water is critical for dairying and for the country. Its ownership, allocation, management, quality and storage are in play right now and the decisions made in the next few years will have consequences that are felt for the next 50 years. If we get them wrong, our success as a nation will be constrained. If we get the balances right, then our ability to harvest and benefit from one of our critical comparative advantages will be enhanced. Water needs not be an issue in 20 years.

We have been running a campaign for the last two years on water storage. It if is successful, in 20 years we will have secured some economic and environmental resilience for the country. Around 30 projects up the eastern seaboard of New Zealand could be developed. We know from Opuha dam experience that for every 1,000 hectares irrigated, about $7.5 million extra cash is pumped into the economy every year and 29 new jobs created. We get more fish, less drought and increased recreational opportunities for the wider community.

We need to build resilience over the next 20 years – both environmentally and economically, and water storage does that. We have just been through the worst recession we've experienced in three quarters of a century, but it wasn't started by the global financial crisis. It was started by the 2008 drought that, according to MAF, cost $2.8 billion.

Urban rural understanding and perceptions of agriculture generally and dairy in particular, will become more critical because the decision-makers increasingly are becoming more distant from the practicalities of farming and farmer numbers are declining in a proportional representation system of government. With Farm Day and other programmes Federated Farmers is trying to address that.

Agriculture needs good infrastructure – roads to cart inputs on to and produce away from our farms and transports links with global markets. Critically, we need rural broadband to enable us to connect with people and markets and to information to enhance productivity and production.

Our concerns about research are not only about investment levels, but also about the incentives on the players in the innovation supply chain. We need to be obsessive about innovation. The risk is that we become complacent.

The world is a competitive place and will become even more competitive over the next 20 years. The New Zealand dairy industry needs to keep ahead of its competitors, some of whom haven't yet been identified, and to be relentless in this pursuit. Genetic and other research around our farming systems needs to remain at the forefront.

That brings me to our agricultural intellectual capital and the importance of capturing cash flows from our genetics, from our farming systems and other agricultural intellectual property. We must develop models to monetise our weightless exports. Concerns around foreign investment in farms to some extent reflect our lack of a successful Intellectual Property (IP) strategy and business model.

The shallowness of our capital markets is tied in with this. The demand channel for protein is strong but the supply channel for credit is weak, resulting in our Government being challenged over the amount of foreign investment intended in farmland and particularly dairy land. Our lack of savings and shallow capital markets are among the country's greatest challenges over the next 20 years and part of the problem retaining our IP. We need to fix it.

The current dairy model is characterised by the aggregation of smaller units into larger ones, more intensely managed, with changing ownership structures. The traditional owner operator family farm is under some pressure, but perhaps the constraints on capital and the removal of gift duty will see a resurgence of that model over the next 20 years.

Succession is a big issue. The farmer in 20 years will be the young man or woman who now will be making decisions about moving into farm ownership. Our share milking structure, which Federated Farmers oversees, has been a huge success but is coming under pressure. After we lobbied to get death duties and stamp duties removed, we began working on gift duty. Its removal should enhance inter-generational transfers.

New models will evolve. More use will be made of leases and equity partnerships, this is starting to happen now.

We've seen from Fonterra's experience in China that consumers want food they can eat that does not harm them. Increasingly they want to eat for better health, rather than just sustenance. New Zealand has an excellent track record and reputation. Enhancing that reputation will become even more important over the next 20 years.

We need skilled people on our farms. Farming is a complex business needing good people to run them and their management systems. We need skilled and motivated people, too, in our science and rural professional communities. Striking the right balance between education and immigration over the next 20 years will be important.

Something that wasn't predicted just a few years ago was the global financial crisis. According to an item on the Bloomberg website on 25 August, it is likely to impact the next 20 years through inflation, deflation, reduced demand, civil unrest, disrupted capital markets and so on. The Bloomberg report quoted a Morgan Stanley executive director, Arnaud Mares, who said investors face defaults on government bonds, given the burden of aging populations and the difficulty of increasing tax revenue.

"The question is not whether they will renege on their promises, but rather upon which of their promises they will renege, and what form this default will take", Mares said.

"While the US government's debt is 53% of GDP, one of the lowest ratios among developed nations, its debt as a percentage of revenue is 358%, one of the highest…

"Italy has one of the highest debt-to-GDP ratios, at 116%, yet has a debt-to-revenue ratio of 188%."

If things turn out as Mares predicts, the greenback is likely to tank and our NZD would appreciate significantly. If our strategy in the dairy sector – and in the wider agriculture sector – is to wait to be saved by a falling dollar, then we are taking a very big risk.

The global financial crisis has seen unprecedented volatility. So farmers have to deal not only with the weather and off-farm regulatory risk, but with volatile commodity, interest and exchange-rate values. Fonterra's new payment system and capital structure will see more volatility, which farmers and their banks will need to get used to. The costs of capital will rise and risk management will become more critical.

Also, as a result of the global response, economies that have over-indulged in debt will have to take drops in standards of living while standards will rise in countries that haven't. We are seeing a massive shift from West to East as one empire declines and another rises. China is taking back the pre-eminent global position it gave up a century or two ago.

It is being followed by India, which is placed today where China was about 10 years ago. This is good news for New Zealand. With a large emerging middle class, we have an increasing number of increasingly affluent consumers who are not too price sensitive and will pay premiums for safe high quality foods and protein. There is a big shift from starch to protein, so the protein demand channel is very strong.

There will be massive demographic changes, too. These are driven by two key issues – lots more people and more people living much longer. The metrics are phenomenal.

And then we have ethnic and family structure changes. This impacts on both the demand and supply side of agriculture.

Along with a geopolitical and demographic change, perhaps we are seeing an emerging ideological change. We are moving from a global division on the basis of democracy versus communism to one based more around religion. That raises questions about our markets – the products we produce, how we produce them, and the location of our markets all may change as has happened over the last 20 years.

A key message is that over the next 20 years, as an agricultural sector, we need to focus on solutions, not just the problems. The longer anyone focuses on a problem and not the solution, the worse it gets.

Many of the issues we are concerned about now will still be concerning us in 20 years. Our ability to have what it takes to farm profitably in New Zealand will still be critical. But we live in an increasingly volatile, unpredictable world where change happens quickly.

The demographic and geopolitical changes that are happening are phenomenal. Technology advances and research endeavours provide an exciting catalyst for change on an ever-shrinking globe. We need to look over the horizon, look to manage increasing risk and volatility. We need to build resilience now. We need to aggressively seize the opportunity, or someone else will. We need to do all this and take the rest of New Zealand with us if we are to have successful agricultural businesses and happy lives.

Technology Transfer can not be Left to Chance

"To kill an error is as good a service as, and sometimes better than, the establishing of a new truth or fact" – *Charles Darwin.*

By Dr Douglas Edmeades, agKnowledge Ltd

The only reference points we have to help us look 20 years into the future are history, the situation today, and what we would want for the future.

The past tells us that the dairy industry has made huge progress, especially over the past 50-60 years *(Holmes 2007)* and it is reasonable to suggest that this progress is built on sound science from many disciplines: animal and plant genetics, pasture and soil management and the control of pests and diseases. From this it can be inferred that the goal of an economically sound and environmentally sustainable dairy industry in 20 years can only be built on the shoulders of sound, robust science. But this is not all, because another lesson from our recent history is echoed in McMeekan's famous dictum: science is of no use unless it is applied on the farm. To achieve this requires technology transfer.

In this paper I am focusing on this junction between science and the farmer. Are we headed in the right direction in terms of the institutional values and ethics required to undertake the necessary research and the integrity to translate that science into information that farmers can understand and trust?

SOME REFLECTIONS FROM HISTORY

McMeekan's dictum does not mean that all agricultural scientists must work at the applied end of the spectrum. All types of science, from pure to strategic to applied, are required to solve the problems ahead. I take McMeekan's imperative to mean we must have scientists capable of synthesising across these artificial boundaries to faithfully bring to the farmer the collective meaning of the science in an understandable manner.

I fear that this type of scientist is becoming a rare breed in agriculture for the simple reason that, apart from DairyNZ, through their Consulting Officer Service, and Meat and Wool via their Monitor Farm Programme, technology transfer nowadays is nobody's responsibility. Even worse, what is now called technology transfer in an age of 'commercialisation' is little more than institutional propaganda designed for marketing reasons.

SCIENCE – PURPOSE

Prior to the CRI reforms the purpose of publicly funded agricultural research was brutally clear – it was for the public good. No accountants or MBA's need apply! Under the CRI Act the purpose of the CRIs is two-fold: to undertake research for the public good and make a financial return to the shareholder which is expressed either as a return on assets, a dividend, or via tax. But commercialising and politicising science undermines the integrity of science by bringing to it motives that contradict its purpose.

The recent CRI review wrestled with this. Its report shows they did consider the idea of making the CRIs "not for profit" organisations. They rejected this, arguing that a change would be disruptive given that so much time and effort had been invested in the current model. Their solution was to better define the purpose of the CRIs, but if we do not know that now after 20 years of effort we will never know. It is my view that while the Act remains the CRIs will continue to be two-headed monsters not confident to look in any direction.

TECHNOLOGY TRANSFER

There was a time when New Zealand had one of the best agricultural technology systems in the world. It was much admired by overseas visitors. It began with Farm Improvement Clubs and developed into the Department of Agriculture Extension Services and then, ultimately, to the Ministry of Agriculture Advisory Services. At its peak, farmers depended on it as the arbiter of good and bad science and information. In the interests of improving the economic efficiency of the nation this system was stupidly dismantled to the cry of user-pays.

What has emerged from the ashes is a disparate group of aging consultants whose focus, it appears to me, is more on the management of farmers' resources rather than transferring emerging science and technology onto the farm. For example, it is becoming obligatory for dairy farmers to have nutrient management plans but the technical skills to roll these out across the nation are meager.

FOURTH ESTATE

Having a science-literate agricultural press, free from commercial constraints, to convey the necessary science to the farmer is also vital. Once again our own history suggests how this should be done. The Department of Agriculture's *Journal of Agriculture* was widely read and treasured by farmers for many decades as a source of hard data and commentary from science. So too was the *Dairy Exporter.* What they published could be trusted and relied upon. Today the agricultural press relies largely on advertising revenue. Hence the stories they carry are often a reflection of the advertisers rather than of science.

SOME SYMPTOMS

So what are the consequences of commercialising and politicising agricultural science and how does this impact on the integrity of the science message delivered to farmers?

EXAMPLE 1. THE PRESS

An agriculture magazine that is widely read and purports to be a quality publication told its readers a new fertiliser product on the market enhances soil quality through "electromagnetism". The same issue carried a story celebrating homeopathy. Scientific evidence refutes both.

How can this be at a time when the national catch cry is "science is the driver of the economy"? From the age of enlightenment, we have emerged into the philosophy of post-modernism which sets aside evidence as the authority and asserts that the 'truth' is what you believe – if you believe it, then it is your 'truth'. Importantly all opinions are to be given equal authority, irrespective of where evidence may lie. These ideas have progressed to what is now called 'post normal science'. This holds that science is subservient to the story that must be told. The role of science is no longer about discovering new 'truth' but supporting the 'story' which is perceived to be the truth. This gives rise to the notion of "noble-cause science", which allows scientists to ignore contrary evidence, or worse, manipulate the evidence, if the cause is noble. We have seen evidence of this in the climate change debate.

Mix together an agricultural press dependent on advertising

revenue with this 'anything is true' post-modernistic nonsense and you have a recipe for a technology transfer disaster. But the 'market model' theorists will argue that this philosophical environment should motivate farmers to become savvier – better educated – so they can winnow the wheat from the chaff. But will this be sufficient? What happens when the scientist becomes the salesman?

EXAMPLE 2: THE CRIS

A predictable consequence of the CRI Act is that scientists have become salesmen. CRI staff are now seen fronting advertising campaigns for products from which the CRI derives royalties. In one case it is known the CRI had data that did not exactly support some of the claims being made for the product. This highlights the clash between the public good (in this case the farmer) and the private good (the dollars). However well-educated, the farmer's confusion is palpable: is the scientist acting as a scientist (public good) or as a salesman (private good).

A further justification for the CRI reforms – we were told – was to get politics out of science. Sadly the effect has been the opposite. Most of the funding decisions are now made in Wellington and it seems unlikely significant funding could be won for a project that did not fit the political agenda. Indeed one of the skills in preparing a FoRST bid is to double-guess the political agenda. Consider for example, how many projects are being funded to investigate the possible mechanisms that govern global temperatures, other than greenhouse gases, such as the sun-spot cycle or the Southern Oscillation?

This politicisation of science also has the potential to compromise the purpose and integrity of science, as the next example highlights. 'Climate Change' is undoubtedly one of the most important issues confronting society, especially agriculture. We now know that the government policy (the ETS) to mitigate increasing greenhouse gas emissions is going to cost agriculture millions of dollars. I am sure no-one would object to this if it was being done for sound, objective reasons. But that is the question; how sound is the science?

The official NIWA website records the average New Zealand temperature *(Figure 1)* and shows the average New Zealand temperature has increased since about 1900. The New Zealand Climate Science Coalition has quite legitimately obtained the raw data *(Figure 2)* and contends they show no warming. These data are derived from seven long-term climate stations and there are legitimate reasons for making adjustments to the record to accommodate changes around, or shifts in, their location. However, after exhaustive enquiries through layers of political obfuscation from the Government and NIWA, it appears that the evidential basis for these changes does not exist.

Importantly, the issue here is not climate change: it is the conduct of science. The checks and balances essential for the science process to operate require that science, and in particular publicly-funded science, must be open to scrutiny.

EXAMPLE 3: UNIVERSITIES

The universities, once regarded as the bastions of independent free thought and debate in society, have also been engulfed by the clouds of commercialisation and politicisation. I could choose many examples but one will suffice.

A New Zealand fertiliser company is marketing a product 'developed' at a university, with funding from the fertiliser company. The patent is in the name of both parties who receive, one assumes royalties from this arrangement. The product is an aqueous solution of a common chemical (DCD) first discovered in the 1950s. DCD slows the conversion of ammonium to nitrate in the soil and much research has been completed in the intervening years and particularly in the Northern Hemisphere, to investigate its potential to reduce nitrate leaching and emissions of nitrogen gases from fertiliser and soils. These issues obviously are relevant to New Zealand, but how robust are the various claims made about the product? Has it been both independently and extensively tested in all farming situations?

I think the only solution is that scientists when writing and commenting about products and services are made to declare all their private interests so that the public can make its own assessment as to what weight, if any, should be placed in any opinion and conclusions which are offered.

EXAMPLE 4: CONFERENCES

Conferences are an important component of the technology transfer system. It is now standard practice for the costs of these conferences to be met by attracting commercial sponsors. In itself that is of no great concern. However problems arise when sponsors are given speaking rights at the conference they have sponsored, or worse, they use their financial leverage to dictate how the conference is managed. Two examples: One of the sponsors of a New Zealand conference where the owner of the company had speaking rights which he exercised by telling the conference of his achievements selling his product. At the beginning of question time the chairman reminded us that science must be tolerant of other views, thus closing down any sensible questioning.

The second was when I co-authored a workshop at a conference on the topic, Fact or Fallacies: who is telling the truth and how to tell the difference? The sad consequence was that I received a letter from the organisers banning me for life from future events for criticising

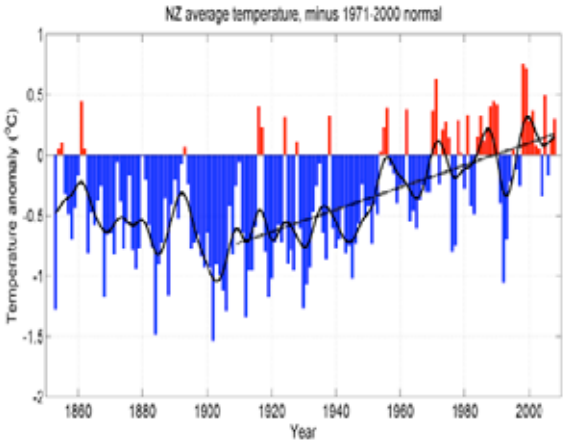


Figure 1 Adjusted average NZ temperatures from 1860 to 2000 as reported by NIWA. (http:/www.niwa.co.nz/our-science/climate/news/all/nz-temp-record)

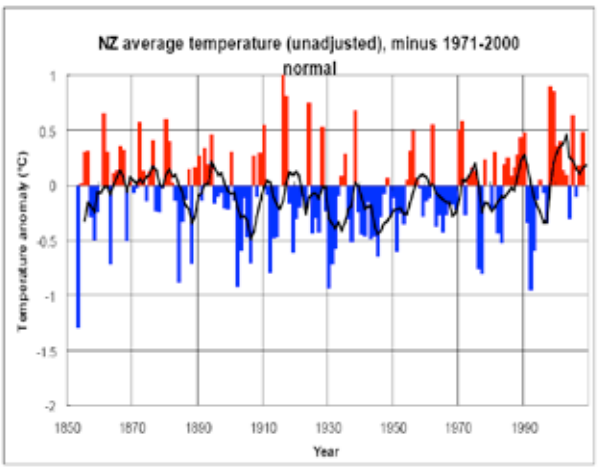


Figure 2. Actual average NZ temperatures from 1860 to 2000 from NIWA data (http://www.climateconversation.wordshine.co.nz/docs/awfw/are-we-feeling-warmer-yet.htm.

one of the sponsor's products. The question arises as to what is the purpose of these conferences – to inform farmers or to protect the interests of the sponsors?

CONCLUSIONS AND SUGGESTIONS

We all want a sustainable New Zealand dairy industry. This can only be achieved by sound, public good science uncompromised by other motives, and a system to translate that science into farming practice, free from commercial considerations. But the frequent comment I hear from farmers throughout New Zealand is that they are confused in respect to scientific and technical information. They do not know who to believe or trust. This is a measure of the state of technology transfer in New Zealand – it is broken. What to do?

First, agricultural science must be returned to its normative roots. The CRIs must be made not-for-profit organisations, bulk-funded and managed by those who are scientifically literate for the public good. This is the only way to maximise the time scientists spend doing science, minimise science transaction costs and maximise allocative efficiency. Science has always been a contest of ideas chasing research money and to overlay this with a further artificial layer of 'competition' and 'accountability' is demeaning and counter-productive *(Edmeades 2004, 2006, Rowarth and Goldson 2009)*. But most importantly, the integrity and purpose of science would be restored. Whatever technology science produces can then, in the interest of the public good, be 'given' to the private sector to develop and deliver to the farmer, as only the private sector can.

The need for technology transfer must be officially recognised and funded. To leave it to chance is not an option.

Case study in sustainability

In this paper we apply a simplified Framework for the Evaluation of Sustainable Land Management (FESLM) definition to two contrasting dairy farming systems: a conventional in situ grazing system and a nil grazing system to try and assess relative sustainability

By Dr Melissa Robson (formerly with Ryder Consulting) now at AgResearch and Dr Doug Edmeades, agKnowledge Ltd

The FESLM definition of sustainability states that:
"Sustainable land management combines technologies, policies and activities aimed at integrating socio-economic principles with environmental concerns so as to simultaneously:

- Pillar 1: Maintain or enhance production/services (Productivity)
- Pillar 2: Reduce the level of production risk (Security)
- Pillar 3: Protect the potential of natural resources and prevent degradation of soil and water quality (Protection)
- Pillar 4: Be economically viable (Viability)
- Pillar 5: Be socially acceptable (Acceptability)."

The FESLM framework allows for many parameters for each pillar and layers within each parameter, but for the purposes of this paper we have taken a much simplified approach using a single parameter representative of each of the five pillars to make the comparison:

- Pillar 1: Production – pasture yield
- Pillar 2: Protection – nutrient leaching, runoff and gaseous emissions
- Pillar 3: Security – risks of incurring future regulation that impacts on farming system
- Pillar 4: Acceptability – public opinion
- Pillar 5: Viability – economic return

The two dairying systems being compared are:

1. a nil grazed, or cut and carry system and
2. a fully grazed, or conventional system, designed to represent current typical dairy practice in New Zealand. Each production system is assessed for each FESLM Pillar with the in-situ grazing system used as the baseline against which the nil-grazing system is compared.

PILLAR 1 – PRODUCTION

New Zealand is a good place to grow grass, but pasture performance, even under well-managed grazed systems, is not optimal for two principal reasons: sward damage and soil compaction from animal treading; and uneven return of nutrients. In terms of production, both research and anecdotal data show that the nil grazing system can increase production and efficiency, both of feed and nutrient use, over the conventional system.

PILLAR 1 – PRODUCTION TABLE		
Parameter	Typical productivity in an 'in-situ' grazing system	Potential gains/losses in a 'nil grazing' system
Nutrient return	Annual average pastures 8-17 t DM/ha	+ 20% pasture produced
Treading	Annual average pastures 8-17 t DM/ha	0-38% pasture reduction
Pasture harvesting	Typical pasture utilisation of 50-80%	+ <35% pasture utilised
Feed conversion	9.6-19.2 kg DM eaten/day	<36% less food required

PILLAR 2 – PROTECTION

At regional and national level, policy and reporting alike point to the degradation of water quality from the intensification of agriculture and potential impacts at the farm level of the inherent nutrient inefficient pasture harvesting system by grazing stock recognised.

The nil-grazing system can deliver improved environmental protection over the conventional system, by eliminating the urine patch driven N leaching and minimizing fertiliser use, however there is the potential for increased in gaseous emissions.

PILLAR 2 – PROTECTION TABLE		
Parameter	Typical 'in-situ' grazing system	Potential gains/losses in a 'nil grazing' system
Nutrient transfer	7-12% excretal returns to non-productive land and lost from system	0% returns to non productive land
Nitrogen leaching	Annual average leaching from typical New Zealand dairy farm 30-50 kg N/ha	55-65% reductions on N leaching
Atmospheric losses		Up to 35% increase in total N losses due to increase ammonia volatilisation Diet manipulation up to 7% reduction in N2O emissions Winter management up to 6% reduction in N2O emissions Reduced animal treading up to 3% reduction in N2O emissions Reduced fertiliser N up to 4% reduction in N2O emissions

PILLAR 3 – SECURITY

This Pillar considers the risk that a given farm system or management practice may not be permitted in the future, in the sense that farming systems that are ill-suited to their environment have both a higher risk of production, (that is, impact on the wider environment), and a higher risk to production, because there is more chance that ill-suited systems will be encourage/regulated to change or go elsewhere. This is the most difficult of the five pillars to assess because it is in effect the end result of how well the dairy industry can manage Pillar 2 (protection) and Pillar 4 (social acceptability). The in-situ grazing system has already begun to see some consequences of practices, manifesting through increasing regulation. Although there is no equivalent actual scenario for the cut and carry system, it is could be argued that the environmental benefits would reduce the risk of the system.

PILLAR 3 – SECURITY TABLE		
Parameter	Typical 'in-situ' grazing system	'Nil grazing' system
Likelihood of system impacts leading to more restrictive environmental regulation	High	Medium-Low
Likelihood of system impacts leading to reduced environmental regulation	Low	Low

PILLAR 4 – SOCIAL ACCEPTABILITY TABLE		
Parameter	Typical 'in-situ' grazing system	'Nil grazing' system
Likelihood of system becoming more acceptable	Low	Medium
Likelihood of system becoming less acceptable	Medium-High	Medium

PILLAR 4 – SOCIAL ACCEPTABILITY

The conventional dairying system is 'socially acceptable' in New Zealand, and continues to grow. Housing of stock (for winter management) is also in on the increase in New Zealand, albeit on a smaller scale, with little public outcry. However, there was considerable and negative public and political reaction to the press coverage on extended housing proposals put forward in the Mackenzie Basin, giving insight into the a general public view on extended housing. Although not all directly related only to housing, these reactions cannot be overlooked.

PILLAR 5 – VIABILITY

The current dairying system is clearly still economically viable, although in part, based on environmental costs being externalized. The industry is globally competitive, with returns to farmers highly variable. For the nil grazing system, little evidence is available on the economics except for de Klein's study in 2001, although the economic benefits for over winter and extended housing (restricted grazing systems) have been illustrated in several New Zealand examples, through removing some of the variability of performance associated with weather, soil damage and animal health. However, if environmental externalities are internalized, or government regulation is justified by their continued presence, then the economic return for the nil grazing systems, capable of more production with lower nutrient losses, may become more attractive.

CONCLUSION

What a rather simple comparison indicates is that according to the parameters chosen, neither system is fully sustainable. But in reality, there are many degrees of farm systems between these two scenarios, with better-performing conventional dairying and restricted or winter housing filling this middle ground – and it is this middle ground that it likely to yield some sustainable solutions.

Looking forward, markets and regulation will require higher environmental performance, and a continued drive of intensification on existing land will, in our view, inevitably lead to some farmers restricting or eliminating winter grazing through housing their stock; and as more informed and rational debates occur and if existing housing systems are shown to deliver benefits to the environment that people care about, the acceptability of housing stock will increase.

So, while we are not presenting housing in the dairy system as 'the' future for all of New Zealand's dairy industry, we believe that it is 'a' future worth considering.

PILLAR 5 – VIABILITY TABLE		
Parameter	Typical 'in-situ' grazing system	'Restricted grazing' system
Research	Wintering out costs $116,000	9-17% return on investment (nil grazing gave a 1 to -10% return on investment) $101,000 increased profit from housing stock over winter
Reported	Biggest global exporter of dairy produce, earning $10 billion in year to March 2008 In 2008/9, on farm operating profit dropped below the average for the decade, giving lowest profit margin in at least a decade. Operating return on assets decreased from 6.6% to 1.6% and down to -14.6% for return on total assets Milk prices expected to increase	
Anecdotal		Satisfactory return on investment compared with conventional farming (extended housing) Profit increases of around $40,000 reported for housing stock over winter in North Island

Profits and Planning

Profits will give us time to think about the future

By Lachlan Mckenzie, Dairy Chairman, Federated Farmers

My goal when I left Massey University in 1980 was to have the ability to retire at 40. I choose those words carefully – "have the ability". I looked around various industries. I didn't think I had enough brains to build enough money to enable me to retire and do nothing. I therefore looked for an industry that would allow me to have choices at that stage and I opted for the dairy industry.

When asked "are farmers too busy to think about the future?", I can say that when I was a university student I certainly had time to look at the future. But things have changed a bit since then as I try to answer that question today.

My grandfather made about 3% return on his capital, my father made about 3% and farmers today are making about 3%, but between 1955 and 2007 farm land prices have increased by 3% above inflation.

But payouts have become volatile. Three years ago the payout would vary by about $1 per kilogram of milksolids but now it can vary $2 from the opening to the end of the season, making cash flows uncertain. There is increased pressure on debt repayment and a focus on production and feed rather than profit.

Milk production grew 6% in the 1990s and about 2% over the 2000s and we are looking at around 1.8% over the next few years, then probably 1% growth per year. But this is still spectacular growth over that period. When I started farming New Zealand was producing about 600m kg milksolids a year, now we are producing about 1.3b kg.

Herd sizes have grown. In my second year I was farming 160 cows and I was an average farmer, now I milk 380 cows to be an average farmer. Production per hectare over the first 10 years increased 200kg of milksolids but over the second decade the increase was only 135kg. Growth in milksolids per cow similarly has tailed off.

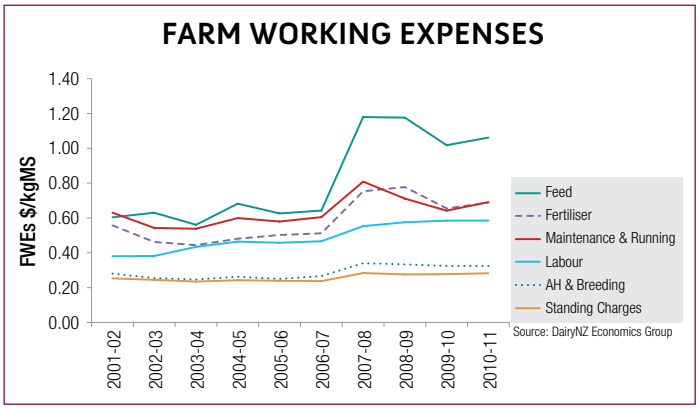
But McKinsey got it wrong when he said milk prices were falling. We have had a real increase on the milk price over that period of time.

The bad news is the bottom line. In 2007/08 it was $1.34 per kilogram of milksolids; the next year it was.83c and the estimate for this year is about.60c. This uncertainty and volatility means we are going to have to adapt and try to work out how we can ensure profitability in our systems.

One of the items we want scientists to help us focus on is feed costs. Their rise is a real concern if we want to stay profitable, the trend is that all costs are increasing.

Bank debt is an issue that everyone is saying has landed the dairy industry in strife, because farmers tripled their bank borrowing from 2003 to 2009, lifting it from $11.2b to $28b. That was an average annual growth rate of about 16%.

But the sheep and beef sector in the same period lifted its borrowing from $5.2b to $10.8b, a 60% increase in a declining industry. Sheep numbers have declined 50% in the past two decades.



The dairy industry has built infrastructure – cow sheds and, in Canterbury, irrigation systems. When was the last time you saw a sheep and beef farmer build a new wool shed?

Another way of looking at the issue is that during the period when farm debt surged, 20% of farms finished up with 80% of the debt, which means 80% of farmers have no significant debt.

The debt-to-asset ratio tells another story. In the past two years land values and stock values have decreased. I predict that over the next few years the debt-to-asset ratio will come down to around 40% again and probably stabilize.

So what best facilitates farmers' ability to look towards the future? I put it down to profit. Profit gives me time to sit in the rocking chair and look out over the farm at somebody else – my sharemilker – bringing in my cows and milking them for me. Profit allows me to innovate and to experiment.

An important role for scientists is in helping farmers to reduce environmental and production costs and maintain productivity gains. And they can help us better understand our farm systems. I am given lots of information but need help in translating it so I can get my sharemilker to understand it and implement it. I am the one who must try and incorporate new science and technologies in my farm system. We are missing the boat in terms of assimilation and understanding the science.

In the future, we are going to have to be the most efficient pasture managers rather than the second cheapest producer of goods. We will want to sell our goods at the most expensive price we can get and minimize our costs on the way through to bring back as much profit as we can which will then be spread through the economy.

The end result is that in 20 years we are still going to be turning sunlight into dollar bills. I am fortunate that I am farming in an area that has had a metre of rain in the past month and will get another two metres probably in the next 11 months. A vast amount of dairying area in New Zealand has sufficient water to fully grow grass, so we have to capture the sun's energy, mix it with a bit of water and soil and export what is grown at the maximum number of dollars we can get.

If we enable and allow farmers to have enough time to look over the horizon, the best of the farmers will still look there. What we have to do is make sure farmers can focus on farming instead of silly rules. We have to ensure that this leads to sustainability through sensible regulations and a regulatory regime that trusts farmers rather than tries to second guess what they might do. This, with good management practices that everybody in the community trusts, will help ensure a prosperous future.

2010 NZIAHS Award Citations

JUBILEE MEDAL Dr Ross Ferguson

Dr Ross Ferguson has been awarded the NZIAHS Jubilee Medal in recognition of his contribution to our scientific knowledge of kiwifruit. He is a world authority on kiwifruit and projects under his leadership have been fundamental to New Zealand's kiwifruit breeding programme. He is a major contributor to the success of this industry and to the wealth of New Zealanders. Dr Ferguson has worked in kiwifruit research for almost 35 years and has published nearly 150 papers, from peer-reviewed science in international journals to popular advice for horticulturalists. He is a Fellow of the Royal New Zealand Institute of Horticulture, a Fellow of NZIAHS, a winner of the New Zealand Science and Technology Medal, an Associate of Honour of the Royal New Zealand Institute of Horticulture, a Fellow of the Royal Society of New Zealand and an Officer of the New Zealand Order of Merit.

NZIAHS FELLOWSHIP – Prof Anthony Conner

Tony is Science Group Leader, Breeding Technologies, at Plant & Food Research, Lincoln and Professorial Fellow (Plant Biotechnology and Genetics) at Lincoln University. He holds a BSc (Hons) in microbial ecology from the University of Canterbury and a PhD in genetics and plant breeding from the University of California, Davis He has 32 years' experience as a research scientist.

NZIAHS FELLOWSHIP – Dr Alan Stewart

Alan is Science Manager and Plant Breeder at PGG Wrightson Seeds, based at the Kimihia Research Centre at Lincoln. He has held that position for five years. For 26 years before that he was a plant breeder and research leader at Pyne Gould Guinness Ltd. He holds a MAgSc (1st Class Honours) and PhD from Lincoln University. His PhD topic was plant breeding aspects of endophytic fungi in ryegrass.

DOUG CAMPBELL AWARD – Prof John Hampton

For too long we have acknowledged John's outstanding service to local sections of our Institute only informally and personally. Formal recognition is long overdue. The Doug Campbell Award provides us with this opportunity and it is very well deserved.

NZIAHS SCIENCE AWARD – Mette-Cecilie Nielsen

Mette received the NZIAHS Science Award to attend the 26th annual meeting of the International Society of Chemical Ecology in Tours, France, where she presented a poster "Optimising the use of allelochemicals for thrips pest management" summarising some of the current knowledge in this area as well as key areas for future research that she will be undertaking in her PhD.

SIR ARTHUR WARD AWARD – Dr Ian Harvey

Ian has made a significant contribution to the extension and adoption of techniques for the identification of plant diseases in agriculture and horticulture. He spent 26 years working for MAF and AgResearch as a plant diagnostician and plant pathologist before setting up his own company Plantwise, in 1997.

Canterbury Section Award

PGG/WRIGHTSON SEEDS SIGNIFICANT ACHIEVEMENT AWARD – Prof John Hampton

Presented to John by George Gerard of PGG Wrightson Seeds in recognition of his contribution to the Canterbury seed industry in the areas of research and technology transfer.

New members We welcome

Tony Kim, Auckland
Damien Duggan-Jones, Manawatu
Jason Wargent, Manawatu
Chris Clarke, Canterbury
Colin Eady, Canterbury

Corporate members

- AGMARDT
- AgResearch
- Ballance Agri-Nutrients
- Catalyst R&D
- Plant & Food Research
- DairyNZ
- Federated Farmers of New Zealand
- Horticulture New Zealand
- Lincoln University
- Massey University
- PGG Wrightson Seeds
- Ravensdown Fertiliser Co-op

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