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Inside

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Jon Hickford
President

First Thoughts From New President

I would like to introduce myself to members as the new President of NZIAHS. I feel highly privileged to be given this opportunity and will do my very best to work with the membership to advance the cause of agricultural and horticultural science in New Zealand.

So where to start? In this issue, following on the back of the recent Science Funding Forum at Lincoln University, I am going to bring up some of the key issues as I see them. I will start by asking a simple question: outside of the small, hard-working and often maligned science community, does anyone else in New Zealand actually now care about science? I suspect that most of us know the answer. I will accordingly be quite blunt in what I am about to say.

I believe that if we continue down the sorry pathway we are following as a country, we will be a third-world nation in no time. We could focus on such things as GDP growth (or lack thereof), low productivity, an investment culture that rewards those who buy rental properties as opposed to those who invest in R&D for their businesses, a poor savings record and spiralling debt (both public and private). But for the sake of not turning this into a book, I will focus on science and science-funding. In this respect, we fail on all fronts.

Let's start with where young New Zealand scientists come from. Primary school interest in science is not just waning, but is dropping precipitously, and this is well documented. At secondary school, science is still taught, but the six science subjects are diluted by 28 others. And let's be blunt: science is hard, so we know it isn't going to be first choice for students. At the tertiary level, in the polytechnics, PTE's and wananga, science is on the back foot and at the university level, science degree output is minor relative to the arts and liberal studies. Graduates in agriculture, forestry, horticulture and viticulture comprised 0.42% of our bachelor degree output in 2007 and there is no indication that things are improving. If this malaise in science education continues, we are in trouble, there is no doubting that.

How do we address this problem? Rather than following the woolly-headed free-market ideology that student-choice should direct education funding (the bums on seats approach), I suggest we get smarter and start to strategically invest in our future. If primary production is the basis of our economic well-being as a country (and that doesn't seem to be in dispute), then our education system should be charged foremost with producing qualified people that serve the interests of the primary production sector.

However, to be fair to the young, why would you contemplate science as a career? If you are talented enough to get through the hard subjects at school and complete another minimum seven years of tertiary education, you might be lucky enough to pick up a post-doctoral position. Your starting salary will be at most $60,000 a year, admittedly better than the $51,000 starting salary for a police constable (and no I wouldn't want that job). But that constable may not be much older than 18. You will likely be 25. What's more, and again only if you are lucky, that post-doc may be for three years. That isn't job security and job options at the end are very, very limited. Little wonder young scientists leave New Zealand.

Let's find the source of the problem, though. Put simply, it is that we have under-funded science for years. With the much-lauded PGP in place, funding may approach 1.3% of GDP. Compare this with the USA's 3% of GDP and Australia's 2.1%. Bluntly, our funding commitment to science is appallingly low and has been for years, despite various changes of government. It is rumoured that the research, science and technology portfolio is considered an "easy ride" for a Minister, and I would suggest that previous Ministers have treated it as such. Take note Dr Mapp, you have an opportunity to turn things around that wasn't taken by your predecessors.

In saying this, I am sure the Government's response will be that the private sector in New Zealand is also a poor investor in RS&T (as if two wrongs make a right), witnessed recently by the failed wool-levy vote at Meat & Wool New Zealand. But let's be blunt: if government isn't prepared to back RS&T seriously in New Zealand, and show leadership, why should the private sector follow suit?

The argument may also be sustained that we cannot afford more RS&T because the public purse is empty. This is tosh, as we spend proportionately more of GDP on health and education than Australia, but nearly half as little on science. Australia is indeed the lucky country if you are a scientist!

So what came out of the forum? It was pleasing to see a realisation from Treasury that RS&T is an investment, although I detected that their thinking was very short-term. It may well be that increased spending in RS&T takes 20-30 years to create a "profit", although Treasury's own research would suggest that that profit is good when it comes. Picking winners is hard and it is a concern to me now that so many of those who manage and direct our country's RS&T are business-people, lawyers and accountants by training, no doubt useful skills for making the books balance at year-end, but of how much value in ascertaining whether what is desirable (and I am sure we all have opinions on that), is actually achievable and over what time frame?

This brings me to my final gripe for this newsletter – the 9% annual return on equity expected from our CRIs. The arguments put forward to sustain this were weak. To argue that this ensures good financial management in CRIs is flawed, when so much of their income is fixed over a longer term by way of contract to FRST and others. Furthermore, the contracted income from FRST is not inflation-adjusted, so CRIs with a large proportion of FRST income will "automatically step backwards" annually. It could also be argued that if CRIs start to build this 9% into their contracting costs (and that would be smart) then it will in some cases be transferred directly to the private sector, a further disincentive to do research I would guess.

Finally, the argument that the 9% return will be re-invested is clearly nonsense. Where is the money being re-invested? An increase in funding to the CRIs each year? I think not!

I have only scratched the surface here and I see many challenges ahead!

By Dr Paul Hutchison
National Party member of Parliament
(acting on behalf of the Hon Dr Wayne Mapp,
Minister of Research, Science & Technology)

New Initiatives to Improve the New Zealand Science System

Your forum theme – "New Initiatives to Improve the New Zealand Science System" – is highly timely. The Government is formulating a forward-looking agenda for science, and supporting primary sector research and innovation is at the heart of our approach.

The agricultural and horticultural sectors are central to New Zealand's future. Our world-class pastoral and food industries generate 64% of our merchandise trade earnings and employ one in five New Zealanders. Their future growth will greatly benefit from the application of research, science and technology to enhance production, processing and delivery of New Zealand-produced food to global markets. Innovation in primary production methods and food products represent some of the country's greatest successes in the global market. The development and global scale-up of Zespri Gold kiwifruit is an important example. The development of the Gold cultivar and R&D costs amounted to around $20m over a 12-year period. More than $50m was spent to create the market awareness and by the end of 2009, Zespri Gold is anticipated to have generated over a $1 billion in revenue for the year. That projected annual revenue is fairly substantial for that sort of investment.

New Zealand needs more of these success stories. Our cultivars require time and money and the Government has an important role to play in sustaining investment in R&D, capability and effectively partnering with industry to enable that to happen.

Science and innovation need to be far more closely supported and connected through the Ministry of Economic Development and Trade & Enterprise New Zealand and our business sector. Singapore is particularly impressive in the way it pursues economic growth and development from science. We need to be far more ambitious in this area and should look to countries like Singapore, Taiwan, Finland and the Netherlands that are aiming to invest up to 3% of GDP in this area of science and innovation.

The global environment in which New Zealand's food producers operate is complex and evolving rapidly. We are no longer the world's lowest-cost producers. To keep up with international competitors we need to produce and market our primary sector products much smarter. Verifying environmental credentials is becoming an access issue in key markets. Research undertaken on this campus to debunk the errors in the food miles debate has been invaluable in helping New Zealand producers to squash misconceptions.

Economic circumstances are limiting us, but we collectively need to position the country to emerge strongly from the downturn. A strong and vibrant RS&T system is an important part of that. Making a commitment to innovation and R&D remains worthwhile in tough economic conditions. I would say extremely worthwhile. History tells us that industries and firms continuing to invest in research and innovation in times of recession continue to prosper. Positioning the primary industries to ride out the economic crisis will be the key to our recovery as a nation. Future-proofing will require collaborative marshalling of public and private resources to lift economic and environmental performance, and sustained investment in research and innovation will be central to the primary sector's future good health.

The announcement of the Primary Growth Partnership in the Budget this year is the government's response to the previous government's Fast Forward Fund. $190m has been committed by government over the next four years for the PGP. Government funding will be matched by industry co-investment. By 2012-1013 the partnership will see government investing $70m a year in primary sector innovation. With a matching commitment by industry up to $140m will be invested annually. This is an enduring commitment from central government – whereas the Fast Forward Fund was due to be wound down after about 12 or 14 years – and the horticultural and agricultural sectors will be significant beneficiaries. But this does depend a lot on what happens to government in the years ahead. When it comes to science policy which is clearly medium and long term, I would make a call for governments of the future to try and agree on fundamentally important funding streams such as this one.

Investments through the PGP will be market-driven and focus on delivering economic growth and sustainability across the primary sectors from producers to consumers. Investments will cover the whole of the value chain including education, research and development, product development, commercialisation, market development and technology transfer. A government industry partnership will lead the strategy and delivery. The PGP will also invest in a centre for agricultural greenhouse gas emissions research. The centre will focus on GHG mitigation research and develop technology to reduce emissions and improve on-farm efficiency and productivity.

New Zealand has world-leading research capability in this area. The initiative will build on this to benefit industry and contribute to the global effort in mitigating climate change. If there is an area of the climate change debate that New Zealand should lead, this is it. Our potential to both contribute and benefit is enormous in this area.

The Minister of Trade, Hon Tim Groser, has had a variety of discussions at overseas forums and many countries have welcomed the thought of New Zealand leading the research into mitigating on-farm greenhouse gases.

The budget included new initiatives totaling $321m for research, science and technology over a period of several years. This includes a focus on basic knowledge creation and capability building with significant increases to both the Marsden Fund and the CRI Capability Fund.

Scientists would like to know how to persuade government to spend more on science. As someone closely involved with National's pre-election science policy, I would like to pay tribute to the New Zealand Science Panel and the excellent publication it put out last year. There is no doubt that well-reasoned debate

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New Zealand's Future Quality of Life

There is a general recognition that research, science and technology plays a critical role in the country's innovation system, in the context of New Zealand's economic strength and the environmental and societal changes we are undergoing. But views range widely on what the RS&T's structure, its funding, its management (in the broadest sense of the word) and its performance in terms of delivery should be.
This article will set out some important requirements for a well performing RS&T system and some of the roadblocks that – potentially – would make a difference if they were removed. It also will address how the Foundation for Research, Science and Technology – and hopefully some other organisations – might remove some of the roadblocks to help increase the national benefit from the $500-plus million we are investing annually in research, science and technology.

In my time at FRST I have learnt some important lessons about RS&T systems, regardless of which country they are in.

First, they are complex. There is no perfect structure, perfect management system, perfect funding system or even easily established performance benchmark. At a large and pre-eminent organisation in Britain a few years ago, I said I had come to find out how they measure their performance. They said: "You are from New Zealand – you are supposed to be coming here telling us how to do it."

Second, hoping for agreement among the players in an RS&T system on what would be good, let alone perfect, is an elusive goal.

Third, there is always more that could be done in the health system if there was more money, and more could be provided in the education system if more funding was available, and in just the same way scientists could always address another research question if there was more money.

There are many reasons why we need a strongly performing economy. Economic wealth is not just about fast cars and bigger houses. It's also about an aging population making inevitable demands on the health system, and about worrying about bio-diversity and spending the money to stem its decline – and so on.

Data showing how we compare with Australia don't make pretty reading.

We are short of Australia's level of GDP per capita by about $7,500 per person. If we multiply that by our population of around 4 million, we get an aggregate shortfall of $30 billion. That's the aggregate GDP gap we must close to match the Australian level of GDP pe r capita.

We could spend a lot of time debating whether we can best do this from our existing large industries or by diversifying the economy into new areas. In terms of the RS&T system, that would fuel a debate – at least partly – about whether the physical or the biological sciences would have the greater impact. It would also

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for the sector is important and will be heeded. And I am ever-optimistic that as New Zealand lifts out of the recession, there will be a future opportunity to invest at a higher level in R&D. Within our caucus I will be doing everything I can to push that aim.

The government is also boosting the profile of science with the inaugural Prime Minister's prizes for science and the announcement of an eminent scientist, Professor Peter Gluckman, as Chief Science Advisor to the Prime Minister. This new role delivers on the government's goal of including science at the heart of its decision-making. I am pleased to see this science prize become a symbol of science's importance to our future and a great celebration of the wonderful scientists and science we have in this country.

In keeping with your theme of improving New Zealand's science system, I will highlight the government's three immediate priorities to improve the way the science system operates.

First, reducing transaction costs faced by the research community when accessing government funding is an immediate priority. There is considerable scope for simplifying processes and improving the way that funding is allocated. The key aim is to ensure that researchers are able to spend more productive time on what they do best, obviously research. Work is already under way and the implementation plan is available on the MoRST website.

Second, improving business performance through R&D. New Zealand's low level investment in business R&D requires attention. The role of R&D in business growth was raised at the Job Summit earlier this year and was the focus of a group looking at capitalising on R&D that was convened recently to advise government on the issue. A review is under way on government support for business and business R&D will come within its scope. Proposed changes within the tax system to provide more targeted support for R&D are among the options along with less stringent requirements for grant recipients.

Third, the government wants transparent and understandable priorities for science with clarity over how spending is decided and how that spending will have an impact. Work is under way to design a process to achieve this.

One of my most inspiring jobs in opposition was as spokesperson on science, research and development because of the opportunity to meet scientists up and down the country who demonstrated extraordinary passion, extraordinary intelligence, extraordinary commitment and extraordinary patience in the pursuit of science.

The future of science and innovation and how it is supported both by government and the private sector is vital to New Zealand's economic growth and productivity.

By Murray Bain
Chief Executive
Foundation for Research, Science and Technology

– the importance of scientific research outcomes

fuel a debate about whether we should focus on transforming the economy, moving further away from a commodity base to higher-value exports, or whether we should be improving the productivity of our existing industries.

For me it's not an either or. The gap is so large we need to throw a fair bit of everything at it!

Whichever pathway we take, the role of the RS&T system is critical so we must consider whether there are opportunities to make better use of what we are investing in.

We could also spend a lot of time trying to determine the optimal level of public sector funding for the RS&T system. Governments around the world are grappling with the right trade-off between potentially crippling company collapses and the resultant unemployment levels and potentially crippling future public debt and higher interest rate payments. No-one knows the right answer. Hindsight will be a wonderful thing!

We spend a lot more on existing sectors and more on the primary sector than on the rest. In other words, we play to our strengths. In financial planning terms we have a balanced portfolio with a conservative bias!

In terms of the total taxpayer funds made available by the Government for RS&T, we can always do more with more, but our first objective should be to make the best use of what we have. Accordingly, if we are going to make our contribution to delivering that additional $30b of economic growth, our whole innovation system must be performing at a very high level. We probably all have a sense it could do better, and we will all have views about what needs changing.

The Scandinavians are clear about the role of innovation and I quite like this catch phrase: "Research is the conversion of money into knowledge and competence" and "Innovation is the conversion of knowledge and competence into money".

The Scandinavians talk about a "triple helix" of government, industry and research organisations. They have made priority calls and charged specific organisations with delivery against those priorities. They have very high company R&D investment, unlike New Zealand, and they have an expectation that all research – apart from basic untargeted work – will be actioned.

Many areas of our RS&T system are working well. But there are extremes – there are highly performing parts of our system and other parts that are not performing well. I am not picking on any sector, but improvements could be made in:

- Alignment of strategic objectives between industry, government and research organisations (the Scandinavian triple helix).
- More high-quality scientists working together, regardless of organisation. This is a small-country requirement. We can't afford many world-class teams and must build the best team we can from the resources that we have available.
- Changes to the funding system, to give greater freedom to operate, to be less prescriptive and allow space to pursue new ideas within an overall direction, and to provide more accountability for delivery inside the system itself.
- More strong links with users must be built – with industry, regional councils and government agencies. Let's identify the big questions that need answers and improve the transfer of technology.

More results need delivering that provide answers to the country's strategic questions and ensure historic growth rates continue. Then we also need innovative ideas that can close the $30b gap with a good balance between the two.

So what are some of the roadblocks to getting the system looking like this?

For some research organisations there is uncertainty about their objectives and how to strike the right balance between national benefit and financial performance. It is hard to get aligned objectives between key players if research organisations are unclear about theirs.

This leads to excessive focus internally on revenue generation and to external uncertainty about the focus on benefits to industry that our key research organisations should have.

Some degree of uncertainty is good. It leads to sharpness of focus and commitment to delivery. But too much can lead to short term focus and a lack of strategic planning.

Trust is another issue. Both end users and the funding agencies can end up frustrated because the conversations they have with research organisations are often more focused on funding than on what can be delivered for the money available.

This lowers the level of trust, the feeling that we don't all have the same objective (in other words, the triple helix doesn't exist). That in turn leads to more prescriptive behaviour by the end users and the funding agencies (including my own); this has the dual effect of making the system more complex and reducing trust still further.

In a small country collaboration is another critical issue because we don't have the funds to run multiple world-class teams. Trust and the feeling there are common objectives (the triple helix again) are important ingredients in ensuring collaboration between organisations grow and thrive. We are all familiar with instances where a lack of trust has become a roadblock to collaboration.

New Zealand is not alone in struggling at times to build a commercially active research culture. The key role of market pull alongside research push is a challenge for many in the science system. But, as the Scandinavians are showing, it is not an impossible challenge.

The Foundation has been looking at how it could help address some of these issues, particularly whether we could help break the distrust cycle. For us this means adopting the over-arching principle that research organisations can be trusted to deliver research outputs and work with end-users to achieve outcomes that benefit the country.

This requires the Foundation to shift its contracting and expectations to higher levels and get rid of a whole lot of low-level milestones. Significant annual reporting no longer will be required. But you will see key checkpoints during the life of the contract – conversations about what progress is being made, much more interaction and much more dialogue and less documentation.

A focus on commercialisation is another high priority for the Foundation.

But we can only do so much. Critical issues like clarity of roles of players in the RS&T system and their associated performance measures are much higher-level issues that remain to be addressed outside of the scope of the work the Foundation is doing.

Looking Ahead

The National Science Panel was established by the Royal Society some three years ago to address the declining state of our nation's science system. Since then, largely because of the manifesto produced by the panel, there has been an open and ongoing discussion in the science community and recognition that all is not well in the system.

So what has the National Science Panel achieved? The policy aspirations in science for this government are very well aligned with the manifesto, but above all the appointment of a Chief Science Advisor is a major step forward. Many other countries have recognised the need to have a Chief Scientist or a Science Council directly advising the government. Independent advice to government across many areas is an essential part of the functioning of any nation and the appointment has elevated the importance of RS&T to many areas of life in our country. The science community now has to strongly support the Chief Science Advisor.

The challenges facing us in the 21st Century are straight forward – public health, energy supply, clean energy technology, food use, land use, environmental security, changing social behaviour to name a few. Many nations face the same challenges.

Treasury plays an important part in the funding of science in New Zealand. Treasury's view, I believe, is simply that our science system is not delivering in economic terms and as a result our investment in science is not thought to be paying off.

Why do we invest in science?

We recognise today that any improvements that we hope to make in our economy, our environment, infrastructure, health, energy, communications and the operation of many of our civil institutions need a strong science base and input.

This brings urgency to using New Zealand's best scientific talent to provide input into the government's wider policy and legislation processes. Otherwise initiatives are misdirected and resources wasted.

We often overlook the relevance of science in the social areas, where it should be used far more to inform and underpin policy on issues such as education, social welfare, child development and family violence. But the government struggles to allocate with confidence its financial resources – particularly now. The real problem is that, like previous governments, this government understands we do not perform well on an international stage and our gravest problem is our lowest productivity rating. This affects our ability to pay our way and to make the kinds of changes we think research, science and technology are going to make to our society.

But while we cannot predict when and how our science capital will be used for commercial gain, the government can influence technological development because it can deploy resources towards the market end, the greatest barrier to actually introducing something new in a small nation far removed from the major markets of the world.

We have to sort out problems with our science system, and in the absence of strategic planning, we are allowing the system to meander wherever the funding takes it.

Hence my first recommendation is simple. We must put in place a long-term strategic planning process to guide our science system and address priorities.

Looking at the past reveals important examples of successes from strategic planning. President Obama, recently addressing the National Academy of Sciences, talked about Abraham Lincoln, who found time during the Civil War in the United States to start the Trans-American Railway, make land grants through the state system on which today are housed all of the state universities of the United States, and allocated funds to found the National Academy of Sciences. Our own leaders, in 1874, were responsible for the New Zealand Universities Act to build the nation's knowledge capacity and, in 1926, established the Department of Scientific Industrial Research to build science to support industry and economic development.

We have today a strong university system and tradition of science in New Zealand. The DSIR surveyed, identified and classified the country's animal, vegetable and mineral resources; worked on ways of increasing the utilisation of natural resources and reducing the risks of natural disasters; bred better plant varieties; developed better pest and disease resistance; control methods for horticulture and agriculture and provided advice for developed industrial developments, standards for commerce and industry and analyses for the maintenance of the public health of the nation and the administration of justice.

Valuing the role science plays in our lives is much more difficult than placing a value on our economy. Our economy is measured by its Gross Domestic Product (GDP) but we aspire as people and a nation to much more than GDP or economic growth. This is why we must have a science system and why we must continue to invest public funds in it. How else does our small nation build the human capital and infrastructure for the changes that must take place in the 21st Century? How do we empower the next generation to make the discoveries that will improve our information technology and capture knowledge which will probably be the number one economic driver 30 years from now? Or improve the public health system that we live under, act as a watchdog for diseases that surely will follow the swine flu, take our agriculture and horticulture to new heights and continue to produce knowledge about ourselves and our physical and social environments. We must plan and prioritise better for the sake of our future.

My second initiative is aimed at the Treasury and the excessive contestability in the public funding process. I draw particular attention to Treasury Report Number 8 on the Innovation System, published in April 2008. It says: "One of the biggest challenges facing New Zealand is its productivity shortfall relative to other OECD countries". We all know that New Zealand is ranked 22 out of 30 OECD countries and that an hour worked in New Zealand typically generates 30% less output than an hour worked in Australia. Low productivity has been with us since the 1970s and we understand we need to focus on productivity not only because it will make New Zealand become more internationally competitive but because in the long run, growth in incomes is fundamentally linked to output per worker.

By Dr Jim Watson
Chair of the National Science Panel

The Treasury Report also states that productivity improvements must be at the heart of New Zealand's future economic growth and that productivity depends on two factors – knowledge and innovation. But the important thing to address is that government must create the best conditions for knowledge growth and innovation. This requires a broad range of initiatives from the funding process used, getting the public and private sectors to work together and encouraging building strong links between private-sector firms that actually apply knowledge and the public-sector organisations that create it.

Why must Treasury deal with the excessive contestability in our funding regime? Fundamentally, because it has created problems with the basic culture of science, the way institutions run their science programmes, the incentives, and the way this spreads down to students. Why are they steering away from science as a career? It is not because they lack passion or ability. Our secondary school students score well for science literacy internationally, but they drop science because they perceive it to be devalued in our country and scientists frustrated with the complex funding and compliance regimes, do not recommend science as a career.

The funding system with its built-in contestability targets the speeding up of short-term economic gain or profits for shareholders. What is the effect on the science culture? It goes to Pavlov. Ivan Pavlov began his higher education as a scientist and student at an ecclesiastical seminary in Russia but dropped out, then re-enrolled in the University of St Petersburg to study Natural Sciences and become a physiologist. He received his doctorate in 1879. In the 1890s he did the work we are all familiar with, investigating the gastric function of dogs. He developed a process for externalising the salivary gland so he could collect, measure and analyse the saliva and its response to food under conditions of different stimuli. He noticed that the dogs tended to salivate before the food was actually delivered to their mouths and set out to investigate what he called physic secretion. He carried out a long series of experiments in which he manipulated the stimuli occurring before the presentation of food and established laws for the basic establishment and extinction of what he called conditional reflexes or reflex responses. He went on to work on experimental models of conditioning to establish models for the induction of neuroses.

This gets close to our funding system. Isn't this reminiscent of how we train our young scientists? What we see today is a reflex response. No sooner than one funding round is completed, the scientists begin yet another round of funding! Isn't this seen rather clearly by students considering a career in science – where is the stability and career development?

My final recommendation is to properly address the commercialisation process that backs up our science system if we are to close the growing GDP gap between New Zealand and Australia.

There is some history to deal with. In 1993 the universities gained open access to the public good science funds for $10m – a steal. At that time this caused considerable resentment between the CRIs and the universities and assurances were given from the government of the day that the PGSF would actually grow at a sufficiently rapid rate to offset the competition that would arise. Moreover, we were assured, the move would probably stimulate appropriate relocation of CRI facilities on university campuses.

What happened is well known. The Public Good Science Fund hasn't grown significantly, competition between the universities and CRIs became severe and – a critical consequence – collaboration between these two organisations for a period collapsed. I don't believe we have recovered from that. But significantly, the roles of the universities and CRIs have become confused.

Performance Based Research Funding defines better the role of the researcher in universities, but is not seen as such by CRIs and leads to the criticism that it simply encourages researchers toward an academic pathway favouring publication. It could be said that it slows the rate at which people are interested in being part of commercialisation. But more importantly for our universities, the PBRF generates a focus on research quality that is important. It makes universities hire, develop and train people in different ways and does have a spin-off for commercialisation.

But there are no such incentives to encourage commercialisation by scientists within the CRIs. As a result I believe the reflex response of a CRI scientist is heightened because they are simply forced onto a treadmill to chase the funding for their salaries and research, too often with little thought to the science involved or the impact on them as scientists being involved in solving real problems, whether academic or commercial in nature.

When I read the 1992 enabling legislation, I struggle to understand the role of the Crown Research Institutes in our modern society. The commercialisation thrust has become all-consuming with the mandate to provide the shareholder with an annual return on investment, although I fail to see this prescribed in the legislation.

The other problem for CRIs is their alignment to industry sectors. New Zealand is a nation of small and medium-sized enterprises. Industry sectors such as forestry, meat and wool have broken down and dairying is dominated by Fonterra. CRIs do not have the traditional sectors of 15 years ago to network with and compete with each other across old sector boundaries.

Auckland UniServices, the commercial arm of the Auckland University brings the university $100million-plus revenue a year. Each CRI is pre-occupied with developing a commercialisation process for itself and maybe there is something to be said for a model which might require several CRIs to work together through one commercial entity.

In summary, we need to start and address long-term strategic planning in our science system. This will inevitably flow on to improving the way we fund science and improve greatly the productivity from the investment. A healthy system with a strong science culture becomes a much more attractive environment for our youth and we need to focus on the CRI sector because it is in trouble.

Funding Choices

It was heartening to see Queen's Birthday honours bestowed on two of the institute's members, your president John Lancashire and Professor Alison Stewart from Lincoln University, giving science the recognition it richly deserves. The work that goes on in our science community is often painstaking, often far from glamorous, and seldom noticed – let alone understood – by the wider public. But there's no doubting the positive and profound impact that science has on our daily lives. It is not always appreciated.

It sounds a bit off the wall to be looking for upsides in a recession, but perhaps one upside is that it serves as a reminder of the importance of science and innovation in driving economic growth and social and environmental outcomes. We have an opportunity to do things differently and look hard at policy settings, so that when we come out of the recession we're in the best possible shape to take advantage of the better times ahead and to differentiate ourselves in a positive way from our international competitors.

Something we must do differently is get the productivity improvements that drive growth. Productivity is one of those words that gets bandied about a lot when New Zealand's economic performance is being discussed. The reality is that we haven't been particularly good at it. Self-respecting Kiwis don't like comparisons with Australia when those comparisons don't reflect favourably on us, but an hour worked in New Zealand still produces about 30 per cent less value-added than an hour worked in Australia even though the rate of productivity growth in Australia has been slowing in recent years.

At the Treasury we give considerable thought to the complex challenge of how to lift productivity, and not just because the Aussies are doing better than us. It is because if we fail to do something about it, we're not going to achieve the standards of living and healthcare, and the sort of investments in education and science and research, that we all aspire to.

When looking at ideas for improving productivity, The Treasury focuses on five inter-linked drivers which all have a part to play in providing the conditions that enable firms to thrive. Four of those drivers are enterprise, skills, investment and natural resources. The fifth is innovation, probably the most critical of them all. It is certainly a critical component of a medium-term economic strategy.

Innovation is about more than R&D. In its simplest form it is about developing or coming across a new idea or a new way of doing things, and putting it into practice. The case for innovation as one of the drivers of productivity rests on solid ground. It has been shown that most of the huge rise in living standards in the developed world over the last two centuries has come about through technological breakthroughs based on increased knowledge. Furthermore, the importance of innovation is borne out by OECD analysis which shows that between 25% and 45% of productivity gains come from innovation.

That is a compelling statistic. But given our small size and distance from markets, we have to do better at innovation than most to secure the gains we desire. In fact we need to be excellent at it.

Unfortunately, that is not the case.

The challenge for all of us is to find that crucial and competitive edge, whatever the level of sophistication of the product or service and whatever the market being targeted. *The Economist* magazine recently reported on a grassroots innovation project in India which produces, among other things, refrigerators built from clay. Apparently they use no electricity, yet they can help keep vegetables fresh for days. By developing a new idea for a standard household product, a huge market in impoverished India is being unlocked.

I'm not suggesting Fisher & Paykel might try its hand at the clay fridge business. My point is that New Zealand too needs to develop more ways of doing things smarter, of turning good ideas into profits, and of getting value for money. For a country like ours, being more innovative is the means to compete with countries that draw on low-cost labour, and that are producing a wider and wider range of goods and services at very competitive prices. What it comes down to in the end is that economic growth is about knowledge and ideas coming to fruition.

Research and development, or R&D, is a foundation stone of any innovation framework and there is little doubt that New Zealand does produce good science. The cutting-edge science happening at our universities, Crown Research Institutes and within corporate research teams is testament to that. Across the sectors you are linked into, such as dairy, meat, wool, horticulture and fertiliser, significant new scientific knowledge is constantly being generated. But as a country we still have some way to go when it comes to turning ideas into profits. In other words, we are doing a relatively poor job at the D end of the R&D equation.

There is no doubt that New Zealand has a strong research base. We are placed in ninth place among 23 OECD countries in terms of the number of science and engineering articles published per one million inhabitants and we are ranked seventh in the world for the number of researchers per 1,000 people who are employed. But our innovation performance is suffering because of the low level of R&D being undertaken by New Zealand firms and our sub-standard efforts when it comes to taking up and applying some of the good research the country does produce. An illustration of this is the low number of patents per one million people. In 2003 New Zealand was down at 21st place on an OECD table of 30 countries, which suggests that the commercialisation of the research base is proving a challenge for us.

While business R&D has been growing in recent years, it is still low by international standards, even taking into account our industry structures. It is currently around 0.49% of GDP, compared to the OECD average of 1.49%.

What can we do about that?

The most important and most effective way of doing something about it is to improve the policy settings that have a pervasive impact on economic performance. It is clear that government can play an important role by cutting back on poor regulation, by boosting competition, by addressing the taxes that are the most negative for growth, by investing in infrastructure, and by making the public sector more efficient. That provides us with the base, if you like, for more sector-specific policies such as sharpening

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programmes that support business innovation, and to make sure that our significant public investment in R&D actually supports firms to innovate.

Some of the opportunities open to us involve building off our strengths, for example by aligning policy with the economically vital primary sectors. There is evidence that some very successful economies such as Canada, Australia and Finland have built strong innovation around their traditional low and medium-tech resource base. There is a real opportunity for New Zealand to strengthen its innovation performance off our comparative advantage and past investment in the primary sector.

The tight fiscal constraints that we are wrestling with will limit what the government can do. But the Primary Growth Partnership, which was announced in the Budget, is about building off this country's strengths and boosting productivity across our traditional primary sectors. It is not about "business as usual" but is explicitly targeted at transformational, ambitious and major projects.

PGP will be funded through appropriations to Vote Agriculture and Forestry, and the $190 million that is being made available over the next four years will have to be matched by industry investment. From 2013 onwards the partnership will see the Government investing $70 million a year, and with the same level of investment by industry, there will be a total of up to $140 million a year.

The significance of this initiative is that it recognises the continuing importance of the pastoral, horticultural, seafood, forestry and food sectors to the New Zealand economy. Those sectors are important first and foremost because of the export revenues they generate and the jobs they create. But they're also important because our primary-sector firms have the scale and global reach that support many domestic businesses. Moreover, the global demand for food is rising and it is likely that at least the food sector will prove more resilient in the global economic crisis than other sectors that more reliant on discretionary consumer spending.

Given the significant fiscal challenges we are facing, the Primary Growth Partnership may be the biggest new chunk of money that will be channeled into your industries' research and innovation needs for a while. We have to make the most of what we've got. Your sectors need to be realistic and make the most of this opportunity to develop effective programmes.

The idea is that Crown and industry investments will be complementary and aligned. The investments that PGP makes will be demand-led, with the prioritisation and delivery process led by a government-industry partnership. Working together is the key to making this opportunity really count.

So what action does Treasury believe is needed to underpin a long-term innovation agenda that will position New Zealand to come out of the recession stronger and better able to generate higher living standards?

While we have to manage the risks and constraints that we've been saddled with, we also need to keep a long-term perspective, particularly on growth and productivity improvement.

The actions that are needed are on several fronts. There have been previous attempts to get an effective business focus to public sector research, but they have been piecemeal and largely unsuccessful. The cost of that is reflected in our poor productivity figures.

Treasury thinks the following ideas will make a real difference, and put New Zealand firmly on course towards an innovation system that is firing on all cylinders. These are ideas and they are Treasury ideas, not the Government's.

First, there's a a place for a clear, overarching statement of what the government priorities for innovation are. The absence of such a statement means we all have different ideas about what we're trying to achieve in our innovation system, but everyone should be clear about what we are working towards. If we do it well, a statement of priorities could present a picture of all the players, from both the public and private sectors. It could set out the government's aims in terms of productivity gains, boosting R&D and getting better collaboration between all the key players. It could make clear its priority areas for investment. And it could explain the actions needed to progress each of those priorities. It would certainly help give the innovation agenda some shape and direction if everyone knows what the big picture is.

Second, there is a need to address business concerns around the accessibility of business assistance programmes. Businesses have consistently told us they have problems with the complexity of programmes offered by a number of different agencies. The OECD gave us the same message in its 2007 review of innovation policy when it pointed to a fragmented system of support to R&D and innovation in New Zealand. A variety of options needs considering, including better coordination between delivery agencies and rationalisation of programmes, some form of physical or virtual single entry point where firms could go to for advice and assistance, or a more radical option of a single delivery agency.

Third, there's a case for a sharpening of funding and other incentives, so that CRIs and universities are able to better support the innovation needs of firms. We spend more than $150 million a year on funding CRIs and universities to carry out research intended to support business. True, there is a need for some funding certainty for them, and for a reduction in transaction costs. But industry should be having more of a say about the priorities for this funding and how the research programmes are designed and put into effect. Part of this approach would be to better incentivise CRIs and universities to work with business, such as giving extra funding to projects that have attracted private sector funding, encouraging scientists to spend some time working

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View from the CRIs

National Priorities won't be a Panacea

John Ziman, a physical scientist and writer from the UK, around 1990 wrote: "Many look back regretfully to a more relaxed and spacious environment for research but nostalgia is a fruitless sentiment. But all scientists know that science cannot thrive without social space for personal initiative and creativity, time for ideas to grow to maturity, openness to debate and criticism, hospitality towards innovation and respect for specialised expertise."

In his book *Prometheus Bound*, Ziman goes on to say "the real question is not whether the structural transition is desirable or could have been avoided. How to reshape the research system to fit a new environment without losing the features are what have made it productive in the past.

An initiative run by Industrial Research in recent times is called IRL's "What's Your Problem New Zealand?" The experience has been instructive. There is a lot of talk around the New Zealand science system about who should be doing what, but the competition has reinforced for me that we are forgetting a more fundamental question: what is the role of technology in society, in business and in the community? And how can we harness technology to achieve our social and economic objectives?

With that in mind, I aim to address four points:

- The funding and administrative changes that are taking place;
- The issues around the establishment of national priorities;
- Technical literacy;
- Role clarification.

First, and briefly, there is a lot taking place to simplify the funding system in New Zealand. This is to be welcomed. We could all decry the amount of funding but there is a lot more we can actually do if we can improve the efficiencies of existing systems of funding.

National priorities are also needed. I want to reflect on some of my experiences in Australia, which first embarked on the establishment of national R&D priorities almost 12-15 years ago.

National priorities have some real strengths and help to focus our attention. They also have weaknesses in the sense of what is left out. We need to think carefully about the types of priorities we set and the balance across them. And if you think national priorities will take all the heat out of funding decisions, think again – as long as we are allocating a scarce resource, there will be tensions.

Some very important signals already come from government to shape research priorities. At present these focus on economic and industry development, productivity improvement, generating export income and so on. To those, we can add some specifics – sustainability, water, carbon capture and so on. Then there are the specific sectoral needs. What we must do is recognise that in a mature system our priorities have to narrow the scope while giving space for the full gamut of enquiry to take place.

Thus national priorities need to address the problem on three levels – the generic development themes (such as economic growth), specific national issues (such as climate change) and the need to develop research solutions for the needs of specific sectors. It is not a case of just picking winners amongst the technologies.

The generic priorities are important for example, because if you if you don't have them you will probably disenfranchise 70% or 80% of industry and business because they won't fall into the specifics technologically. And in a country where we need to grow our private research investment even greater than our public research investment, we cannot afford those types of alienation.

The question of under-investment by industry also raises questions of technical literacy and, more important, the extent to which we understand the place and the role of technology in developing the economy.

We are learning much from the IRL's "What's your problem New Zealand?" programme, an exercise through which we have invited New Zealand business and industry to submit their big ideas for R&D. We have narrowed some 105 inferences down to 10 and the winning entrant will receive $100 million of research services from IRL alongside their investment in the development of their R&D initiative.

Among other lessons learned is that there is a huge unmet demand for research services. People have been exploring the role of technology in their businesses and their industries, and they are starting to think more deeply about innovating, rather than saying "I have got a problem, why haven't you got a solution for me?"

And we are learning that we should not be saying "Do I have a technology for you?"

It is clear that the role of technology and technological development is not well understood in industry and in business and I suggest it is perhaps not well understood in our science sector as well.

I now want to discuss what are called market fractals and the avoidance of sector capture of scarce resources.

Consider the case of a national feed manufacturer who has developed a new product aimed at the Australian market. The product development through the vertical axis, the industry sector axis, has been done by AgResearch. The company has now come to IRL to access our skills in manufacturing automation, sensing and detecting quality systems to work out a better (or more efficient) way to produce that product.

So you have got production, export income, productivity improvement and the achievement of two major objectives and the government. But my organisation often gets criticised for this type of engagement, because we are either seen as not having a sector or we are cutting across sectors that other parts of the research system are serving. The reality is that we have different skills and are addressing different problems. In this case the combined forces and resource capability of different CRIs deliver on the outcomes that are fully aligned with government policy.

Another example comes out of work we have done in dental imagery, a programme largely funded (around $7.4 million) by the Foundation. We now have a private company established in that area. Along the way the forestry industry, which works with Scion, came to us with a problem about the structural integrity of

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saw logs. This led to the development of a product called Hitman to test structure. It is reported to have 80% penetration of the industry and return about $235m in annual productivity gains, another example of what could be lost through sector capture.

These experiences illustrate why you have got problems if you don't have a look at the total impact of segments and sectors.

What we have found from IRL's "What's your problem New Zealand?" is that many of our industries and many of the people working in an industry don't have a good understanding of the flows of knowledge and technology, nor a good handle on impacts. Tools such as stage-gating do exist, but are patchily deployed. So we have got a way to go in building industry confidence to grow private R&D investments.

My final point is that there is scope for us to think a little bit more about our national innovation policy. During my three years in New Zealand I have learned that we have an unhelpful debate around whether we have universities or whether we have CRIs. We need both. Further than that, we need collaborative funds that allow us to work together. There are already many examples with every CRI and every university of how we work together, such as the McDiarmid Institute. We don't give enough credence to that. We need to stop trying to pull apart the dollar we've got and focus more on getting value for that dollar and on lifting total investment.

In summary, we are starting to make some useful changes in funding and administration. National science and technology priorities will help but they won't be the panacea. If they are done poorly they will actually be more divisive than helpful. I consider, too, that we need to actually improve technical literacy, and we really need to understand what is happening in the application of technology in industry. And we need to be able to work alongside and talk with industries so that they understand the price of technology and what is needed to actually develop and get that technology through into the market.

Finally, we need to accept the different roles of the CRIs and the universities. CRIs concentrate research efforts around industry national priorities, universities have a primary role to create a lot of the knowledge and train future professionals.

Funding Choices

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in industry, and looking at how the performance-based research fund can be fine-tuned so that excellence in business-related research is rewarded. It would also require a bigger focus on connections with firms and industries when CRI strategic plans are being assessed. By doing so we are likely to do better at getting our excellent research taken up and applied.

Fourth, there is a role for more direct financial incentives for R&D along the lines of other OECD countries. Even we at Treasury were persuaded over the last few years that instruments like an R&D tax credit could lift innovation. But even without a tax credit there are options to choose from, depending on what you want to target and the level of funds available in these fiscally restrained times. We could go down the path of innovation vouchers aimed at getting smaller firms better linked to public research organisations. We could put up prizes or advance purchase commitments to try to solve one-off New Zealand-specific problems. Or a new grant scheme could be considered. This could provide funding along the same lines as the old R&D tax credit but with revised parameters to reduce the cost. Again, the tight fiscal situation is going to limit what the government can do, so these perhaps are realistic options only if there is significant re-prioritisation of business assistance spending.

The four-point plan is about the government setting out its priorities and goals so that we all understand the big picture, it is about making the business assistance programmes easier to understand and access, it is about sharpening funding and other incentives so that the science happening in CRIs and universities is in synch with the innovation needs of firms, and we need to be looking at a greater range of financial incentive tools to give R&D a lift. These specific policy areas need to be nested within a broader policy environment that supports innovation and growth.

Some things, such as our small size and remoteness, put New Zealand at a disadvantage. But we can overcome that disadvantage. As a country we are very good at science, but not as good at turning it into profits, so the challenge is to progress the D side of the R&D equation. We all have an interest in getting the policy mix right so we get the most out of the Government's investment. All of the scientific community needs to be involved in debating these issues and giving decision-makers a steer on what are choices about the country's future economic strength.

It has been said science is a collective activity that demands collaboration, and it is certainly clear that networking and collaboration play an important part in innovation. Commercially valuable innovations do not arise in isolation. They will develop out of the collaborations that you as researchers and scientists have with industry and their customers, and with decision-makers.

Science, Innovation, Australians and Dividends

New initiatives to improve New Zealand's science system was the subject of a panel discussion at Lincoln University on 30 June. Stephen Goldson, who chaired the discussion, spurred questions by saying he sensed there is growing recognition about the nature of science and its importance. He noted Murray Bain's observation (see pages 4-5) that innovation is different from science and innovation different from research. Then he called for questions. Among them (this is an edited account of the proceedings) were these…

JOHN LANCASHIRE: Why do we continue to compare ourselves with Australia? It is six times the size of our economy; they have got holes in the ground and we have got water and grass. Murray [Bain] talked about the comparison with Australia but went on to talk about all the Scandinavian countries.

MURRAY BAIN: Australians are the people we compare ourselves with most easily in terms of health care standards, educational standards and in terms of our way of life. It is true they are different from us because they have holes in the ground versus water and grass but I was trying to draw comparison with our living standards compared to Australia's. They are the ones we see reported in our media all the time.

STRUAN LITTLE: Australia is an obvious comparative because it is so close but we have spent a lot of time looking at other countries that I think are similar to New Zealand – small more remote countries, including the Scandinavian countries.

A second point – and we all should take this very seriously – New Zealand among OECD countries has the second highest rate of mobility of people as a consequence of changes in the economy (Ireland has the highest rate). If this economy is not doing well, people sitting in this audience are not going to be here in five years. Conversely if we do well, a lot of talent will be coming back to New Zealand.

A third point is that when we looked at the 30% difference between us and Australia, we asked if it is because they dig holes in the ground, but when you strip that out, the answer is no. It makes a difference but only 5-10% of the difference.

STEPHEN GOLDSON: Is the Treasury aware of a policy to extract 9% return on investments from CRIs, which then goes to the consolidated fund. How is that going to assist research and development in New Zealand?

STRUAN LITTLE: You have to think about the sustainability of the science and innovation system. That 9% is about making sure those CRIs are sustainable in the long run – it is about funding things like the capital, the replacement of equipment, and so on. You can argue whether that is the right number, plus or minus.

The question for me is not so much the right rate of return, but how much money should be put into the science and innovation system and whether you are going to get some of it back again. If we didn't have the 9% it would simply mean that we would either have to put more money in as the central government or we produce less science.

SHAUN COFFEY: I would be more convinced of that answer if the government had put more than $12.5m in new equity into the sector since it was established in 1992. My CRI received an equity injection in 2008 and a lot has been made of the fact that this is the first time that has happened and suggested that it will be the last.

GARTH CARNABY: I think you have made a very good point about the 9% in terms of the economic sustainability of the CRIs but it is quite another thing for them to have to pay it back to the Crown by way of a dividend rather applying it to the purpose for which the CRIs exist, which is essentially a public good purpose. They are very different to SOEs. The CRI Act essentially sets them up as not-for-profit entities with a mission. Why the Crown wants them to be entirely focused on making a profit so they could pay it back to the Crown is beyond comprehension.

JIM WATSON: This dividend is a total nonsense. If you are a small company and you are building your internal capacity and your product and your skills, you will do what farmers did 150 years ago. You will put any money you made back into your

Jim Watson

Murray Bain

Garth Carnaby

business to grow it. Treating CRIs like pseudo-commercial entities, paying a dividend, is like a 1950s view of how you might treat your money. Putting the money back into building the business is the only logical thing to do. So I am with Garth – I think that it is crazy.

NICK PYKE (Foundation for Arable Research): I represent about 3,000 farmers New Zealand-wide and invest their funds in R&D. If 9% is to be creamed off back to the government, then I have to look seriously at where we are going to invest those funds – into a CRI or somewhere we know the 9% is going to be used to generate R&D that will be of value to our farmers.

MURRAY BAIN: There are two things about the 9% issue. One is that real shareholders operating in a real commercial environment will spend time making sure there is good dialogue about what the right of return and the right rate of reinvestment for any particular organisation should be. So we might want to think about whether a blanket one size fits all, or whether a shareholder company dialogue is an important issue. The second thing – more important for me – is the focus of CRIs on financial returns. CRIs' contribution to the national benefit and scientific quality inside the organisations should sit alongside the financial measures and emphasising any one without the other two is a mistake. Focusing on just one will encourage perverse behaviours.

STRUAN LITTLE: I would differentiate – you have got to work out the cost of running a business, so there is something about the logic of the 9% or some target in sustainability. If you are not going to have that target, the money has got to come from somewhere. That is a trade-off. Second, there is the question of who should be entitled to a dividend. Is it the taxpayer's money, and so should the taxpayers have a say in where that money gets applied, or should it be the entity? That is an open question.

TERRY PARMINTER (AgResearch): I am a project programme leader at AgResearch rather than a manager in our institution and my science experience is not restricted to AgResearch. Generally across a number of CRIs the rate of return is pushed down from the company to the people leading programmes and projects and it is the common experience of most scientists to find that the level of profit is set by the company for all projects, irrespective of their context or alternative ways of delivering for the national outcome. I wonder whether some of the policy-level concern about economic return couldn't be better focused on the portfolios of FRST so that if the government is investing through portfolios we look at the return of science to those portfolios rather than through the CRI dividend or through the individual profit line on specific projects. As a scientist I have very little awareness of how well the other science institutions and agencies and scientists are actually working together to deliver collectively on portfolio outcomes. There are two issues there. One is the scale of measuring our economic return, the other one is the ability for scientists to be aware of their delivery into portfolios.

JIM WATSON: CRIs fundamentally have to deal within industry sectors, although for the life of me I don't see any more industry sectors than the ones that might have existed 20-30 years ago.

I was amazed with Shaun Coffey's talk because of the variety of customers he had and where they were coming from. If I were a CRI and had a mandate to serve an industry sector, and that sector comprised of say 2,500 small to medium enterprises, that's quite different from dealing with an energy sector where there are three or four major players with international markets or whatever. It comes back to the point that if you have research and you are developing new technology, who is going to take it up?

A lot of the technology we develop doesn't have a compatible industry or industry sector to actually take it up. I struggle with this because I would like to see the dividend going back to the CRI, and I would put rings around it for that money to be used to try and build the users. We still talk about industry alignment and I am not sure what those major industry alignments actually are.

SHAUN COFFEY: Jim's point around sectors is significant. IRL's return to success has come because we are working in areas of the economy where we can have an impact and we work with whichever company has the most energy, the best

Shaun Coffey

Struan Little

Stephen Goldson

investment opportunity, the best ideas, where we can get a major impact. But we kept getting told we can't do that, we've got to find a sector and get captured in the sector.

The type of thing we are doing is developing generic technologies, whether they are widgets, products or processes that can apply across a whole range of industries.

The thing we have missed out of the debate is how we actually leverage our know-how and our technological capacity for the best return. We tend to get captured in sectors rather than look to where we can leverage the most advantage.

STEPHEN GOLDSON: I will attempt to sum up this bit. One of the fights I have had in my career is this business of over-delivery of science – that is, that you are doing too much science or making too fast a project, or you should stop doing it and hand the money back because you have achieved the goal.

There is a tension between achieving what is required on contracts and the other goal of CRIs and universities, to be excellent in science. That conflict has not been sorted out yet.

The focus so far has been on economic growth and productivity and not on public health, sustainability or the environment. That is a big problem because we cannot measure the benefits.

STRUAN LITTLE: I agree those things are crucial, the social and environmental sides, so I wouldn't dismiss those for a moment. But the economic stuff really does matter because we aspire to first-world standards in heath and environment and those things are connected with the growth in productivity. So I think they are both important.

DEREK WOODFIELD (AgResearch): We have been discussing the New Zealand science system but I haven't heard any mention of MoRST. I wonder whether there is any place for MoRST and whether it and FRST should be amalgamated to create efficiencies. Second, I wonder whether the PGP Fund is going to be like the Pasture 21, where money is given to the pastoral sector on one side and then levelled out by FRST on the other side by not allowing new bids in that area to go forward. So is there government policy to improve our productivity in the sector or is this a levelling exercise and are we just going to move into other areas?

JIM WATSON: MoRST should be a very strong organisation in the strategic area because if you have a strategy then you can understand how to develop policy, and that's not something we are particularly good at. And I am assuming the reason we have a Chief Science Advisor is to advise the Prime Minister on how to go about some of these matters and what might be done. So I think there should be more clarity between the role of MoRST in a strategic and policy leading area. It is an area that the Royal Society should also be involved in, working closely with MoRST and the Chief Science Advisor with the National Science Panel overseeing a lot of it. That is quite different from the decisions about funding, but a long-term strategy and underpinning support in terms of policy and legislation is absolutely essential for the funding side to focus on the funding mechanisms.

MURRAY BAIN: There are clear and distinctive roles for policy ministries and for agencies like ours. The most obvious one is the separation from political interference of the decisions about who gets money from the science funding system. Arm's length is a very important attribute. It removes the lobbying. You can go and talk to the Minister all you like and persuade him that you are the best thing since sliced bread but my board and my organisation is arm's length.

You can criticise us over how well we do our job, but it is to face outwards to the science sector and the business sector and to be talking about facilitation and putting those two together. The ministry's job is to face government and to deal with things like budget processes and policy issues and things like that. If my organisation was trying to face both ways, where should I spend more of my time: on The Terrace or out in the field?

Another question raised is that of priority setting. To date the policy setting in terms of priorities has been fairly high-level. I think the Minister is interested in coming down a layer and that is something the Foundation welcomes.

I think that would be a good process. Because of financial constraints, choices must be made and those choices should be made at a political level rather than inside the Foundation.

JIM SALINGER (University of Auckland): I want to get away from dollars and cents. I am not a management or MBA type. But two life experiences were remarkable for me. One was in 1970 at the Salk Institute where I met one Jim Watson. It was an incredible model. They just chose Nobel Prize winners and then they had a whole business structure for going out and getting the money, and they told the scientists to write what they thought was important science and they left the scientists to get on with it.

Second, about a week ago I was in Boulder, Colorado celebrating Tom Wigley's career. He was director of the Climatic Research Unit, at the University of East Anglia, which became the top environmental science school in the UK. The management style we were celebrating was a lack of management and total disdain for bureaucracies. Out of that environment came over 100 papers. I would like people to comment on those two experiences.

JIM WATSON: I spent 16 years in the United States working at the Salk Institute, then at the University of California. Some things were done quite differently there. Science was treated as a business and the science leaders within the institution actually had to present their planning forecasts to management and life went on. So there was strong science input into what you did and how it was managed, but what has changed dramatically – probably world-wide but excessively in New Zealand – is that there was once time for the creative juices and reflection to be used in problem solving or developing new things or developing collaboration. Somehow the demands of the system today take away from the time individual scientists have to ply their trade.

Policymakers and political leaders seem to forget that science is actually a business. If you think about a science project – you have to plan it, you have to raise the money, you have to employ people, you have to run a team and you have got to get an output. But the output is the difficult thing for an economist or a political leader to understand because sometimes it is simply not measureable at that point in time.

So the system was different and much greater responsibility was put on to the scientist and the science community and the science leaders to present the case for science, but generally they were adopted. At the National Institutes of Health every year a panel was put together within each institute, around 12-15 members, generally youngish scientists (in the 40-45 age group). They come together for three days, they plan ahead, they put in their priorities, it is published, you can pick up a document at the end of the day and read it but that is the document that goes to the National Institutes of Health and the director that formulates policy and formulates funding allocation for the next period.

RICKARD BLAKEY (University of Canterbury/McDiarmid Institute). I would like to think about some of the things that are working well in this system and seek comment from the panel on a couple of areas that are working well. The Marsden Fund works very well from a scientist's perspective – it is easy to understand, has been established for a long-extended period, is non-partisan, has withstood numerous governments and is delivering good benefit to the country, but science excellence is the main criteria. Marsden cores can be used as an example for addressing some of the problems that need to be addressed around inter-institutional co-operation, breaking down barriers, getting work going across the sectors.

JIM WATSON: Marsden Fund cores work well – it is a pity there aren't more. Also working well are some of the universities that have graduate student organisations. I go regularly to the Auckland one – it is a science-come-business evening – and the students, usually in the second or third year of their PhD, present their projects. They have these fantastic two-minute presentations. They generate energy, they generate heat, they generate collaboration and I think they generate a lot of excitement. A lot of staff come, a lot of students come, a lot of PhDs come and I think that is beginning to work well, which is saying that there are areas of the culture which work extremely well.

Another thing – I am amazed at the resilience of scientists and I think the productivity of a lot of individual scientists is actually very high. There are measurement problems, but individual scientists generally work very hard and their output is great. That is supported in terms of the statistics. So yes, there are some very good things within the science system. Another good thing is that there is a lot more dialogue than there was two or three years ago. MoRST, FRST, the Royal Society – there is a lot more get-out-and-talk about what is going on.

STEPHEN GOLDSON: Where did the idea come from that the science community or the science output is not very good. Today we have learnt it probably is pretty good. Therefore the problem is not science, it is not research, it is development. Why should the scientists do this development? They are scientists, not technology developers. And if the scientists shouldn't do it, who should – and who should pay for it?

SHAUN COFFEY: The model we have around science tends to talk about doing research and commercialising research. But some significant parts of the equation are missing. One is co-funding, another is technology transfer.

The New Zealand model of research, science and technology is particularly weak in terms of technology transfer because there is a much narrower focus on capturing the commercial benefits in terms of a commercial operation, rather than making judgments – as I guess I do every day – and deciding it is not worth pursuing $500,000 on your bottom line if that is going to kill an opportunity that might deliver a million dollars of benefit to the economy.

If you had a better technology transfer culture, it would work. All the big institutions around the world have commercialisation units and they have technology transfer units. Australia and New Zealand started throwing that out about the time we starting moving away – in agriculture – from extension services in the early 1990s.

The second issue is in terms of the commercialisation model, particularly the model in the CRIs. It is about capturing the commercial benefit coming through at the end of the technology development. We need a more mature approach that allows better co-funding with industry, the actual generation of the IP in the first place and a maturity.

Something I have done in previous positions, for example, is give up the promise of $100m and $150m dollars of licensing revenue (that may or may not materialise) for $5m or $6m up-front fees. I can reinvest this in plant equipment and so on.

An issue with developing good co-funding models is our contracting model, where we have contracts and sub-contracts. I go out and negotiate my primary relationship with industry, which has an idea or a problem. We work with them, develop the problem and come up with a solution. We go to someone at the Foundation to get it funded. The Foundation has a contract with me and the industry becomes the sub-contractor or it has a contract with Auckland University and we become a sub-contractor. Or the contract is with me and the university becomes the sub-contractor. So you suddenly move from being equal partners; and industry, particularly, will say "well hang

on, we were equal partners, this was our idea, this was our problem and then all of a sudden we have been relegated to a sub-contract status."

That is not a criticism of the Foundation, that is the way in which it has developed over a long period of time.

MURRAY BAIN: We have been doing some work on where across the value chain, from the pure research end right through to the applied end, our funds are actually being applied. We are relatively non-prescriptive about that, it is actually coded by the research organisations who tell us where along the chain they will be using that money. The big spikes are in the first two – the research-driven end – and the tiny spikes are with experimental, development and product development.

Jim made a suggestion about some collaborative commercialisation of technology transfer function among CRIs. AgResearch tried that a little while ago and looked to extend that among other CRIs.

I disagree in principle with that approach because I think tech transfer and commercialisation should be part of the culture of each organisation. If we are really going to get research flying out the door it needs to be part of the culture of our research organisations and therefore integrated within it rather than sitting as a separate body.

STRUAN LITTLE: The commercialisation process often isn't linear and sometimes the spin-offs go backwards into the scientific end. When Louis Pasteur was designing tins of food for the French military, he didn't know he was going into some fundamental microbiology. And even if you don't like it, the customer matters. The customer has to go with the money and the customer is will be doing the lobbying for you guys and what you are trying to do.

CHRIS CALDER (Institute of Geological Nuclear Sciences): A question for Struan Little – we talked about ideas to boost productivity in New Zealand and to involve industry more heavily into the decision making on how the money is spent. This raises a few alarm bells because industry is notoriously short-term and science is fairly mid-to long-term. So there might be a conflict.

STRUAN LITTLE: Yes, there is a potential tension between some scientific endeavour which is very long-term and some of the expectations of the commercial sector. But the funding I was talking about is the stuff that is looking more at innovation – that is where we really are trying to bridge the gap in some of the discussions we were having back here.

MURRAY BAIN: There is also a role that our research organisations need to play in terms of education of industry. Our industry and our businesses are so small, compared to many overseas ones. They don't see over the horizon. That is a part of the role I think our CRIs and our universities can play, to help educate some of those guys. Otherwise our businesses are not going to be thinking strategically and be competitively globally.

JIM WATSON: Should we largely ignore the dinosaurs and look out there for building new-age businesses? Much of the science and technology that is done here, with all the education in the world, will never make it into some of our businesses not because they are not receptive but because they feel they don't need it. A major example was the forestry sector in the 1980s and 1990s. Far more effort therefore must go into building what I call new-age business because that is where the growth is and that is where the impact of science and technology will be felt. Going out and consulting with industry is great but when an industry doesn't intend to use the technology to start something new where there is a need, then you are never going to convert an industry to do it.

PETER KETTLE: The "What is your problem New Zealand?" model could have much wider utility. I would like Shaun and Murray to discuss it because some initiatives from the Foundation are somewhat similar and I think it could be developed and be of significant utility to the innovation system.

MURRAY BAIN: I am a strong supporter of "What is your problem New Zealand?" and Shaun and I are talking about how we can extend it. It is starting to get real legs. It is fascinating how many companies are coming out the woodwork, now they are starting to hear about this, so we have a bit of a marketing campaign on the go. I don't think either of us are as pessimistic as Jim about the ability of New Zealand business and industry to start embracing R&D. Initiatives like "What's your problem New Zealand?" are good ones for that.

SHAUN COFFEY: Just a few statistics. In the couple of months after we launched the competition we briefed over 700 representatives of business companies. Almost half of those were new introductions to the New Zealand R&D system. We had 105 entrants (we were expecting about 35-40) and we have got everyone from the big players with very long-term projects to people with warranty problems. That, coupled with what is happening with the TechNZ work, suggests the statistics about the interest particularly of the SME sector in innovation probably are under-cooked. There is a far greater interest in step-change in business than I think we have given credence to. The trick now is to have an appropriate ongoing dialogue.

In several cases where there is a technical match between IRL and a company, we become facilitators – we will help the group shape its problem then find the persons they need to talk to. To get good long-lasting effective change in the New Zealand system, we need a better dialogue between the people on the science side and the people in industry going for these big new ideas.

PETER BUCHANAN (Landcare Research): I am concerned about science profile. Since 1992 it has been reduced significantly – if you ask the public what a CRI is, 17 years later, they probably couldn't tell you. I wonder whether the Government has obscured the science structure apart

from universities into a group of organisations, each too small to have a major profile. Young science students might wonder where science in New Zealand is done, when it is spread across lots of organisations with different names.
A second question, now that the Foundation is funding multi-year projects up to 12 years, is whether funding will be inflation adjusted year by year?

SHAUN COFFEY: I couldn't agree more about science profile. It is no better or worse than elsewhere around the world but we need to do a lot more there. Something I am looking at building into the requirements for my scientists is that we generate more opinion pieces. My biggest problem is getting scientists to stand up and accept they have got to communicate in an environment where the media and the public are looking for absolutes and we have to talk in terms of risk management.

MURRAY BAIN: With respect to those long-term contracts – and there are an increasing number of them – the Foundation can't guarantee an increase in funding, even if it wanted to, because our funding isn't indexed. We have flat funding unless it is increased through the annual budget process.

Secondly, while we can't guarantee an increase in funding we deliberately don't specify that funding will stay flat right through. We have stated we will try and increase it, and we have seen that with the outcome-based investments in Landcare and others where we have got budget bids through to increase those funds.

We have got two options in terms of increases. One is persuading government this is a good investment and we should put more money into it. The second is that we could shift funding out of contestable processes into those long-term contracts, but that would reduce contestable funding. We have space under our cap to do some of that if we choose but we have got a lot of other places where we also want to put negotiated funding, so we are careful about using it up too fast.

STRUAN LITTLE: The Government this year and next is expecting to spend more than it gets in tax by somewhere in the order of $7billion – $9billon. That means money is going to be hard to find so that puts the acid back on some of the discussions we are having – how do we make the best use of the current science system?

BILL KAIN (AGMARDT): My question is directed to Struan Little – I am appalled at our track record in productivity and wonder if it results from current government policies and unintended consequences. I refer to the volatility of our exchange rate and the disincentive this causes with business firms to make an investment and we know that it probably is driven as much by the Reserve Bank Act as others. I also like to think about tax incentives and how they can create disincentives away from intangible assets into much more tangible assets because of bank lending policies. I wonder whether straightening out some of these would provide some of the benefits we are seeking for research and development.

STRUAN LITTLE: Productivity is not about just one thing, it is a whole lot of things, and one of the points I was trying to make is that science and innovation will be helped not just by the policies directed at those sectors but also by some of these wider policies. Certain issues you have raised are right, and there are many more. Successive governments have been trying to tackle this. Productivity performance has been poor for a long time and we are going to have to do a lot and cross a lot of ground. But the point I would emphasise is that the innovation system and the science system is critical to that effort.

STEPHEN GOLDSON: We are grateful for Struan Little's contribution. It is important we de-mystify what Treasury is doing. The science environment we are working in is full of competition. Scientists compete for peer esteem all the time. We don't need a lot of extra competition ladled on top of existing competition. If an adjustment is to be made, it is to reduce the contrived competition through structure and allow the competitive nature of scientists to drive for excellence and value in productivity.

Awards

NZIAHS Fellowship
Prof Julian Heyes

John Lancashire presenting NZIAHS Fellowship to Julian Heyes

Julian Heyes' contribution to agricultural and horticultural sciences covers a wide range of activities, from basic research on cell membranes and water transport to applied aspects of flower and fruit senescence and post-harvest quality, and from science leadership within New Zealand research institutes and related scientific societies, to a view of the wider world, how science can contribute to the economic benefit of all and the importance of those international linkages to New Zealand.

Plant biology has been an enduring interest, first as an undergraduate at Victoria University and then as a Rhodes Scholar at Oxford University, studying membrane integrity in plant cells under nutrient stress. Julian joined MAF Technology in 1989 and has held positions as a scientist and science manager within Plant & Food Research. His research on cell biology and membrane integrity was directed toward post-harvest quality and in particular textural and ripening changes in fruit crops such as nectarines and pepino. The nature of water transport across membranes and the activity of aquaporins, integral membrane proteins that allow the controlled flow of water, has been a research highlight.

Julian's recent research has been more focused on the influence of fruit and vegetable quality on human health and the retention of vitamins and nutrients in stored produce.

The importance of post-harvest science for developing countries is not only in ensuring food supplies to the local population but also in developing processes to allow the export of tropical crops with the necessary post-harvest storage life to make them commercially viable. Julian has been an advocate for the use of post-harvest technology in developing countries as a means for economic advancement but also as a tool for food security. He has been the New Zealand representative on the Postharvest Action forum, a group aligned with the FAO and CGIAR, looking to make post-harvest technology available and ensure its appropriate and effective use. He has been a committee member for the Tropical Fruit Network and an invited speaker at a number of international conferences, advancing the need for and value of sustainable post-harvest technology. He also has been a supervisor for a number of visiting overseas postgraduate students, developing their expertise in post-harvest technology.

His involvement in science strategy and management includes positions as a Research Leader and Science Group Manager within Plant & Food Research, most recently as the SGM of the Fresh Whole Foods group. He has been leader of the Future Vegetables research project, a varied research programme incorporating plant breeding, biochemical, physiological and molecular biology expertise from within the research institute and a project run in partnership with Horticulture New Zealand, ensuring good industry linkages. He is also co-leader of the Vital Vegetables programme, a collaborative research programme with the Department of Primary Industries in Victoria, Australia, and the administrator for Nutrigenomics New Zealand, a four-party collaborative research programme linking nutrition with human health and involving scientists from both research institutes and university departments.

Julian has been a member of NZIAHS since 1990 and has served on the committee and as secretary/treasurer since 2001. He is a life member of the New Zealand Society of Plant Biologists, served as a council member for several years and was President in 2003 and 2004. Julian is also a member of the International Society for Horticultural Science and the Royal Society of New Zealand.

Julian has shown his skills as a communicator, the ability to work with diverse groups of people and a love of teaching. His first position after graduating from Oxford University was as a lecturer in plant physiology in the Department of Biological Sciences at the the University of Zimbabwe. He has supervised several post-graduate projects during his time at Plant & Food Research and recently accepted the position of Professor of Postharvest Technology at Massey University, where he can combine his research skills and experience with a teaching role and the ability to pass on his enthusiasm and interest in plant biology.

PGG Wrightson Significant Achievement Award
Prof Steve Wratten, Lincoln University

For his Greening Waipara Project which has introduced and established more sustainable vineyard management practices in the Waipara region, North Canterbury.

NZIAHS Science Award
Dr Mike Dodd, AgResearch Grasslands

Mike attended the combined International Synposium on soil organic matter dynamics in Colorado Springs USA, in July and spent a week in Fort Collins at the Natural Resource Ecology Lab of Colorado State University.

He presented a paper at the Soil Organic Matter symposium based on recent soil carbon and nitrogen work at Whatawhata examining decadal patterns of soil C and N, and developed international collaborative opportunities with other attendees.

Mike also reacquainted himself with the use of the CENTURY soil organic matter model and its development team. The model has been significantly upgraded since he was using it at the Colorado State University in the mid 1990s in ways which will make it more applicable to our purposes in New Zealand.

NZIAHS Science Award

Dr Emma Bermingham, AgResearch Grasslands

Emma is a FRST Post-doctoral Fellow based in the Food, Metabolism & Microbiology Section at AgResearch Palmerston North where she is studying "Post-Natal Nutrition and Epigenetic Regulation of chronic Intestinal Inflammation".

The hypothesis of her research is that selenium and folate supplementation can reverse the epigenetic effects of poor diet that predispose the host to chronic intestinal inflammation. Emma presented results from her FRST Postdoctoral Fellowship at two conferences in Europe in September.

Sir Arthur Ward Award

John Lancashire

John Lancashire has shown inspired leadership of the Institute, his hallmark being regular engagement with the news media on matters of importance to agricultural and horticultural science, research and technology.

Jon Hickford and Jenny Taylor presenting the Sir Arthur Ward Award to John Lancashire.

John has not shied from the most challenging issues and at the highest levels to present balanced but compelling arguments to protect our national interests in agriculture and horticulture. He has earned the respect of his adversaries without recourse to bitter or acrimonious debate and is respected as one of the few independent voices in the sector.

John sets a new standard in communication and his activities over the past five years for the Institute have placed us in good stead. The institute unreservedly applauds him for his contribution to science in New Zealand.

AGMARDT Technology Transfer Award

Dick Lucas, Lincoln University

Dick Lucas taught pastures at Lincoln University between 1974 and 2004, when he influenced the thinking of hundreds of diploma, undergraduate and postgraduate students on the topic of pastures. His influence was clearly demonstrated when he was awarded a Life Membership of the New Zealand Grassland Association. Nearly one third of those present at the conference were former students.

Top: Peter Kettle presenting AGMARDT Technology Transfer Award to Dick Lucas
Bottom: Murray Craighead receiving the Doug Campbell Award

A significant contribution Dick has made to New Zealand agriculture has been his refusal to toe the rye/grass white clover fits all party line, vigorously espousing the causes of less familiar pasture legumes and grasses that grow and perform in acidic, low phosphate, droughty soils.

Although he has published widely, it is his missionary zeal for those species that highlights his major contribution. He has talked on conference field days, specialist field days and on monitor farms promoting his message in the field to the farming community.

Doug Campbell Award

Murray Craighead – Canterbury Section

Murray has been an outstanding member of the Canterbury Section Committee since 2001. He has judged at the Canterbury/Westland Schools Science Fair. Even before his committee membership, Murray had been active in section events. He arranged sponsorship from Ravensdown Fertiliser for field events in North Canterbury and around Lincoln and organised field trial visits by Institute members to dais farming trials at Culverden and to the lysimeter trials at Lincoln University. Murray has been a key member of the Canterbury Committee in organising and running forums held at each of the last three national conventions at Lincoln University.

Graham Everitt

Graham Everitt, MNZM, PhD, was an Honorary Fellow of NZIAHS. He joined the Institute in 1957. This obituary is based on the eulogy delivered by Ken Drury.

Dr Graham Everitt was known variously over the years as Ippy to my family, Francois, the Commodore, the Colonel and in later years, Grumpy – a totally inappropriate name, but one that he seemed to embrace and used as his email signature. I believe it arose from a misspelt email username of all things.

Born and raised in Warwickshire, he dabbled in farm work before spending a period in the British Army Intelligence forces in post-war Germany. His experiences there, and the injuries he received in an unpleasant fracas, were to bother him throughout his life. After a lengthy recuperation he turned to an academic life and embarked on study at several colleges and universities. He was at Cambridge in 1957 when he was offered an appointment as a scientist at Ruakura Animal Research Station by C. P. McMeekan, its superintendent. He accepted because of the wide renown of its research.

He came to Hamilton with his wife Margaret and their two sons.

His earliest research at Ruakura was into how growth and carcass quality of both lambs and beef cattle could be improved. He then went to the Waite Institute, part of Adelaide University, and completed a doctorate (his thesis was titled "Factors affecting foetal growth and development of merino sheep with particular reference to maternal nutrition").

On his return to Ruakura in 1965, Graham was asked to set up a programme of research into beef production from the dairy herd and soon set up a broad research effort ranging from the dairy farm to the meat works. He ran experiments on calf rearing, breeds and crosses, and grazing systems for weaners. He took his research on to farms, organising Livestock Improvement to make matings in dairy herds and then he arranged the transfer of the weaners to grazing.

Meat buyers denigrated him and his research (they insisted he was dealing with mongrels with no meat in the right place) but he wasn't discouraged and cajoled AFFCO to let his staff into the boning room at Horoitu freezing works to measure actual meat yields, an unheard of intrusion. It was the whole deal, with hundreds of animals recorded. His data eventually dispelled the entrenched negative opinions.

He saw the need for the orderly marketing of weaner calves and special dairy beef days were initiated at saleyards. At the first sale at Frankton late in 1967, a prominent beef breeder stood on the catwalk used by the auctioneers and decried the event. Graham jumped up with him and fought a prolonged verbal battle until, in his excitement, he slipped and fell into a pen of calves. But the day was a huge success and became part and parcel of the sales calendar.

The acceptance of dairy beef animals by the industry owed a lot to Graham, his team at Ruakura and the enthusiasm of the advisors and farmers he worked with.

Over 15 years he produced scores of articles for research journals, conferences both here and overseas and for the farming media. His mantra was work done and work not published is work not done.

He organised the publication of a book on all aspects of beef production, promoting better integration from farm to market.

He helped and mentored many new research workers and was active in science groups that promoted communication outside the constraints of the public service.

His work on committees and as president was recognised by his election as Life Member of the New Zealand Society of Animal Production, and an Honorary Fellowship of the New Zealand Institute of Agricultural Science.

In 1979, as he put it, he "suffered the fate of so many successful scientists" and became a Research Director in Northland until he retired in 1987. He enjoyed his days in Whangarei, developing research facilities at Kamo and Kerikeri but always battling the funding limitations imposed during that time.

The Role of Life Cycle Management in Land-based Industries

Massey University's Manawatu campus will be the base for a new Life Cycle Assessment Centre focused on managing New Zealand's environmental footprint – from greenhouse gas emissions to water use. The Ministry of Agriculture and Forestry awarded a $1.3 million contract to the university to co-ordinate New Zealand work in the sector in collaboration with AgResearch, Landcare Research, Scion and Plant & Food Research. The initial steps included a workshop on "The Role and Importance of LCM in Land Based Industries" and Kimberly Robertson, Catalyst® R&D, presented at the workshop and has provided this report.

Life Cycle Management (LCM) is used to help manage the total life cycle of products and services towards more sustainable consumption and production patterns, and New Zealand has an opportunity to become environmentally, economically and socially sustainable using LCM to try to reduce total greenhouse gas emissions to the atmosphere.

A life cycle is made up of all the activities that go into making, selling, using, transporting and disposing of a product or service, from initial design, right through the supply chain. LCM is a framework for planning and management that helps:

- Analyse and understand the life cycle stages of a product or service;
- Identify the potential economic, social, or environmental risks and opportunities at each stage; and
- Establish proactive systems to pursue the opportunities and manage or minimise the risks (such as greenhouse gas emissions and water use).

The focus of life cycle analysis has so far been on greenhouse gases, but LCM/LCA covers a range of other environmental issues including eutrophication, acidification, human toxicity, marine and fresh water toxicity.

The LCM Centre will focus on managing New Zealand's primary sector's environmental footprint from greenhouse gas emissions to eutrophication. Massey University is partnering with AgResearch, Landcare Research, Scion and Plant & Food Research and will have an advisory group made up of international experts, industry, education, and research providers. They are considering the appointment of a new Professor of Life Cycle Management.

The major considerations driving MAF's funding of the LCM Centre include:

- Current consumption patterns are not sustainable globally or nationally;
- New Zealand is largely a land-based economy which relies on natural capital, external energy and nutrients;
- A high proportion of our production is exported;
- Consumers are becoming more conscious of the environmental impact of their product choices;
- Therefore the way we produce impacts not only the environment but also the economy;
- Life cycle management provides a process to look at the entire life cycle of products, reduce their inputs and/or outputs and embed sustainability within businesses.

The aims of the LCM Centre are:

- Education and training of LCM and LCA practitioners – it will offer undergraduate papers and postgraduate Masters and Doctorates;
- Research to address methodological issues, and meet consumer demand for product environmental information.

About 50 people from CRIs, government and industry took part in the workshop on the role and importance of LCM in land-based industries that preceded the announcement of the new centre. The presentations highlighted issues such as market access, living up to New Zealand's "clean green" image and the food miles controversy.

Terminology was identified as a barrier to communication between LCM practitioners and engineers/designers. It was recommended that there be some alignment in terminology, integration of LCM/LCA within design practices and better communication between designers and LCM practitioners. A key conclusion was the need for the LCM Centre to move beyond a focus on the primary sectors as soon as possible.

Emission factors used to calculate greenhouse gas emissions due to shipping of products to export markets were among other issues discussed. A MAF-funded study to review calculation methods concluded that a range of emission factor sources have been used in New Zealand studies and there is little consistency and high variability in those sources. The study recommended that actual fuel use be used if available.

Uncertainty is a problem with estimates of emissions of nitrous oxide from soil, refrigerants and transport of products from retailer to consumer. Other methodological issues are defining an average product, allocation of emissions between co-products and how to communicate variability/uncertainty to consumers.

Issues with the use of PAS 2050 (assessment of the life cycle GHG emissions of goods and services) were identified, too, including the lack of balance in the way that wood products carbon stocks and emissions are accounted for. It was noted that the International Standards Organisation (ISO) standards do not have the same issues and ISO is drafting a standard on the carbon footprint of products that is likely to supersede the PAS 2050.

New Zealand is at the forefront of sector-specific approaches to greenhouse gas footprinting internationally and this provides an opportunity to contribute towards the development of international greenhouse gas footprinting standards, such as those being developed by the ISO and the World Resources Institute/World Business Council for Sustainable Development, and product category rules under ISO. This will help ensure that all analysis in a particular sector uses the same methodology and hence, hopefully, provide comparable results.

Queen's Birthday Honour for Members

PROFESSOR ALISON STEWART CNZM

Professor Alison Stewart, Director of the Bio-Protection Research Centre, has been appointed a Companion of the New Zealand Order of Merit (CNZM) in recognition of her services to biology, in particular plant pathology.

Professor Stewart fully appreciates the honour which she sees as recognition of the area of bioprotection research.

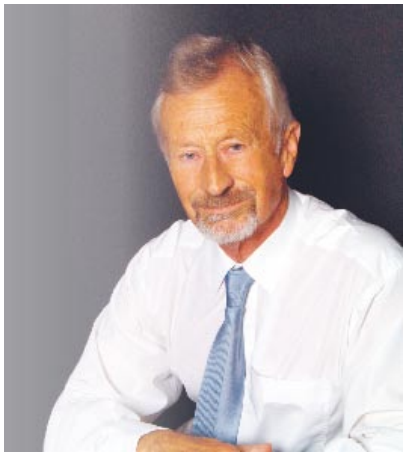
"I've always believed in the value of science and in particular the value of bioprotection science. I'm delighted by the appointment, not just on a personal level, but because I see it as a public acknowledgement of the importance of bioprotection research and of the success of the Bio-Protection Research Centre as a whole.

"The New Zealand economy relies on land-based industries which are having to find new ways of dealing with traditional and novel weeds, pests and diseases. Bioprotection research is becoming more and more important in developing techniques and technologies to mitigate or remove those threats."

Prof Stewart is a plant biologist who has focused on plant disease management, biological control and microbial ecology. She has developed integrated disease management strategies and commercial products for diseases of onions, lettuce and grapes.

In 1988 she was appointed the first female Professor at Lincoln University and became the Director of the Bio-Protection Research Centre, a Centre of Research Excellence (CoRE), on its formation in 2003.

JOHN LANCASHIRE QSM



John Lancashire, Immediate Past President and Honorary Fellow of the Institute, has been given The Queen's Service Medal (QSM) for his services to conservation. John worked with the Department of Scientific and Industrial Research (DSIR) for 30 years and was director of DSIR Grasslands. He has contributed to conservation for more than ten years. He has been involved with a wide number of environmental and conservation issues in the Kapiti Coast District for over ten years. He is the chair of the Whareroa Community Trust. He has chaired The Friends of Queen Elizabeth Park since its inception in 2003 where he has obtained funds for the restoration of the Whareroa Stream and the 100 year old barn in the park and been involved in the development of a 20 year strategy for improving the park's facilities. John was also involved in the establishment of the Whareroa Community Trust and was responsible for obtaining substantial funds from the Ministry for the Environment's Sustainable Management fund to start the restoration of the catchment of the Whareroa Stream.

New members

We welcome

Chris Cowell (Auckland)
Miriam Farrell (Auckland)
Bob Travers (Auckland)
Shane Dyer (Bay of Plenty)
Don Hunter (Manawatu)
Erin O'Donoghue (Manawatu)
Nicola Kelland (Canterbury)

Corporate members

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

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