

Levy oration

Looking back and looking forward

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Introduction

Thank you for your kind introduction. What I will present to you is a perspective of New Zealand Science, and research funding, from a governance viewpoint, as well as my own take on some of the issues the pastoral sector is facing. Most emphatically, these are definitely my views and do not represent those of the Minister or the Ministry.

New Zealand science

Firstly, the last Ministry of Business, Innovation and Employment (MBIE) contestable funding round seemed to have been a shock for the majority of universities. I'm not sure why this should have been the case as over the last 2 years both Minister Joyce and the Ministry have put out clear messages to the research community that this particular fund is for wealth creation and researchers would need to demonstrate very significant connections to industry and thus a clear path to market. Excellent science remains essential, but is not sufficient on its own for MBIE funding.

Thus it is indeed unfortunate that these signals were not heeded by some organisations with the inevitable result that one highly ranked university obtained funding for only one of its 24 proposals. Others had similar results. I can assure you all that next year's funding round will not be different, and consideration must be given to the cost of such extensive but unrewarding bidding, both in terms of time, and scientists' morale. That said there are several issues regarding the MBIE contestable round which I want to touch on:

- Within each of the discipline portfolios the funding is lumpy year-to-year depending on the number of projects coming off funding. This does impede continuity of effort by the scientists, but also has implications for research organisations and clients for their research budgets. MBIE with the Minister are currently looking at ways to prevent occurrence of this sudden discontinuity.
- Since the removal of core funding from this pool to CRIs, and this year to Research Associations as well, the total available for contestable funding has shrunk correspondingly. However, given this (now core) MBIE-type funding was always won by the CRIs and Research Associations, in practice the contraction of

funding available to other organisations has been more apparent rather than real.

- While the establishment of National Science Challenges will add some new funding into the research system *per se*, the open contestable pool will actually shrink further as those projects identified to be aligned to a particular Challenge come to an end. Thereafter that funding will be diverted into the aligned Challenge and its reallocation will then become a role for that Challenge's Governance Committee. This will be on some kind of contestable basis.
- Longer term contestable funding has also shrunk a little because of the establishment of "smart ideas" funding.
- Finally, this funding is not inflation-proofed in any way (unlike Marsden and PBRF).

What are the implications of this?

As funding drops contestability goes up, and unfortunately the acceptability of high risk research goes down. For a perceived sense of fairness the research timelines tend to be shortened, which for example militates against gaining an understanding of the large and increasing sustainability issues facing New Zealand – I will come back to this later.

At the MBIE Science Board we also have to be assiduous in distinguishing between scientific discovery research and technology development. In the drive for wealth creation, technology development can appear at first sight to be more attractive. In my view there are in fact other funding streams available for this; for example those now being managed by Callaghan Innovation. As Chair I feel that I have had to be adamant about this need to stay focused on science and as such this may in part be a reaction to the number of industry people now on our assessment panels. This is compounded, in some quarters at least, by the poor understanding by officials of how and why science is different from other forms of public investment.

As it happens I am a Member of the Royal Society of New Zealand and I would have thought this peak science agency would be assisting to prevent such misinterpretation of existing funding criteria.

Before going onto some of the issues facing the pastoral sector I want to commend the Minister

and MBIE for finally tackling what I believe to be a scandal in our grants system, and that is the granting of large amounts of development funding – usually via New Zealand Trade and Enterprise, to establish high technology companies. If that company is successful, and then gets sold off, the recipients of the development funding sequester the money with no obligation to reimburse the government, which is of course all of us, as taxpayers. Three companies I can think of in this category are: Fisher and Paykel Appliances, Endace Technology, and Dynamic Controls. The quantum of funding involved has been \$15.9 million, \$14 million and \$7.7 million respectively. One solution to this could be along the lines of the grants being replaced by preference shares which are written off in the year it is given, but with a residual obligation which will provide a windfall profit to the organisation administering it, i.e. the Government, when and if the business is sold.

Issues relating to the pastoral sector

To change gear completely I would now like to make some comments about this country's absolutely vital pastoral sector. The most widely discussed issue facing the sector is the "Clean Green New Zealand" epithet. One of the biggest fears the commercial sector has in this area is the adoption of genetic modification of our animals and the food fed to them.

As it happens it may be possible that genetic modification could help the country's reputation. For example, having a genetically modified legume or grass with a condensed tannin gene, which gives a higher feed conversion efficiency, and lower methane emissions may well be positive for New Zealand's brand. Likewise considering *Pinus radiata*; if a sterility seed gene was to be introduced to our forestry industry that would stop proliferation of wilding pines, this too would be of environmental benefit. However while our industry magnates and our politicians continue with New Zealand's anti-GE stance we could well slip behind other primary-based economies in the efficiency and production of dairy, meat, wool and forest products. There really does have to be a big margin on our exports to keep justifying our "clean green" position.

Conversely, if zero GE is going to be New Zealand's long term strategy why should we keep funding GM work in our CRIs and Universities? Would the very short supply of research funding be better placed in other areas?

Apart from the generic issue of enthusing children to do science when, at the same time there are few or no jobs for them after degree completion, the one sector which is chronically undersupplied with graduates and trained workers is in fact agriculture/horticulture. One figure I have seen is that training institutes in New Zealand supply only 40% of the positions required in agriculture and horticulture, and these sectors are now reliant on migrant workers. I will come back to this later with regard to postgraduate training.

Another tension is between increasing production from the land, and its environmental integrity. An area of increasing concern is the high intensity dairy farming on the Canterbury Plains. I probably do not need to remind you that a lot of it is on about 20–30 cm of soils over many metres of gravel. Until fairly recently there has not been a pooling of the information gained from a diverse cluster of individual trials around the sustainability of this practice. It now appears there could be a higher quantum of nutrients being leached to the underground aquifers than originally thought, and that soil structure may be breaking down due the heavy stocking rates.

New Zealanders are now universally more determined to protect all of the land-mass in a sustainable fashion, and they and their representatives (local bodies etc.) are monitoring farming activities far more closely. The continuing dairy conversions are one factor in accentuating the urban/rural divide. I do appreciate that farmer organisations are moving to get farmers to fence off berm areas and restrict, if not eliminate, stock access to rivers and streams, while also using fertiliser more precisely.

What cheers me the most is the commitment by the Dairy Industry to extract three to five times more value per kilogram of milk solids than it is currently obtaining from its largely commodity exports. If this strategy succeeds it will take pressure off the relentless grind to increase milk solids per hectare. However this idea is not new and I well remember the Dairy Research Institute working on this issue 30 years ago. However, that doesn't mean it can't be done.

What is badly needed in New Zealand is long term, multidisciplinary, public good research to inform the policies critical to our future, such as land use, and water allocation and use. Without this, New Zealand will continue to muddle along, making the best (if uninformed) decisions in these areas, while the appetite for funding these sorts of studies, as I stated earlier in

Years	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Total PhDs	499	551	620	642	634	641	793	865	982	6227
Agr/Hort/Env	7	10	4	8	14	7	11	5	8	74

my talk, is currently simply not there. It is hoped that the yet-to-be-formed Land and Water National Science Challenge will address this.

Lastly I wish to discuss the situation of university training for the pastoral sector.

On the previous page are the figures over the last 9 years for Agricultural, Horticultural and Environmental PhD completions.

In this nine year period, from 2002 to 2010, New Zealand produced only 74 PhDs in agriculture, horticulture and environmental and related studies. That represents 1.18% of the nation's 6227 PhDs that graduated in that period. So, 71% of New Zealand's overseas export receipts (not counting tourism) rest upon 1.18% of our intellectual capital creation – and in two of those years not a single New Zealander. Latest statistics are showing non-primary manufactured export goods to be down again – this year by 8.6%.

Thus there is a huge disjunct between our nation's export earnings and the capability we are developing within New Zealand. So how many PhDs from this category can be absorbed by New Zealand's science community? We know that CRIs (which employ two-thirds of the nation's publically funded science researchers) also recruit 57% of new staff with PhDs from offshore each year. Only a few of them are returning Kiwis. This statistic seems bizarre. Can you

imagine other countries behaving as we do with regard to training and recruitment for their most important industry?

Conclusion

I could go on for a while but need to conclude. Considering both parts of my presentation, I believe that they are interrelated. I feel that all parts of the science community, including especially the Royal Society of New Zealand, must continue to challenge the existing funding models and levels of funding. At the same time, groups such as the Grassland Association must highlight the risks inherent in land use change and intensification without proper research into the implications. At the same time we must continue to draw attention to the woefully inadequate supply of New Zealand-trained relevant science and agriculture graduates. Our sector is indeed at a critical point in its history.

Thank you

Note. Dr Hay's previous roles include GM at AgResearch and CEO at Environmental Science and Research (ESR). He is currently consulting in a range of areas as well as company director roles.

