



OFFICE OF THE PRIME MINISTER'S SCIENCE ADVISORY COMMITTEE

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Speech at the Riddet Institute Agri-Food Summit, Wellington Wednesday 14 April 2010

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Everybody in this room understands that New Zealand's economical, social, and environmental development is very much dependent on an effective agricultural system producing products that the world wants, at a price that makes New Zealand wealthier and in a way that ensures our environment is protected. Each of those three elements requires a considerable investment in obtaining new knowledge through the processes of research. Unfortunately the New Zealand research system has not developed at a pace of those of those our comparator nations.

As a whole, we spend only 1.2% of GDP on research, about half of that from the public sector, and half of that from the private sector whereas comparator nations spend somewhere between 2 and 3 times that amount. Of particular concern is our low expenditure from the private sector. If we just compare ourselves to Denmark, a nation of similar size and with a strong agricultural sector, in 1980 we and the Danes invested very similar amounts in research, science and technology. But between 1980 and 2010, if we were to have spent at the same rate as the Danes, we would have invested an additional NZ\$35 billion in science than we have and at least 50% of that would have come from the private sector.

I have no doubt that it is this cumulative under-investment in knowledge that explains why our productivity relative to that of Denmark has declined so far. Successive governments have until recently not given much more than lip-service to the role of science in enhancing New Zealand's productivity potential. But in the last 18 months we have seen a considerable shift in focus. For the first time we are seeing research being treated as a proper investment rather than a cost to society and slowly but progressively the various elements of the New Zealand science system are being analysed, and as our economic situation allows, the issue is being confronted.

As exemplified by my appointment, we have seen a positioning of science within the highest level of policy formation, recognising that science has a much broader part to play than simply in the narrow sense of how we spend Vote RS&T.

The Minister of Science has issued a list of strategic priorities for the sector which represent a very progressive and forward-looking view of what science can contribute to New Zealand. The agency functions are being addressed with the merger of the Foundation and the Ministry to create a more effective policy-driven unit for science and in time this will lead to more effective arrangements for the science system.

The Crown Research Institutes have been reviewed to remove the perverse incentives that led to the crown research institutes being in competition with the private sector rather than working to support the growth of New Zealand industry. We have seen a re-consideration of the role of science in our international partnerships.

As you will soon see there will be attention to improving the transfer of knowledge from the public to the private sector and the development of strategies to increase New Zealand's private sector investment in RS&T. There is much more to do – the competitive funding system has multiple problems, there is a need for better science infrastructure, there is the need to recruit and retain more talent and these issues are all well understood and becoming points of focus.

But let me now return to the sector of interest to this conference: that of food. The food industry faces a number of significant challenges. Firstly, the nature of our markets continue to change, increasingly our markets will be in Asia rather than in Europe and I believe with that change will come a change in emphasis on what the markets wish to purchase.

At the same time, as the world population will increase from 6.5 to 9.5 billion people over the next thirty years or so. Issues of resources utilisation will change consumer attitudes to food which is based in high-energy consumption, release high amounts of green-house gases or has large virtual water footprints. The world is becoming increasingly concerned about issues of food security and indeed we are seeing nations – particularly in Asia – ensuring their long term food security by gaining reliable and sustained access to crops - particularly in Africa.

From New Zealand's perspective, the issue is a particularly complex one. We actually produce only enough food to feed arguably 20 million people. That is a large but not the largest city in China, we could not feed the whole of Mexico City to an acceptable standard. So, in terms of global food production, our production is not particularly significant. Yes, we are a large cross-boundary trader of milk-related products but we only produce 2% of the world's supply. If we think about food and the food industry, there are really three kinds of food product. There are bulk commodity ingredients in foods. We cannot get rich or sustain any prosperity by simply being an exporter of commodity foods.

Secondly, there are foods which have a premium value because the consumer values them more. New Zealand lamb has a high market value because it is seen as a luxury food, so are prime beef cuts, so is venison, and green-lip mussels. But the nature of consumerism will change – the challenge of carbon footprints, the challenge of water footprints, the shift from Europe to Asia will all influence how and what consumers will buy and what premium we can put on such foods.

Thirdly there is the issue of food related to quality of life. A classic example of course is infant formula. Infant formula has not commodified over its long period of production because infant formula has been designed and is marketed on the basis of it being better than cow's milk in supporting the growth of children. Increasingly food is being sold on the basis of what it does for the quality of life. But we need to be careful. What qualities of life is it that food will maintain a premium for? In Asia it is largely around cognitive function and metabolic disease.

One of the problems we face is the food industry is full of unsubstantiated claims about the health benefits of foods. Increasingly, regulatory authorities are worried about such unsubstantiated claims and we are seeing the regulators getting much more interested in such claims. Yes nutraceuticals and foods for health will be the largest opportunity for value-added products but they will not do so on the basis of

unsubstantiated claims. They will only do so on the basis of properly evidence-based research. Where such evidence can be obtained, the potential for very high value-added premiums is very large. So what is to be the strategy for the New Zealand food industry? We cannot bring much more land, if any, into food production, we have to protect the environment and we have to ensure that farmers and growers achieve profits as well as the down-stream manufacturing companies and marketing companies. We need to start thinking ahead – what will we be selling in 10 or 20 years time?

My bias is that one area that we need to give more emphasis to is supporting food for health, supported by robust claims and supported by firm research, because that I believe, is the major area in which large and larger premiums can be maintained and sustained. This is an area where we have a competitive advantage in that there is already a lot of interaction between our agricultural and medical research communities.

What kind of research strategies do we need? And remember we need research strategies that bring profit to the farmer and the grower as well as to those beyond the farm gate, or beyond the paddock. The first thing we need is better research infrastructure. The research infrastructure of New Zealand has been particularly weak in some areas of the biological domain. Yes the PGP programme and the associated food innovation network are addressing some of the down-stream food science issues. But there are big up-stream issues.

We need to better understand how to match soil, forage, animal and climate; we know very little about the soil microbiome and its relationship to crop production or greenhouse gas emissions, we understand very little about key cycles – for example just last week it was reported that trees channel soil methane and emit it, we have been slow to exploit the molecular capacities in terms of animal and plant genomics and particularly animal and plant epigenomics. Epigenetics is uncovering layers of complexity about gene environment interactions and we need to exploit such opportunities .

Given the extent to which we use livestock as the basis of furthering our food supply, our animal science capacities are surprisingly weak. We have not started to apply the modern technique of non-invasive metabolic imaging and so forth to advance the industry. We have been very slow to really make the best of animal genomics and epigenomics to advance science in this area.

And when it comes to post-farm gate, I am not in a position to say much about food science although there have been welcome new initiatives in the food production space. I am very concerned about the low number of agricultural and food science graduates within New Zealand. But what is clear to me is that we do not yet have the infrastructure in terms of doing proper nutritional research to validate food-for-health claims. We have limited capacity in human metabolomics, we have minimal capacity in clinical nutritional research facilities including state of the art sensory capacities using techniques such as functional MRI. We need to take advantage of our ethnic mix to help design foods for a broader range of markets. These are the mainstays of modern nutritional research.

So what are the impediments beyond funding to us moving ahead? The first no doubt, is our very small and highly contestable research attitude. We like to fight each other and compete rather than to collaborate and fight the rest of the world. The funding mechanism has driven that – the CoREs represent one successful attempt to reduce that, the CRI reforms will represent another major step. We have not done well in attracting major international research companies to focus effort in New Zealand - because we have not done well in exposing them to, and thinking about, what we offer.

I am concerned about the fact that New Zealand companies only spend as a total of 0.4% GDP on research. Whereas in all our comparator countries that investment ranges between 1 and 3% GDP is invested by the private sector in research.

So let us explore the low public and private sector spends a little further. At the heart do we have a real deep cultural issue? Have we been seduced by the national myth – number 8 fencing wire, punching above our weight, we think we are innovative when the report of the OECD and the recent report from the NZ Institute show that we are not. We live on a past glory that probably was never there. Could it be that we are a very young country which has not yet learnt to value intellectualism but Singapore gives lie to that as an excuse. Is it that strong egalitarianism inhibits expenditure on research which is envisaged as elitist? Is it that our current spending pattern was established in the post war period of protectionism and farming for Britain at a time when commodity was king and we built up an almost untouchable pattern of high social spending meaning that finding that extra 0.5% GDP for investment where the Crown should invest in R&D has not been achieved. Strategic investment is hard when electoral cycles are short. I sense we are starting to have that dialogue in a constructive way. It cannot afford to be partisan. Science operates on a much longer time base than electoral cycles.

The issues of why the private sector does not invest in research have been a particular focus of mine. I worry that the public sector investment is so low that the private sector does not see value in a parallel investment. Could it stem from the chronically low public sector investment dis-incentivising the private sector from seeing RS&T as exploitable because there has been insufficient ideas flow? I worry that the public sector investment has been too end-user focused and therefore displaced private sector investment. Indeed, several food companies have told me that has been the case. I worry that companies have also been seduced by our national myth of the number eight fencing wire. We need to eradicate that myth from our thinking.

If our real strength is in the export of ideas in the form of value-added and services, then our businesses need to work better with the public sector to form liaisons and international partnerships to take ideas to scale, to find capital. The food industry has only thrived because of science and technology making us so efficient. That is selling ideas. If we make widgets we do not often sell them well to the world. We are in the age of parallel discovery – just making the best does not sell – the market goes to those who can take it to scale and to big markets. That is why we need cleverer partnerships at the pre-commercial stage with those with money and market access.

Given the quality of science and engineering education in New Zealand, we clearly have a large unexploited potential for knowledge based industry growth but clearly there is an issue of the availability of investment capital and the commitment of the New Zealand shareholder to more speculative investments or those with a longer term return. Perhaps some of the impending changes in the tax system might assist the necessary shift in mindset.

I worry that we do not have enough scientists involved in the senior management of companies and particularly in board rooms, to encourage companies to see the value of research and I worry most of all that our companies focus on short-term returns - the next pay-out cycle - rather than recognising the importance of investing over a number of years.

Government can make so much change but the fundamental change is going to have to be in removing institutionalised, cultural attitudes within academia, crown research institutes and the private sector. We have institutionalised behaviours that limit our ability to move ahead. Institutional competition overweighs the national interest time and time again.

This government has made enormous strides in trying to change the positioning of science within New Zealand. The CRI Taskforce is an outstanding example. The government has created a situation where the CRIs can contribute so much better than they have in the past. But for this reform to be successful, the scientists and the CRIs, the managers, the Boards and the companies and academics that interact with, will have to develop very new behaviours.

New Zealand is a small country. Despite the national myth, we don't punch above our weight – indeed our productivity is lousy. Despite the national myth we are not as innovative as we pretend to be. But at the end of the day, prosperity depends on new knowledge, new knowledge which is used to advance our place in the world by adding value to those things we can produce, namely food and minerals. The real challenge is to use research and technology to make real increases in that value, not just potentially unstable market gains for the high paying consumer of advance western markets. But particularly for those aspects of food where a premium can be sustained predictably into the long-term.

Thank you very much.