Positioning New Zealand's Research and Education Resources

A university perspective on future food production

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The Netherlands is generally regarded as the agri-food innovation leader in the northern hemisphere, while, half a world away, I like to think that New Zealand leads in the south. It is great news that Wageningen University has chosen Massey University to collaborate with on a project centred on protein studies that will tackle global food supply problems – and I am pleased that work on the foundations of that project, which is named 'Proteos,' has begun at the Riddet Institute.

New Zealand has long been a land of milk and honey – even though we might well now phrase that as, mainly milk! Milk now earns >$10 billion annually – and is growing steadily; honey is still earning <$1 billion but is growing fast – watch this space! Seriously, our agricultural abundance has been our rock, the single most compelling comparative advantage we have, and still the brightest hope for our future growth.

Agriculture and food research were in their zenith when I was a young student at Massey studying agricultural science, and the country was congratulating itself on the prosperity generated from our primary produce. Then for decades agri-foods became unfashionable, and during initiatives such as the 'knowledge wave' new tech industries based on ICT, biotech and creative arts were to be our saviours. Had the focus been on using these as a means of adding value to our agri-food sector we may have had more success. However, the wheel has turned yet again and our pastoral and food sectors are once more seen as key drivers of economic growth. We are in the midst of a global biological revolution focusing on scientific excellence to produce high-value foods. Is New Zealand putting its resources into this so we can compete? Are we up with the play - or are we seriously wanting?

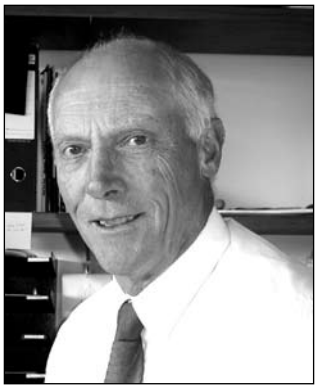
We don't appear to have made much progress in terms of our views on agri-foods. Based on our exports, we are still stuck in the mindset that commodities are enough to generate a good income. Other countries have moved on and, through considerable investments in science, have added **real** value to their food products. Money is being made with the help of the new sciences – genomics, proteomics, metabolomics, immunology, nanotechnology. We have to get on with it. We can't afford to be stuck in the mud.

You may ask what is the urgency. What has changed?

New Zealand feeds around 20 million of the world's population, or five times our own. However, because food is in abundance here, perhaps we have become insulated from what is happening globally. Are we really fully aware of how important food is going to be in the next 50 years and what pressures are on world food supplies?

Agri-food systems today face global environmental change, agricultural intensification, concentration of production, water shortages, value chain volatility, regulation and urbanisation. So many problems. We have growing consumer reaction against highly processed food produced with heavy agro-chemical inputs; and an unbalanced food distribution system. Some analysts have likened the whole food system to an hourglass – there are billions of consumers at the top, a small number of multi-national food companies in the middle, and farmers and food producers at the bottom, who absorb most of the risk for low rewards, and who are at the mercy of nature and trade policies.

What does it mean globally? Five and half billion of the world's 6.5 billion people live in developing countries and more than half of these people live rurally, producing food. Most of the world's trade barriers are for agri-products. One third of OECD agricultural production is protected. Government subsidies to



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farmers have driven down world prices for commodities such as sugar, milk, and beef and in doing so have undermined production and growth in developing countries.

Now, the world's population is set to rise to 10 billion in the next 50 years and experts agree there will be increased chronic hunger as nature and population squeeze the capacity to produce food.

In contrast, in the developed world, markets have become much more demanding in terms of food grades, standards and health effects. Thirty eight percent of people in the USA make food-buying decisions based on how responsibly they perceive that food is produced. Again, I note that in New Zealand many still believe we should focus on production and it is only a few groups and individuals who are beacons of change, calling for a push to produce smart foods that promote health, and value-added foods for those markets that can pay a premium. This is one avenue we must go down. While New Zealand still has the potential to further increase the volume of its food production – so playing a role in offsetting and alleviating world hunger, our own economic development will be more reliant on adding value to our food products.

There are other areas where our scientific expertise can contribute to a world facing a food crisis. The biggest issue facing the agri-food sector is long-term sustainability. The problems of hunger, a changing environment, limits to technology gain, land degradation, and food safety and nutrition become global problems for all of us. Food is rapidly becoming a political problem and we are all involved in these issues and in the need to find solutions.

In the past, science has concentrated on better production methods – fertilisation, mechanisation, plant breeding, molecular genetics, irrigation technologies and so on. However, there are now bigger issues at stake than straining to get marginal increases in production. Technology alone cannot solve the problems in the global food chain.

Some of the world's experts are calling for an interdisciplinary and integrated mode of enquiry where agri-science is not just 'a science of the parts' – long-term sustainability also involves ecological, economic, and social perspectives. When different people or different institutions look at a problem from their own angle and then merge their viewpoints, the potential is there for inspired solutions. We must all be better connected across disciplines and organisations for the best results.

Universities by their very nature are multi-disciplinary. They were founded as a united collection of disciplines not as a set of separate schools in different locations. A university is a superb model of integration with a big-picture focus. It is not rooted in the here and now and in the accepted way of doing things – its inhabitants are continually stepping back and looking for other ways to solve problems.

Science must also operate via collaboration, where the exchange of previously unrelated information can produce innovation. Universities are experts at this and in fact that's what makes them unique in the area of R&D. That broad sharing of information, that diversity, are what produces creativity.

Universities in the 21st century have changed considerably in terms of their involvement in policy and current affairs. Universities have now, I believe, accepted a third mission in life in addition to their traditional research and teaching roles – economic development. Knowledge-based innovation and the government drive to improve overall economic performance have meant universities have become key players in economic development – and they have willingly taken on this role.

I think that some universities have shied away from openly saying that they are engaged in economic development – for some, providing benefit to a few commercial entities is antithetical to social benefit. But universities such as Massey and Lincoln have accepted this role and in fact embraced it in the agri-foods sector. There cannot be a large gap between a knowledge-based society and a university with a large emphasis on science. Moreover, the content and format of our teaching and our research are continually realigning with policy directions.

So universities:

– not only have the long-term vision engendered by the research focus, where knowledge is continually being added to; and

– not only produce graduates versed in the skills of knowledge production;

– but also, as inventors, they can transfer knowledge to industry for immediate use via the products of their research and the production of skilled graduates.

It is the university's capacity for knowledge transfer that excites governments who want science-based economic development. They want the human capital and the innovation that can help new firms establish. However, universities are much more than this in terms of economic utility. It is the longer view, the capacity for multi-disciplinary engagement that will provide the real gems for the future.

What about our colleagues in other organisations? There are differences between scientists working in universities; in Crown research institutes, and in industry. The organisational structures, cultures and missions are different, as are the income streams, and the work is done from different perspectives. To fuel that innovation spark and to move forward together, we need ways to increase the interactions between industry and public science, and between the three kinds of science providers. Barriers must be broken down that block co-operation. I believe there is a role for new organisations where science and business are integrated. Public and private must interact much more if there is going to be a true push for innovation across the agri-food sector.

An impediment to this collaborative, integrated vision has been the competitive science system. I congratulate the authors of the recent report from the Crown Research Institute Taskforce, which recommended less emphasis on contestable processes. The report was heartening in its views on further collaboration, but now we need to see some action in reforming the science funding system and the cultures which have developed under the competitive system. In this regard the university research funding programme, the performance-based research fund (PBRF), with its focus on the individual and publications in highly rated research publications, is also an impediment to collaborative research – particularly that with industry scientists. To get the critical mass in New Zealand to undertake world-class new biological sciences we do need some significant changes.

We are seriously wanting when we line ourselves up against other countries. We need to be happy with the answers to questions such as:

- Are we developing the right expertise in our universities?
- Are we maximising our limited resources in agri-science?
- Should we roll up these resources together, like other countries like the Netherlands and Denmark have done – and they are larger than New Zealand?

We also have to ask ourselves as a country if we are striving for true excellence or are we content with second-best? We are here today at the invitation of the Riddet Institute, a Centre of Research Excellence (CoRE), the only one in food. Is a CoRE a good model and, if it is, do we need to expand them or create more of them? What about CoREs in plant breeding, animal biology, or stem cell research? The Riddet Institute is a world-class centre, but only one weapon in what should be a whole artillery at this very top level. These are questions we should be debating around a table and looking hard at because the time for complacency has long gone.

Apart from contributing to innovation through research, universities have an obligation to teach. In OECD countries the number of science and engineering graduates is falling, just when the demand for scientific innovation is increasing. The call for governments and industry to increase R&D spending will require new researchers. However, it is not enough to be able to pay for them. We have to have the people who want to take up these roles.

We have to examine the causes of why science, and in particular why agri-science, is unattractive to school leavers:

- Is it the curricula in schools and universities?
- Is it a lack of talented teachers?
- Does our society accord suitable status to scientists and engineers or are they the poor cousins of the other professions?
- Do science and progress frighten people?

A university is particularly well placed to discover the reasons for poor uptake of science careers and even better placed to offer inspiration. **We** have to generate some of the excitement about the sector in the hearts and minds of more of our young people.

This challenge is an example of how a university can draw on its diverse disciplines to solve such issues. There is a role for sociologists perhaps to look at what makes healthy rural communities and positive perceptions of agriculture, particularly among city dwellers. Perhaps it is their task to design initiatives to help attract and retain students in the agri-food area.

As outlined in our recently published Agri-Food Prospectus, Massey's intentions are to investigate the significance of the agri-food industry in New Zealand school curricula; provide quality distance education for those in rural communities; find out why high-school students are drawn to a career, or not, in agri-food science, and design initiatives to excite the next generation. Industry has a role to play here also. We have not seen a high level of pro-activity to draw young people towards technology careers in their industries.

So where do we go from here? As I have said, universities have a leadership role in 'yet to be applied' research, a role in providing policy makers with information about sustainability, a role in transfer of knowledge to industry and in educating the next generation.

University researchers are globally connected, up with the latest research, and connected to each other. However, to maximise our contribution to economic development we must increase our connectivity with other research providers and industry – and turn this connectivity into integrated action around key focus areas driven by a clear agri-food sector strategy.

It is imperative that we foster innovation in our most important sector, or New Zealand will not get the economic gains that we are all seeking. A lot of new thinking is going on in our CRIs and universities and industry. The question for us today is how can we harness it effectively to bring about change? How can we add value without being impeded by the lack of a single vision and unnecessary competition, duplication, and fragmentation?

I believe we need to have our producers, processors, marketers, researchers and Government agree upon a clear and forward-looking strategy for the agri-food sector. Then, in support of this, bring together, in a formal way, the best minds and the best facilities in the country to deliver a coherent, consistent and integrated agri-food research and development effort. We may need to look no further than the Wageningen model – with some adaptations to fit New Zealand – for a means of achieving this.

It is very apparent to me that in terms of a theoretically desirable positioning of New Zealand's research and educational resources to optimise our long-term returns from the agri-food sector, our current situation has suboptimal institutional, governance, cultural and funding arrangements.

We need to get off the sheep's back or the butter and milk powder gravy train and discover where the real opportunities lie. Only then will we re-enter another golden age of prosperity based on our natural advantages – temperate climate, good soil, and very adaptable people. To make this happen we must all ensure that this Agri-Food Summit is not just seen as another 'talkfest'.