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Agricultural science, Government policy and the farmer

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It is a privilege for a humble farmer like me to have the opportunity to address you today.

In this address I quote heavily from distinguished academics, researchers and communicators who have tried to address the many issues currently affecting farming in an uncertain world; more often than not their words are used with appropriate references.

Agricultural research in New Zealand

"Research improving" was how Minister Steven Joyce described the performance of Crown Research Institutes (CRI's) in technology transfer in 2013, and he went on to say "*CRI's should be as close as possible to the sector they service".*

Often CRI's are seen not to be close to farming because of the infrastructure they operate in, when in fact our science community is very accessible. One New Zealand Grassland Association conference is proof of that, and the productivity gains that have occurred over the last 100 years are testament to this fact. Sure, there has been a level of disconnect at times but farmers get it back on track ourselves more often than not. To give but one example; the efforts of Professor Paul Kenyon (Massey University) to get farmers and researchers working closely together, he is using Riverside farm (near Masterton) to re-connect farmers and scientists by involving farmers in the research and using enhanced knowledge transfer systems (Kenyon 2013).

Recently, Professor Jacqueline Rowarth (Rowarth 2015a) quoted from an address made by Sir Peter Gluckman to the Institute for Governance and Policy Studies symposium in July 2015: *"In a democracy, policy formation and political decision-making are and should be based on more than scientific advice alone. Science alone cannot decide whether or not a society should accept a particular trade-off between economic growth and environmental protection" (see http://www.pmcsa.org.nz/ for a series of papers by Sir Peter Gluckman).*

Sir Peter suggested that the solution is to find a common understanding of evidence and how it should be assessed. He also pointed out that different stakeholders have different views on what constitutes evidence, how it is sourced, and whether it is sufficient to support one course of action over any other.

"To do just that we need to demonstrate that a strong economy is good for the environment" says William Rolleston (2015a). He continued *"If agriculture is to keep contributing to New Zealand's economy we must address the issues of productivity and environmental impact. We must continue to enhance our economic benefit by increasing productivity, adding value to current products and developing new high-value products. We must address the risks which exist in the market, in our social licence to operate, in biosecurity (including pests) and in our climate. New Zealand cannot feed the world, but we must play our part. It would be irresponsible of us to squander or under-utilise our resources. Three potential answers lie in resource expansion, science to increase efficient use, and collaboration. If we are to truly make economic gain while supporting a healthy environment, decision makers need to ensure they get the science right. So our challenge is to ensure regulators, politicians and the judiciary make decisions in line with the science, and reflect the uncertainty of the time but are not paralysed by it. The use of caution in the decision making process is essential, but the standpoint taken by activists, i.e. the 'Precautionary Principle' which in essence says 'do nothing until all risk is eliminated', is an example of the paralysis which we should avoid. Decision makers need to distinguish between disagreement between parties and scientific uncertainty. They need to understand what drives the certainty of any one party and put the uncertainty of experts in context. A growing economy can support a healthy environment but a shrinking one does not stand much chance. The best way to achieve a growing economy while supporting a healthy environment requires sound judgements by councils, with the appropriate use of science, engaging not enraging farmers, providing them with the tools of modern technology and seeking solutions which align economic and environmental outcomes. These are all requirements to grow sustainably."*

Farmers have enough uncertainty, but a government enabling research for the future through adequate investment in science at all levels ensures that we will win when trade is good and will continue to advance even in times of adversity. Uncertainty comes in many forms for farmers, climate, economic and market, for example.

Professor David Hughes writes (Hughes 2015) *"Red meat producers and processors need to buckle in and*

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prepare for volatility in the years ahead. Put your seatbelts on and crash hats too because the long-term outlook for meat looks really rosy - but it's not just a straight line. It will be all over the place and that makes business planning really difficult. There will be increasing volatility in global food and feed markets, influenced by climate and weather events, food safety 'disasters', livestock disease events, economic downturn in key markets and political incidents that were hard to forecast, although New Zealand is still blessed with a golden, pure image, a powerful national label that is worth a lot of money."

There was less excitement about Chinese markets than there had been at previous Institute conferences, reflecting that country's slowing growth. Arron Hoyle, a former senior supply director for McDonald's China says *"It now takes 90 days (for China) to add the equivalent of the New Zealand economy (to its own). It used to take 60 days."*

Investment in agricultural research

The primary sector has been chided by the Prime Minister's chief science advisor for its failure to invest in Research and Development (R&D) *(*Gluckman 2015b*)*. Sir Peter Gluckman told the Agricultural Chemical and Animal Remedy Manufacturers Association (AGCARM) there are huge up-sides for the primary sector investing in R&D. He noted the sector was still living off some science done at Ruakura Agricultural Research Station 30 years ago. Gluckman claims the primary sector has become wedded to the idea that research is the Government's responsibility. He says pastoral agriculture has been built on decades of R&D, disproportionately funded from the public purse; it is disappointing to see how little the private sector has helped co-fund the proposed Food Safety Research Centre, for example. Gluckman says the primary sector appears to find it difficult to think more than a few years ahead.*"It needs to think long-term. Quite clearly the agricultural systems of the world are changing and we have climate change and changing consumer preferences; so we have to move up the value chain. All that has to be based on science and that science has a long life cycle – 7 to 10 years, at least, for much of this stuff. We must get beyond commodities and think strategically about what we could do to lift the sector."*

Gluckman says while the primary sector appears to have some difficult years ahead, he believes this is not the time to hunker down, but rather to invest strategically in research and innovation and look out up to 2 decades ahead. He says the thinking in R&D has to be beyond the consumer. Consumers have different fashions and that's part of it. But beyond commodities you have consumer driven demand for high quality cuts of meat, for better cheeses, wine and kiwifruit, he explained. But there is one more layer of value beyond that - health. Especially in Asia there is growing understanding that nutrition, health and food are all linked. We need to do the science that better links those things and get the evidence base.

Gluckman says the New Zealand private sector's investment in the primary sector is so small that you would need "a very big microscope" to see it. *"We have one of the lowest private sector investments in R&D. It's understandable at one level – the company structure is different. In most countries the private sector spend comes from large companies – in fact 75% comes from companies employing over 250 people and they are the multinationals."* But while Gluckman concedes it is hard for companies to engage in R&D, it must be done. He says R&D is not cutting meat differently or necessarily developing new fruit and vegetables - it is about getting serious added value. This is a major hurdle for the agricultural sector and the science community to overcome. How do we determine where the emphasis should be? It comes from Government policy and in the case of science, from decision makers looking at trends and investing in research. On that basis we rightly can develop the case to argue for continued public sector science resourcing. Gluckman went on to push for clusters of investment and activity to emerge especially a drive into precision agriculture, New Zealand is competing in the biological sector with one hand tied behind our back, where the world is moving with new technologies that may or may not be acceptable to society.

The state of agricultural research in New Zealand

Recently, AgResearch has announced decisions to reduce science roles in areas where sector need, and therefore revenue, is reducing. It appears that science staff are expected to generate more revenue from contracted work, staff numbers need to either match customer demand or be aligned with its science road map. Areas of research promise AgResearch are pursuing includes food safety, security and innovative high-value products, Māori agribusiness, and farm systems. There are some serious gaps in this list from what farmers have known coming from AgResearch (Anon 2015).

Why is this the issue?

"Science gap to hamper farming. A lack of public sector science investment was leading to a rising tide of scientific and economic literacy holding back farming" says Professor Bill Malcolm (University of Melbourne). "*Its the issues we face that are in strife, that strife is agriculture. In the future, having less good science and economic knowledge available to help develop and apply new technologies that increased productivity, essential for farmers to continue to achieve their goals,*

*was of huge concern. There was justifiable, serious and growing doubt about the capacity of agricultural research, development and economic systems of New Zealand and Australia to deliver the suite of new technologies that farmers urgently required to remain profitable in the face of rising costs at a time when competitors were rapidly catching up. The capacity of people in the farm services sector, (research scientists, technical input suppliers, farm financiers, technically-based advisors, extension and education services may already or in future is likely to be found wanting. This is the result of inadequate investment in agricultural research, development and economics and science training coupled with deficiencies in the analyses conducted and service provided, because of a lack of understanding of farm economics" (*Malcolm 2015*).*

"Nothing more vital than producing food" to quote Professor Rowarth (Rowarth 2015), *"Few things are more important to New Zealand's future than primary production and everything it entails"*. She goes on to reinforce the importance of basic understanding of what underpins New Zealand Inc., a lack of primary sector status through our schools and society in general means that many able students leave school without realising the employment advantages in knowing something about New Zealand's export economy, and who have failed to take the subjects that will provide them with the foundation to make a difference – and reap the rewards. *"Every subject at school should be taught through the lens of food. The point is, by integrating food through the curriculum, understanding becomes part of life"* (Cribb 2014).

And credit where credit is due, the Government has announced a new participatory science programme a pilot programme in schools in Dunedin, Auckland and Taranaki. Sir Peter Gluckman says (Gluckman 2015a) "*Any assessment of New Zealand suggested that science had played an important role in the country's social development and its environmental and economic progress. Let's not forget our biological economy has for at least 100 years been based on a very solid background of research and technological development that has allowed a very small country distant from its markets to survive and thrive as a first world economy that has been dominated by agriculture*.

Professor Rowarth is not alone when she poses the question: "*Is science policy enabling what is needed for the future?"(http://pundit.co.nz/content/science-is-golden-but-wheres-the-gold*).

The Brookings report on the Hidden STEM (Science, Technology, Engineering and Mathematics) economy, published in June 2013, makes the point clear: 20% of all jobs require a high level of knowledge in any one STEM field. Overall, workers in STEM fields play a direct role in driving economic growth, and are rewarded for their knowledge by above average pay - at least in America. In New Zealand the Ministry of Business, Innovation and Employment Occupation Outlook suggests that job prospects are good, but fees are high and income only average - despite the evident need, signals that science is not important are still sent. In contrast, Occupation Outlook suggests that job prospects for Policy Analysts are moderate, fees are moderate but income is high. Although a degree of almost any sort can result in a career in policy, school students tend to aim for the shortest route to career, and link the job with the degree. Science does not appear to be the right route. In other words, those who pursue an animal science degree can find employment in teaching, research, livestock, and government agencies. While these are extremely important fields, one cannot expect to be making very much money and should plan to live a low budget lifestyle.

Scientists have been trying to provide the information that decision-makers need, while working in an increasingly challenging research environment which is a function of policy. Improvements will be achieved only through a change in the policies around funding, project selection and also around education. The Deputy Prime Minister, The Prime Minister's Chief Science Advisor and the Parliamentary Commissioner for the Environment have made the importance of good scientific research very clear. The sustainability of the economy and the environment depend upon it and upon all parties having sufficient understanding to engage in productive and progressive discussion. Without a change in the policies around science funding management and science education, there will be no transformation on the land – and New Zealand as a whole will suffer (Rowarth 2015b)

These are educated commentators fuelled by science and tempered by experience, who research the facts before they speak; why are we as a nation not listening to them. Sadly, it is a case of, as Dr Doug Edmeades (http://dougedmeades.com/) has said "*Science is one voice among many*", too often the informed are not given the status they should have.

"New Zealand and Australia both face a cost-save squeeze and consequently competition challenges were increasing as emerging economies catch up; these emerging countries are pouring huge investment into research and development. The trends are going the wrong way in the developed countries, in the emerging countries it's developing" (Malcolm 2015). Malcolm also offered a warning: *"Value-add, is it cost adding or profitable value adding? There is a need for farmers and scientists to identify the research that will give the best cost ratio for the investment; rates of agricultural productivity increases are declining and we as farmers cannot let the so-called experts get away with anything"*.

White *et al*. (2013) concluded: *"Nevertheless in all countries, the irregular reporting of technology adoption and incomplete analysis of associated impacts distort the accuracy of adoption and impact estimates. Within the sample, over 200 different types of effects were reported and approximately two-thirds of the effects were intermediate, not longer-term, larger-scale impacts. Although economic effects were most frequently reported, less than 20% of all reported effects were quantified economic impacts. Analyses of economic impacts employed inconsistent estimation methods and assumptions, thereby preventing a valid summation of total economic benefit of the studies. Review of economic impacts reported within the sample revealed nine critical methodological shortcomings, many of which have been highlighted in other meta-analyses of economic benefits.*

Improved grass and legume forages have generated substantial impacts across uncountable social, economic and environmental landscapes. Nevertheless, the sample was likely biased with a tendency to report only larger, relatively homogenous impacts that are easier to measure. Consequently, impacts are conservative and represent a fraction of the total.

Furthermore, enhanced inquiry into informational demands and associated targeting of communications regarding the benefits of improved forages RDTE (Research, Development, Training and Extension) *can help meet the specific priorities and needs of diverse potential investors, ranging from farmers to international organisations. With the substantiation of multiple benefits of improved forages, greater levels of investment can be motivated not only from traditional public sector agencies and philanthropic foundations, but also the private sector and non-government organisations."*

So when Dr Richardson explains AgResearch's proposed restructuring and staff redundancies is down to reduced funding and animals and forages do not appear on the of interest list, given the assumptions required and the bias attributed, I can understand why there is consternation across the agricultural sector. How on earth can a cost benefit comparison economic analysis be believed? The CRI's have a research value to New Zealand so much more encompassing than any cost benefit or Net Present Value analysis is ever going to show (Richardson 2015 a,b; Robinson 2015 a,b).

Minister Joyce has defended the CRI funding model saying "*The CRI's can produce excellent science of benefit to New Zealand, and the industry-related CRI's also produce science that will be of commercial use to their industries"*. Dr Nicola Gaston stated that "*Inflation had eroded AgResearch's core funding which had exposed its science capability to short term priorities"*. Minister Joyce replied (Joyce 2015) that "*The governments annual investment in science had increased 70% in the last 7 years from 850 million to 1.5 billion dollars*" which on the face of it sounds large. But (as I have learned in my time in New Zealand Grassland Association), it depends. Looking closer at these figures, has Government actually increased funding of AgResearch? Citing the Primary Growth Partnership (PGP) programme as one source of such "increased" funding and the National Science Challenges (NSC) as another (the NSC is, in fact, largely funded by taking core funding off the CRIs and moving it into the NSC pot). So, smoke and mirrors again.

On PGP's: Minister Joyce and others may cite the Dairy Value Chain PGP as a prime example of Government research funding (it is big, ~ $170 million in total over 6 years, counting industry investment), but for the on-farm component of that programme, there is "peanuts" going into what would be called research projects. A handful of research sub-projects like the one on pasture persistence, sit in that programme, but the vast majority of the funding goes into capability and upskilling programmes for dairy farmers and rural professionals in animal welfare, effluent management, nutrient management and so on – all important, but not research.

More-recently the criteria for PGP have moved heavily to supporting proposals that demonstrate a clear business outcome – sadly, on the face of it, the Dairy PGP bid would not succeed under the current rules (training/up-skilling does not equate to business growth).

A couple of years ago, DairyNZ and Beef + Lamb New Zealand applied for PGP funding for the development of the Forage Value Index across sectors, but this did not have a strong enough business growth case for them. Why? Too much R&D. It appears to me that the building up of science and research with capability and up-skilling will lead only to one outcome and that is the latter, as the very people putting the projects together and managing the projects are the management component. The playing field lacks a consistency that is clearly needed. Why? Because the national debate that I referred to in my 2014 presidential address, and what commentators are calling for, is yet to happen.

Local columnist Alan Emerson (Emerson 2015), described the scenario graphically *"Painting over the cracks never works well, eventually they become chasms and cost not only the primary sector but also the whole economy, sadly, our system is so broken it needs strong political will and leadership to get it back on track."* This is strong and emotive language; politicians living for 3 year terms in government are not the leaders we need. Research on-farm costs more than developing computer modelling in an office; but which gets the farmer and the researcher closer connected?

Cutting Green House Gas research, forage and animal science in our climate is not long-term thinking, and at odds with Nathan Guy's comments (Guy 2015). There is insufficient overall R&D investment to support the current level of scientific and technical capability at AgResearch hence the staffing cuts, but are we not serious as a nation about these very areas of research? So we need to lobby for increases in real terms. Emerson concludes: *"We need reform of the science funding model, bits of cash in lots of buckets with no guarantee of continuance is no way to run a science system. The New Zealand Institute of Economic Research estimates every dollar spent in research today will generate $32 in 2025*"; I agree with Mr Emerson "*it is a no-brainer"*.

And we now have the Regional Research Initiatives (RRI) proposals (New Zealand Farmers' Weekly, May 25th 2015).Will they be a star or another bucket with cash requiring top-ups from existing buckets?

Tomorrow I am back on the farm, immediate concerns (Spring 2015) focus heavily on the dry, windy spring conditions, but I am buoyed by what I see and read. Forage systems as have been demonstrated during the conference field days and printed material such as *"New pastures huge potential"* (Kerr 2015) describe what is possible; the alternative is a lack of profitable land use, a lack of hope and pastures chocked full of Chilean needle grass or some other pest plant of national importance destroying livestock farming in New Zealand; the latter is not an option for New Zealand no matter how one looks at it.

Farmers have to, firstly, focus on what makes a difference to 'our' businesses, and then be part of a team who delivers a message. We need research capability and capacity in our agricultural science community; to that end, we need the message to be well researched, well written and well delivered; whoever puts it together needs every one of us alongside.

To conclude, I quote, Dr Rolleston of Federated Farmers (Rolleston 2015b) "*Agricultural science is a long term investment which is difficult for governments on a short term 3 year election cycle. We would like to see a growing agricultural science sector which is moving forward with confidence. We all hope the National Science review which is due out shortly will reflect the importance of science in agriculture, more attention to basic research capacity. Greater stability and certainty*."

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