

## **WHERE WILL AGRICULTURAL SCIENCE BE IN 20 YEARS?**

Dr D C Edmeades, agKnowledge Ltd, PO Box 9147, Hamilton  
[doug.edmeades@agknowledge.co.nz](mailto:doug.edmeades@agknowledge.co.nz)

"To kill an error is as good a service as, and sometimes better than, the establishing of a new truth or fact" Charles Darwin.

[The comments and opinions expressed in this paper are not intended and should not be taken as a criticism of any individual or group of individuals. The examples used in this paper are symptoms of the system into which science and scientists have been placed. The devil lies not in the people but in the system].

### **INTRODUCTION**

The theme of this conference urges that we project forward and ask what will New Zealand's dairying industry look like in 20 years time? And the only reference points we have to help us in this exercise are history, the situation today, and what we would want for the future.

The past tells us that the dairy industry has made huge progress, especially over the last 50-60 years (Holmes 2007) and it is reasonable to suggest that this progress is built on sound science from many disciplines: animal and plant genetics, pasture and soil management and the control of pests and diseases. From this it can be inferred that the goal of an economically sound and environmentally sustainable dairy industry in 20 years time can only be built on the shoulders of sound, robust science. But this is not all, because the other lesson from our recent history is echoed in McMeekan's famous dictum: science is of no use unless it is applied on the farm. To achieve this requires what is now called technology transfer.

It is this junction between science and the farmer that I wish to focus on in this paper. Are we headed in the right direction in terms of the institutional values and ethics required to undertake the necessary research and then integrity translate that science into information that farmers can understand and trust?

### **SOME REFLECTIONS FROM HISTORY**

#### Science -People

The first point that must be dealt with is McMeekan's dictum. It should not be taken to mean that all agricultural scientists must work at the applied end of the spectrum. That I am sure is not what he meant. All types of science, from pure to strategic to applied, are required to solve the problems ahead, which renders this type of argument redundant. What I take from McMeekan's imperative is that we must have scientists capable of synthesizing across these artificial boundaries to faithfully bring to the farmer the collective meaning of the science in an understandable manner.

I fear that this type of scientist is becoming a rare breed in agriculture for the simple reason that, apart from DairyNZ, through their Consulting Officer Service, and Meat and Wool, via their Monitor Farm Program, technology transfer is now no one's responsibility. Even worse, what is now called technology transfer in this age of

‘commercialization’, is little more than institutional propaganda designed for marketing reasons. The crunchy useful ‘take-home’ message has evaporated in the heat of cash-flow. The current joint DairyNZ/AgResearch/Maf road-show on climate change is an example.

#### Science – Purpose

Prior to the CRI reforms the purpose of publicly funded agricultural research was brutally clear – it was for the public good. No accountants or MBA’s need apply! Under the CRI Act the purpose of the CRIs is two-fold; to undertake research for the public good **and** make a financial return to the shareholder which is expressed either as a return on assets, a dividend, or via tax. I have written elsewhere of the dangers of commercializing and politicizing science (Edmeades 2004) and the only point I need to reinforce here is that to do so undermines the integrity of science by bringing to it motives that contradict the purpose of science.

The recent CRI Review wrestled with this. Their report tells that they did consider the idea of making the CRIs “Not for Profit” organizations. They rejected this arguing that a change would be disruptive given that so much time and effort had been invested in the current model. This is equivalent to not releasing an innocent prisoner on the grounds that freedom would not be good for him! Their solution was instead to better define the purpose of the CRI’s. Frankly if we do not know that now after 20 years of effort we will never know! It is my view that while the Act remains the CRI will continue to be two-headed monsters not confident to look in any direction.

#### Technology Transfer

There was a time when New Zealand had one of the best agricultural technology systems in the world. It was much admired by overseas visitors. It began with Farm Improvement Clubs and developed into the Department of Agriculture Extension Services and then ultimately to the Ministry of Agriculture Advisory Services. Such was its ‘mana’ at its peak that it was relied upon by farmers as the arbiter of good and bad science and information. Stupidly in the interests of improving the economic efficiency of the nation this system was dismantled to the cry of user-pays.

What has emerged from the ashes of this former Phoenix is a disparate group of aging Consultant, whose focus, it appears to me, is more on the management of farmers resources rather than transferring emerging science and technology onto the farm. For example, it is becoming obligatory for dairy farmers to have Nutrient Management Plans but the technical skills to roll this out across the nation are meager.

#### Fourth Estate

Having a science-literate agricultural press, free from commercial constraints, to convey the necessary science to the farmer is also vital. Once again our own history suggests how this should be done. The Department of Agriculture’s “Journal of Agriculture” was widely read and treasured by farmers for many decades as a source of hard data and commentary from science. So too was the Dairy Exporter. What they published could be trusted and relied upon. Today the agricultural press relies largely on advertising revenue and consequently the stories they carry are often a reflection of the advertisers than of science.

## **SOME SYMPTOMS**

With that brief summary of our history I now wish to look at where we are today: what are the consequences of commercializing and politicizing agricultural science and how does this impact on the integrity of the science message delivered to farmers? Repeating my earlier caution; Irrespective of how the how these examples are expressed they could be seen by some as offensive, but I go with Walter Lippman on this: “He has honor if he holds himself to an ideal of conduct, though it is inconvenient, unprofitable and dangerous to do.”

### Example 1. The Press

A recent Dairy Exporter (Dairy Exporter July 2010) told its readers that there is a new fertiliser product on the market that enhances soil quality through electromagnetism and, in the same issue, there was a story celebrating homeopathy. Scientific evidence refutes both. How can this be at a time when the national catch cry is “science is the driver of the economy”?

I have written elsewhere on some of the possible reasons why the respect for science is slowly being eroded (Edmeades 2009). In brief, from the age of enlightenment we have emerged into the philosophy of post-modernism which sets aside evidence as the authority and asserts that the ‘truth’ is what you believe – if you believe it, then it is your ‘truth’. Importantly all opinions are to be given equal authority irrespective of the where the evidence may lie. These ideas have progressed to what is now called ‘Post Normal Science’. This holds that science is subservient to the story that must be told. The role of science is no longer about discovering new ‘truth’ but supporting the ‘story’ which is perceived to be the truth. This gives rise to the notion of “noble-cause science”, which allows scientists to ignore contrary evidence, or worse, manipulate the evidence, if the cause is noble. We have seen evidence of this in the climate change debate.

Mix together an agricultural press dependant on advertising revenue, with this ‘anything is true’ post-modernistic nonsense and you have a recipe for a technology transfer disaster. But the ‘Market-Model’ theorists will argue that this philosophical environment should motivate farmers to become savvier, - better educated - so they can winnow the wheat from the chaff. But will this be sufficient? What happens when the scientist becomes the salesman?

### Example 2: The CRI’s

A predictable consequence of the CRI Act is that scientists have become salesmen. Last year the then CEO of AgResearch fronted a high profile television advertisement promoting AR37 ryegrass for which AgResearch derives royalties. At the same time DairyNZ had data which did not exactly support some of the claims being made for AR 37. This highlights the clash between the public good (in this context the farmer) and the private good (the dollars). But this particular issue goes deeper. Because of the CRI Act AgResearch generates royalties from many pasture cultivars and the companies use AgResearch’s scientists to market them. How ever well educated, the

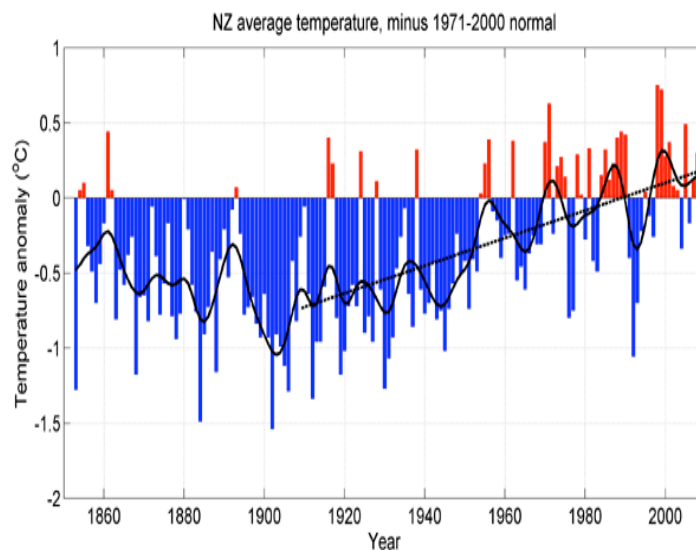
farmer's confusion is palpable: Is the scientist acting as a scientist (public good) or as a salesman (private good).

A further justification for the CRI reforms was, we were told, to get politics out of science. Sadly the effect has been the opposite. Most of the funding decisions are now made in Wellington and I would suggest it would be most unlikely to get significant funding for a project that did not fit the political agenda. Indeed one of the skills in preparing a Forst bid is to double guess the political agenda. Consider for example; how many projects are currently being funded to investigate the possible mechanisms that govern global temperatures, other than GHGs, such as the sun-spot cycle or the Southern Oscillation?

This politicization of science also has the potential to compromise the purpose and integrity of science, as the next example highlights. 'Climate Change' is undoubtedly one of the most important issues confronting society and in particular agriculture. We now know that the government policy (the ETS) to mitigate increasing greenhouse gas emissions is going to cost agriculture millions of dollars. I am sure no-one would object to this if it was being done for sound, objective reasons. But that is the question; how sound is the science?

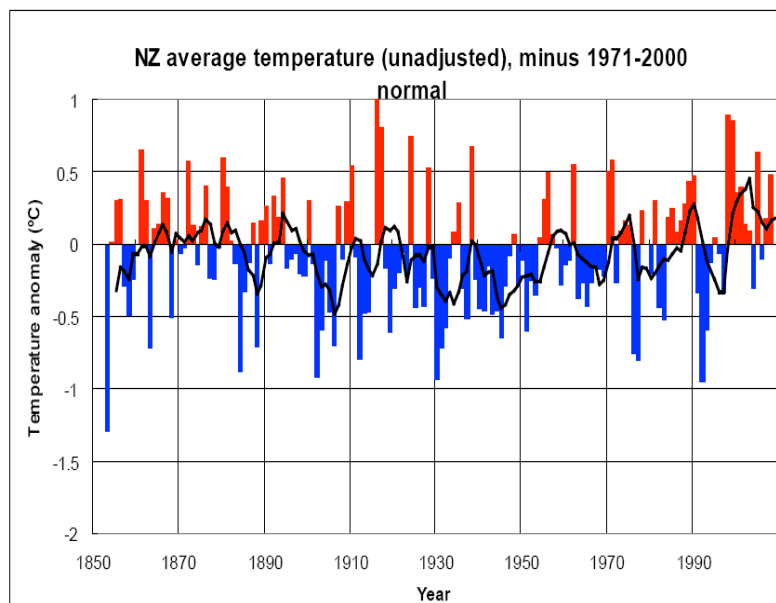
The official NIWA website records the average New Zealand temperature as follows (Figure 2). It shows that the average New Zealand temperature has increased since about 1900.

Figure 2. Adjusted average NZ temperatures from 1860 to 2000 as reported by NIWA. (<http://www.niwa.co.nz/our-science/climate/news/all/nz-temp-record>)



The New Zealand Climate Science Coalition has quite legitimately obtained the raw data (Figure 3). It shows no warming.

Figure 3. Actual average NZ temperatures from 1860 to 2000 from NIWA data (<http://www.climateconversation.wordshine.co.nz/docs/awfw/are-we-feeling-warmer-yet.htm>).



These data are derived from 7 long-term climate stations and there are legitimate reasons for making adjustments to the record to accommodate changes around, or shifts in, their location. However, after exhaustive enquiries through layers of political obfuscation from the Government and NIWA, Brill (2010a), has found that the evidential basis for these changes does not exist. In response to this challenge and to support the earlier Seven Station Series, NIWA published a further graph this time based on an Eleven Station Series. Brill (2010b) has exposed this also as a contrivance, achieved the selection of particular weather records.

Importantly, the issue here is not climate change. It is about the conduct of science. The checks and balances which are essential for the science process to operate, require that science, and in particular publicly funded science, must be open to scrutiny.

We now have a Government reliant on data to support its ETS policy, which in the scientific sense cannot be validated. This is not just a problem in New Zealand (D'Aleo and Watts 2010). Is this a local example of sloppy science or is it what was alluded to earlier – Post Normal Science - science in the service of a good story?

### Example 3: Universities

The universities, once regarded as the bastions of independent free thought and debate in society, have also been engulfed by the clouds of commercialization and politicization. I could choose many examples but one will suffice.

Ravensdown Fertiliser Cooperative Ltd is marketing a product called EcoN. It was 'developed' at Lincoln University's, Centre for Soil and Environmental Research with funding from the fertiliser company. The patent is in the name of both parties who receive, one assumes, royalties from this arrangement. The product is an aqueous solution of a common chemical (DCD) first discovered in the 1950's. DCD slows the conversion of ammonium to nitrate in the soil and much research has been completed in the intervening years and particularly in the Northern Hemisphere, to investigate its potential to reduce nitrate leaching and emissions a nitrogen gases for fertiliser and soils. These issues are of course relevant to New Zealand.

Based on the Lincoln research it is claimed that EcoN can increase pasture production by up to 20% and decrease nitrate leaching by 64% (Cameron et. al. 2009). Recent reviews of DCD generally (Edmeades 2004) and EcoN specifically (Edmeades 2008) do not support these conclusions. For example it was concluded (Edmeades 2008), based on all the available field trial research in New Zealand (n = 28) that the average pasture response was 2% +/- 1%, exactly as predicted based on its N content (DCD is an N compound).

The reason for the discrepancy is plain. All the research conducted at Lincoln University measured the effects of EcoN in the presence of large N inputs (200 kg urea N/ha and 1000 kg urine N/ha). As the researches themselves say they have been investigating the 'worst case scenario'. The point is that the results of these experiments, while perfectly valid, cannot and should not be extrapolated to the normal field situation. This point has been made abundantly clear in both reviews cited above.

If the commercialization of science is here to stay what should be done in such cases to protect the public interest? I think the only solution is that scientists, when writing and commenting about products and services, are made to declare all their private interests so that the public can make its own assessment as to what weight, if any, should be placed in any opinion and conclusions which are offered.

#### Example 4: Conferences

Conferences are an important component of the technology transfer system. It is now standard practice for the costs of these conferences to be met by attracting commercial sponsors. In itself that is of no great concern. However problems arise when sponsors are given speaking rights at the conference they have sponsored, or worse, they use their financial leverage to dictate how the conference is managed. Two examples;

One of the sponsors of the NZ Soil Science Conference in Rotorua (200X) was a company that sells ground basalt rock to farmers, passing it off as a fertilizer. The owner of the company had speaking rights which he exercised by telling the conference of his achievements selling a useless product. At the beginning of question time the Chairman reminded us that science must be tolerant of other views, thus closing down any sensible questioning.

The South Island Dairy Event (SIDE) is a popular annual conference for dairy farmers. I coauthored a workshop at the 2006 conference on the topic; Fact or Fallacies: Who is Telling the Truth and how to tell the Difference? The sad consequence was that I received a letter from the organizers banning me *for life* from

future SIDE events for daring to criticize one of the sponsor's products! The question arises: what is the purpose of these conferences – to inform farmers or to protect the interests of the sponsors?

## **CONCLUSIONS AND SUGGESTIONS**

We all want a sustainable New Zealand dairy industry. This can only be achieved by sound, public good science uncompromised by other motives, and a system to translate that science into farming practice, free from commercial considerations. But the frequent comment I hear from farmers throughout New Zealand is that they are confused in respect to scientific and technical information. They do not know who to believe or trust! This is a measure of current state of technology transfer in New Zealand – it is broken. What to do?

In the first instance agricultural science must be returned to its normative<sup>1</sup> roots. The CRIs must be made NFP organizations, bulk funded and managed by those who are scientifically literate for the public good. This is the only way to maximize the time scientists spend doing science, minimize science transaction costs and maximize allocative efficiency. Science has always been a contest of ideas chasing research money and to overlay this with a further artificial layer of 'competition' and 'accountability' is demeaning and counter productive (Edmeades 2004, 2006, Rowarth and Goldson 2009). But most importantly the integrity and purpose of science would be restored. Whatever technology science produces can then, in the interest of the public good, be 'given' to the private sector to develop and deliver to the farmer, as only the private sector can. Finally, the need for technology transfer must be officially recognized and funded. To leave it to chance is not an option.

Finally I return to my theme best expressed by Samuel Johnson (1759): Integrity without knowledge is weak and useless and knowledge without integrity is dangerous and dreadful.

<sup>1</sup>[Normative = pertaining to a norm, establishing a standard]

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