Levy oration

Agricultural science and extension

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Since this oration is in the name of Sir Bruce Levy, I took the time to google his biography and found it in the Te Ara Encyclopedia of New Zealand. Many of us are aware of his role as the Father of New Zealand Grasslands with his message of fertiliser, improved pasture cultivars and the efficient cycling of nutrients through grazing. But what interested me was his extension technique with farmers. This was described as akin to a sergeant major (Sir Bruce) dressing down the latest group of raw recruits (the farmers). It was clearly suitable for those times. Interestingly, Sir Bruce Levy, in taking his research findings out directly to farmers, was emulated by other notable scientists such as McMeekan and Brougham.

The basis of this presentation is that science findings need to be robust but are of little value unless communicated to users in a manner that can be understood and put into practice. Some of the lessons learnt during my 31 year career as an agronomist/soil scientist and 9 years as a science extension specialist for Ballance Agri-Nutrients will be used to illustrate this. To provide some relevance, a personal view will be presented on how science and extension can help one of our most important pastoral sectors, sheep and beef.

In 1975 a young, keen and very raw Massey University Masterate Graduate started out on the West Coast as a Field Research Officer. I was one of about 20 scientists in the country whose main role was to carry out field trials on farm to solve local problems. In my favour, I had grown up on a dairy farm, had a very receptive farming community, was in a region where there were large areas of pakihi soils to be developed and had no need to bid for research funding.

What we lacked from school and university, however, was training in effective communication. Two of my earlier presentations to farmers were way over their heads. One was a theoretical talk on soil potassium to Kowhitirangi dairy farmers and the other, a simpler one on fertiliser and pasture development to Haast runholders. The problem was that most of the the Haast farmers had never used fertiliser.

Lesson number one – make sure what you are communicating is relevant and can be understood by the audience.

Further time in my 12 years on the West Coast showed the value of carrying out research in the local area and taking farmers along to the trial sites to see the results. Farmer uptake was very high. It also illustrated that farmers, also technical sales representatives and probably most people are

visual or kinisthetic learners, they need to see things for themselves to understand and believe them.

After a very educational stint on the West Coast, Rogernomics necessitated a shift to the MAFTech Research Centre at Lincoln. Here I fell on my feet. Canterbury dairy farmers had realised the market access risk from soil DDT residues getting into milk and funded us to come up with mitigation strategies to minimise this. After we had carried out on-farm trials and monitoring, appropriate strategies were developed and communicated to farmers. In addition the Dairy Company imposed financial penalties for those farmers who did not sufficiently reduce their milk residue levels but also paid for consultancy services to help them. Milk DDT residues dropped significantly. This experience, also learnt on the West Coast, showed the benefit of scientists and farmers working together to come up with solutions to an issue. And if it is a serious enough issue, farmers will take action. Another interesting observation came from the farmer on whose property we carried out the research. He told me that he only believed the trial results fully when he saw them "work" on a whole-farm scale rather than the paddock scale that we used.

After five years in Canterbury, it was time to move to AgResearch Invermay to manage the Soils Group. Contestable research funding from the Foundation for Research, Science and Technology was now the norm. As happens to all groups over time, people age and slow down, impetus is lost and there is a need for rejuvenation. This rejuvenation was achieved by bringing in some young scientists and once they were in place more young scientists wanted to come and work with them. Hence we soon had a dynamic science group, which is still in existence today. As always, it was people and people wanting to work with good people that made the difference. Certainly facilities are important but people are more important.

At Invermay, the realisation finally struck that though while it was nice to be surrounded by colleagues, what was missing was the regular contact with farmers. Sure you could go and talk about your science at field days all over the country and while you generally got a good hearing, you also knew that it was unlikely that the farmers would go home and put what they had heard into practice. Even if the research was locally based, they did not know you and therefore did not completely trust what you were saying. Therefore they were unlikely to change.

In 2005, after 12 years at Invermay, frustrated with applying for funding and not seeing a great future for applied science within AgResearch, I joined the commercial world as a Science Extension Officer for Ballance Agri-Nutrients covering the South Island. Here my main role was to provide technical support to fertiliser sales representatives. The great advantage of being able to influence some 20 extension agents all with about 200 farmer clients was that they could give better advice on fertiliser to a much greater number than I could alone. And if they were well established in their area, they had the farmer trust that is the key to adoption.

So what were the main learnings from my career in science and how it related to extension? These could be summed up in three words all starting with c. Contact with farmers so you live in their world, co-operation with farmers so that the research you were doing is relevant to them and communication so that they can understand and apply the research results to their farm

The sheep and beef sector is adversely affected by a shrinking land area and falling stock numbers. On the better land, more profitable dairying is expanding, especially in the South Island. In the hill

country, forestry is still competing for sheep and beef farmland. It is sensible to have a balance between farm types, not only for environmental reasons but also for diversification of export products.

So how can science help this situation? Certainly there is a need for new research to continue for the sector because there is a lag period between the science being carried out and uptake of the results. Otherwise in twenty years' time there will be a shortage of research information. But I would argue that at least as much effort should be put into the extension of science results from the last thirty years. At the Dunedin Conference in 2006, John Caradus listed all the technological advances that had been published in the Grassland Association Proceedings since 1930. What struck me was not only how many advances there were but how few had been taken up by sheep and beef farmers.

One of the reasons for this lack of uptake in the last thirty years has been that these farmers are quite understandably not prepared to take the risk of changing their farm system while being under the financial and climatic pressure that they have experienced. This would be especially so for the younger farmers who possess the most drive to improve profitability. So before they adopt a new farming practice, farmers need to have confidence in its success.

One of the roadblocks to more co-ordinated science and extension in the sheep and beef industry is the large number of funding bodies. Beef and Lamb with its levy funding is a major player but there is also the Ministry of Primary Industry with the Primary Growth Partnership and Sustainable Farming Fund programmes, the Ministry of Business, Innovation and Employment with its Pastoral 21 Programme plus a number of others. There is a need for identification of industry priorities agreed by all parties and co-ordination of the funding through one agency, probably Beef and Lamb. This would ensure that the most important issues can be addressed in depth rather than a piecemeal approach.

So let's address another challenge, the current and impending shortage of pastoral scientists to do the work and communicate the results to consultants and farmers. Above all, it is essential that new applied scientists have a sound knowledge of farm management systems so that they understand how their science findings can fit in. Many of our generation of scientists had the advantage of being brought up and actively involved on a farm but that is not always the case today. Obviously the recruitment of scientists is a problem, for reasons of both salaries and job security. One solution that is practised by Dairy NZ is to select suitable students before the final year of their Bachelor's degree and, support their funding. They then employ them after graduation to learn from scientists, consultants and farmers for a period before undergoing post-graduate study and practising science. Beef and Lamb could organise a similar scheme through the Crown Research Institutes.

In an age of increasing specialisation, what will be lacking in the sheep and beef industry in the future is the integrator, the person who can understand the research results and their implications for the farm system and facilitate the extension of these to the farmer. The old MAF trained Farm Advisory Officers are a good example of this. Unfortunately most of them are ageing and consultants with good extension skills, especially in a group situation, are not being trained. Perhaps the industry needs to look to suitable farmers, who are looking for a new challenge after a period of farming, to fill that role.

It also makes sense to use the experience and expertise of the many older scientists recruited in the 1970's and now in retirement mode to help fill information gaps and tutor young scientists and consultants. Beef and Lamb could compile a list of contacts who are available in each region, together with their capabilities, to be circulated to interested parties.

Successful extension of research results is never easy and requires a concerted plan using an appropriate framework based on sound adult learning principles. Two ideas that I have come up with in the past are Technology Testing Units and Regional Research Focus Farms.

The aim of the Technology Units is to take proven results from component research and test them in combination in a series of farm systems trials. Research Stations at Ballantrae, Winchmore and Woodlands would be ideal sites to carry these out. It is important that these projects have ambitious production targets with no economic constraints. How about 1000 kg of carcass weight per hectare per year under intensive and 400 kg per hectare under extensive conditions? I remember in the early 1990's that when the then Dexcel, now Dairy NZ, came up with a target of 1750 kilograms of milk solids per hectare per year from all-grass, some thought that it would never be achieved. But today many commercial dairy farmers have matched or exceeded it.

When researching this intensification, the environmental impacts would also have to be assessed and mitigation strategies developed.

Today there is still a reasonable amount of component research being carried out but the integration of the results from this needs to be tested in farm systems trials. In this proven manner, the interaction between different practices can be tested rather than assuming that the effects are additive.

It is envisaged that there could be up to twenty Regional Research Focus Farms sited in each of the important sheep and beef farming areas to take into account the diverse climatic conditions. On these commercial farms, land and animals would be leased and purchased to allow scientists in association with farmers and consultants to further test and demonstrate what has been proven in the farm systems trials. These trials would need to be carried out on a large enough scale to measure the economic returns.

The other key occupation whose numbers are contracting are farm consultants. More funded involvement in these types of long term projects would allow them to recruit more young graduates. In addition there are a large number of commercial company field staff that if familiar with the outcomes from these farms, could be used to extend the information to their farmer clients.

In the time that I have spent working in Europe and South America, it became obvious that one of the real advantages that we possess is the interaction between scientists and farmers. In these overseas countries most scientists do not stray far from their research stations. When they do venture out to interact with their farming community, they do not communicate effectively. Loss of this competitive advantage would be detrimental to our industry.

Within the sheep and beef sector it is hill country that is the most vulnerable. We all know that for a farming system to be sustainable, the nutrients leaving the farm must be replaced. All the data indicates that this is not happening on large areas of hill country. The major cause of this is lack of profitability with fertiliser only able to be applied infrequently, especially on the harder hill country.

Hopefully implementation of the measures recommended above will assist in the longer term but in the short term, here are some suggestions that could help.

As measured in long term grazing experiments and observed on farms, annual fertiliser application is required on hill country pastures if productivity and profitability is to be sustained. At the Ballantrae long-term rates of superphosphate trial, a relatively low rate of 125 kg/ha/yr maintained a soil Olsen P level of 10 and stocking rate of 11 SU/ha. I understand that most of the fertiliser is applied in autumn because of cash flow. But if it can be applied on the more depleted steeper hills earlier in the growth season, enough P and S can be supplied from the fertiliser, even if it is lacking in the soil.

On hill country, pasture productivity changes with aspect and slope and fertiliser can be used more efficiently if the nutrient type and rate match this variability. Spreading technology in planes has now been developed to allow variable rather than uniform application of fertiliser. Application costs will increase slightly but I urge the industry to look past this and focus on the significant benefits.

Stock transferring nutrients from steep areas to stock camps is a major inefficiency in fertiliser use. Can we use poplar and willow planting, which has also many other advantages, to encourage stock to spend more time and excrete more on these steep areas?

To conclude, it is vital for the farming industry that adequate human and financial resources are provided to ensure effective science and extension. What has worked in the last thirty years will not necessarily work in the future and fresh thinking is now required.

Whether it was Sir Bruce Levy earlier last century, our generation of agriculturalists in the 1970s or those who are just starting out today, there are still exciting opportunities in New Zealand grassland farming. The challenges are different but are still out there. To make genuine progress, they need to be addressed.