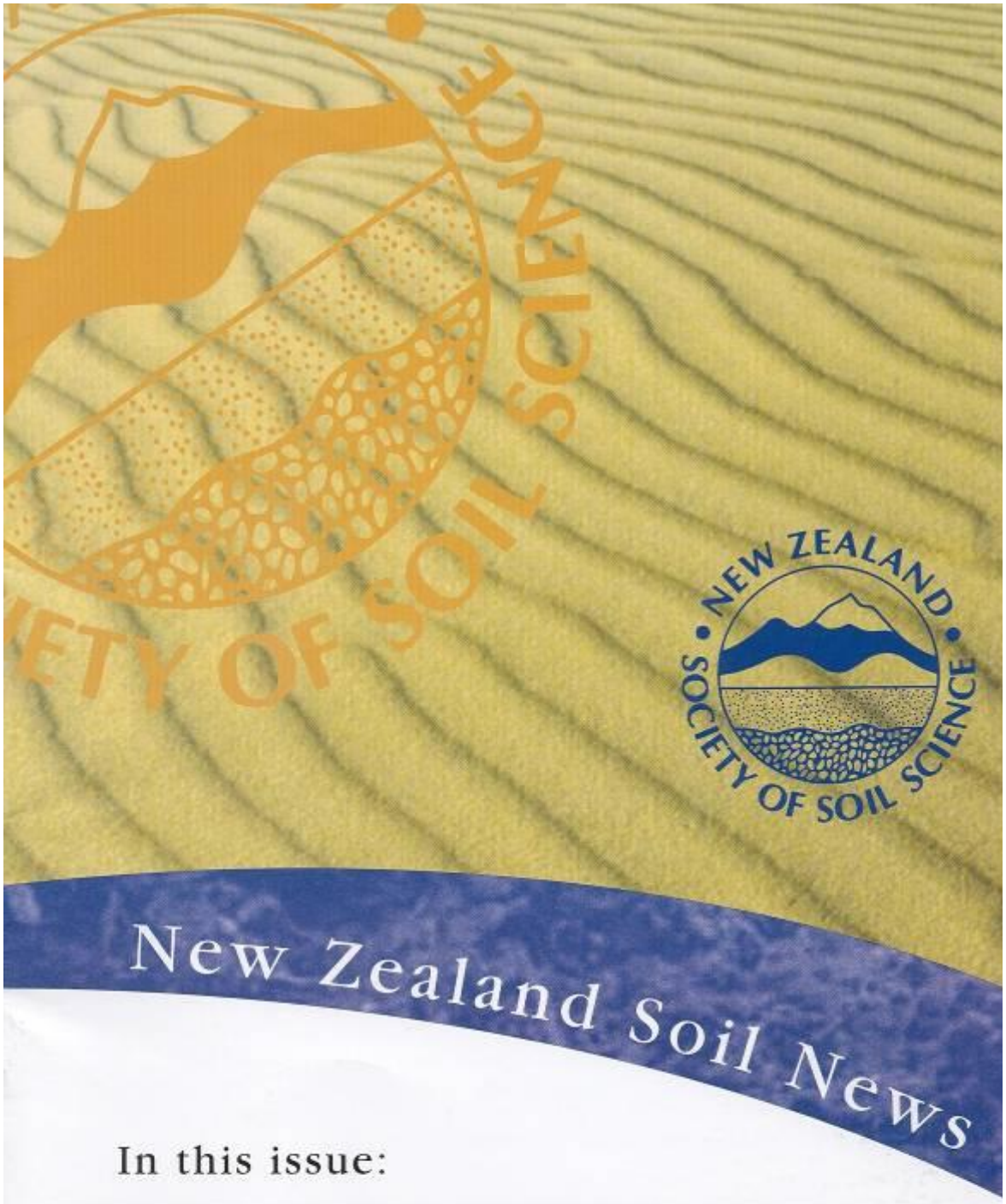

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Volume 64 No 1 February 2016

New Zealand Soil News

Newsletter of the New Zealand Society of Soil Science

ISSN 0545-7904 (Print)
ISSN 1178-8968(Online)

Volume 64 Number 1 February 2016

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Your contributions are required - New Zealand Soil News is your newsletter

News, views, letters, articles (serious or otherwise)—send to:
Isabelle Vanderkolk
Climate Land and Environment Section
AgResearch Ltd
Private Bag 11008
Palmerston North
FAX: (06) 351 8032 email: isabelle.vanderkolk@agresearch.co.nz

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Deadline..... for the **May** issue of Soil News is **Monday 16th May 2016**

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New Zealand Soil News

Editor *D. Houlbrooke- dave.houlbrooke@agresearch.co.nz*
Typing *I Vanderkolk – isabelle.vanderkolk@agresearch.co.nz*
Printing *Massey University Printery*
Correspondents *I Lynn*, Landcare Research, Lincoln; *B. Robinson*, Lincoln University; *L. Currie*, Massey University; *C Hedley*, Landcare Research (Massey University), Palmerston North; *S Lambie*, Landcare Research (Hamilton); *D J Lowe*, Waikato University; *R Doyle*, Australia; *M Taylor*, Environment Waikato, Hamilton; *S Laurenson*, AgResearch Lincoln; *M Dodd*, AgResearch Grasslands, Palmerston North; *R Stenger*, Lincoln Agritech, Ruakura Research Centre, Hamilton; *R Gillespie*, Plant & Food Research; *G. Lucci*, AgResearch, Ruakura Research Centre, Hamilton; *R Gentile*, Plant & Food Research, Palmerston North.

New Zealand Society of Soil Science Officers 2014–2016

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Editorial: Sam Carrick

15 years in the soil science industry – what have I learned?

The International Year of the Soil has just finished, but our collective efforts to maintain the productive, life-supporting capacity of our soils are continuing apace. Over the Christmas break I also realised that 5 years has passed since I returned to Landcare Research. Not quite enough to get a long service medal, but enough for me to contemplate on how things are going. Three days of fruitless fishing leads you down such potentially dark paths! Surprisingly though my revelations were of the positive things I've learned through a diversity of colleagues and projects.

I first cut my teeth in the green pastures of Southland, working in the community funded Topoclimate project. We had solid funding and a clear purpose to complete a soil survey of 850,000 ha in 3 years. Through rain, sun, and the odd snowfall we had up to six vehicles out surveying most days of the year. The successful delivery of this project on time was directly due to the teamwork and dedication of the young graduate staff, of whom seven are still working in the soil science industry 15 years later. The soil survey information is still widely used today, which combined with the staff capability development, is compelling evidence for a successful return on investment. Underpinning this was the willingness to invest in the next generation, both in terms of funding, but most importantly the mentorship by senior scientists. This post-graduate first job is a key step in a young scientist's career, and in my opinion a co-ordinated post-doctorate scheme is a significant 'missing link' in our current funding model.

Next was a move to Landcare Research, working on the GrowOtago project, with a similar clear focus to produce a soil map for 750,000 ha of the Otago region, again within 3 years. In contrast to Southland, there was a rich history of soil survey in Otago with over half the area already mapped. Our team was smaller, with probably half of our time spent recompiling the data from 22 different historical maps. Some of these are true gems, such as the hand painted 1930's era map by Ferrar or the high quality and comprehensive 1960's era survey bulletins, which I still frequently refer to some 50 years on! The Otago project opened my eyes to the value and richness of legacy data and knowledge, but also how easily the link to this past it is lost, which I see as a particularly pertinent risk that our industry faces today as the cohort of 'DSIR generation' scientists retire.

Following completion of the Otago project, I changed tack and returned to Lincoln Uni Soils Department to complete my PhD in soil physics. Why the change? Well another lesson I'd observed was that to survive as a scientist you needed diversity in skills, to navigate through the inevitable funding cuts and shifts in research priorities. I'd also mapped a multitude of different soils, almost all of which we know little about how they function in a hydrological sense. The PhD again reinforced to me the importance of mentorship to the next generation of our industry, with a range of people supporting me with their time, wisdom, and skills. Financially I'll always be grateful for the support of AgMardt, Landcare Research, and the Centre for Soil and Environmental Research.

Luckily for me, Landcare Research offered a scientist position to me, and I returned into the fold. Five years on my work schedule is a complex mosaic of different projects and people. This year I'm involved in 16 projects, working directly with 52 different colleagues, from 13 different organisations, with funding from 11 different sources!! Crikey that that's a bit daunting when you add up the numbers, and sorry if I forget to reply to your email! All of the people who I work with in these projects are in a similar boat, and I share the concerns of many of my colleagues with the fragmented and transient nature of research funding, and the

limitations this can impose on making real progress. However, I would argue that within these limits we are making substantial progress in a number of directions, maybe not as great as we are capable of, but good progress none the less. This raises the question: When we are so fragmented in time, how do we get anything done? To me it's clear that's its due to co-operation, flexibility and respect between us all. Our success is based on our skills as team players, and our collective enthusiasm to make real progress on the role that soil has in pivotal national issues such as productivity, climate change, and water quality. So as we gather steam into working through the inevitable challenges of a new year, hopefully we'll all keep focussed on the value of our colleagues, and I look forward to hearing about the diversity of projects they have been working on at our society's conference in December.

You may have been surprised that this editorial has mentioned little about the soil! The gallery of beauties I end this article with are a selection of soils I have worked with over the last year. Remarkably in 2016 we still know little about how these function, despite the crucial role they play in the productivity and health of our many diverse ecosystems, in particular their filtering and buffering capacity against contaminant loss. Somehow I think the next generation will still be working on understanding these wonders of our world…

High country Brown soil

Central Otago Semi-arid soil

Canterbury very stony Brown soil

North Canterbury Recent soil

North Canterbury Pallic soil

Mackenzie Basin Brown soil

Article – Soil Science in Primary Schools - A & L Schipper

As an educator, it was exciting to see the resources developed for the 2016 International Year of Soils. The Society was very kind to fund the ilovesoil.kiwi website and related print materials. These resources were later modified to support primary school teachers and published on the Science Learning Hub. The Science Learning Hub now has soils resources spanning school years 1-13.

"We won't stop digging until we find something spectacular"

One activity we developed, Dig a hole, involves the award winning picture book Sam & Dave Dig a Hole. The books' clever illustrations and open-ended story line only has a little to do with soil science but provides a wonderful opportunity to explore the science capabilities of observation and inference. Sam and Dave set out to dig a hole and decide not to stop until they've found something spectacular. After reading the book, students go outside to dig their own hole and observe the soil at their school.

I've had the pleasure of doing this activity at a few schools and the students have indeed found spectacular things. As soil scientists, you've dug lots of holes, but it's often a new experience for children. One class found small quartz stones and marvelled at how they sparkled in the sun; they considered the stones their treasures. Another class found bits of charcoal from a school fire last century.

The students observed how the soil changed as we dug deeper. They could see, feel and in some cases hear the differences. In the words of one 6 year old boy:

> "We dug a MASSIVE hole and I didn't know the ground went that far down. When we went deeper we found different soils like clay and it was harder and crumbly. I loved being a scientist."

Sharing Sam and Dave with Hamilton schools

To make the most of the International Year of Soils, Louis and I (with the support of the University of Waikato) made up resource packs for the 38 primary schools in the Hamilton City area. The packs included a copy of Sam & Dave Dig a Hole, VSA for kids activity, NZ soil orders posters, IYS brochures and stickers and soils related resources from the Science Learning Hub. We've had lovely feedback from some of the schools and invitations to dig holes.

Primary Science Week 2016 – May 16th to 20th

The New Zealand Association of Primary Science Educators has chosen soil as the theme for this year's Primary Science Week. Megan Balks, Louis and I met with NZAPSE educators Sandra Jackson and Greta Dromgool to work out an activity for the national investigation – most likely measuring soil moisture content.

NZAPSE has asked if NZSSS members could be available to answer email questions from students who do the national activity.

The Science Learning Hub has volunteered to vet email queries and forward them to volunteer scientists – sparing you the possibility of being inundated with questions by curious kids.

Getting involved with your local school

Consider offering your services to your local school. You'd be surprised at how much children enjoy the simple activity of using a soil auger to discover what's under the back field. If the school has a copy of Sam & Dave Dig a Hole (or can find a video of a read aloud version), teachers can do the groundwork before your visit – as suggested in part one of Dig a hole.

Your role will entail a trip outside with a soil auger and a ground sheet. Let the students help use the auger – ask the teacher to choose who helps. Lay out the soil on the groundsheet to make a profile. Encourage the students to observe the soil as it is placed on the sheet. If the teacher asks the students to be quiet and listen, it's surprising what students might hear as you use the auger. Dig a hole in another location to see if the soil differs. Students can carefully carry the profiles and lay them side by side for comparison. After digging the hole, go back inside and look at the soil order poster – students are really surprised to see how different soils can be.

If the thought of being in a primary classroom seems daunting, please remember that it is up to the classroom teacher to keep the students under control, not you. Your responsibility is to visit with a soil auger or spade and to answer question the children may have. I usually schedule an hour to dig a hole or two. If the activity finishes earlier than you'd planned, it's okay for you to leave early – don't feel as if you have to fill in time – you are a guest.

If you'd like to help with Primary Science Week as an expert, let us know at enquiries@sciencelearn.org.nz.

Angela and Louis Schipper

Articles by Doug Edmeades

The following articles, written by Doug Edmeades, were recently published in NZ Farmer.
Dr Doug Edmeades, MNZM, is an independent soil scientist and managing director of agKnowledge. He was Federated Farmers' Agriculture Personality of the Year in 2012 and is a former Landcorp Agricultural Communicator of the Year.

When only a spade will do

Agricultural research in New Zealand is in a shambles, declares Doug Edmeades.
The agricultural science mode is starved of money, has no clear leadership and contains disgruntled staff, says Doug Edmeades.

I am often accused of being too blunt, matter-of-fact, to-the-point. Some advise me to tone-it-down, soften-the-edges, become more …… more….. well, PC. But there are times when "A spade is a spade". It is not a shovel, it is not a rake, it is not a hoe, it is not fork. A spade is a spade and there are times when a spade is needed to bring clarity and impact to an issue in an attempt to penetrate the callused hides of the political bureaucracy. They must be made to listen – somehow.

I declare that agricultural research in New Zealand is in a shambles. And I am not alone in my opinion – don't call me a lone wolf.

Agriculture is our biggest industry, but since the science reforms began in 1991 New Zealand's agricultural research has been, and is being, choked to death. Strangled by funding cuts, stifled by obfuscating management-speak and as leaderless as a beheaded chicken.

Government funding to AgResearch, the supposed flag-bearer for agricultural science, has declined since the reforms began from about $130 million to about $70m, reflected in a decline in staff numbers from about 1100 to about 750. Within this context AgResearch's chairman Sam Robinson's statement to the recent Government education and science committee, sounds as hollow as a rotting rimu – "the staff are our most important asset." So staff redundancies are a form of asset stripping!

The Government's retort to this decline in funding is to say that they are putting millions of dollars in the Primary Growth Partnership (PGP) Program to enhance "long-term innovation programs to increase the market success of primary industries." The policy logic stems from a Treasury belief that you cannot trust science and scientists – don't give money to them they will squander it on their own pet hobbies. So the PGP puts money for innovation in at the business end of the science-technology-innovation spectrum. I am involved in some of these projects. They are science lite and PR rich. And in the meantime the agricultural science engine of NZ starves to death. Good thinking Treasury!

Meanwhile back in AgResearch, the management, besotted by goobledegook modern management theory, introduces Matrix Management, a sure way to sap the innovational-energy in any organisation, and comes up with its cunning Future Foot Print (FFP) plan. The Titanic may be sinking but we are going to look busy, progressive, strategic, innovative, business savvy, inter and extra linked and connected with industry until our last gasping swallow.

The FPP plan is simple: uproot most of the Ruakura and Invermay staff and establish hubs in and around the Lincoln and Massey Universities in the name of "improving infrastructure quality and innovation and catalysing agricultural innovation centres." My 'hubbie' is going to be a Centre of Excellence with a high degree of inter-entity density. The language gives it away and it is the reason why spades are needed - to dig for the reality.

Never mind that Berl Economics says that the business case for such radical changes in not sound. Never mind that the staff, who are of course so important, have lost confidence in management – the recent survey of staff suggest only 39 per cent have confidence in the management. Never mind that star quality staff have already left, or intend to leave. And never mind that at the start of the CRI reforms both the Ruakura and Invermay research centres were already world class.

The recipe for world-class status is well understood. You start with quality scientists doing quality research. Making the deck chairs look more comfortable while those in the bowels of the ship are drowning is called spin, PR and, if you have your spade ready, idiotic.

The problems confronting agricultural research will not be solved with the FFP plan. The problems are more deep seated and if you dig deep enough, glaringly obvious: the science policy, as embedded in the two headed CRI Act – do public good research and make money; the lack of R & D funding, the application of modern management theory to science administration, and an almost complete lack of clear, effective leadership.

The Minister for Primary Industry Nathan Guy has set the immediate goal for agriculture – to increase agricultural receipts by 50 per cent by year 2025. But he (his office) no longer controls R & D expenditure, or sets, with input from the farmer leaders and the farming industries, the priorities and agenda for agricultural research, as was the case prior to the reforms, when agricultural research was truly world class.

There were some glaring faults with the old agricultural science model – the Public Service Act, which meant that ineffective staff could not be fired, and the Public Finance Act that made financial accountability difficult. We have replaced these problems by creating an agricultural science model that is starved of money, has no clear leadership and contains disgruntled staff. AgResearch's credibility and relevance to, the New Zealand farmer, and to farming industries, dwindles year-by-year

My name is Doug, I dig, and I know a spade when I see one – go sharpen yours.

McScience diet is hard to swallow

Today's Dr McScience spends little time out in the field doing science.

My spade has hit a wellspring of agreement – agricultural research in New Zealand is a shambles and it appears from feedback that many agree with my assertion.

So let's clean and sharpen the spade. How and why has this happened?

The Labour government started the process in the mid 1980s to commercialise agricultural research and technology transfer – remember "users pays"?

This policy bud blossomed with the passing of the CRI Act (1992) and the establishment of the Crown Research Institutes.
Scientists were now required to do research for the public good and make a dollar – a return on investment.

The reforms, we were told, were intended to: Increase the efficiency, accountability and flexibility; achieve better alignment between science and industry and enhance technology transfer.

It is beautifully ironic that I left AgResearch Ruakura in 1997 because I could see that gap between science and the farmer was becoming increasingly wider and wider and I was told, "Your job is to make money for the CRI, not inform the farmer".

Truth be told, I was depressed, distraught and confused. Was I going mad or was the new science system insane?

I embarked on a post-graduate Diploma in Management to ease my troubled mind. I got to read erudite papers on organisational models – why are there so many different models and why different models suit different endeavours (further reading at dougedmeades.com: Is the Commercial Model Appropriate for Science?).

The commercial model is good for delivering tangible goods to the public.

You can buy a loaf of bread or a hunk of 4x2 anywhere in New Zealand at about the same price. The unseen hand of the open market applies.

But it is not the best model for delivering services that have a large intangible component. Hence the distribution of education and health services to society is achieved largely via a public service model.

It should be no surprise that most of our agricultural industries operate within the co-operative model – specific goods and services for the benefit of a specific sector of society.

In this context, it is fascinating to realise that most of our humble human activities are performed within the not-for-profit model - sports clubs, social clubs, incorporated societies, charitable trusts, churches etc.

The focus is on community good for the good of community. The "goods and services" are largely intangible.

Importantly, the absence of the profit motive does not mean inefficiency – it simply means that any money left over (profit) cannot be appropriated away from the organisation.

Where does science fit along this continuum?

To answer this we must explore the question – what are the values implicit in science? Is there a set of operational conditions that would optimise the conduct and delivery of science for the public good?

Here are some of the important ones:

. The integrity and objectivity of science and scientists must be protected.
. The motivation for doing science and speaking about science must not be compromised.
. The organisation must be open internally and externally to discussion and debate. This is essential for defining problems of public importance and the development of scientific ideas.

. Science is a creative activity and hence scientists must have time and space. The funding, planning and reporting processes need to reflect the long-term nature (5-15 years) inherent in science activity.

Without any objective analysis of the values and requirements of science, the Rogernomes thoughtlessly assumed that the one-size-fits-all commercial model could be applied to science. They could not have done worse.

The purpose of science now, operating under the CRI Act, is primarily focused on making money, hitting revenue targets and gawking at the bottom line.

Welcome to what is now being called, Post Normal Science. Science is no longer about seeking to understand the world around us for the betterment of the public.

The role of science is now to serve the machine – the CRI. The age of McScience is upon us.

And spare a thought for Dr McScience. We know from surveys that he is distrustful of management and disillusioned with his career, to the point where he would not recommend a science career to his children.

We know he spends little time doing science. He is too busy being "accountable" to be accountable, preparing budgets, reporting on projects and developing new funding proposals.

He must rush to and fro, greasing the many palms of the many "shareholders" that feed him to ensure his begging bowl is never empty – a never-ending rush to stave off the day when the wolf arrives and claims more colleagues who "regretfully" did not make it into next year's budget.

Dr McScience tries hard to smile when he hears his senior management repeat the mantra "Our people are our most important asset".

It is a pity that there is no heading under "Assets" in the balance sheet called "Scientists". Its absence allows an otherwise perfectly sane board chairman to explain that more science staff have been laid off to protect the company's assets.

My point should be obvious: When the values and needs of science are considered, the last organisational model you would choose for science is a commercial model.

That is the tragedy of the CRI Act and it is the single most important reason why agricultural research in New Zealand is a shambles.

Is there a solution? I believe so, but that will have to wait for the next column.

CRI Act traps science in a cage

Science time is immeasurable. "I spent 10 years studying the problems related to soil acidity in New Zealand and still there is work to be done," says Doug Edmeades.

Now, where was I? Oh yes, I was saying that New Zealand agricultural science is a shambles.

Leaving aside the poorly conceived foolish Future Footprint Plan, this is not a criticism of the current, or indeed previous, management of AgResearch – they were and are simply slaves of the CRI Act, doing their "best" under this legislation.

The problem, and hence the solution, does not lie with them. It rests squarely on the shoulders of the politicians – those who originated and those who now choose to perpetuate the CRI Act, which compromises the purpose of science and traps it in an inappropriate management framework.
So, what is the optimal management model for science? We must now ask further questions: Does science have special requirements that must be respected, protected and incorporated into a science management model?

Science is unique among the professions. Its existence in society is not underpinned by law as are the legal and accounting professions, it is not governed by health requirements (medicine and dental), or mandated by the societal requirement for education. It is also different from its nearest cousin – engineering - which is required to maintain safety standards – safe roads, bridges, and manufacturing processes.

Science is a truly discretionary profession. Incidentally, this is why it has so little political power.

It is unique in other ways. Its input and outputs are often intangible and mostly immeasurable. There is no obvious starting point except for a problem or question and there is no definable endpoint. As Einstein remarked, "If we knew what we were doing it would not be science."

More importantly the value of the science cannot be predicted *a priori*.

No one at the time could have predicted the enormous financial benefits that would accrue to society when Faraday started tinkering with magnets and electricity.

Similarly, how much should society have invested in Einstein when he started thinking about things going very fast?

That is why it is offensive to ask a scientist in to state the internal rate of return in his funding proposal.

Science progresses incrementally, layer by layer, and the monetary value of each layer only becomes apparent when it has been consolidated, by time, debate and reason, into a hard rock of evidence to stand and build upon - just like the formation of sedimentary rocks - allowing for the odd seismic paradigm shift.

This is the heart of the matter. Contract theory which is the managerial basis for most commercial activity works well when the inputs and outputs are tangible, time-constrained and hence the transactions can be defined in dollar terms: "All the bricks arrived as specified", "the bridge is complete within time and on budget", "your tooth is fixed", "your heart operation was successful", "the judge has delivered his judgment".

Many goods and services that have a specified, definable, quantifiable beginning and end are delivered on this - normally short-term - contractual basis.

The double-entry financial accounting system was developed for these definable activities. It works well where the primary purpose of the activity is to generate profits from a definable asset - property, industrial process or shareholder funds.

Reporting and hence the accountability in such activities is undertaken appropriately on an annual time step.

But time steps in science are much longer – I spent 10 years studying the problems related to soil acidity in New Zealand and still there is work to be done.

The CRI Act with its emphasis on managing dollars on an annual basis has resulted in a new breed of managerial staff in science – at the expense of science activity, it is noted.

They busily spend their days managing contracts and budgets, ensuring KPIs and milestones are being met and at the same time introducing the latest managerial mumbo-jumbo, all in the name of financial accountability and mostly irrelevant to an enterprise whose purpose is to optimise scientific.

More importantly, it is assumed in commercial entities that staff are replaceable. Apart from wages and salaries they do not appear in the balance sheet. If the storeman resigns he is replaced, so too the chief executive.

But how do you replace a scientist who has an international reputation for advancing the understanding in a particular subject? What about a new up-and-coming scientist who is just reaching his productive best after years of investment in his development?
We always reckoned that it took about five years of in-house learning before a new PhD graduate started to hit his straps.

In a science organisation, the staff are THE asset and careful management and recruitment is required so the experience, wisdom and institutional knowledge of an aging scientist is passed to the next generation.

There is no place in the commercial model for such quaint notions, as we are seeing as AgResearch continues to lay off staff to meet its budget. Incrementally it is divesting itself of its most important asset in the name of being fiscally responsible.

I am not arguing that science must go back to the public service model. That was too inflexible, as previously mentioned.

The half way house between the commercial model and the public service model is the Not-for-Profit Model.

It would remove the profit and commercial focus currently engulfing science management, allow science to return to its normative roots, preserve the integrity of science and allow the development of a management framework that reflects the special requirements of science.

I made this submission to the 2010 Research Task Force who rejected the idea, in effect saying that too much time and effort had been invested to make the CRI Act work.

This is similar to telling a wrongly convicted prisoner that he would not be released because so much effort had been invested in his confinement. I say let the prisoner free.

Welcome to the science equivalent of Middle Earth

Agricultural science research has gone from simplicity to complexity in 30 years of reforms, writes Doug Edmeades.
The agricultural science funding model is rotten, says Doug Edmeades.

In the last few columns I have focused attention on the woeful state of agricultural science in New Zealand. I have attributed this to the adoption of the commercial CRI model. I have suggested a not-for-profit solution.

My commentary will be seen by some as the barking of a lonely, possibly rabid, wolf. After all, not one CRI scientist has written in support. I suggest that this is another sign indicating that the current model is rotten – they dare not speak for fear of losing their job. I have good reason to suggest this possibility because we do know what scientists collectively think of their plight.

In 1996 and again in 2000 comprehensive surveys of CRI scientists were undertaken on behalf of the Royal Society of NZ, to gauge the success of the science reforms, which you will recall began in 1992.

The author's conclusions were stark. The results showed "a stunning level of dissatisfaction with New Zealand's science and technology reforms." Specifically, 70 per cent of respondents disagreed with the statement that: "the management systems now in place are appropriate for the effective enhancement of research."

Any chief executive worth his salt would, upon hearing such news from his staff, immediately set about the remedy the situation, because business research instructs: happy staff equals productive staff. Not so in the CRIs.

As if 'on queue', news is breaking that a further 80 staff from AgResearch Ltd are to be made redundant. I shake my head in anger and disgust because the demise of agricultural research as a consequence of adopting the commercial CRI model was predictable and therefore preventable. And, as the survey results show the writing has been on the wall for some time now.

It is often useful when things are tough to ask the question: how did we get here? Can we retrace our steps in order to understand where we went wrong and hence better formulate a successful way forward?

If you go back to the time when I started my science career (1977) the bulk of government science in New Zealand was funded via the then Department of Scientific and Industrial Research (DSIR) (Vote Science) and the research arm of the Ministry of Agriculture and Fisheries (MAF) (Vote Agriculture). There was also research undertaken as component of teaching within the universities (Vote Education). There were three pots - three funding distributors to feed the spark plugs of science

Today these three founts of funding (Votes) are funneled out to science organisations via 13 pots. (see Chart 1 page 14, Draft National Statement of Science Investment 2014-2024). And this does not include industry bodies that collect R&D funds via levies (DairyNZ, Foundation for Arable Research, Beef+Lamb NZ) and organizations like agMardt and FMRA.

And it all started in 1992 with a simple, albeit flawed, model: science was to be treated like any other commodity and managed via one large competitive contestable pool.

It did not take long for cracks to appear: not all science is the same. Some science is motivated by curiosity, not by problems in the market. No probs – we will have a Marsden Fund. Some science is long-term. No probs – we will allow some multi-year funding. The universities want a part of the action. No probs – PBRF is born. Competition puts up barriers between organisations. No probs - we will support collaborative funding bids. The system is unstable. No probs – we will use some funds to provide CRI core funding. We need to make some short-term commercial gains. No probs – Primary Growth Partnership (PGP) becomes the rage. The Prime Minister's science advisor Sir Peter Gluckman gets heavily nuanced and comes up with some sexy national science challenges. No probs – he must have his own pot.

Each funding pot of course must have a governance body and plan, a strategy, a budget, policies for this and that, and a paper trail to ensure transparency and accountability. Welcome to the science equivalent of Middle Earth. Sciberton is a labyrinth of complexity and complication. The transaction costs of doing science escalate with every increment of complexity.

From simplicity to complexity in 25 years of reforms? The reason is obvious, at least to this observer. The starting point - the commercial science model - was flawed. Rather than confront that original mistake; year after year, bureaucracy after fumbling bureaucracy, science minister after science minster; they kept adding new patches, new bandages, new layers, new accommodations, new facets, new dimensions. And each incremental step was introduced with a hail of spin announcing yet another step closer to science utopia – world-class science.

And do you want to know the really, really, really, sad part - the important bit that the reformers ignored then, and continue to ignore now – world class is where they started from! Angry and disgusted – you bet.

Freeing scientists from the chains of commerce

Doug Edmeades explains how he would change the legislation governing science funding to remove the current nasty commercial taint.
Doug Edmeades would make the CRIs Not-for-Profit Trusts.

I recall speaking to a conference of Nuffield Scholars some years ago about the flaws in the current commercially driven science system. I couched my comments in the context of pretending what I would do if I had my day in Parliament.

The then Minster of Science, Steve Maharey, who spoke after me, quipped that I would not get much done in one day in Parliament. Quite true of course! But his comment indicated a desire to belittle me rather than grasp a simple figure of speech.

If I had my day I would change the Crown Research Institutes Act and make the CRIs Not-for-Profit Trusts. I would write into the deed of trust the principle that the sole purpose of the CRIs is for the public good. I would remove the commercial imperative, making it absolutely clear that CRIs are not required to make a return on investment in the normal financial sense of that phrase, acknowledging and accepting that society always benefits – there is always an economic return – from long-term investment in science.

This one swift step would return science to its normative purpose and restore and emphasise the inherent values of science – the objective and impartial pursuit of knowledge delivered with integrity and untainted by commercial and political considerations. This is how society is best served by science.

Accepting that the Government's research and development pot is not bottomless, and that science has always had an important role working with industry, I would encourage these trusts to seek private R & D funding. BUT, I would make it clear that the process of doing science must never be captured by or for commercial interests.

To facilitate this I would offer tax incentives to industry. After all, that is what the science-reformers wanted, more private R & D investment.

Furthermore I would remove one barrier preventing private investment in public science. I would tell the trusts that they are not to own IP or technology or products or collect royalties – the commercial fruits of science.

Owning, marketing and selling the products and services derived from science are properly the role of commerce not science. Scientists by their nature are as much out of their depth in commerce, as commercially trained people are ignorant of the nature of science – they are worlds apart

The role of science in this not-for-profit model is broadened – the public good specifically includes helping industry and commerce develop their businesses, because this, too, will benefit society.

But this model sets a clear boundary around what is science and what is commerce, so that the science is not compromised.

This model would spell an end to the pseudo McManagement industry currently crippling the CRIs and emphasises the role of the science: to deliver objective and impartial science-based solutions to public and to commerce, free from commercial and political considerations.

I would bulk-fund the CRIs. The current Wellington-based system for allocating science funds is grossly inefficient - it greatly increases the allocative and transactional costs of doing science.

Ironically, it has had the opposite effect to what was intended – to make science contestable and competitive and therefore efficient. But this machinery was and is an artificial contrivance. Science funding has always been a contest of ideas chasing a limited pool of money.

The theory of allocative efficiency informs us that it is optimised where the knowledge and information is richest and deepest. There are people in Wellington making decisions about the allocation of funds to science who would not know a piece of science if it leapt out of their in tray.

To solve this problem I would ensure that the boards of the NFP Trusts are "science rich"; comprising scientists, science leaders, science managers who have a science pedigree, and science-literate industry representatives.

In the case of, say, AgResearch, science-minded farming leaders would be a must. I would trust such people to decide how to prioritise and distribute, on behalf of the Government, the allocated bulk funds.

Where would this leave the scientist? Applying that famous quote from Martin Luther King to a slightly different end: "Free at last, free at last – thank God almighty, free at last."

I know this will be a difficult concept for the pollies and bureaucrats in Wellington to accept, but this is the novel outcome of my proposed model.

The scientists would be free to do what they are trained to do – science.

So powerful, so elegant so simple, so refreshing – let scientists do science! Yes some accountability would be needed but it would be minimal compared to the current intumescent system.

For an in-depth analysis of the above go to http://dougedmeades.com/publications

MEMORIES OF MALAYSIA – BRIS SOILS, 1981 - Norman Wells

It seemed rather odd to me at the Soil Bureau to receive a request, out of the blue, for a report on the Bris soils of North-East Malaysia, and an appraisal of the scope of existing crop trials. However, while working in Singapore I had visited these soils during the ASEAN Conference in 1975, and again at the CLAMATROPS Conference in 1977. With the request came a closely-planned proposal for a visit to Malaysia; one week allowed for travel from New Zealand and return plus meeting staff at the headquarters of the Malaysian Agricultural Research and Development Institute (MARDI) at Serdang, near Kuala Lumpur, then only three days for a whirlwind tour of trial sites in the states of Kelantan, Trengganu and Pahang. My report had to be written and typed before leaving Malaysia. Was this some sort of rapid mail-order report service? It did not sound like either a grand Colombo Plan task, or a friendly bilateral aid project; it had the air of some development project that had to be confidential to obviate land speculation.

The name Bris is an acronym for Barren Ridges Interspersed [with] Swales, and the soils had been well studied by a number of eminent pedologists. The latest study at that time, by Parmananthan, presented the system as a catena of profiles (Rudua and Jambu series) on ridges of marine sands, with an organic soil (Rusila series) in between. The A_2 horizons on Rudua (Troporthod) were around 30cm. deep, above a spodic horizon, while on the older inland ridges, the Jambu A_2 was up to 1.5m deep. In their extreme forms these soils supported no agriculture, no tropical hardwoods nor jungle, with no potable water, no access roads, and consequently, no population. The exception in all this was the main North-South highway from the capital of Kelantan, which ran along the coastal sand ridge adjacent to the Bris system inland. In the north this coastal strip was sparsely occupied by very traditional Muslim people, inshore fishermen, using small boats, at night, with a light lure. Inland, on the Rudua soils near Bachok, tobacco was grown by redundant fishermen.

The Bris soils have been cut across by many small rivers that are subject to flooding during the N.E. wet monsoon, when variable amounts of silt could be deposited within the Bris, to give the Baging series, with better hope for agriculture, but variable in character. Deeper deposits of silt gave the Rompin series of soils, having no profile development, but with a wide range of agricultural uses; these are not included in the Bris soils, but showed what could be achieved in the area, where soil and water conditions were more favourable.

The trip to Malaysia was rapidly approved by NZ DSIR, and I arrived promptly in Kuala Lumpur. I had been told that the hotel selected for me would be European in character, but with an understanding of Muslim values. This set the tone for my visit. The next day, I rang MARDI and was picked up by car from the hotel. Staff at the Institute were happy to discuss their research projects, but at the introductions some of the older scientists were even happier to explain the significance of the term hajji after their names. I could understand the feelings of awe and reverence evoked by the pilgrimage, culminating in the circumnavigation of the black tomb, but the act of stoning the devil was harder to accept in the same light. Not much new came out about the Bris soils. I began to feel slightly uncomfortable when the topic emerged of a young Institute scientist whose thesis had been rejected by the adjacent agricultural university; would I like to have a go at it? My reply had to be that it was outside the terms of reference for my visit. The discussion then turned to research policy. They were thinking of getting out of trials with tobacco, which would leave a job available in an alternative crop. I had to gently squash this proposal, not my line.

Lunch time arrived, so I made my way to the Cafeteria building. There was no queue to enter, but a stampede the other way, of people rushing out of the building as if it were on fire; they were in tears, but laughing. One stopped long enough to warn me off, saying that Cook had

overheated a vat of chillies, causing the mass evacuation. I found my driver, and he offered to take me to an Indian restaurant in town, where he would teach me the etiquette of eating off a banana leaf. It was to be fingers, and the correct way of using them, to mop up a thick spicy paste with rice. Opinion about the quality of the meal was expressed in how one left the leaf – neatly folded once for a good meal, crumpled for a disgusting offering. But then, he might have been pulling my leg.

Back at the Institute I suggested that for the coming Saturday, I would appreciate it if a car and driver would be available to take me to the Genting Highlands, just north of Kuala Lumpur, where temperate vegetables can be grown at high altitude. There are differences in quality compared with those grown in temperate regions, which could be related to high night temperature and to short day length. This was turned down, as outside my terms of reference regarding the Bris soils - touché, Norman.

Next day, Saturday, was spent in the hotel, rewriting the text I had prepared in New Zealand, into a readable script for the typist at MARDI. It covered the Bris soils under the headings – soil resources, soil units, climatic factors, and water regimes, assembled from published work, which left me with only the crop trials on the east coast, not yet visited, and my recommendations, yet to be formulated without knowing what it was all about.

On Monday morning I turned up at the Institute, and found they worked on Saturday mornings, and I should have turned up then. This was a remaining influence from the British Colonial Service; New Zealand, with Dominion status, had developed a slightly different Public Service. The Institute staff had worked out a rapid tour of agricultural trial sites. Interestingly, it worked from south to north, whereas my previous soil tours had run north to south. It may seem a small point, but did reveal a difference in approach between soil and plant scientists. To a soil scientist, the Bris system of the north east had developed from marine sands that must have originated in erosion of the granitic highlands by the monsoon-fed Sungei Kelantan, whose estuary was near the border with Thailand. The typical Bris system occurred southwards from where the river first made its input of sand to the China Sea. A soil scientist would start in the north where the unit under study was best expressed. As one went south, the Bris system was cut by small rivers, which in the wet season deposited silt. In the extreme south, the river systems won; the Bris had run out of its source of marine sand for the ridges, and an alluvial soil then developed, which gave the non-Bris Rompin soil, supporting a wide range of agricultural crops. An agriculturist would start the tour in the south, with its versatile soil, and travelling north show that eventually the Bris system dominated, and agriculture became difficult. For marketing crops one would also start from the south, for beyond Johore was the large population of Singapore.

The visit to the crop trials on the Bris soils began by air in a low-flying turboprop plane from Kuala Lumpur to Kuantan over the central highlands. The flight gave a clear view of the FELDA oil palm scheme, with a factory sited next to the oil palm plantation. On the other side was a model village; when I had visited two years earlier it had a new sign, Kampong New Zealand, in recognition of start-up assistance. There was a lot of goodwill around in those days. Also visible in the Genting Highlands was a newly-cut road up the hill to a casino, designed to attract wealthy visitors, particularly the Chinese with their well-known interest in gambling.

My colleague from MARDI was sitting in another window seat on the opposite side of the plane, leaving me to talk to myself about the wider context of this visit. Starting with the really fanciful, was the origin of the request for the report cultural, as a defence of the traditional lifestyle of the Malay inshore fishermen, housed on the coastal strip, which featured a series of mini-mosques, where the men met together? It was the male equivalent of the village pump, the traditional meeting-place for women in Western society. The Bris soils acted as a barrier against a creeping intrusion by agriculturists and a different way of life. To make that case, however, would require a Koranic scholar from the Muslim heartland in the Middle East, not me.

Was it more likely to be political? Development of part of the Bris soils by a national organisation such as FELDA would be a large-scale operation, and needed to be based on firm evidence. I had read the FAO book on plants for emerging nations, as preparation, but it concentrated on the dry land in Africa, and the salty land in Central Asia, with nothing on the humid tropics. If there was a confidential development proposal, wouldn't it help to know what it was all about?

The existence of swamps between sandy ridges gives a wrong impression of water availability on the Bris soils. To the north, in Kelantan state, there is no hinterland to the Bris system that would feed ground water into the swamps. The swamps drain to the sea through the subsoil, but some could drain back inland to the huge Sungei Kelantan catchment, which left only local rain water to top-up the swamps. The formation of thick A_2 horizons in the soils on the ridges would have contributed a significant amount of iron to the swamp. When a shallow tube well operates in such an area the iron is oxidised in contact with air, and deposited as ferrihydrite. This captures phosphate ions, reducing their availability to plants. It also blocks pump systems. The swamps, with very slow-moving water, would be unsuitable for fish ponds.

The same soils series name, Rudua, was used for the Troporthod formed on an old terrace of granitic alluvium, just inland of the Bris system. Monsoon rains were rapidly removed by ephemeral streams, without forming an organic soil in a swale. This area was the most difficult for agricultural development.

In the southern states an extensive hinterland to the Bris soils supports jungle, giving a deep forest peat soil, which buffers the effect of the wet monsoon. The resulting feed of ground water into the Central and Southern Bris soils is helpful in diluting the iron levels, as well as being a source for irrigation in the dry monsoon.

From Kuantan we were driven south to look over trials on fruit trees, run by the Department of Agriculture, and on cashew nuts, run by CIMA. Very soon the classic sandy ridges of the Bris system had run out, and the alluvial deposits from small rivers dominated to give non-Bris soil.. Here we met a water-melon grower whose large crop was ready to go off to market in Singapore, showing that even low-priced produce could stand the transport costs. We then turned north back to Kuantan for the night at the only European-style hotel on the east coast. Next morning we headed north to the MARDI substation at Sungei Baging. This site had the main range of crop trials, including grass species, a surprise in the tropics; it was an attempt at stabilising the Jambu soils, to prevent its A_2 horizon from slipping into the organic soil. One wondered if both soils might be improved if the slipping were encouraged. A foot bridge had recently been constructed across the Rusila soil to give access to the Rudua. I could have stayed for days at the MARDI substation, but we had to be off north.

We did stop in Kuala Trengganu, to meet the two soil surveyors, on the 5th floor of a 12-storey state office block. Money from oil deposits had rubbed off into state finances. I talked to them about the A_2 horizon of the soft Jambu soil, how it differed from the hard A_2 horizons in New Zealand. The Jambu soil lacked silt-sized and clay-sized particles, to fill between the sand particles to give it strength, so was prone to slumping.

It was announced that we would all be having lunch together in the survey office, to be brought in and paid for by group kitty. They then mentioned that I had been booked to meet the Head of Department on the top floor of their mini-skyscraper building. I could sense a trap, but was led to the lift with some ceremony, rather like going to execution. They insisted on summoning the lift for me, and pressing the right buttons, in case I did a runner by going downwards. Going up, I could plot the scene to come, I said to myself, "The HOD will be a politician, and a religious one. If I am asked for comment, what topic would be best?" I thought of the coastal fisherman, living just above subsistence level, with too many children to be absorbed locally as they grew up. The rest would end up as labour in the building industry in Kuala Lumpur or Singapore, or in the food industry (that is the males; I am ashamed to say that I missed the chance to bring up the plight of the females).

All too soon I was up there and shaking hands. I told him I had been asked to write a report on cropping trials on the East coast. I mentioned coastal Kelantan, with its single poor crop, tobacco. He nodded and shut his eyes; in this oil-rich state they must have been well aware of their backward neighbours. Change of tack, then. What a wonderful view from this room! I was waved to a position nearer the large glass window. What possibilities. With a lift on the outside of the building up to a roof garden, tourists could enjoy the best view of the state; lunch, telescopes, toilets – all could be charged for, but it just was too remote from the weekend trade from Singapore to be realistic. I excused myself as gracefully as possible, mentioning I had a meeting with the soil survey staff below, and took the lift back. Going down I concluded that the report on the Bris soils had not been requested by Trengganu.

Lunch had arrived at the Soil Survey office; three chairs were facing the table, for serious eating, while mine had been placed at an angle. I told them they all ate too much, and that to the Malays sociability meant eating; they said that to the West it meant drinking. We got on very well, but then it was off again up north to Telong and Kandis, all concerned with growing tobacco on modified Bris soils. On the way, I asked myself why the soil surveyors had not been asked to write the report. The answer seemed to be that they were not part of MARDI Head Office. I was a temporary graft on to the MARDI organisation, to give them a foot in the door into something big, still in the planning. It had been possible to converse easily with the soil surveyors from the Department of Agriculture, whereas all the MARDI staff seemed gagged.

The Kandis scheme had been developed to teach surplus fishermen of the Bachok region how to grow tobacco on scraped Bris soils using pumped irrigation. We completed our tour of the trial sites but kept on driving towards the State capital. Then in the middle of nowhere our guide slowed down, turned the car and started back towards Kuala Trengganu, where we were to stay the night; my colleagues would be with friends, and I would go to the local hotel. As we turned I called out from the back seat “Where are we?” and the reply was “Beris Lalang”. I had been in that area four years earlier, but had made a different approach, from the inland side. It appeared to have been abandoned by the settlers. My shot at translating the name was Weedy Beris, as lalang was an invasive grass with a rhizome that colonised roadsides and took over neglected plantations. This received no response from the driver of the car, but the place had to be important; in the light of later developments, you might say it was a small crack in the wall of silence round a project about to start there.

We sped back towards Trengganu through the best expression of Bris soils. I asked for a stop, as I wanted to have another look at the boundary of black organic soil and white sand of the coastal ridge. Was there any strip that could be considered for an agricultural soil? I went alone: part of the magic of the Bris was its silent deadness. Crossing the road I disappeared into the low scrub vegetation, and quickly came to the edge of the swamp. The boundary between swamp and ridge showed no extra plant growth; however this line would vary according to wet or dry season.

Looking across the swamp to the white ridge of the Rudua soil I had a shock, seeing in the middle distance four men walking in line with baskets on their heads, of what looked like water melons. These were not women carrying melons grown locally, but porters. They were traversing the Bris system heading for the road, though there was no market, no cluster of houses. However, this road was the only link between Singapore and Bangkok, and a thirsty driver in the Muslim world would find in a slice of melon the equivalent of our cold beer. One could imagine that melon grown in the Kelantan Basin would not fetch a high price if sent to market in the state capital, but selling it by the slice at the roadside would be more rewarding.

At Trengganu I was dropped at the small Muslim-styled hotel. I liked it, but I knew from experience to check the bedroom and put a temporary cap over any floor drain, to keep out some very odd creatures that might emerge during the night. Upside down, in the corners of the ceiling were geckos watching, with non-blinking eyes, the movements of the mosquitos. Their sticky tongues were poised to strike for their meal, but were too short to eliminate the

mosquitos, enough of which survived in an environment in equilibrium. Lying in bed, looking up at the ceiling, one saw the arrow pointing towards Mecca, a constant remainder to focus ones thoughts. I pondered which direction the pointer would indicate if I were lying in a hotel bed in the UK, and concluded it would be towards the North Pole, cold and uninhabited, whereas Mecca was warm, and significant to so many.

Next day it was back to Kuantan. For the record, in the three-day visit we looked at seven crop trial schemes, run by six organisations, and the actual travel had amounted to one whole day, and two half-days on the road, plus two half days by air. It was hardly an in-depth appraisal, but all the trial details were available in their annual reports. If I had shown interest in the job mentioned for replacing tobacco I might have had a longer and more informative trip. After farewells to the field officer I boarded the flight to Kuala Lumpur, with my MARDI companion. I had a suspicion that I might be incubating a tropical fever, but was not yet incapacitated. Back at the same hotel I noticed my key was for the identical room I had before. I remarked on this coincidence, but was told that it was booked for me until I departed Malaysia. It sounded like a nice form of prison.

That night the fever took its course, and, having turned off the cooling system, by Saturday morning I was in a sweat. I raided the mini-bar for tonic water and bitter lemon, both of which contained quinine as well as liquid replacement. Later, I turned back the bed to dry out, and went up to the hotel roof, leaving the “Please make up my room” sign on the door. It was pleasant on the roof, with shade and a view, and when I returned the bed was made up and the mini-bar replenished. I was working to the old adage ‘Feed a cold and starve a fever’. Saturday vanished from my time scheme, and Sunday was a repeat of Saturday. On Monday, I walked out of the front door of the hotel, to see how I felt in the outside world. I decided I could walk as far as the chemist shop next door, really thinking it smelt nice, and might be a better place to keel over than the hotel. I bought some aspirin, and got back to my room, but that had been enough for one day. I decided not to ring MARDI, as I did not know what I would say to them. Monday again vanished in sweat, but on Tuesday I got up with the feeling that it would be nice to eat something – breakfast seemed very acceptable after all that fluid intake. I rang MARDI and arranged for the car to pick me up, to go back to work.

Earlier, on first arriving in Kuala Lumpur, I had rewritten material on the Bris soils that I had brought from New Zealand. When I presented the script at MARDI with over half the report done, they assumed that I had worked through the weekend and Monday to produce it. It was gratefully received and went straight off to the typing pool. All I had to do to complete it was to write up the scope of trials on the East Coast trip.

MARDI said that they thought that my visa for Malaysia would run out before I finished the report, and arranged a three-day extension; they also rebooked my Thursday flight to Singapore for Saturday.

The next day at MARDI, Wednesday, was plain sailing, though I still did not know what it was really all about, and did not want to know. It would be a truly independent survey, for whatever purpose. I took the final few pages of the script to the typing pool, along with a large bunch of orchids, and thanked them. I had the impression that they had never been given any recognition before. On my last day I was given carbon copy no.4 of the report, to take back to New Zealand.

When I left Kuala Lumpur by air on the Saturday I relaxed and let my imagination wander over what had been my role in this scenario. All the world’s a stage, after all, but I hadn’t been one of the actors; these would be their field officers, waiting in the wings. Who was writing the script? I had been employed to paint the scenery for Act I: The Status Quo. It was indeed a tragic start, settlers gone, huts abandoned, failed crops, weeds taking over. A dirt road vanished into the background of white ridges and dark swales, but the sky in the east had a hint of golden sun. It remained to be seen how it would play out.

At the Soil Bureau our own typist said that the carbon copy of my report was harder to read than my scribble, but with a moratorium of five years it just went into the bottom drawer. It emerged in 1986 as New Zealand Soil Bureau Record 104, the lowest form of publication.

POSTSCRIPT, 34 years later

This account would not be complete without finding out what the report had been leading up to My east coast trip had turned back at what was then a failed agricultural settlement, Beris Lalang, with no hint of possible future development. Time and a Google search ended commercial confidentiality. In 2008 the East Coast Economic Region reported an announcement from the South Korean firm Samsung Shiel Industries of the first shipment of kenaf (Hibiscus cannabinus L.) from their factory at Beris Lalang to Japan and South Korea; it was in the form of a polymer composite powder for making laminates from long fibres, and tubes from short fibres, to be used as an alternative to non-degradable fibreglass in the electronic and automotive industries. The initial export target was 1000 tonnes per month to South Korea, and twice that amount to Japan.

The outer fibre of kenaf, 'bast', was separated from the less strong core, processed, and mixed with polylactic acid resin to reinforce a biodegradable moulding powder, which qualified for tax incentives under the Kyoto protocol. Kenaf was being grown on the Bris soils by former tobacco growers near Bachok in Kelantan, and on similar Rudua soils, on the Terengganu (new spelling) plain where another factory was proposed, in collaboration with a local firm.

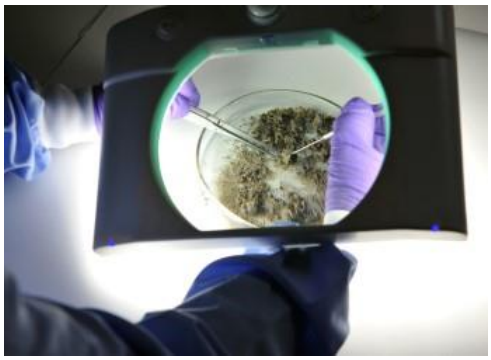
Cultivation of kenaf on sandy ridges in the Bris soils of Kelantan initially showed poor growth. A study by Rosian et al. in the 2011 Malaysia Journal of Soil Science (p.1511-24) showed that levelling the ridges for irrigation, addition of fertilisers, and mulching with rice straw allows kenaf to be grown commercially. These authors were based in the Department of Land Management, Agricultural University, Serdang. Emphasis was placed on reducing the depth to the spodic horizon, with its organic layer over the iron-rich layer. This horizon controlled the path of water and the direction of root penetration sideways, toward the swale. Water low in iron, for irrigating the crop and its processing must have been obtained from deep bores. A system of indexing properties showed these soils, that they classified as spodosols, could be used for agriculture and rated marginally suitable for producing kenaf.

The factory for processing kenaf grown in the Bachok area was on the land abandoned around the two hamlets of Beris and Lalang. The staff totalled several hundred, providing local employment for the children of the original fishermen of the coast. The tobacco-growing family-style farm had become a supplier of grown kenaf for the factory to collect. The Malaysian Tobacco Board had become the National Kenaf Tobacco Board.

The Dirt

A collection of soil-related oddities from Godzone and around the world

Murder, Mud, and Malbec



The soil forensics group at the James Hutton Institute (UK), headed by Professor Lorna Dawson, are using soil DNA profiling methods to solve cold cases. The team uses a combination of both inorganic (XRD, FTIR, XRF, ICP) and organic (GC, GC-MS, FTIR spectral colour, VOC) analysis techniques to compare samples and to provide discrimination of sample characteristics. They are now able to use samples that were previously too small to be characterised; around 20 mg, or what you'd find under a fingernail. One case was the murder of Robert Rose on the Orkney island of Sanday in 2009. Comparing soil found on the suspects' car, they were able to locate where on the beach this car had been. They also found a match between the soil found near the body and traces found on a shovel belonging to the suspect. *(Source: http://www.scotsman.com/news/ and http://www.hutton.ac.uk/)*

Jesse Graves has been looking to the soil with a less violent aim: art and advocacy. Like a Banksy-eco-warrior Jessie uses stencils and mud to put environmentally conscious messages in public spaces. This makes these muddy works of art ephemeral, non-toxic and completely legal (except where there are laws against playing with mud). *(Source: http://jessegravesart.com/)*

Being a winemaker definitely has its perks. One of them is the ability to test the influence of soil type on the flavour, aroma and character of wine. José Lovaglio Balbo from Argentina is doing just that with his *Vaglio* range which includes: "Chango" a Malbec blend from sandy soils; "Chacra" a Malbec from clay based soils; and "Aggie" a Malbec from alluvial soils. However, Lovaglio does concede that "The best reds in Argentina are blends, which offer the edited highlights of each region". *(Source: http://www.thedrinksbusiness.com/) (Beautiful video on YouTube: https://youtu.be/C6Qmd7IDY9I)*

Waikato/Bay of Plenty

Waikato University

WaiBoP Soils 2015

The University of Waikato in Hamilton hosted the third regional soils conference, "WaiBoP Soils 2015", for soil scientists in the Waikato-Bay of Plenty regions, on Friday 4 December, 2015. Held every two years on or close to World Soils Day (5 December) by members of the NZ Society of Soil Science, and convened this year by **Dr Megan Balks** of the university's Earth Sciences programme in the School of Science, the meeting also marked 2015 as the International Year of Soils (Fig. 1). The one-day conference was sponsored by Waikato Regional Council, Landcare Research, and Waikato University. Around 20 papers were presented on a wide range of topics involving current research on different aspects of soil science. With more than 50 attending, including participants from Auckland and a number of graduate students from Waikato University (Fig. 2), a feature was the annual N.H. Taylor Memorial Lecture of NZSSS entitled "When being told to P-off is good" delivered by **Prof Richard McDowell** (AgResearch and Lincoln University). Prof McDowell spoke about phosphorus nutrient cycles and impacts within the New Zealand agricultural industry and how new research is leading to new insights relevant to this key nutrient (along with nitrogen) in soils and waterways. At the end of the lecture, Prof McDowell was presented with the N.H. Taylor award and a special soil auger (once owned and used by Taylor) by current NZSSS president **Dr Reece Hill** (Waikato Regional Council) (Fig. 3).

Fig 1. *Dr Megan Balks welcomes all to WaiBoP Soils, 4 December, 2015. Photo: David Lowe*

Fig 2. *Some of participants of the "WaiBOP Soils 2015" conference. Photo: David Lowe*

Fig 3. *Prof Richard McDowell with the Taylor soil auger at the end his lecture. Photo: David Lowe*

The opportunity was taken at the meeting to present two NZSSS awards for 2015. The Sir Theodore Rigg award (best masterate thesis) was presented to **Tim Norris** (now at Dairy NZ, Hamilton) for his thesis entitled "Detection of differences in soil carbon and nitrogen stocks between paired dairy and drystock pastures". The Morice Fieldes award (best doctoral thesis) was presented to **Dr Brendon Welten** (now at AgResearch, Hamilton) for his thesis entitled "Effects of oral administration of dicyandiamide to cattle on nitrogen-leaching losses from grazed pastures". Both were supervised by **Professor Louis Schipper** (Fig. 4).The NZSSS award for the best undergraduate student at Waikato University in soil science who has just completed a bachelor's degree was presented to **Francis Garrity**, now enrolled in a masterate programme in 2016 (Fig. 5). The conference ended with the cutting of a commemorative cake especially baked for the meeting to acknowledge the importance of 2015 as the International Year of Soils (Fig. 6).

Fig 4. *Tim Norris (left) and Dr Brendon Welton (right) with Prof Louis Schipper in the middle. Photo: David Lowe*

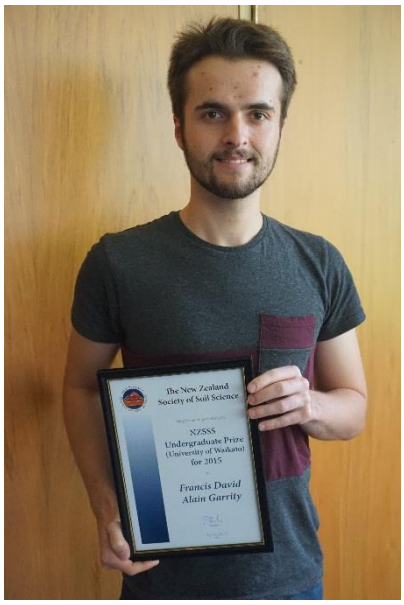


Fig 5. *Francis Garrity. Photo: David Lowe*

Fig 6. *Prof Richard McDowell (left), Dr Reece Hill (middle), and Dr Megan Balks (right) cutting the cake commemorating 2015 as the International Year of Soils. Photo: David Lowe.*

Doctorates completed
We are delighted to congratulate four postgraduates who have successfully completed their PhD theses over the past 2 to 8 months or so: **Dr Electra Kalaugher**, "Adaptation of New Zealand dairy farms to climate change: an integrated, farm-level analysis" (Electra is now with Landcare Research in Lincoln); **Dr Jordan Goodrich**, "Magnitude and controls on the net carbon balance of a New Zealand raised bog" (Jordan has a postdoc position in San Diego); **Dr Yu-Tuan (Doreen) Huang**, "Studies on carbon and DNA preservation in allophanic soils and paleosols on Holocene tephras in New Zealand" (Doreen is now undertaking DNA-soil postdoc work in Umea, Sweden); and **Dr Sam McNally**, "Carbon inputs from roots of two contrasting pasture swards" (Sam is currently working as a postdoc for Plant and Food Research at Lincoln; part of this role will see him continuing to work with the Waikato soils group). These students, all of whom published papers during their doctoral studies, were supervised by one or several of **Prof Louis chipper, Associate Prof Dave Campbell,** or **Prof David Lowe**, with great support from associate supervisors at Waikato and from other institutions both in New Zealand and overseas (including **Dr Jock Churchman**, University of Adelaide, for Doreen Huang's thesis).

Masterates completed
Relatively few mastertate theses involving soils were finished by late February this year (plenty in the pipeline, though): **Adrea Noyes** submitted her thesis entitled ""Soil recovery on landslides in hill country at Whatawhata Research Station, western Waikato, New Zealand" (chief supervisor Megan Balks); and **Remedy Loame** "Using a tephrostratigraphic framework to determine the past 40,000 years of rupture and paleohydrothermal activity on the east strand of the Whirinaki Fault, Ngakuru Graben, central Taupo Volcanic Zone" (chief supervisor David Lowe/Dr Adrian Pittari, with support from GNS Science).

Congratulations!
University of Waikato technician **Aaron Wall** won the Hill Laboratories Laboratory Technologist Award at the August 2015 KuDos Hamilton Science Excellence Awards. Aaron is a key member of the Waiber soil group's (collaborative) project that aims to mitigate soil carbon losses and increase gains in soil carbon by adjusting management practices.

Megan Balks, with co-author **Prof Darlene Zabowski** of University of Washington and support from graphic designer **Marianne Coleman**, submitted her book, provisionally entitled "Celebrating Soil", to Springer Publishers in mid-2015. Megan and Darlene have written a wonderful, profusely illustrated, global view of soils. Watch this space…

David Lowe spent the second half of 2015 on sabbatical leave, in part based in the UK where he worked on writing papers, editing, applying for funding, and undertaking preparations for a book on tephrochronology with **Prof Nick Pearce** (Aberystwyth University). He spent time also with **Prof Siwan Davies** and her tephra group at Swansea University with an eye to new research involving micro-tomographic analysis of tephra layers in lake sediments and other potential applications (Fig. 7). Enroute to the UK, David attended the INQUA Congress in Nagoya in July-August 2015. His report on the conference to the Royal Society of NZ, whom he represented in the International Council at the congress (with **Dr Alan Palmer**), is available on David's ResearchGate site. The conference with nearly 1800 delegates began with the emperor and empress of Japan attending the opening ceremony. Involved with the Southern Hemisphere SHAPE project, David was also busy co-convening tephra sessions under the auspices of the International focus group on tephrochronology and volcanism (INTAV), and he organised a business meeting of INTAV of which he was president from 2011-2015 (currently immediate past-president). David was extremely thrilled and humbled to be nominated by NZ Quaternarists and awarded an honorary life fellowship of INQUA for his research achievements and involvement with INQUA, especially his work with the tephra group which he began in

1987 when he attended the INQUA congress in Ottawa. Fittingly, contemporary **Prof Brad Pillans** (ANU), formerly at Victoria University of Wellington, was also awarded an honorary life fellowship in Nagoya (nominated by Australian Quaternarists) (Fig. 8).

Fig 7. *David Lowe at an outcrop called Craig Rhos-y-Felin in north Pembrokeshire, SW Wales, UK, identified as the primary source of the "bluestones" found at Stonehenge. Photo: Nick Pearce.*

Fig 8. *Nearly half the AQUA participants at Nagoya, with many sporting new AQUA t-shirts. Photo: AQUA website.*

In November last year, **Dr Tanya O'Neill** (teaching fellow at Waikato) was invited to speak alongside sound and intermedia artist Phil Dadson at the TSB Wallace Arts Centre. The talk, 'Touching Base: Art and Science on Antarctic Desert Pavement' was part of a 3-month long

Antarctic exhibition *Elusive Earth: Refined Images of Antarctica*, which features representations of Antarctica by seven contemporary New Zealand artists, who have travelled to the continent with assistance from Antarctica New Zealand under the Artists to Antarctica Programme. The aim of the exhibition talk was to come at the intricacies of the desert pavement from their own particular angles and expertise as Tanya and Phil discussed aspects of their research work in the McMurdo Dry Valleys of Antarctica. Somewhat more prosaically, Tanya is delivering Louis' 2nd year soils course in the first semester this year while he is on leave.

Other staff and student activities

Louis Schipper is spending time at Landcare Research in Hamilton on sabbatical (for the first half of 2016) working on papers and proposals. He is finishing editing a special issue of *Journal of Environment Quality* entitled "Moving Denitrifying Bioreactors beyond Proof of Concept". The lead editor is **Laura Christianson** who visited Massey University some years ago as a Fulbright scholar. This special issue is targeted for publication in May 2016 and will contain some 15 papers focussed on recent developments in application and testing of denitrifying bioreactors for nitrate and pathogen removal from water leaving agricultural systems and from wastewaters.

At the end of last year, Louis and **Jack Pronger** (PhD student) attended the America Geophysics Union in San Francisco. Louis presented work by **Jasmine Robinson** (MSc student currently completing) on latest development in the new theory of temperature dependence of soil biological processes. Jack presented on farm-scale evaporation losses measured using eddy covariance at three sites demonstrating very low spatial and temporal variation in losses. Louis has been working with **Angela Schipper** on developing further primary school resources that support teachers and their students to dig holes to explore the below ground world (see story elsewhere in this issue of "Soil News").

Megan Balks is supervising **Sylvia Sabbagha** (Fig. 9) for a project characterising both physically and chemically a range of Organic Soils (on peat) in the Waikato area for masterate project with Waikato University and AgResearch. Her main aim is to examine how pasture response to nitrogen fertiliser varies between Organic Soils at different stages of agricultural development.

Fig 9. *Sylvia Sabbagha in the field. Photo: supplied.*

AgResearch Ruakura

In December, **Dave Houlbrooke** and **Natalie Watkins** attended the official opening of the new Overseer office in Wellington by the Primary Production Minister Nathen Guy. The opening was also an opportunity to launch the new Overseer strategy (http://overseer.org.nz/whats-new), describe the new Governance arrangements and introduce the new wider team that now supports the GM Caroline Read.

Also in December, **Gina Lucci** and **Mike Wilson** (pictured left) spoke at a Foundation for Arable Research (FAR) field day at the Northern Crop Research Site in Tamahere, Hamilton. Mike spoke about integrated management of slugs using slug baits, ploughing and biological control with nematodes that infect and kill slugs. Gina gave a talk on behalf of Trish Fraser (Plant and Food) on how grazing animals affect the distribution of nitrogen in the soil. Trish provided some brilliant visual aids with actual urine patch size and volume for sheep and cows.

In February, **Dave Houlbrooke** visited an innovative new dairy parlour near Whakatane with **Theresa Wilson** and **Logan Bowler** from DairyNZ. The farm, which is operated by the Law family Trust, has developed a low-water-use dairy effluent management system that includes a roofed yard with water capture and reuse. This method appears to decrease storage requirements on high risk soils that otherwise would require dairy effluent to be withheld from land application for significant periods in spring.

February was also when a large contingent of the team travelled down to sunny Palmerston North for the annual Fertiliser and Lime Research Centre workshop. **Stewart Ledgard**, **Jeerasak Chobtang**, **Bill Carlson** all presented papers.

Welcome to our newest Post Doc **Sandra Payen** from Montpellier, France. Sandra is Life-Cycle Analysis (LCA) scientist, working with Stewart Ledgard, and is part of the Nutrient Management and Environmental Footprinting Team based at Ruakura.

And last, but certainly not least, congratulations to **Brendon Welten** for the 2015 NZSSS Maurice Fieldes award for the most meritorious soil science PhD thesis conferred in the previous year.

Manawatu/Hawke's Bay

Plant & Food Research – Palmerston North

In November, **Brent Clothier** presented the Nyle C Brady Frontiers of Soil Science Lecture at the Annual Meeting of the Soil Science Society of America (SSSA) in Minneapolis. The Brady Lecture is the keynote address presented at the Awards Ceremony of the SSSA. Brent's talk was entitled "Soil: Natural Capital Supplying Valuable Ecosystem Services".

Kyle Robertson (summer student) has spent the summer working with **Karen Mason**, **Robert Simpson** and **Karin Müller** investigating relationships between enzyme activities and soil properties in Recent and Pumice soils, especially looking at factors associated with soil water repellency. Soil was collected in a field trip to the Hawke's Bay Region in November 2015. Unfortunately, the expected droughts of an El Nino summer did not eventuate so a second sampling in high summer was abandoned. Samples were analysed for physicochemical properties including: hot and cold water extractable carbon, total carbon and nitrogen, mineral nitrogen, Olsen-P and measures of soil water repellency. Enzyme activities measured included dehydrogenase, tyrosinase, peroxidase, sulphatase, monophosphatase and a suite of complex carbohydrate degrading enzymes. Relationships amongst the properties were explored using various statistical methods.

Kyle Robertson and Karen Mason collecting soil samples in Hawke's Bay.

Dr Céline Duwig, a soil scientist from the Institute for Research and Development in Grenoble, France, spent six weeks over summer with the Production Footprints team in Hamilton. Céline coordinates the European Union's Horizon H2020 research and innovation programme PROTINUS (PROviding new insighT into INteractions between soil fUnctions and Structure). Plant & Food Research is one of the five non-European research partners of PROTINUS. This visit was Céline's first secondment in New Zealand funded through PROTINUS. Together with **Karin Müller** and **Robert Simpson**, she designed and conducted experiments to analyse how carbon management practices in vineyards affect soil structure and colloid transport.

Celine taking intact soil cores in a vineyard in Hawke's Bay for measuring hydrodynamic properties of the soil in the lab using PFR's solute transport equipment SOLO.

University of Auckland and Plant & Food Research organized the first New Zealand based PROTINUS workshop 'in Auckland from 18-20 January 2016. The workshop was entitled 'Image analysis for soil structure characterisation'. The program featured papers covering topics from soil science to hydraulic engineering and from image analysis to modelling of soil processes at the pore scale and is published on the project's webpage http://www.protinus.ird.fr/content/view/full/226683.

International Water Summit, Abu Dhabi, 18-21 January 2016

The International Water Summit (IWS) was recently held in Abu Dhabi as part of their Sustainability Week (ADSW) in conjunction with the World Energy Summit and EcoWaste Exhibition. In 2015, some 32,000 people attended ADSW. This year's Conference was opened by Ban Ki Moon, Secretary General of the United Nations.

Plant & Food co-hosted a stand with Maven Consultants of Wellington at the IWS. Brent Clothier and Brian Ward manned the stand, along with Lesley Kennedy, the CE of Maven. The stand highlighted the two water projects that being carried out by **Brent Clothier** and **Steve Green** for Environment Agency Abu Dhabi (EAD). Maven are the project managers. Many people visited the stand, including Jeremy Clark-Waton, the NZ Ambassador to the UAE, plus Shane Jones, the NZ Ambassador for the Pacific, as well as school children who enjoyed eating the NZ apples that Brent Clothier was giving away. Shane Jones was interested in the work that Plant & Food is doing with Maori.

Brent Clothier handing out NZ apple samples to school children at the International Water Summit.

Plant & Food and EAD gave a 45-minute joint presentation at the IWS on "Sustainable Irrigation of Date Palms and Forest Trees using both Groundwater and Treated Sewage Effluent".

Plant & Food and EAD speakers during question period. From left-to-right: Shaikha Al Hosani, Executive Director (Environmental Quality), Brent Clothier, Ahmed Al Muaini (EAD & Massey PhD student), Wafa Al Yamani (EAD & Massey PhD student).

Wafa Al Yamani, a scientist with Environment Agency - Abu Dhabi, and a PhD student in the Plant & Food-Massey University Joint Graduate School, presented her confirmation presentation and report to Massey on 17th February. She was successful, and her provisional PhD registration is now confirmed. Wafa has been working on her PhD with **Brent Clothier** and **Steve Green** for the last year on irrigation of arid forests in the UAE using treated sewage effluent.

The Production Footprints team enjoyed the annual FLRC workshop at Massey. **Brent Clothier** gave an invited talk on water as a valuable natural asset, and **Trevor Jones** presented his work on drought tolerance and water-use efficiency of poplar clones. The team's work in Abu Dhabi was covered by two posters from the EAD scientists and Massey PhD students **Wafa Al Yamani** and **Ahmed Al Muaini**. **Steve Green** and **Roberta Gentile** had posters showcasing the water and nutrient management work in our aid project on avocados in the Central Highlands of Kenya. Summer student **Kyle Robertson** had the opportunity to present a poster on his summer project investigating the relationships between enzyme activities and soil properties in Recent and Pumice soils.

Steve Green, Wafa Al Yamani and Brent Clothier in front of Wafa's poster on irrigation of arid forests in the UAE using treated sewage effluent at the FLRC workshop.

Massey University, Palmerston North

Ranvir Singh and five Massey University post-graduate students attended the NZ Hydrological Society Annual Conference 'From Data to Knowledge' held in Hamilton in December 2015 and presented on-going research work. Three (out of a total five) best student presentations were awarded students from Massey University. Below are details of these students and their presentations:

1st Best Student Oral Presentation Award – Ms Heather Martindale
Masters Student in Environment Management. Main supervisor Dr Ranvir Singh (Senior Lecturer in Environment Hydrology and Soil Sciences), co-supervised by Dr Uwe Morgenstern (GNS Sciences in Lower Hutt):

Heather is investigating the use of Radon tracers for measurement of groundwater – river water interaction in New Zealand gravel-bed rivers. Radon is a soluble, colourless, gaseous, unstable isotope generated as part of the uranium decay series in almost all rocks and soils, resulting in the release of radon from uranium bearing minerals in groundwaters. Surface waters which have elevated concentrations of radon indicate a location where groundwater is discharging into the surface water. Her presentation focused on using this naturally occurring isotope, Radon, to map where groundwater was being discharged into the Hutt and Mangatainoka Rivers. She also compared radon measurements with concurrent stream flow gauging as tools for measuring groundwater discharge patterns and showed that the dynamics of gravel bed rivers are not as well captured by concurrent flow gauging alone.

Heather also won best poster award last year at the the Joint Conference for the NZ Hydrological Society, NZ Freshwater Sciences Society and IPENZ Rivers Group '2014 Water Symposium – Integration: The Final Frontier', November 24-28, 2014, Blenheim, Marlborough.

3rd Best Student Oral Presentation Award
Mr Ahmed Elwan, PhD Candidate in Soil and Earth Sciences. Main supervisor Dr Ranvir Singh (Senior Lecturer in Environment Hydrology and Soil Sciences), co-supervised by Dr Jon Roygard (Horizons Regional Council):

Ahmed is investigating influences of different hydrogeologic settings on spatial and temporal nitrogen attenuation capacity and land-based nitrogen loads to rivers in the Manawatu river catchment. He presented a novel approach to calculate land-based river nitrogen loads using estimates of nitrogen attenuation capacities of different soil and rocks combinations in the catchment. This novel hydrogeologic model is based on the magnitude and spatial variability of the nitrogen attenuation factor for different subcatchments in the Tararua Groundwater Management Zone. Based on this study, it is recommended that regional councils and policy makers take account of spatial and temporal variation of nitrogen attenuation capacity in subsurface environment when formulating policies for productive and sustainable land use practices across agricultural catchments.

Ahmed also won best student oral paper award last year at ASABE Conference organized in Hamilton, Nov. 2014.

Best Poster Presentation – Mr. Andrew Neverman
PhD Candidate in Physical Geography. Main supervisor Dr Ian Fuller (Associate Professor in Physical geography), co-supervised by Dr Ranvir Singh (Senior Lecturer in Environment Hydrology and Soil Sciences):

Andrew presented his poster entitled, 'Can substrate stability data be used to increase our knowledge on cyanobacterial growth in New Zealand rivers?'. This poster presented results from a collaborative project with Tara McAllister from University of Canterbury, examining the relationship between substrate stability and cyanobacteria biomass. A novel index is used to assess substrate stability through the assessment of a range of geomorphic and hydraulic variables. Stability results are compared to 30 weekly Chlorophyll a and Ash-free Dry Mass values at 8 sites. Substrate stability was found to have a negative relationship with maximum Chlorophyll a, suggesting substrate stability may act as a limiting factor for cyanobacteria biomass.

From left to right – Clare Houlbrooke (Golder Associates – award sponsors), Ahmed Elwan, Heather Martindale and Ranvir Singh (Massey University), Joseph Thomas (President, NZ Hydrological Society) and Andrew Neverman (Massey University).

Staff from New Zealand Centre for Precision Agriculture, have been working on the spring campaign of the Primary Growth a Partnership Project: 'Pioneering to Precision' and are still carrying out calibration and validation work on a number of farms in both the North and South Island. The project objective is to of use remote sensing to better inform fertiliser placement.

The team have also been working with Ravensdown to improve the accuracy of fertiliser placement through aerial topdressing. Again a great deal of testing has been completed in order that variable rate application can be achieved from the air in order that fertiliser distribution from an aircraft can be more tightly controlled. An extensive field trial programme has been deployed with the last trial taking place in December 2015. The work has been lead and carried out by Professor Ian Yule, Dr Miles Grafton and Sue Chok who is completing her PhD as part of the project. For a link to TVNZ story on this project Click Here.

The team have are also continuing their work on using UAV's both Multirotor and fixed wing to measure pasture and create accurate digital terrain maps which help build a detailed picture of our farm environment.

Massey University, along with scientists from other New Zealand research organisations, has contributed to a report issued by the Intergovernmental Technical Panel on Soils. Associate Professor Marta Camps Arbestain, was the representative of the South West Pacific Region, along with Dr Neil McKenzie from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia. The Status of the World's Soil Resources intends to constitute the reference document on the status of global soil resources with a strong regional assessment on soil change. The information is based on peer-reviewed scientific literature, complemented with expert knowledge and reliable project outputs. It provides a description and a ranking of ten major soil threats that endanger ecosystem functions, goods and services globally and in each region separately. Additionally, it describes direct and indirect pressures on soils and ways and means to combat soil degradation at all levels. The full report can be viewed at: http://www.fao.org/globalsoilpartnership/highlights/detail/en/c/357163/

The 29th Annual FLRC workshop was held on the 9th-11th February and this year was titled 'Integrated Nutrient and Water Management For Sustainable Farming'. In all, there were 97 presentations (both oral and by poster) during the three days of the workshop and more than 280 delegates, representing universities, CRI's, fertiliser industry, private consultancies, DairyNZ, Fonterra, regional councils and national policy-makers in New Zealand attended. Invited presentations were given by:

Dr Cameron Gourley, DEDJTR, Ellinbank, Australia
Dr Thomas Nemecek, Institute for Sustainability Sciences, Zurich, Switzerland
Dr Stewart Ledgard, AgResearch, Hamilton
Mr Nathan Heath, Hawkes Bay Regional Council, Napier
Dr Brent Clothier, Crop & Food Research, Palmerston North, and
Mr Andrew Curtis, Irrigation NZ, Christchurch.

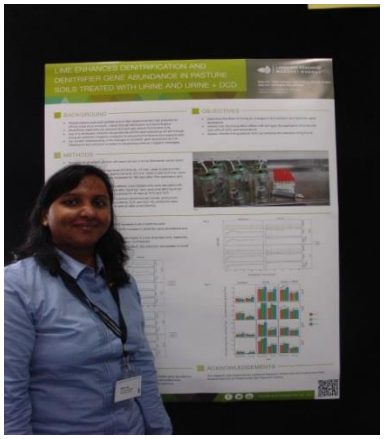
There were many excellent presentations and it was good to see so much positive work going on in this space.

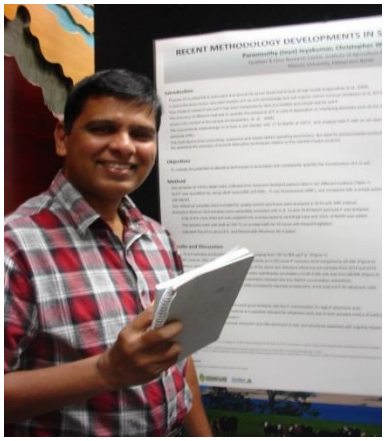
The event is always very well supported by many organisations who provide financial support that allows for presentations by invited speakers, involvement of students from several universities and enables registration costs to be kept to a minimum. This year there were 40 students who attended free of any registration fees – representing 6 of the 8 New Zealand Universities. Many students presented snapshots of their work at the workshop.

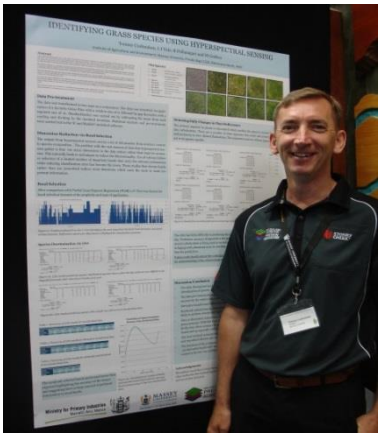
A feature of the FLRC Workshops is the opportunity for worthwhile discussion with a wide range of stakeholders involved in sustainable agriculture within New Zealand and internationally. Discussion sessions within the programme are preserved through good timekeeping by the Chairmen and in addition to the 'formal' discussion, many networking opportunities are available to delegates throughout the three day event. The dinner in the marque at Wharerata was attended by more than 150 delegates who enjoyed the typical 'balmy Palmy' weather – with lovely warm days (and nights) throughout the three days.

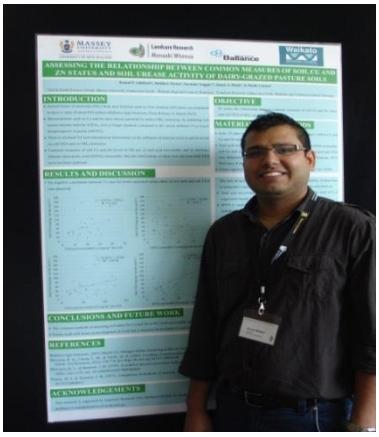
At time of writing, the organisors are receiving the written manuscripts of all presentations which will be loaded to the FLRC website (http://flrc.massey.ac.nz), constituting the 'Proceedings' of the event.

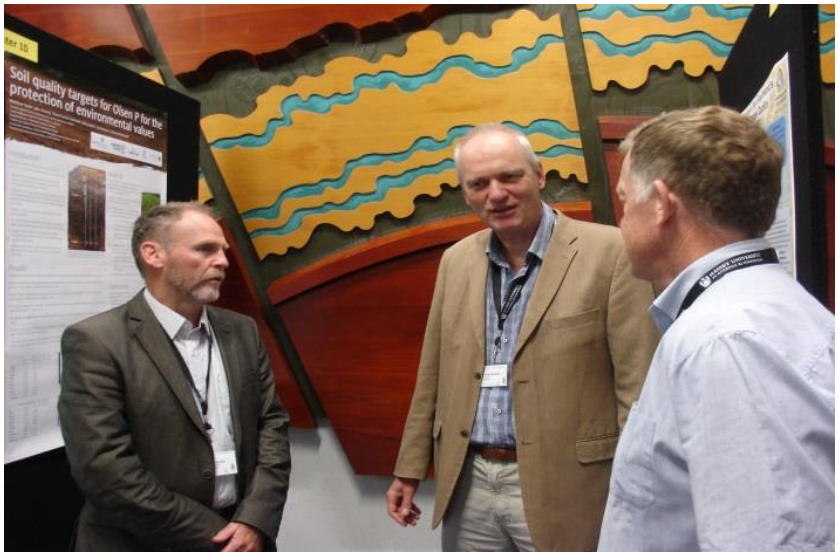
Some photos from the Workshop are included here:











Lucy Burkitt and **Ranvir Singh** recently hosted Phil Jordan, Professor of Catchment Science at Ulster University in Northern Ireland in Palmerston North. Phil's visit was part of a C. Alma Baker Travel Fellowship awarded for a joint project between the trio. As part of the collaboration, Phil has kindly loaned Massey University a high frequency nitrate sensor (Nitratax) for a year, which in collaboration with Horizons Regional Council (HRC), has been installed at one of HRC's monitoring sites in the Manawatũ River, near the Fitzherbert Bridge.The first step, will be to validate the sensor and examine changes in nitrate concentrations in the Manawatũ River for a 6 month period, then move the sensor to a local stream of higher known nitrate concentration. It is expected that the high frequency data will give us a more detailed understanding of the diurnal and seasonal changes in nitrate concentration at these sites.

Left to right: Paul Peters (Horizons Regional Council), Prof Phil Jordan (Ulster University) and Genevieve Smith (Massey University Honours student) examine the pumping equipment at the HRC monitoring site near the Fitzherbert Bridge in Palmerston North.

Landcare Research, Palmerston North

While Soil Scientists in New Zealand celebrated The International Year of Soils with the launch of the website www.ilovesoil.kiwi; distribution of "I LOVE SOIL" stickers, brochures and posters at the NZ National Agricultural Fieldays®; regional soils days; and the release of the "Future Requirements for Soil Management in New Zealand". **Surinder Saggar** celebrated by training the Government and University agricultural researchers of one of the poorest Southeast Asian country Lao (also called Laos or Lao PDR) which is a small (236 800 km2), largely mountainous, land-locked country with a population of 6.8m. This training involved lectures, laboratory and field work to assist the trainees in understanding the significance of soils in the development and implementation of best management practices to increase rice productivity in a sustainable way by mitigating nutrient losses from through climate smart agricultural practices including improved resource use efficiencies. Lao is increasingly suffering from environmental problems, with deforestation a particularly significant issue, as expanding commercial exploitation of the forests, plans for additional hydroelectric facilities, foreign demand for wild animals and more cropped products for food, and a growing population all create increasing pressure.

Soil sampling, description and characterisation (Soils Day 5th December 2016)

Soil processing and analyses (Soils Day 5th December 2016)

Soil water measurement studies

End of the mission

Canterbury

Plant & Food Research, Lincoln

Dr Wei Hu has accepted the position of scientist (Environmental Physics) in the Land Management team of the Soil Water and Environment science group, starting late February. Dr Hu graduated with a BSc degree specializing in agricultural resources and the environment from the Northwest Agricultural & Forestry University in Yangling, Shaanxi Province. The Northwest Agricultural & Forestry University is one of China's leading universities and the only educational institution in China that is completely dedicated to the disciplines of agriculture, forestry, and water science. Dr Hu's MSc degree (Ecology) was completed in the Institute of Soil and Water Conservation and his PhD degree (Soil Physics) was completed in the Institute of Geographic Sciences and Natural Resource Research, both in the Chinese Academy of Sciences. His research focussed on spatial-temporal variability of soil water content and hydraulic properties at hillslope and watershed scales and the influence of soil type, vegetation and topographic features. After completing his PhD degree, Dr Hu was briefly employed as an assistant professor in the Institute of Geographic Sciences and Natural Resource Research of Chinese Academy of Sciences before taking up his current position as a Professional Research Associate in the Department of Soil Science at the University of Saskatchewan in October 2013. Dr Hu has published more than 40 scientific journal articles and has delivered several international conference presentations. He has also served as the principal or co-investigator on several government funded research programmes.

Lincoln University

Peter Almond has been out with PhD student Monica Bucci north of Christchurch city near Kaiapoi doing more liquefaction research. Peter and Monica have been joined by Pilar Villamor and Will Rees of GNS documenting the styles of liquefaction manifestation in areas of dune sand. This is an extension of the work they have completed in areas of fluvial geomorphology near Lincoln, and complements the work they did last summer in areas of human modified dunes at Wainoni and QE II Parks in the city. One of the main findings is that liquefaction manifests very differently in sandy compared to silty or clayey soils. The sand country appears to produce large isolated eruptions of liquefied sand in contrast to the long linear sand boils of the fluvial country. The low coherence of the sand soils also seems to cause much more injection of liquefied sand into the soil producing thick dikes and sills. The liquefied sand also appears to inject into soil A horizons splitting them and producing complex soil stratigraphy.

We farewell Dr **Nimlesh Balaine** who has gained a prestigious 2-year postdoctoral position in the Plant Science department of UC Davis. Nimlesh has been with the Department of Soil Science since 2008, first as a PhD student and subsequently as a postdoctoral fellow and research associate. We wish her all the best for her future endeavours.

The Department of Soil Science would like to welcome **Engracia Madejon** from the Institute of Natural Resources and Agrobiology of Seville, Spain. Engracia is here on a 6-month sabbatical working with Brett Robinson and Nick Dickinson.

A trio of Centre for Soil and Environmental Research PhD students; **Peter Carey, Roshean Woods** and **Ana Carlton** went to the FLRC conference at Palmerston North this week to present research from their respective studies. Peter presented "Can a winter-sown catch crop reduce nitrate leaching losses after winter forage grazing" Anna Carlton presented a poster on

"The effect of optimum vs. deficit irrigation on plant nitrogen uptake and nitrate leaching loss from soil", Roshean Fitzgerald presented "Does gibberellic acid reduce nitrate leaching losses from animal urine patches?"

Trish Fraser and **Craig Tregurtha** presented at the FAR Arable Research in Action Day at Chertsey in December. Trish discussed the losses of nitrogen and other nutrients following grazing, and how the choice of crop can impact on losses. She gave a graphic demonstration of what a cow urine patch looks like when the N in the urine is simulated with urea at 1200 kg N/ha! Trish then described research that is underway to assess the value of different crops to recover N. Craig discussed the effects of soil compaction and disease on potato yields, revealing that yields in Canterbury have peaked at 50-60 t/ha, well short of the modelled potential yield of nearly 90 t/ha. This yield gap is occurring despite increased inputs in irrigation and disease control. It was found that background effects from compaction and powdery scab affected the yields of some crops but all the monitored crops were affected by the soil borne pathogen Rhizoctinia. Craig described the value to growers of digging a profile pit when the crop is near maturity to see how much the root system has been affected by compaction. He also indicated that destruction of the soil can happen very quickly especially with the use of destoners for bed preparation especially if the soil is too wet.

Trish Fraser describing the effects of cow urination to delegates at the FAR ARIA field day

Craig Tregurtha issues restricting potato yield in Canterbury

Craig Tregurtha with a profile pit

And to cap the day off perfectly, **Trish Fraser** was awarded the FAR Researcher of the year FAR in recognition of in recognition of her "ongoing contributions to research and extension which is linking government and industry investments to deliver significant benefits to NZ's arable farmers". Congratulations Trish!

Trish Fraser receives her FAR Researcher of the year award from CEO Nick Pyke.

And in typical style, Trish's award was celebrated back at Lincoln with cake!

Steve Thomas travelled to California and presented at a US:NZ Science Workshop

Thomas S, Clothier B, Mueller K, Sharp J, Brown H, Wallis D, Hedley CB, Carrick S, Roudier P 2015. *Maximizing the value of irrigation using smart soil and plant management decisions – a NZ research programme*.
US:NZ Science Workshop – Water Utilisation and Nitrate Management in Perennial Horticulture, October 2015, UC Davis, USA.

The Winter Forage Trial at Lincoln comes to an end in February. This experiment has satisfied objectives in the FRNL and Pastoral 21 programs. It has been a beast of a trial for the technical staff with a phenomenal amount of work being put in by a big crew. There was a very intensive period of work last July when the trial had a simulated grazing, with synthetic urine and mechanical treading treatments applied. Since then, there have been a myriad of measurements made, including greenhouse gas, nitrate leaching, soil moisture and temperature, crop biomass, soil porosity, bulk density, penetration resistance, and soil mineralisable nitrogen. A quick summary suggests that at least 29 staff have been involved in this trial, some for huge proportions of their year's workload to date. We've probably generated enough data to keep **Mike Beare** and **Steve Thomas** busy until their retirements!
Here's some pics of the WFT

WFT prior to harvest

Richard Gillespie operates a Wintersteiger Cibus forage harvester at the WFT

Treading a plot (foreground) and synthetic urine application (rear)

A treaded plot

Auto sampling gas chamber maintenance by Chris Dunlop and Gina Clemens (front) and mineral N soil sampling (rear)

The technical team for deep mineralisable nitrogen soil sampling L to R Craig Tregurtha, Sam Wilson, Sarah Glasson, Richard Gillespie, Mike Hirata, Gina Clemens, Peg Gosden, Frank Tabley, Weiwen Qiu, Chris Dunlop, Tony Johnson, Rebekah Tregurtha

Alex Michel organised a mini field day at the rainshelter facility in December where we showcased our current experiment investigating the effect of soil water deficit and nitrogen on canopy development and water extraction patterns of a spring sown feed wheat. Presenters included **Richard Gillespie** who described the history and operation of the shelter, **Mike George** discussed canopy light interception measurements (Greenseeker, Sunscan), leaf appearance and senescence rates, and biomass, Alex talked about the autologging TDR system for soil water measurement and calculation of crop water use, **Edmar Teixeira** summarised the session, discussing the objectives of the trial.

Richard Gillespie describes the rainshelter facility

L to R Edmar Teixeira, Mike George, and Alex Michel

Press Release: (summarised **by** Belinda Jeursen at Lincoln Uni)

Celebrating soils in the Hub

Scientists, students, local government and industry representatives gathered at Lincoln University on 2 December 2015 to celebrate the International Year of Soils at a workshop that focussed on the profound importance of soils globally and to New Zealand.

The New Zealand Society of Soil Science organised the workshop with the intention of bringing together Lincoln Hub partners, members of other local research institutions, industry bodies and regulatory authorities to talk about the management and protection of soil resources in New Zealand, where the growing intensity of farming is making soil-related issues more urgent.

Summing up the day's talks, Dr David Whitehead of Landcare Research said the workshop was an example of "smarter science", connecting across disciplines and sharing resources to find solutions to common problems. Dr Whitehead emphasised the importance of collaboration in the context of global climate change, saying innovation is required to transform agricultural systems and lower the environmental footprint of agriculture without losing productivity.

"New Zealand's livelihood and economy relies on the land. We need to keep doing research on soils. We need knowledge and good management to maintain our agricultural systems and be sustainable."

The diverse range of presentations at the workshop, covering irrigation, soil borne diseases, cultivation, grazing, plant-soil interactions, technology, dairy farming, nutrient loss and greenhouse gas emissions, illustrated the crucial role soil plays in every area of life and the need for cooperation to effect change.

Plant and Food Research's Dr Trish Fraser is a member of the Society of Soil Science and helped organise the event. "We wanted to organise the day to not only raise the importance of soil, but also for local researchers in the vicinity of the Lincoln Hub to become more aware of each other's' current activities in soil research, for the students to get a snapshot of the research activities going on in the locality, and also for any other interested members of the local community to come along and learn about soil."

A number of Lincoln PhD students are actively involved in soil-related research and presented their research findings at the workshop. Roshean Woods is looking into how plants can help reduce nitrogen loss from farms, while Gustavo Boitt is researching the nature and distribution of soil phosphorus under irrigated grazed pasture.

The International Year of Soils 2015, and the annual World Soil Day on 5 December, aim to raise awareness of the importance of soils for food security, agriculture, the mitigation of climate change, poverty alleviation and sustain.

Otago/Southland

AgResearch Invermay

Ross Monaghan and other members of the southern team have been busy collating data and drafting documents that summarise findings from the P21-funded dairy farmlet study at Telford (near Balclutha) that ran from 2011 to 2015. This research has identified a number of important and practical management decisions that reduce N, P and sediment losses to water without incurring large reductions in farm profitability."

Rich McDowell has been promoted to Chief Scientist of the Our Land and Water programme, which is a great achievement. He holds the role until 2019, at which point it's reviewed. Rich also recently spent 5 days contemplating and evaluating water quality, global food security and other topics of immediate interest while at a U.S. National Science Foundation-sponsored workshop feeling at home in the appropriately named McDowell mountains in the Arizona desert (see photos below). Sounds nice, but apparently everything was designed to nick, spike and bite you, which is why he was looked at sideways when walking in shorts… one afternoon.

Cecile de Klein and **Tony van der Weerden** attended the Greenhouse Gas and Animal Agriculture Conference in Melbourne in February, where they each presented poster papers. The conference provided an excellent opportunity to meet with others to discuss and develop future research programmes.

McDowell mountains, Arizona, where Rich attended a workshop on water quality amongst other topics.

The ranch (centre of photo) – location of workshop - in the middle of nowhere.

Enzymatic activity inside and outside of water-stable aggregates in soils under different land use

S. A. Garbuz, N. V. Yaroslavtseva, V. A. Kholodov
Eurasian Soil Science, №3, 2016 (in press)
http://www.maik.rssi.ru/en/journal/soilsci/

Abstract
A method is presented for assessing the distribution of enzymatic activity inside and outside of water-stable aggregates. Two samples of water-stable aggregates >1 mm have been isolated from dry aggregates of 1-2 mm. To determine the enzymatic activity, a substrate has been added to one of the samples without disaggregation, the other sample has been preliminarily disaggregated. Enzymatic activity within water-stable aggregates has been assessed from the difference between the obtained results under the supposition that the penetration of substrate within the water-saturated aggregates is hampered, and enzymatic reactions occur only at the periphery. The levels and distributions of enzymatic (peroxidase, polyphenol oxidase, and catalase) activities in water-stable aggregates of soddy-podzolic soils under forest and plowland and typical chernozems of long-term field experiments have been studied. The peroxidase, polyphenol oxidase, and catalase activities of water-stable aggregates vary from 6 to 23, from 7 to 30, and from 5 to 7 mmol/(g h), respectively. The ratio between the enzymatic activities inside and outside of soil aggregates has showed a higher dependence on soil type and land use, as well as on the input of organic matter and the structural state, than the general activity level in water-stable aggregates.

Nitrous oxide emissions from urea fertiliser and effluent with and without inhibitors applied to pasture

van der Weerden, T.J., Luo, J., Di, H.J., Podolyan, A., Phillips, R.L., Saggar, S., de Klein, C.A.M., Cox, N., Ettema, P., Rys, G. (2016).

Abstract: There is currently a limited number of New Zealand studies quantifying nitrous oxide (N2O) emission factors (EF1, N2O emissions as a percentage of N applied) for farm dairy effluent (FDE) and urea fertiliser. Therefore, two experiments were conducted in four regions of New Zealand to determine EF1 for FDE and urea fertiliser applied to pastures with contrasting soils and climatic conditions. Experiment 1 included urease and nitrification inhibitors to determine their effect on EF1. Urea treatments included (i) standard urea; (ii) urea amended with the nitrification inhibitor dicyandiamide (DCD) at 0.02 kg DCD kg-1 nitrogen (N) and (iii) urea amended with the urease inhibitor N-(n-butyl) thiophosphoric triamide (nBTPT) at 250 mg nBTPT kg-1 urea, while FDE was applied with or without DCD, at 10 kg DCD ha-1. Experiment 2 focused solely on FDE, which was applied to pastures that had either never received FDE or had a history of repeated application of FDE over several years. Urea fertiliser produced a large variation in EF1 values, ranging from 0.03% to 1.52%. Application of FDE resulted in EF1 ranging from 0.06% to 0.94% across both experiments. The urease and nitrification inhibitors had little or no effect on reducing EF1 from urea fertiliser and FDE application. The history of repeated applications of FDE to pasture also had no effect on EF1.

Agric., Ecosys and Environ., 219: 58-70.

Refining the New Zealand nitrous oxide emission factor for urea fertiliser and farm dairy effluent

van der Weerden, T.J., Cox, N., Luo, J., Di, H.J., Podolyan, A., Phillips, R.L., Saggar, S., de Klein, C.A.M., Ettema, P., Rys, G. (2016).

Abstract: Applications of urea fertiliser and farm dairy effluent (FDE) to New Zealand pastures are the second and third largest sources of nitrous oxide (N2O) emissions, after emissions from excreta deposited during grazing (urine and dung). New Zealand currently employs emission factors (EF1) (percentage of N applied which is emitted as N2O) of 0.48% and 1% for urea fertiliser and FDE, respectively, for calculating its national N2O inventory. The country specific emission factors for urine and dung are 1% and 0.25% respectively. Because FDE has a higher organic nitrogen (N) content than urea, and because it is a diluted mixture of urine and dung, the mean FDE EF1 is expected to be less than 1%. With a recent increase in research trials measuring EF1 for FDE and urea, the objective of this study was to refine New Zealand-specific EF1 values for these N sources. We analysed urea fertiliser and FDE N2O emission data from 45 EF1 field trials conducted in New Zealand. This meta-analysis yielded a combined (urea and FDE) EF1 mean of 0.46% (95% confidence interval of 0.07% and 0.90%), with EF1 means for urea and FDE of 0.59% and 0.25%, respectively. There was no statistical difference between urea fertiliser and FDE EF1 values. However, we recommend separate country-specific EF1 means of 0.6 and 0.3% for urea fertiliser and FDE, respectively, for New Zealand's agricultural soils N2O emissions inventory due to the different origin and characteristics of these N sources.

Agric., Ecosys and Environ., 222: 133-137.

The following are a selection of abstracts from the 29th Annual FLRC workshop at Massey University, on the 9 – 11th February 2016

The implications of intensification on nitrogen use and recovery in Australian dairy farms

Cameron J P Gourley[1] and Kerry J Stott[2]
[1]*Agriculture Research and Development Division, Ellinbank Centre, Department of Economic Development, Jobs, Transport and Resources, Ellinbank, Victoria 3821*
[2]*Agriculture Research and Development Division, Parkville Centre, Department of Economic Development, Jobs, Transport and Resources, Carlton, Victoria 3053*

There is increased international interest in the intensification of grazing-based dairy systems such as occur in Australia and New Zealand. However, associated with increased milk production is the potential for decreasing nitrogen (N) recovery and increased N losses to the environment. In this study we produced a 22-year time series of N recovery measures, for the entire Australian dairy industry and largest dairy producing State, Victoria, using a farm-gate N balance method and long-term farm survey data between 1990 and 2012. Nitrogen recovery measures included whole-farm N balance (kg N ha^{-1}), N use efficiency (%) and milk production N surplus (g N l^{-1} milk) and also total industry-wide N surplus (t N). On-going intensification in dairy production at both the national and state level has led to fewer and larger dairy farms, with increased stocking rates, reliance on imported feed, nitrogen fertiliser use and milk production per cow and per ha. All N recovery measures deteriorated markedly over the 22 year period examined, though the adverse trend has moderated somewhat since 2006. The Victorian industry was found to be higher-performing in terms of N recovery compared to the national

dairy industry as a whole, though there has been some convergence in the last decade. The whole-farm N surplus for the 'industry average' Australian dairy farm has increased from 54 to 158 kg N ha^{-1} and from 38 to 136 kg N ha^{-1} yr^{-1} for the average Victorian dairy farm, between 1990 and 2012. Nitrogen use efficiency for the average Australian dairy farm has declined from 40 to 26% while for the average Victorian dairy farm, the decline was from 51 to 29%. Milk production N surplus increased from 10.2 to 17.3 and 6.9 to 15.2 g N l^{-1} milk, for the average dairy farm in Australia and Victoria, respectively. Total N surplus has also increased from 63,076 to 164,621 t N for the Australian dairy industry as a whole, despite a decline of 470,000 hectares in land used in dairying, suggesting a growing problem in terms of higher losses of reactive N. Looking to the future, we examined a scenario whereby N use efficiency for Victorian dairy farms increased to 35% by 2030, in accordance with national dairy industry sustainability goals. This turn-around rests on an anticipated improvement in milk yield per cow and per hectare, delivered through further improvements in forage yields, bovine genetics and feed conversion efficiency. We conclude that achieving this whole-farm N use efficiency will be challenging within current grazing-based dairy farming operations. Improvements in N recovery will more likely depend on significant on-farm mitigation strategies incentivised by cost-effective policy measures and future technological advances stemming from strong public and industry investment in research and development.

Life cycle assessment of dairy production systems in New Zealand

Stewart Ledgard[1,3], Jeerasak Chobtang[1,2,3], Shelley Falconer[1] and Sarah McLaren[2,3]
[1]*AgResearch, Ruakura Research Centre, Hamilton*
[2]*Institute of Agriculture and Environment, Massey University, Palmerston North*
[3]*New Zealand Life Cycle Management Centre, Massey University, Palmerston North*

Life Cycle Assessment (LCA) is a standardised approach to evaluate resource use and environmental emissions of a production system or product. It covers multiple stages including raw material extraction, production of farm inputs and farm emissions (i.e. cradle-to-farm-gate stages), and can extend to milk processing, transport, consumer use and waste stages.

LCA has been applied in agriculture over the past decade to examine the total greenhouse gas (GHG) emissions associated with products such as milk. More recently it has been applied in assessing a range of environmental emissions. For example, the current European Product Environmental Footprinting initiative covers 15 environmental impact categories.

This paper reports on studies using LCA to evaluate effects of dairy intensification in New Zealand (NZ) covering cradle-to-farm-gate stages. Initial focus was on the carbon footprint of milk (total GHG emissions) and the effects of intensification using different brought-in supplementary feeds. This showed a large effect depending on type of feed, with highest emissions from use of palm kernel expeller. Results were compared with French dairy farm systems at varying levels of intensification using the same methodology (to provide an international comparison) and showed high efficiency of some NZ farm systems. Recent research extended the use of LCA to evaluate a wider range of environmental impact indicators (up to 12) across a range of farm intensification levels. This evaluation showed an increase in emissions per kg milksolids for the high intensification level compared to the low intensification level of 5-32% depending on the impact indicator, with the highest increase for Freshwater Ecotoxicity. The main factors affecting the different environmental impact indicators and mitigation benefits are discussed.

Overseer and phosphorus: strengths and weaknesses

C W Gray[1], D M Wheeler[2], R McDowell[3] and N L Watkins[2]
[1]*AgResearch, Lincoln Research Centre, Private Bag 4749, Christchurch, New Zealand*
[2]*AgResearch, Ruakura Research Centre, Private Bag 3123, Hamilton, New Zealand*
[3]*AgResearch, Invermay Agricultural Centre, Private Bag 50034, Mosgiel, New Zealand*

Increasingly decision support tools such as OVERSEER® Nutrient Budgets (OVERSEER) are being used by consultants and policy makers to estimate the likely effects of land management practices on off-farm losses of nutrients, for nutrient allocation, and decisions in policy relating to nutrient management. OVERSEER estimates phosphorus (P) loss, but the P model in OVERSEER has come under scrutiny. The aim of this paper is to highlight how well OVERSEER currently estimates phosphorus (P) loss from farming systems, along with comment on some of its perceived weaknesses and recommendations for improvements to P modelling in OVERSEER.

The core of the P loss submodel was developed and integrated into OVERSEER a decade ago. It accounted for most combinations of P loss from pastoral agricultural systems. However, some agricultural systems were not included due to a lack of data at the time of the submodel's development. Since then, new research has been undertaken on P loss from agricultural systems, some of which has been integrated into the P loss submodel. A number of additions and changes to other submodels in OVERSEER, which directly affect P loss have also occurred. Currently, comparison between measured P losses from 46 sites with different landuse (dairy, deer, forest, sheep/beef and mixed), at a range of scales (<1 ha plots to catchments) indicate OVERSEER can predict P loss reasonably well (R^2 >0.80; P<0.001).

However, despite the good prediction of P loss, there are modifications that could be made to OVERSEER to improve P loss estimates. It is recognised that some agricultural systems are currently inadequately modelled e.g. arable cropping, cut and carry, and fodder crop. Some individual components of farm systems could be considered for inclusion or updated in OVERSEER, for example losses from farm structures. There is also an opportunity for the standardisation of the estimation of P loss via runoff and leaching, and separate reporting of P losses via different pathways. Consideration of new features in OVERSEER could include a better estimation of P loss from sediment, estimation of P removal in wetlands, and for the model to increase its spatial and temporal capability.

Interpreting pasture eaten and pasture growth estimates from overseer and what to look for when comparing them with other measured and modelled estimates

Chris Glassey[1], Diana Selbie[2] and David Wheeler[2]
[1]*DairyNZ,Hamilton*
[2]*AgResearch, Hamilton*

Background:
Overseer nutrient budgets for DairyNZ farmlet trials produced pasture eaten/ha and pasture growth/ha estimates that differed from actual measured estimates. We investigated what factors were important for generating these differences between estimates, and what assumptions and information needs to be checked for improving and verifying estimates.

Why is this important?
Nutrient loss predictions from Overseer are strongly linked to the volume of pasture and other feeds used per ha by the farm animals. Overseer users also potentially have a variety of other estimates of pasture use per ha available to them e.g. individual paddock yield measured on farm, DairyBase, and FarmMax modelling. Some of these estimates are made using similar model predictions. Overseer users are asking what degree of difference between estimates is tolerable, and which estimates can be used reliably for farm management purposes.

While it may not be possible to align all these estimates our view is that some key input assumptions should be checked for alignment between estimates before any conclusions are made on their reliability and accuracy.

Factors to check (from our experience):
Assumed pasture utilisation %. In our case pasture utilisation was different to the Overseer default.
Assumed wastage and utilisation of supplements
Quantity of supplements fed
Quality of supplements fed
Assumed energy (ME) profile of pasture

Description of an outdoor pig model for overseer

David M Wheeler[1], Ian W Barugh[2] and Patrick C H Morel[2]
[1]*AgResearch, Hamilton*
[2]*Institute of Veterinary, Animal and Biomedical Sciences,*
Massey University, Palmerston North

To provide an estimate of nutrient flows within an outdoor pig farm, an outdoor pig sub-model has been developed that is consistent with the scope of OVERSEER® Nutrient Budgets (OVERSEER). In developing the model, the first consideration was estimating feed intake, in particularly the grass component and understanding the effect of management on nutrient flows. The primary focus was on nitrogen (N). Initial modelling indicated that the amount of excreta dung and urine was dependent on the amino acid composition of the feed, and that grass amino acid composition was close to optimum for minimising the amount of urine excreta N. Grass protein is poorly digested by pigs, leading to increased faecal excretion. However, feeding regimes are highly controlled as feed amount and quality, including amino acid composition, is critical for production. Given the controlled feeding regimes, management practices had the largest effect on nutrient losses, and the focus has been placed on modelling the latter.

The model is based on the number of animals and performance using standard industry inputs. The amount of feed brought in and its quality is user defined, and defaults are available. Utilisation (including bird loss) is defined by the feeding method. The outdoor pig unit is divided into management areas (areas for lactating, mating, and growers and finishers, and an acclimatisation area for replacements). Sows use huts, and can be placed in village's pre or post farrowing, and any pig class can be placed in sheds or barns as a means to reduce excreta deposition on the block. The model includes waste management options for the bedding and excreta from each form of housing. The nutrient flow and excreta deposited in each management area is estimated. For N, leaching losses where highly dependent on the stock density (the amount of feed intake) and the amount of pasture cover. Pasture cover is dependent

on management (for example, stock density, placement and movement of troughs and huts, nose ringing) and hence pasture cover for each management area is an input.

This paper describes the developed outdoor pig model.

Case studies using the outdoor pig model in overseer®

Ian Barugh[1], David Wheeler[2] and Natalie Watkins[2]
[1]*Institute Veterinary and Biomedical Sciences, Massey University*
[2]*AgResearch , Hamilton*

Regional Councils have signalled that the primary method of recording nitrogen leaching rates will be through the use of OVERSEER® Nutrient Budget (OVERSEER). While indoor pig farms in NZ can be modelled using OVERSEER®, outdoor bred pigs, which comprise 40% of NZ production, until recently could not. A NZPork and Sustainable Farming Fund funded project set out to integrate outdoor pigs into OVERSEER®. Outdoor farms require low rainfall and free draining soil and as such are situated in Canterbury. Farms are different for a variety of reasons including soil type, rainfall, farm and land area under pigs, stocking rate, ground cover, productivity and feed type. Development of the outdoor module required inputs limited to the key parameters that were easy to obtain, and where possible assumptions and default figures were used. Case studies were undertaken on two farms using a development version of OVERSEER. Farm 1 had total area of 196ha of which 65 ha running 900 sows, 106 ha pastoral with sheep and dairy grazers, 15 forestry and the balance being housing and sheds. The soil was Lismore silt loam, annual rainfall of 717mm and sow feed intake of 1.53 tonne /sow/year. OVERSEER determined a nitrogen (N) leaching rate of 14 kg N /ha over the whole farm and 33 kg N/ha under pigs.

Farm 2 had 118ha, of which 13 ha was running 390 sows, cattle on 73.8 ha, fodder beet and green oats on 23.2 ha and lucerne on 6.5 ha. Timaru and Rakaia soils with average rainfall of 554mm and feed intake/sow/year of 1.45 tonne. The predicted whole farm N leaching rate was 25 kg/ha and under the pigs 71 kg/ha.

For these two farms the inputs were varied to highlight the key influencers on N leaching. These were ground cover, stocking rate and rainfall, followed by feed make up and usage, with productivity factors such as weaning weight, sow performance, replacement rates having less effect.

Relationship between shoot and root nutrient concentrations for a range of temperate pasture and cereal species

David M Wheeler
AgResearch, Hamilton

When modelling pasture uptake, there is little data on the contribution of roots to total nutrient uptake by the plant. This requires an estimate of root growth and root nutrient concentrations. A series of experiments have been undertaken for a range of temperate pastures species (grasses and legumes) and cereals grown in low ionic strength solution culture in which shoot and root nutrients concentrations have been measured. The relationship between shoot and root nutrients concentrations were determined using regression analysis. There were significant ($P<0.05$)

differences in the relationships between the grass and cereal species (monocotyledons) and the leguminous species (dicotyledons). In general, for a given shoot concentration, grass and cereal species generally had higher root concentrations of magnesium (Mg), iron (Fe), and aluminium (Al), and leguminous species generally had higher root concentrations of nitrogen (N), sulphur (S), potassium (K), and manganese (Mn). All root nutrient concentrations increased linearly with shoot concentrations, except for K where there was a biphasic relationship. For both groups (temperature pasture and cereal species, and legumes), root sodium (Na) concentrations were higher than shoot concentrations, with the relationship between shoot and root concentrations depending on the form that Na was added. For legumes N, S, P, Mn, zinc (Zn), copper (Cu), and Fe concentrations, root concentrations for a given shoot concentration were lower when root K concentrations were <3%. Including other nutrients in the regression analysis did not significantly improve the relationship except in wheat, where increasing root Ca concentrations increased root Mg concentrations, and increasing root Ca concentrations increased root Mg concentrations. The results from this study give an empirical method of estimating the distribution of root and shoot nutrients when modelling nutrient flows in pasture.

Determination of nitrogen fertiliser requirements in dairy production systems based on early indicators

Iris Vogeler[1] and R Cichota[2]
[1]*AgResearch, Hamilton*
[2]*AgResearch, Lincoln*

Early estimates of nitrogen (N) fertiliser requirements are desirable to ensure an adequate N supply for targeted pasture growth, as well as to minimise N losses. High spatial and temporal variability of both N supply by the soil and demand by the plant means that synchronising these is very challenging, and early indicators are lacking. To manage this variability in N requirements by plants effectively, various methods have been developed to determine optimum fertiliser application rates based on the N nutrition status of the plant. The use of remote sensing for mapping spatial variations in crop N status offers potential for fertiliser management practices tailored to spatial variability in the field, which can improve nitrogen use efficiency and thus lead to environmental and economic benefits.

To determine optimum N fertilisation rates which will maximize plant growth based on the pasture N content and environmental conditions, a simulation study using the Agricultural Production Systems Simulator (APSIM), was set up. The APSIM model, with a refined version of the pasture module (AgPasture), which allowed N remobilisation to occur from all the different tissue stages, was used for an irrigated ryegrass pasture in the Canterbury region of New Zealand. Simulations comprised 10 different fertilisation rates (ranging from 10 to 100 kg N/ha), which were applied every month at alternating rates, resulting in 90 different fertiliser treatment combinations. These were run for 20 consecutive years, giving a total of 1800 combinations of pasture N contents and pasture growth responses for each month. Based on statistical analysis, the optimum N fertilisation rate dependent on pasture N content and environmental conditions was determined. For example in October, optimum fertilisation rates at which 90% of the maximum yield was achieved were estimated to be 160 kgN/ha if the pasture N content was below 2.4%. However, at much higher pasture N contents (between 3.6 and 4%) only 60 kg N/ha was required to obtain the same yield, reflecting the much higher supply of N by the soil.

The approach using pasture N content and environmental conditions as early indicators for guiding N fertilisation offers potential for improved management of the spatial and temporal

variability in N demand and supply. Further model testing under different conditions and linked with experimental studies are required to test this approach.

Design of a low cost winter stand-off pad for reducing nutrient losses to water from winter forage crops grazed by dairy cows

J Chrystal[1], R Monaghan[1], M Hedley[2] and D Horne[2]

[1]*AgResearch, Invermay*
[2]*Massey University, Palmerston North*
Email: jane.chrystal@agresearch.co.nz

Dairy cow wintering in Southern New Zealand most commonly involves grazing brassica crops *in situ*. This system is relatively low-cost compared to alternative wintering systems, such as barns and wintering pads, due to: the low cost of the feed, low labour requirement, no structure needed, and no effluent storage required. However, grazing at high stocking densities during winter, combined with high winter rainfall and excessively free-draining soils or heavy soils and sloping land can result in high contaminant losses (N, P, *e.coli*, sediment) to water. This wintering practice is increasingly coming under scrutiny from those who are seeking alternatives to reduce these losses. Current alternatives are high cost and require feed to be brought to the animals at further cost. Therefore, a low-cost stand-off that reduces contaminant losses to water, whilst utilising the low cost brassica crop as a feed source, is urgently sought. This trial investigated the feasibility of a portable pad system that consists of an impermeable liner to capture effluent, overlain by a suitable surface for cow comfort and durability. Cows graze the brassica crop *in situ* and return to the portable pad for a proportion of the day. The portable pad has the ability to be moved around the farm in different years as the location of the forage crop paddock changes. Minimal effluent storage is required due to the application of the liquid effluent to a neighbouring pasture during winter using low rate and low depth application methods. This paper describes the first stage in the evaluation of this system where the objectives were (i) to determine if a portable pad could be constructed that captured the excreta and rainfall deposited on the pad surface and (ii) to find a readily-available commercial product suitable for the cow comfort layer. Of the 3 surfaces trialled, a geotextile 'carpet' was selected as the surface of choice to be used in further trials. The concept of effluent capture and the use of a low-cost plastic liner overlain with a cow comfort layer was a success and proved worthy of further investigation.

Volumes and nutrient concentrations of effluent products generated from a loose-housed wintering barn with woodchip bedding material

J M Chrystal[1], R M Monaghan[1], M Hedley[2] and D Horne[2]

[1]*AgResearch, Invermay Agricultural Centre, Mosgiel, New Zealan*
[2]*Massey University, Palmerson North, New Zealand*
Email: jane.chrystal@agresearch.co.nz

In Southern New Zealand there has been an increase in the use of off-paddock wintering systems as an alternative to the traditional approach of grazing winter brassica crops. These off-paddock systems capture and store effluent products that differ in their characteristics depending on the particular system used. The volumes generated and nutrient characteristics of the effluents produced are poorly defined and this means that the associated nutrient values are not easily recognised. We monitored the volumes and nutrient concentrations of the

effluents and manures produced by a loose-housed deep litter wintering barn utilising woodchip as a bedding material. Effluent and manure products from 5 sources were monitored: drainage through the barn bedding, solids scraped from the feeding alley, farm dairy effluent (FDE), leachate from the silage pad, and the used barn bedding. Total amounts of nutrient per cow from all captured effluent sources in the dairy farm system were equivalent to: 38.4 kg N cow^{-1} $year^{-1}$, 9.6 kg P cow^{-1} $year^{-1}$ and 56.1 kg K cow^{-1} $year^{-1}$. This equates to an annual fertiliser value of \$140 cow^{-1}. The manure products with the highest nutrient concentrations were associated with dung and urine deposition in the feeding alley and on the barn bedding. The largest volumes of effluent were generated by the FDE and rainfall falling on the concrete area of the milking yard, feeding alley and silage pad. The total volume of effluent captured by the pond system was equivalent to 19 m^3 cow^{-1} $year^{-1}$ and the volume of spent bedding represented 7.4 m^3 cow^{-1} $winter^{-1}$.

After fertiliser application earthworms remain an important component of our soil-pasture system

Nicole Schon[1], R A Gray[2] and A D Mackay[2]
[1]*AgResearch, Canterbury*
[2]*AgResearch, Palmerston North*

Greater emphasis is being placed on ensuring fertiliser application minimises losses to the environment and is nutrient efficient. Earthworms increase nutrient mineralisation and plant growth. The few studies which have explored the role of earthworms on plant growth after fertiliser application have found varying results depending on soil type as well as nutrient inputs. Here we investigate the contribution of deep burrowing earthworms to pasture growth at three field sites after the application of superphosphate and urea.

At each site we selected a site where the deep burrowing earthworm A. longa was present or absent. Pasture production was monitored throughout the year. At the sites where A. longa was present pasture production was greater and pasture quality was higher, especially increasing growth during autumn, winter and early spring when earthworms are most active. The application of both superphosphate and urea also increased pasture production. Earthworms had a larger influence on pasture production with superphosphate application. Even after the application of fertiliser earthworms contribute to the soil-pasture system and their importance for pasture production is highlighted in this study.

Soil quality targets for olsen p for the protection of environmental values

Matthew Taylor[1], John Drewry[2], Fiona Curran-Cournane[3], Barry Lynch[4], Lisa Pearson[5] and Richard McDowell[6]
[1]*Waikato Regional Council, Private Bag 3038, Waikato Mail Centre, Hamilton*
[2]*Greater Wellington Regional Council, PO Box 41, Masterton*
[3]*Auckland Council, 1 The Strand, Takapuna, Auckland*
[4]*Hawke's Bay Regional Council, Private Bag 6006, Napier*
[5]*Environment Southland, Corner of North Road and Price Street Waikiwi Invercargill*
[6]*Faculty of Agriculture and Life Sciences, Lincoln University*

Agricultural land contributes considerable amounts of nutrients to surface water in many regions throughout New Zealand, particularly land managed under intensive farming practices. Considerable focus has been on nitrogen (N) but, as the community continues to raise concerns

about the health of streams and rivers, regional councils in New Zealand are increasing scrutiny on the role of phosphorus (P) in water quality. Historically, it has been assumed that P is not often transported through soil, but more recent work has shown subsurface flow can transport considerable amounts of P.

Several studies have shown the importance of soil P levels to subsequent P losses. Olsen P, a measure of plant available P, is a commonly used soil fertility and soil quality monitoring indicator. Low concentrations of Olsen P tend to inhibit production, while high concentrations have been associated with transfer of P to surface water. Avoiding both extremes is important in retaining soil quality, while avoiding excessive Olsen P is important in retaining water quality.

Soil quality indicators, like Olsen P, can be used to assess how land use and management practices influence soil for plant growth or for potential risks to the environment. Targets for indicators have been developed and are now commonly used by regional councils. Recommended upper Olsen P targets have often been exceeded by land under intensive agriculture and horticulture.

Regional councils are contributing to the development of the land-based component of the Environmental Monitoring and Reporting (EMaR) project with the Ministry for Environment and other agencies, and to generate information that will help inform the National Policy Statement for Freshwater Management process. In this paper we will discuss estimating potential P loss from different soils. We show that there are substantial soil Order and slope effects on P loss risk. It appears that although the risk of P loss is less on flatland, it can still be considerable and we present data showing the movement of P down the soil profile.

Potential reductions in farm nutrient loads resulting from farmer practice change in the upper waikato catchment

David Burger[1*], Ross Monaghan[2], Nicola McHaffie[1], Adrian Brocksopp[1] and Mike Scarsbrook[1]
[1]DairyNZ, Private Bag 3221, Hamilton 3240, New Zealand
[2]AgResearch, Private Bag 50034, Mosgiel 9053, New Zealand
**Email: david.burger@dairynz.co.nz*

The Upper Waikato Sustainable Milk Project is the largest environmental good-practice catchment project ever undertaken by the New Zealand dairy industry. Co-funded by the Waikato River Authority, Primary Growth Partnership and DairyNZ, the project aims to accelerate the adoption of good environmental practice on farm to ultimately improve the health of the Waikato River. Over a three-year period from June 2012, all 700 dairy farms in the Upper Waikato Catchment were offered one-on-one advice and support via the development of a farm-specific DairyNZ Sustainable Milk Plan (SMP). All actions were recorded and coded into specific management categories to provide a more comprehensive analysis of the likely impacts of successful implementation on farm contaminant losses. In this paper we estimate potential reductions in farm nutrient losses for 594 farms which have completed the full SMP process. For each farm, nitrogen (N) and phosphorus (P) reductions were derived from individual farm Overseer® Nutrient Budget information and assumed nutrient reduction efficacy rates assigned to each specific mitigation strategy. Given the uncertainties and variability associated with quantifying efficacy rates attributable to different mitigation strategies, several approaches were trialled using a combination of Overseer modelling, existing studies published in the scientific literature and expert opinion. Mean reductions in farm

nutrient losses for actions already completed are estimated to be 5% for N and 12% for P. These reduction estimates are expected to increase to 8% for N and 21% for P once all actions across all 642 SMP farms are fully implemented.

Transfer pathways – new research to improve contaminant transfer understanding

Roland Stenger[1], S R Wilson[1], G F Barkle[2], M E Close[3], S J R Woodward[1], L F Burbery[3], L Pang[3], J Rekker[1], Th Wöhling[1,4], J C Clague[1], R McDowell[5], S Thomas[6], B Clothier[6],L Lilburne[7] and B Miller[1]
[1]Lincoln Agritech Ltd, [2]Aqualinc Research Ltd, [3]Environmental Science and Research, [4]Technische Universität Dresden, [5]AgResearch Ltd, [6]Plant and Food Research Ltd, [7]Landcare Research Ltd

Land use (source) can only be defensibly linked to an effect on a receiving water body (recipient) if the critical transfer pathways and the hydrological and biogeochemical processes that occur along them are understood. Depending on the natural setting of the catchment and the contaminant concerned, surface runoff, interflow, artificial drainage, shallow and deep groundwater may be critical pathways. The time it takes a contaminant to move from source to recipient ('lag time') is one of the key hydrological characteristics of each transfer pathway. Amongst the biogeochemical processes, those that result in contaminant attenuation (e.g. denitrification of nitrate) are of greatest relevance. Failing to explicitly consider both types of processes concurrently will inevitably result in poor contaminant transfer understanding. For example, the effects of long lag times can easily be misinterpreted as indication of high attenuation rates and vice versa.

The Transfer Pathways Programme, which was successful in the MBIE 2015 investment round, has therefore been developed to quantify pathway-specific transfers of nitrogen (N) and phosphorus (P) that take lag times and attenuation potentials of the different pathways into account. The multi-disciplinary research team will be working closely with industry (DairyNZ) and council partners (Waikato Regional Council, Environment Canterbury, Marlborough District Council), as well as iwi on achieving the programme's aims.

By 2018 we will have established how N and P transfer is partitioned across the pathways relevant in four case study areas (Wairau Aquifer, Ashley-Waimakariri, Upper Waikato, Hauraki). A catchment typology scheme will facilitate the application of transfer pathway understanding in other, less well studied catchments. Concurrently, we will apply an iterative modelling framework to integrate existing data of different types and quality, identify knowledge gaps, characterise and quantify fluxes, analyse uncertainty, and ultimately derive simplified models for management purposes.

The research will help to maximise economic outcomes on the land while achieving the water quality targets mandated by the community.

Future requirements for soil management in New Zealand

Alec Mackay[1], Alison Collins[2] and Gerald Rys[3]
[1]*AgResearch, Palmerston North*
[2]*Landcare Research, Palmerston North*
[3]*Ministry for Primary Industries, Wellington*

A review commissioned by the Ministry for Primary Industries identifies the most significant pressures on the soil resource result from:

- Intensification: the addition of more chemicals, irrigation and inadequate vegetation cover
- Land use change: fragmentation and urban expansion, as well as poor matching of land use to inherent capacity
- Legacy: impact of past deforestation and pests and diseases.

These pressures result in a range of proximal (effect on soil stocks including availability and condition) and distal (effect of the loss of soil function on the condition of other resources) impacts. The scale (national, regional or local) and magnitude (high, medium or low) of these impacts varies according to the ability to mitigate or reverse the impact and the social acceptability of impacts.

To address these pressures and impacts will require appropriate capability within and outside of the science system. This readiness will also require addressing significant gaps in coverage, scale or utility of nationally-agreed underpinning resource information and ensuring it is easily accessible to a range of users.

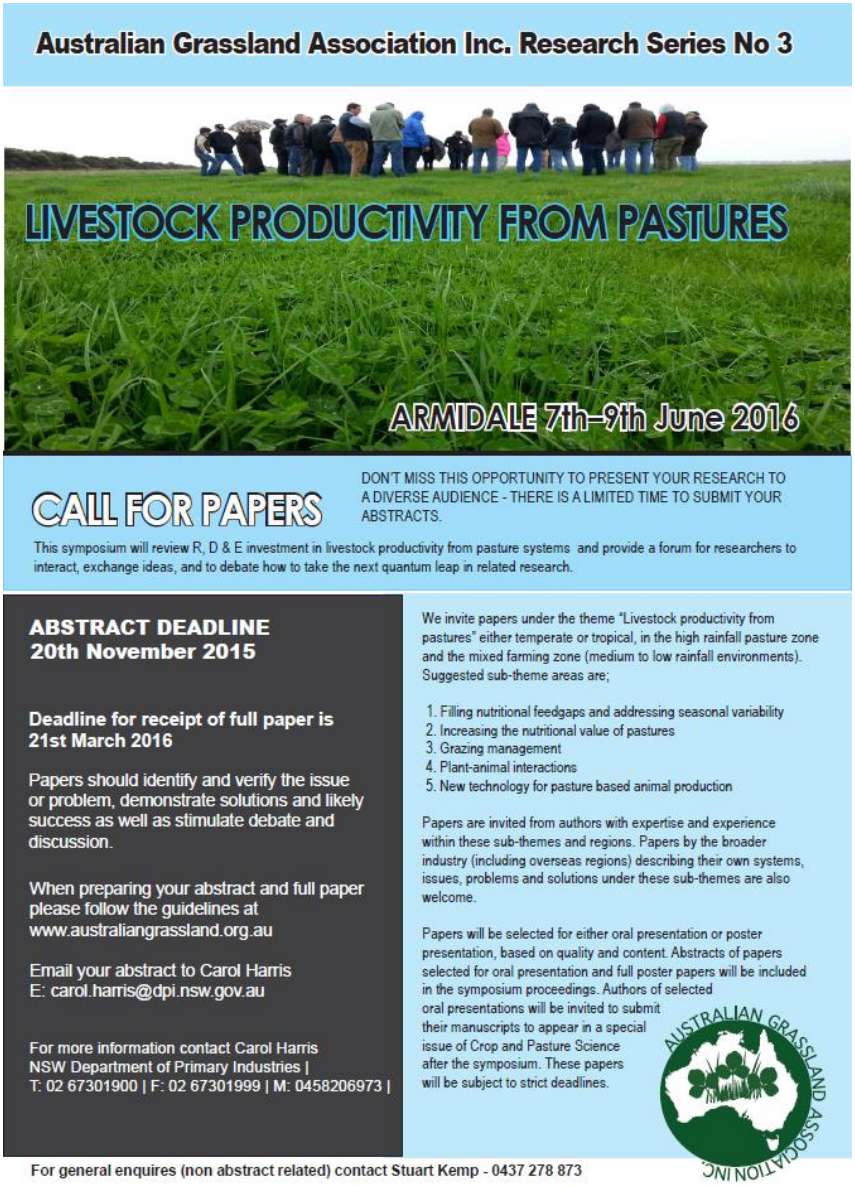
The study also reveals:

- Complexity in the governance of soil in New Zealand, reflecting ownership and iwi and the involvement of a diverse range of organizations, sectors and individuals in decision-making
- That while the primary sector practises a number of soil management approaches to address these pressure, it is difficult to determine their effectiveness
- Greater attention is needed within our policy and planning framework to protect soil functional capacity, reduce the fragmentation of land and loss of versatile soils. This includes the development of regulatory and non-regulatory measures to ensure the full range of services provided by soils is sustained into the future.

As a result of this study a *National Soil Management Group* is to be established and work towards the development of Aotearoa's Living Soil Action Plan. The Action Plan will incorporate the recommendations of this study to unlock and realise the full potential of New Zealand's soils.

Conferences:

June 2016



7th Global Workshop on Digital Soil Mapping, Århus, Denmark, **June 27 – July 1, 2016**
http://digitalsoil.auinstallation35.cs.au.dk/digital-soil-mapping-workshop-2016/

July 2016

8th International Acid Sulfate Soil Conference, College Park, Maryland, USA, Acid Sulfate Soils: Pathways to Exposure and Remediation. **July 17 to 23, 2016**
http://www.midatlanticsoilscientists.org/acid-sulfate-soils-conference

Eurosoil 2016

(17—22 July 2016, Istanbul, Turkey)

http://www.eurosoil2016istanbul.org/

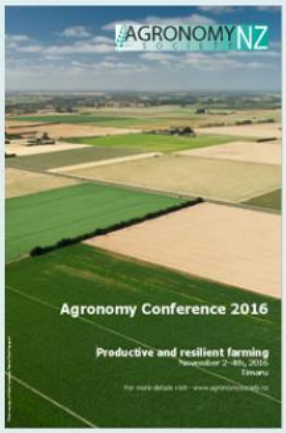
August 2016

http://www.conference.ie/Conferences/index.asp?Conference=394

November 2016

http://www.agronomysociety.nz/2016-agronomy-conference.html

2016 Agronomy Conference



2016 Agronomy Conference - Productive and resilient farming

The 2016 Agronomy Society Conference will be held jointly with the NZ Grasslands Association in **Timaru** from **November 2-4, 2016**.

We are now calling for papers on all aspects of crop agronomy that relate to our theme "**Productive and resilient farming**".

Topics of interest may include (but are not limited too):
- Redesigning production systems
- Water allocation and crop water use
- Delivering higher value crops
- Climate change and adaptation
- Modelling crops and pastures
- Precision technologies and applications
- Seed, vegetable and forage production

More details will be available on our website in the coming months, including a full programme outlining the mix of plenary speakers, technical sessions and field visits.

The **registration link** on the Grassland Association website will become available later in the year.

Key dates to remember:

Title and abstract due	24 February 2016
Authors advised of paper acceptance	2 March 2016
Full manuscript due	18 May 2016
2016 Proceedings published	November 2016

Titles and abstracts should be submitted using the attached template to:
Paul Johnstone at ***secretary@agronomysociety.org.nz***
(for further information call +64 6 975 8899)

Please forward this call for papers to other colleagues and students who may be interested in submitting a paper.

9th Australasian Soilborne Diseases Symposium

Heritage Hanmer Springs, Canterbury, New Zealand
14-18 November 2016

The 9thASDS will be held in the spa resort township of Hanmer Springs, in the early summer of 2016, under the auspices of the Australasian Plant Pathology Society

Hanmer Springs is a "magical" place, surrounded by mountains and forests, with crisp alpine air. Beside the lure of plant pathology and soil (!!), attractions include boutique shopping, excellent cafes and restaurants, an 18 hole golf course, farm parks and adventure activities (e.g. fishing, hunting, jet boating, bungy jumping). The award-winning Hanmer Springs Thermal Pools and Spa is a key attraction

Symposium themes (and Keynote Speakers)

- **Biocontrol** (Prof Gabriele Berg, Austria)
- **Soil Health** (Prof Jos Raaijmakers, the Netherlands)
- **Biosecurity** (Dr Treena Burgess, Dr Nick Waipara)
- **Disease Management** (Dr Steve Johnson, USA)
- **New Technologies/Diagnostics** (Dr Andy Pitman)

The Symposium will highlight research on all aspects of soilborne plant diseases, through *Offered papers*, delivered as posters or oral presentations

Key dates

4 April 2016	Registrations open
9 Sept 2016	Last day for abstract submission
3 Oct 2016	Notification of paper acceptance
28 Oct 2016	Registrations close

9thASDS website www.lincoln.ac.nz/ASDS

[Reduced registration fees for Students]

4 – 8 December 2016

International Nitrogen Initiative Conference

On behalf of the Organising Committee and INI, authors are invited to submit four-page papers for possible inclusion in the conference program of the **7th International Nitrogen Initiative Conference (INI2016)** to be held in Melbourne from **4 – 8 December 2016** at the iconic MCG. All submissions are due by 29 April 2016 and can be submitted electronically via the INI 2016 Presentation Portal. Please use the word template provided, incorporating the formatting guidelines when preparing your four-page papers. All presenters will be required to register for the conference and pay the appropriate registration fee. Unless agreed to by the organizing committee, presenters need to meet their own travel and accommodation costs.

www.ini2016.com

NZASSS

NZ SOCIETY OF SOIL SCIENCE & SOIL SCIENCE AUSTRALIA

12 - 16 December 2016, Millennium Hotel, Queenstown

CALL FOR **ABSTRACTS**

Submit online at nzassconf.co.nz

CALL FOR ABSTRACTS IS NOW OPEN

Abstract submissions for oral and poster presentations are being received for this year's joint conference of the New Zealand Society of Soil Science and Soil Science Australia.

THEMES

The main conference theme is **"Soil, a Balancing Act Downunder"**, authors are invited to submit oral and poster abstracts under the following sub-themes:

- Pedology, soil landscapes and spatial mapping
- Balancing soils physical function and their management in the environment
- Effective management of nutrients and water
- The living soils: macro/micro biology
- Protecting our soil resource from degradation & contamination
- Soils and climate change
- Balanced solutions at a farm system and catchment scale
- Advances in soil science for improved decision making

IMPORTANT DATES

- Abstract Submission Deadline 4 July
- Author Notification 4 September
- Registrations Open 14 March
- Early-bird Registrations Close 30 September

DEADLINE TO SUBMIT ABSTRACTS: 4 July 2016

Conference Organising Committee

Cecile de Klein, AgResearch // Tim Overheu, SSA President
Tony van der Weerden, AgResearch // Sam Carrick, Landcare Research
Trish Fraser, Plant & Food // Seth Laurenson, AgResearch
Jim Moir, Lincoln University // Lucy Burkitt // Massey

For further Information Contact

On-Cue Conferences Phone: +64 3 546 6330 Email: lea@on-cue.co.nz

NEW ZEALAND SOCIETY OF SOIL SCIENCE

SOIL SCIENCE AUSTRALIA

NZSSS award recipients

President's Invitation Lecture
1972 W A Pullar
1973 T W Walker
1974 A J Metson
1975 H S Gibbs

Norman Taylor Memorial Award
1976 I L Baumgart
1977 G D Smith
1978 J D McCraw
1979 G G Cossens
1980 A C S Wright
1981 C During
1982 C G Vucetich
1983 N Wells
1984 G M Will
1985 J K Syers
1986 L C Blakemore
1987 W M H Saunders
1988 K R Tate
1989 P J Tonkin
1990 E J B Cutler
1991 C Childs
1992 D R Scotter
1993 No award
1994 A Sinclair
1995 B Clothier
1996 A Hewitt
1997 K M Goh
1998 A Mackay
1999 J Watt
2000 V Neall
2001 S Saggar
2002 D J Lowe
2003 P Singleton
2004 G Sparling
2005 R McLaren
2006 G Yeates
2007 A Carran
2008 M. Balks
2009 P Fraser
2010 C de Klein
2011 T Webb
2012 M McLeod
2013 M Hedley
2014 S Ledgard
2015 R McDowall

NZSSS Postgraduate Awards
1971 D W Ives
1972 I Nairn
1973 -none-
1974 V E Neall
1975 -none-

Morice Fieldes Memorial Award for PhD Thesis
1976 J C Ryden
1977 -none-
1978 A N Sharpley
1979 K W Steele
1980 -none-
1981 A G Hogg
1982 A W Limmer
1983 A B Cooper
1984 A D Mackay
1985 R A Petch & P J Tonkin
1986 I R Phillips
1987 D J Horne
1988 J S Rowarth
1989 A W Young
1990 P B Greenwood
1991 C D A McLay
1992 A W Rate
1993 L A Schipper
1994 D Tambunan
1995 No award
1996 R Lieffering
1997 H Wang
1998 P Almond
1999 B Robinson
2000 T J van der Weerden
2001 B Miller
2002 G Barkle
2003 C Rooney
2004 J Menneer
2005 H Jones / F Moreno
2006 D Houlbrooke
2007 S Gaw
2008 M Hughes
2009 M Bloomberg
2010 S Carrick
2011 N Schon
2012 A Eger
2013 N Balaine
2014 P Mudge
2015 B Welten

Sir Theodore Rigg Award for Masterate Thesis
1976 K D Earl
1977 T H Webb & N E Logan
1978 -none-
1979 D A McKie
1980 C Hedley (née Hubbard)
1981 D Karageorgis
1982 D J Lowe
1983 L A Benny
1984 K B Marsh
1985 B McLaughlin
1986 -none-
1987 C D A McLay
1988 B E Green
1989 S P Cameron-Lee
1990 P J de Lange
1991 G N A Wigley
1992 R B Doyle
1993 -none-
1994 P L Carey
1995 J Moir
1996 -none-
1997 S Park
1998 S Thiagarajan
1999 H Jones
2000 R Dragten
2001 B Robinson
2002 S Tutua
2003 D J Palmer
2004 M W Hughes
2005 R Standish
2006 D Dewar
2007 E Hoftsee
2008 N Watkins
2009 DA Lloyd
2010 P Mudge
2011 DF Wallace
2012 E Harris
2013 A Barnett
2014 A Robinson
2015 T Norris

Bert Quin Award 2014
Was Summit Quinphos Bursary (renamed Altum Award 2012)
1993 J Luo
1994 W J Morrell
1995 I Vogeler
1996 C W Gray
1997 B Robinson & B Miller
1998 A Mitchell
1999 A Khan
2000 Chengrong Chen
2001 Suman Mishra
2002 S Gaw
2003 D Houlbrooke & R Bhandral
2004 D Palmer
2005 J Singh
2006 S Khan
2007 B Kusomo
2008 S Carrick
2009 P Jeyakumar
2010 G Lucci
2011 N Wells
2012 R Dodd
2013 No award
2014 S McNally

The L C Blakemore Award (Biennial award)
1992 N P Smith
1994 H Kettles
1996 No award
1998 L Currie
2000 B Daly
2002 P Theobald
2004 T Hendry
2006 B Toes
2008 C. Smith
2010 M Sprosen
2012 C Tregurtha
2014 M Premaratne

The M L Leamy Award (Biennial award)
1992 B E Clothier
1994 A Hewitt
1996 No award
1998 S Cronin
2000 H J Di

2002 K R Tate
2004 N S Bolan
2006 S Saggar
2008 R. McDowell
2010 Not awarded
2012 D Curtin
2014 L Schipper

The T W Walker Prizes

1992 (oral paper) —S T Olykan
(poster)—G N Magesan
1994 (oral paper)—J Luo
1995 J Zanders & S Park
1998 (oral paper)—J Menneer
(poster)—C P Rooney
2000 (oral & poster papers)
—L Barton
2002 (oral paper)–D Houlbrooke
(poster)—K Wilkins
2004 (oral paper)─J Singh
(poster)–D Dewar
2006 (oral paper)-R Parkinson
(poster)–F Scherr
2008 (oral paper) – P. Mudge
(poster) – G M Lucci
2010 Not awarded
2012 Not awarded
2014 (oral paper) O Jordan
(poster) J Owens

Undergraduate Prizes

1994 R McDowell
(Lincoln University)
R Hodgson
(Massey University)
M Boyes
(Waikato University)
1995 W R Cookson
(Lincoln University)
A Reyland
(Massey University)
J C Menneer
(Waikato University)
1996 R Dragten
(Waikato University)
1997 J McCaw
(Lincoln University)
C Eastwood
(Massey University)
V Gough
(Waikato University)
1998 L Garrett
(Waikato University)
N Treloar
(Massey University)
C Rissman
(Lincoln University)
1999 A Manderson
(Massey University)
K McLauchlan
(Waikato University)
S Petrie
(Lincoln University)
2000 S Pitcher-Campbell
(Massey University)
N Dunn
(Waikato University)
C Ducey
(Lincoln University)
2001 C Davies-Colley
(Waikato University)
M Buchan
(Lincoln University)
P Nelson
(Massey University)
2002 A Souness
(Lincoln University)
T A O'Neill
(Massey University)
D Worthy
(Waikato University)
2003 S O'Driscoll
(Waikato University)
F Shanhun
(Lincoln University)
2004 M Clancey
(Waikato University
J Bertram
(Lincoln University)
2005 Vanessa Coombe
(Waikato University)
Samuel Dennis
(Lincoln University)
2006 Laura Buckthought /
Georgina Mackie
(Lincoln University)
Louise Fisk / Paul Mudge
(Waikato University)
2007 Paul Bowater
(Lincoln University)
Hamish Mulcock
(Massey University)
Georg Kruger
(Waikato University)
2008 Glen Treweek
(Waikato University)
Emma Anne Phillips
(Massey University)
Nicola Jane Kelland
(Lincoln University)
2009 Rebecca Bylsma
(Waikato University)
Helen Free
(Massey University)
Sean Gresham
(Lincoln University)
2010 Josh Scarrow & Jack
Pronger
(Waikato University)
Louise Anne McCormack
(Massey University)
Aimee Elizabeth Robinson
(Lincoln University)
2011 AM Carter
(Waikato University)
Joel Perry
(Massey University)
Roshean R Fitzgerald
(Lincoln University)
2012 L Creswell (Waikato
University)
J Howes (Massey)
A Whitley (Lincoln)
2013 H Bredin-Grey (Waikato)
Massey – N Hyslop
N Mesman – (Lincoln)
2014 D Le Lievre – (Waikato)
J Winters – (Massey)
S Rayner – (Lincoln)
2015 T Leabourn (Massey)
B Robertson (Lincoln)
F Garrity (Waikato)

Fellows of the NZ Society of Soil Science

L C Blakemore
M R Balks
N Bolan
K C Cameron
I B Campbell
C W Childs
J Churchman
B E Clothier
I S Cornforth
H J Di
K M Goh
P Gregg
R J Haynes
S F Ledgard
D J Lowe
J D McCraw
A Mackay
L Schipper
L Condron
D Ross
T Clough
R McDowell
R G McLaren
R Naidu
V E Neall
R L Parfitt
J A Pollock
A H C Roberts
S Saggar
A G Sinclair
G Sparling
T W Speir
J K Syers
K R Tate
B K G Theng
P J Tonkin
T W Walker
J H Watkinson
G W Yeates
A Hewitt
M Beare
M Hedley
C De Klein

Honorary Fellow

B Miller

Life Members of the N.Z. Society of Soil Science

L C Blakemore
I B Campbell
C W Childs
R J Furkert
R Lee
R B Miller
V Orchard
W M H Saunders
J K Syers
P J Tonkin
T W Walker
J P C Watt
J Adams
R McLaren
P. Gregg
A Mackay

Grange Medal

K Tate
B Clothier