Welcome to the Soil News

February 2021
Issue #1 -Vol #69

In this issue…

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

Isabelle Vanderkolk
AgResearch Ltd
Private Bag 11008
Palmerston North
FAX: (06) 351 8032
email:
isabelle.vanderkolk@agresearch.co.nz

Have you liked us on Facebook? The NZSSS has a Facebook page and Twitter handle (@NZ_Soil_Soc). If you are already a user, please follow us. You can

also keep an eye out for new NZSSS posts by checking the feed from our website

Officers of the NZSSS 2019-2020

President: Megan Balks, University of Waikato
Vice President: Tim Clough, Lincoln University
Past President: Dave Houlbrooke, AgResearch
Secretary: Diana Selbie, AgResearch
Treasurer: Haydon Jones, Waikato Regional Council

Council: Brendan Malcolm, Plant & Food; Chris Anderson, Massey University; Tanya O'Neill, University of Waikato; Pierre Roudier, Landcare Research; Paul Johnstone, Plant & Food; Sam Carrick, Landcare Research

NZSSS President's report: December 2020

Dr Megan Balks

Nga mihi nui
What a year of changes it has been. Instead of holding our BGM in the steam heat of Cairns we are now working via regional zoom-linked meetings. Never fear though, the Cairns meeting is still planned to go ahead in June next year which will be a much nicer time of year to escape our winter and enjoy some Australian hospitality. If travel is still not freely available there will be virtual options to allow everyone to participate.

Over the last two years your council has worked hard to ensure that our usual NZSSS activities have been maintained where possible.

Special thanks to Dave Houlbrooke, our immediate past president for whom this will be his last meeting as a council member of the NZSSS (at least for now). Dave has been a great, dependable, leader of the NZSSS. He was editor of Soil News for several years, and continues to support Gina Lucci as she took over as editor. Dave has had a major role in organising several successful conferences, notably leading the conference in Hamilton in 2014 and as a major support of the 2016 Queenstown conference and the 2018 Napier conference. Dave has also served on the NZSSSS council for 12 years, including as Vice President, President, and more recently as Immediate Past President.

I must thank Haydon Jones for his excellent and diligent work as our Treasurer. I really appreciate Haydon's attention to detail and his excellent organisation. Haydon can be relied upon to always have the answers to the details of our obligations under the various Acts that we operate to meet the reporting requirements, ensure that our financial liabilities are monitored, and that all reporting and auditing is undertaken as required. I am grateful to Haydon for agreeing to take on a third term as our treasurer.

Diana Selbie has been an enthusiastic new member of Council in this term and has taken the stretch of immediately taking on the role of Secretary. She has been on a

strong learning curve but is always helpful and cheerful and we are pleased that she has agreed to continue this role for an additional term.

Pierre Roudier has also been an enthusiastic new member of Council. He has arranged on-going back-up of all our electronic records, through Landcare Research, which is important to give us extra security should our secretariat ever become unavailable to us. Pierre brings a useful international perspective to the council.

Paul Johnstone, also a new Council member, was a key leader of the 2018 Napier conference and has continued to be proactive in getting our plans in place for Blenheim in 2022 and Rotorua (with the Australians) in 2024. Paul brings excellent organisational skills to Council and cheerfully, and efficiently, takes on any task as needed.

Brendon Malcolm has had the very busy, and important, job as the Awards Convenor on Council. The fruits of his work will be evident shortly as our 2020 awards are announced. Ensuring that all our wide range of awards are organised is a significant undertaking with a plethora of rules, deadlines, and conditions to ensure are met.

Tanya O'Neill and Chris Anderson, along with vice-president Tim Clough have provided important links between the NZSSS Council and Waikato, Massey and Lincoln Universities. The role of the NZSSS in supporting student activities, including awards as well as conference and soil judging competition participation, is an important part of ensuring the future of New Zealand Soil Science.

I must also thank our editor of Soil News, Gina Lucci. Soil News is a key part of the Society's activities. Gina is ably supported by Isabelle Vanderkolk and AgResearch.

Our other important means of communication is our website. We are lucky to have the support of Robyn Chappel and Hamish Lowe, of Lowe Environmental Impact, who manage our website.

Thanks also to our Secretariat at Groundworks who provide the society with a wide range of support, managing the day to day financial and administrative work of the society. Their expertise and support is greatly appreciated.

In the "post-covid" world the role of the NZ Society of Soil Science will be more important than ever in providing a link between members within the increasingly isolated NZ soil science community, and via the International Union of Soil Science to the global Soil Science community.

Seems to me it is unlikely that organisations will allow staff to travel any time soon so I think that local and regional events will need to become more common and more strongly supported. If you would like to get involved in organising some regional/local social/networking/professional events for your soil science community do get in touch with one of the NZSSS council members.

Overall, in spite of the challenges that Covid19 has brought soil science has a critical role to play in New Zealand's future. Understanding, and sustainably managing,

our soil resource, to help support both the environment and food, fuel, and fibre production for the increasing global population, has never been more critical.

Thus I must finally thank all of our members for their continuing support of the NZSSS and hope you continue to find it an important part of your professional life in Soil Science.

Letter from the correspondents -survey results

Greetings soil lovers,
In our November edition we asked you, our readers, for your feedback on the Soil News. We asked you to complete a survey and 26 of you took the time to share your thoughts with us. Here we share the results of this survey and our proposed response to the findings. We do acknowledge this is a very small sample of the NZSSS population, but it is all we have to go on. We like to think that those that did not respond are very pleased with the Soil News as it is.

Out of our 26 respondents 96% said they read the Soil News "always" or "most of the time". Most read the Soil News to "See what the NZSSS community is up to", "See what soil-related events are happening" and "To look for research that's related to my own work". In addition, "community" and "connection" were often mentioned as well as "keeping up to date" in the free text comments about the value of the Soil News. As well as providing relevant current information, another vital function of the Soil News is to provide a long-term record of our activities and people. Such archiving is especially important where no other record exists.

There were 73% of respondents that agreed with the statement "I like the Soil News as it is", while 54% agreed with the statement that "I think there should be more letters and open debate about soil-related issues in the Soil News". The regular Soil News features (e.g., News from the regions etc.) were all rated important or useful to a greater or lesser degree. Therefore, we will be keeping all of the existing sections.

As for the format, no one was missing the paper copies and more people preferred a PDF version (n= 12) than a web-based version (n = 8) of the Soil News.

Some of the suggestions that we are going to pursue in future Soil News editions are:

- An **annual summary of Masters and PhD theses** submitted in the year until November, as a new regular feature for the November edition. This will require some coordination to pull it all together. If you are willing to volunteer to take this job on for 2021 please let us know -otherwise we might not be able to make it happen!
- A system of **rotating guest editors** to highlight different soil perspectives on specific topics. Many comments were about a lack of diversity and poor representation across the NZSSS and links with other related disciplines. This would be a one-off contribution to support the NZSSS community and would entail choosing a topic area (and communicating to the Soil News correspondents in good time to allow us to prepare!) and writing an opinion piece on the subject. In addition, soliciting views from others, highlighting key

sources of information and any other items to add to the Soil News on the topic would be very welcome. The other "standard" Soil News features will be collected via the usual means. **If you would like to take on one issue of the Soil News please get in touch -we would love to have you on board!**

- Re-shuffle in the order of some sections, making sure that the more highly rated sections are up-front, prioritising the community related events and happenings - which is what most people value in the Soil News. We will also revisit the format and explore other options/tools/apps for sharing the Soil News. We will also look at including an audio/visual section to share any other media types that you might have produced from projects or other channels.

Finally, just a reminder that YOU are the Soil News and there is no news if you don't share it! Many people enjoy the Soil News, but it only happens through our network of contributors and correspondents. So please, contribute your stories and put your hand up to help us out with an issue on a topic that's near and dear to your heart and we all will benefit!

Gina Lucci on behalf of the soil correspondents

Deadline..... For the May 2021 issue of Soil News is Friday 21 May 2021

Editor Gina Lucci – gina.lucci@agresearch.co.nz
Secretarial: I Vanderkolk – isabelle.vanderkolk@agresearch.co.nz

We are your New Zealand Soil News correspondents:
T. Caspari, Landcare Research (Lincoln); C Smith, Lincoln University; R Calvelo, Massey University; J Drewry, Landcare Research, (Palmerston North); S Lambie, Landcare Research (Hamilton); Tanya O'Neill, Waikato University; M Taylor, Environment Waikato (Hamilton); Nicole Schon, AgResearch (Lincoln); R Stenger, Lincoln Agritech (Hamilton); R Gillespie, Plant & Food Research (Lincoln); G Lucci, AgResearch (Hamilton); R Gentile, Plant & Food Research (Palmerston North); S Smaill, Scion Research

Society News

Celebrating Success – Recipients of the NZSSS Awards for 2020

Compiled by Dr Brendon Malcolm, NZSSS Awards Convenor (2017-present)

The 2020 biennial NZSSS conference, joint with our Australian counterparts (Soil Science Australia), was scaled back and held virtually in early December. Despite the challenges, this did not stop us from honouring and celebrating the success of those who have made significant contributions to soil science. The awards presented, and the recipients of those awards, are briefly profiled below. On behalf of Council **congratulations** to all those who received awards.

The Norman Taylor Memorial Award

The Norman Taylor Memorial Award (Lecture) is awarded by the President of the NZSSS in recognition of outstanding contributions to soil science in New Zealand.

The 2020 recipient of the Norman Taylor Memorial Award was Dr Carol Smith. Carol is currently a Senior Lecturer in soil science at Lincoln University. She gave a very stimulating and passionate lecture entitled, *'Learning is better by doing": pedagogy in a disruptive world'*, and highlighted the importance of helping students to thrive in the area of soil science by engaging them in practical/hands-on activities, such as field work, laboratories and interactive group discussions, and of course *competitions* (e.g. soil judging).

Carol's research interests revolve around pedology, micromorphology, soils and landscapes (in particular Quaternary paleosols and loess), the role of carbon in rehabilitating degraded soils and Antarctic soils. Latterly, her research has focused on developing effective pedagogy for teaching field based soils skills. She is currently HoD, Soil and Physical Sciences and the elected academic staff member on the Lincoln University Council.

Life Membership of the Society

Life Membership of the Society recognises outstanding service to the Society. Our deserving recipient for 2020 was **Professor David Lowe**.

Over the past 45 years David has made a huge contribution to the Society, as well as to the wider soil science community. He has encouraged a long line of students to join the Society and participate in NZSSS activities, and has always been one to undertake the "heavy lifting" when it comes to organising field trips within the Waikato region and the wider North Island as part of NZSSS conferences. He has prepared numerous, detailed and comprehensive field trip guides and was instrumental in establishing and orchestrating the Societies Grange Medal Award.

He has also been a key leader in developing the successful WaiBoP model for our regional meetings in non-conference years, and has been a long-term contributor to Soil News as the Waikato Correspondent.

Fellowship of the New Zealand Society of Soil Science

Fellowship of the New Zealand Society of Soil Science is an honour conferred for distinction in any or all of the following areas; research, technology, teaching, extension, and/or the advancement of soil science.

In 2020, our Society's most recent Immediate Past President, Dr David Houlbrooke was elected Fellow of the Society. Dave is a soil scientist with AgResearch who is well known nationally and internationally for his research activities relating to effective soil, water and effluent management. His research has been published in a range of media and he has multiple high quality scientific publications in various soil and environmental journals.

Dave's recognition goes well beyond the research community, having active involvement with industry bodies and regional councils to ensure that key research is utilised by farmers and policy groups. Dave has taken an active role in NZSSS, contributing as a Council member since 2008, including a term as President from 2016 to 2018. As part of his contributions on Council he was the chair of the NZSSS conference organising committee for the conference in Hamilton in 2016, and on the organising committee for the conference in Napier in 2018.

The L.I. Grange Medal

The L.I. Grange Medal is awarded by the Society for outstanding service to New Zealand soil science. It commemorates Dr Leslie I. Grange's extraordinary leadership and service to New Zealand soil science through his pioneering pedology, his far-sighted and constructive administration, and for his pivotal role in helping establish the discipline in New Zealand.

The recipient of the Grange Medal for 2020 went to **Dr Fiona Curran-Cournane**. We were particularly privileged and honoured to have close family members of Dr Grange assist with the presentation (pictured with Fiona below).

Fiona was recently appointed as a principal scientist at the Ministry for the Environment, based in Auckland. Prior to that, Fiona was an environmental/soil scientist with the Research and Evaluation Unit (RIMU) of Auckland Council for nearly nine years, holding a Senior Scientist position by the end of her tenure. Fiona is also an Honorary academic at the University of Auckland, her appointment dating from August 2015 through to the present-day.

Fiona has contributed in applying science into policy formulation, which has led to her involvement as an expert witness for hearings related to resource consents, unitary plans, and the Environment Court. Fiona has made an outstanding contribution to soil science in her research and policy-related work, her primary motivation being to firstly demonstrate the unique value and distribution of versatile or high class soils referred to as elite and prime soils in the wider Auckland region, and secondly to help protect such soils from subdivision or from fragmentation through life-style blocks. Such developments would reduce the pool of high-class soils available for potential food production, a seriously deleterious impact given the relatively limited areas of such soils in Auckland (and in New Zealand in general) and in light of the region's favourable climate for horticulture and huge local market.

The M.L. Leamy Award

The M.L. Leamy Award commemorates the outstanding ability and contributions to New Zealand Soil Science of Michael Lucas Leamy, and recognises meritorious contemporary work. The award is made to the author or authors of the most meritorious New Zealand contribution to soil science, published in the past three years.

The Society had the pleasure in jointly presenting the Leamy award to **Drs Denis Curtin** and **Mike Beare**.

The pair have published extensively over the past two decades on N cycling in agro-systems and are leading experts worldwide in the processes that affect N mineralisation and immobilisation. In 2017, together with colleagues they published a capstone to their work, 'Rapid assays to predict nitrogen mineralization capacity of agricultural soils', in the Soil Science Society of America Journal. The research directly targeted our inability to predict the quantity of N a soil can supply via mineralisation, a serious impediment to improving N management in production systems. The paper summarised the results of a suite of new laboratory assays to estimate N supply reliably and rapidly and compared these to existing standard tests. The team found particularly strong correlations were obtained for hot water extractable N and the gold-standard test (a 14 week incubation), suggesting that this easily-measured organic N fraction can be used to predict N supply potential across a wide range of soil types and land uses.

This finding has provided the foundation for further research and application over the past three years to refine a new N mineralisation test. This test is now being adopted by commercial testing laboratories in New Zealand and will gradually replace established approaches to measuring potential mineralisation.

The L.C. Blakemore Award

The L.C. Blakemore Award honours the outstanding ability and contributions to New Zealand Soil Science of Les Blakemore and recognises meritorious contemporary work by technicians. It is awarded to the outstanding New Zealand Soil Science Technician or support staff member of the past two years.

The recipient of the Blakemore award for 2020 was **Roger Cresswell**.

Roger has worked at Lincoln University in the Soil Science Department for over 27 years.

Since 2018, Roger has had a University-level role in the design and development of new science laboratory facilities for the Science North Building. The work has involved extensive consultation and liaison with end users, staff, students, senior university management, architects and project managers to facilitate the progression of the different design stages of the project. Roger has approached the complex task with a dedicated and logical approach. The success of the now completed detailed design phase is due in no small part to the attention to detail and thorough, methodical approach he has employed. His knowledge of all areas of soil research and teaching within the department has meant that he has been invaluable in the planning of the laboratories for this first class building which is due to commence building early 2021.

Roger also uses his extensive chemistry knowledge, skills and experience to assist postgraduate students within both the soils department and the Faculty with technical aspects of their research. This was recognised by the university in 2017 when Roger was the recipient of the Lincoln University Gold Award, awarded to employees who go above and beyond to contribute to university life.

The Fertiliser Associated Award

The Fertiliser Association award recognizes the efforts and present, or likely, contribution to New Zealand soil science arising from a Doctorate study. Eligible candidates for this award must be 3rd year PhD students working on the properties, productivity or sustainability of NZ's soil and land resources.

The recipient of The Fertiliser Association award for 2020 went to **Thomas Corbett** of University of Waikato.

Thomas began his PhD in April 2018. His research focusses on ensuring the long-term sustainability of food production by quantifying the loss of key nutrients from agricultural land to freshwater systems, and determining the performance of mitigation strategies such as denitrifying bioreactors.

On completing his PhD, Thomas is keen to obtain further postdoctoral experience and contribute to New Zealand agriculture and soil science. He is seeking to pursue an academic career that may also make use of his degree in politics and philosophy.

The Morice Fieldes Memorial Award

The Morice Fields Memorial Award recognises a PhD theses from the previous calendar year of exceptional merit. In 2020 the Society awarded this to Femke Rambags of University of Waikato for her thesis *'Microbial contaminant removal and alternative nitrogen removal pathways in denitrifying bioreactors'*. Judges noted that the thesis was especially comprehensive and well written and demonstrated a solid understanding of the topic.

The Sir Theodore Rigg Memorial Award

The Sir Theodore Rigg Memorial Award recognises a Masterate theses of exceptional merit from the previous calendar year. Manawa Kokiri Huirama, University of Waikato, was our recipient of the award for 2020, for her thesis 'A Comparison Between a Native Forest Catchment and a Mixed-Use Pine and Pasture Catchment in the Waikato Region of New Zealand'. Judges notes that the thesis was very well written, and highly relevant on the topic of relative contributions of erosion sources to stream sediment.

Undergraduate prizes

Each year the Society awards the best performing third year undergraduate student in each of the three major Universities (Lincoln University, Massey University and University of Waikato). For 2020, the recipient of the award for University of Waikato was **Annabelle Carrington**.

Congratulations again to all our deserving award winners!
(A complete list of current and past award recipients can be found at the end of this issue)

More awards from Australia

Bill Cotching has been awarded the Soil Science Australia LHJ Teakle Award for 2020.

The LJH Teakle Medal is an annual award given to a financial member of Soil Science Australia for outstanding effort in promoting and raising the awareness of soil science through activity with Soil Science Australia and the wider community.

Bill's first solo art exhibition "Acceptance" has just opened at the Cradle Mountain Wilderness Gallery and runs until the end of May.

Norman Taylor Memorial Lecture

Learning is better by doing: pedagogy in a disruptive world.

Carol Smith, Department of Soil and Physical Silences, Faculty of Agriculture and life Sciences, Lincoln University.

Thank you to our President, Megan Balks for the invitation to present this year's Norman H Taylor Memorial lecture. Norman Taylor had a significant influence on soil science in New Zealand (Tonkin, 1990). He started in 1928 as an assistant geologist with the DSIR (Geological Survey branch), and so his 35 year odyssey through the landscape of soils began. In 1948 he authored the genetic classification of NZ soils and in 1952 was appointed Director of the Soil Bureau. In 1954, he was the foundation President of the NZ Society of Soil Science. In 1962, he retired, but still had a passion for teaching the next generation of soil scientists at VUW. These included Derek Milne who authored the Soil Description Handbook we all use in the field today. Phil Tonkin was another student of Norman Taylor at VUW. Phil helped to cultivate my love for New Zealand soils when I arrived at Lincoln University in the early 1990's; it wonderful that he is with us here today, as a tangible link back to Norman Taylor.

As a pedologist I have many passions – mainly revolving around soils and landscapes, but also focusing on the use of recycled organic matter and rehabilitating degraded landscapes. I've been fortunate to visit many exciting and diverse soil landscapes with many passionate colleagues over the years; ranging

from polar deserts in Antarctica, to investigating uplifted marine terraces on Rakiura. But recently, I have been focusing on examining the pedagogy and the efficacy of how we teach practical field skills in soil science.

Above all, Norman Taylor was a pedologist, a naturalist and an inspirational teacher. When I was planning this talk, this central aspect of Norman Taylor's life resonated with me; his pedology and his teaching – inspirational and innovative. In my talk I want to remember and reflect on this linkage, and its relevance to us in our disruptive world. Today I want to explore one aspect of my current research – developing effective pedagogy for teaching practical field soil skills, and then moving on to consider how we can devise strategies for doing this in a disruptive world of external impacts and alternative learning environments.

What is disruption? It's not just external disruptors like earthquakes and global pandemics; consider also the recent changes in the Universities. Uncertain times with cuts to classes, resources, the way we deliver and teach our science. While there will always be an important cohort of students who want to come to a physical campus to experience face to face learning, there is a growing number who want to learn off-campus and part time. We do need to recognise this shift in demand; our teaching needs to evolve to accommodate this additional learning and teaching mode, while still being able to deliver on campus.

I also want to acknowledge many colleagues in both New Zealand and Australia who have inspired and shared my passion for soils and landscapes. Also our soil judging Australian colleagues who we have worked with over the years, and my colleagues at Lincoln University who have worked diligently to teach and make the soil judging happen.

Developing effective pedagogy for teaching practical field soil skills

Back in the 1990's and 2000's at Lincoln University, we ran courses in soil geomorphology and soil resources at the 300 level, led by Phil Tonkin and Peter Almond. Here was a perfect environment for students to immerse themselves in pedology, profile description, landscape interpretation. It was a total experience. It was experiential learning and also pedagogically – aligned. That is, the teaching practice was aligned with the subject matter. It was also constructivist pedology – constructing knowledge through direct experience and hands on learning.

After many trips in the field and observing how students learnt pedology so effectively on these courses, it became apparent to me that it really was by the pedagogy (teaching practice) we used: kinaesthetic, experiential learning over several days. It set me thinking. Is there a way to more effectively facilitate student learning of pedology and landscape interactions, apart from running lots of field trips? Then a chance conversation with Stephen Cattle from University of Sydney, at the World Congress of Soil Science, Jeju, 2014, about the possibility of a Soil Judging Competition at the Queenstown conference in 2016. The Australians had been organising Soil Judging Competitions since 2012. This was an epiphany – soil judging was a pedagogically aligned way of teaching pedology and soil science, in a supportive, educational environment.

But what is Soil judging? Not “best in show” but essentially, describing a soil profile accurately and correctly (compared to a professional description), and to make landscape interpretations for land use within a time limit. Students compete as teams and as individuals. Most importantly, it is an educative experience in a supportive environment. Soil judging has a long and distinguished history in North America. First initiated in the 1960’s and held annually at a different host institution each year. Institutions compete first within regions, with the winning regional team heading to the national championships. In North America, soil judging is seen as a key component of the soil science curriculum and an important part of the graduate attributes of all soil science graduates. There is stiff competition to be selected into the soil judging team, and team members train weekly during the competition season.

But *why* exactly is it seen as a valuable approach to teaching soil science? There is certainly more to soil judging than just “pedology by stealth”. We would all agree that it is advantageous for every soil science graduate to be able to describe a soil profile at a basic level and from this, to make some informed interpretations. Whether it is for land use, fertiliser recommendations, nutrient fluxes, irrigation scheduling or waste disposal. We also teach soil science in an ever changing world. Students who study soil science increasingly do so as part of other allied disciplines like agronomy, agriculture, environmental science, horticulture; and often at an introductory level. There is also an increasing need internationally for students with soil science expertise.

What is the research supporting the pedagogy? A wide-ranging study of teaching soil science around the globe found that the initial focus of soil science teaching is geared towards capturing the interest and attention of the student, and is then followed by courses that deepen and extend that knowledge (Hartemink *et al*. 2014). Balks noted that in order to engage with students at a foundation level, successful techniques include those that bring soils alive in the classroom, and also that allow students to grow in confidence in their ability to understand and work with soils (Hartemink, *ibid*). Soil judging is one approach to engage and capture the interest of students.

Other global studies have shown that a field component remains vital to our soil science teaching – both at the introductory and advanced levels. Students like learning in the field; it helps them to comprehend soils as not only part of the landscape, but also part of a functioning ecosystem. In the field there is more time to think and to interact with staff so that learning occurs at a deeper level. In a study of graduates who had majored in soil science (as part of a larger study of soil science specific teaching principles) the most effective learning activities reported were: field work (43%), laboratories (36%), tutorials/group discussions (11%). More ‘traditional’ learning and teaching practices comprising lectures (8%), presentations / assessments (7%) and writing reports (5%) appeared less effective (Field et al., 2011).

Chris Baxter of University Wisconsin-Platteville noted that in his experience, soil judging competitions do encourage students into the discipline. The tactile and investigative side of soil judging is something that many students can excel in. The competition aspect, if managed well, makes soil judging a fun activity that engages

student curiosity to learn more about soils. It is a powerful recruiter to University soils courses and degree programmes (Baxter, pers. comm).

But increasingly, time spent learning practical field skills is squeezed in the curriculum, but clearly, some component of field-based learning can only help students in their soil science studies.

We started soil judging at Lincoln University with the organisation of the inaugural Australasian Soil Judging Competition at the 2016 Queenstown conference. This competition attracted 13 teams from 11 institutions: University of Western Australia; University of Wisconsin-Platteville; University of Sydney; University of Southern Queensland; University of Queensland; Queensland combined team; University of Melbourne; University of Western Sydney; University of New England; University of Waikato; Massey University and Lincoln University.

Following this event and also positive student feedback, we continued the program at Lincoln. Since 2017, we have sent two –three teams (undergraduate and postgraduate) to compete annually in the Australian Soil Judging Competition. Students have had the opportunity to travel to Queensland, Canberra and Adelaide to experience soils and landscapes so very different to here in NZ. At the 2018 Napier conference, Reece Hill organised the Soil judging Competition where Waikato, Massey and Lincoln competed.

There are wider benefits to this soil judging experience. The Lincoln undergraduates, drawn predominantly from a background of agricultural science and environmental science, work during the year within their student soil society to raise funds towards the cost of their trip. They undertake weekly training during the second Semester, led by their coaches. They organise their own self-study, with the guidance and mentoring of their coaches. The element of group work within their learning also starts to allow the groups to discover collaborative working practices and thus builds interpersonal skills.

Once in Australia, the competition is structured to include one practice day, where the teams can familiarise themselves with the local soils and landscapes, and one competition day. Often there is a specific educational aspect, with talks and discussions on aspects of the soils; landscapes and sustainable management practices. These competitions are more about crafting an educational experience in a supportive environment.

Time management skills (in particular who does what in the team), are vital. For the competition day, the teams have 60 minutes per pit. Teams have to complete a scorecard by describing the site characteristics and soil profile morphology; and to then estimate certain soil profile characteristics such as hydraulic conductivity, effective soil depth and estimate soil drainage class. They also estimate from their soil descriptions the soil water holding capacity. When teams were “out” of the pit, they complete other tasks on the scoresheet such as texture, colour and structure on the samples they collect from the pit face. A further step is to check against a table of suitability interpretations for 3 different land uses, and assess suitability of each soil for that land use. Finally, they classify the soil. Time management skills are just an important as soil skills, as the teams rotate in and out of the pit during the official practise time. In for 5 minutes, out for 5; in for 10, out for 10 and then the last

30 minutes is a free for all with any team members allowed to enter the pit. A pit monitor makes sure teams enter and exit the pits on time and abide by the competition rules.

Students come into these teams with a range of expectations and prior experience of soil science:

"I learnt more pedology during this experience than I did during my lectures"

"It was an amazing experience to see soils that were so different to New Zealand and to meet other soil science students"

"Soil judging allowed me to apply my theory knowledge from lectures to the field and landscape. I'm doing Hons next year!"

But *why* is soil judging such an effective pedagogy for teaching pedology and soil science? This is not just about pedology, it is also about understanding fundamental soil processes. For example, understanding the chemistry and physics behind redox and water flow allows us to make informed interpretations around the effect on soil profile morphology (presence/absence of mottles and concretions); and what this tells us about the water movement in the landscape. Soil judging is also an effective approach as it builds a wider appreciation in the student of the place that soil holds as part of a functioning ecosystem.

For some students (e.g. graduate students who have studied chemistry or biology but are working with soils, and international students with backgrounds that do not include soil science) participation in a soil judging competition may be their first experience of pedology and soil description. For these students it is really important to ensure that the competition emphasis remains as a "fun" activity and that participation and team co-operation are as, or more, important than winning. For students with limited background, that have been involved in a soil judging competition, the training day at the competition is critically important, as is the team approach.

It has been observed that students with little prior experience, and just one or two preparatory sessions, learn a great deal and grow hugely in confidence, as well as in their knowledge of soil science, in the course of a couple of days of intense involvement in a competition. It leads them to be much more engaged in further soil-related study as a result. Soil judging also builds those more generic skills of team work, critical reflection, building interpersonal skills, and an opportunity to engage in deeper learning in a particular discipline.

Strategies for pedagogy in a disruptive world.

Teaching and learning for us all in a disruptive world is a work in progress and I certainly don't have all the answers. But I want to share some of my ideas and observations around how we can devise strategies for teaching field-based skills in a disruptive world of external impacts. These external impacts include people who are seeking life-long learning opportunities, using discrete packages of learning, as well as a move to on-line learning environments.

Micro-credentials is one example of such a strategy. In 2018, The New Zealand Qualification Authority allowed micro-credentials to be part of New Zealand's regulated education and training system. In 2019, the Tertiary Education Commission in New Zealand moved to approve funding of micro-credentials. So, after 3 years of running soil judging at Lincoln, there was the opportunity to develop a micro-credential. This allowed us to deliver specific knowledge and skills in a discrete package, and the students could gain academic recognition for their learning. Our credential (SOSC901) was 'Soil Skills for Professionals 1: profile description and landscape interpretation'.

Micro-credentials are credit-bearing, stand-alone courses intended to enable learners to access specific knowledge and skills in a cost-effective and time-efficient manner. They are also specified by a statement of purpose, learning outcomes, and strong evidence of need by industry, employers, iwi, professional associations, and/or community. A micro-credential will normally certify a range of assessable learning outcomes of between 5 and 40 credits, i.e. smaller than a qualification and with a focus on skill development opportunities not currently available in the tertiary education system (TEC, 2020).

So, at 5 credits, the students could gain academic credit for the 50 hours of study and assessment for soil judging. As well as offering this to students, in the future we can see many benefits to the land-based sector in being able to offer this to working professionals and life-long learners.

There is a growing shift in demand for different delivery styles of learning. Face to face on campus is still very important, but an increasing number of people want to learn throughout their lives. This includes continuing professional development for working professionals who can't study full-time on campus.

What is an effective pedagogy for teaching practical, field-based subjects on-line? Here at Lincoln University, Louisa Hall is researching for her Masters into the effectiveness of on-line delivery for practical based learning in the geosciences. Studies indicate that student learning from on-line teaching can be at least as high as face to face, when the curriculum is developed around constructivist pedagogy and facilitating student engagement. However, it can be as time intensive as face to face teaching (Angiello, 2010; McPhee and Söderstrom, 2012; Pelz, 2007).

Hastened by the impact of COVID-19 this year, there has been significant disruption to teaching in conventional ways at universities. Lockdowns and other public health measures have driven a necessity for changes in learning: on-line and off campus. But with disruption comes opportunities: the opportunity and potential in the future to teach additional new and different groups of people in blended on-line and practical block delivery. However, this recent move to remote delivery in 2019 has been emergency remote teaching, rather than properly designed, on line teaching resources. Thus, ensuring new ways of teaching and learning are properly resourced for developing material and delivery is extremely important.

Here is another opportunity to consider. How we in the soil science community in New Zealand could work together to create resources for the benefit of the land-based sector as a whole. Massey University do this really well with their FLRC professional development courses. The British Society of Soil Science also deliver

a suite of development courses in soil science. How can we develop and effectively deliver discrete units of learning, in a blended or on-line mode, to a wider audience?

So returning full circle to soil judging, where the pedagogy is grounded in hands on learning. How do we run a virtual soil judging competition in an on-line world? This week, our colleagues in Soil Science Australia led by Andrew Biggs, have been running a virtual soil judging competition, for both students and teams of young (U35) working professionals. Practice sessions are by zoom, using high-definition PDF images of Australian soil profiles, plus additional close-up images of the profile. Additional soil information is provided, like colour, texture and chemical/physical characteristics. Teams still need to work collaboratively together to complete the exercise within the time given. And I understand the results will be announced after my talk.

Conclusions.

Pedagogically aligned learning through the medium of soil judging allows the alignment of teaching two important aspects of soil science. These are discipline specific concepts and theories and wider generic skills required by the soil science graduate. It is an effective way to help equip today's soil science graduates with skills that will make them valuable contributors to society.

Soil judging is a highly effective approach to teaching many aspects of soil science: not only practical field soil skills and a deeper appreciation of pedology but also a wider appreciation of the integration of theory and concepts within the biophysical landscape. The ability to interpret soil profiles and wider landscapes and make assessments or recommendations on sustainable soil management is at the heart of many applications of soil science in a wider multidisciplinary world.

While we cannot control external disruptors like global pandemics, we can control how we respond to these, in particular in our approach to teaching. How do we develop strategies for effective teaching? Exploring options for teaching and learning in a disruptive world is important. Today I have shared my experience of one approach for teaching practical soil-based skills in such an environment. Soil judging, when incorporated within a micro-credential framework has the potential to offer an effective means of teaching these skills in a disruptive world.

References

Angiello, R. (2010). Study looks at online learning vs. traditional instruction. *The Education Digest, 76*(2), 56-59

Field, D.J., Koppi, A.J., Jarrett, L.E., Abbott, L.K., Cattle, S.R., Grant, C.D., McBratney, A.B., Menzies, N.W. & Weatherley, A.J. (2011): Soil Science teaching principles. *Geoderma* 167-168: 9-14.

Hartemink, A.E., Balks, M.R., Chen, Z.-C., Drohan, P., Field, D.J., Krasilnikov, P., Lowe, D.J., Rabenhorst, M., van Rees, K., Schadi, P., Louis, A. Schipper, L. A., Sonneveld, M. & Walter, C. (2014): The joy of teaching soil science. *Geoderma* 217-218: 1-9.

McPhee, I., & Söderström, T. (2012). Distance, online and campus higher education: Reflections on learning outcomes. *Campus-Wide Information Systems, 29*. doi:10.1108/10650741211243166

Pelz, B. (2007). (MY) three principles of effective online pedagogy. *Journal of Asynchronous Learning Network, 8*. doi:10.24059/olj.v14i1.1642

TEC (2020). Releasing the potential of micro-credentials. Retrieved from https://www.tec.govt.nz/news-and-consultations/archived-news/releasing-the-potential-of-micro-credentials/
Tonkin, P. J (1990). Pedocorp- incorporation of land and soil. *Soil News*, 38, 1: 4-13.

News from the Regions

Waikato/Bay of Plenty

Lincoln Agritech

Critical Pathways Programme

The MBIE-funded Critical Pathways Programme (CPP) aims to unravel the different pathways of contaminant transfer at the sub-catchment scale, so the team have been busy preparing sites for continuous flow and nitrate monitoring, installing pressure sensors in selected streams to monitor water levels over time, and performing summer low flow gauging at pressure sensor locations (Figure 1).

Figure 1: Stream gauging in the Upper Piako catchment to correlate flow and water level heights measured by the pressure sensor (in the PVC tube).

As part of our Vision Mātauranga commitment, we held a much-appreciated wananga with members of Ngāti Tahu – Ngāti Whaoa at various sites in the Waiotapu Stream catchment and at Matārae Marae. Tribal members used their kaupapa Māori phone app, which was recently expanded with support by our programme (Figure 2), while we demonstrated how stream gauging and water chemistry sampling was performed (Figure 3). As our stream water chemistry dataset gradually builds up, we envisage carrying out more comparisons between our chemistry results and the assessment of the water's condition from a te ao Māori perspective. We will also be

hosting community workshops in each catchment in the next quarter to share our knowledge and results gained thus far.

Figure 2: Members of Ngāti Tahu – Ngāti Whaoa demonstrate their Mahinga Kai app.

Figure 3: Stream gauging in the Waiotapu catchment using a RiverSurveyor.

Plant & Food

We welcome **Erin Lawrence-Smith** to the North Island! Erin made the migration north to the warmer island from Lincoln over the holiday break and is now based at our Te Puke site in the stunning Bay of Plenty.

Kūmara at the Cape

Cape Runaway is the eastern extremity of the Bay of Plenty and lies within the tribal boundaries of Te Whānau-a-Apānui. Through the Growing Futures programme of The Lightest Tread, **Aleise Puketapu** and **Brent Clothier** have been engaging with MPI's Māori Agribusiness Cluster (MABx) at Whangapāraoa-Cape Runaway to re-establish the whakapapa of kūmara growing in māra kai gardens that are, in the first instance, marae-centric.

Over the last weekend of November, Aleise, **Alex Hickman** (a Te Pūhoro summer intern with PFR in Te Papaoeia), and Brent planted a māra with two cultivars of kūmara and some tutaekuri potatoes. They also needed to establish a remote and automatic climate station to understand the impact of local weather on the phenology

of the crops, so as to predict crop performance elsewhere across the rohe. The whānau would also be able to access real-time weather from the ‘cloud’ via this station. The weather station needed to have line-of-sight with a cell-phone tower. In consultation with Rika Mato of the MABx cluster, it was decided that the best farm was that of MABx member Rawiri Waititi, the Māori Party co-leader and new MP for the Waiariki electorate.

Here’s the team ready to plant with Brent, Winston (Rawiri’s Dad), Rawiri Waititi, and Alex.

A great day’s work resulted in the planting of the māra, watering of the tipu, and commissioning of the remotely accessible weather station. Great work from the whānau led to a successful outcome.

Aleise and Alex water-in the kūmara tipu and tutaekuri potatoes at Cape Runaway-Whangapāraoa.

Ecosystem services with indigenous vegetation

In early January a multi-disciplinary team (**Karin Müller**, **Joanna Sharp**, **Mike Cummins**, Jacqui Todd, Brad Howlett, Toni White and Rebecca Campbell), looking at the ecosystem services associated with indigenous vegetation in the productive landscape, travelled to Kerikeri to collect baseline data on a new commercial kiwifruit property.

The owners of the property have recently planted a mosaic of approximately 18 ha of indigenous vegetation across their almost 140 ha property, which was previously a dairy farm. These new indigenous plantings are planned to restore into Kahikatea, Kauri, Pūriri-Taraire and Totara-Towai forest, in areas ranging from riparian and gully areas, to ridges, slopes and terraces, complementing an existing 5 ha of indigenous vegetation protected under covenant. The remainder of the property is being established in gold kiwifruit.

The team set up a series of transects across the boundaries between the indigenous vegetation and the kiwifruit blocks. These are being used to explore the spatial and temporal scale over which multiple ecosystem services are delivered in the production environment.

The group spent a week and a half sampling across varied terrain, more exciting and challenging than your typical PFR research orchard. Soil samples along transects spanning across the different vegetation types on the property were collected for physical and chemical analyses, in addition to setting up pitfall and window traps to sample a range of invertebrates.

The social science component has also commenced, with interviews with the grower to understand the values that underpin their business. For this grower it was important to have sustainability embedded in their behaviour and they aspired to "champion land use change for positive impact". Future work aims to explore a broader suite of ecosystem functions in the different vegetation types, and elucidate the changes that occur as the vegetation transitions from pasture to kiwifruit or indigenous vegetation.

University of Waikato

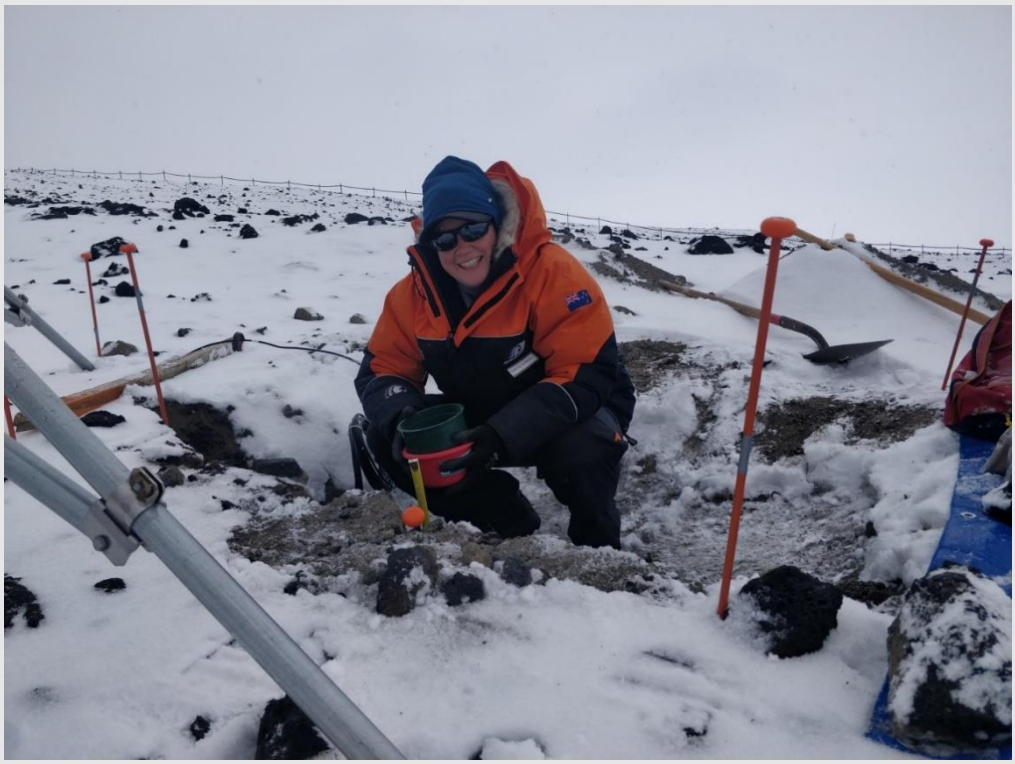
Chilling out

Dr Tanya O'Neill and **Pete Wilson** of Canterbury University were one of a handful of science events to Antarctica this summer due to covid-19 restrictions. As a requirement for all individuals travelling to Antarctica, they undertook two-weeks of managed isolation and three rounds of covid tests in Christchurch before a 12-day campaign to the ice. This was **Tanya's** 9th visit to Antarctica and she admits "*touching down on the ice shelf felt quite different to other seasons*" and "*I felt very lucky to be back in the continent that first captured my heart in 2007*". Tasked with three main objectives over their short campaign, the team installed two AWS (met stations) in the Miers Valley of the McMurdo Dry Valleys; completed the annual download and maintanence of the Ross Sea region network of soil climate stations and borehole sites (a two-decade collaborative partnership between Manaaki Whenua Landcare Research, the Natural Resource Conservation Service of the United States Department of Agriculture and Waikato University, comprising nine soil-permafrost climate stations that monitor temperatures to 1.2 m depth plus two 30 m deep permafrost monitoring temperature boreholes); and installed a brand new soil climate station at Scott Base.

Tanya at Bull Pass soil climate station in the Wright Valley of the McMurdo Dry Valleys. Photo: Wills Dobson

The original Scott Base soil climate station was installed in 1999 about 200 m from Scott Base and proposed earthworks associated with the redevelopment of Scott

Base will extend across the current site. It was critical a new station was installed this year to allow for a two year overlap of data. The team encountered -22 ºC conditions and plenty of snow as they prepared the pit and wired the sensors on the spot.



Tanya in ECW jacket (i.e. cold and its still snowing!) preparing pit for temperature sensors. Photo: Wills Dobson

The new Scott Base soil climate station, Crater Hill and the wind farm in the background. Photo: Tanya O'Neill

Finding fault

David Lowe along with **Vicki Moon** and soon-to-be masterate student at Waikato, **Joshua Hughes**, took part in a GNS Science-led trenching exercise investigating the newly discovered Te Puninga Fault near Morrinsville. The project is led by **Pilar Villamor** (GNS Science) and funded by EQC (PI Pilar Villamor), "Paleoseismology of the newly discovered Te Puninga Fault, Hauraki Plains", and in part by the Marsden Fund (PI David Lowe), "Earth-shaking insight from liquefied volcanic-ash layers in lakes: using geotechnical experiments, CT-scanned lake sediment cores, and tephrochronology to map and date prehistoric earthquakes" (see https://tephra-seismites.com/). We are trying to work out if activity on the Te Puninga Fault may have impacted on Hamilton Basin, where we suspect the liquefaction evident from the tephra seismites in lake sediments has been caused by activity on one or more local Hamilton Basin faults. This EQC/Marsden work on Te Puninga Fault will test that idea.

Joshua Hughes near Te Puninga Fault scarp (in background) near Morrinsville. Photo: D.J. Lowe

View of trench dug at right angles to fault scarp of newly discovered Te Puninga Fault in Hauraki Basin. An Allophanic Soil (Waihou series) occurs in the uppermost position (see photo of soil profile

below) with a Gley Soil (Waitoa) in low-lying position in foreground. In between is the Te Puninga soil (soil nomenclature based on Wilson 1980). In background is Mt Te Aroha. Photo: D.J. Lowe

Three large trenches were opened on two different strands of the fault scarp that runs essentially north-south parallel to SH 27 a few kilometres to the northeast of Morrinsville. The fault was discovered during LiDAR-based studies in 2016 on the nearby and well-known Kerepehi Fault farther to the east (Persaud et al. 2016). The depth at top part of trench is a bit more than 3 m (the side 'benches' are at 1.5 m depth); the trench is nearly 6 m wide, with the central deep part 2 m wide, the width of the digger blade used in the excavation.
The fault made national news coverage including the entire front page of the *Waikato Times* (19 Feb 2021) and TV news items including Joshua speaking on One news (see links below).

https://www.stuff.co.nz/national/124287263/fault-line-discovered-near-morrinsville-has-potential-to-for-67-quake

Video Scoop
https://vimeo.com/user51597298/review/513602647/93ba477c0f

Newshub
https://www.newshub.co.nz/home/new-zealand/2021/02/experts-investigating-waikato-fault-line-which-could-generate-6-7-magnitude-quake.html

One news
https://www.tvnz.co.nz/one-news/new-zealand/new-earthquake-fault-line-unearthed-near-hamilton-v1

Profile about 2.5 m high of the upper part of a trench excavated through the Te Puninga Fault scarp. The photo shows a Waihou soil (Allophanic Soil, Hapludand) comprising about 0.6 m of accumulatory tephra (weathered partly to form allophane) overlying (redox-mottled) volcanogenic alluvium (Hinuera Formation), i.e. the soil is formed in both parent materials. The upper profile formed by developmental upbuilding pedogenesis (i.e. the soil horizons, weakly developed, were forming whilst thin tephra layers accumulated slowly, millimetre by millimetre, at the same time over c. 20,000 years so that the land surface has been rising slowly since the Hinuera Surface was abandoned). Below the c. 0.6-m-thick tephra mantle the redox zone is about 0.6 m thick and marks the upper part of the alluvium overlying mainly greyish alluvium. The grey alluvium contains reduced iron as demonstrated by positive reaction to the Childs' test for ferrous iron (Childs 1981): see the three pink patches, one alongside the 30-cm-long cutting tool and two more below it (where I sprayed the dye). Photo: D.J. Lowe

References

Childs, C.W. 1981. Field tests for ferrous iron and ferric-organic complexes (on exchange sites or in water-soluble forms) in soils. *Australian Journal of Soil Research* 19, 175-180.

Persaud, M., Villamor, P., Berryman, K.R., Ries, W., Cousins, W.J., Litchfield, N., Alloway, B.V. 2016. The Kerepehi Fault, Hauraki Rift, North Island, New Zealand: active fault characterisation and hazard. *New Zealand Journal of Geology and Geophysics* 59, 117–135.

Wilson, A.D. 1980. Soils of Piako County, North Island, New Zealand. *N.Z. Soil Survey Report* 39.

Manawatu

Manaaki Whenua – Landcare Research

We welcomed Jimena Rodriguez into a laboratory role in our Environmental Chemistry laboratory. Our pedologists Sharn Hainsworth and Lauren O'Brien with Nadia Laubscher (Hamilton) have been busy with fieldwork contributing to S-map soil mapping in the Wairarapa and Manawatu-Wanganui regions. The landscapes span ranges, plains, hill country and beach fronts. The following photos from Nadia encompass a tiny snapshot of some of interesting soils and landscapes they encountered.

Photo: Restricted roots in a Typic Firm Brown Soil (Kaituna) in Wairarapa. Note the fragipan and large peds that have formed, causing restrictions in roots. This soil has developed into a weakly consolidated sandstone.

Photo: Pedologist Sharn Hainsworth in his element examining a profile (Mottled Firm Brown Soil) on Western Lake Road, close to Lake Onoke, Wairarapa. This profile, in loess, has a clay pan and has a fragipan.

Photo: Fault line near Lake Wairarapa - can you spot it (or them)?

Massey University

Congratulations to **Marta Camps-Arbestain,** the new editor-in-chief of **Nutrient Cycling and Agroecosystems** along with Dr Else K. Bünemann. The editorial entitled "Scientific publishing for greater research impact" https://t.co/q6cCX8VRlj?amp=1

(Nutrient Cycling in Agroecosystems 119, 1-5) was recently published by Johannes Lehmann, Else K. Bünemann, Marta Camps-Arbestain, and Melania Ruiz Esparza Cataño.

Guopeng (Gorden) Jiang, recently defended his thesis entitled **"Predicting spatiotemporal yield variability to aid arable precision agriculture in New Zealand: a case study of maize-grain crop production in the Waikato Region"** under the supervision of **Miles Grafton**, **Diane Pearson** and **Mike Bretherton** (Massey University). Gorden's work on precision agriculture attempts to manage within-field spatial variability by applying suitable inputs at the appropriate time, place, and amount. To achieve this, delineation of field-specific management zones (MZs), representing significantly different yield potentials are required. To date, the effectiveness of utilising MZs in New Zealand has potentially been limited due to a lack of emphasis on the interactions between spatiotemporal factors such as soil texture, crop yield, and rainfall. To fill this research gap, Gorden's thesis aimed to improve the process of delineating MZs by modelling spatiotemporal interactions between spatial crop yield and other complementary factors.

Data collected from five non-irrigated field sites in the Waikato region, based on the availability of several years of maize harvest data, were used. To remove potential yield measurement errors and improve the accuracy of spatial interpolation for yield mapping, a customised filtering algorithm was developed. A supervised machine-learning approach for predicting spatial yield was then developed using several prediction models (stepwise multiple linear regression, feedforward neural network, CART decision tree, random forest, Cubist regression, and XGBoost). To provide insights into managing spatiotemporal yield variability, predictor importance analysis was conducted to identify important yield predictors.

The spatial filtering method reduced the root mean squared errors of kriging interpolation for all available years (2014, 2015, 2017 and 2018) in a tested site, suggesting that the method developed in R programme was effective for improving the accuracy of the yield maps. For predicting spatial yield, RF produced the highest prediction accuracies (R^2 = 0.08 - 0.50), followed by XGBoost (R^2 = 0.06 - 0.39). Temporal variables (solar radiation, growing degree days (GDD) and rainfall) were proven to be salient yield predictors. This research demonstrates the viability of these models to predict subfield spatial yield, using input data that is inexpensive and readily available to arable farms in New Zealand. The novel approach employed by this thesis may provide opportunities to improve arable farming efficiency and reduce its environmental impact.

AgResearch – North Island

Mark Shepherd participated in a panel discussion on a webinar "Agriculture's Brave New World: Empowering Asia's farmers in an era of Climate Change". There was interest in the research and policy happening in New Zealand (and just as the Climate Change Commission consultation appeared). However, it was sobering to understand the reliance on smallholdings for food production in Asia, and the challenges they face in terms of Covid and climate change.

Gina Lucci and animal welfare scientist Gosia Zobel have recently started on an Our Land and Water Rural Professionals Fund project looking at the impacts of trees on pasture production, composition and quality, and animal welfare on a dairy farm in the Waikato (pictured below). They hypothesise that cows in the treed pasture will have a more varied time budget, choosing to spend more time grazing in the open areas and resting and ruminating in the treed areas. Improved choice is a key metric towards demonstrating the positive animal welfare implications of a management system.

As part of the recent science engine restructure at AgResearch, Dave Houlbrooke has changed roles and is now the Innovation Centre of Excellence Leader for Ethical Agriculture. This is a multi-disciplinary collection of science teams that cover technical capability across the pastoral science domain including environment, farm systems, plant biology, animal welfare and animal health. Needless to say soil science will be an important contributing factor in developing and championing New Zealand as a leading example of an ethical approach to farming that international consumers value. Natalie Bartlett has now taken over leadership of Dave's former Environmental Research team

Canterbury

Lincoln University

Soil Judging Competition.

Over the weekend of 6-9 November, 13 students (6 PG, 7 UG) plus Roger McLenaghen, Josh Nelson and Carol Smith travelled to Golden Bay for the formal assessment part of our micro credential SOSC901. Otherwise known as the Lincoln University 2020 soil judging competition, the students convened on Ellis Creek Farm, near Takaka. The soils and landscapes of this unique part of Golden Bay are dominated by faults, old basement rocks (Arthur Marble, Takaka Terrane, Separation Point granite) plus younger cover strata of mudstones, coal measures and clays. The warmer, wetter climate made for some highly weathered soils. Landslides are frequent, and buried soils are common. These all combined to produce some really unique soils, quite different to those in Canterbury, and a good test of the students soil description and interpretation skills. The teams chose their own soil themed team names…

Team Results:

1st: Ragey geophages (Louisa Hall, Kirstin Deuss, Sam Earl-Goulet)
2nd: 10YR we so loud (Julie Gillespie, Will Talbot, Balin Robertson)
3rd: The knights who say Ni- washi (Shana Dooley, Fin Proebst, Erin Cheng)
4th: Roes Hoes (Doug Stalker, Bella Taylor, Henry Bassant, Carole Lim)

Individual results:

1st: Louisa Hall
2nd: Fin Probst
3rd: Shana Dooley

We would like to thank Jono Williams for his help with organising the competition and for being able to use his Family farm. We also thank one of our alumni, Veronica Penny from Maanaki Whenua Landcare Research for acting as chief judge.

Team "The knights who say Ni-washi" studying a buried Ap horizon in an Immature, Orthic Brown

Soil Judging Competition 2020: team photo

Lincoln scientists celebrate World Soil Day

As part of the global celebrations for World Soil Day last Saturday 5th December, The NZ Society of Soil Science (NZSSS) teamed up with Soil Science Australia to present a virtual World Soil Day event. Soil scientists from Lincoln and the local CRIs gathered at Plant and Food Research to zoom into the meeting. This Trans-Tasman event included the annual NZSSS awards, where Roger Cresswell was presented with the Les Blakemore award by Sam Carrick (Manaaki Whenua). Carol Smith was invited to deliver the Norman H Taylor memorial lecture; receiving the Award from Tim Clough, the incoming President of the NZSSS.

Trans-Tasman Virtual Soil Judging Competition

The Lincoln University soil judging teams also performed exceptionally well in the virtual soil judging competition. This involved 43 students from 9 universities describing and interpreting Australian soil profiles from images. Soil colour, texture and chemical properties were provided, but they still had to describe horizon boundaries and horizon designations.

Lincoln 1 (Kirstin Deuss, Sam Earl-Goulet and Louisa Hall) won the Trans-Tasman trophy (beating all the Australian university teams), with Louisa and Sam placing 1st and 2nd in the individual competition. Both teams credited the recent soil judging competition in Golden bay as helping them in their preparation for this competition.

Virtual Soil Judging Competition: Team Lincoln 2 (William Talbot, Julie Gillespie, Balin Robertson)

Team Lincoln 1(Kirstin Deuss, Louisa Hall and Sam Earl-Goulet)

Manaaki Whenua – Landcare Research

New staff

Balin Robertson has joined the Soils & Landscapes team at MWLR Lincoln as a pedologist/soil surveyor and will initially be focused on mapping the soils of the Greater Wellington area and Banks Peninsula.

Balin Robertson

In a collaboration between MWLR and Lincoln University Balin has recently completed his PhD on 'The effect of rock fragments on the water retention properties of New Zealand stony soils'.

Balin's background in soil physics, specifically in stony soils, has nurtured an unhealthy fascination for rocks such that most of his spare time is spent rock climbing or collecting rocks. However, other hobbies include diving, surfing and hunting.

Fieldwork impressions

Veronica Penny has been sharing a couple of photos she took during recent field work:

- Soil sampling for the Beyond Myrtle Rust project in the North Auckland area.

Photo: Veronica Penny

Photo: Veronica Penny

- Sampling a soil – possibly a PPJ – with beautiful concretions near Leeston:

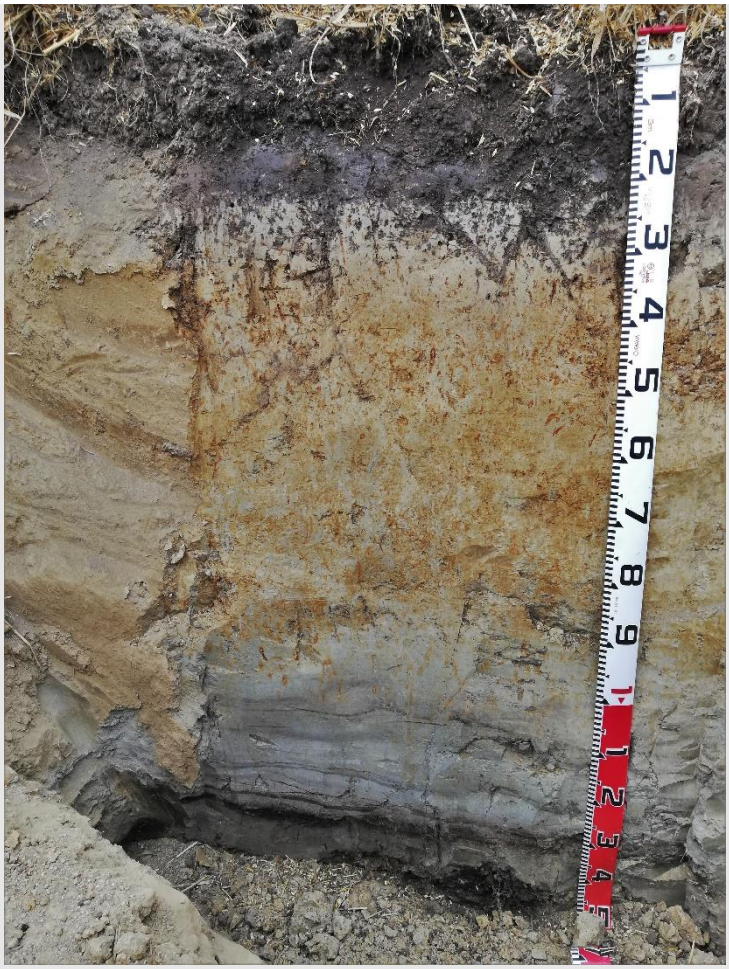


Photo: Veronica Penny

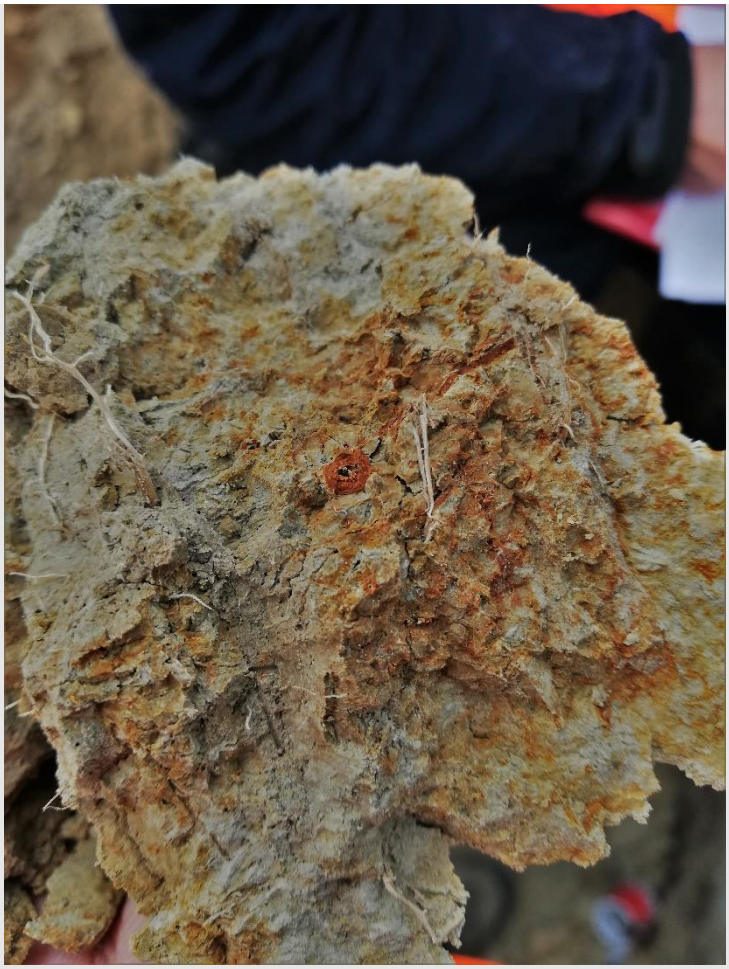


Photo: Veronica Penny

Conferences and Training

9th National Symposium on Control of Soil Degradation and Recovery

May 24-26, 2021, “Ciutat d'Elx” Congress Center, Elche, Spain
Soil is a key element for sustainability, mitigation of the effects of climate change and food production. In addition, it is the support of human activities, both cultural and productive. The symposium focuses on aspects associated with soil degradation, with an emphasis on Mediterranean environments, and proposes solutions to reverse these situations.
Read more: https://condegres.es/

Eurosoil 2021: Connecting People and Soil

23-27 August 2021, Geneva, Switzerland
The objective of Eurosoil 2021 is to bring together leading research scientists working on soil related topics and stakeholders dealing with issues of public concern, such as soil degradation and consequences of climatic changes. The important

bridging role of soil practitioners to translate scientific knowledge into practice will be emphasised during Eurosoil 2021.
https://eurosoil-congress.com/

INI2020: 8th Global Nitrogen Conference (Online)

The conference will take place on 30 May – 3 June 2021. The 8th Global Nitrogen Conference of the International Nitrogen Initiative will follow on from the previous conferences held since 1998. This time, the overall framework will be "Nitrogen and the UN Sustainable Development Goals (SDG)". Most of the SDGs are closely interlinked with the nitrogen cycle. Sustainable nitrogen management is therefore a key element in tackling environmental and societal issues on a global scale. There is no registration fee, participation in the conference is free, fees already paid for 2020 have already been reimbursed.
https://ini2020.com/

LuWQ 2021

LuWQ 2021 has now been postponed until **12-15 September 2022.** More information available on the website https://www.luwq2021.nl/ Here's hoping things have settled down by then!

NZSSS Conference 2022

Plans are underway for our regular NZ Soil Science conference to be held in Blenheim in the last week of November, 2022. If you are interested in helping on the organising committee for that meeting please contact our current society president megan.balks@earthbrooke.co.nz or vice president Timothy.clough@lincoln.ac.nz

NSSS BGM 2020 – Treasurer's Report

Haydon Jones, NZSSS Treasurer

11 November 2020

Audited financial statement for the 2019/20 financial year

- A copy of the audited financial statement for 2019/20 (a non-conference year for the NZSSS) has, together with this report, been circulated to members. Note that the previous financial year (2018/19) was a conference year for the NZSSS, which largely explains the difference in total expenses and total income between 2019/20 and 2018/19. The key points of the audited financial statement are as follows.
- Profit & Loss Statement for the period ending 30 June 2020:

1. Total income was $32,461 (down $24,420 on the previous year, with the main difference being the conference dividend received in the previous year).
2. Total expenses were $23,416 (down $10,638 on the previous year, mainly due to the absence of conference-related and biennial award-related expenses).
3. **Net profit was $9,045** (down $13,783 on the previous year as expenses were down less relative to the reduction in income).

- Balance Sheet as at 30 June 2020:
    1. Total assets were $205,698 (up $8,873 on the previous year end).
    2. Total liabilities were $723 (down $171 on the previous year end).
    3. **Net assets (total equity) were $204,976** (up $9,045 on the previous year end).

Budgeted expenditure for the current financial year (2020/21)

- In the current financial year (a joint conference year for the NZSSS), we are anticipating a total full-year income of approximately $34,340 and have planned a total full-year expenditure of about $52,340, leaving an expected deficit of about $18,000. The main reason for an expected deficit in this financial year is the significant level of planned financial support for student involvement in the upcoming joint SSA-NZSSS conference in Cairns (27 June to 2 July, 2021) and will draw on the surpluses we've run in recent years.
- A high-level breakdown of the budgeted full-year expenditure is provided by Figure 1 below.
- Support for the involvement and development of students in soil science is reflected in the allocation of a significant proportion of expenditure (32%) to supporting student involvement in the joint SSA-NZSSS conference plus an additional 23% of expenditure on the provision of awards & grants, many of which are targeted at students. 'Connectivity' includes costs associated with membership of the Royal Society of New Zealand, maintenance of the NZSSS website, the NH Taylor lecture, and support for regional meetings (e.g. Wai-BoP) and is expected to account for about 11% of expenditure. Operational expenses associated with running the Society, including ongoing work toward improved levels of service delivery to our members, is expected to account for about 28% of expenditure in 2020/21.

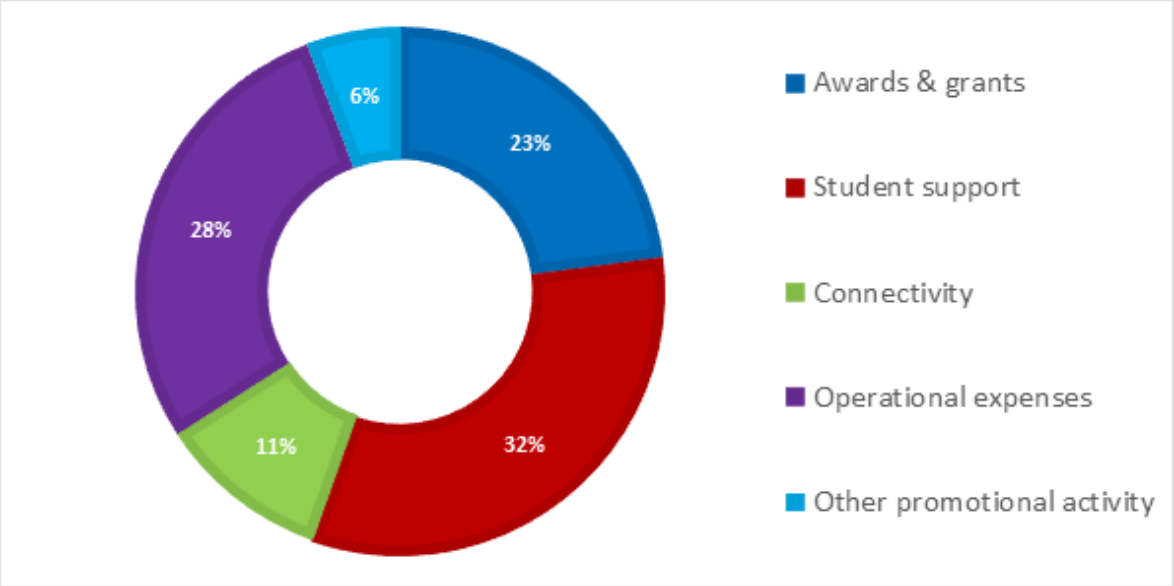


Figure 1. *Breakdown of budgeted NZSSS expenses for 2020/21 (~$52,000 total).*

Comment from the Treasurer

- Over the past two years the NZSSS Executive Council has maintained and delivered on a commitment to achieving a sustainable and secure financial position for the Society.
- We have delivered on this commitment by adhering to a four-year budget designed to deliver expected levels of service within the bounds of available income on an ongoing basis. Working to this four-year budget cycle allows us to anticipate and effectively manage the annual differences in income and expenditure among conference, non-conference, and joint conference years. Achieving modest surpluses in some years allows us to confidently invest even more in key priorities (e.g. student support), to the extent of running a modest deficit, in years when the opportunities are greater (e.g. joint conference years).
- The ongoing financial support for student involvement and development in the discipline of soil science in New Zealand, and the promotion of soil science in general, continue to be key priorities for the Executive Council

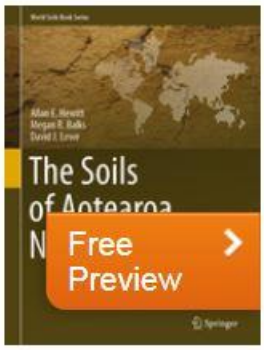
New book on New Zealand soils now published online

This book has just been published online (20 February 2021). The entire book in hard copy form is scheduled for publication in late March 2021.
Details including table of contents for the 18 chapters can be found at:
https://link.springer.com/book/10.1007/978-3-030-64763-6

Individual chapters are available for purchase as well as the entire book.

» Environmental Sciences » Soil Science

World Soils Book Series



© 2021

The Soils of Aotearoa New Zealand

Authors: **Hewitt**, Allan E., **Balks**, Megan R., **Lowe**, David J.

Customer can order the book or individual chapters via https://www.springer.com/in/book/9783030647612

Two databases that may be of interest:

- A database containing all the Winchmore data is now freely available (and will be kept updated) at: https://www.nature.com/articles/s41597-021-00841-x.
- A global database on GHG and NH_3 emissions from the manure management chain at: http://www.dataman.co.nz.

References and abstracts are provided below.

Abstracts

Imaging the electrical conductivity of the soil profile and its relationships to soil water patterns and drainage characteristics.

El-Naggar A.G., Hedley C.B., Roudier P, Horne D, Clothier B.E. 2021 Imaging the electrical conductivity of the soil profile and its relationships to soil water patterns and drainage characteristics. Published online 2 January 2021. *Precision Agriculture* https://doi.org/10.1007/s11119-020-09763-x

Soil water content (θ) measurement is vital for accurate irrigation scheduling. Electromagnetic induction surveys can be used to map spatial variability of θ when other soil properties are uniform. However, depth-specific θ variations, essential for precision irrigation management, have been less investigated using this method. A quasi-2-dimensional inversion model, capable of inverting apparent soil electrical conductivity (EC_a) data to calculate estimates of true electrical conductivity (σ) down the entire soil profile, was developed using EC_a data collected by a multi-coil Dualem-421S sensor. The optimal relationships between σ and volumetric water

content (θv) were established using all coil arrays of the Dualem-421S, a damping factor of 0.04, an initial model of 35 mSm^{-1}, and with ten iterations ($R^2 = 0.70$, $bias = 0.00\ cm^3cm^{-3}$, $RMSE = 0.04\ cm^3cm^{-3}$). These relationships were then used to derive soil profile images of these properties, and as expected, θv and σ follow similar trends down the soil profile. The derived soil profile images for θv have potential use for irrigation scheduling to two EC_a-derived soil management zones under a variable rate irrigation system at this case study site. They reflect the intrinsic soil differences that occur between texture, texture transitions and drainage characteristics. The method can also be used to guide placement of soil moisture sensors for in-season monitoring of spatio-temporal variations of θv. This soil imaging method showed good potential for predicting $2D$ depth profiles of soil texture, moisture and drainage characteristics, and supporting soil, plant and irrigation management.

Could patterns of animal behaviour cause the observed differences in soil carbon between adjacent irrigated and unirrigated paddocks?

Lìyǐn L. Liáng, Miko U.F. Kirschbaum, Donna L. Giltrap, John E. Hunt, Johannes Laubach. Could patterns of animal behaviour cause the observed differences in soil carbon between adjacent irrigated and unirrigated paddocks? 2021, Science of the Total Environment (accepted).

Previous soil sampling from grazed pastures in New Zealand compared the changes of soil organic carbon (SOC) in adjacent irrigated and unirrigated portions of the same paddocks. It showed that irrigated portions had lower SOC stocks than unirrigated portions, with an average difference of 7.0 tC ha^{-1} or 0.6 tC ha^{-1} yr^{-1}. These findings have formed the basis of an assessment for the net effect of conversion of New Zealands grazed pastures to irrigation. However, since cattle could move freely between irrigated and unirrigated portions of the paddock, there could have been excreta transfer and/or different grazing intensity between the irrigated and unirrigated portions of the same paddocks. Both these factors could have affected SOC stocks. In this study, we used the process-based model, CenW, to simulate the consequences of this possible carbon transfer via animal excreta and different grazing intensities. We found that the observed increase of 0.6 tC ha^{-1} yr^{-1} in SOC stock in the unirrigated portions could result from a transfer of 20% excreta from the irrigated to unirrigated portion (with an area ratio of 6:1) of a paddock and with the unirrigated portion being grazed only lightly with 2.0 tDM ha^{-1} in foliage biomass residuals remaining after grazing. That means that the observed higher SOC stocks in the unirrigated portions could potentially be attributable to the behaviour of grazing animals. We suggest that a realistic extent of carbon transfer and/or differences in grazing intensity could be sufficient to account for the observed differences in SOC stocks even if irrigation per se caused no differences in carbon stocks. It is therefore inappropriate to ascribe the change of SOC to irrigation effects based on experimental findings where SOC changes can be affected by the behaviour of grazing animals.

Formation and mechanisms of nano-metal oxide-biochar composites for pollutant removal: A review

Chenxi Zhao, Bing Wang, Benny K.G. Theng, Pan Wu, Fang Liu, Shengsen Wang, Xinqing Lee, Miao Chen, Ling Li, Xueyang Zhang. Formation and mechanisms of nano-metal oxide-biochar composites for pollutant removal: A review. Science of the Total Environment (2021), https://doi.org/10.1016/j.scitotenv.2021.145305

Biochar, a carbon-rich material, has been widely used to adsorb a range of pollutants because of its low cost, large specific surface area, and high ion exchange capacity. The adsorption capacity of biochar, however, is limited by its small porosity and low content of surface functional groups. Nano-metal oxides have a large specific surface area and high surface energy but tend to aggregate and passivate because of their fine-grained nature. In combining the positive qualities of both biochar and nano-metal oxides, nano-metal oxide-biochar composites (NMOBCs) have emerged as a group of effective and novel adsorbents. NMOBCs improve the dispersity and stability of nano-metal oxides, rich in adsorption sites and surface functional groups, maximize the adsorption capacity of biochar and nano-metal oxides, respectively. Since the adsorption capacity and mechanisms of NMOBCs vary greatly amongst different preparations and application conditions, there is a need for a review of NMOBCs. Herein we firstly summarize the recent methods of preparing NMOBCs, the factors influencing their efficacy in the removal of several pollutants, mechanisms underlying the adsorption of different pollutants, and their potential applications for pollution control. Recommendations and suggestions for future studies on NMOBCs are also proposed.

Nitrous oxide emissions from cow urine patches in an intensively managed grassland: Influence of nitrogen loading under contrasting soil moisture

Bhupinder Pal Singh, Promil Mehra, Yunying Fang, Warwick Dougherty, Surinder Saggar (2021). Nitrous oxide emissions from cow urine patches in an intensively managed grassland: Influence of nitrogen loading under contrasting soil moisture. *Science of the Total Environment* 757 (2021): 143790 https://doi.org/10.1016/j.scitotenv.2020.143790

In dairy grazing systems, livestock urine patches are hotspots that contribute to global warming, both directly through nitrous oxide (N_20) emissions, and indirectly, through nitrate leaching. However, under warm-dry temperate environments, N_20 emission factors (EFs) have not been thoroughly evaluated, accounting for the influence of urinary nitrogen (N) concentration and urine volume, and emissions measurement approach through different urine application methods. Here we quantified and compared N_20 emissions and EFs on a moderately well-drained sandy loam soil from urine patches established in naturally expanding effective area (NEEA), representing urine volumes of 2, 3 and 4 L m (equivalent to urine -N loadings of 141, 211 and 282 kg N ha^{-1}), and using the uniformly wetted area (UWA) with urine applied at 10 L m (709 kg N ha^{-1} under two different soil moistures (below

field capacity, BFC; field capacity, FC). The results showed that cumulative N_20 emissions in the NEEA urine patches were 0.36-0.52 kg N_20-N ha^{-1} over 146 days (early-winter to late-spring). In the UWA urine patches, cumulative N20 emissions were 2.3 times higher at FC (1.96 kg N_20-N ha^{-1}) than BFC (0.87 kg N_20-N ha^{-1}). The EFs were similar between UWA (0.09%) and NEEA (0.07-0.10%) at BFC but were significantly higher ($P < 0.05$-0.1) in UWA (0.26%) than NEEA (0.09-0.16%) at FC. The EFs in NEEA were not affected by urine-N loadings under BFC and FC, ranging between 0.07 and 0.16%. The relatively high versus low urine-N loadings in NEEA enhanced pasture herbage and N-uptake responses under both soil moistures. However, there were no differences in apparent N-use efficiency (ranging from 27 to 39%) across the treatments. The EFs observed in this study are much lower than the existing Australian cattle urine annual EF of 0.4%, and further examination to determine a more accurate EF for the industry is required.

Use of a urease inhibitor to mitigate ammonia emissions from urine patches
Maria Jimena Rodriguez, Surinder Saggar, Peter Berben, Thilak Palmada, Nicolas Lopez-Villalobos and Pranoy Pal (2021) Environmental Technology 42, 20-31 https://doi.org/10.1080/09593330.2019.1620345

Urine deposition by grazing livestock is the single largest source of ammonia (NH_3) volatilisation. Urease inhibitors (UI) have been used to mitigate NH_3 losses from fertiliser urea and animal urine. In previous trials, the UI effect in reducing NH_3 emissions from urine has been measured by applying urine mixed with the UI to the pasture soil thus increasing NBTPT; ammonia the chances of better interaction of the UI in inhibiting the urease enzyme. However, these trials do not represent a realistic grazing scenario where only urine is deposited onto the soil. This current research aimed to identify the best time to spray nBTPT (a UI containing 0.025% N-(n- deposition butyl) thiophosphoric triamide) onto pasture soil to reduce NH3 losses from urine patches. The treatments were: a control (without urine and nBTPT), urine alone at 530 kg N ha^{-1} and urine plus nBTPT. The UI was applied to the chambers and soil plots 5 and 3 days prior to urine deposition, on the same day and 1, 3 and 5 after urine deposition in autumn. Ammonia losses were measured using the dynamic chamber method. The application of the inhibitor prior to urine deposition reduced NH_3 losses with reductions of 27.6% and 17.5% achieved for UAgr-5 and UAgr-3, respectively. However, reductions in NH3 emission were 0.6-2.9% for inhibitor applied post urine deposition. There was also a reduction in both soil NH^+_4-N concentration and soil pH in comparison with urine alone or with the treatments where nBTPT was applied after urine deposition.

Distribution of ^{137}Cs and ^{60}Co in plough layer of farmland: Evidenced from a lysimeter experiment using undisturbed soil columns
Wenxiang Liu, Yong LI, Hanqing Yu, Surinder Saggar, Daozhi Gong and Qiong Zhang (2021) **Distribution of ^{137}Cs and ^{60}Co in plough layer of farmland: Evidenced**

from a lysimeter experiment using undisturbed soil columns. *Pedosphere 31: 180-190. doi:10.1016/S1002-0160(19)60837-4 ISSN 1002-0160/CN 32-1315P*

Radionuclide fallout during nuclear accidents on the land may impair the atmosphere, contaminate farmland soils and crops, and can even reach the groundwater. Previous research focused on the field distribution of deposited radionuclides in farmland soils, but details of the amounts of radionuclides in the plough layer and the changes in their proportional distribution in the soil profile with time are still inadequate. In this study, a lysimeter experiment was conducted to determine the vertical migration of ^{137}Cs and ^{60}Co in brown and aeolian sandy soils, collected from the farmlands adjoining Shidaowan Nuclear Power Plant (NPP) in eastern China, and to identify the factors influencing their migration depths in soil. At the end of the experiment (800 d), > 96% of added ^{137}Cs and ^{60}Co were retained in the top 0–20 cm soil layer of both soils; very little ^{137}Cs or ^{60}Co initially migrated to 20–30 cm, but their amounts at this depth increased with time. The migration depth of ^{137}Cs was greater in the aeolian sandy soil than in the brown soil during 0–577 d, but at the end of the experiment, ^{137}Cs migrated to the same depth (25 cm) in both soils. Three phases on the vertical migration rate (v) of ^{60}Co in the aeolian sandy soil can be identified: an initial rapid movement (0–355 d, v = 219 ± 17 mm year^{-1}), followed by a steady movement (355–577 d, v = 150 ± 24 mm year^{-1}) and a very slow movement (577–800 d, v = 107 ± 7 mm year−1). In contrast, its migration rate in the brown soil (v = 133 ± 17 mm year^{-1}) was steady throughout the 800-d experimental period. The migration of both ^{137}Cs and ^{60}Co in the two soils appears to be regulated by soil clay and silt fractions that provide most of the soil surface area, soil organic carbon (SOC), and soil pH, which were manifested by the solid-liquid distribution coefficient of ^{137}Cs and ^{60}Co. The results of this study suggest that most ^{137}Cs and ^{60}Co remained within the top layer (0–20 cm depth) of farmland soils following a simulated NPP accident, and little reached the subsurface (20–30 cm depth). Fixation of radionuclides onto clay minerals may limit their migration in soil, but some could be laterally distributed by soil erosion and taken up by crops, and migrate into groundwater in a high-water table level area after several decades. Remediation measures, therefore, should focus on reducing their impact on the farmland soils, crops, and water.

National scale 3D mapping of soil pH using a data augmentation approach
Roudier P, Burge OR, Richardson SJ, McCarthy JK, Grealish GJ, Ausseil A-G. 2020. National scale 3D mapping of soil pH using a data augmentation approach. *Remote Sensing 12*: 2872.

Understanding the spatial variation of soil pH is critical for many different stakeholders across different fields of science, because it is a master variable that plays a central role in many soil processes. This study documents the first attempt to map soil pH (1:5 H2O) at high resolution (100 m) in New Zealand. The regression framework used follows the paradigm of digital soil mapping, and a limited number of environmental covariates were selected using variable selection, before

calibration of a quantile regression forest model. In order to adapt the outcomes of this work to a wide range of different depth supports, a new approach, which includes depth of sampling as a covariate, is proposed. It relies on data augmentation, a process where virtual observations are drawn from statistical populations constructed using the observed data, based on the top and bottom depth of sampling, and including the uncertainty surrounding the soil pH measurement. A single model can then be calibrated and deployed to estimate pH a various depths. Results showed that the data augmentation routine had a beneficial effect on prediction uncertainties, in particular when reference measurement uncertainties are taken into account. Further testing found that the optimal rate of augmentation for this dataset was 3-fold. Inspection of the final model revealed that the most important variables for predicting soil pH distribution in New Zealand were related to land cover and climate, in particular to soil water balance. The evaluation of this approach on those validation sites set aside before modelling showed very good results (R2 = 0.65, CCC = 0.79, RMSE = 0.54), that significantly out-performed existing soil pH information for the country.

Wallach et al (2021) **Multi-model evaluation of phenology prediction for wheat in Australia.** *Agricultural and Forest Meteorology* 298-299 (2021) 108289

Predicting wheat phenology is important for cultivar selection, for effective crop management and provides a baseline for evaluating the effects of global change. Evaluating how well crop phenology can be predicted is therefore of major interest. Twenty-eight wheat modeling groups participated in this evaluation. Our target population was wheat fields in the major wheat growing regions of Australia under current climatic conditions and with current local management practices. The environments used for calibration and for evaluation were both sampled from this same target population. The calibration and evaluation environments had neither sites nor years in common, so this is a rigorous evaluation of the ability of modeling groups to predict phenology for new sites and weather conditions. Mean absolute error (MAE) for the evaluation environments, averaged over predictions of three phenological stages and over modeling groups, was 9 days, with a range from 6 to 20 days. Predictions using the multi-modeling group mean and median had prediction errors nearly as small as the best modeling group. About two thirds of the modeling groups performed better than a simple but relevant benchmark, which predicts phenology by assuming a constant temperature sum for each development stage. The added complexity of crop models beyond just the effect of temperature was thus justified in most cases. There was substantial variability between modeling groups using the same model structure, which implies that model improvement could be achieved not only by improving model structure, but also by improving parameter values, and in particular by improving calibration techniques.

Wallach et al (2021a) **How well do crop modeling groups predict wheat phenology, given calibration data from the target population?** *European Journal of Agronomy* 124 (2021) 126195

Predicting phenology is essential for adapting varieties to different environmental conditions and for crop management. Therefore, it is important to evaluate how well different crop modeling groups can predict phenology. Multiple evaluation studies have been previously published, but it is still difficult to generalize the findings from such studies since they often test some specific aspect of extrapolation to new conditions, or do not test on data that is truly independent of the data used for calibration. In this study, we analyzed the prediction of wheat phenology in Northern France under observed weather and current management, which is a problem of practical importance for wheat management. The results of 27 modeling groups are evaluated, where modelling group encompasses model structure, i.e. the model equations, the calibration method and the values of those parameters not affected by calibration. The data for calibration and evaluation are sampled from the same target population, thus extrapolation is limited. The calibration and evaluation data have neither year nor site in common, to guarantee rigorous evaluation of prediction for new weather and sites. The best modeling groups, and also the mean and median of the simulations, have a mean absolute error (MAE) of about 3 days, which is comparable to the measurement error. Almost all models do better than using average number of days or average sum of degree days to predict phenology. On the other hand, there are important differences between modelling groups, due to model structural differences and to differences between groups using the same model structure, which emphasizes that model structure alone does not completely determine prediction accuracy. In addition to providing information for our specific environments and varieties, these results are a useful contribution to a knowledge base of how well modeling groups can predict phenology, when provided with calibration data from the target population.

McDowell, R.W., Moss, R.A., Gray, C.W. *et al.* Seventy years of data from the world's longest grazed and irrigated pasture trials. *Sci Data* 8, 53 (2021). https://doi.org/10.1038/s41597-021-00841-x

Pastures are the most widespread land use, globally. The Winchmore trials were established in 1948–1949 in Canterbury, New Zealand and examined either different rates of phosphorus (P) fertiliser on the same irrigation schedule (Fertiliser trial), or different irrigation scheduling at the same rate of P application (Irrigation trial). About 96,000 records of soil chemistry and physical data and pasture yield and botanical composition are available along with nearly 7000 soil samples. These data have been used in 475 publications that have explored topics as diverse as: improvements in sheep, dairy and deer production; the efficacy and scheduling of irrigation; improvements in pasture and crop production; agronomic and environmental soil and water research; and entomology. In addition to above topics, these data are invaluable for calibrating models to predict long-term issues like the

accumulation of soil carbon or contaminants like cadmium and informing policy on climate change and agricultural practices. The data and soil samples are available for use and may yet yield discoveries, unforeseen 70 years ago.

Beltran, I, van der Weerden, TJ, Alfaro, MA, et al. DATAMAN: A global database of nitrous oxide and ammonia emission factors for excreta deposited by livestock and land-applied manure. *J. Environ. Qual.* 2021;1–15. https://doi.org/10.1002/jeq2.20186

Nitrous oxide (N_2O), ammonia (NH_3), and methane (CH_4) emissions from the manure management chain of livestock production systems are important contributors to greenhouse gases (GHGs) and NH_3 emitted by human activities. Several studies have evaluated manure-related emissions and associated key variables at regional, national, or continental scales. However, there have been few studies focusing on the drivers of these emissions using a global dataset. An international project was created (DATAMAN) to develop a global database on GHG and NH_3 emissions from the manure management chain (housing, storage, and field) to identify key variables influencing emissions and ultimately to refine emission factors (EFs) for future national GHG inventories and NH_3 emission reporting. This paper describes the "field" database that focuses on N_2O and NH_3 EFs from land-applied manure and excreta deposited by grazing livestock. We collated relevant information (EFs, manure characteristics, soil properties, and climatic conditions) from published peer-reviewed research, conference papers, and existing databases. The database, containing 5,632 observations compiled from 184 studies, was relatively evenly split between N_2O and NH_3 (56 and 44% of the EF values, respectively). The N_2O data were derived from studies conducted in 21 countries on five continents, with New Zealand, the United Kingdom, Kenya, and Brazil representing 86% of the data. The NH_3 data originated from studies conducted in 17 countries on four continents, with the United Kingdom, Denmark, Canada, and The Netherlands representing 79% of the data. Wet temperate climates represented 90% of the total database. The DATAMAN field database is available at http://www.dataman.co.nz.

Past NZSSS Award recipients

(Apologies, this table is a bit hard to follow grey and white shading have been used to mark the original page breaks in the table)

President's Invitation Lecture	1978 A N Sharpley	1991 G N A Wigley
1972 W A Pullar	1979 K W Steele	1992 R B Doyle
1973 T W Walker	1980 -none	1993 -none
1974 A J Metson	1981 A G Hogg	1994 P L Carey
1975 H S Gibbs	1982 A W Limmer	1995 J Moir
	1983 A B Cooper	1996 -none1997 S Park

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 McDowell
2016 L Schipper
2017 T Clough
2018 A Roberts
2019 M Camps
2020 C Smith

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
2016 D Huang
2017 S McNally & J Owens
2018 M Bucci
2019 C Gardiner
2020 F Rambags

Sir Theodore Rigg Award for Masterate Thesis

1976 K D Earl
1977 T H Webb & N E Logan
1978 -none
1979 D A McKie

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
2016 N Laubscher
2017 J Robinson
2018 O Petrie
2019 J Millar
2020 M Kokiri Huirama

Fertiliser Association Award 2019

Was 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

NZSSS Postgraduate Awards 1971 D W Ives 1972 I Nairn 1973 -none1974 V E Neall 1975 -none **Morice Fieldes Memorial** Award for PhD Thesis 1976 J C Ryden 1977 -none	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	2011 N Wells 2012 R Dodd 2013 No award 2014 S McNally 2016 J Pronger 2018 T Geretharan 2019 A Wecking 2020 T Corbett **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 2016 J Jiao 2018 B Moorhead 2020 R Cresswell **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 2016 D Selbie, L Buckthought, M Shepherd (jointly) 2018 J Luo 2020 D Curtin, M Beare (jointly) **The T W Walker Prizes** 1992 (oral paper) –S T	(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)	(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)

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
2016 (oral paper) – R Woods
(poster) – A Carlton2018
2018 (oral paper) – A Tumbure
(poster) – K Deuss

Undergraduate Prizes
1994 R McDowell
(Lincoln University)
R Hodgson
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
S Rayner – (Lincoln)
2015 T Leabourn (Massey)
B Robertson (Lincoln)
F Garrity (Waikato)
2016 M O'Grady (Waikato)
H Jensen (Lincoln)
SA Whiteman (Massey)
2017 C Tomlinson (Waikato)
S Pike (Massey)
I Setiawan (Lincoln)
2018 M Hall (Waikato)
M Van Baarle
C Chisholm
2019 E Kitchen (Waikato)
S Earl-Goulet (Lincoln)
2020 A Carrington (Waikato)

Fellows of the NZ Society of Soil Science
L C Blakemore R Naidu
M R Balks V E Neall
N Bolan R L Parfitt
K C Cameron J A Pollock
I B Campbell AHC Roberts
C W Childs S Saggar
J Churchman A G Sinclair
B E Clothier G Sparling
I S Cornforth T W Speir
H J Di J K Syers

K M Goh K R Tate
P Gregg B K G Theng
R J Haynes P J Tonkin
S F Ledgard T W Walker
D J Lowe J H Watkinson
J D McCraw G W Yeates
A Mackay A Hewitt
L Schipper M Beare
L Condron M Hedley
D Ross C De Klein
T Clough R Monaghan
R McDowell D Curtin
R G McLaren D Houlbrooke

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

Grange Medal
K Tate
B Clothier
G Rys
M Hedley
F Curran-Cournane

	P Gregg A Mackay P Fraser B Quin D Lowe	