



Welcome to the Soil News

August 2018

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

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President's message

Kia ora NZSSS members.

In the May edition of Soil News I shared a letter to Minister for Environment Rt. Hon David Parker that the Council of the NZSSS prepared discussing versatile soils and our support for a proposed National Policy Statement (NPS) on this matter. We have not yet received a response to this letter. However, independent of this approach, the Minister for Agriculture (Rt. Hon Damien O'Connor) requested a meeting with a delegation of soil scientists to discuss soil-related issues relevant to New Zealand agriculture. This meeting took place at Parliament on June 25th with a delegation chosen by MPI. I was there representing the NZ Society of Soil Science and was accompanied by Dr Alison Collins (Ministry for the Environment, Departmental Science Advisor), Dr Peter Millard (Manaaki Whenua Landcare Research, General Manager Science) and Professor Louis Schipper (University of Waikato). The Minister requested a broad presentation from the delegation and we covered soil carbon, soil quality (esp. soil compaction & Olsen P), nutrient management, OVERSEER, contaminants, protecting versatile soil, soil databases, soil mapping and the Our Land and Water National Science Challenge. This was followed by wider discussion on topics including the development of the next generation of soil scientists (and their skill requirements), the tools required to develop and enable future land use policy and funding issues for soil science. The funding conversation focussed on (i) the inability to develop or maintain long term monitoring to inform robust land use decision making, (ii) the need for complete national soil databases and maps, and (iii) soil science knowledge required to inform robust model and decision-making tools. The Minister made it clear that tighter environmental limits were on the way, that alternatives to forestry land use were required, and that an NPS will be developed to protect versatile soils - likely by MPI. The meeting ended with a request by the Minister for the delegation to stay in touch and inform him of what we felt the next steps should be. As per his suggestion we have since followed up with a letter covering knowledge gaps, capability development and MBIE funding reviews. It was very pleasing to find that the Minister is very engaged on the topic of soil science, seeing great value in its role for the challenges ahead for our agricultural industry.

Things are progressing nicely for the upcoming NZSSS conference in Hawkes Bay in December. The local organising committee have now completed a science programme following the submission of over 160 abstracts. In addition a great line up of Keynote speakers have been confirmed including the Parliamentary Commissioner for the Environment (Simon Upton) and Celebrity Chief Annabel Langbein, who will discuss the connection between food and its source in the soil. A big thank you to the organising committee (led by Paul Johnstone and Rebecca Withnall) for all of their work to date. The next step is to go ahead and register with early bird registration closing on October 20th. More details on this event are included in this newsletter.

Some of you would have recently travelled to Brazil to attend the 21st World Congress of Soil Science. I hope it was a successful event and look forward to reading about it in this edition of Soil News.

Regards Dave Houlbrooke - NZSSS President

Society News

2018 NZSSS Conference
3-6 December 2018, Napier, New Zealand

Soils2018 will be held in Napier from 3 to 6 December 2018. This biannual conference

Soil2018 will be held in Napier from 6 to 9 December 2018. This biennial conference is a must attend event organised by the NZ Society of Soil Science and OnCue Conferences, and will cover a range of topics under the theme “**diverse soils – productive landscapes**”. The wider Hawke’s Bay region is home to a diverse mix of primary production, from forestry and sheep and beef production on the coastal and northern hill country, intensive dairy systems on the flat and rolling terraces abutting the ranges, to highly productive horticulture and cropping on the fertile Heretaunga and Ruataniwha plains. During the 4-day conference you’ll get a chance to hear from a wide range of researchers, industry leaders, consultants and advisors, regulators and land managers on all things soil-related, anchored by a range of exciting keynotes focused on soilscapes, food production and hot topics around water use and environmental indicators. The conference will be held at the new Napier War Memorial Conference Centre (NWMCC), a great venue on Napier’s iconic Marine Parade that looks out on Cape Kidnappers and the city coastline. Centrally located, the NWMCC is across the road from local hotels, restaurants and the downtown shopping precinct. Around the conference you’ll have a chance to connect with your colleagues during social activities at some of the Bay’s well known wineries, and look at a wide range of offerings from our event sponsors. All of the details about this event can be found at the conference website <http://nzsssconference.co.nz/>. The call for abstracts resulted in the submission of 115 oral papers and 48 posters. The programme is being fine-tuned and will be available on line before the end of August <http://nzsssconference.co.nz/programme-v>. Likewise all submissions will receive correspondence before the end of August with regards the status of their abstract submissions.

We have been able to secure an interesting and wide range of keynote and plenary presenters for the conference:

- Annabel Langbein - Celebrity Chief
- Andrew Waterhouse and Mark Shepherd - Co Editors in chief Journal of Food and Agriculture
- Brent Clothier - Plant & Food Research
- Greg and Racheal Hart - Hawkes Bay farmers
- Sam Robinson - Hawkes Bay farmer and agri-Governance
- Jonno Rau - Manaaki Whenua
- Blair Waipara - Te Tumu Paeroa
- Simon Upton - Parliamentary Commissioner for the Environment
- Ants Roberts - Ravensdown

More details available at <http://nzsssconference.co.nz/speakers>

If you have any further queries about the science programme please contact David.Houlbrooke@agresearch.co.nz. Conference registration is open and early bird registrations close on the 20th of October.

Rebecca Withnall and Paul Johnstone, co-convenors
Lea Boodee, On-Cue Conference

Soil-art exhibition – invitation and advance warning!

After our successful inaugural soil art exhibition at the Hamilton conference in 2014 we are planning to again hold a soil-related art exhibition at our NZSSS conference in Napier in December 2018. We would like to showcase the widest possible interpretation of soil-related art, produced by you, the New Zealand Soil Science community.

Everyone can participate - all forms of art will be accepted including: sculpture from soil/clay/earth materials or with a soil-related theme, paintings related to soils or made using soil materials, poems or short statements that can be displayed on a wall poster, photography, fibre art, computer generated art, soil peels, sand paintings, cartoons - anything is possible.

everything is possible.

WHY??

- Art is fun to create and to view.
- Art is a way to reach a non-science audience with messages about the importance, beauty, vulnerability and versatility of soil.
- Art (done by the science community) is a means to break down stereotypes about the sorts of people who are scientists.

Thus, the challenge is to get creative. Start now while there is lots of time to work on it. There is still time for you to join a pottery, art, or sculpture class to get some upskilling to create your masterpiece. Do something to show off some of your interpretations of soil or soil materials.

Get committed, let Megan Balks megan.balks@waikato.ac.nz know if you plan to contribute so we can ensure we have enough suitable display space.

Land, Air, Water Aotearoa (LAWA):

LAWA has been established by like-minded organisations with a view to helping local communities find the balance between using natural resources and maintaining their quality and availability. LAWA connects us with the environment by sharing environmental data and information. They have recently produced a video: [LAWA land cover video](#)

News From the Regions

Waikato/Bay of Plenty

Waikato University

Changes in curriculum/papers taught

Teaching staff at the university have been working on major curriculum changes for several years now, with new papers at year-1 and year-2 level being introduced this year. In 2019, new or modified papers are being introduced at year-3 level and at graduate level for some subjects. For the soil science (sub)discipline in Earth sciences, two papers at second year have been amalgamated into a single paper, "Soil science", taught by **Tanya O'Neill**, **David Lowe**, and **Louis Schipper**. At third year, David's "Pedology and land evaluation" paper continues (expanded a little); Louis' and Tanya's "Soil and land management" paper is being joined with a catchment hydrology paper previously taught by **David Campbell** into a single soil-hydrosphere paper, "Soil and water management". At graduate level, two soil science-focussed papers continue, which is good news, but another paper, "Quaternary: past environments", which David has taught for 20 years, has been discontinued.

Staff

As well as **Megan Balks'** retirement in February, volcanic mineralogist **Dr Shaun Barker** (gone to University of Tasmania) and sedimentologist/paleolimnologist **Dr Beth Fox** (gone to University of Huddersfield) left our Earth sciences group in June. On the credit side, a new lecturer in sedimentary geology, **Dr Andrew la Croix** (University of Queensland) has just been appointed and takes up a lectureship with us later this year or early next. And although no longer at the university, Megan continues to be heavily involved with soil science including supervising students and working on a book and other projects. Currently, Megan Balks and masterate student **Annette Carshalton** are at the World Soil Congress in Rio de Janeiro, Brazil. They sent us these great photos (Fig. 1) of a real pedon (3D monolith) set up at the entrance to the congress (Annette on the left, Megan on right).



Fig. 1. Annette Carshalton (left) and Megan Balks admiring an impressive pedon at the entrance to the Rio18 World Soil Congress (12 August 2018). Photos: Annette Carshalton and Megan Balks.

David Lowe has been involved in the International Focus Group on Tephrochronology and Volcanism (INTAV)-led tephra conference, “Crossing New Frontiers: Tephra Hunt in Transylvania”, held at Moieciu de Sus (near Brasov) in the southern Carpathian Mountains of Transylvania, Romania, in late June this year. INTAV is a long-standing global tephra research group within the International Union for Quaternary Research (INQUA). It organises specialist tephra meetings every four years or so on average, although the most recent until this year was way back in 2010 in Kirishima, Japan.

The Romanian meeting, convened by Daniel Veres (Romania) and Ulrich Hambach (Germany), together with the INTAV executive committee (Britta Jensen, Canada; Peter Abbott, UK/Switzerland; Takehiko Suzuki, Japan; Siwan Davies, UK; and David Lowe, NZ), was a great success: it included 92 participants (Fig. 2), a record number for INTAV meetings, from 20 countries. They were treated to 94 stimulating and insightful oral (41) and poster (53) papers along with seven outstanding keynote presentations, a special evening lecture on the complex local geology (including volcanic and tephra deposits) that helped inform the mid-conference field excursion which included a visit to Dracula’s castle (Fig. 3) and a fantastic Bayesian-based age modelling workshop led by Maarten Blaauw (UK). The conference was followed by a compelling three-day post-conference field trip involving 32 participants that included a visit to a huge and impressive underground salt mine; proximal rhyolitic and dacitic tephra deposits, domes, and craters; dynamic and complex tectonism, mountains, and monasteries; loess encompassing distal tephtras (Fig. 4); and spectacular mud volcanoes. The conference abstract volume is available at the conference website (under ‘programme’) at http://www.bayceer.unibayreuth.de/intav2018/en/prog/gru/html.php?id_obj=15981





Fig. 2. Participants in the “Tephra Hunt in Transylvania” conference in front of columnar basalt in the Perşani volcanic field (active from 1.2-0.6 Ma) in the southern Carpathians during the mid-conference excursion on 26 June 2018. Photo: Pierre Oesterle.

Tephra studies, especially those associated with distal cryptotephra deposits (glass shard and/or crystal concentrations insufficiently numerous to be visible as a layer to the naked eye), are clearly very strong at present. Papers from the conference are to be published in a special volume of *Quaternary International*. All participants are especially indebted to Daniel Veres and Ulrich Hambach, and their wonderful student and postdoc helpers, who looked after everyone exceptionally well from start to finish. The warmth and friendliness of the Romanian hosts, insight into the excellent research being undertaken in the region, and the obvious enthusiasm for all things tephrochronological by the participants, made the conference especially memorable.



Fig. 3. David Lowe at the base of Bran (Dracula) Castle, in Bran, Transylvania, which was completed in 1388 AD. Photo: Maria Gehrels

Funding obtained by the INTAV executive from the Stratigraphy and Chronology Commission of INQUA (grant 1710P) helped enable 18 early career researchers and students (there were 22 of the latter, including 17 undertaking PhDs) attend the conference. Four students were additionally awarded prizes (from a Waikato University special award) for first and second places in poster and oral presentations - as noted by the judges, the standard of presentation was uniformly high throughout the conference. Gudrun Larsen of Iceland and David Lowe of New Zealand were awarded honorary life memberships of INTAV, their achievements in tephrochronology being described in brief by Andy Dugmore and Peter Abbott, respectively, at an awards ceremony during the conference dinner. Veteran

tephrochronologist John Westgate of Canada was awarded, to universal acclaim, a special framed certificate by David Lowe to commemorate the 50th anniversary of the publication of John's pathfinding paper (with the late D.G.W. Smith) in *Earth and Planetary Science Letters* in 1969 on the use of the electron probe to characterise glass shards in tephtras to enable them to be correlated over long distance (Figs. 5 and 6). The hosts also baked a special chocolate layer-cake to help commemorate that important milestone!





Fig. 4. Loess section supporting Mollisols on the Wallachian plains in southeast Romania alongside the Buzău River. At the base is a thick distal tephra (~0.5 m), the Y5 tephra associated with the Campanian Igmimbrite eruption c. 40-39 ka in the Campi Flegrei field, Italy. Much of the land in this region was supporting corn/maize alongside wheat and sunflower crops. Photo: David Lowe.



Fig. 5. Commemorating 50 years since the advent of the use of the electron probe to analyse major elements in glass shards to chemically 'fingerprint' tephras to enable them to be correlated. John Westgate (centre with jacket) wrote the seminal first paper (with colleague Dorian Smith) to demonstrate this usage in 1969. The photo shows the special certificate awarded to John and a commemorative layer cake. From left are Takehiko Suzuki (president INTAV), Cora and John Westgate, Britta Jensen (vice-president INTAV), Peter Abbott (vice-president INTAV), and David Lowe (immediate past-president INTAV).



Fig. 6. The special certificate presented to John Westgate in Romania, 27 June 2018. The SEM images of glass shards represent the North American tephras John analysed in undertaking his seminal research. The certificate was designed by Betty-Ann Kamp (Hamilton). Photo: David Lowe.

Lincoln Agritech

Aldrin Rivas, Brian Moorhead (both LAL) and **Greg Barkle** (Aqualinc) have been working on field instrumentation for determining the vertical variation of the saturated hydraulic conductivity in the shallow groundwater underlying the root zone. The vadose zone and shallow groundwater can be simply thought of as an extension of the “soil zone”, less influenced by plant roots and with lower microbial biomass. However, it represents the crucial transfer pathway for contaminants lost from the root zone into the local streams or deeper groundwater. The hydrological conditions in this zone influence the partitioning of the recharge between shallow lateral flow components discharging relatively quickly into local streams, and the vertical components into the regional groundwater system sustaining the flow of larger rivers. As the associated lag times and attenuation potentials of these two pathways differ substantially, it is crucial to understand the hydrological and physical conditions that control this partitioning.

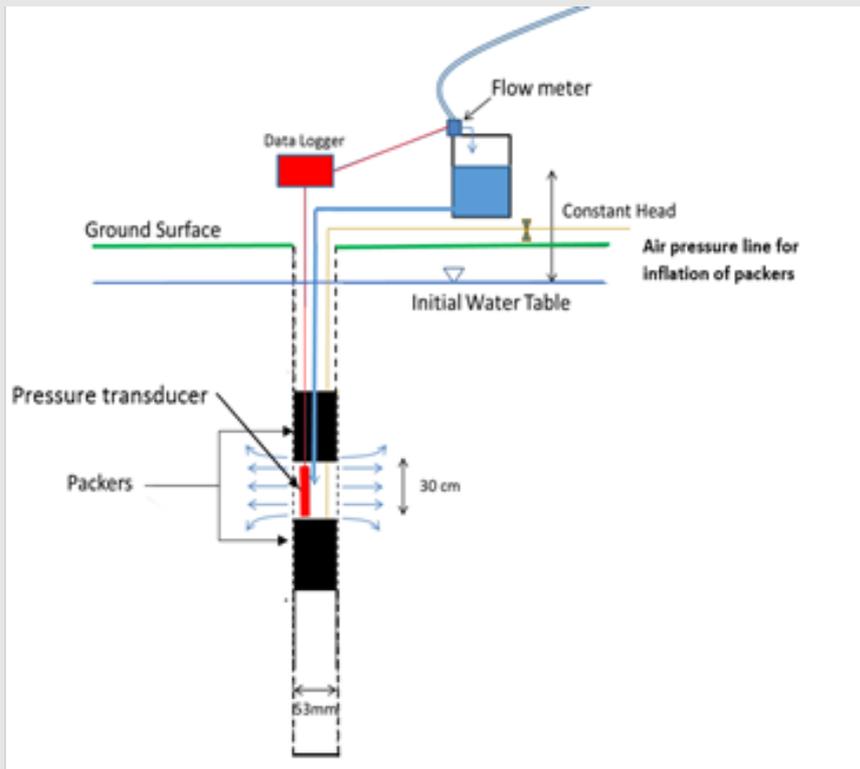
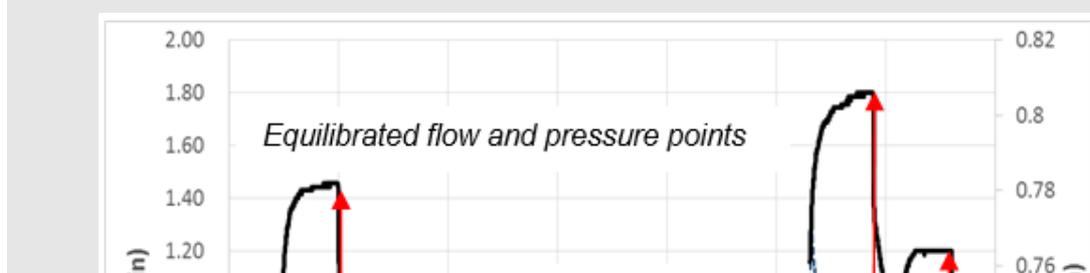


Figure 1: Experimental setup of the dual packer system for determining the saturated hydraulic conductivity in the shallow groundwater

The setup of the instrumentation developed is shown in Fig 1. Essentially, water is injected at a relatively low flow rate (typical 0.1 to 5 l/min) and constant head (typical range from 2 to 4 m above the watertable) through a short section of well screen, isolated with inflatable packers, until a constant equilibrium flow is obtained. The resultant equilibrated flow rate and head represents one data point for the investigated depth. The head is then adjusted slightly, and the resulting new equilibrium flow rate determined. A number of data points of equilibrium flow rate and head (approx. 4 to 6) are obtained at the depth of interest. An example of the typical flow and head data collected over a completed test is shown in Figure 2. The equilibrium data points are then plotted, with the expectation that a linear relationship will fit the data well. The resulting gradient of the line is directly related to the hydraulic conductivity and the geometry of the measurement zone being investigated.



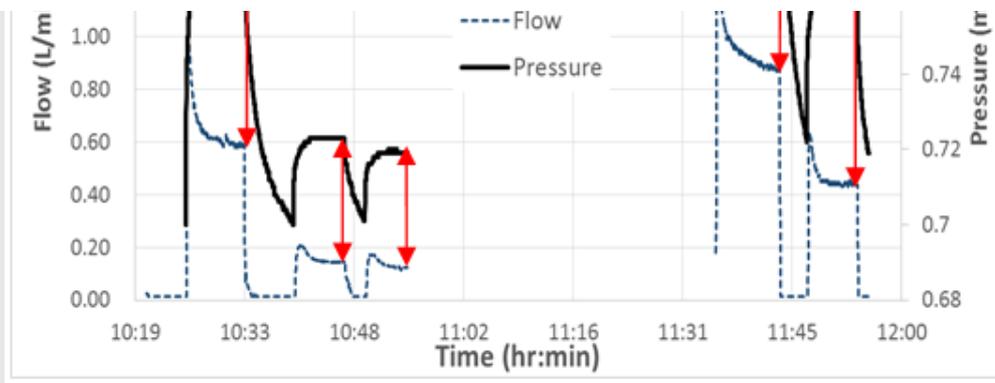


Figure 2: Flow and pressure traces under laboratory conditions in a sand flume.

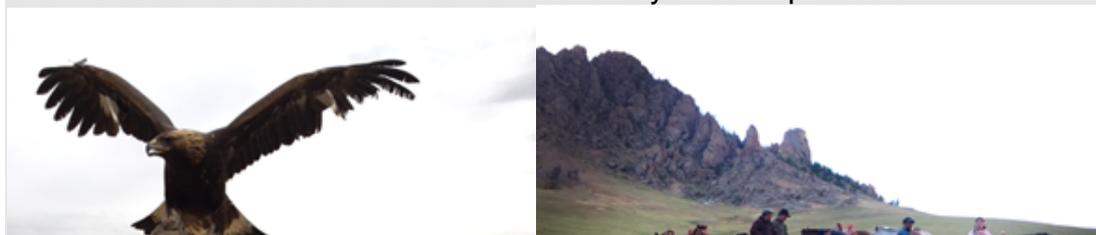
AgResearch Ruakura

In July, **Jiafa Luo** and **Bob Longhurst** travelled to China to assist Ministry for the Environment (MfE) in a China/NZ environmental cooperation project. The project will demonstrate a “circular economy” in effluent management from a dairy farm. The aim is to grow maize and wheat using effluent and manure from cow housing barns. The trial would also include comparisons to inorganic fertilizers with yields, N uptake and N loss to water measured. The field trial hopes to demonstrate that organic manures can successfully be employed in growing maize and wheat with less reliance particularly on fertilizer N inputs and that a reduction in N leaching losses will be the result.



Photo: Chinese officials from central, provincial and local EPA, Chinese scientists, NZ Embassy representative, Jiafa Luo and Bob Longhurst, and farm staff at one of field sites (The temperature was 41°C when this photo was taken).

In June **Gina Lucci** traveled to Mongolia to participate in the Global Agenda for Sustainable Livestock’s multi-stakeholder meeting outside Ulaanbaatar. The theme of the meeting, “Livestock on the move”, was inspired both by the traditional nomadic herding lifestyle that is common in Mongolia and the rapidly changing dynamics in the global livestock sector. The sustainable livestock priorities discussed during the meeting were i) Food nutrition and security, ii) livelihoods and economic growth, iii) health and animal welfare, and iv) climate and natural resource use. Pasture degradation and overgrazing is a real problem in Mongolia, but there were a number of inspiring projects showcased at the meeting demonstrating successful collaborations between pasture user groups and researchers to support herders to sustainably manage their pastures and increase the value of their camel wool and yak down products.





Photos: left Gina holding a very large eagle (highlight of the trip!); Right: Mongolian herders.

The Environmental Research team has two recent additions. We welcome **Lisa Box**, a recent Lincoln University graduate. Lisa started a post-doc at AgResearch, where she will predominately be working with **Brendon Welten** and looking at nitrogen excreta with the help of urine sensors. We also welcome **Natalya ('Taly') Matthews**, an MSc student at Waikato University who has joined the team as part of her Masters degree in GIS. AgResearch has been working on developing a high accuracy GPS locator for cattle studies. Taly will be helping us to interpret the data, as part for her thesis. The research falls into two parts: *evaluation* of the GPS technology to help us understand the relationships between sampling frequency and GPS accuracy on calculated values such as distance travelled, categorisation of activity type, etc; and then, *application* of the GPS tool to investigate for example, between animal variations in behaviours. Taly is with us until February.

Waikato Regional Council

Completing SMAP across the region has been accelerated and will be completed in 7-8 years.

Scion (Rotorua/Christchurch)

Scion scientists at the 13th North American Forest Soils Conference

Five soil scientists from Scion attended this event, held on June 10th - 14th in Quebec City. Session themes addressed the role of forests and forest soils in climate change adaptation and mitigation, the effects of fire on soil properties, technological advances in forest soil research and monitoring networks, and the linkages between management, land use change and forest productivity, as well as a session exploring the role of forest soils in society. From the Scion contingent, **Peter Beets** presented information regarding research into the soil factors that have the greatest consistent effect on forest productivity in New Zealand conditions, **Amanda Matson** presented preliminary results from a nitrogen leaching trial, **Loretta Garrett** discussed results from end-of-rotation assessments of long term organic matter removal and fertiliser trials, while **Simeon Smaill** presented information from trials exploring soil-plant-microbe interactions in New Zealand planted forest systems, and their impact on productivity. Simeon Smaill and Loretta Garrett combined to introduce the large scale Accelerator Trial network to the attendees, and provided some early results from these high-value new trials. **Peter Clinton** had the honour of bringing the conference to an end, presenting a Closing Keynote address exploring the importance of preserving the value that forests and forest soil provides to society, and the need for forest scientists to keep ahead of the pressures that climate change will bring. The Scion team engaged with various attendees during the conference, advancing existing collaborations and identifying new opportunities for joint projects. After the conference Loretta Garrett, Amanda Matson, Peter Beets and Peter Clinton visited the world famous Hubbard Brook Experimental Forest in New Hampshire (8,000-acre area). The long-term Experimental Forest has been running for over six decades and studies the response of ecosystem (air, water, soils, plants and animals) structure, composition and function to disturbances, both natural and anthropogenic.





Figure 1 Peter Beets, Peter Clinton, Loretta Garrett, Simeon Smaill and Amanda Matson amongst a group other soil scientist during the conference field trip. The forest is dominated by sugar maple, which is the source of that great Candia invention, maple syrup.

Investing in soil modification to improve future tree rotations

Scion is currently installing the sixth and final site in the Accelerator Trial series at Tokoiti, Otago. This 10-ha trial site is being established on a fertile soil that produced a highly productive first rotation of trees, but the productivity of the second rotation is anticipated to be increasingly limited by moisture availability. To address this, the Scion team is attempting to modify the capacity of the site to store moisture with treatments that increase the organic matter content of the soil by increasing the retention of harvest debris from the first rotation and incorporating this material into the soil profile to a depth of 500 mm. The land preparation treatments at the sites are nearly complete, and the second rotation at the site will be established with a range of improved radiata pine genotypes in late August. Cultivation on this scale is outside the bounds of conventional forest practice, but has been strongly supported by the forestry company that has provided the land due to the potential for this intervention to increase not only the value of the next rotation, but that of subsequent rotations.



Figure 2. Loretta Garrett standing amongst the first rotation of radiata pine at the site. Scion scientists made two visits to the site prior to the harvest of the first rotation, during which the soil properties at the site have been examined and future plot locations identified for the trial.





Figure 3. Examination of the root plates from fallen trees indicated a very shallow rooting depth in some areas of the trial. In this case tree roots did not extend more than about 350 mm into the soil, forming a dense mat above an impermeable layer of rock. This greatly reduces moisture storage and availability, and informed aspects of the cultivation treatments designed to modify physical soil properties at the site.

Site specific management - soil & foliage workshop

In July 2018 a workshop series was held by Scion staff on the use of soil and foliage information for site-specific forest management. The purpose of the workshops, which were held in Rotorua and Christchurch, was to give forest managers greater confidence in managing planted forest productivity using soil and foliage information together with their current practices.

The workshop focused on providing forestry companies with a practical approach to soil or foliar analytical results, and the likely responses to management practices like fertiliser inputs. The workshops went beyond just soil and foliar tests, considering planted forests from a holistic perspective - climate, terrain, disease spread and genetics to support the right tree, in the right place, and for the right purpose. Scion staff provided information on (1) nutrient movement in planted forests (storage, uptake and nutrient cycling), (2) foliar and soil test interpretation (including micronutrients), (3) how to approach where to install Permanent Sampling Plots (PSP) to represent the forest, and when to sample PSP's for foliar and soil, (4) how to improve site productivity through nutrient management (e.g. keeping organics on site or the addition of nutrients through fertilisers), (5) examples of fertiliser responses from trial data, (6) the implementation of forest nutrition management plans, (7) developments using a "balanced nutritional approach", and (8) possible future forest nutrient management paradigms.

Both workshops were warmly welcomed by the forestry industry participants, who found the events to be very useful. Discussion sessions planned within the workshop indicated that the information provided would result in industry uptake and implementation. In addition, there was an agreed consensus that this type of content be presented on a more frequent basis, incorporating recent research to support forest industry needs and to identify practical applications of the latest nutritional science.





Figure 4. Loretta Garrett leading the site-specific management workshop in Christchurch

Biosolids research trial at Rabbit Island near Nelson

Biosolids application to forestland enables the beneficial reuse of biosolids-derived nutrients and organic carbon (C) for improving soil fertility and forest productivity without the risk of contaminants entering the human food chain. Scion's scientists have been investigating the impact on soil and groundwater quality, tree nutrition and growth, and wood quality of long-term biosolids application to a radiata pine plantation forest growing on a poor soil at Rabbit Island in Nelson. The pine forest on Rabbit Island, near Nelson, is a very sand soil. The coastal proximity means that appropriate land use and management on this site is important for environmental impacts of soil loss and nutrient movement off site. A long term biosolid application trial has been conducted on the site for the last 20 years. An important outcome of the trial is the understanding of the relationship between biosolids, forest production, soil physical strength, and nutrient loss.

Scion scientist, **Jianming Xue**, based in Christchurch, has been exploring these complex interactions here for a number years. The work, funded by MBIE, Tasman District Council and PF Olsen, is showing that the biosolid application can be highly beneficial to soil structure. There may be both a direct effect, whereby biosolids increase soil organic matter and the microbial interactions and 'glue' that bind soil together, and secondary effects where increased pine growth can stabilise the soil. However, Jianming Xue has found that there may be a window of risk for soil or nutrient loss during pine harvest. Understanding this window - when, where, and for how long it's open - and managing the ecosystem to better utilise the soil physical properties, will be a key focus for ongoing research.



Figure 5. The Rabbit Island biosolids research trial and soil sampling

Manawatu Plant & Food

Steve Green has been busy maintaining his field sites measuring water and nutrient drainage and runoff in kiwifruit orchards. In the Bay of Plenty region, there are drainage fluxmeters installed in seven orchard sites and a prototype 35 m² runoff plot installed in one orchard that is measuring substantial runoff during intense rain events. Steve presented results from these monitoring sites to growers at Zespri's Spotlight on Water event.



Above: Steve Green speaking at Spotlight on Water. Below: Installing the runoff plot in a kiwifruit orchard.

Also in kiwifruit **Roberta Gentile**, with the help of Carlo van den Dijssel, Nathan Arnold and Jian Liu, has been busy field sampling for deep soil carbon stock quantification. Twenty paired kiwifruit and pasture sites in the Waikato and Bay of Plenty regions are being sampled to 2-m depth to test the hypothesis that perennial horticulture can increase soil carbon storage at depth.



The collection of paired soil samples in kiwifruit and pasture land uses.

Brent Clothier and **Wafa Al Yamani** were co-authors, along with 126 others, in publishing a soil-water infiltration global data base. Brent and Wafa's contribution was on their soil-water infiltration results from the western desert of Abu Dhabi.

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Earth System
Science
Data

Development and analysis of the Soil Water Infiltration Global database

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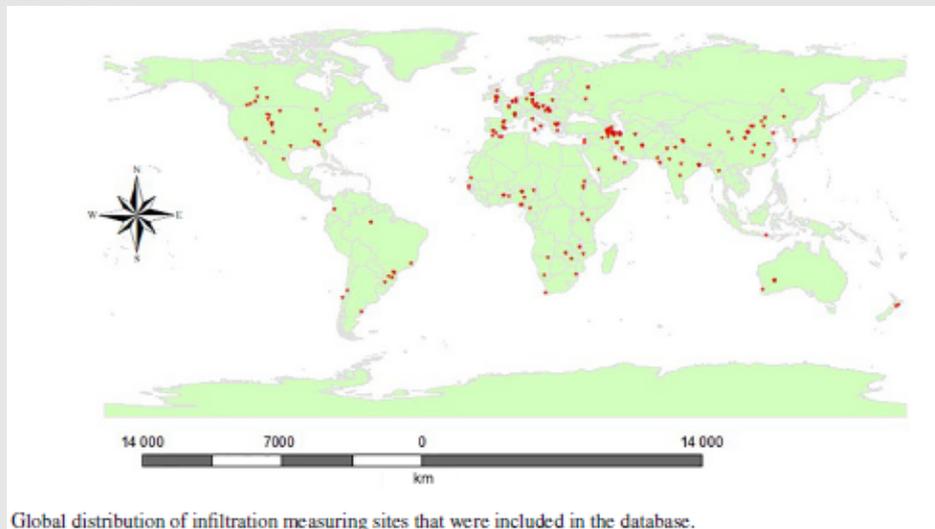
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⁷Department of Environmental Sciences, Urmia Lake Research Institute, Urmia University, Urmia, Iran

Published by Copernicus Publications.

Here is the global map of locations where infiltration data were referenced. **Iris Vogeler** and **Rogerio Cichota** from Plant & Food contributed with infiltration data from New Zealand.



Global distribution of infiltration measuring sites that were included in the database.

Massey University

July saw the retirement from Massey University of **Professor Mike Hedley** (a council member of NZSSS), after a career spanning 35 years. Mike graduated from Leeds University with a BSc in Biochemistry, before attending Massey to complete his PhD under **Professor Keith Syers**. He was an avid rugby player and enjoyed (and still does enjoy) pranks, laughs and social occasions. Following some post-grad placements overseas and marrying **Carolyn (Landcare Research)**, Mike returned to Massey as a Lecturer in 1983. He later became Director of the Fertilizer and Lime Research Centre (FLRC) and the Soil and Earth Science group leader. Mike's ability to lead by example and identify student and staff strengths and weaknesses has been a major reason for the group's successes. He has been visionary, inspiring and committed to the group, and we regret retirement may slow Mike down for a while.

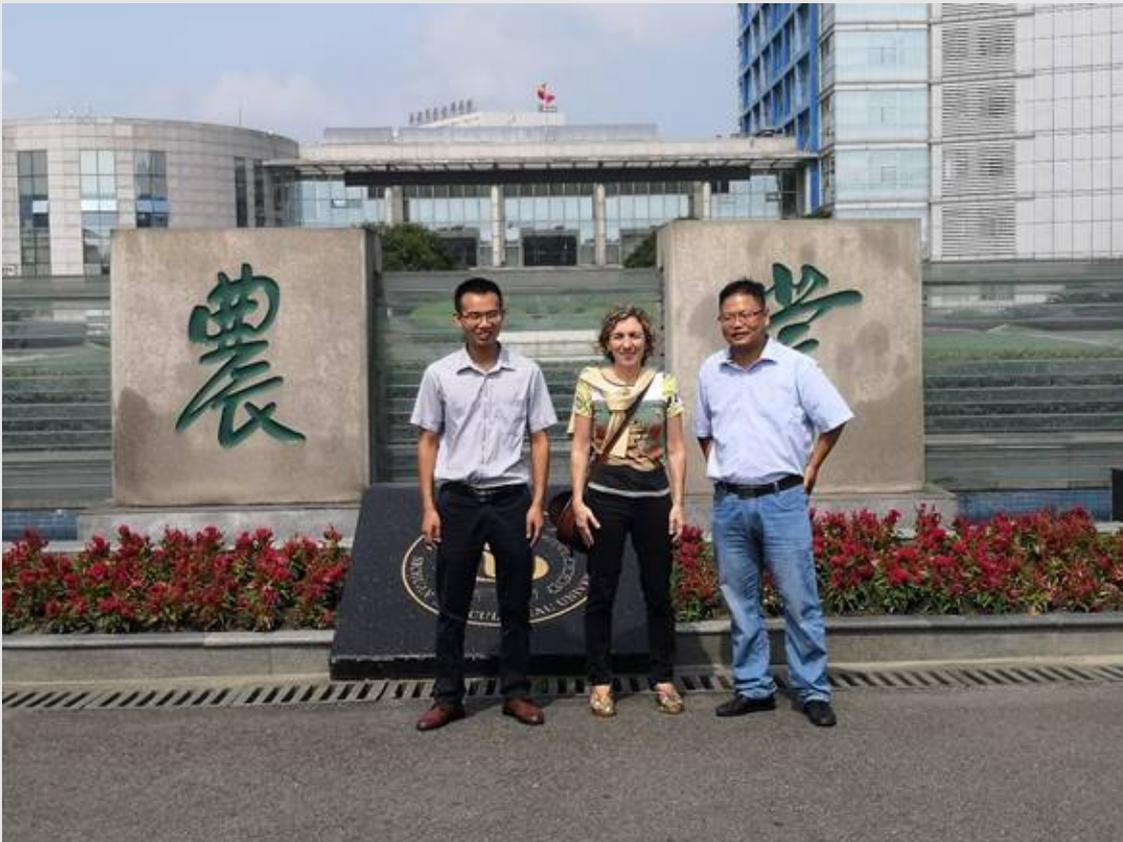
committed to the cause - and we suspect retirement may slow Mike down for a while, but he won't stop! Mike intends to now find some more time for working on his block of land and visiting family. A couple of great retirement functions were held to mark the occasion, with attendance (and stories!) from old friends, students and university and industry colleagues. The team at Massey wish him well for a happy, healthy, well-deserved retirement.



Mike giving his 'retirement speech'



Mike & Carolyn cutting a 'retirement cake'



Professor Marta Camps Arbestain with Professor Fei Shen and Dr Dong Tianwhere in China in July. Marta gave a talk on "Soil Carbon and Climate Change" at Sichuan Agricultural University, in Chengdu. Prof Fei Shen visited Massey University last year, and current Massey PhD student **Yang Li** completed her MSc under the supervision of Prof Shen at Sichuan Agricultural University.





Attendees at the 2018 CRG GRA meeting at EMBRAPA. There were three kiwis attending: Alessandro Aduso from MPI, Mike Beare from Plant and Food Research, and Professor Marta Camps Arbestain from Massey University. Marta was funded by the Global Research Alliance to attend this meeting.

Professor Marta Camps Arbestain has also recently been elected a member of the “Institut d’Estudis Catalans”, which would be equivalent to becoming a fellow of the Royal Society in NZ.

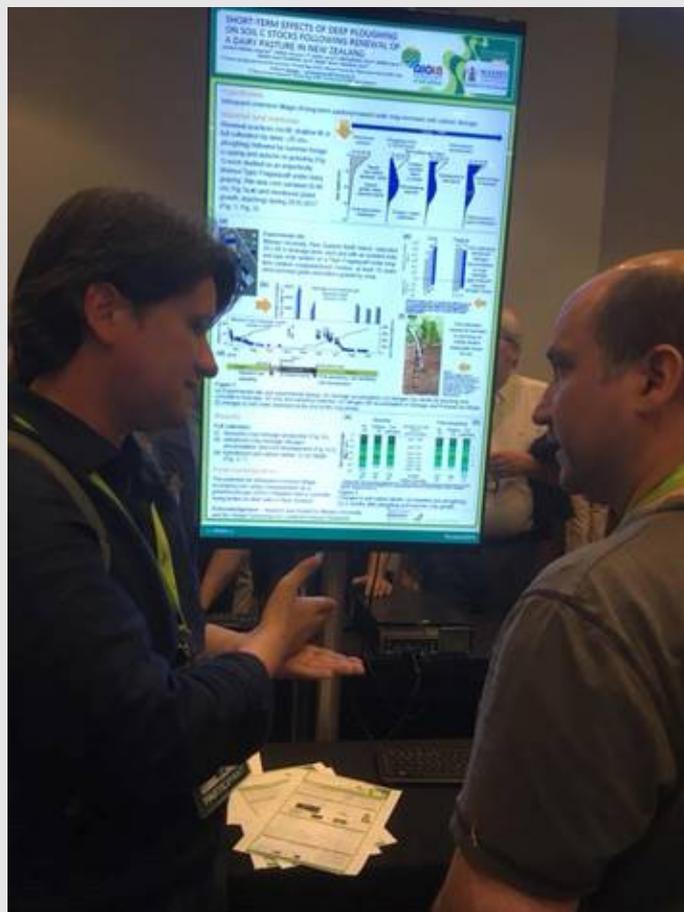
Dr Roberto Calvelo, Professor Marta Camps Arbestain, Dr Qinhua Shen, and Yang Li (Massey University) recently attended the World Congress of Soil Science in Rio de Janeiro (Brazil). Roberto Calvelo Pereira presented a poster entitled “Short-term effects of deep ploughing on soil C stocks following renewal of a dairy pasture in New Zealand”. Yang Li presented a poster entitled “An improved method to synthesize pure allophane”. She received an IUSS student grant for travel from the International Union of Soil Sciences and a Helen E Akers PhD Scholarship from Massey University. Qinhua Shen gave an oral presentation on “An Investigation of Organic Matter Quality and Quantity in Acid Soils as Influenced by Soil Type and Land Use”. She received an Early Career Academic Grant from the Association of Commonwealth Universities to attend the Congress. Marta Camps Arbestain gave an oral presentation on “A meta-analysis and review on the long-term role of organic amendments in building soil nutrient fertility”.



Dr Roberto Calvelo, Professor Marta Camps, Dr Qinhua Shen, and Yang Li (Massey University) have recently attended the World Congress of Soil Science in Rio de Janeiro (Brazil).



PhD student Yang Li with her poster at WCSS 2018 in Rio de Janeiro.



Dr Roberto Calvelo Pereira discussing his poster at WCSS 2018 in Rio de Janeiro.

Lincoln University

Lincoln University was well represented at the 21st World Congress of Soil Science held

in Rio de Janeiro, Brazil, 12-17 August 2018. Staff representing Lincoln University at the Congress were **Prof. Hong Di**, **Prof. Leo Condon** and **Assoc Prof. Jim Moir**; PhD Students included **Carmen Medina Carmona**, **Balin Robertson** and **Sephray Rayner**. A total of about 4000 delegates from over 100 countries were at the Congress. It provided a great opportunity for soil scientists from around the globe to get together and share the latest research findings, exchange new ideas, and discuss the importance of soil and soil science to human survival, feeding the growing world population, protecting the soil resources and the environment, combating climate change, among other important topics. The presentations and posters from Lincoln University were all well received, and the research presented was right at the forefront in addressing some of the major issues the world is facing today.

I Love soil in different languages



Plant & Food

Several delegates are presenting at the 21st World Soil Congress in Rio de Janeiro, Brazil including **Mike Beare**, **Steve Thomas**, **Rogério Chicota**, and **Carmen Medina**. Mike will be presenting an invited keynote address: Beare MH, McNally S, Curtin D, Baldock J 2018. Defining and Predicting the Organic Carbon Sequestration Potential of Soils.

It's been a very busy winter at Lincoln for many people at Lincoln, especially for field staff.

The Plant & Food Research and Forages for Reduced Nitrate Leaching (FRNL)-funded trial (FxT) on the Lincoln University Research Dairy Farm investigating the potential for no-tillage establishment of fodder beet and kale to reduce soil compaction and N losses following winter grazing was grazed by dairy cows over a six week period in June and July. For several days during the grazing, **Brendon Welton** and **Brian de Vantier** from AgResearch fitted urine sensors to the cows to monitor N loading on the soil. This is the first time that the two crops have been tested at the same time. Following the grazing there was an intense soil sampling period for mineral N and soil physical parameters. A further set of samples for mineral N were taken by **Wei Hu** and his team. These were taken in a grid pattern that was previously sampled and will help to establish variability in soil nitrogen following grazing.





Cows grazing the FxT site approximately mid-way through the grazing



Cows fitted with urine sensors return to the forage crops after their daily inspection in the yards

The GPLER-funded trial established in March aimed at assessing the potential for pasture renewal using full inversion tillage to increase soil C stocks compared to other common renewal practices (PRT), has established well and has seen a lot of field work recently. The site has a greenhouse N₂O emission factor component with three nitrogen treatments imposed in late July. Since then, measurements of gas losses have been intensive. Regular sampling for changes in mineral N concentrations (reflecting the risk of N leaching). The trial site was grazed for the first time recently too. **Sam McNally** and **Craig Tregurtha** have been preparing for a ¹³C labelling experiment on the PRT site, to quantify the stabilisation of newly fixed C, on inverted and non-inverted topsoils in New Zealand. We will start the ¹³C labelling in early spring 2018. The decomposition of buried SOC will be assessed from the decay of C4 plant-derived C buried at multiple depths within the soil profile at the Lincoln trial site.

A successful field day featuring these two field sites was held in July.



Dairy cows graze fodder beet and kale during the field day at the FRNL FxT site



Mike Beare presents the PRT site to field day attendees

Shane Maley and his team are working with **Peter Carey** from Lincoln AgriTech, starting a three year SFF project on catch crops following winter grazing by dairy cows. Trials are located in Central Canterbury and Southland using forage oats, triticale, barley and ryecorn.

Other FRNL work lead by **Brendon Malcolm** continues. Brendon with **Shane Maley**, **Mike George** and **Steven Dellow** are working in Southland on a time of sowing and species trial. Shane reports that both planned sowing dates have been completed in challenging conditions





The June sowing emerging in Southland

Shane also reports on a new bit of kit that was used at Gore last month to sow an SFF catch crop trial. A local contractor has imported the machine from the Netherlands for sowing into wet soil. It features a 3m Farmax spader linked to a Kongskilde seed drill.



The spader and drill in work in very heavy conditions

Soil in the news

“The City’s Buried Treasure Isn’t Under the Dirt. It Is the Dirt.”

<https://www.nytimes.com/2018/07/25/nyregion/the-citys-buried-treasure-isnt-under-the-dirt-it-is-the-dirt.html>

“Listening to earthworms burrowing and roots growing – acoustic signatures of soil biological activity”

Soil is a critical living system that supports key biogeochemical cycles, a rich array of ecological processes, and contributes to numerous ecosystems services. The complex aggregation and arrangement of mineral and organic soil constituents give rise to an important and fragile trait called soil structure, considered central to soil agro-ecological functioning. Read more: <https://www.nature.com/articles/s41598-018-28582-9>

Related Society Notices

International Union of Soil Sciences

From the desk of Rattan Lal:

“Beyond Food and Fuel: The Power of Soil to Address Global Issues”

https://iuss.boku.ac.at/files/iuss_08012018_special.pdf

“Did the Stone Age End Because the World Ran Out of Stones?”

https://iuss.boku.ac.at/files/iuss_08012018.pdf

“Drylands”

https://iuss.boku.ac.at/files/iuss_07012018.pdf

Also, IUSS has a YouTube site where you can view some of the Viewpoints direct from Rattan Lal himself:

<https://www.youtube.com/channel/UCX2edAyoQ5QDy0FtD9bQee/videos>

Abstracts

Defining a standard method to measure the total and bioavailable concentration of fluorine in New Zealand soils

Thangavelautham Geretharan^{a,b}, Paramsothy Jeyakumar^a, Michael Bretherton^a, Christopher W.N. Anderson^a

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^b Faculty of Agriculture, Eastern University of Sri Lanka, Chenkalady 30350, Sri Lanka

Abstract: The concentration of fluorine (F) in New Zealand pastoral soils is increasing as a consequence of Phosphorus (P) fertiliser application, and there is concern over the long-term impact of this F on animal and soil microbiological health. Ongoing soil F monitoring to underpin comprehensive soil F management practices requires an accurate and simple test to quantify both the total and bioavailable concentration of F in soil. In this study, soils were collected from various locations across New Zealand, representing different soil orders and land uses. The total soil F concentration was measured using an ion specific electrode following extraction with four different concentrations of NaOH (4 mol L⁻¹, 8 mol L⁻¹, 12 mol L⁻¹ and 16 mol L⁻¹), or fusion with NaOH (the conventional method used to analyse total soil F). We concluded that NaOH extraction gave an acceptable level of accuracy for organic matter and volcanic parent material derived soils. Agreement was, however, less strong for recent and pallic soils. The extraction method was subsequently validated through repeat analysis of three further soils (n = 270).

To define a method for quantification of the bioavailable concentration of F in soil, samples were extracted with water, 1 mol L⁻¹ HCl, 0.01 mol L⁻¹ CaCl₂, 0.01 mol L⁻¹ KCl, and 1 mol L⁻¹ NH₄Cl. The correlation between 0.01 mol L⁻¹ CaCl₂, 0.01 mol L⁻¹ KCl, and water extracted F concentrations were significant ($p < 0.05$), and extracted the same soil F fractions. Results were normalised to the water-extractable concentration to compare recovery as a function of soil order. The recovery percentage of 0.01 mol L⁻¹ CaCl₂ was high compared with water for soils which have high Al and Fe contents. We propose that 0.01 mol L⁻¹ CaCl₂ extraction should be adopted as a standard method to assess the bioavailable F concentration of New Zealand pastoral soils.

Geretharan, T., Jeyakumar, P., Bretherton, M., & Anderson, CWN. (2018). Defining a standard method to measure the total and bioavailable concentration of fluorine in New Zealand soils. *Microchemical Journal*. 142, 94-101

A farm-scale investigation of the organic matter composition and soil chemistry of Andisols as influenced by land use and management.

Ritha Kov, Marta Camps-Arbestain, Roberto Calvelo Pereira, Manuel Suárez-Abelenda, Qinhua Shen, Stanislav Garbuz, Felipe Macías Vázquez.

Biogeochemistry <https://doi.org/10.1007/s10533-018-0473-7>

Andisols are characterised by having abundant reactive Al in the form of short-range ordered (SRO) Al constituents and organo-Al complexes, which facilitates the accumulation of soil organic matter (OM). However, recent studies of New Zealand pastoral systems have reported loss of carbon (C) from Andisols when under intense management. This study compares the organic and inorganic chemistry of Andisols on two adjacent pasture sites under different pastoral management regimes (Paddock 2 being more intensively managed than Paddock 1), as well as under a nearby pine stand (Forest). Mean soil pH-H₂O in Forest (5.3) was significantly lower ($P < 0.05$) than that in Paddock 1 (5.7), which itself was significantly lower ($P < 0.05$) than in Paddock 2 (6.1). Soil C concentrations were significantly higher ($P < 0.05$) in the soils under pasture than under pine (63.8 g C/kg), and C in Paddock 1 (98.1 g C/kg) was significantly higher ($P < 0.05$) than in Paddock 2 (84.1 g C/kg). The ratio of Al in organo-Al complexes (as estimated

with sodium pyrophosphate) to the sum of Al in both SRO and organo-Al complexes (Alp/Al_o) was significantly smaller ($P < 0.05$) as the alkalinity of the soils increased (0.38, 0.23, 0.16 for Forest, Paddock 1 and Paddock 2, respectively). At the molecular level, soils under Forest had a larger relative contribution of degraded products of plant polysaccharides than those under pasture, while these had a larger contribution of fresh (e.g. cellulose and cutan/suberan aliphatic structures) and N-rich OM (e.g., microbial fingerprints, denoting a high microbial activity). Dissolved organic C content in the rhizosphere of pasture species was similar between paddocks, but Paddock 2 had a significantly ($P < 0.05$) greater contribution of organic acids of MW < 500 Da and higher pH (6.8 vs. 6.2). The results (1) confirm the common enrichment in organic C of New Zealand top soils under pasture compared to those under pine, and (2) reveal that the changes in the soil chemistry associated with pasture management may weaken the ability of these soils to preserve OM.

Books

Soil and Sustainable Development Goals

Edited by Rattan Lal, Rainer Horn and Takashi Kosaki. Published in the series GeoEcology Essays in July 2018 by Schweizerbart. 196 pages, 49 figures, 21 tables, ISBN 978-3-510-65425-3, US-ISBN 1-59326-269-8, price paperback EUR 29.90; reduced price for IUSS members: EUR 25.00 (plus shipping costs).

In 2015, the UN formulated seventeen global Sustainable Development Goals (SDGs), among them ending poverty, eliminating hunger, protecting the planet and ensuring peace and prosperity. Although judicious management of soils is critical to advancing most of these goals, the word soil is not once mentioned in any of these laudable goals. SDG#15, for example, mentions land degradation but does not specifically focus on soils. In line with previous UN programs, SDGs thus reflect an utter lack of awareness of the importance of the most basic of all natural resources on which depends all terrestrial life - soils.

Consequently, this book aims to document the importance of soil and soil protection to reaching these Sustainable Development Goals. This fifteen-chapter book, authored by experienced and knowledgeable researchers from around the world, is a synthesis of the knowledge and state-of-the-science, linking soil properties and processes to specific SDGs. The volume highlights individual soil related aspects of these SDGs, such as the contribution of soil science, soil management and use, measures to minimize erosion, climatic effects, carbon sequestration by soils, soil restoration, the role hydrology plays in sustainable soil management, ways to preserve soil structure of fertile volcanic soils.

Read more: www.schweizerbart.com/9783510654253

Conferences

2018 NZSSS Conference

3-6 December 2018, Napier, New Zealand

Soils2018 will be held in Napier from 3 to 6 December 2018. This biannual conference is a must attend event organised by the NZ Society of Soil Science and OnCue Conferences, and will cover a range of topics under the theme 'Diverse soils - productive landscapes'. <http://nzssconference.co.nz/>. This year we have the following conference themes:

- Macro Influences - Global Food, Water Scarcity, Regulatory Requirements, Climate Change, The Digital Age
- Soil carbon and greenhouse gases

- Soil carbon and greenhouse gases
- Soil contamination, degradation and remediation
- Soil biology and ecosystems
- Soil fertility, nutrient management and plant nutrition
- Soil quality and function
- Soil physics and water management
- Use of soils for wastewater/effluent treatment
- Soils in the landscape (Pedology) - Past, Present and Future
- Sustainable management - paddock to catchment scales
- Natural capital and ecosystem services
- Our Land and Water National Science Challenge

International Interdisciplinary Conference on Land Use and Water Quality’ – Agriculture and the Environment:

Aarhus, Denmark, 3-6 June 2019.

LuWQ2019 is conference on the cutting edge of science, management and policy to minimise effects of agriculture and land use changes on the quality of groundwater and surface waters. The conference is aimed at scientists, land and water managers and policy makers involved in water quality improvement. If you consider attending and would like to have a conversation with a local member of the Scientific Advisory Committee, please feel free to contact Roland.Stenger@lincolnagritech.co.nz. Abstracts are due by **15 October 2018** More information: www.luwq2019.dk

Alpine Soil Partnership Symposium in Bavaria

7 November 2018, Bavaria, Germany.

Sustainable soil management means adapting land uses to changing climate conditions. Especially in forestry this long-term perspective needs to be taken into account. How can living soils help us meet future challenges? We cordially invite you to the Alpine Symposium on Regional Solutions for Climate Resilient Municipalities and Sustainable Soil Management.

Read more: [http://www.alpine-](http://www.alpine-space.eu/projects/links4soils/news/links4soils_munich_alpine_symposium_nov2018.pdf)

[space.eu/projects/links4soils/news/links4soils_munich_alpine_symposium_nov2018.pdf](http://www.alpine-space.eu/projects/links4soils/news/links4soils_munich_alpine_symposium_nov2018.pdf)

World Agri-Tech innovation summit, London, UK

16 and 17 October 2018, London

The event will bring together agribusiness leaders, investors and innovators. The theme of the summit is “Building agri-food systems fit for the global consumer”, with sessions on precision agriculture, gene editing, artificial intelligence, robotics and indoor farming

Read more: <https://worldagritechinnovation.com/>

ASA National Soils Conference 2018

18-23 November, Canberra, Australia.

The conference will have the theme Soil: The key to past, present and future and we expect that the conference will be a great opportunity for you to showcase your work and to network with your colleagues. There will be significant emphasis on the practice of soil science. Sponsorship opportunities will be available, and a prospectus will be sent to each member of the society.

More details: [here](#)

2019 International Soils Meeting

January 6-9, 2019, San Diego, CA

<https://www.sacmeetings.org/>

Soil Improvement: Impact of Management Practices on Soil Function and Quality

16 -17 October 2018, Leicester UK

The application of soil improving techniques is crucial to maintain soil functions, long-term productivity and the broad range ecosystem services provided by soils. These

term productivity and the broad range ecosystem services provided by soils. These techniques include tillage, crop diversity, crop management, cover crops and the use of organic amendments. More information [here](#)

Scotland's Biennial Land Use and the Environment Conference XII

Rewarding the Delivery of Public Goods: How to Achieve this in Practice?

28-29 November 2018, Edinburgh

This conference will consist of platform presentations and posters under the following themes:

1. What type of environmental public goods should be prioritised for delivery by land managers in the future?
2. How can land managers be encouraged and helped to deliver those public goods effectively?
3. What mechanisms are available for rewarding land managers for the provision of public goods?
4. A fourth session will consist of a panel-debate on what changes in policy or governance are required to reward land managers for the delivery of environmental public goods in a cost-effective and transparent way.

More information <https://www.sruc.ac.uk/landuseconf>