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# New Zealand Soil News

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

News, views, letters, articles (serious or otherwise)—send to:

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**Deadline..... for the October issue of Soil News is Friday 4<sup>th</sup> October 2013**

Visit our website:

<http://nzsss.science.org.nz/>

### New Zealand Soil News

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### NZSSS subscriptions

NZSSS subscriptions become due on **1 July** each year. Individual members who do not pay their subscription before 31 October in a given year will be asked to pay an additional \$NZ10.00 as a penalty for late payment.

	<i>If paid by 31<sup>st</sup> October:</i>	<i>After 31<sup>st</sup> October:</i>
Member (NZ)	<b>\$60.00</b>	<b>\$70.00</b>
Student Member	\$35.00	\$45.00
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**Soil News is one of the great benefits of membership to the Society!**

**Take advantage of the prompt payment discount for member subscriptions – \$10 off – which ends 31 October 2013.**

For any subscription queries, please contact [nzsss@groundworkassociates.co.nz](mailto:nzsss@groundworkassociates.co.nz)

### Root zone losses are just the beginning!

As soil scientists we may decry it, but our cherished soils rarely capture the public's attention. In contrast, freshwater quality is consistently named as the number one environmental issue in New Zealand. More specifically, surface water bodies like streams, rivers, lakes, wetlands and estuaries get most of the attention, while groundwater features much less prominently. A case of out of sight, out of mind?

Most of the impacts on water quality are linked to the way we use our soils. However, it appears to me that our compartmentalised science system has not been particularly successful to date in tackling the source → transport/transformation → impact chain. Reflecting the dominance of pastoral land use, many New Zealand soil scientists focus on *'the top 15 cm of our soil on which 17% of our GDP depends'*, while freshwater scientists focus on the impacts on surface water bodies, with relatively little research being conducted on the transport and transformations occurring in-between.

In the following, I will be focusing on the subsurface flow path that is critical for the transport of nitrogen from the land into surface water bodies. The reason for this is that just published 20-year monitoring results on river water quality in the Waikato region demonstrate *'important deteriorations'* in nitrogen concentrations in 57% of all sites, while *'important improvements'* were only found at 11% of the sites. In contrast, phosphorus, which is predominantly transported on the surface flow path, has been much more stable and improvements outnumbered deteriorations.

Nitrate losses from the soil are often estimated by measuring leachate concentrations in 60 to 90 cm depth using lysimeters or suction cups, and multiplying these concentrations with measured (lysimeters) or more often modelled water fluxes (suction cups). Apart from mere practical constraints, the choice of 60 to 90 cm depth reflects that any nitrate leaching deeper is beyond the reach of the pasture's root system and therefore lost from the soil-plant system. Accordingly, leaching losses estimated using the OVERSEER nutrient budgeting tool also refer to the bottom of the root zone.

However, these root zone loss estimates cannot directly be related to the limits that are currently being set for groundwater and particularly for surface water bodies. Where, when, and to which degree the root zone losses impact on freshwater bodies depends on the transport and transformation processes occurring in the vadose zone – groundwater – surface water continuum.

Understanding the 'where' requires investigating the relative importance of the various subsurface flow paths (e.g. artificial drainage, interflow, shallow and deeper groundwater). This analysis also reveals how far away nitrate leached from a given piece of land enters a surface water body. Modelling of the subsurface hydrological system also helps to define the groundwater catchments that contribute water (and the nitrate it carries) to a monitoring site.

These groundwater catchments do not necessarily match the topographically defined surface water catchments. Regarding the ‘when’, it is essential to consider the subsurface lag times, both in the vadose zone and in the groundwater system. Depending on the relative importance of the various flow paths mentioned above, not all nitrate lost from the root zone will reach a surface water body at the same time. The resulting distribution of transfer times further complicates establishing the link between an impact observed in a surface water body and the land use activity that has caused it. As for the ‘degree’ to which root zone losses impact on freshwater bodies, it is critical to account for attenuation processes occurring along the flow paths. Regarding nitrate, the two major ones are mixing/dilution of polluted water with clean water, typically recharged in the conservation estate and exotic forests, and denitrification that can also occur below the root zone.

When trying to relate observed freshwater quality to land use, the impact of land use activities on freshwater quality can easily be underestimated when the time lags associated with the various flow paths are not adequately taken into account. Usually we do not know which combination of past land use activities is responsible for current surface water quality. Any attenuation processes occurring between the bottom of the root zone and the water quality monitoring site additionally complicate understanding of the cause → impact relationship.

It has been argued that all our efforts should go into reduction of root zone losses as any leached nitrate will ultimately end up somewhere unwanted in the hydrosphere once our groundwater systems’ natural assimilative capacity is exhausted. This may be right from a purely precautionary point of view. However, this approach is insufficient if we are in earnest to take up the twin challenge posed by the government, namely doubling the export earnings from primary production while also enhancing or at least maintaining freshwater quality.

Precision Agriculture and other innovations will help to reduce root zone losses for a given production system, but the achievable reductions are unlikely to make up for the additional nitrogen losses caused by the concurrent expansion of high-intensity land uses (e.g. pine-to-pasture conversions). We only have a chance of mastering this challenge if we use all tools in the tool-box, including those that go beyond the farm scale. Land use planning has to date largely focused on supportive capacities like soils and climate. Understanding the subsurface transport and transformation processes operating at the scale of a water management zone may in the future allow defining the ‘carrying capacity’ of that area in a defensible way and help to match land use intensity accordingly.

Root zone losses are just the beginning as far as managing to environmental limits is concerned, so let’s overcome our compartmentalisation and collectively tackle the source → transport/transformation → impact chain.

Roland Stenger  
Lincoln Agritech

## Article – Teaching soil science to school students

*Angela Schipper and Barbara Ryan* : Science Learning Hub

*Louis Schipper* : Earth and Ocean Sciences and Environmental Research Institute, University of Waikato

In the short and long term, understanding the importance of soil and its use by society requires education of the youngest. While as a soils community we have a deep interest and understanding of the role of soils, it is unlikely most teachers have backgrounds in earth sciences, farming or soil science. As the NZSSS, our members can bridge this gap by providing local and national scale experiences in the classroom. Equally important is supporting teachers with materials that fit into the existing school curriculum so they are encouraged to include soil science and farming in their science programmes.

Helping to bridge this gap and support both teachers and the soil community, the [Science Learning Hub](http://sciencelearn.org.nz) (sciencelearn.org.nz) has developed [Soil, Farming and Science](#). The Science Learning Hub is an MBIE funded project to promote student interest and engagement in science by providing contemporary, contextualised resources for teachers of students in Years 2–10. Hub resources feature short articles and videos about NZ scientists and their research and highlight some of the key science ideas and concepts fundamental to basic science knowledge. All resources are web-based and free for anyone to use.

**Soil, Farming and Science** features the research of NZSSS members: Selai Letica, Richard McDowell, Ross Monaghan and Louis Schipper. Through their work, students are introduced to a few soil basics, nitrogen and phosphorus cycling, farm nutrient management and some of the innovative ways in which science is helping to protect the environment. The resource includes an [interactive nitrogen cycle](#) with short video clips of Louis giving simple explanations. [Student activities](#) include a child-friendly [Visual Soil Assessment](#), simple yet effective ways to demonstrate the links between terrestrial practises and their effects on ground and surface waters, nitrification and denitrification in a jar of sand and using an ethical approach to investigate the issues of farming and the environment.

A number of NZSSS members have been most helpful with reviewing science articles, providing images and answering many, many questions. We've included an organisation profile about the Society to recognise your ongoing contribution to education.

Although the Hub's audience is classroom teachers, our resources are also of benefit to NZSSS members when asked to visit schools.

Ways to use Soil, Farming and Science:

- Students of any age enjoy hands-on science. Bring in some clover plants so students can investigate nodules. Ask the teacher beforehand to provide hand lenses, digital microscopes or viewing devices. After your visit, the teacher can use Hub articles and videos on the role of clover to follow up your visit.
- Get permission to dig a hole. There is a simplified VSA on the Hub. Alternatively, use a soil auger to see what is under the ground. Students can view and feel the soil to see if/how the soil changes with depth.
- Show students a soils map of your local area. Use the [Soil names](#) article on the Hub and discuss how soils are named and why they differ from place to place. Use the classroom's interactive whiteboard to display some of the [images](#) from the [www.nzsoils.org.nz](http://www.nzsoils.org.nz) website.

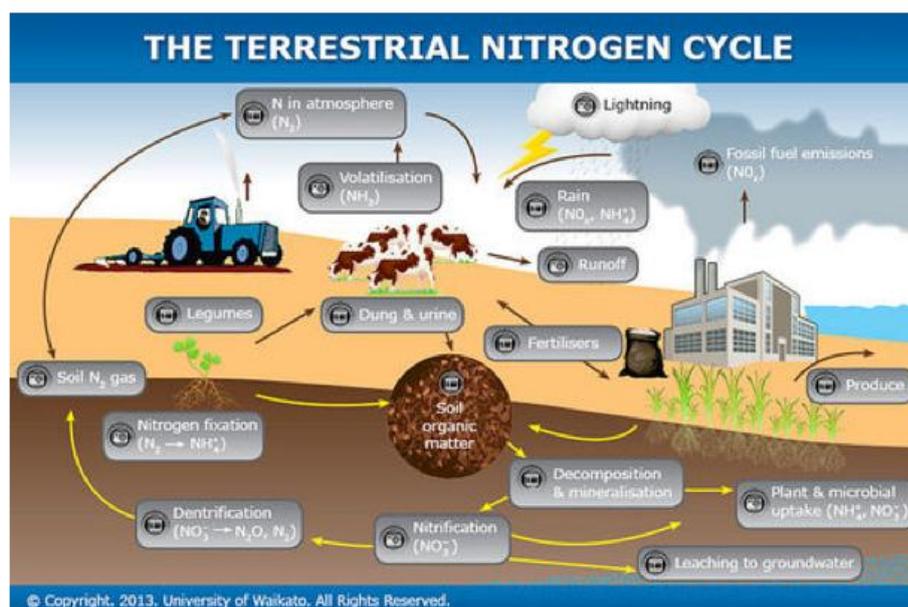
- Make up a Winogradsky column and keep it on hand. It is a wonderful way to introduce students (especially the younger ones) to soil microbes. Discuss some of the things soil microbes do. A teaching activity on the Hub explains how to make the column. Give the class soils from different locations so classes can make their own to compare ‘soil habitats’.
- Encourage the class to look through Soil, Farming and Science and develop a list of questions they would like to ask during your visit or topics they wish to know more about.
- Or simply peruse the Science Learning Hub website. There are 300 activities on the site – all of which are all supported by science articles and videos – you can find the connections in the Related Content button on each page.

Another set of Hub resources, Earthworms, showcases the work of Trish Fraser and Nicole Schon. **Earthworms** targets a younger audience and its purpose is to encourage students to look beyond tiger worms and compost. Key science ideas are living and nonliving, adaptation, and niches within an ecosystem. Once students have a basic understanding of earthworm species and niche, they can use an interactive tool called Wormface – social networking for worms – to develop a ‘profile’ for their selected species.

A classroom visit may seem intimidating or something else to fit into a busy schedule – but it is a really valuable tool. Students enjoy meeting an expert and from anecdotal evidence, prefer the sound of your voice to that of their teacher! Students are able to see that scientists are ordinary people, breaking down some of the mystique around science careers. And now, there are Science Learning Hub resources so that your visit doesn’t have to be a one-off experience. It can be part of a larger unit of study. Not only will you support student learning, but simple explanations and enthusiasm on your part also helps to support teachers. Once they have a better understanding of a science topic, teachers are likely to cover it again and share the knowledge/resources with their peers.

### The terrestrial nitrogen cycle

An interactive showing the main components of the terrestrial nitrogen cycle.



An interactive nitrogen cycle uses video, images and text.



Important soil properties



Managing the nutrient problem

Short videos feature the scientists discussing their research and/or explaining science concepts.

### Farm management practices

Farming is an economic venture – farmers work the land to gain an income. Many New Zealand farmers have an interest in preserving and enhancing the land for future generations. In order to maximise economic returns and look after the environment, there are a number of farm management practices that help to minimise the effects of **nutrient leaching** and run-off and reduce sediment loss from paddocks.



Farming in New Zealand

Short articles explore fundamental science ideas and give further insight into the topic.

If you'd like advice on how to get started, appropriate topics for various age levels, or curriculum links for teachers, please contact Angela Schipper: [aschippe@waikato.ac.nz](mailto:aschippe@waikato.ac.nz).



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

Welcome to the first edition of *The Dirt*, an offbeat collection of light, soil-related, news snippets from around the world.

### **The Mysterious Black soil**

Just in case you were despairing that all of soils mysteries have been discovered, consider the black soil of *VietNamNet Bridge* in Vietnam. Apparently this one hectare of soil is home to a radioactive substance which renders it a soft, glistening black mess, yet the water is clean and pure and no abnormal sicknesses have been recorded. However, before you plan your next vacation there, beware that vegetables sown in this soil have a tendency to expire, and residents have been told not to plough it, or the radioactive substance in the earth will be released!

*Via vietnamnet.vn*

### **Dining on soil**



Ever frustrated by the lack of soil contact you get in your office during the day? Maybe the Soil Table, designed by Ori Mishkal, is what you've been looking for! The artist's aim was to bring nature into the living space. The twist is that the plants grow upside down, allowing you to see the growth below as well as above the surface. It might not be the most practical piece of furniture, but a table that allows you to sit and contemplate the wonder of soil is highly commendable!

*Via designboom.com*

### **Wine and Mozart**

Maybe everything isn't in the soil. Owner and winemaker, Giancarlo "Carlo" Cignozzi, of Il Paradiso di Frassina, Montalcino, Italy plays classical music 24 hours a day, 365 days a year to his grapes. Not only can he taste the difference, but investigations made by the University of Florence found that the grapes closest to the speakers ripened faster and grew 50 % larger than the rest of the vineyards, comparing the variation to grapes growing with and without fertiliser. The effect that sound waves have on parasites, mould and bacteria is also being looked at by the University of Pisa. Keen to make use of this technology is Peter Yealands, owner of the Marlborough winery Yealands Estate.

*Via thestar.com*

**Minutes of the meeting of the NZSSS Council held at 9:30 am to 11:30 noon on Friday 2nd August 2013 via teleconference**

**PRESENT:** Trish Fraser, Tim Clough, Mike Hedley, Reece Hill, Tony van der Weerden, Dave Houlbrooke (leaving meeting at 11 am), Iris Vogeler (joining meeting at 10:50).

**APOLOGIES:** Roger McLenaghan, Allan Hewitt, Hamish Lowe,

**SECRETARIAT:**

- Minutes of last meeting held on 6th June 2013 were accepted as a true and accurate record. Moved Trish/ seconded Tony, carried.
- Matters arising from the minutes. No matters were arising from the minutes that were not already on the agenda.
- Items for General Business. No further items were raised for general business to be placed on the agenda.
- Approval of Agenda. Moved Trish/ seconded Tony, carried.

**CONFERENCES**

- Update on 2014 NZSSS conference:

This will be held in Hamilton December 1st to December 4th 2014. The theme is 'Soil science for future generations'. Venues have been secured for the conference proceedings (University of Waikato) and the conference dinner (Hamilton Garden Pavilion). A budget has been scoped in collaboration with Groundwork Associates and assuming 200 registrations with the committee obtaining \$25K in sponsorship. Aim is for a registration cost of no more than \$600 per person.

Following further discussions with Groundwork Associates into them being engaged as the 'conference organiser' their price was found to be well in excess of other companies in the market. Thus to date a total of \$8,700 will be paid to Groundwork Associates for services to date. They have been verbally advised following a meeting that their services are too expensive.

*Action: Reece will also formally write to Groundwork Associates explaining that due to the Society's limited budget the conference organising committee will engage a less expensive conference organising company.*

This company will be OnCue who were very competitive on price. They require \$5K to seed a bank account.

It was moved that \$13,700 be made available to the conference organising committee to pay invoices to Groundwork Associates and to set up bank account with OnCue. Moved David/ seconded Mike, carried.

*Action: David is to check and ensure that OnCue will organise and include in the conference registration price the cost of all necessary insurance (professional indemnity, general insurance etc.).*

OnCue should be engaged once insurance issues are clarified. Moved Trish/ seconded David, carried.

- World Soils Conference is in Korea 8th-13th June 2014.
- Queenstown conference 2016.  
Cecile, and others, at Invermay were looking at organising aspects of this. Does this need further consideration due to possible shift in staffing to Lincoln? Discuss at next meeting.

## **TREASURY**

- Financial position  
The Society's Cash summary moved from a balance of \$37,832 in March 2013 to be \$32,021 in June 2013. This shift was largely due to Awards and grants along with payment of invoices to Groundwork Associates.
- Secretarial Services (Groundwork Associates).  
The charging by Groundwork Associates is still not transparent, despite Tony requesting and having received further information from Groundwork Associates. The original quote from Groundwork Associates was ca. \$5,500 and will not greatly exceed this in their projected estimate for 2013/2014. However, it is not clear how they are charging for their work. The statement of secretarial transactions from 1 Jul 2012 to 30 Jun 2013 shows the actual sum is closer to \$18,600. Far in excess of projected costs.

*Action: Tony is to urgently follow up on this and ask for a detailed explanation of how/why these transactions exceed Groundwork Associates budgets for services shown in their original quote of May 2012 and their projected annual forecast for 2013/2014.*

## **MEMBERSHIP**

- Current NZSSS membership breakdown is as follows:
  - Ordinary members = 248
  - Student members = 71
  - Retired members = 29
  - Life members = 10
  - Honorary members = 3
  - Library members. 13TOTAL = 374

It was moved the following adjustments to the membership list be accepted (Moved Tim/ seconded Mike, carried).

- Resignations
  - i. Annie Barker
  - ii. Erica Hofstee
  - iii. Jim R Bruce-Smith
  - iv. Mark Joblin
  - v. Mathew W Hughes
- Deceased
  - i. Sally J Officer
  - ii. J E Cox
- New members
  - i. Alan Harvey
  - ii. Amy Elizabeth Whitley
  - iii. Andriy Podolyan
  - iv. Beckie Phillips

- v. Jay Howes
- vi. Robert Simpson

### **SOIL NEWS**

- all on track. Cut-off date for next edition is 9th August.

### **NZSSS WORLD WIDE WEB PAGE**

- all on track.

*Action: Iris is to assess if the Soil News editions can be placed onto the NZSSS web page so that members can access the current and past editions.*

The Society's Facebook page is going well.

### **SOILS IN THE NZ LANDSCAPE**

- no news to report.

### **AWARDS**

- Thesis submissions have/are being made for awards and council members are requested to consider if they are available to judge these awards.
- Ballance Agri nutrients are not interested in continuing sponsorship of our year three PhD award (previously Altum/Summit Quinphos). Action: Reece is to contact Ballance and confirm this in writing and ask their reasoning.

### **PROMOTING SOIL SCIENCE – no news to report**

### **SCIENCE FAIRS**

- Roger reported that there has been strong interest from around the country in having books as prizes and in supplying science fair judges.

### **SCIENCE FUNDING ISSUES**

- no issues raised.

### **GENERAL BUSINESS**

- no issues raised,

### **SECRETARIAT**

- Correspondence

The RSNZ Annual Meeting for Constituent Organisations will be held in Wellington, Wed 16 Oct 2013. An invitation has been provided to the NZSSS to have a representative attend. At this stage nobody on the council is available.

### **NEXT MEETING DATE – aim will be to have this about the 8th of November.**

-----  
Tim Clough  
Secretary



### FAO Global Soil Partnership Five Pillars of Action

<http://www.fao.org/globalsoilpartnership/the-5-pillars-of-action/en/>

- 1- Promote sustainable management of soil resources for soil protection, conservation and sustainable productivity
- 2- Encourage investment, technical cooperation, policy, education awareness and extension in soil
- 3- Promote targeted soil research and development focusing on identified gaps and priorities and synergies with related productive, environmental and social development actions
- 4- Enhance the quantity and quality of soil data and information: data collection (generation), analysis, validation, reporting, monitoring and integration with other disciplines
- 5- Harmonization of methods, measurements and indicators for the sustainable management and protection of soil resources

## IUSSS

### Universal Soil Classification System Working Group Meeting

The Universal Soil Classification System is a Working Group under Commission 1.4 (Soil Classification) which is part of Division 1 (Soil in Space and Time) of the International Union of Soil Sciences (IUSS). This IUSS Working Group will meet August 1-4, 2013 in Florianópolis, Brazil following the Brazilian Soil Science Society Meetings. The goal of this working group is to develop a Universal Soil Classification system by working with all sectors of the Soil Science community to improve the consistency of soil classification tools and too use the most up to date information, data and technology to enhance Soil Classification by developing a common language to describe soils that can be used internationally. The working group is comprised of members from around the world with expertise in Soil Taxonomy from different areas of expertise and knowledge in different taxonomic systems. The focus of the Universal Soil Taxonomy Working Group will be on taxonomic issues of soils, with special attention on morphology and taxonomy of tropical and cold soils. Other issues that will be discussed are 1) progress in the horizon nomenclature harmonization, 2) progress in the diagnostic horizon studies, 3) progress in the development of a horizon classification system, 4) taxonomic relationships of mollic soils, 5) the calculated centroids of the US Soil Taxonomy Great Groups and 6) soil moisture and temperature. More information about the Working Group and the task groups can be found at [http://soils.usda.gov/technical/classification/Univ\\_Soil\\_Classification\\_System/](http://soils.usda.gov/technical/classification/Univ_Soil_Classification_System/)

### New Publications

**The Soils of Croatia.** Series: World Soils Book Series. By Bašić, Ferdo. 2013, XII. Springer. ISBN: 978-94-007-5814-8. Hardcover, 240 pages. Price \$129.00. The Soils of Croatia is a six-chapter book detailing all aspects of Croatian soils. The book presents, in a reader friendly way, the lively history of pedology in Croatia. It explains soils as natural resources for this country and offers a detailed view on the different agricultural regions referenced in Croatia. The Soils of Croatia also contains useful information regarding the different factors of soil genesis in the different regions as well as on soil taxonomy and it gives a very detailed classification of different Croatian Soils. Overall, this book contains everything that pedologists, students and anyone else interested in Croatian soils should know about.

**Organic Compounds in Soils, Sediments & Sludges: Analysis and Determination.** By T Roy Crompton. November 29th 2012. CRC Press. Taylor & Francis. ISBN: 978-0-415-64427-3. Price \$159.95. The increasing awareness of the effects of pollutants in the eco-system and on the development of suitable methods of analysis has stimulated a lot of research recently. This volume comprehensively discusses the range of methods available for the analysis and determination of organic compounds in soils, river and marine sediments and industrial sludges. A review is provided of the instrumentation used in soil and sediment laboratories and an indication of the types of organics that can be determined by each technique. Subsequent chapters discuss the analysis of various types of organics in a logical and systematic manner. Guidance is provided on the applicability of techniques in certain environments, the advantages and disadvantages of using one method over another, likely interference, the sensitivity of particular techniques, and detection limits. The work will be of interest to agricultural chemists, agriculturists concerned with ways in which organic chemicals used in crop or soil treatment permeate the ecosystem and to biologists and scientists involved in fish, plant and insect life. Toxicologists, public health workers, oceanographers, and environmentalists will also find the book beneficial.

**Quantifying and Modeling Soil Structure Dynamics.** By Sally Logsdon, Markus Berli, and Rainer Horn, Editors. Soil Science Society of America. Hardcover. 208 pp., 2013. Advances in Agricultural Systems Modeling 3. ISBN: 978-0-89118-956-5 (print). Also available at <https://dl.sciencesocieties.org/publications/books>. Quantifying and Modeling Soil Structure Dynamics emphasizes a systems approach to how soil structure changes in response to inputs and to the environment. Soil structure is a dynamic, complex system affected by tillage, wheel traffic, roots, soil life, shrink–swell, and freeze–thaw. In turn, soil structure affects root growth and function, soil fauna, solute transport, water infiltration, gas exchange, thermal and electrical conductivities, traffic bearing capacity, and more. Ignoring soil structure or viewing it as "static" can lead to poor predictions and management. Readers will especially appreciate the description of soil structure influence on endpoints, such as environmental contamination and efficient water use, and how models should be adjusted to include dynamic soil structure components for accurate outputs.

**Enhancing Understanding and Quantification of Soil-Root Growth Interactions.** By Dennis Timlin and Laj R. Ahuja, editors. ASA, CSSA, and SSSA. Hardcover. 324 pp., 2013; Advances in Agricultural Systems Modeling 4. ISBN: 978-0-89118-338-9 (print). Also available at <https://dl.sciencesocieties.org/publications/books>. Researchers must come together and leverage our understanding of the rhizosphere to maximize efficient, sustainable use of limited water and soil nutrient resources. Enhancing Understanding and Quantification of Soil–Root Growth Interactions takes on this challenge to solve society's growing problems in the conservation of quality water and soil resources—from addressing the critical needs in nations who cannot afford costly fertilizers, to the global challenge of enhancing soil carbon storage to reduce climate change effects of elevated carbon dioxide. This book brings together scientists from different disciplines, worldwide, together to encourage synthesis of transdisciplinary knowledge and further research and developments in the area of root–soil interactions.

### Soil micromorphology

One year after the 14th International Working Meeting on Soil Micromorphology, the first issue of the proceedings, with seven selected papers presented at the meeting, have been published in the Spanish Journal of Soil Science. These open-access proceedings, with Irina Kovda and Curtis Monger as guest editors, cover sessions 1 to 4 of the meeting: [http://sjss.universia.net/pdfs\\_revistas/revista\\_35\\_1373878761852.pdf](http://sjss.universia.net/pdfs_revistas/revista_35_1373878761852.pdf). The separate papers can be downloaded from: <http://sjss.universia.net/verRevista.jsp>. A second volume will appear on November the 15th. The proceedings of Session 5 of the meeting will be published as special issue of Quaternary International, with Richard MacPhail as guest editor. The meeting proceedings are dedicated to the late micromorphologists Ulrich Babel and Nicolas Fedoroff.

### Waikato/Bay of Plenty

#### Lincoln Agritech



Our ‘cutting-edge’ Spydia vadose zone research facility in the Lake Taupo catchment was rated very highly by the review panel that conducted the ‘Fresh Water Multi Contract Review’ for MBIE in May. However, while **Eddy Wöhling**, **Greg Barkle** (ARL), and **Roland Stenger** are still analysing collected data and writing publications, the decommissioning of the Spydia is meanwhile in full swing. **Brian Moorhead**, our new colleague **Ali Shokri**, and internship students **Maike Rath** and **Lisa Emerich**, have already removed the majority of the automated equilibrium tension plate lysimeters that enabled us to track the movement of water and solutes from the bottom of the root zone down to the groundwater. We are looking forward to applying the knowledge gained, and most of the equipment, at future research sites – preferably located a bit closer to our Ruakura base than the Lake Taupo catchment.

**Roland** has recently been to Europe to attend the Land Use and Water Quality conference in The Hague, Netherlands. This conference addressed the interface of science, management and policy to minimise effects of agriculture and land use changes on the quality of groundwater and surface waters. Roland reported on our research on catchment scale groundwater and nitrate fluxes and on denitrification occurring in shallow groundwater, which in some catchments is a significant, but so far insufficiently understood nitrate attenuation process. Most conference presentations are publically available at <http://www.luwq2013.nl/>.



*Fig. 1: Entrance to the Spydia with some of the sampling containers taken out.*

*Fig. 2: Lisa Emerich inside the Spydia, removing one of the equilibrium tension lysimeters from the vadose zone (here at 5.1 m below ground surface).*



## AgResearch Ruakura

*On the conference circuit...*

**Dave Houlbrooke** attended two conferences in Europe during June. The first was called Ramiran (Recycling of Agricultural, Municipal and Industrial residues in agriculture) held at Versailles, France. Ramiran is a biannual event which started as an EU member state workshop related to manure management issues. The delegate list was dominated by European attendees with a few exceptions. The conference was well attended by approx. 300 delegates (largely scientists) and proved to be an ideal setting to learn what the latest international (Europe focus) concerns regarding manure management and also the research activity surrounding this. A large emphasis was placed on avoiding pollution swapping within the N cycle. In this regard it was interesting to note that nitrate leaching came a distant third place behind issues of NH<sub>3</sub> and GHG (N<sub>2</sub>O & CH<sub>4</sub>) emissions.

The second conference attended by **Dave Houlbrooke** was the LuWq (Land use & water quality) Conference at Den Haag, Netherlands. This was attended by 6 New Zealand delegates including fellow NZSSS member **Roland Stenger**. The concept for the conference was to bring policy makers and scientists together at one international conference to discuss the issues of fresh water quality and its pressure from agricultural diffuse pollution. The problem definition was unashamedly European as a key aim was to determine if the existing policy structure was meeting the required environmental outcomes. However the audience (whilst European dominated) was global, with attendees from North and South America, Africa, Asia and Australasia. Policy and controls around nutrient loading and timing (especially manure) were not so easily associated with improved fresh water quality, perhaps in part to do with the unknown lag times. However reduced root zone losses were clearly identified by controlling inputs of fertilisers and manures. It was considered that Europe was currently at a cross roads with regards to research and policy in order to achieve the necessary reduction in diffuse losses.

**Stewart Ledgard** recently attended an FAO meeting in Beijing on methods for estimating the environmental emissions associated with animal feeds using Life Cycle Assessment, which was run by the FAO. The meeting was run by Europeans who had done lots on the detail of producing concentrates for feeding housed animals but seemed to have forgotten that a lot of ruminant animals consume perennial pastures and their production and environmental effects are very different from crop-based feeds. The meeting had a large component from developing countries and Stewart found it interesting about the diverse feed systems used in Asia and Africa. For example, 3-tier systems in Asia now have animals grazing ground-covers while browsing on shrubs and being fed cut branches and leaves from tree crops used for human feeds.

Research collaboration between AgResearch and Teagasc (the agriculture and food development authority in Ireland) moves to a new height. **Jiafa Luo** recently travelled to Ireland to discuss collaboration opportunity with Drs **Karl Richards** and **Gary Lanigan** to develop cost-effective techniques for reducing nitrous oxide emissions from soil in grazed livestock systems. During the visit to Teagasc at the Johnstown Castle site, Jiafa also visited several nitrous oxide and ammonia field experimental sites and discussed field methodologies with a number of research associates, farm managers and PhD students. In addition, Jiafa presented a seminar on our current nitrous oxide work and visited field and laboratory facilities at the Teagasc Johnstown Castle (pictured). While in Ireland, Jiafa also attended a workshop on techniques for measuring GHG from soil and manure. The chamber technique for measuring nitrous oxide was discussed and debated. It appears that the UK and Ireland

have gas sampling procedures (particularly sampling period and numbers on each occasion) that are different from a common procedure used in NZ. Jiafa also attended a GGAA (Greenhouse Gases in Animal Agriculture) conference held in Dublin and presented a poster paper on methods for measuring N<sub>2</sub>O emissions. Representing NZ, Jiafa also attended a GRA (Global Research Alliance) manure management network meeting in Dublin to strengthen our international networks with scientists working in this field.



And finally to round out the conferences, **David Wheeler** also attended the Greenhouse Gas and Animal Agriculture conference (Ireland) and provided an invited presentation on carbon Footprinting using Overseer.

*And now some congratulations are in order...*

**Diana Selbie** has submitted her PhD thesis Lincoln University entitled: The fate of nitrogen in an animal urine patch as affected by urine nitrogen loading rate and the nitrification inhibitor dicyandiamide. Her supervisors are Keith Cameron, Hong Di and Jim Moir (Lincoln University) and Karl Richards and Garry Lanigan (Teagasc).

**David Wheeler** and **Mark Shepherd** have won the inaugural AgResearch Technology Prize for the Overseer Nutrient Budgets model. The selection panel decided that Overseer made the greatest environmental, economic and social impact on New Zealand's pastoral sector, and stated that "it would be difficult to imagine where the industry and regulatory bodies would be without the technology".



*Photo: Diana Selbie, Bob Longhurst, Laura Buckthought, Brendan Leonard and Andrew Horrell (from left to right) investigating the lysimeter facility at Ruakura.*

And finally, congratulations to our talented neighbors here at Ruakura; the Chiefs! **Mark Shepherd, Diana Selbie, Sheree Balvert, Bob Longhurst, Alec McGowan, Natalie Watkins and Laura Buckthought** hosted two Chief's players in June. **Andrew Horrell and Brendan Leonard** were briefed on environmental issues, research in soil and nutrient management, and toured some of the current trials. We think that their knowledge of the soil beneath their feet possibly gave them the advantage over the Brumbies in the final.

## **Annual Conference News, Hamilton December 2014**

### **Please contribute your ideas for keynote speakers.**

Planning is underway for the NZSSS annual meeting scheduled for December 2014 in Hamilton. We are looking forward to seeing you there.

Our theme is “Soil Science for future generations”. Under this theme we hope to foster participation by students and encourage the younger generation to recognise potential careers within the broad field encompassed by Soil Sciences. We also want to continue to highlight the on-going importance of soils as protectors of the environment, producers of food, support for biodiversity and a place to live.

We will keep you updated as plans develop and encourage your participation. Your organising committee is headed by Dave Houlbrooke supported by Natalie Watkins, Gina Lucci, Reece Hill, Haydon Jones, Megan Balks, Sharn Hainsworth and Louis Schipper. We are currently considering who might be valuable keynote speakers from research, policy, extension or land managers. If you have an international visitor coming from overseas who coincides with the conference and you think they might be an excellent keynote speakers please let us know. We can only have three or four keynote speakers and will have some from New Zealand as well.

Thanks for your help.

Organising committee NZSSS annual conference, Hamilton 2014

**NEW ZEALAND SOCIETY OF SOIL SCIENCE**

**NZSSS 2014 Soils Conference**

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*Soil Science for Future Generations*

December 1-4, 2014 · Hamilton, NZ



Please submit ideas for:

- Themes· ·Fieldtrips· ·Guest Speakers· ·Sponsors·

to any of the organizing committee members: Dave Houlbrooke, Gina Lucci, Natalie Watkins, Megan Balks, Louis Schipper, Reece Hill, Hayden Jones or Sharn Hainsworth

## Manawatu/Hawke's Bay

### Massey University Soil and Earth Sciences, Palmerston North

**Michael Bretherton** recently successfully defended his PhD thesis which is titled '*An Investigation into Repellency-Induced Runoff and its Consequences in a New Zealand Hill Country Pasture System*'. Supervised by **Dave Horne**, **David Scotter**, and **Mike Hedley**, he examined the effects of repellency-induced runoff at two pastoral hill country sites located on the East Coast of the North Island. Detailed measurements of climate variables and runoff volumes were taken from small (2 m<sup>3</sup>) plots at a site near Alfredton, while the potential effects of repellency-induced runoff on stream flow were investigated at a catchment site near Waipawa.



There has been growing recognition of the effects of repellency-induced runoff on agricultural systems, in particular its effect on the 'normal' matrix flow of rainfall or irrigation through the soil. This effect could potentially increase bypass flow through the soil (and reduce the soil's filtering potential) and could increase overland flow (and thereby increase the potential for erosion, nutrient runoff losses, and enhanced stream flows). Major changes in these hydrological flows would have a significant impact on pasture production and on New Zealand's agricultural economy.

The results from Mike's PhD thesis indicated that on an annual basis, repellency-induced runoff was a minor hydrological process (less than 5 %) in New Zealand's East Coast hill country. However, given the hydrological complexity and variability of this region, water repellency may become more significant at spatially localised scales.



**Rashad Syed** is a new PhD student with the Soil & Earth Sciences group in conjunction with Landcare Research and the Institute of Fundamental Sciences (Massey University). Rashad is working on a "methane biofilters" project supervised by Prof **Surinder Saggarr**, Dr **Kevin Tate** and Prof **Bernd Rehm**.

Methane is one of the greenhouse gases affecting climate change and this project aims to mitigate methane emissions from land based sources (anaerobic dairy ponds, landfills, herd homes, coal mines etc) using Biofilters (soil seeded with methane eating bacteria, methanotrophs). Preliminary experiments conducted at Landcare Research with the biofilters shows 90-95% methane removal efficiency. All year round field testing is yet to be done. In his PhD study Rashad aims to develop more understanding of the engine of the biofilter technology by studying methanotrophs ecological behavior and developing an efficient biofilter than can mitigate methane all year round with no or little maintenance.

**Lucy Burkitt**, **David Horne**, **Mike Hedley**, **Steve Morris** and **Mike Bretherton** have been leading a project at Massey's Hill Country Research farm (Tuapaka) in the Manawatu catchment near Palmerston North examining the effect of winter grazing and pugging damage on P, N and sediment runoff and on denitrification and nitrate leaching. Lucy along with **Bob**

**Toes** and **Ross Wallace** have been busy setting up equipment and experimental plots for this Beef and Lamb and Alma Baker-funded project. Runoff plots have been established in a steep area at the back of the farm and weirs have been set up in several streams to monitor stream flows and water quality. Stream data will be used to develop a detailed catchment model for the farm, which incorporates the recently acquired Lidar data.



*Installations on the Tuapaka hill-country farm*

An informal morning tea was held recently to mark the occasion of **Lance Currie** having completed forty years working for Soil & Earth Sciences at Massey. Appointed by Professor Keith Syers in 1973 on a project to assess the impact of agriculture on water quality, the milestone also serves to highlight the decades that Massey have been researching in the agriculture/environment space. Lance is the longest serving member of staff in the Soil & Earth Sciences group, with **Vince Neall** having recently retired a few months shy of completing his forty years. Lance thanked those who had surprised him with this celebration, noting that his longevity and enjoyment of his job had been a direct result of working with many great people, and that he has an expectation that this will continue for some years yet.



*Some things never change over four decades....  
(Lance still enjoys a beer!)*

Massey Soil and Earth Science recently celebrated Lance Currie's 40<sup>th</sup> (note the "fork handles", you can judge whether it was his birthday or 40 years to the day since Keith Syers appointed Lance to Soil Science Dept. at Massey).

The soils group at Massey wished Lance well for his next 40 years and thanked him for all the work he has done to make the Department and the Fertilizer and Lime Research Centre what they are today.

### **Plant & Food Research – Palmerston North**



**Brent Clothier** was presented with the Sir Arthur Ward Trophy by the New Zealand Institute for Agricultural and Horticultural Science (NZIAHS) at the dinner for the Plant Science 2013 conference held at Massey University.

The trophy was donated by Sir Arthur Ward (a founding member of the New Zealand Institute of Agricultural Science, former General Manager of the Dairy Board and Chair of the National Research Advisory Council) and recognises a significant contribution to the extension and adoption of agricultural or horticultural science.

*Brent Clothier receiving his award from David Lewis.*

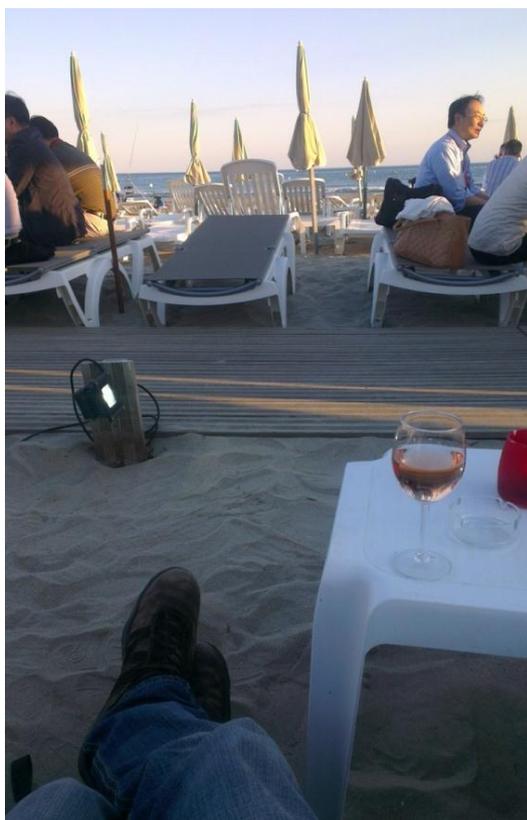
Brent was awarded the trophy on the basis of his extensive record of scientific publication in the area of water and chemical movement through soil, irrigation allocation and water management, plus sustainable orchard practices for horticultural production, including carbon and water footprinting. His work has moved into looking at land-use policies, ecological economics, and the idea of natural capital valuation - valuing the ecosystem services that natural capital provide.

In terms of communication, not only did the awards committee note Brent's scientific papers but also the reports for industry bodies and regional councils, translating science into practical uses.

David Lewis  
President NZIAHS

**Roberta Gentile** and **Steve Green** were forced to spend a week on the Gold Coast in July. They met with collaborators for an annual update on our Productivity, Irrigation, Pests and Soils (PIPS) project in Australian apple orchards, and they presented highlights from our work on orchard soil carbon stocks and soil health in an Apple & Pear Australia (APAL) research update meeting.

### Landcare Research, Palmerston North



The greenhouse gas research team led by **Surinder Sagar** have been busy in the field and establishing some new lab trials to investigate mitigation strategies for nitrous oxide emissions from soils. Our **proximal soil sensing team** have been to the top of Tuapaka hill country farm to collect soil cores for soil organic carbon analysis, and development of our Vis-NIR calibration models. One member of our proximal soil sensing team, **Pierre Roudier**, also travelled to Europe, to attend the 3<sup>rd</sup> Global Workshop on Proximal Soil Sensing in Potsdam, Germany. Here he presented some of our research findings on high-resolution mapping of carbon stocks from a case study farm in the Manawatu Sand Country.

*Figure 1 Pierre hard at work during one of the networking evenings organised by one of the spectrometer manufacturers*

Pierre reports that that workshop focussed on two “hot” topics in the research community. The first one is spectroscopy for soil science. This technology is developing, and researchers around the world are working on bringing the technology out of the lab into the field. On the

proximal soil sensors, electromagnetic and gamma radiometrics were the most discussed topics, with gamma radiometrics giving very encouraging results in most conditions. Pierre then travelled to France for the International Conference on NIR Spectroscopy (ICNIRS), which for the first time had a dedicated session on soils, proving the increased interest in spectroscopy for soil science. With more than 650 attendees, ICNIRS is a leading international spectroscopy conference. Pierre presented some of his work on mapping microbial habitats in the Dry Valleys of Antarctica at this meeting.

**Beckie Phillips** then joined **Pierre** at the European Conference on Precision Agriculture (ECPA) Conference. The photo below depicts the cathedral where attendees met for the first evening. Several topics were discussed at the conference that centred on how agriculture can be improved through research and technology across countries. The field tour to the vineyards showcased the latest technology in remote sensing plant canopy structure, plant moisture, physiological stress, and nutrient status both at multiple spatial scales. A highlight was the remote-controlled helicopter that we watched as it mapped canopy water stress image during the tour.



*Fig. 2 Attendees at the European Precision Agriculture Conference met at this Spanish cathedral on the first day of events.*

Following the conference, a KBBE (Knowledge-Based Bio-Economy) Forum workshop was organised by Landcare Research and attended by several NZ researchers. The KBBE Forum is an initiative from Australia, Canada, the EU and New Zealand to foster collaboration and accelerate research by aligning research programs of the partner countries. The KBBE workshop in Lleida was building on the ECPA conference to discuss the possible collaboration topics in precision agriculture research.

**Benny Theng** and wife, Judy, have just returned from Brazil where they attended the 15th International Clay Conference in Rio de Janeiro (7-11 July, 2013). On the way back to New Zealand, they spent two happy weeks with son, Andrew, in Vail, Colorado. The conference was held in the Centre of Mathematical and Physical Sciences (CCMN) building on the campus of the Federal University of Rio de Janeiro on Fundao island, about 45 minutes

away by bus from Downtown and Copacabana hotels where the majority of delegates were accommodated. That meant a very early rise each morning, and breakfast at dawn, in order to catch the shuttle bus at 7.15 am. Lunch was also some distance away (about 3 km) from the CCMN building, requiring a daily bus trip. On the plus side, Rio is a magnificent city built around an attractive wide harbour with many sandy bays and beaches, and surrounded by tall outcrops of granitic rocks, including the famous “Sugar Loaf” and “Christ the Redeemer” both of which are easily accessible by van and cable car.

Of the 300 or so participants, the majority were from Latin America. Benny did not meet another kiwi, reflecting the low profile of clay mineralogy in New Zealand as well as the tight control on overseas travel. By the same token, there were fewer delegates from Australia, the EU, Japan and China than usual. Indeed, a number of oral and poster papers were cancelled because of non-attendance. The four plenary lectures were well attended. The lecture by David Bish on the X-ray diffraction results of Mars soils was especially interesting. There are quite a few oral and poster papers on polymer-clay nanocomposites, the so-called “material for the 21st century”. None of the presentations, however, had a “wow” factor. Benny is also pleased to report that the pre-conference short course (of 12 lectures) he gave on “The Chemistry of Clay-Polymer Reactions” was well received.

## Canterbury

### Lincoln University

**Brendon Malcolm** successfully defended his PhD thesis on “The effect of pasture species composition and a nitrification inhibitor on nitrate leaching losses.” Brendon was supervised by Professors **Keith Cameron**, **Grant Edwards**, **Di** and Dr **Jim Moir**.

On the 14<sup>th</sup>, 15<sup>th</sup>, and 16<sup>th</sup> of August Scott Sharp-Heward will travel to Marlborough to present the work from his master’s thesis to landowners of two vineyard properties used in his thesis, as well as to the Marlborough District Council (MDC). Scott’s thesis, titled ‘*Impacts of landscape recontouring on soil properties in Marlborough, New Zealand*’, is due to be submitted soon and has investigated the effects of earthworks on hilly land in terms of soil morphology, chemistry, and physical properties. Some investigation of salinity in drainage water and an irrigation pond was also covered, as well as differences in organic C and N between virgin and recontoured soils. The presentations which will be given to landowners and the MDC (who funded the research) are considered an essential courtesy to those who have enabled Scotts work and will be of use to continued primary production on these sites. Scott states that it has been his pleasure to work with the landowners as well as his contact in the MDC (Dr. Colin Gray), and he looks forward to seeing them next week.

**Fiona Shanhun** attended the XI<sup>th</sup> SCAR Biology Symposium held in Barcelona from the 15<sup>th</sup> – 19<sup>th</sup> of July 2013, where she presented some of her research into diel variation in the biotic and abiotic components of soil CO<sub>2</sub> fluxes in Taylor Valley, Antarctica. Fiona managed to offset the heat of the Spanish summer by enjoying some of the local Catalan cuisine and delicious wine. Despite the late dining hours of the Spanish, the morning sessions of the conference were always well-attended, and a successful and enjoyable week was had by all. Fiona was granted a SCAR Biology Travel Award from the Royal Society which enabled her to attend.

## Plant & Food, Lincoln

**Steve Thomas** attended the GGAA 2013 (Greenhouse Gases & Animal Agriculture) Conference held at University College, Dublin and a preceding conference workshop on “Techniques for Measuring GHG from Soil and Manure”. Steve presented findings from recent field experiments conducted at Plant & Food Research on understanding and mitigating nitrogen losses (nitrous oxide and nitrate leaching) during pasture renewal. It is clear from this work that the method of establishing and managing a crop or grass during pasture renewal can have important impacts on nitrogen losses and plant production.

### **New lysimeter facility**

Recently builders have been busy constructing a new lysimeter facility on the Plant and Food Research farm at Lincoln, primarily for use by members of the Soil, Water and Environment Team (Trish Fraser and Steve Thomas), but also to further their recent collaborative work with Landcare (Sam Carrick) and AgResearch (Samuel Dennis). Keith Cameron and his colleagues at Lincoln University have also been very generous in giving us both advice and the benefit of their experience in setting up the facility.

As our facility will soon be ready for lysimeters to be installed, we have already collected some lysimeters (50cm diameter x 70cm deep) from out in the field, so that we can have them fully instrumented and ready for installation once the facility is complete. We want to conduct controlled irrigation experiments (e.g. different amounts, timings rates and intensities of irrigation) to improve our overall understanding of the soil mechanisms that simultaneously affect the amounts of N involved in nitrate leaching and/or gaseous N emissions (nitrous oxide) under different moisture regimes. Hence this particular lysimeter facility is also going to have the additional unique feature of a retractable greenhouse rainshelter. The greenhouse is currently being erected and we are busy designing and installing the irrigation and drainage systems. We hope to have the facility up and running in time for the coming irrigation season, so that we can start to assess drainage flow and nutrient losses from our selected soils ( we sampled rather stony ones which made sampling the lysimeters interesting!)

The data collected from the forthcoming research will also be used by our computer modelling team (Jo Sharp and Hamish Brown) to improve their model predictions.

Here are some snapshots of the building process and progress to date :





## **PFR – Hawkes Bay**

**Dirk Wallace** has stepped down from his role as a research associate in the Soil, Water and Environment group at Plant & Food Research. In the months ahead he will start his PhD, focusing on soil water dynamics. In July, **Paul Johnstone** attended the 9<sup>th</sup> European Conference on Precision Agriculture in Lleida, Spain. Also attending from New Zealand were Pierre Roudier and Beckie Phillips (Landcare Research), Reddy Pullanagari (Massey University) and Armin Werner (Lincoln AgriTech). Aligned to the conference was a 1-day KBBE workshop on future opportunities for precision farming within agriculture.

## **Landcare Research, Nelson & Lincoln**

**Trevor Webb** has been happily resurveying the soils of the plains and downs of North Canterbury (between the Hurunui River and Kekerengu) and Fairlie basin to fill in gaps in S-map coverage and is writing a report to describe soil genesis, soil properties and soil pattern for soils on alluvial landscapes in Canterbury. Significant work is proceeding with a team improving the estimation of soil water parameters for S-map (total porosity, field capacity, and wilting point) that can be used as inputs for models such as Overseer.

**Les Basher** has been busy writing reports and a draft paper on work to characterise the impacts of erosion on soil carbon stocks in the erodible hill country. This has been done in support of the Soil CMS model, used for Kyoto Protocol reporting, which currently doesn't account for the effect of erosion. The work has shown that erosion has a very significant influence on soil C stocks and needs to be incorporated into the Soil CMS model. With Chris Phillips and Mike Marden he's also been working on a SLMACC-funded project, led by Scion, to identify ways of reducing the impact of large storms on steepland forest harvesting. He has also contributed to development of a new erosion model for New Zealand, based on the Australian SedNet model, that has been set up and run for the Manawatu catchment and tested using Horizons extensive suspended sediment data records. Parts of the model have also been used in a study of sediment sources in the Waipa catchment. Locally in Nelson Les has contributed to the debate about the extent to which sediment has been the cause of the decline in the scallop fishery in Tasman and Golden Bays.

**Ian Lynn** continues to contribute to S-Digital and S-System programs and developments of the S-map platform, and developing linkages between S-map and Land Use Capability classification. Along with James Barringer and Les he ran a successful NZLRI-LUC workshop in October last year where the beginnings of a roadmap for the future were sorted out. Ian has been assisting Les with the reports and papers on the impacts of erosion on soil carbon stocks in the erodible hill country, and has been a major player in Boffa Miskell, Department of Conservation lead study of the natural character of coastal Marlborough. He has been allowed out of the office to map the soils between Inchbonnie and the Crooked River at Rotomanu in the Lake Brunner catchment, and to undertake an investigation of a proposed oil drilling mud disposal site near Bluff.

**Sam Carrick** has mostly been chipping away (often literally!) at the world of stony soils (<45 cm to gravels) through a number of collaborative projects. An important paper was presented at the 2013 FLRC conference highlighting the spatial distribution of stony soils, and identifying them as a hotspot for land use change over the last decade. Current stony soil projects involve quantifying the effect of irrigation depth and rate on nitrogen leaching and gas emissions (together with Trish Fraser and Steve Thomas, Plant and Food, plus Samuel

Dennis, AgResearch). Results are almost complete for a series of 'scoping' experiments to quantify the vulnerability of young stony sands to leaching of nitrogen, phosphorus, carbon, microbes, and trace elements (together with Trevor Webb, John Scott, Jo Cavanagh, Malcolm McLeod and David Palmer). Sam also spends about 20% of his time teaching undergraduate soil physics and soil resource assessment for the Soil and Physical Sciences Department, Lincoln University. Sam and Peter Almond (Lincoln University) have produced a short video on the soil mapping project that they have jointly run, linking pedology with precision irrigation (<http://www.youtube.com/watch?v=IcUpsuYbGmo>).

**Allan Hewitt** reflects that looking back on the diverse salad of projects he has been involved with over the last year, there have been many highlights including:

- ~ Passing the NZSSS President role over to Trish Fraser's very capable hands, and a refreshed Council.
- ~ The "Grey Beards" project designed to give a few ancient pedologists the opportunity to record some insights for posterity – I chose the Otago Uplands, one of the first places I dug pits in anger.
- ~ It has been great to see digital soil mapping techniques being used operationally over extensive terrain in the North Island soft rock hill country by Sharn Hainsworth and Dave Palmer. There is hope here for much better soil resource characterisation of our hills and steeplands.
- ~ Applying for the first time the stock adequacy method of quantifying soil natural capital in the Wairarapa which has highlighted the stark differences between deep loamy and shallow stony soils in terms of their delivery of soil services.
- ~ Great to see the inference system of S-map now being used extensively to provide soil management inputs, and plans to build interoperability between models.

## Otago/Southland

### AgResearch Invermay

It has been a relatively busy winter this year on the Telford Dairy Farm where AgResearch (**Ross Monaghan** and **Seth Laurenson**) have been conducting a number of trials as part of the Pastoral 21 programme. Developing more strategic ways to graze winter forage crops has been part of this programme and is more or less finished for the year. Following submission of her PhD, **Ros Dodd** has joined the team in her new role as a water quality scientist with a focus on phosphorus. We are continuing with other trials including effluent and grazing trials. Staff in Invermay are getting to grips with new announcements on the campus future footprint. It is intended the Nutrient Losses to Water and Atmosphere team continue to focus on regional issues based out of the existing campus location. There will be some relocation of some team members from Invermay to Lincoln, however exact details are yet to be finalised.

## **Recent publications from the Department of Soil and Physical Sciences, Canterbury University:**

**Barrows, T, Almond, P C, Rose, R, Fifield, K & Mills, S.** Late Pleistocene glacial stratigraphy of the Kumara-Moana region, West Coast of South Island, New Zealand. *Quaternary Science Reviews*; p.1-21 2013. <http://dx.doi.org/10.1016/j.quascirev.2013.04.010>

**Eger, A, Almond, P C, Wells, A & Condrón, L M.** Quantifying ecosystem rejuvenation: foliar nutrient concentrations and vegetation communities across a dust gradient and a chronosequence. *Plant and Soil*; 367: p.93-109 2013.

**Goloran, J, Chen, C, Phillips, I, Xu, Z H & Condrón, L M.** Selecting a nitrogen availability index for understanding plant nutrient dynamics in rehabilitated bauxite-processing residue sand. *Ecological Engineering*, 58: 228-237. 2013.

**Hamonts, K, Nimlesh, N, Moltchanova, E, Beare, M, Thomas, S, Wakelin, S A, O'Callaghan, M, Condrón, L M & Clough, T J.** Influence of soil bulk density and matric potential on microbial dynamics, inorganic N transformations, N<sub>2</sub>O and N<sub>2</sub> fluxes following urea deposition. *Soil Biology and Biochemistry*; 65: p.1-11 2013.

**Hamonts, K, Clough, T J, Stewart, A, Clinton, P W, Richardson, A E, Wakelin, S, O'Callaghan, M & Condrón, L M.** Effect of nitrogen and waterlogging on denitrifier gene abundance, community structure and activity in the rhizosphere of wheat. *FEMS Microbiology Ecology*; 83(3): p.568-584 2012.

**Jangid, K, Whitman, W, Condrón, L M, Turner, B L & Williams, M.** Progressive and retrogressive ecosystem development coincide with the soil bacterial community change in a dune system under lowland temperate rainforest in New Zealand. *Plant and Soil*; 367: p.235-247 2013.

**Jangid, K, Whitman, W, Condrón, L M, Turner, B L & Williams, M.** Soil bacterial community succession during long-term ecosystem development. *Molecular Ecology*; 22: p.3415-3424 2013.

**Jack E. Lee, Hannah L. Buckley, Rampal S. Etienne, Gavin Lear.** Both species sorting and neutral processes drive assembly of bacterial communities in aquatic microcosms. *FEMS Microbiology Ecology*. DOI: 10.1111/1574-6941.12161.

**Turner, B L & Condrón, L M.** Pedogenesis, nutrient dynamics, and ecosystem development: the legacy of T.W. Walker and J.K. Syers. *Plant and Soil*; 367: p.1-10 2013.

**Turner, B L, Lambers, H, Condrón, L M, Cramer, M, Leake, J, Richardson, A E & Smith, S.** Soil microbial biomass and the fate of phosphorus during long-term ecosystem development. *Plant and Soil*; 367: p.225-234 2013.

**Wells, N.S., Clough, T.J., Condrón, L.M., Baisden, W.T., Harding, J.S., Dong, Y., Lewis, G.D., Lear, G.** Biogeochemistry and community ecology in a spring-fed urban river following a major earthquake. *Environmental Pollution*. 182: 190-200, 2013.

**Di, H J, Cameron, K C, Shen, J, Winefield, C S, O'Callaghan, M, Bowattee, S & He, J Z.** The Role of Bacteria and Archaea in Nitrification, Nitrate Leaching and Nitrous Oxide Emissions in

Nitrogen-Rich Grassland Soils. In: J. Xu and D. Sparks(ed.) Molecular Environmental Soil Science, Springer 81-91. 2013. Dordrecht, Netherlands.

**Simmler, M, Ciadamidaro, L, Schulin, R, Madejon, P, Reiser, R, Clucas, L, Weber, P, Robinson, B** Environmental Science and Technology: 47, 9, 4497-4504, 2013.

**Melpaque M, Collet S, Del Gratta F, Schnuriger B, Gaucher R, Robinson B, Bert V** Combustion of Salix used for phytoextraction: The fate of metals and viability of the processes. Biomass and Bioenergy 49, 160-170, 2013

**Evangelou MWH, Robinson BH, Gunthardt-Goeg MS, Schulin R.** Metal uptake and allocation in trees grown on contaminated land: implications for biomass production. International Journal of Phytoremediation 15(1), 77-90, 2013

**Rees, R , Robinson, BH, Rog, CJ, Papritz, A, Schulin, R.** Boron accumulation and tolerance of hybrid poplars grown on a B-laden mixed paper mill waste landfill Science of the Total Environment 447, 515-524, 2013.

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## **Risk assessment of vegetables irrigated with arsenic-contaminated water**

**S. M. Bhatti,<sup>a,b</sup>\*, C. W. N. Anderson,<sup>a</sup> R. B. Stewart<sup>a</sup> and B. H. Robinson<sup>c</sup>**

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### Abstract

Arsenic (As) contaminated water is used in South Asian countries to irrigate food crops, but the subsequent uptake of As by vegetables and associated human health risk is poorly understood. We used a pot trial to determine the As uptake of four vegetable species (carrot, radish, spinach and tomato) with As irrigation levels ranging from 50 to 1000  $\mu\text{g L}^{-1}$  and two irrigation techniques, non-flooded (70% field capacity for all studied vegetables), and flooded (110% field capacity initially followed by aerobic till next irrigation) for carrot and spinach only. Only the 1000  $\mu\text{g As L}^{-1}$  treatment showed a significant increase of As concentration in the vegetables over all other treatments ( $P < 0.05$ ). The distribution of As in vegetable tissues was species dependent; As was mainly found in the roots of tomato and spinach, but accumulated in the leaves and skin of root crops. There was a higher concentration of As in the vegetables grown under flood irrigation relative to non-flood irrigation. The trend of As bioaccumulation was spinach > tomato > radish > carrot. The As concentration in spinach leaves exceeded the Chinese maximum permissible concentration for inorganic As (0.05  $\mu\text{g g}^{-1}$  fresh weight) by a factor of 1.6 to 6.4 times. No other vegetables recorded an As concentration that exceeded this threshold. The USEPA parameters hazard quotient and cancer risk were calculated for adults and adolescents. A hazard quotient value greater than 1 and a cancer risk value above the highest target value of  $10^{-4}$  confirms potential risk to humans from ingestion of spinach leaves. In our study, spinach presents a direct risk to human health where flood irrigated with water containing an arsenic concentration greater than 50  $\mu\text{g As L}^{-1}$ .

# Effects of urease and nitrification inhibitors on the efficient use of urea for pastoral systems

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## Abstract

The effects of a urease inhibitor [N-(n-butyl) thiophosphoric triamide (nBTPT- trade-name Agrotain®) alone and a combination of nitrification inhibitor dicyandiamide (DCD) and nBTPT, defined as a double inhibitor (DI) on urea fertilizer use efficiency in pastoral systems was investigated. The treatments comprised urea alone, urea with nBTPT, urea with DI at a low rate (LDI), and urea with DI at a high rate (HDI). Each treatment had 3 replicates and was applied at two rates - 30 and 60 kg N/ha to 3 trials sites (North Island-1, North Island-2 and South Island) in New Zealand during 2005-2006 seasons. The trials at North Island-1 and South Island received six applications of fertilizers, giving total N application rates of 180 and 360 kg N/ha over an 18-month period. The North Island-2 trial received these treatments 5 times during a one-year period, giving total N application rates of 150 and 300 kg N/ha. Soil samples collected after the first fertilizer application from the South Island trial indicated that compared to urea alone, urea with nBTPT and urea with the DI treatments applied at the 60 kg N/ha rate exhibited a significantly slower release of ammonium-N during the first two weeks. Nitrate-N production was only partially delayed by DCD applied in the DI treatment during the first week. On individual site and over all sites, urea applied with nBTPT, and to a lesser extent, urea applied with the DI treatment, consistently produced significantly higher pasture dry matter (PDM) and N response efficiency (NRE), relative to pastures receiving urea alone at the two N rates. Across all 3 sites at the 30 kg N/ha rate, over the entire period, urea with nBTPT produced 20,441 kg DM/ha compared to 18,383 kg DM/ha produced by urea alone representing an increase of 11.2% over urea alone. At the 60 kg N/ha rate, the increase in PDM by urea with nBTPT was 8.3% over urea alone. PDM yields from urea with LDI and HDI treatments were slightly lower than PDM yields of pastures receiving urea with nBTPT, but significantly higher than those of urea alone. The NRE of individual site and over all sites were significantly higher for the treatments of urea + nBTPT, or urea + DI, relative to those pastures receiving urea alone. NRE values dropped at the higher urea rate (60 kg N/ha). Compared to urea alone, urea with nBTPT or urea with the DI treatments also showed an improvement in N uptake in pasture herbage. However, these improvements in pasture N uptake were only significant for HDI and LDI treatments at 60 kg N/ha. This suggests that applying urea with nBTPT alone has the most potential to improve the efficiency of urea fertilizer use. The DI treatments may have other environmental benefits, like reduction in N<sub>2</sub>O emission and NO<sub>3</sub>- leaching, though the agronomic benefits appear unlikely to be greater than those achieved by using urea with nBTPT alone.

Keywords: Urea, Agrotain, nBTPT, DCD, Pasture, N response efficiency.

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## Conferences:

### **Wai-BoP Soils 2013** **One-day conference: Thursday, 5<sup>th</sup> December, 2013** **University of Waikato, Hamilton**

As announced earlier, we propose to hold the second one-day regional conference of Waikato-Bay of Plenty-based soil scientists on **Thursday 5<sup>th</sup> December, 2013**, at the University of Waikato, Hamilton. The conference will be convened by professors David Lowe and Louis Schipper of the Department of Earth and Ocean Sciences, University of Waikato. The meeting will provide a great opportunity for the many soil scientists and others in the region with interests in land and soil to assemble for a stimulating day of talks and networking away from the commitments and rush associated with bigger conferences. We hope to conclude the conference with the N.H. Taylor Memorial Lecture for 2013.

Students will be strongly encouraged to attend and participate and to meet and talk with local geoscientists and others interested in soils. As in 2011, we plan to make the day as straightforward as possible (Fig. 1). The conference will be held on the Waikato University campus, probably starting at around 8.30-8.45 am (tbc). We will not publish abstracts nor proceedings. Our provisional plan is for oral presentations of 12 minutes in total, 10 minutes for presentation followed by 2 minutes for questions or comments, strictly enforced, so the day will move along at a fair clip. We also hope to have extended breaks for informal discussions and networking. There will be no posters. We may have to limit the number of oral presentations if we have a lot of proposals for talks.

Although the meeting will target Waikato-BOP soil scientists, we welcome attendance from those in other regions who have a professional interest in soils (e.g., from Auckland, Hawke's Bay, Taranaki), our only stipulation being that all participants must be paid-up members of the New Zealand Society of Soil Science (NZSSS). Society membership application forms are available on the website <http://nzsss.science.org.nz/join.html> (annual membership, if paid before 31 October, is only \$60 for full membership, \$35 for students). Registration for the conference is free, thanks to generous sponsorship for the event by the **Waikato Regional Council, University of Waikato**, and NZSSS.

#### **Call for papers and notification of attendance**

If you want to present an oral paper, please email David Lowe (d.lowe@waikato.ac.nz) by Tuesday 5 November 2013 at the latest with the title of your paper, the authorship, and the name of the person who will present it. The title must reflect the content. We will notify presenters if the paper has been accepted or otherwise a week or so after the deadline. So that we can plan for catering and venue size, we also need to know likely attendance by those not giving papers. Consequently, all those who are planning to attend must advise David via email by Monday 5 November, 2013. Earlier notification of your paper or attendance is welcome of course!

Please feel free to pass this notice on to people or organisations who may be interested in attending. We hope to see many of our society members and others interested in the wonderful world of soils at the Wai-BoP Soils 2013 conference on the 5th of December. Remember, "Wai-BoP Soils? Why not!"

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*Louis Schipper: [schipper@waikato.ac.nz](mailto:schipper@waikato.ac.nz)*

**Soil Change Matters 2014, 24-27 March 2014, Bendigo, Australia.**

**[www.soilmatters.org](http://www.soilmatters.org)**

Soils change in response to land use, land management and climate. Understanding the mechanisms and rates of change in fundamental soil properties, and their extent across the landscape, is critical for management of soil and land to ensure enduring productivity and provision of ecosystem services. Soil Change Matters will bring together scientists who can explain the critical changes in soils, particularly during the past century of increasingly intense land use. Soil Change Matters will include dialogue between policy makers and scientists to clarify policy needs, as well as the current capability of soil knowledge systems and soil monitoring approaches. We invite you to be part of this international workshop organised by the Victorian Government's Department of Environment and Primary Industries, and supported by Soil Science Australia and the International Union of Soil Sciences. Please visit [www.soilmatters.org](http://www.soilmatters.org)

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**20<sup>th</sup> World Congress of Soil Science – Korea**

**June 8 – 13 2014**

**[www.20wcss.org](http://www.20wcss.org)**



The 20th World Congress of Soil Science will be held at the International Convention Center Jeju (ICC Jeju) on Jeju Island, Korea, from June 8th to 13th, 2014. The theme of the conference is Soils Embrace Life and Universe, and the congress is also a celebration of 90 years IUSS. Jeju is an oval-shaped volcanic island with 1,950 meter Halla Mountain in the middle. Jeju is known for its unique volcanic features making the entire island a volcanic museum. For further information see [www.20wcss.org](http://www.20wcss.org) or e-mail [wcss@20wcss.org](mailto:wcss@20wcss.org)

Key dates:   Deadline for Abstract Submission: October 31, 2013  
                  Notification of Abstract Acceptance: January 15, 2014  
                  Deadline for Early Registration; March 20, 2014  
                  Deadline for Regular Registration: May 8, 2014

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**9th International Symposium AgroEnviron, 3-7 August 2014 in Goiânia, Brazil.**

**[www.agroenviron2014.com](http://www.agroenviron2014.com)**

With the theme “Impacts of Agrosystems on the Environment: challenges and opportunities”, the scientific program will focus on problems and solutions related to the environmental sustainability of agrosystems. The conference will address broad topics on soil and water conservation and management, agriculture and environmental policies, environmental sustainability, technology innovation, and education. A guided one-day field trip to the savannah with examples of tropical agriculture is included in the registration fees. Abstracts submission is open at [www.agroenviron2014.com](http://www.agroenviron2014.com)

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