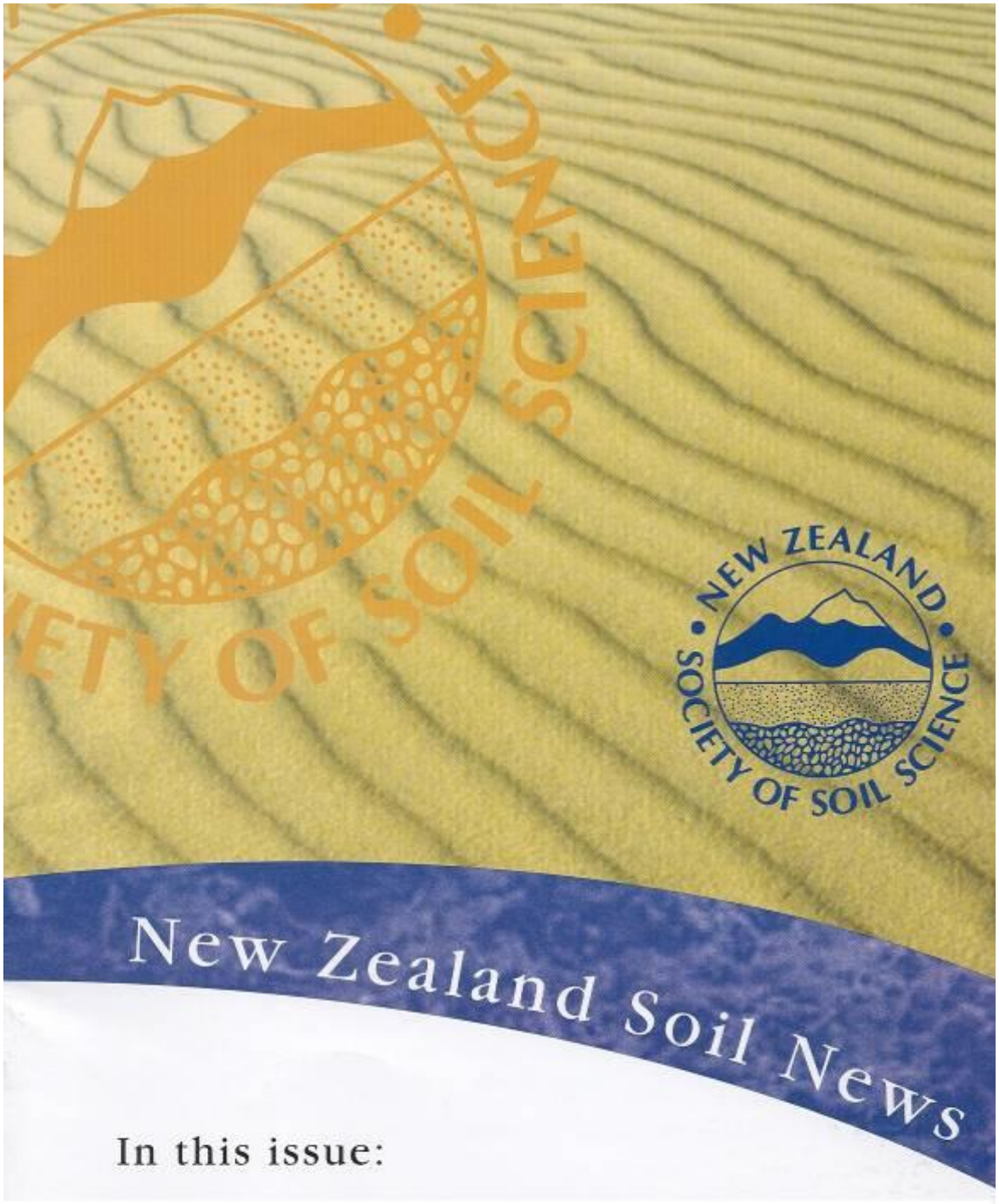

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Your contributions are required - New Zealand Soil News is your newsletter

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Deadline..... for the February issue of Soil News is **Friday 19th February 2016**

Visit our website:
http://nzsss.science.org.nz/

New Zealand Soil News

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Editorial:– Using an ecosystems approach to advance land evaluation and farm systems analysis – E Dominati & A Mackay

Future shape of land evaluation

Land evaluation is formally defined as 'the assessment of land performance when used for a specified purpose' and has a long history of describing and quantifying the differences between units of land. The procedure uses limiting factors arising from climate, hydrology, landforms, soils, and vegetation as the basis for evaluation of sustainable yields, with critical values determining the boundaries of suitability. In New Zealand, land use capability classification has been the basis for assessing suitability for sustained production.

Two new trends emerging from land evaluation frameworks globally are the recognition of the wider functions provided by landscapes and the need for greater stakeholder participation in exploring the balance between economic, environmental, social, and cultural outcomes (FAO 2007). With increasing demands on the finite land resource, land evaluation must go beyond assessment of land suitability for just primary production and consider the performance of all services provided by a combination of land type, climate, land use and management practices, as well as impacts on receiving environments. Modern soil information systems have increasing capacity to help doing just that (Lagacherie & McBratney 2006).

A rapidly emerging multi-disciplinary approach to assess the multi-functionality of natural resources is the ecosystems approach based on the concepts of natural capital and ecosystem services. Natural capital is defined as the 'stocks of natural assets that yield a flow of ecosystem goods or services into the future'. This concept comes from trying to frame the contribution of natural resources to the economy alongside built capital (factories, buildings), human capital (labour, skills), and social capital (education, culture). Ecosystem services are defined as 'the benefits people obtain from ecosystems', not only food, but also flood mitigation, nutrients filtration, GHGs regulation or pest regulation, and so forth.

While multi-functional landscape models are already used to map and value some ecosystem services, representation and inclusion of the contribution from soils to ecosystem services provision, and especially the impacts of land use and management on soil properties and therefore all ecosystem services flows, often remains inadequate due to model limitations to account for complexity and feedbacks in the systems. Until land use, management intensity, and level of inputs are specified, the actual land condition and therefore performance (McBratney et al. 2014) in ecosystem services delivery cannot be assessed (Figure 1). Adding an ecosystems approach to land evaluation enables the supply of ecosystem services to be directly linked to the performance of a combination of land type, land use and management intensity to deliver specific outcomes (Dominati et al. 2016).

Emerging farm systems analytical capability

Farms often are an assemblage of multiple landscapes that include a mix of topographies and soil types, both of which influence pasture and crop production, as well as other services. Importantly, these land units show different responses to inputs and practices. Today's intensive agricultural systems are the product of successfully combining built capital with diverse natural resources (e.g. land, water) to produce food and fibre for profit. Future analysis of the farm system will need to be extended to include the implication of decision-making not just on food and fibre production, but also on the services our farm systems provide.

Building an ecosystems approach into farm system analysis through multi-functional land evaluation offers a way of separating and assessing the contribution of natural and built capital

to the farm system and its ecosystem services provision. The approach provides new insights into the impacts of natural capital (soil conservation, riparian margins) and built infrastructure investments (irrigation, feed-pads, herd homes) on the performance of the combination and the farm system towards multiple outcomes. An ecosystems approach also creates the ability to define 'ecological boundaries' within which resources should be managed, which addresses the purpose (section 5) of the Resource Management Act 1991. Some of these boundaries will be defined at the farm scale by the landowner (sustaining soil quality), at the catchment scale by community (thresholds on nutrient losses, sediment) and consumer (practice and produce quality), or at the national scale (GHGs emissions) by global targets.

New generation farm systems models therefore need to integrate biological data from each land management unit (similar natural resources and management practices) within the farm, departing from the use of whole farm average, in order to adequately represent the range of land capabilities across the farm. This, in turn, can be used to truly optimise the farm system for the best use of resources within defined boundaries, while targeting multiple ecosystem services delivery. This approach is starting to be implemented in New Zealand and represents an advance for isolating and examining the value of investments targeted at specific parts of the farm for the whole farm business.

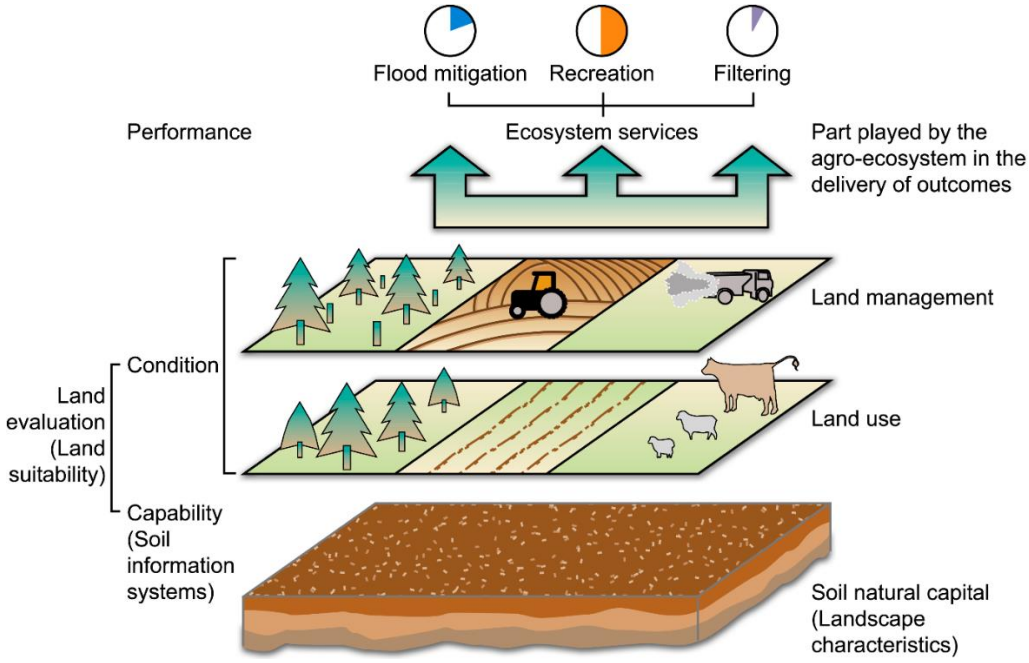

Figure 1: Combining land capability with resource condition under a use to quantify ecosystem services provision for multi-function land evaluation (Dominati et al. 2016).

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Dominati, E. J.; Mackay, A. D.; Bouma, J.; Green, S. 2016: An ecosystems approach to quantify soil performance for multiple outcomes: The future of land evaluation? *Soil Science Society of America Journal*, in press.

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McBratney, A.; Field, D. J.; Koch, A. 2014: The dimensions of soil security. *Geoderma 213*: 203-213.

Obituary: Ben Clayden

Ben had not been in good health for many years and passed away on Friday 31 July. Born in 1933 in Barking, East London, he deferred his National Service in 1950 to attend Sheffield University, studying Geology and Geography and graduating in 1953. A period in the army soon followed, in a field regiment of the Royal Engineers, based in Osnabrück in Germany. On emerging from the army in 1955 Ben joined the Soil Survey of England & Wales and was based in Bristol. It was here that he was to meet his future wife, June, at the Clifton Lawn Tennis Club. A transfer to Devon came in 1959, where all four children were born, and then a move to Swansea in 1969 to oversee soil survey work in Wales. In 1979 came a move to Soil Survey HQ at Rothamsted, to work with Brian Avery on the development of a comprehensive classification of soil families and series. This is the basis of the present England & Wales national soil maps. Ben first came to New Zealand in 1981 to attend the "Soils with Variable Charge" Conference and take in tours of the S and N Islands. He and Peter Bullock had contributed a chapter for the Variable Charge book on "The morphological properties of Spodosols". He must have liked what he saw and who he met, and impressed the powers that be, as he accepted a position at NZ Soil Bureau, DSIR, Taita, Lower Hutt, arriving in February 1982, taking up the post of Chief Pedologist and Section Leader, Soil Resources prior to Des Cowie's retirement in 1984.

Ben had key skills, acknowledged internationally, in soil classification, allied to a sound grounding in soil survey methods and practices. By asking basic questions and leading his colleagues through to the consideration of new concepts and the establishment of better definitions and clearer procedures, he guided changes in taxonomy, which in turn benefited mapping and survey work. He was a frequent sounding board for new ideas, which he would chew over for a day or two and often come back with insightful comments. His international links and standing continued, especially in relation to taxonomic development of the Andisols and Aquic soils. As chief pedologist, Ben also had to read and approve the various reports and publications from soil resources staff, a task to which he brought his high standards of written English and an aim for brevity and clarity of meaning.

Ben's was a very outgoing and friendly personality; well-liked and respected by his colleagues. We are sure many will remember after a meeting, or a day in the office or the field, sitting around a table with Ben, perhaps at an appropriate hostelry or the conference bar, reminiscing, telling stories, having the odd beer and a good singalong. And we must not forget the hospitality afforded to his colleagues by June and the family, especially to those from out of town and the younger pedologists, whom Ben mentored well. Ben was a keen sportsman, especially tennis and swimming, and played rugby in his earlier days. He also had a quirky hobby collecting penguins (paperbacks, not birds!) and was always delighted if someone turned up with a copy he didn't have, which became increasingly difficult! Ben was saddened and disappointed by the changes taking place in science policy in the late 80s and early 90s and in many ways felt powerless to mediate the impact they were having on his discipline, no doubt coloured by the knowledge of what had happened at his old alma mater the Soil survey of England & Wales. Ben did not transfer into the CRI system and retired in late December 1993. He and June continued to live in Lower Hutt, until moving to Tauranga some years ago, to be nearer daughter Nicky and her family.

Ben took great delight and pride in his family. To June, Nicky, Peter, Cath and John, and to the rest of the extended family, we express our sympathy at Ben's passing. He was a husband and father to be proud of and a science leader who strengthened pedology in the UK and New Zealand, and made an impact internationally in furthering the development of Soil Taxonomy.

Bob Lee & Allan Hewitt

Obituary: Dr Alistair Campbell

The Lincoln University community, including the vast network of international alumni, will be saddened by the death of retired Associate Professor of Soil Science Dr Alistair Campbell, who died in Christchurch on Saturday 3 October 2015.

Dr Campbell was on the staff at Lincoln University for 44 years, 1959-2003, and on retirement was the longest-ever serving staff member.

Soil mineralogy and chemistry were his academic areas but his service to Lincoln University extended far beyond the classroom and laboratory. In sport he was long associated with the Soccer XI as player and club official. In staff welfare and relations with management he was a respected tertiary teachers' union representative and advocate. In campus cultural life he is well remembered for helping to organise and MC International Night for many years and his involvement with capping concerts.

Alistair was legendary for his international network of friends and contacts and he gave superlative service to Lincoln University maintaining overseas links, particularly in South East Asia and among former Colombo Plan students. For this work he was awarded a Lincoln University 125th Anniversary Medal. His generous help and support for students in general, especially in extra tutoring of chemistry, carried out in his own time, free of charge, was another facet of his dedication to the life of the University.

Beyond the University, Alistair was fully involved with the community of Lincoln township, where he lived. This included editing the Community Newsletter, service on the local historical society and above all serving on the Lincoln Community Committee.

In all of this work Alistair was loyally helped and supported by his wife Pat, herself a PhD graduate and Lincoln staff member of 31 years standing. They were a close team, involved fully in the academic and community life of Lincoln University and beyond it Lincoln township. The University's sympathy goes out to Pat at this sad time.

Alistair came to Lincoln University from Dunedin where he had his secondary education at King's High School (1949-1953) and graduated MSc from Otago University. He completed a PhD in Soil Science under Professor TW Walker in 1975 while a member of Lincoln's Soil Science staff. He retired in 2003 as an Associate Professor.

John Hay
Interim Vice-Chancellor
5 October 2015

Alistair and his wife Pat on the occasion of a 2013 Colombo Plan reunion held at Lincoln University which the Campbell's assisted in organising. Alistair was noted for his connection with former Colombo Plan ex Lincoln students over many years and attended reunions in Malaysia post his retirement in 2002.
Photo by David Hollander, Lincoln University

Article about Dr Leslie Grange and Ettie Rout

Dr Leslie I. Grange and Ettie Rout - a story from the past that began in the First World War and ended in an acknowledgement of a war time heroin who lies in a graveyard in Rarotonga, Cook Islands.

Philip Tonkin

Dr Les Grange is known to New Zealand Soil Science as the leading member of the small team that included Norman Taylor and Theodore Rigg, who initiated the soil survey in 1930. He subsequently became the founding Director of the Soil Survey Division and Soil Bureau of the Department of Scientific and Industrial Research. Dr Grange's contribution is memorialized in the societies Grange medal.

What may not be so well known is that Dr Grange was firstly a geologist and New Zealand's first Government volcanologist and that he undertook the first systematic mapping of tephra in the central North Island. He had graduated from Otago University with a degree in geology at the time of the First World War. He then enlisted and in view of his geological training was assigned to the New Zealand Engineers Tunneling Company in France in 1916. His meeting with Ettie Rout is told in a book on her life and work ensuring the sexual health of New Zealand Soldiers. The following extracts are from Jane Tolerton's 1992 edition on Ettie Rout, a new edition of which has just been published (Tolerton, 2015).

"Leslie Grange, a private with the New Zealand Engineers who had been a student at Otago University before joining up near the end of 1916 at the age of twenty two, met Ettie through other soldiers in Paris while on leave from the Somme battlefield in September. She gave him a prophylactic kit and persuaded him to spend some of his leave in the south of France. He went to Nice and Monte Carlo. When he got back to Paris he succumbed to the deadly influenza that had become epidemic in the last months of the war. Ettie organised him a hotel bed and looked after him. 'Four or five girls were later lined up for me … by the fellow who helped her'. He returned to the front in October and emerged from the war unscathed, to be promoted to the most senior rank for a non-commissioned officer. "Nothing should be suppressed in dealing with Ettie,' he wrote sixty years later."

They put her in the furthest corner of the graveyard (in the church yard of the beautiful solid and plain London Missionary Society now Cook Islands Christian Church at Avarua), over by the stone wall. … Its only when you get up close that you notice that she has two gravestones. Leslie Grange, the young private whom Ettie had sent to the south of France and nursed when he had the flu, had not heard her name for thirty years when, as head of the New Zealand Soil Bureau, he arrived in Rarotonga in 1950 to survey the island's soils. He was amazed when her name cropped up in a conversation with the island's director of agriculture who said she was buried there, though he did not know exactly where. By the time the grave had been located, Grange was back in New Zealand. But his host sent him a copy of the inscription. Grange had a new stone made to fit on the existing one. It was a personal, secret tribute - and therefore a totally appropriate one. But it was the closest Ettie came to having a memorial erected for her war service."

The identical inscription read:

IN MEMORY OF
ETTIE A. HORNIBROOK
(ETTIE A. ROUT)
Died 17th September, 1936
Aged 59 years

Some foot notes to this story. The 1918-1919 Flu Pandemic also known as the Spanish Flu was the deadliest in modern history with one estimate of 500 million affected worldwide and some 20 to 50 million deaths. Many flu victims were young otherwise healthy adults. The high death rate was attributed to the flu virus entering the lungs causing pneumonia and death. The second and most highly contagious wave of this pandemic appeared in late 1918 and swept through the ranks of the allied and German soldiers on the Western Front. Les Grange was fortunate to fall into the care of Ettie Rout. The man who assisted Ettie in arranging the nursing of Les Grange in Paris was Fred Hornibrook who later married Ettie. Fred was uncle of Norcott Hornibrook a noted New Zealand micropalaeotologist (Stevens, 1995).

In 1950 at the request of the South Pacific Commission, Dr Les Grange and Pat Fox travelled to the Cook Islands to make a reconnaissance soil survey (Grange and Fox, 1955). It was during the survey of Rarotonga that Les Grange became aware that Ettie Rout was buried on the Island. Her gravesite was not located while he was on the island but the Director of Agriculture Mr Maurice M. Baker undertook to local it. While reviewing Soil Bureau files on the Soil Survey of the Cook Islands I came across the following correspondence in the Pacific Islands files regarding the tombstone for Ettie Rout.

Letter from Dr L.I Grange to Mr Maurice B. Baker Director of Agriculture Rarotonga Cook Islands - the 28th August 1950. - I hope you were able to locate Ettie's resting place in time for a photograph by Mr J. Pat Fox (Pat Fox had remained in Rarotonga to complete the soil survey after Dr Grange had returned to New Zealand).

Memorandum from Dr L.I. Grange to Mr Maurice B. Baker Director of Agriculture Rarotonga Cook Islands - 17th August 1951. - The panel for Ettie has been shipped by the "Waikawa" on 4th August 1951.

Letter Maurice Baker Residents Commissioners Office of Administration of Niue - 21 August 1951. - At present I am in Niue. Ettie's tombstone should have arrived during my absence and I will let you know if this is so after my return toward the end of September.

Maurice Baker had the tombstone placed on Ettie's grave and during a visit to Rarotonga this year James Barringer of Landcare Research took this photo of Ettie's grave with its two grave stones and the poppies laid on ANZAC Day. Without the nursing given to Dr Les Grange in 1918 he may not have returned from the First World War.

Sources:

Grange, L.I. and Fox J.P. 1955: Soils of the Lower Cook Group. Soil Bureau Bulletin 8. 65 pages and 6 maps.

Stevens, G.R. 1995: Les Grange and Norcott Hornibrook: the Ettie connection. Newsletter of the Historical Studies Group, Geological Society of New Zealand. No. 10 pp. 31-33.
Tolerton, J. 2015: Ettie Rout: New Zealand's safe sex pioneer. Penguin.

Celebrating Soils in The Hub

A 1-day workshop for the International Year of Soils, also incorporating the 2015 Norman Taylor Memorial Lecture.

Friday 27th November

Stewart Block, Lecture Theatre 1, Lincoln University

The workshop is open to all and free to attend but for catering purposes please let us know you are attending by emailing to trish.fraser@plantandfood.co.nz

	Presenter	Organisation	Title of Presentation
9.00 - 9.10	Welcome		
9.10	Brett Robinson	Lincoln University	Closing the nutrient loop: rebuilding our soils with bio-wastes
9.30	Colin Gray	AgResearch	Beneath the surface: nutrient loss from soils
9.50	Mike Beare	Plant & Food Research	Soil science at the interface between sustainable production and environmental protection
10.10	Allan Hewitt	Landcare Research	How good are New Zealand soils?
10.30 - 11.00	Morning Tea		
11.00	Armin Werner	Lincoln Agritech	Contributions from engineering and science to measure, model and manage soils for Precision Agriculture in New Zealand
11.20	Simeon Smaill	Scion	Soil as a driver of sustainable increases in forest productivity
11.40	Murray Close	ESR	Structure and connection below the root zone: implications for transport in alluvial gravel systems
12.00	Andrew Curtis	Irrigation NZ	Soils - Growing SMART Irrigation
12.20 - 1.15	Lunch (NOT provided)		
1.15	Ogi Mojsilovic and Jeromy Cuff	ECan	Back to the future: what are our long-term soil quality issues
1.35	Nick Pyke	FAR	Cropping – how best to use our soil resource?
1.55	David Chapman	Dairy NZ	Soils for resilient dairy farming systems
2.15	Gustavo Boitt	Lincoln University Student	Nature and distribution of soil phosphorus under irrigated grazed pasture
2.30	Roshean Woods	Lincoln University Student	How can plants help reduce nitrogen loss from farms?
2.45	Brief summing up		
3.00 - 3.30	Afternoon Tea		
3.30	Richard McDowall	AgResearch	Norman Taylor Memorial Lecture: When being told to P-off is good
4.30	Finish		

WaiBoP - Waikato, Bay of Plenty soil science

WaiBoP Soils Meeting

Friday 4th December 2015
Room S1.05, University of Waikato

Thanks to Sponsors – Waikato Regional Council, Landcare Research, University of Waikato

All Welcome – please RSVP to m.balks@waikato.ac.nz if you plan to attend by Nov 30. Thanks to those who have already replied.

Provisional Programme

8.30 am Welcome: Conference Convenor, Dr Megan Balks

8.31 Session 1 Chair: Natalie Watkins, AgResearch, Natalie.Watkins@agresearch.co.nz

8.35 David Houlbrooke, The impact of stocking rate and soil type on soil physical quality in the P21 Waikato farmlet trial. Houlbrooke, McGowan & Shepherd, AgResearch David.houlbrooke@agresearch.co.nz

8.50 David Lowe, 3 x 3: advances from the Marsden project "New views from old soils" Lowe, D.J., Huang, Y.-T., Churchman, J., Schipper, L., Cursons, R., Zhang, H., Rawlence, N., Young, J., Chen, C., Cooper, A. University of Waikato d.lowe@waikato.ac.nz

9.05 Diana Selbie "A simple model shows that soil development status influences mineralisation-immobilisation turnover in animal urine patches" AgResearch, diana.selbie@agresearch.co.nz

9.20 Adrea Noyes Soil recovery following landslides at Whatawhata Research Station, Waikato, New Zealand

9:35 Fiona Curran-Cournane 'Attitudes and perspectives of a farming community towards town growth and land use change' Fiona.Curran-Cournane@aucklandcouncil.govt.nz

9.50 Gina Lucci "Modelling nitrogen losses from a wastewater disposal site using Overseer® Nutrient Budgets" AgResearch Gina.Lucci@agresearch.co.nz

10:05 Morning tea

10.30 Session 2 Chair: Annie Perkins, Groundwork Associates, **annie.perkins@groundworkassociates.co.nz**

10.30 Haydon Jones "EMaR Land and the changing landscape of national environmental reporting" Waikato Regional Council Haydon.Jones@waikatoregion.govt.nz

10.45 Jack Pronger 'Low spatial and inter-annual variability in evaporation from an intensively grazed pasture system' University of Waikato. jp73@students.waikato.ac.nz

11.00 Susanna Rutledge "CO2 dynamics following pasture renewal to moderately diverse pasture'. University of Waikato s.rutledge@waikato.ac.nz]

1.15 Juliet Clague Investigating how soil drainage class affects the redox status of shallow groundwater, Lincoln Agritech, juliet.clague@lincolnagritech.co.nz

11.30 Justin Wyatt "A soil moisture monitoring network for the Waikato Region". Waikato Regional Council Justin.Wyatt@waikatoregion.govt.nz

11.45 New Zealand Society of Soil Science AGM for formal confirmation of financial report and any general business (no elections of officials or other detailed business).

12.00 Lunch

1.00 Session 3 Chair: Laura Buckthought, Auckland Council, Laura.Buckthought@aucklandcouncil.govt.nz

1.00 Liyin L. Liang "Regulation of soil CO2 and N2O fluxes from agriculture soil". University of Waikato, lliang@waikato.ac.nz

1.15 Louis Schipper, Denitrifying Bioreactors for Nitrate Removal: A Meta-analysis. Kelly Addy, Arthur J. Gold, Laura E. Christianson, Mark B. David, **Louis A. Schipper**, and Nicole A. Sacha. University of Waikato

1.30 Mark Shepherd Organic matter levels across a chronosequence on Taupo pumice soils. AgResearch mark.shepherd@agresearch.co.nz

1.45 Nigel Bell "Microbes From Inner Space: The impact of soils, land management and biotic stress on the root endophytic and rhizospheric microbiomes of *Trifolium repens". AgResearch* nigel.bell@agresearch.co.nz

2.00pm Public Lecture = all welcome, no RSVP necessary.

Norman Taylor Memorial Lecture: Chair Reece Hill.

"When being told to P-off is good"

Professor Richard McDowell, AgResearch/Lincoln University

Professor Richard (Rich) McDowell is a Principal Scientist at AgResearch, Invermay, a Professor at Lincoln University, and a Fellow of the New Zealand Society of Soil Science. He was educated at Lincoln and Cambridge Universities before working for the United States Department of Agriculture – Agricultural Research Service and subsequently joining AgResearch in 2001.

Professor McDowell has produced ground-breaking research contributing to more than 300 well-cited publications. He has displayed exemplary national and international leadership of research into the quantification, impact, and management of contaminant loss from land to freshwater (especially phosphorus). His work informs and underpins policy within New Zealand (e.g. Industry guidelines, Regional Council limits, and New Zealand's National Policy Statement on Freshwater Management) and overseas.

3.00 Afternoon tea + Celebration of International Year of Soils and Awards

3.30 Session 4. Chair: Ian Power, Ballance Agri-nutrients Ian.Power@ballance.co.nz

3.30 Paul Mudge. Irrigation of dairy pastures decreases soil carbon and nitrogen stocks. Paul Mudge, Frank Kelliher, Louis Schipper, Trevor Knight, Denis O'Connell and Scott Fraser. Landcare Research. MudgeP@landcareresearch.co.nz

3.45 Robyn Simcock, Landcare Research – Urban soils

4.00 Scott Fraser "S-map - observations from the ped face: How do we avoid a red face in the future? Landcare Research. FraserS@landcareresearch.co.nz

4.15 Suzanne Lambie "The priming response of 27 New Zealand soils to bovine urine" Landcare Research. LambieS@landcareresearch.co.nz

4.30 Happy hour ☺

Meeting of the NZSSS Council to be by teleconference at 9:30 a.m. on Friday 14 August 2015.

AGENDA

Present: Reece Hill, Tony van der Weerden, Mike Hedley, Megan Balks, Sam Carrick, Hayden Jones, Dave Houlbrooke, Hayden Jones, Roger McLenaghan, Tim Clough

1. Apologies – Trish Fraser, Hamish Lowe

2. Secretariat

Minutes of last meeting
It was moved (Reece) "that the minutes of the last meeting held on 21st May 2015 were a true and accurate record", seconded (Tim), carried.

Matters arising from the minutes
Reece can do publishing in house but needs to consider binding options elsewhere. Prices required. **Action: All members to go to their university/local book binding business's to get some prices.**

Tony – hosting IYS debate. Need to follow up methodology and contacts to do this.

Sam – need to know Norman Taylor details set prior to booking Lincoln workshop day.

Placement/use of historical items e.g. Norman Taylor's trowel still need to be resolved. Place on agenda next meeting. **Action: all to consider best use of these items**.

Items for General Business
No additional items

Approval of Agenda
It was moved that the agenda be approved by the Chair (Reece), seconded (Tim), carried.

3. Treasury

Profit & Loss –for the year: 1 July 2014 to 30 June 2015

Expenses were $29,725
Income was $23,280
Net profit ($6,445)

Groundwork Associates are under budget.
Accounts will be audited for AGM

Accounts are all tracking well.
It was moved (Tony) that the accounts presented for the latest period be accepted.
Seconded Megan, carried.

4. Membership

New members / resignations

Approval of new members:

Sylsvia Sabbagha – NZ student, University of Waikato.
Karen Marie Mason – NZ member, Plant & Food Research
Tihana Vujinovic – NZ Student, Lincoln University
Monica Giona-Bucci – NZ Student, Lincoln University
Adrian Goward – NZ Member, Irrigation Services Ltd.

Resignations and deaths:

Mathew Darling
Tao Wang
Chris Anderson
Ivan Chirino
Bambang H Kusumo
Roger L Parfitt
Murry R Davis

Removal of members for arrears:

Shabana Khan
Hannah Wright

Moved that the listed changes to membership be applied (Tim / seconded Reece), carried.

Life membership nomination suggestions

Possible nominations discussed.

Fellowship nomination suggestions

Possible nominations discussed. Soil news needs a reminder to be placed for nominations **(Action: Hayden)**.

5. Student representative on council.

Council supports student representation on council.
One suggestion is to rotate the 'student rep' between Universities.
Clarification of rules is required. (Action: Hayden to clarify with Trish). In the meantime the suggestion is to have the president of the Lincoln University Soil Science club to be co-opted on. (**Action: Roger and Hayden to follow up on this and get it in place**)

6. Norman Taylor Lecture

This will be given by Richard McDowell.
Centres will be Auckland, Hamilton, Palmerton North (FLRC meeting), Wellington, Lincoln, and Dunedin.
Action: (Reece and Megan draft a press release; Reece supply information to soil news ASAP).

7. Soil News

Next issue 24th August.
No major issues to report.

8. NZSSS World Wide Web Pages

Hamish working on updating the site and will inform committee of progress at next meeting.

9. Soils in the NZ Landscape
Everybody to check binding costs at their local facilities.

10. Awards
Some nominations have arrived for theses, currently arranging judges.
Candidates for the Grange medal were discussed.

11. Promoting soil science
- IYS2015
  Sam & Trish: Lincoln soils workshop. Hoping to organise late Nov/Dec but have it on the same day as the Norman Taylor Lecture so that this can follow the workshop. Now Norman Taylor speaker is known this date can be arranged with the speaker.
- Leo Condron weekly seminar series at Lincoln (11 Sept – 20 Nov).
- Mystery Creek opening night provided an excellent profile for soils.

12. Science Fairs
Books have been sent out to schools. No regional web site promoting school science fairs anymore. Bay of Plenty School recently corresponded seeking copies. About one year of books left.

13. Conferences
Joint Queenstown conference: Teleconference was held on 4th June. Theme "Balancing act down under". Possibly Andrew Sharpley as a guest speaker. Programme being teased out now. Also look at getting a student on committee. Student soil judging competition and field trips being organised.

14. General Business
No further items

15. Secretariat
Correspondence

Next Meeting date to be organized for early November.

Tim Clough

Waikato/Bay of Plenty

AgResearch Ruakura

Stewart Ledgard, **Jiafa Luo** and **Mark Lieffering** travelled to Shijiazhuang in China for the inaugural meeting of a joint NZ-China project on effects of dairy farming on water footprinting and water quality. While there they planned the research programmes, tasted plenty of great Chinese food (and their strong distilled spirit baijiu!) and visited a year-round housed dairy farm system co-operatively owned (Pictured below). The main feed for cows was locally-grown maize silage under bi-cropping and irrigation on sedimentary soils.

Stewart Ledgard, Mark Lieffering and Jiafa Luo

The Kudos Science Excellence Awards are held annually in Hamilton to celebrate Waikato scientists and their world-leading research and innovation. This year, **Jiafa Luo** was humbled and surprised hearing his name read out as the winner of the Gallagher Agricultural Science Award (pictured below with John Gallagher). Dave Houlbrooke says his win was extremely well-deserved: "Jiafa is doing regionally excellent science in greenhouse gas inventory and mitigation but it has global outcomes. His work means it will be easier for New Zealand to meet its international greenhouse gas reduction obligations. We're now able to underpin specific New Zealand inventory numbers rather than use worldwide ones." Jiafa was pleased to be recognised by the science community for his work and expressed his sincere thanks to MPI, AgResearch nitrous oxide research and NMEF team and the collaborators from other universities and CRIs. Jiafa also gave the best acceptance speech of the evening, making the audience roar with laughter when he teased MC Jesse Mulligan.

Jiafa Luo receiving his Kudos award from John Gallagher

Dave Houlbrooke hosted a field day at AgResearch's Whatawhata Hill Country Research station in September for the AgResearch Nutrient Management and Environmental Footprinting team. **Gavin Sheath** and **Mike Dodd** were invited as guests while members of the team; with a rich history of research at the station, relayed technical details of historical trials and stories from the many characters that worked there. The day demonstrated that Whatawhata played an important role in contributing to soil science understanding particularly through its integration into farm systems research. AgResearch will be ending its long term lease of Whatawhata Hill country Research Station in Autumn 2016.

Mark Shepherd dropped in to Teagasc's Catchment Science 2015 conference in Wexford in September while over in Europe on other business and holiday related activities. Ireland's Catchment Science programme was instigated in response to the need to implement the EU Water Framework Directive. The science programme is now well advanced, and the emphasis was more on catchment level questions, including how to bring about change. Topics included: Detecting change and lag times –patience and policy implementation; Integrated management, stakeholder engagement and catchment economics; Soil analysis and nutrient management – achieving environmental and agronomic goals; Adaptive management approached to reducing nutrient loss risk; Disentangling the impact of multiple stressors on aquatic ecology. Conference abstracts and ppt presentations are available at: http://www.teagasc.ie/publications/2015/3739/index.asp

Waikato Regional Council

Haydon Jones is currently Acting Team Leader for the newly formed Land and Soil Team within the Science Section of the Science and Strategy Directorate. The Land and Soil Team encompasses 11 staff and covers a range of work areas including air quality, terrestrial & wetland ecology/biodiversity, geothermal science, contaminated land, and land and soil resources. Haydon also continues to lead the EMAR Land project.

Justin Wyatt is currently working with environmental historian, **Joanna Bishop**, on examining old files for any information on peat depth, etc. and recording this information into a GIS layer.

Using the 2012 Waikato region aerial photographs, a desktop assessment of soil stability has been completed at 6122 points across the region. This survey was previously completed in

2007 and 2002. **Amy Taylor** will be updating WRC's soil stability indicator based on the analysis of the updated dataset.

Reece Hill is working on Phase 2 of the Waikato Regional Prioritisation Project. Recently, Reece and **Justin Wyatt** have been out in the field with **Harley Betts** and **Mike Marden** (Landcare Research) looking at erosion. The data will inform a SedNet model for the Waikato catchment. This model and others are being used to prioritise soil conservation implementation across the Waikato region.

Matthew Taylor has been working on soil quality monitoring, with this year's samples collected. Matthew has also been involved in consent hearings.

Several indicators in the land and soil resource work area are scheduled to be updated this financial year. These include two riparian-related indicators (stock access to waterways and riparian vegetation), soil stability, soil quality, and peat subsidence.

News from the Land Monitoring Forum

The LMF (a regional council special interest group – SIG) held its bi-annual meeting on the 6-7 August at Greater Wellington Regional Council, Wellington. A total of 14 regional/unitary council soil and land scientists attended along with guests from Landcare Research, Ministry for the Environment, and Ministry for Primary Industries. **Reece Hill** provided a general overview of the history and operation of the LMF group, due to a number of new attendees. Major focus points for the meeting included:

- An update of the EMaR Land project by **Haydon Jones**. The scoping phase is now completed. A number of significant issues were identified including, inconsistencies in monitoring methods, data storage and management, and reporting, which highlight the need for nationally consistent guidelines and standards.
- Soil Quality monitoring, guidelines and datasets are a standard topic at the LMF. This is even more so with the introduction of the EMAR project. There was discussion on how to align measuring techniques; deriving a relationship between hot water carbon and anaerobically mineralised N as the former is proposed to replace AMN; formalising data storage; how to record land use change at sites; and progress on the microbial diversity library in collaboration with Auckland University.
- **Alison Collins** from the National Land Resource Centre (NLRC) provided an update on Our Land and Water national science challenge, the National Land Resource Centre, and S-map. There was discussion of the MPI future soil management project. This included understanding the pressures on soils, and how well are sectors and policy able to respond to these pressures.
- As always, several current projects were updated and ideas for future proposals presented. These included 'Interoperable SMAP' – join S-MAP with OVERSEER; "Sediment Yield Predictor" – Integrate sediment datasets together for Waikato, Northland, and Auckland. Other projects included Trace Element Fingerprinting, Manuwatu SedNet, Manuwatu NZEEM, Soil guideline values for ecosystem receptors, Soil Cd, Hot water carbon, a project to value the both the production and other environmental ecosystem service on farms, and Land Use Capability.

Manawatu/Hawke's Bay

Plant & Food Research – Palmerston North & Hamilton

The Production Footprints team welcomes **Kyle Robertson**, who will be working with us as a summer student for the next three months; he has completed his first year in a bachelor of natural sciences at Massey University, Albany. Kyle's project is a study of possible biological causes of soil hydrophobicity. This will involve sampling soils in the Hawkes Bay area in early and late summer, soils will be chosen to include a range of hydrophobicity in similar soil and topological sites. Physical and chemical soil properties plus a bank of enzymatic activities will be measured in the samples and related to the determined soil hydrophobicity.

The team has also been busy this spring initiating a new Vineyard Ecosystems project in collaboration with other Plant & Food researchers and the University of Auckland. This project aims to determine the long-term impacts of two different management practices on the ecology of vineyards. The two management practices of interest are "Contemporary" with the use of synthetic herbicides, fungicides, pesticides and fertilisers, and "Future" with the establishment of semi-permanent groundcover under vines and without the use of synthetic chemicals. **Steve Green** and **Carlo van den Dijssel** have been busy instrumenting two vineyards in both the Marlborough and Hawkes Bay regions with drainage fluxmeters, TDR and weather stations to monitor environmental parameters. **Roberta Gentile** has collected baseline soil samples from these vineyards to quantify natural capital stocks.

Water and Nutrients in Horticulture: A PFR-UCD Workshop in California

Under the auspices of an MBIE grant through the International Research Fund (IRF) - a joint workshop was recently held between Plant & Food Research and the University of California-Davis. The meeting was held at Davis between 20-22 October. The workshop was on Water Utilisation and Nitrate Management in Perennial Horticulture. The motivation was to build joint capacity for utilizing scarce water supplies in perennial horticulture production systems. It focussed on:

- developing strategies for minimizing and managing orchard water use and product water footprints,
- understanding and promoting how horticultural soils deliver valuable regulating ecosystem services,
- and discussing the impacts of environmental constraints and climate-induced stresses on plant performance and nutrient leakage.

Sixteen New Zealanders including 11 Plant & Food scientists and managers attended the workshop, along with 24 UC-Davis researchers. Representatives from MBIE, AgResearch, Landcare Research, the University of Waikato and Horticulture NZ attended.

The participants at the PFR-UCD Workshop at the University of California-Davis workshop on "Water & Nutrients in Horticulture".

The meeting highlighted the challenging conditions for horticulture under water and nutrient constraints and we explored the different approaches being taken in New Zealand and California. There were mutual learnings from the contrasting and complementary approaches by scientists and regulators.

Massey University, Palmerston North

Mid year Dr Alan Palmer went to Nagoya, Japan to attend and present a poster paper at the XIX INQUA Congress. The Congress was followed by a four day field trip.

INQUA (International Quaternary Association) is a member of IUGG and is a multidisciplinary organisation specialising in geological events on earth for the last 2.6 million years. As such, INQUA involves geologists, paleoclimatologists, ecologists, botanists, meteorologists, hydrologists and geophysicists to name a few. It deals with the geological events that impact on Man. A Congress is held every four years, but between these events, Commission (there are 5 of them) meetings, usually workshops and fieldtrips, may be held.

New Zealand scientists have a long history with INQUA. The IX INQUA Congress was held in Christchurch in 1973. This year 18 New Zealand scientists and postgrad students attended out of a total participation of approximately 1800. Alan is a past New Zealand delegate to INQUA Council meetings held during the Congresses, representing the Royal Society of New Zealand. Our current delegate is Professor David Lowe of Waikato University who was made a life member of INQUA for his services to the organisation. The event was held in stunning facilities at the Nagoya Convention Centre.

Following the Congress Alan participated in a field trip to Kyushu. The major theme of the field trip was volcanism and its interaction with people. The field trip visited 3 major volcanoes and several calderas which have been the source of ignimbrite eruptions. The thought of a caldera eruption occurring today, in such a densely populated area is truly frightening. Fortunately such events are several thousand years apart. Other volcanoes that emit ash and lava flows, such as Sakurajima at Kagoshima erupt far more frequently. This volcano had erupted 500 times in the previous year, but had been quiet for ten days at the time of the field trip.

At archaeology sites visited, the participants were reminded that people had lived and dealt with volcanoes for the last 9000 years. The fertility of the local soils was heavily influenced by the ash. At Mt Unzen and Sakurajima, there are graphic reminders that ordinary volcanic eruptions are less deadly than the unusual events. In 1991 at Mt Unzen, more than 50 people were killed by the collapse of a lava dome during an otherwise unspectacular eruption. The collapse of a lava dome on a dormant volcano nearby led to the greatest recorded loss of life from a volcano in Japan. The resulting debris avalanche swept through a town then into a bay. This resulted in a tsunami that crossed the bay and devastated a town on the other side. This event in 1792 killed 15,000 people. At the foot of Mt Unzen is a wonderful interactive Science Centre that teaches about both volcanic events. In Japan it is apparent that they do not really try to stop people living in harm's way. Caldera floors, potential lahar or pyroclastic flow paths, and other areas close to volcanoes are heavily populated. They instead are relying on early warning systems to evacuate people in the event of a catastrophe, and practise for such events.

Alan Palmer (centre back) with the field trip group. Two other Kiwi's are in the group, both from Victoria University – Brent Alloway (kneeling, far right) and Matt Ryan (standing, second from left). In the background is Kaimondake volcano near Kagoshimaat.

Chris Anderson (Soil and Earth Sciences) and Janet Reid (Agriculture and Horticulture) from Massey University are the first international scientists to be made adjunct professors of the University of Mataram in Indonesia. Associate Professor Chris Anderson has been made Adjunct Professor in Soil and Earth Sciences and Dr Janet Reid an Adjunct Professor in Agricultural Social Science in acknowledgement of the close relationship that has been forged between the two universities.

Dr Bambang Kusomo took up a position as Lecturer in Soil Science at the University of Mataram following the completion of his PhD at Massey University in 2009 and has helped build the relationship between the two Universities.

Chris Anderson began working with the University of Mataram in 2010, studying mercury pollution in small-scale gold mines and this relationship has now been extended due to the specialties of agriculture, food technology and animal science which the two universities have in common. The University of Mataram is located on Lombok Island in eastern Indonesia – a developing part of the country where large numbers of the population live below the poverty line. Chris leads a project where several Massey scientists have been contracted by the New Zealand aid programme to design an agricultural development activity in eastern Indonesia.

Both universities are benefiting from the mutual relationship with staff working on joint research projects and publications, and Massey staff assisting with teaching design and delivery. These activities are in turn increasing the status and ranking of the University of Mataram within the Indonesian education system. The benefit for Massey University is an increased presence in this important part of South–East Asia which gives access to new international students and creates opportunities for New Zealand agribusiness to become more active in the region.

Their professorships were awarded in October in a formal ceremony to commemorate the anniversary of the University of Mataram.

Bambang Kusomo flanked by Chris Anderson and Janet Reid at the awarding of their Adjunct Professorships at the University of Mataram in October 2012

In September Ranvir Singh travelled to Europe and attended two international conferences, the Land Use and Water Quality 2015 held in Vienna (Austria), and the Catchment Science 2015 held in Wexford (Ireland).

At the International Interdisciplinary Conference on Land Use and Water Quality 2015 in Vienna Ranvir presented on-going research on better understanding and management of nitrogen flow pathways and its attenuation in the Manawatu River catchment. The conference

was small but much focused on solutions to better manage and mitigate effects of agricultural land use on water quality. There was a very good representation from New Zealand and research work presented by NZ participants, especially on the collaborative process to set and manage land use within water quality limits, and better understanding of nutrient flow pathways and their potential attenuation to develop catchment specific targeted solutions.
Ranvir visited the Institute for Water Quality, Resources and Waste Management at the Technical University Wien and met with Professor Matthias Zessner. Along with some of his students, they are studying water flow pathway and contaminants (nutrients, sediments, microbes) transport processes in a very intensively monitored agricultural catchment. They call this the 'Hydrological Open Air Laboratory' (HOAL) which is located at Petzenkirchen in Lower Austria (http://hoal.hydrology.at/index.php?id=2).

Ranvir and Professor Matthias Zessner visiting the HOAL 'Hydrological Open Air Laboratory', located at Petzenkirchen in Lower Austria.

Ranvir presented again at the International Conference on Catchment Science 2015 in Wexford (Ireland) with the majority of presentations coming from research findings of an on-going catchment-scale research project in Ireland. This project is called the Agricultural Catchment Programme (ACP) (http://www.teagasc.ie/agcatchments/), which also uses high resolution monitoring in six selected agricultural catchments representing different land use practices and hydrogeologic conditions across Irish agricultural landscape. This project also involves a multidisciplinary team of researchers and a number of PhD research students to better understand contaminant's source pressures, mobilisation factors, flow pathways and receiving environments to help reduce effects of land use on water quality. Professor Phil Jordan (Principal Science Advisor to the ACP project) gave a keynote paper on their project's research findings at our FLRC Workshop in February 2015. And will return to Massey for the 2016 FLRC Workshop.

Phil Jordan

Marta Camps chaired the International Biochar Initiative retreat held in Oxford (UK) on the 10, 11, 12 and 13 September.

The agenda items of the IBI retreat included: Appreciating our current state; State of the industry - key findings; Voice of the biochar consumer and producer; Defining IBI's desired future; Impact on connecting research and industry; Assess results from the different scenarios and choose leading direction(s); Implications for proposed direction(s); Discuss proposed direction(s) with Board quorum and Closing reflections and remarks.

The 29th FLRC Workshop will be held on the 9th-11th February at Massey University Palmerston North and is titled 'Integrated Nutrient and Water Management For Sustainable Farming'

Confirmed invited speakers for this event include:

- Dr Cameron Gourley, *Agriculture Research and Development Division, Ellinbank Centre, Victoria 3821, Australia*
- Dr Thomas Nemecek, *Agroscope, Institute for Sustainability Sciences, Zurich, Switzerland*
- DrPhil Jordan, *Agricultural Catchments Programme, Ireland*
- Dr Brent Clothier, *Plant & Food Research, Palmerston North*
- Dr Stewart Ledgard, *AgResearch, Hamilton*
- Mr Andrew Curtis, *Irrigation New Zealand, Christchurch*
- Mr Nathan Heath, *Hawkes Bay Regional Council, Napier*

Further details of this event can be found at: http://flrc.massey.ac.nz/

AgResearch Grasslands

Ray Brougham Trophy

This award was instituted in memory of Dr Ray Brougham. His family donated a bronze statue of a seed sower and this is awarded annually to a person who has made an outstanding national contribution to the New Zealand grassland industry.

This year, the award was made to **Dr Alec Mackay** for his contribution to soil science, land management, and research and development of hill farming systems. Alec joined DSIR Grasslands as a scientist in 1985 and is currently a Principal Scientist in AgResearch based on the Grasslands Campus in Palmerston North. His early research was centered on the changes in soil fertility, biological, and physical properties of hill soils under long-term fertilizer use, cattle grazing and treading, conservation tree plantings, pastoral fallowing and low chemical input and organic farming systems. More recently, his research has focused on exploring the use of a natural capital and ecosystems service approach to resource management and is heavily involved in farm systems modelling that has the capacity to integrate data from multiple land management units within a farm business to inform decision making.

Alec receiving the Ray Brougham Award from Gavin Sheath, chair of the NZ Grassland Trust

The knowledge gained from these studies has been used in the development of a wide range of applications. These include: Soils underpinning business success (SUBS) package for assisting land owners in the identification and mapping of their own soils, the concept of Land Management Units, development of the Land and Environment Planning Toolkit for sheep and beef farmers, development of Project Green – an on-farm Quality Assurance programme, development of a conversion package for exploring shift from conventional to organic sheep and beef production, use of a natural capital based approach to allocation of leaching losses as part of the Horizons One Plan and working towards the development of a new generation farm system optimization tool.

Alec's commitment to science is demonstrated by the number of positions he has held in the New Zealand Society of Soil Science; by the 20+ post graduate students that he has supervised; and by the 120+ refereed journal and 200+ conference papers he has published. In addition he has been committed to helping achieve change on-farm through his continual engagement with farmers and those people who service farmers. We can expect this commitment to science and application to continue for many more years.

Canterbury

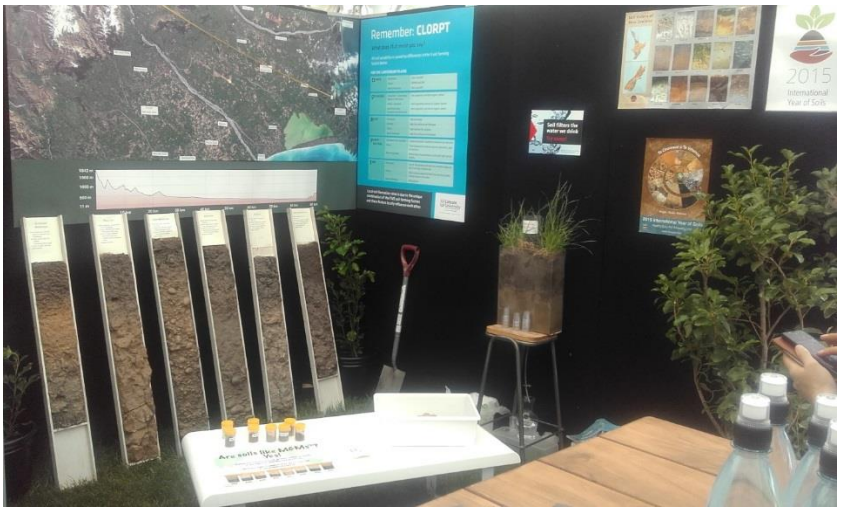
Lincoln University

To honour the International Year of the Soil, the Department of Soil and Physical Sciences at Lincoln University, in collaboration with Landcare Research and Plant&Food organised a display for the Ellesmere Show. The display was subsequently shown at the Ashburton Show and the Canterbury A&P show.

The display featured a satellite image of the Canterbury plains and foothills, with an associated altitude transect. Beneath the satellite image, there were corresponding soil monoliths, demonstrating the range of soil types representing the various soil forming factors.

To demonstrate the importance of keeping our soils healthy, there was soil profile onto which simulated dairy effluent was applied. Punters, including the Honourable Jo Goodhew and the Mayor of Ashburton, Angus McKay, were then invited to drink the crystal-clear drainage water.

Roger McLenaghen and **Judith van Dijk**, who built the display and attended all three shows, propounded the importance of soils as the basis for our economy and environment as well as demonstrating the correct use of a spade.



On the 15th of October, Daniel Martin-Hendrie, a PhD student under the supervision of Dr **Jim Moir, Prof Derrick Moot, Prof Leo Condron, Dr Alistair Black, and Dr Nik Lehto** gave his proposal seminar entitled “Using target phosphorus, sulphur and lime inputs to improve hill and high country pasture systems".

Prof. Keith Cameron was elected to the Fellowship of the Royal Society of New Zealand. Keith was very quick to acknowledge the support of his colleagues and the team in the Centre for Soil and Environmental Research. The Royal Society of New Zealand now has 404 Fellows and 59 Honorary Fellows. Congratulations Keith!

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Soils

Recent publications:

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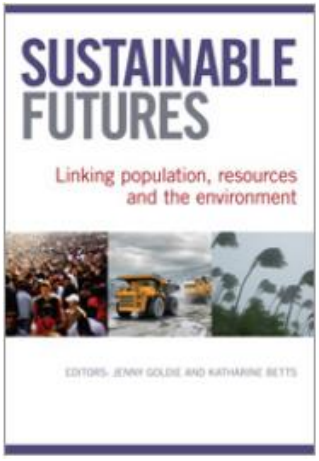
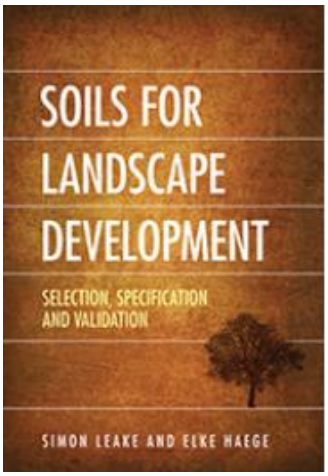


Sustainable Futures
Linking Population, Resources and the Environment

Edited by: Jenny Goldie, Sustainable Population Australia
Katharine Betts, Formerly Swinburne University (retired)

Describes world-leading research in population, resource scarcity, climate change and food security and their effect on Australia.

2014 - CSIRO Publishing - 232pp
Paperback - 9781486301898 - $39.95



Soils for Landscape Development

Selection, Specification and Validation

Simon Leake, SESL Australia
Elke Haege, Landscape Architect and Consulting Arbo
Paperback – 2014, Publisher: CSIRO Publishing
ISBN: 9780643109643 - AU $ 69.95

Soils for Landscape Development provides a clear, practical and systematic template for specifying landscape soils based on scientific criteria. The soil specifications provide essential information and a universally applicable method for landscape architects and designers, specification writers, landscape contractors and soil supply companies to ensure quality and fit-for-purpose soils. A strong emphasis is placed on reducing environmental impacts by reuse of on-site soil, promoting appropriate minimal soil intervention, and using recycled products.

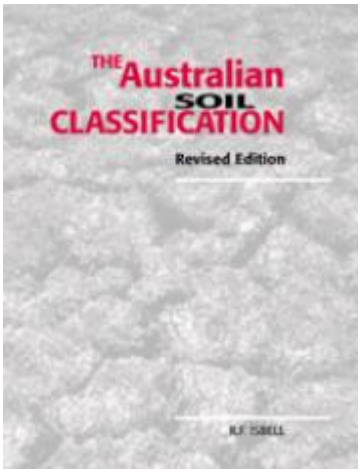
Soil Carbon in Australia's Agricultural Lands

Soil Research Special Issue Volume 51, Numbers 7 & 8

Edited by:
Chris Anderson
Saumitra Banerjee

Paperback - 2014
ISBN: SR51/7/8 - AU $125.00

219 pages
Publisher: CSIRO Publishing



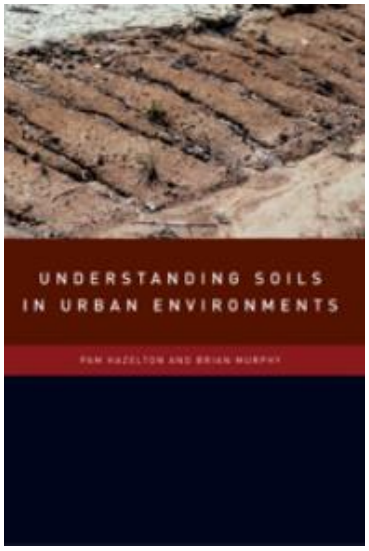
The Australian Soil Classification

Revised Edition
Australian Soil and Land Survey Handbooks Series 4
Raymond Isbell

ISBN: 9780643068988 - AU $ 39.95

A new edition of this title will be published in late January 2016. Stock of the current edition will be discounted until sold out.

The *Australian Soil Classification* provides a framework for organising knowledge about Australian soils. It provides a means of communication among scientists and land managers.



Understanding Soils in Urban Environments

Pam Hazelton, University of Technology, Sydney
Brian Murphy, NSW Department of Environment and Climate Change

Publisher: CSIRO Publishing
ISBN: 9780643091740 - AU $ 59.95

Understanding Soils in Urban Environments explains how urban soils develop, change and erode. It describes their physical and chemical properties and focuses on specific soil problems, such as acid sulfate soils, that can cause environmental concern and also affect engineering works. It also addresses contemporary issues such as green roofs, urban green space and the man-made urban soils that plants may need to thrive in. It provides a concise introduction to all aspects of soils in urban environments and will be extremely useful to students in a wide range of disciplines, from soil science and urban forestry and horticulture, to planning, engineering, construction and land remediation, as well as to engineers, builders, landscape architects, ecologists, planners and developers

SPECIAL ISSUE OF THE JOURNAL OF SOIL SCIENCE AND PLANT NUTRITION DEDICATED TO THE WORK OF PROFESSOR KM GOH

"Role of Soil Organic Matter in Nutrient Cycling and Plant Nutrition"

FINAL Call for Contributions

Emertius Professor Kuan Meng Goh MAgSc, PhD, J.P., ONZM, FRSNZ, FNZIC, FNZSSS died in January 2014 at Christchurch, New Zealand aged 78 years. He had retired from Lincoln University in 2008 after 47 years in Department of Soil Science. Professor Goh's expertise was in the field of soil organic matter and soil nutrition using a wide range of isotopic techniques. Professor Goh first came to New Zealand in 1957 from Malaysia and graduated with a MAgSci from Massey Agricultural College in 1961. He was appointed Junior Lecturer and then Lecturer in Soil Science in the Faculty of Agriculture in the University of Malaysia. From 1965 to 1969 he was a Fulbright Scholar at the University of Illinois Champaign-Urbana in the United States, and completed his PhD in the chemistry of soil organic matter in 1969. Dr Goh then returned to New Zealand and in 1971 he was appointed as Senior Lecturer in the Department of Soil Science at Lincoln College (now Lincoln University) and in recognition of his contributions to teaching and research was promoted to Reader in 1978 and Professor in 1991. He together with his postgraduate students and other colleagues contributed some 300 reviewed publications including numerous book chapters. The topics covered included the chemical nature and turnover of organic matter in soil, soil carbon sequestration and climate change, together with soil nitrogen, phosphorus and sulphur cycling. The isotopic techniques used in these studies included nitrogen-15, sulphur-35, carbon-13 and carbon-14, and also carbon-13 and phosphorus-31 nuclear magnetic resonance spectroscopy. He also served as a subject matter reviewer for over 50 national and international scientific journals, technical publications and books. Professor Goh received a Special Achievement Award from Lincoln University in 1994, and was made an Officer of the New Zealand Order of Merit in 1999 for services to Soil Science and the Chinese community in New Zealand.

The main purpose of this Special Issue of the Journal of Soil Science and Plant Nutrition is to formally recognize the significant contribution that Professor Goh made to soil science research during his long and distinguished career.

We invite contributions describing original research on the Role of Soil Organic Matter in Nutrient Cycling and Plant Nutrition., which can be submitted via the Journal of Soil Science at Plant Nutrition website http://cl.submission.scielo.org/ - by 30 November 2015

Leo Condron, Lincoln University, New Zealand [Guest Editor]
Alex Seguel, Universidad de la Frontera, Chile [Managing Editor]
Maria de la Luz Mora, Universidad de la Frontera, Chile [Editor-in Chief]

Abstracts

Sensitive pyroclastic-derived halloysitic soils in northern New Zealand: interplay of microstructure, minerals, and geomechanics.

Moon, V.G., Lowe, D.J., Cunningham, M.J., Wyatt, J., Churchman, G.J., de Lange, W.P., Mörz, T., Kreiter, S., Kluger, M.O., Jorat, M.E. 2015.

In: Rotonda, T., Cecconi, M., Silvestri, F., Tommasi, P., eds. Volcanic Rocks and Soils. Proceedings of the International Workshop on Volcanic Rocks and Soils, Lacco Ameno, Ischia Island, Italy, 24-25 September, 2015. Taylor and Francis, London, pp. 3-21.

Abstract
Sensitive soils in the Bay of Plenty in North Island occur within weathered, rhyolitic pyroclastic and volcaniclastic deposits, with hydrated halloysite (not allophane) as the principal clay mineral. We evaluate the development of sensitivity and characteristic geomechnical behaviours for sequences of the silt-rich, halloysitic soils. Morphologically the halloysite comprises short tubes, spheroids, plates, and, uniquely, books. Key findings include (i) the varied morphologies of halloysite minerals within the microstructure create an open network with small pores and predominantly point contacts between clay particles; (ii) low plasticity, high natural water contents, low cohesion, low CPT tip resistance, and low permeability are attributable to the dominance of halloysite; (iii) boundary effects between pyroclastic units amplify Earth tide effects; and (iv) large spikes in pore water pressures follow rainfall events. The regular deposition since c. 0.93 Ma of siliceous pyroclastic deposits from ongoing explosive rhyolitic volcanism in TVZ, together with high natural water content and low permeability, have created a locally wet environment in the stratigraphic sequences that generates Si-enriched pore water from the weathering mainly of rhyolitic volcanic glass shards and plagioclase, providing conditions suitable for halloysite formation. Initial hydrolysis of glass shards also releases cations that promote cohesion between clay minerals. Eventual enleaching of these cations reduces cohesion between clay minerals, resulting in sensitive behavior.

Paleoliquefaction in Late Pleistocene alluvial sediments in Hauraki and Hamilton basins, and implications for paleoseismicity.

Kleyburg, M.A., Moon, V.G., Lowe, D.J., Nelson, C.S. 2015.
Proceedings, 12th Australia New Zealand Conference on Geomechanics (ANZ 2015), 22-25 February, 2015, Wellington, pp. 524-531.

Abstract
Liquefaction susceptibility of the Late Pleistocene Hinuera Formation is of interest to the engineering community as it is unclear whether materials of this age will still be prone to activation by cyclic stresses. In this paper we report on rare paleoliquefaction features in the form of injection structures that we have identified at two sites near Hamilton. These structures are clearly earthquake induced, and indicate the potential for future liquefaction episodes. However, we suggest that the hazard is restricted to areas with impeded drainage that imparts a high water table. Such areas are localised, and may be recognised from the modern (pedological) soil distribution. Evaluating piezocone penetration test (CPTu) data from the sites of known paleoliquefaction indicates that the CPTu gives a meaningful indication of liquefaction potential, and questions the validity of applying aging factors to these deposits.

DNA adsorption by nanocrystalline allophane spherules and nanoaggregates, and implications for carbon sequestration in Andisols.

Huang, Y-T., Lowe, D.J., Churchman, G.J., Schipper, L.A., Cursons, R., Zhang, H., Chen, T-Y., Cooper, A. 2015.
Applied Clay Science (in press) (http://dx.doi.org/10.1016/j.clay.2015.11.009)

Abstract
This study provides fundamental knowledge about the interaction of allophane, deoxyribonucleic acid (DNA), and organic matter in soils, and how allophane sequesters DNA. The adsorption capacities of salmon-sperm DNA on pure synthetic allophane (characterised morphologically and chemically) and on humic-acid-rich synthetic allophane were determined, and the resultant DNA-allophane complexes were characterised using synchrotron-radiation-derived P X-ray absorption near-edge fine structure (XANES) spectroscopy and infrared (IR) spectroscopy. The synthetic allophane adsorbed up to 34 μg mg^{-1} of salmon-sperm DNA. However, the presence of humic acid significantly lowered the DNA uptake on the synthetic allophane to 3.5 μg mg^{-1} by occupying the active sites on allophane so that DNA was repulsed. Both allophane and humic acid adsorbed DNA chemically through its phosphate groups. IR spectra for the allophane-DNA complex showed a chemical change of the Si−O−Al stretching of allophane after DNA adsorption, possibly because of the alteration of the steric distance of the allophane outer wall, or because of the precipitation of aluminium phosphate on allophane after DNA adsorption on it, or both. The aluminol groups of synthetic allophane almost completely reacted with additions of small amounts of DNA (~2−6 μg mg^{-1}), but the chemical adsorption of DNA on allophane simultaneously led to the formation of very porous allophane aggregates up to ~500 μm in diameter. The formation of the allophane nano- and microaggregates enabled up to 28 μg mg^{-1} of DNA to be adsorbed (~80% of total) within spaces (pores) between allophane spherules and allophane nanoaggregates (as physical adsorption), giving a total of 34 μg mg^{-1} of DNA adsorbed by the allophane. The stability of the allophane-DNA nano- and microaggregates likely prevents encapsulated DNA from exposure to oxidants, and DNA within small pores between allophane spherules and nanoaggregates may not be accessible to enzymes or microbes, hence enabling DNA protection and preservation in such materials. By implication, substantial organic carbon is therefore likely to be sequestered and protected in allophanic soils (Andisols) in the same way as demonstrated here for DNA, that is, predominantly by encapsulation within a tortuous network of nanopores and submicropores amidst stable nanoaggregates and microaggregates, rather than by chemisorption alone.

Carbon storage and DNA adsorption in allophanic soils and paleosols.

Huang, Y-T., Lowe, D.J., Churchman, G.J., Schipper, L., Rawlence, N.J., Cooper, A. 2014.
In: Hartemink, A.E.; McSweeney, K. (eds).
"Soil Carbon". Progress in Soil Science Series, Springer, New York, pp. 163-172.

Abstract
Andisols and andic paleosols dominated by the nanocrystalline mineral allophane sequester large amounts of carbon (C), attributable mainly to its chemi-cal bonding with charged hydroxyl groups on the surface of allophane together with its physical protection in nanopores within and between allophane nanoaggregates. C near-edge X-ray absorption fine structure (NEXAFS) spectra for a New Zealand Andisol (Tirau series) showed that the organic matter (OM) mainly comprises quinonic, aromatic, aliphatic, and carboxylic C. In different buried horizons from

several other Andisols, C contents varied but the C species were similar, attributable to pedogenic processes operating during developmental upbuilding, downward leaching, or both. The presence of OM in natural allo-phanic soils weakened the adsorption of DNA on clay; an adsorption isotherm experiment involving humic acid (HA) showed that HA-free synthetic allophane adsorbed seven times more DNA than HA-rich synthetic allophane. Phosphorus X-ray absorption near-edge structure (XANES) spectra for salmon-sperm DNA and DNA-clay complexes indicated that DNA was bound to the allophane clay through the phosphate group, but it is not clear if DNA was chemically bound to the surface of the allophane or to OM, or both. We plan more experiments to investigate interactions among DNA, allophane (natural and synthetic), and OM. Because DNA shows a high affinity to allophane, we are studying the potential to reconstruct late Quaternary palaeoenvironments by attempting to extract and characterise ancient DNA from allophanic paleosols.

Changes in the chemical composition of soil organic matter over time in the presence and absence of living roots: a pyrolysis GC/MS study.

Suárez-Abelenda, Manuel, Riaz Ahmad, Marta Camps-Arbestain, and Saman HMSK Herath.
Plant and Soil 391, no. 1-2 (2015): 161-177.

Aim To determine changes in the organic matter chemical signature of soils incubated in the absence of fresh organic matter input, and how these were affected by the reestablishment of vegetation.

Methods An Alfisol and an Andisol were incubated in 1.50 dm3 PVC pots for 295 days. Thereafter two 0.65 dm3 undisturbed subsamples from each pot were taken. In one subsample, Medicago ativa L. was seeded; in the other, the incubation was continued without plants for an additional period of 215 days. Soils sampled at times 0, 295 d and 510 day were characterised using pyrolysis-GC/MS.

Results and Conclusions During the first 295 days (in which plants were absent) the most evident changes detected were the degradation of the most labile fraction as shown by the decrease of pyrolysis products of plant-derived polysaccharides, intact lignin and long-chain aliphatic compounds, along with the residual accumulation of guaiacol, mid- to short-chain aliphatic compounds, and the aromatic fraction. On day 510 and in the absence of plants, fingerprints of lignin and plant-derived polysaccharides largely decreased whilst microbial-derived polysaccharides showed an accumulating trend. Moreover the relative contribution of nmethyl ketones increased whereas that of long-chain aliphatic compounds, specifically n-alkanes, decreased. The relative contribution of plant-derived compounds was larger in the Alfisol at T0 and decreased more intensely than the Andisol along incubation. The Andisol had a considerable fraction of microbial-derived compounds (e . g . , acetamide and diketopiperazine compounds). Plant inclusion (during the last 215 days of incubation) increased (i) the presence of compounds associated with fresh plant detritus (e.g., plant-derived polysaccharides and lignin) and (ii) alkylated benzenes (likely root-derived). An enhanced microbial activity due to input of plant detritus could be inferred from the increased content of chitin-derived compounds, this being especially evident in the Andisol.

Closing the Loop: Use of Biochar produced from tomato crop green waste as a Substrate for Soilless, Hydroponic tomato production

Dunlop, Samuel J., Marta Camps Arbestain, Peter A. Bishop, and Jason J. Wargent.
HortScience 50, no. 10 (2015): 1572-1581.

Greenhouse tomato (*Lycopersicum esculentum* Mill.) producers are urged to reduce their environmental footprint. Here, the suitability of biochar produced from tomato crop green waste as a substrate for soilless, hydroponic tomato production was evaluated. Substrates containing different combinations of biochar (BC) and pine (*Pinus radiata* D. Don) sawdust (SD) were produced (BC0-SD100, BC25-SD75, BC50-SD50, BC75-SD25, and BC100-SD0) and characterized. The effect of these substrates on tomato growth, yield, and fruit quality was studied. Most of the measured properties of substrates containing biochar were suited to use as a soilless substrate. The electrical conductivity (EC) of substrates containing biochar was initially high (>4.6 $mS \cdot cm^{-1}$), but was easily reduced to <0.5 $mS \cdot cm^{-1}$ by rinsing with water before use. The pH of substrates containing biochar was higher than is considered acceptable for tomato production (7.5–9.3) but did not significantly ($P < 0.05$) affect any plant growth, yield, and fruit quality indicators measured compared with those of plants grown in pine sawdust. The results support the concept of creating a closed loop system whereby biochar produced from tomato crop green waste is used as a substrate for soilless, hydroponic tomato production, providing a sustainable means to support the growth of high-value food crops.

Net changes of soil C stocks in two grassland soils 26 months after simulated pasture renovation including biochar addition.

Calvelo Pereira, R., M. Hedley, M. Camps Arbestain, E. Wisnubroto, S. Green, S. Saggar, B. H. Kusumo, and A. F. Mahmud.
GCB Bioenergy (2015).

The use of deep-rooting pasture species as a management practice can increase the allocation of plant carbon (C) below ground and enhance C storage. A 2-year lysimeter trial was set up to compare changes in C stocks of soils under either deep- or shallow-rooting pastures and investigate whether biochar addition below the top 10 cm could promote root growth at depth. For this i) soil ploughing at cultivation was simulated in a silt loam soil and in a sandy soil by inverting the 0 to 10 and 10- to 20-cm-depth soil layers, and a distinctive biochar (selected for each soil to overcome soil-specific plant growth limitations) was mixed at 10 Mg ha^{-1} in the buried layer, where appropriate and ii) three pasture types with contrasting root systems were grown. In the silt loam, soil inversion resulted in a general loss of C (2.0–8.1 Mg ha^{-1}), particularly in the buried horizon, under shallow-rooting pastures only. The addition of a C-rich biochar (equivalent to 7.6 Mg C ha^{-1}) to this soil resulted in a net C gain (21–40% over the non-biochar treatment, $P < 0.10$) in the buried layer under all pastures; this overcame the loss of C in this horizon under shallow-rooting pastures. In the sandy soil, all pastures were able to maintain soil C stocks at 10–20 cm depth over time, with minor gains of C (1.6–5.1 Mg ha^{-1}) for the profile. In this soil, the exposure of a skeletal- and nutrient-depleted soil layer at the surface may have fostered root growth at depth. The addition of a nutrient-rich biochar (equivalent to 3.6 Mg C ha^{-1}) to this soil had no apparent effect on C stocks. More research is needed to understand the mechanisms through which soil C stocks at depth are preserved.

Assessment of the surface chemistry of wood-derived biochars using wet chemistry, Fourier transform infrared spectroscopy and X-ray photoelectron spectroscopy

Calvelo Pereira, R. Calvelo, M. Camps Arbestain, M. Vazquez Sueiro, and J. A. Maciá-Agulló.
Soil Research 53, no. 7 (2015): 753-762.

In order to understand the reactivity of biochar in soil, we thoroughly examined the carbonaceous surface of different biochars, paying particular attention to the distribution of oxygen-containing functional groups. Biochar was produced from pine, poplar and willow at two different temperatures (400 and 550°C) and characterised using elemental analysis and wet chemistry (Boehm and potentiometric titrations, cation-exchange capacity (CEC) measurement). In addition, Fourier transform infrared spectroscopy (FTIR) and X-ray photoelectron spectroscopy (XPS) analyses were performed on both untreated and acid-washed biochar samples. Qualitative relationships were observed between data generated from the titration methods under investigation and XPS analyses, both describing the general distribution of oxygen-containing surface functional groups. Total acidity of biochar ranged widely, between 32 and 1067 mmol kg^{-1}, and was mostly attributed to the presence of hydroxyl or phenol groups. The number of functional groups containing oxygen decreased with increasing pyrolysis temperature, mainly because of a decrease in the content of phenol groups. A quantitative comparison of titrations and CEC (i.e. biochar's ion-exchange capacity) measurements was compromised by a masking effect caused by the biochar's inorganic fraction (<8%). An acid-washing step with nitric acid was shown not to alter the biochar surface systematically. The use of potentiometric titrations with an acid-washing pretreatment proved to be suitable to quantify biochar acidic functional groups, and hence biochar acidity.

The chemical composition of native organic matter influences the response of bacterial community to input of biochar and fresh plant material.

Wang, Congying, Craig Anderson, Manuel Suárez-Abelenda, Tao Wang, Marta Camps-Arbestain, Riaz Ahmad, and H. M. S. K. Herath
Plant and Soil 395, no. 1-2 (2015): 87-104.

Aim To investigate how the chemical composition of native organic matter of two contrasting soils varies with inputs of biochar and fresh material (including plant roots) and how these underlying changes influence microbial community structure.

Methods Corn stover (CS) and CS-derived biochars produced at 350 °C and 550 °C were applied at a dose of 7.2 t C ha−1 to two contrasting soils—an Alfisol and an Andisol. After 295 days of incubation, two undisturbed subsamples from each pot were taken: (i) in one, Lucerne (Medicago sativa L.) was seeded (plant study, P) and (ii) in the other, the incubation was continued without the plants (respiration study, R); all subsamples were incubated for an additional 215 days. Soils without amendments were usedas controls. At the end of the incubation (510 days), their bacterial community profiles were characterised using ARISA and the molecular composition of soil organic matter (SOM) was investigated by pyrolysis-GC/MS.

Results There were significant interactions between soil type, study type (P or R) and organic amendment. Organic amendments influenced overall SOM composition with microbial community response being mainly influenced by soil type but also strongly affected by the

presence or absence of plants. For a specific soil type, ≥ 40 % of total variation in bacterial community ordination could be explained by the molecular composition of SOM.
Conclusions The molecular composition of SOM is proposed as an important factor influencing the microbial response to organic amendments, including biochar.

Biochar in co-contaminated soil manipulates arsenic solubility and microbiological community structure, and promotes organochlorine degradation

Gregory, Samuel J., Christopher WN Anderson, Marta Camps-Arbestain, Patrick J. Biggs, Austen RD Ganley, Justin M. O'Sullivan, and Michael T. McManus. (2015): e0125393.

We examined the effect of biochar on the water-soluble arsenic (As) concentration and the extent of organochlorine degradation in a co-contaminated historic sheep-dip soil during a 180-d glasshouse incubation experiment. Soil microbial activity, bacterial community and structure diversity were also investigated. Biochar made from willow feedstock (*Salix sp*) was pyrolysed at 350 or 550°C and added to soil at rates of 10 g kg^{-1} and 20 g kg^{-1} (representing 30 t ha^{-1} and 60 t ha^{-1}). The isomers of hexachlorocyclohexane (HCH) alpha-HCH and gamma-HCH (lindane), underwent 10-fold and 4-fold reductions in concentration as a function of biochar treatment. Biochar also resulted in a significant reduction in soil DDT levels ($P < 0.01$), and increased the DDE:DDT ratio. Soil microbial activity was significantly increased ($P < 0.01$) under all biochar treatments after 60 days of treatment compared to the control. 16S amplicon sequencing revealed that biochar-amended soil contained more members of the *Chryseobacterium*, *Flavobacterium*, *Dyadobacter* and *Pseudomonadaceae* which are known bioremediators of hydrocarbons. We hypothesise that a recorded short-term reduction in the soluble As concentration due to biochar amendment allowed native soil microbial communities to overcome As-related stress. We propose that increased microbiological activity (dehydrogenase activity) due to biochar amendment was responsible for enhanced degradation of organochlorines in the soil. Biochar therefore partially overcame the co-contaminant effect of As, allowing for enhanced natural attenuation of organochlorines in soil.

The working life of John McCraw (1925−2014): a remarkable New Zealand pedologist and Earth scientist.

Nelson, C.S., Lowe, D.J. and Tonkin, P.J. 2015.
Journal of the Historical Studies Group (Geoscience Society of New Zealand) 50, 2-29.

John McCraw was an Earth scientist who began working as a pedologist with Soil Bureau, DSIR, then became the Foundation Professor of Earth Sciences at the University of Waikato in Hamilton, inspiring a new generation to study and work in Earth sciences, a discipline he introduced into the tertiary education system in New Zealand. In retirement, he was an author and historian with a special emphasis on Central Otago as well as the Waikato region. Throughout his career, marked especially by meritorious leadership, accomplished administration, and commitment to his staff and students at the University of Waikato, John McCraw also contributed widely to the communities in which he lived through public service organizations and as a public speaker. He received a number of awards including an MBE, fellowship, and companionship, and, uniquely, is commemorated also with a glacier, a fossil, and a museum-based research room named for him.

The anti-inflammatory activity of natural allophane

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[f] Landcare Research, Private Bag 11052, Palmerston North 4442, New Zealand

Abstract
This paper presents evidence of the novel anti-inflammatory properties of natural allophane collected from New Zealand, Japan, and Ecuador. Allophanes were assessed by (i) the mouse-ear edema method using 12-O-tetradecanoylphorbol-13-acetate (TPA) as inflammatory agent; and (ii) the myeloperoxidase (MPO) enzymatic-activity method. After 4 h, applying 1 mg ear^{-1} allophane conveyed edema inhibition (EI; $p \leq 0.01$) in up to 39%, while MPO content inhibition (CI) values surpassed 60%. Pearson's correlation analysis between EI and MPO data showed that edema was mediated by the migration of neutrophils at $t = 4$ h ($p < 0.05$), but not at $t = 24$ h. The lack of variation in cellular migration with time was explained because of a reaction of zero-order kinetics. EPR spectra for allophanes showing higher anti-inflammatory activity denoted a broad signal centered at $g = 2$, and an intense spin-spin interaction, typical of a low-spin, octahedral Fe^{3+} environment ($S = 1/2$); and overlapping signals typical for Ni, with octahedral coordination, explained either by oxidation states +1 (Ni^{1+}), +3 (Ni^{3+}), or bulk Ni^{2+} ions.

Applied Clay Science **105–106**: 48–51 (2015)

Al_{13}-pillared montmorillonite modified by cationic and zwitterionic surfactants: A comparative study

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[b] University of Chinese Academy of Sciences, Beijing 100049, China
[c] Landcare Research, Private Bag 11052, Manawatu Mail Centre, Palmerston North 4442, New Zealand

Abstract
A series of inorganic-organic montmorillonites (IOMt) were synthesized by modifying polyhydroxy aluminum(Al_{13})-pillared montmorillonites (Al-Mt) with the cationic surfactant, hexadecyltrimethylammonium bromide (C16), and the zwitterionic surfactant, hexadecyldimethyl(3-sulphonatopropyl)ammonium (Z16). The products prepared using different surfactant concentrations (0.4-5.0 CEC) were characterized by X-ray diffraction

(XRD), X-ray fluorescence (XRF), Fourier transform infrared spectroscopy (FTIR), thermogravimetric analysis (TG), and C, H, and N elemental analysis. The results show that the structure of the IOMt was strongly influenced by surfactant type. In the case of C16-modified Al-Mt (C-Al-Mt), the surfactant molecules entered and expanded the interlayer space, leading to the partial release of pre-intercalated Al_{13} cations. At high surfactant concentrations (> 2.0 CEC), the basal spacing of C-Al-Mt showed no further expansion although the *gauche/trans* conformer ratio of the intercalated surfactant increased. In the case of Z16-modified Al-Mt (Z-Al-Mt), however, the amount of Z16 intercalated did not increase when the surfactant concentration exceeded 1.0 CEC, while the basal spacing was identical with that measured for the unmodified Al-Mt. This observation may be attributed to a difference in the capacity of Al-Mt for intercalating C16 and Z16. We propose that C16 is intercalated through both cation exchange (with Al_{13}) and physisorption, while the intercalation of Z16 is primarily mediated by electrostatic attraction between the interlayer Al_{13} cation in Al-Mt and the negatively charged group of Z16.

Applied Clay Science **101**: 327−334 (2014)

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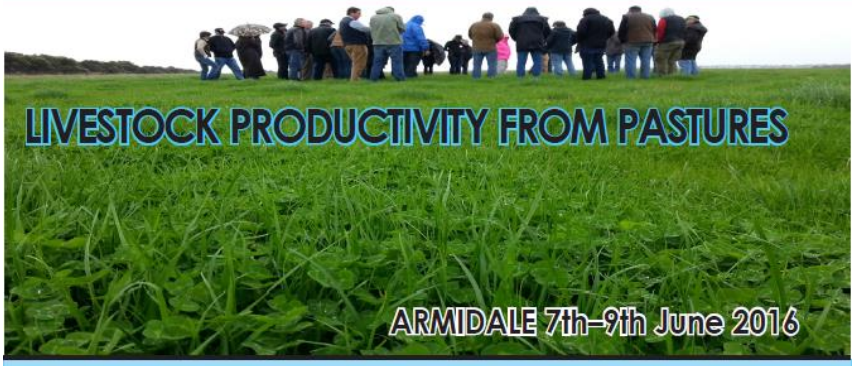

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June 2017

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