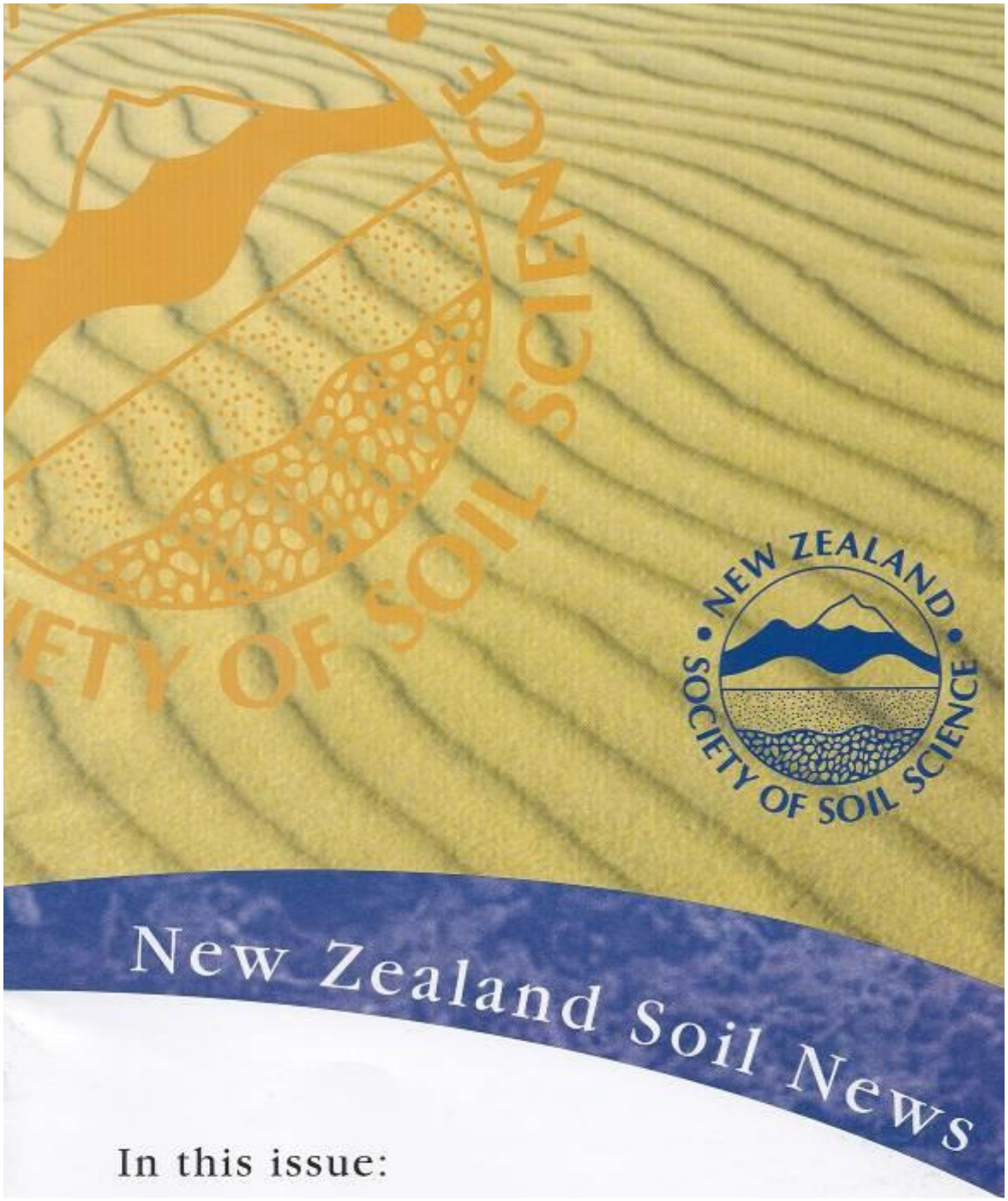

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Your contributions are required - New Zealand Soil News is your newsletter

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Deadline..... for the August issue of Soil News is **Friday 14th August 2015**

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New Zealand Soil News

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New Zealand Society of Soil Science Officers 2014–2016

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Editorial: Food Futures – by Jacqueline Rowarth

At the end of March a news release on the Food Navigator-Asia.com website announced a new way of cooking rice that could cut calories. By simmering rice with coconut oil for 40 minutes and then refrigerating for 12 hours, resistant starch is increased meaning fewer calories are ingested. The scientists from Sri Lanka did the research to find a food-based solution to the growing obesity problem. With resistant rice, people can have the same intake satisfaction but 'slash the number of calories absorbed by more than half…'

At the same time wonder machines are being advertised – 'don't juice it, don't blend it, extract it – transform ordinary food into superfood; add years to your life by **breaking down ingredients in to their most nutritious, most absorptive state! And giving you the nutrients your body craves.'**

In short, the developed world relationship with food is becoming increasingly bizarre.

New Zealand is part of the trend. The United Nations reports that New Zealand has the fourth fastest growing fast food transaction rate in the OECD (beaten only by Canada, Ireland and Australia). New Zealand also tops the fastest growing Body Mass Index in the OECD… and already ranks third in obesity rates behind Mexico and the United States.

The real problem with food is availability: food is everywhere, is ready to eat, and is cheaper as a proportion of discretionary income than it has ever been. Although the food price index has increased over the past year, average incomes have increased proportionately more. The result has been increased potential to spend money on discretionary items including food: expenditure on ready-to-eat meals from supermarkets, fast food outlets, cafés and restaurants has increased.

The problem with processed and prepared food is that in order to make it attractive, fat and sugar are added – and it is these elements, all to do with processing rather than on-farm production, which are causing problems.

Although on-farm production has been targeted in human health because of reliance on chemicals, there is no consistent evidence that shows any health problems. Research released from Oxford University last year showed that eating organic food did nothing to reduce the chances of being diagnosed with cancer. Repeated research by the American Cancer Society and Heart Foundation have shown that people who followed guidelines on weight control, diet, physical activity, and alcohol had a significantly lower risk of dying from cancer, cardiovascular disease, or all causes than those that didn't.

At the end of November, the International Agency for Research on Cancer released results from a study investigating the link between obesity and cancer. The authors reported that in 2012, excess body weight was the reason behind 481,000 new cases of cancer – representing 3.6% of all new cancers that year. The association between obesity and cancers was high in developed countries. Colon, uterine and breast cancer accounted for almost two thirds of the cancers.

Despite the research, well-meaning people continue to point fingers at modern-day production systems implicating them in the increase in allergic reactions and what we know to be genetic disorders such as Parkinson's disease.

The American Society for Nutritional Sciences published research on infant mortality in the 20th Century in 2001. Author Myron Wegman from University of Michigan School of Public Health, has calculated that in 1912, over 12,000 babies died per 100,000 live births. By 1997 the number had decreased to less than 1000 overall. Diarrhoeal diseases, infectious diseases and pneumonia and influenza had all but been eliminated, leaving approximately 450 dying from 'congenital malformations and perinatal conditions'. In 1912, however, that figure was more than 4500 babies. This tenfold decrease is a triumph of modern medicine, but successful medical intervention in childhood has removed the biological effect of the survival of the fittest. These children reach adulthood and produce children themselves - thereby increasing the likelihood of more problems. The child that would in the early 1900's have died from an acute asthma attack survives to produce children all of whom have the propensity to suffer.

In short, we are creating a less and less 'fit' genetic population.

It is a triumph of agricultural science that we are feeding more people to a better state of nutrition than ever before. The FAO reported last year that less than15% of the world's population is now under-nourished in comparison with approximately 24% in 1990.

We're also living longer, healthier lives.

The availability of cheap, convenient, processed food is enabling poor nutritional choices that have deleterious consequences. These choices have little to do with the pre-farm gate production system, and nothing to do with sustainability. In fact, obesity is unsustainable… and is causing medical problems.

Creating greater understanding of food production systems requires education, through schools, tertiary institutions and society in general. Science is the starting point and good scientific research is a *condicio sine qua non* for progress. Nobody has shown that advances can be made without some sort of research and getting to the answer, whatever it might be, requires people with enquiring minds and the foundation of knowledge upon which to build. Soil scientists have what it takes; it is up to us all to spread the word.

Jacqueline Rowarth, Professor of Agribusiness, The University of Waikato

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Note from the editor

Some of our members may have noticed that this issue has arrived in late May rather than late April. The reason for this is that in the February council meeting of the NZSSS the decision was made to decrease the number of issues from six per year to four. This decision was made in light of changing communication methods available through electronic media. Previous canvassing of our membership has shown that the existing format of the Soil News is still appreciated, especially for the delivery of 'news from correspondents' section. The council feels that a quarterly edition will still allow plenty of opportunity for this to continue. The NZSSS will increase its focus on communication through its website, Facebook and Twitter. In accordance with this the council is looking at revamping its existing website http://nzsss.science.org.nz/ in order to better facilitate communication through this means. We will keep you posted as things develop. In the mean time you can expect to receive your quarterly Soil News in the months of February, May, August and November.

Regards Dave Houlbrooke (Soil News Editor and NZSSS Vice President)

Obituary – Graeme Howard 1938 - 2015

This tribute acknowledges Graeme Howard's contribution to and close association with Land Use Capability Survey in New Zealand and its development through the 1960's and 1970's, eventually leading to the establishment of the New Zealand Land Resource Inventory. Most of this commentary is taken from a taped conversation between Graeme Howard and Philip Tonkin in late 2014 in which Graeme reflected on his own career in Soil Conservation.

Graeme started work in 1960 after completing his BSc in geology at the University of Canterbury and subsequently gained a Post-graduate Diploma in Agricultural Science at Lincoln College where he studied soil conservation. He was appointed to the Soil Conservation section of the Farm Advisory Division of the Department of Agriculture in Christchurch. Charles Harris, Chief Soil Conservator for the Nelson Catchment Board, had recently requested the Department's Christchurch based survey team undertake Land Use Capability [LUC] surveys on several river catchments in the Nelson region. The survey of the Takaka catchment was already in progress, and next up was the Motueka, then several others.

On a high country soil conservation survey in Western Otago

At that time, land use in the Motueka was a mix of horticulture, pastoral farming and fledgling commercial forestry. Given the challenges facing farming, notably steep land in the high-rainfall headwaters, and low fertility in the soils developed on the Moutere Gravels, the conclusion was that optimum primary production in the Motueka catchment should be two-pronged - horticulture and viticulture towards the seaward end of the downlands formed on the Moutere gravels and adjacent alluvial river terraces, and exotic production forestry on the steeper Moutere hill country inland to the ranges. The Motueka LUC survey was a catalyst for the large-scale expansion of production forestry in the Nelson region.

The high country survey team, led by Graham Dunbar together with Rod Prickett, Noel Holmes and after 1960 Graeme Howard, undertook surveys in catchments and on farms throughout the South Island, from Southland's Mararoa northward through the Waitaki, North Canterbury and into Marlborough. The survey of the Waimakariri drainage basin that included an earlier survey of the Broken River catchment done in the mid 1950's, was a major survey. For this survey, and others,

Graham Dunbar navigating the Hunter River in Western Otago

Graeme made the base maps and transferred across resource data from aerial photos. In those days, most high country areas had cadastral map coverage only. It was a laborious process identifying trigs and other markers on aerial photos and using a mix of proportional dividers and an epidiascope, combined with local knowledge and common sense, transferring the data from the distorted photographs to the planimetrically correct cadastral maps. It was interesting, and reassuring, comparing these base maps with the Lands & Survey 1:63,360 topographic maps when they became available.

In 1966 Graeme moved to Wellington, as assistant to Doug Campbell Chief Soil Conservator, providing technical service for the Soil Conservation Council. Dave Wilkie had recently visited the United States of America on a study tour and arranged for the Chief of the US Soil Conservation Service, D.A. Williams, to visit New Zealand and recommend where soil conservation should be placed in the government departments. Although he recommended the Prime Minister's Department, Soil Conservation instead passed from the Department of Agriculture to the Ministry of Works. A Water and Soil Division was created within the Ministry of Works so that flood control and drainage became linked to land use and erosion control in catchments.

About that time Doug Campbell appointed Charles Harris to lead a North Island survey team, similar to that in the South Island, to be based in Palmerston North. They surveyed a number of catchments in the North Island. A major one was the LUC survey of Gisborne-East Coast, where headwaters of major rivers were 'falling to pieces' with widespread mass-movement and severe gully erosion. Doug Campbell publicized this situation in a widely distributed booklet *"Down to the Sea in Slips".* The 'Taylor committee' (Dr. N.H. Taylor, former Director of Soil Bureau) was charged with correcting the situation. A comprehensive erosion survey of the entire district was completed as a first step in revealing the scale of the damaged land. Out of that survey evolved the concept of the *"blue line"*, a mapped line, behind which the severest erosion in the headwaters was located. This land was earmarked for protection - production forestry, and was separated by the line from the more stable lands that could remain in agriculture ─*"the pastoral foreland"* where erosion could be treated by planting willows and poplars.

One of Graeme's duties at Water and Soil Head Office was to handle soil conservation and erosion proposals from the Poverty Bay Catchment Board. It had become 'social custom' to space-plant poplar poles into a heaving sea of moving earth, many farmers received their annual consignment of poles in the belief that they were doing the 'right thing'. Technically Graeme considered that this practice was achieving nothing in the still badly-erosion-affected parts of the *pastoral foreland,* and reported this to the Soil Conservation and Rivers Control Council (SC&RCC). The outcome was to revisit the Taylor Committee recommendations, with a further, more detailed LUC resurvey of the pastoral foreland.

Graeme Howard ever a practical man

In November 1962 Massey University hosted the International Soil Science Society Conference of Commissions IV (Soil Fertility) and V (Soil Genesis and Classification). The Ministry of Works LUC survey team in Christchurch had prepared a small-scale (ca. 1:1,000,000) LUC map of New Zealand to be displayed at this Conference. The aim was to indicate where New Zealand's best, most versatile land lay, and given the hilly and mountainous nature of the country, where land had limited uses or needed to be protected. The LUC framework described at this time was *"use of every acre according to its capability and treatment of every acre according to its needs."*

As a follow-up, at a Soil Conservators' Annual Conference at Lake Ohau, about 1965, the same team presented the extent of LUC survey coverage in the South Island, which was by then considerable. Graeme compiled a list of catchments and other areas that had been surveyed, along with other special projects such as south-east Waipara County Nassella Tussock Survey, and the Mt. Cook National Park vegetation/grazing line transects. Some had been published and others were internal reports to Catchment Boards, but the intention was to publish them all. Charles Harris and Garth Eyles then set about doing a comparable synthesis for the North Island.

Graeme made a significant contribution to the Land Use Capability Survey Handbook which standardized methodology for LUC and the land resource inventory on a national basis, first published in 1969. The preface to the 1st Edition credits CS Harris, G Howard and RC Prickett with 'considerable revision, extension and editing' of the original text compiled by DA Campbell, GA Dunbar, M King and JW Ramsay.

By the early 1970's the National Water and Soil Conservation Organisation (NWASCO) was in a position to develop a national LUC coverage based on the 1:63,360 topographic maps. Graeme Howard in head office and Charles Harris in Palmerston North chipped away putting forward the idea of a National Land Use Capability coverage to Research Acting Director, Alan Greenall. Although Greenall, who had a background with the Otago Catchment Board, was at first more focused on farm scale plans than regional and national mapping, Graeme was eventually instructed to prepare a paper proposing the project to the Soil Conservation and Rivers Control Council (SC&RCC), setting out format, logistics, staffing, time-frames etc. It was approved by the SC&RCC and commenced shortly after in 1973. To gear-up for this National Land Use Capability Survey, Graeme was sent on a comprehensive international study tour in 1974 assessing the national land and water resource inventories of the countries visited.

While Graeme was overseas, Dr. K.J. Mitchell, ex Director of Plant Physiology Division, DSIR was appointed Research Director of the Water and Soil Division of the Ministry of Works. On Graeme's return he had a thorough one and a half day de-briefing with Dr. Mitchell. Dr Mitchell immediately set out four fields of research, (1) a national land resource inventory based on LUC with standardized methods and producing derivative national erosion and vegetation maps, (2) erosion processes research, (3) remote sensing at large scales using aircraft sensors, and (4) orthophotography to be pursued in collaboration with the Department of Lands and Survey.

The first of these objectives was already underway and recruiting of additional suitable staff was required. Dr Mitchell insisted that compiling a National Land Resource Inventory i.e. the factual basis of LUC, rather than LUC per se was to be the main thrust. He saw greater value in the underlying national land resource inventory, fully computerized, from which various derivative maps could be made as required. These could be used for a wide variety of purposes. This is how the "Land Resource Inventory Worksheet" national coverage was born. Developing national statistics required that the national coverage be completed as quickly as feasible. Two enlarged teams were formed, one led initially by Charles Harris in Palmerston North and the other by Rod Prickett in Christchurch. Initially, Garth Eyles was based in Wellington, overseeing LUC standards, resolving mapping difficulties, and publication. This role was later taken over by Stephen Walsh when Garth moved to Palmerston North and eventually to the newly established Aokautere Science Centre. As Manager of Land Resources Research and Survey, Graeme was responsible for the overall project from design through to its conclusion.

The teams were unable to access the large capacity IBM computer in the Ministry of Works for the project. At that time desk-top computers were coming in and Water and Soil Division were shrewd enough to realize that this was the future for SC&RCC needs. Hewlett Packard set them up with computer facilities and a printer, cryptically purchased through Ministry of Works stores, as an *"Automatic Planimeter"*. Mike Harvey was in charge of the computer setup in Christchurch and Patrick Van Berkel a math's and software graduate from Canterbury University was appointed to write all the software to get the system operating. It was the first fully computerized interactive system on the land resources of New Zealand. A fully computerized and supported national coverage of Land

Resource Inventory Worksheets was completed and operational by the time Graeme left head office in 1980.

Graeme noted that these were times of immense pressure and stress and the atmosphere was quite political and not always pleasant. In 1979, at the age of 41, with a wife and four dependent children, Graeme suffered a major cardiac event. This resulted in much soul searching and the measured decision of a change. A long-time friend and colleague of Graeme's Dex Knowles noted that after Graeme's heart attack, Ray Dixie arranged for him to take study leave and he enrolled for a PhD in the Department of Geology at the University of Canterbury.

The topic of his research focused on the Quaternary geology of the Craigieburn Range and the adjacent lowlands in the Waimakariri and Rakaia basins. Associate Professor Dr John Bradshaw was Graeme's advisor and he commented that Graeme developed a complex scheme for observations of Torlesse outcrops that ranged from basic lithology, joint orientation and spacing to aspect, altitude, slope and climatic factors etc. In this project Graeme amassed a vast amount of data with the objective of understanding the processes of erosion and the controlling factors. He worked extremely hard but in the event perhaps the concept was too ambitious. This project would have been a challenge to a younger man let alone one who had suffered a coronary. There were times when Graeme out alone on top of the Craigieburn Range or elsewhere had cause for concern. On one such occasion he had to make a dash back to Christchurch resulting in him ending up in hospital. Graeme did not want it known in his lifetime the extent to which operating in a relatively remote mountain environment once more, post-coronary, tested his confidence. Through persistence he rebuilt that confidence and fitness to the extent he could climb and tramp the length of the Craigieburn Range summits. Unfortunately Graeme was not to complete his doctorate during his study leave. Perhaps the project was too big and couldn't be constrained within the time limits demanded by the University. Graeme always hoped to be able to pick up his PhD project; however life events were not conducive to this ambition and further complicated as their son Michael had begun to show signs of his serious illness which eventually claimed his life in 1998.

Some of Graeme's study is to be found in tour guides; a New Zealand Society of Soil Science tour of Lake Coleridge - Waimakariri - Craigieburn in 1984, the Geological Society of New Zealand's post conference field trip of the Late Quaternary geomorphology of the Upper Rakaia and Waimakariri Valleys in 1985 (NZGS Miscellaneous Publication 32B) and field trip notes for a Quaternary Workshop held at Cass in 1992.

Within a few years of returning to work in the Christchurch outpost of the Aokautere Science Centre he was caught up in the Government's reorganization of science. With the closure of the Ministry of Works various staff were redeployed in the emerging Crown Research Institutes and others faced redundancy. This brought Graeme's career in soil conservation to an abrupt end yet his contribution through the New Zealand Land Resource Inventory lives on in the work of the CRI Landcare Research and in the Regional Councils around New Zealand.

Graeme with his loyal companion Jock after a day in the field

Graeme Howard died on Thursday the 26th of February 2015 in Christchurch at the age of 77 years and is survived by his wife Angela and three daughters, their son having died in early adulthood.

By Philip Tonkin and Grant Hunter

2015 – International Year of Soils

The NZ Society of Soil Science commissioned Angela Schipper and Marianne Coleman to develop some web-based materials that promote the importance of soils and engage with young people. The website will be launched in Mystery Creek Fieldays week (2nd week of June) – check it out at www.ilovesoil.kiwi

To support the website we are giving away "I love Soil" stickers in English and Maori along with a poster and brochures. If you have a group that you would like to give stickers or brochures to please contact Megan Balks (email m.balks@waikato.ac.nz) and she can send you some. The stickers and brochures are freely available to promote international year of soils. Also the pdfs will be available on the NZSSS website for you to download. If you need a higher resolution version to print larger or better quality (for instance if you want to get some t-shirts printed) contact Megan.

2015 – International Year of Soils – what are you doing to celebrate it?

There are many simple things you could do to celebrate International Year of soils – take a kid out to play in the mud, have a morning tea bake-off with a soil theme, run a seminar, get some tee-shirts made up with the "I love soil" logo on them or design your own, talk to a school group, have some fun with it – get some "I love soils" stickers off Megan (m.balks@waikato.ac.nz) to give away to anyone who is participating.

Article – International Year of the Soil – by Doug Edmeades

The United Nations has declared 2015 as the International Year of Soils. They list a number of reasons for this initiative, the most important of which are: raise awareness about the "profound importance of soil for human life" and "educate the public about the crucial role soils play in food security, poverty alleviation and sustainable development." So why should we celebrate this thin skin of weathered rocks which we call soil?

The soil, as one of NZ most famous pedologists, Norman Taylor, declared, is a living body. Just like humans, soils age, albeit over geological time, not human time. The endpoint can be soils that are leached and bleached of all goodness (nutrients). Think at this point of the highly weathered pakahi (West Coast) or gumland soils (Northland). And plants grow in soils, if the climate is conducive, and whenever this happens organic matter in the form of dead roots and leaves are returned to the soil. This is the food that supports the teeming abundance of macro and microorganisms that call the soil home. Healthy soils must breath in oxygen and as the organic matter decays breath out carbon dioxide. Soil must have water –too much or too little is disadvantageous.

One of my mentors Prof Walker took the analogy to the extreme: treat soils like a baby: keep them warm, don't let them get waterlogged and feed them properly. He, like most soil scientists got annoyed when soils, our magic mantle, was crudely referred to as dirt. Dirt is what you get under you figure nails – soils are altogether a far more noble thing.

We are blessed in New Zealand. Our soils are relatively young geologically. With the exceptions noted above, they have not yet had time to weather and wither. Hop across the ditch to that much, much older landscape and check out the difference. I love baiting the Australian farmers with that old good-news-bad-news routine: The bad news is that your soils are poor; the good news is that there is plenty of them!

We are also blessed because our major land use is clover-based pastoral agriculture. It is the ultimate in conservative land management. It is almost, but not entirely, a closed system in which the animal returns plant material and nutrients to the soil from whence it came. The current challenge in pastoral agriculture is the close the system more effectively so that we do not lose the nutrients N and P to waterways.

In comparison to the pastoral system, cropping is exploitive – organic matter and nutrients are removed from the soil. Civilizations have collapsed by not ensuring a legume-based crop at some stage in the rotation to restore the soil fertility. It is a cruel law of mother-nature that what you take off you must replace. This is the fatal flaw in some organic farming enterprises. Sure purchasing your neighbour's wastes, whether animal manure, effluent or compost, may be good for your land but it comes at the expense of depleting the neighbour. As the good book says: The Lord giveth and the Lord taketh away. Free lunch anyone?

Recent surveys, of the biological, chemical and physical quality of NZ soils, which are ongoing by the way, show that by and large we are in good shape. The negatives, by no means serious or irreversible yet, are 1) a decrease on soil organic matter levels and increase in soil compaction is some cropping soils, as we might anticipate, 2) an increase in some regions in soil compaction on some soil under dairying, as has been predicted by science and 3) excessively high Olsen P levels on some dairy farms, a suggestion perhaps that the fertiliser industry is overzealous in its salesmanship. This should not be taken to suggest that farmers are using too much fertiliser – too much P perhaps, but in my experience, not enough of the other important nutrients we must add like K and S. It is called nutrient balance.

So we have much to be thankful for in this year of the soil. We are in good shape and it puts to rest all that doomsday nonsense that the fringe fertiliser companies blather on about; that chemical fertilisers like superphosphate, potash and urea are destroying our soils. That is something to celebrate. As the ad says: crack a bottle of the good stuff Kevin.

The Anthropocene: an Australasian perspective and survey

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Introduction

In 2000, Crutzen and Stoermer suggested that the Holocene (the geological period of time since 11,700 years ago: Walker et al., 2009) had finished and that humanity had now entered the "Anthropocene". As summarised by Steffen et al. (2011) and Wolfe et al. (2013), these scientists were referring to the Anthropocene as the interval of demonstrable human alteration of global biogeochemical cycles, beginning subtly in the late 18th Century following James Watt's invention of the coal-fired steam engine, and accelerating markedly in the mid-20th Century (called "The Great Acceleration").

The term "Anthropocene" is now regularly used in the geological/environmental literature, appearing in nearly 200 peer-reviewed articles in 2012, and three new journals were launched over the last few years specifically focussed on the topic (see also Waters et al., 2014). The problem is that the Anthropocene has not yet been formally defined and different disciplines have different viewpoints as to when the Anthropocene began, if at all (e.g. Brown et al., 2013; Gillings and Paulsen, 2014; Table 1). In addition, most perspectives on these issues are derived from the Northern Hemisphere (Bostock et al., 2015).

In 2016, members of the International Commission of Stratigraphy (ICS), as custodians of the formal Geologic Time Scale, will decide whether the Holocene epoch has given way to the Anthropocene and, if so, (*1*) where the boundary between the two should be placed, known as a "golden spike" or Global Stratotype Section and Point (GSSP), and (*2*) when the age or date of inception took place, known as a Global Standard Stratigraphic Age (GSSA). As well as the issues of defining a stratotype and age, the Anthropocene Working Group (AWG) of the Subcommission on Quaternary Stratigraphy, which advises ICS, is to recommend which hierarchical status the Anthropocene should attain if adopted. If it is to be a geological "epoch" (i.e. at the same hierarchical level as the Pleistocene and Holocene epochs) then it would lie within the Quaternary Period and follow the (terminated) Holocene Epoch. Alternatively, it could be considered at a lower hierarchical level such as "age", implying it is a subdivision of the ongoing Holocene Epoch (Monastersky, 2015).

At the same time the ICS will decide whether to formally adopt a proposal to subdivide the Holocene into three sub-epochs (Walker et al., 2012; see also Lowe, 2013). This parallel effort to subdivide the Holocene is relevant to the Anthropocene question because it clearly characterizes the Holocene as being based primarily on natural climatic/environmental events, thus leaving open the possibility of a subsequent epoch defined entirely by the global signature of significant human impact on the environment.

A key problem in attempting to define the Anthropocene is to distinguish between the *detection* of human impacts and their (patchy) distribution in time and space (which are known from archaeological and palaeoenvironmental records, e.g. see Ellis et al., 2013; Ruddiman et al., 2015), and the point at which the *magnitude* of human impacts on the Earth system (key biogeochemical cycles) exceeds the influence of the natural systems and which can be recognised in the context of geological time (Steffen et al., 2011; Wolfe et al., 2013). In a nutshell, the Holocene might be seen as wholly adequate to cover the former, and the Anthropocene could be used to cover the latter (Bostock et al., 2015).

Table 1. Ages or dates proposed in the literature for the start of the Anthropocene (after Bostock et al., 2015, adapted from Lewis and Maslin, 2015).

Option	Event	Age or date	Geographical extent
1	Use of fire	Early Pleistocene	Global but highly localised and diachronous
2	Megafaunal extinction	50,000-600 yrs BP	Global but diachronous
3	Origin of agriculture	~11,000 yrs BP to present	SW Asia then global
4	Intensification of agriculture	~8,000 yrs BP to present	Eurasian then global
5	New-Old World collision	AD 1492-1800	Eurasia- Americas
6	Industrial Revolution	AD 1760 to present	NW Europe then global
7	Tambora eruption (Indonesia)	AD 1815 (April)	Global: synchronous sulphate fallout at both poles
8	Great Acceleration	AD 1950	Many local events, global influence
9	Nuclear weapon detonation	AD 1945 to present (peak AD 1964)	Global

Australasian perspective

Bostock et al. (2015) have presented an Australasian perspective on defining the Anthropocene for the newsletter of the Australasian Quaternary Association (AQUA), and have invited feedback and comments (by 1 September 2015) that will be compiled and sent to AWG to help advise the ICS. If readers are interested in this topic and would like to see the full article of Bostock et al. (2015), then please contact David Lowe (email address given below). We do not suggest that Australasian evidence should necessarily be at the forefront of defining the onset or formal stratigraphic status of the Anthropocene, but that the evidence from our region should be compatible with, and should help inform, any globally applicable definitions.

In summary, Bostock et al. (2015) suggested that the Anthropocene onset must be (largely) globally discernible, and hence the Australasian evidence precludes definitions 1-5 of Table 1, because, in the words of Ruddiman et al. (2015, p. 39), "the timing of these changes varied from region to region, leaving no single 'golden spike' to mark their onset". Our favoured options (definitions 6-9) are discussed briefly below.

Industrial Revolution and the 1815 Tambora eruption

The rise in the ice cores of CO_2 and other greenhouse gases is evident from the early 19th Century (definition 6), but it is difficult to define precisely. The initial change in concentrations is gradual, reflecting the variable spread in the use of coal, starting in northwest Europe and slowly spreading to North America and then globally. Hence there is no abrupt change in CO_2 or other products associated with the burning of fossil fuels (Lewis and Maslin, 2015).

In Australia, large-scale European colonisation did not occur until 1788 with the development of the penal colonies around Sydney and the satellite convict settlements on Norfolk Island (from 1789) and Hobart (1803). In New Zealand, Europeans set up small whaling and sealing stations around the country, and undertook other activities, from the early 19th Century (e.g. King, 2003), and large pakeha (primarily British) settlements developed thereafter. For the next ~100 years there is considerable evidence from historical records and palaeoenvironmental archives that the European settlers in both Australia and New Zealand had a considerable impact on the landscape, including draining wetlands and clearing forests, leading to changes in vegetation and increased charcoal in the archives, and large increases in sedimentation in lakes, estuaries, and near-shore environments (e.g. Wilmshurst, 1997; Haberle et al., 2006; Brooking and Pawson, 2011), with industrial-type activity being limited.

However, if the Industrial Revolution (i.e. dating from the late 18th Century or the early 19th Century) were to be chosen as the start of the Anthropocene, as originally suggested by Crutzen and Stoermer (2000), an option for defining a golden spike (GSSP) for this event is fallout from the Tambora volcanic eruption in Indonesia (definition 7), which occurred 200 years ago in April 1815, and resulted in global cooling and "the year without a summer" in the Northern Hemisphere (e.g. Oppenheimer, 2003; Smith, 2014). More importantly for generating a global marker, the eruption produced an instantaneous, synchronous, and recognisable aerosol-derived sulphate spike in the ice cores of both Greenland and Antarctica and in glacier ice in North and South America, a distinct signal in dendrochronological records (Briffa et al., 1998; Smith, 2014), and likely fine-grained ashfall over very wide regions potentially discernible as a cryptotephra deposit (a glass-shard concentration not visible as a layer in the field: Lowe, 2011; Davies, 2015). Probable fallout from Tambora in New Zealand was identified by Gehrels et al. (2008) from measurements of Pb isotopes in salt-marsh sediments at coastal south Otago. Thus the Tambora eruption deserves serious consideration as the GSSP for the start of the Anthropocene because it generated a demonstrably globally synchronous signal that ties in with associated evidence of increasing human impact, namely the atmospheric greenhouse gas rise from the early 1800s (Smith, 2014). Alternatively, this eruption event in 1815 could simply be seen as globally marking the start of an approximately 150-year *transition* from the Holocene to the Anthropocene.

Great Acceleration and Nuclear Age, AD 1950

Bostock et al. (2015) argued, however, that the definitions on balance that relate best to the evidence in the Australasian region are 8 and 9 (Table 1), respectively the "Great Acceleration" combined with the "Nuclear Age" at around AD 1950 (i.e. between AD 1945 and 1965).

The Great Acceleration was an important time globally, with a major expansion of human population after World War II, and the development of many new technologies and materials (plastic, artificial fertilizers, advent of new breeds of crops such as rice, etc.) (e.g. Wolfe et al., 2013; Steffen et al., 2015). Although large-scale environmental development (such as the "grasslands revolution" in New Zealand) occurred from the late 19th and early 20th centuries (e.g. Brooking and Pawson, 2011; Cushman, 2013; Brooking and Wood, 2013; Park, 2013), and accelerating soil erosion, flooding, sedimentation, and measurable human-derived geochemical influences are recorded in landscapes and in lacustrine and marine sediments from the 1920s onwards (e.g. Rawlence, 1984; Hume et al., 1989; Page et al., 2000; Augustinus et al., 2006; Gomez et al., 2007; Gehrels et al., 2012; Basher, 2013), the 1950s was an important decade for both New Zealand and Australia with markedly increased intensification of land use, including the advent of aerial topdressing from 1948-49 in New Zealand, leading eventually to widespread changes (degradation) in water quality (e.g. Pawson and Brooking, 2013).

These changes, globally and locally, have had a major impact on our atmosphere and climate with atmospheric CO_2 and methane rapidly increasing after the 1950s. It is estimated that nearly half of the nitrogen in our bodies today was produced in a factory using the Haber-Bosch process. In addition, plastic can now be found in all parts of the Earth – the current estimates suggest the ratio of plastic to marine life in the world's major marine gyres is 6 to 1 by weight (e.g. Vince, 2014; Kidwell, 2015; Young, 2015).

Others have argued that the date of around AD 1950 postdates the upward inflection of atmospheric CO_2 and CH_4 from fossil fuel and agricultural emissions at the start of the Industrial Revolution by more than a century, as noted earlier. Similarly, Ruddiman et al. (2015, p. 39) pointed out that "following the introduction of mechanized agriculture, most prairie and steppe grasslands had been plowed and planted with crops by 1900", and they implied that it does not make sense "to define the start of a human-dominated era millennia after most forests in arable regions had been cut for agriculture, most rice paddies had been irrigated, and CO_2 and CH_4 concentrations had been rising because of agricultural and industrial emissions". However, Steffen et al. (2015, p. 81) demonstrated that "only beyond the mid-20th Century acceleration is there clear evidence for fundamental shifts in the state and functioning of the Earth System that are beyond the range of variability of the Holocene and driven by human activities". Climatologically, this is the first interval where there is evidence that

anthropogenic greenhouse gas forcings dominated over natural climate forcings (Hansen et al., 2008). Thus the ~AD 1950 date crucially fits with the definition of the advent of the Anthropocene as being the point at which the magnitude of human impacts on Earth system (key biogeochemical cycles) exceeds the influence of the natural systems (Wolfe et al., 2013).

In a similar way that the Tambora eruption provides a geochronological marker for the start of the Industrial Revolution, the global fallout of bomb-test radioisotopes has the potential to create a truly global isochronous marker horizon for the start of the Anthropocene after AD 1950 (Zalasiewicz et al., 2011, 2015). The nuclear weapon detonations introduced a range of human-induced (not naturally occurring) radioactive isotopes that can be traced in soil, sediment, ice, tree-ring, and coral archives. Caesium-137 and strontium-90 were first detected in soils in 1952, and there is evidence that bomb radiocarbon in geological/environmental archives peaked in 1965 in the Southern Hemisphere, slightly offset by a couple of years from the Northern Hemisphere peak in 1963 and that of the tropics in 1964 (Zalasiewicz et al., 2015).

There is no need for the Anthropocene (yet)

Other scientists completely disagree with all these proposals and believe that we are still in the Holocene and that the "anthropocene" should remain an informal unit (e.g. Smith and Zeder, 2013; Gibbard and Walker, 2014; Ruddiman et al., 2015). In this case, the name would continue to be used in the same way as such archaeological terms as Neolithic and Bronze Age (Monastersky, 2015).

Finally, another view is that we are in the transition towards the Anthropocene and need a much longer perspective to assess "the character of the fully developed Anthropocene" and it should be left to future generations to decide (with hindsight) when the Anthropocene began (Wolff, 2014). For example, Ruddiman et al. (2105) suggested that future changes – such as species extinctions and ocean acidification – may be much larger than those already seen. Similarly, Gillings and Paulsen (2014), who suggested that the 'Great Acceleration' be assigned a formal starting date of 1953, the year the structure of DNA was first published, noted that although "microbial evolution is currently keeping pace with the environmental changes wrought by humanity, it remains to be seen whether organisms with longer generation times, smaller populations, and larger sizes can do the same in the future".

Conclusion

Please have your say. Specific questions to address include:

(1) Should the Anthropocene be formalised as part of the Geological Time Scale?
(2) If adopted, when should it start?
(3) If adopted, what status should a formally defined Anthropocene have in the hierarchy of the Geological Time Scale: epoch, age, or something else?

Send your answers and comments on these issues to Helen Bostock (Helen.Bostock@niwa.co.nz) ***by 1 September 2015.*** Contact David Lowe (d.lowe@waikato.ac.nz) if you would like a copy of the full *Quaternary Australasia* article by Bostock et al. (2015).

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Article – A Golden Anniversary for Soil Science in Fiji

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2015 represents the golden anniversary of the publication of a most significant document for soil science in Fiji. ***The Soil Resources of the Fiji Islands***, 2 Volumes, by Ian T. Twyford and A. Charles S. Wright was published in 1965 by the government printer in Suva. This was the result of intensive field work with accompanying laboratory studies and a detailed inventory of land use in the colony (as it was then) in the 1950s and early 1960s. The publication consisted of a descriptive and interpretative volume (Volume 1, 570 p) and an accompanying set of maps (Volume 2). The set was originally sold for 7 guineas (£7-7-0).

Volume 2 contained a set of 8 soil map sheets produced at a scale of 1 inch to 2 miles (1: 126,720), 8 land classification sheets, a soil map legend, a land classification map legend, a general soil pattern, a generalised land use map, a geological map, a rainfall and climate environmental map, a map of alienated land in Fiji, a landslope map and a population distribution map. These two volumes thus presented an extensive body of information on the soils of Fiji providing the country with one of the best resource statements of any developing country at that time. The information was widely used for land use and other resource decision making for about 30 years until new soil maps and accompanying information was produced following new soil mapping and related research in the 1980s.

This new information was produced in a collaborative effort coordinated through the Land Use Section of the Fiji Department of Primary Industries, and led by a senior soil surveyor (D.M. Leslie) seconded using NZ Ministry of Foreign Affairs and Trade support. Substantial support came from the New Zealand Soil Bureau DSIR (now part of Landcare Research Manaaki Whenua), along with financial and technical inputs from Australia and USA. Collaboration involved the University of the South Pacific, the Sugar Research Centre of the Fiji Sugar Corporation (now the Sugar Research Institute of Fiji), Fiji Pine Commission. Queensland DPI, South Pacific Applied Geoscience Commission (SOPAC) and the Secretariat of the Pacific Community (SPC).

The new information includes a set of 48 soil maps at scale of 1:50,000 covering the whole country, an accompanying set (Leslie and Seru, 1998) of Soil Taxonomic Unit Description Sheets for each of the 220 soil series identified, a monograph summarising the key features of the soils of Fiji (Leslie, 1997), detailed soil survey reports of the Fiji government agricultural research stations (and the Tutu station on Taveuni), and a user friendly interpretative manual for managing Fiji soils (Leslie, 2012). Fiji once again has one of the best soil information databases for strategic land use planning and management.

Over the last 50 years significant changes have occurred in the Fiji economy with a move away from heavy dependence on sugar and other agricultural commodities as the main foreign exchange earner. Tourism, mining and forestry have become more important, but there is still a heavy dependence of soil related activities for export earnings and local economic activity? Domestic production of food is still of critical importance and a degree of subsistence living is still found in more rural areas. This dependence on soil resources is expected to continue far into the future and the knowledge base that should be used for land use and related decision making is now readily available. Activities based on Twyford and Wright have helped Fiji in achieving many of its development goals, and the future well-being of its citizens will continue to involve good use of the soil resources.

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Minutes of the Meeting of the NZSSS Council held at 1:00 pm on Tuesday 4th November 2014 via teleconference

Present: Trish Fraser, Tim Clough, Mike Hedley, Reece Hill, Tony van der Weerden, Dave Houlbrooke, Roger McLenaghan, Allan Hewitt, Hamish Lowe.

Apologies: Iris Vogeler,

Secretariat

- It was moved (Trish) "that minutes of last meeting held on 7th August 2014 were a true and accurate record", seconded Roger, carried.

Matters arising from the minutes.
No matters were arising from the minutes that were not already on the agenda.

Items for General Business.
Confirm NZSSS Thirty-first two yearly report of the NZSSS Council for 2012-2014

Approval of Agenda
It was moved "that the agenda be approved", Chair - carried.

Treasury
Accounts for payment/ financial report

Audit from previous financial year has been signed off by the auditor. All accounts are OK. It was moved (Tony) "that the financial report be accepted by the Council", seconded Mike – carried.

Current financial report.

Profit & Loss – indicates good income stream as subscriptions have picked up and some new members are joining. Outgoings have included operating secretarial services, ticking over as expected, and Soil News editor's fee that comes out twice a year. Increase of $15K over last 6 months as a consequence of interest and subscriptions being paid.

Balance Sheet
Cash summary all running OK. Check with Groundwork why subscriptions income differs from figures in profit and loss sheet. *Action – Tony will follow up with Groundwork Associates*

- Should subscriptions be increased?

The question of an increase in subscription rates was raised as subscriptions have been at a constant level for many years. Our current subscription rates are low when compared with other associations (ASSSI, SSSA). A relatively small increase would make a good increase in annual revenue stream. There is a current increase in subscriptions, most likely the result of the cheaper NZSSS conference registration if those registering are NZSSS members and the fact that students get assistance from NZSSS for conference costs if they are a NZSSS member. So regular conference keeps subscriptions up, and Mike noted that at the moment there is no need to change subscriptions since local meetings haven't been sufficient to bring NZSSS membership demand. Megan noted it was better to keep subscriptions tracking with inflation. While subscription income needs to keep ahead of expenses there is no current dire need to increase subscriptions if the money is not being spent. There is no current project that requires a new level of spending. It was noted that the NZSSS awards have been recently reviewed and that these need to be kept at a 'worthy' value. Status quo remains.

Membership

New members for approval

Name	*Job Title Organisation*	*Member type*
Ahmed Elwan	PhD Student Massey University	NZ Student
Ainul Faizah Mahmud	PhD Student Massey University	NZ Student
Aldrin Rivas	PhD Student Massey University	NZ Student
Bernard Simmonds	PhD Student Lincoln University	NZ Student
Craig Anderson	Scientist Plant & Food Research	NZ Member
David Campbell	Senior Lecturer University of Waikato	NZ Member
Femke Rambags	PhD Student University of Waikato	NZ Student
Hannah Franklin	PhD Candidate Lincoln University	NZ Student
Henry Wai Chau	Lecturer Lincoln University	NZ Member
Jack Pronger	PhD Candidate University of Waikato	NZ Student
Jennifer Owens	PhD Student Lincoln University	NZ Student
JoAnne Cavanagh	Senior Environmental Scientist Landcare Research	NZ Member
Johannes Nicolaas Faurie	Director Geosciences Ltd	NZ Member
Mahdiyeh Salmanzadeh	PhD Student University of Waikato	NZ Student
Merce Boy Roura	Research Assistant Lincoln University	NZ Member
Nicole Matheson	Resource Mgt. Consultant Aqualinc Research Ltd	NZ Member
Qinhua Shen	PhD Student Massey University	NZ Student
Rashad Syed	PhD Student Massey University	NZ Student
Sasikunya Cheuyglintase	PhD Student Massey University	NZ Student
Tommy Cushnahan	PhD Student Massey University	NZ Student
Shamim Al Mamum	PhD Student Lincoln University	NZ student
Sephrah Rayner	PhD Student Lincoln University	NZ student
Tanya O'Neill	Teaching Fellow University of Waikato	NZ Member

Resignations

Glenys Wallace
Mark Buckley

Removal of members due to non-payment of subscription arrears.

Bruce Main
Graeme Spiers
Jacinta Parenzee
Mohammad Zaman

It was moved (Tim) "that all new member applications and resignations be approved, and that those members listed above with subscriptions in arrears have their membership cancelled." Seconded Trish – carried.

Soil News

Due out imminently. Push on advertising the conference in it. Gold sponsors have a one page advert. Guest editorial is from Dr Doug Edmeades.

NZSSS World Wide Web and Facebook Pages

Iris not continuing on Council so need to identify someone else to carry on this role in 2015 onwards.

Facebook page - has a good following – currently ~350 followers.

Soils in the NZ Landscape

Pdfs of individual chapters for placement on NZSSS website is still to do! *Action: -Allan will get this sorted with Megan.*

Awards

Reece – nominations for Leamy, Blackmore, and Grange awards have been received. Finalising of thesis judging is ongoing with decisions imminent. Awards will be announced at the NZSSS conference in Hamilton.

Promoting soil science

NZSSS Poster – Megan has an updated quote; 2000 copies (A2 size) will be $893 incl. GST. Committee agreed that Megan proceed with the printing. Posters will be available at the NZSSS conference in Hamilton.

World Soils Day is Friday 5th December –

"The International Union of Soil Sciences (IUSS), in 2002, made a resolution proposing the 5th of December as World Soil Day to celebrate the importance of soil as a critical component of the natural system and as a vital contributor to human wellbeing. Under the leadership of the Kingdom of Thailand and within the framework of the "Global Soil Partnership", FAO has supported the formal establishment of the World Soil Day as a global awareness raising platform. The FAO Conference, in June 2013, unanimously endorsed World Soil Day and requested official adoption at the 68th UN General Assembly. In December 2013, the 68th UN General Assembly declared 5th of December as the World Soil Day."

This year World Soils Day coincides with the NZSSS conference in Hamilton where there will be a large 'world' cake and a world map where attendees can mark their origins and collaborations as a celebration of World Soils day.

International Year of Soils 2015 – IYS2015

"After two years of intensive work, 2015 has been declared the International Year of Soils by the 68th UN General Assembly (A/RES/68/232). The IYS aims to be a platform for raising awareness of the importance of soils for food security and essential eco-system functions.

The objectives of the IYS2015 are:

- to create full awareness of civil society and decision makers about the fundamental roles of soils for human's life;
- to achieve full recognition of the prominent contributions of soils to food security, climate change adaptation and mitigation, essential ecosystem services, poverty alleviation and sustainable development;
- to promote effective policies and actions for the sustainable management and protection of soil resources;
- to sensitize decision-makers about the need for robust investment in sustainable soil management activities aiming at healthy soils for different land users and population groups;
- to catalyze initiatives in connection with the SDG process and Post-2015 agenda;
- to advocate rapid enhancement of capacities and systems for soil information collection and monitoring at all levels (global, regional and national)."

See following video clip:

http://www.youtube.com/watch?v=TqGKwWo60yE

To help promote IYS2015 in New Zealand ideas being considered or worked on include:

- getting Mystery Creek Field Days to have a 'Soils Theme'
- high profile NHT traveling talk
- obtain a high profile international visiting lecture tour.

- Louis Schipper will get National Radio involved (Veronica Meduna) and aim for a panel discussion next year for National Radio
- Soil focused bumper stickers
- Allan has been discussing a 'Bio-blitz type' event with Julie Grendell from Landcare who has suggested a theme such as 'Cirque de soil'
    - Would need about $10K to run it from suitable fund
    - Events would be at various centres e.g. Lincoln/Palmerston/Hamilton
    - Open days with public bringing soils samples/S-map/profile pits/soil invertebrates/microbes/soil textures/etc.
    - Events could be over 2 days
    - Posters/flyers/field trips could all be included.
    - Needs a sub committee to get it progressed
    - Norman Taylor lecture could follow such events.

Action: Megan will send an email out for a lunchtime meeting at the NZSSS conference to help develop these IYS2015 ideas.

Next year Ministry for Ed has a focus on bringing science into schools (Trish & Hamish will discuss this and report to next meeting).

School science Fairs
No new matters to report

Conferences

NZSSS in Hamilton December 2014
Everything on track for Hamilton conference ca. 130 people registered for talks or posters, social events all organised. Marketing also making progress with media interest and participation. Field trips all sorted. Need a short meeting on conference communications – key messaging. Registration expected to be about 200. This should generate a small profit.

Caroline Olsen incoming president Soil Science Society of America has agreed to come as a plenary speaker.
Financial conference attendee support requests have been received from Lincoln. Massey and Waikato will forward their information.

Queenstown joint conference:
Venue is still an issue. Would be good to confirm this at NZSSS conference. Tony will look into this.

General Business

Confirm NZSSS THIRTY-FIRST TWO YEARLY REPORT OF THE NZSSS COUNCIL FOR 2012-2014. Tim presented the 31st two yearly report of the NZSSS Council for 2012-2014. After short discussion and minor amendments it was moved "that the 31st two yearly report of the NZSSS Council for 2012-2014 be accepted by the council", seconded Trish – carried.

Correspondence
None to report

Next Meeting Date
AGM will be held at NZSSS conference in Hamilton

Minutes of the Meeting of the NZSSS Council held at 10:30 a.m. on Thursday 26th February 2015, Brentwood Hotel, Wellington.

Present: Reece Hill, Sam Carrick, Tony van der Weerden, Hayden Jones, Megan Balks, Tim Clough, Hamish Lowe, Trish Fraser (arrived at 11:15 due to travel delays).

Apologies: Dave Houlbrooke, Mike Hedley, Roger McLenaghan
President welcomed new members and thanked past members for their service over the years. Letters will be sent officially thanking members for their service.

Secretariat:
Minutes of the last meeting:
It was moved (Reece) "that minutes of the last meeting held on 4th November 2014 were a true and accurate record", seconded (Hamish), carried.

Matters arising from minutes of last meeting:
'Soils in the New Zealand landscape', now in individual chapters and up on the web free to download at NZSSS web page.
Posters (several hundred) now need to be distributed.
Tony checked differences in figures on profit/loss sheet against subscriptions and all is OK and clear.
No items of general business were noted.

Approval of Agenda:
It was moved that the agenda be approved (Reece), seconded (Tony), carried.

Council Roles and Responsibilities

President	Reece Hill
Past President	Trish Fraser
Vice President	Dave Houlbrooke
Secretary	Tim Clough
Treasury	Tony van der Weerden
Soil News Editor	David Houlbrooke
Awards Convenor	Hayden Jones
Science Fairs	Roger McLenaghan
Website & social media	Hamish Lowe/Trish Fraser
Royal Society	Reece Hill/Trish Fraser/Mike Hedley
Public outreach/Int. Year Soil	Megan Balks/Sam Carrick
Soils and public policy	Reece Hill/Hamish Lowe

Moved Megan/Tony, carried

Treasury
Profit & Loss 1 July to 31 January 2015
Expenses were $21, 605.27.
Income was $24,407.48.
Net profit $2,802.21
Move accounts be accepted Tony/second Megan, carried.

Secretariat
Membership Summary Feb. 2015

NZ member	236	NZ retired	22
Overseas member	25	Overseas retired	3
NZ student	55	Life member	10
Overseas student	3	Libraries	13
Honorary	1	**Total**	**368**

No new members for approval.

Member Resignations & Deaths
Deceased: J.D. McCraw, R.G. Duffy, J.A. Pollok.
Resigned: J. Gauld, K. Hina, H.E. Waterland.
Removed by employer: M. Zaman, A. Zakharova.
Removed for subscription arrears: J. Parenzee, G.A. Spiers, B. Main, G.J. Salt, N.A. Scott, R, Ahmad, S.K. Herath, X. Zhou, B. Manono, H. Nouri, I. Herath, J.J. Penny, S. J. Krishnaraj, S. Jiang, S. Vale.
It was moved (Tim) that the membership list be corrected to allow for changes due to deaths, resignations, removal by employers and subscription arrears, seconded (Tony), carried.
Action – council members are to prompt others less in arrears to pay their subscriptions.

Awards
Nominations for all awards need to be advertised in next soil news.
Nominations for the Royal Society Fellows need to be considered.
Action – Dave

List of awardees from 2014 presented at NZSSS conference in Hamilton:
Grange medal (new in 2012): Dr Brent Clothier, Plant & Food Research
Leamy award (biennial award): Prof. Louis Schipper, Waikato University
Blakemore Award (biennial award): Manjula Premaratne, Lincoln University
Norman Taylor Memorial Award: Dr Stewart Ledgard, AgResearch
Morice Fieldes Memorial Award (PhD thesis): Dr Paul Mudge, University of Waikato, "Changes in delta ^{15}N in pastoral soils under varying management intensity"
Sir Theodore Rigg Award (MSc thesis): Aimee Robinson, Lincoln University,
"The effect of soil aggregate size and pH on nitrous oxide emissions, ammonia oxidising communities and DCD effectiveness in a grazed pasture soil"
Bert Quin Award (for final year PhD study): Sam McNally, University of Waikato
Undergraduate Awards:
Danielle le Lievre, Waikato University
Josephine Winters, Massey University
Sephrah Rayner, Lincoln University
TW Walker award for best student oral presentation at the NZ Society of Soil Science conference: Olivia Jordan, University of Waikato
TW Walker award for best student poster presentation at the NZ Society of Soil Science conference: Jen Owens, Lincoln University

Soil news
Editor (Dave Houlbrooke) has asked if soil news should move to four issues a year, (currently six per year). It was decided, given current technology and the fact that almost all members have access to email and web sites, that a move to quarterly issues was a good idea: February, May, August, and November. Moved (Reece), seconded (Megan), carried.
However, February 2015 issue is committed so this move will occur after the February issue. While slowing down hard copy issued publications we will move to have more information on the www site and emailing of members if in fact any issues are urgent. This requires that the web site is upgraded.

NZSSS web page and social media
Hamish will follow up on this with Iris, who has resigned from committee, and look at further developing the NZSSS site. The web site needs modernising: needs improved functionality so mobile devices can access it, broken links need rectifying, and improved consistency is required.
Facebook: number of followers has doubled since the NZSSS conference in Hamilton.
Trish is maintaining a twitter account on behalf of NZSSS.

Soils in the NZ landscape
Now available on the NZSSS web site.

Further copies can be printed if we want to. Reece will confirm this and costs of what a hard copy might be.
There is a contract (Allan Hewitt & Megan Balks) with Springer publishing to update this with the update due after 2017.

Science Fairs
Do we keep sending out books and use up the last of them as science fair prizes? Other possible prizes – running internships at science institutes around the country? More ideas are required as to what to offer as prizes for the school science fairs.

Promoting Soil Science
Activities we will do in 2015:
National Radio series to mark international year of soils is underway where Pierre Roudier will do the 'Nights on RNZ slot'.

Norman Taylor Travelling lecture (Stewart Ledgard)
Mystery Creek Field days (NZSSS stand)
NZ Soil Order posters
"I love soil" stickers

International Year of Soils – also in 2015
As part of IYS Prof. Leo Condron will run a lecture series on soil science projects underway in the Lincoln science community, with particular encouragement of post graduate students.
A proposal was put to council by Megan Balks, Angela Schipper and Marianne Coleman specifically aimed at generating short articles and hands-on-activities on the NZSSS website to promote soils amongst education providers and school children. An IYS poster and stickers linking to the website would be used. The project "Soils: The World Beneath My feet" will require technical and graphics support. A motion was moved that "The project will be managed for a maximum of $10,000 as outlined in the proposal" Moved Sam/seconded Tony, carried.

Other possible activities in 2015
Fund a high profile international visitor.
Organise soil ambassadors e.g. Graduate students to talk to schools (based at Waikato, Lincoln, Massey). May need to pay a stipend.
IYSoils branded wine – competition for soil wine regions 'terroir'
Continue developing Twitter/Facebook
Other organisations to liaise with e.g. Soil related section in federated farmers?
Soil related articles in magazines (QE2, Country wide, Jill Galloway, reporters)
Soil bioblitz – been done in Auckland by Landcare but can we do this for soils
Land Treatment Collective conference – does NZSSS have a banner?

Conferences:
Joint Australia and New Zealand Soil Science Conference,
Millennium Hotel Queenstown, 12- 15 Dec 2016
Update from organising committee:
Proposed committee members:

1. Cecile de Klein (convenor)
2. Tony van der Weerden
3. Seth Laurenson
4. Sam Carrick
5. Trish Fraser
6. Jim Moir
7. Australian ASSSI member – have asked Lucy Burkitt (was member in 2012 and now at Massey); she is keen but will confirm soon
8. Australian ASSSI member – Reece will follow up with his counterpart

(also, David Houlbrooke in an unofficial, non-member capacity, as a sounding board based on his experience with NZSSS conference in Hamilton 2014)

Proposed conference organisers: OnCue Conferences and Events, Nelson

No contract as yet, but we are on their website under 'upcoming events' and they have already booked the venue for us.

It was moved (Tony) that $10,000 seeding money be approved for the organising committee to spend developing the conference further, seconded (Reece), carried.

Next meeting will be a telephone conference within 1st two weeks of May.
Meeting closed at 2:45 pm.

**********All entries go into the draw to win Central Otago wine**********

New Zealand Soil Science Society Awards 2015

Award	Presented	Nomination Deadline	Eligibility	Conditions
Bert Quin Award	Annual	31 July 2015	Advanced level in PhD study (not yet completed)	Head of the Soil and Earth Science Groups at NZ Universities can nominate one student who is an active member of NZSSS.
The Grange Medal	Bi-annual (conference year)	31 July 2016	Open to non-members, members, fellows, or life members of NZSSS	Any active member of NZSSS can nominate non-members, members, fellows, or life members of NZSSS.
Morice Fieldes Memorial Award	Annual	31 July 2015	PhD thesis submitted within the previous calendar year	Head of the Soil and Earth Science Groups at NZ Universities can nominate one thesis from their group.
Sir Theodore Rigg Award	Annual	31 July 2015	MSc thesis submitted within the previous calendar year	Head of the Soil and Earth Science Groups at New Zealand Universities can nominate one thesis from their group.
Undergrad award	Annual	21 Nov 2015	Best 3rd year student in Soil and Earth Sciences	Head of the Soil and Earth Science Groups from Massey, Lincoln and Waikato Universities should nominate one student.
Leamy award	Bi-annual (conference year)	31 July 2016	Author(s) of most meritorious publications in the last three years	Any active member of NZSSS can nominate active members from Universities, CRIs and other organizations (e.g. Regional Councils).
Blakemore award	Bi-annual (conference year)	31 July 2016	Technician/ support staff	Head of the Soil and Earth Science Groups at NZ Universities, CRIs, and other organizations (e.g. Reg. Councils) can nominate one active member from their group.

Bert Quin Award

1. The award recognises the efforts and present or likely contribution to New Zealand soil science arising from a Doctorate study.
2. Eligibility: - A postgraduate (Ph.D) student working on the properties, productivity or sustainability of New Zealand's soil and land resources who is about to enter their third year of study.
3. The annual award shall be known as the Bert Quin Award and shall carry a stipend of $5000 for one year.
4. Nominations must be received in writing from the Head of Department or Group, or delegated academic staff member with two other signatories by the **31st of July**. Nominations should include a CV and a supporting statement of not more than two pages. Only one nomination will be accepted from each University Department/Group.
5. The award shall be judged by a subcommittee designated by Council.
6. To be eligible, candidates must be either student or full members of the NZSSS and should not be on the academic or technical staff of the department that nominates them.
7. The Award shall be presented or announced at a General Meeting of the Society.

The Grange Medal

The L.I. Grange Medal for Outstanding Service to New Zealand Soil Science
(Short title: The Grange Medal)

Description
The Grange Medal is for outstanding service to New Zealand soil science. It commemorates Dr Leslie I. Grange's extraordinary leadership and service to New Zealand soil science through his pioneering pedology, his far-sighted and constructive administration, and for his pivotal role in helping establish the discipline in New Zealand*. The Grange Medal is normally made every two years to one or two individuals who have made an extraordinary contribution to the promotion or advocacy of soil science (in its broadest sense) including for the following reasons:

- through outstanding use of the media,
- through outstanding administration or management,
- through outstanding publications including outreach/extension and other ('non-academic') material (e.g. development of a DVD or CDR),
- through outstanding advocacy of soil conservation or sustainable land-use practises,
- through outstanding mentoring.

Nominations are open to both non-members of the Society as well as members, fellows, or life members of NZSSS.

*A summary of Grange's career is given in *New Zealand Soil News* 55, p.177-180 (2007)

Postgraduate awards (Morice Fieldes Memorial Award and Sir Theodore Rigg Award)

1. To be eligible for the awards, theses must have been presented for a degree which was awarded by a university council in the calendar year immediately prior to its submission to the Society (for the purposes of these rules, "awarding of the degree" implies approval in the previous year, not necessarily actual conferring of the degree at a graduation ceremony).
2. The awards are open to all degree candidates irrespective of their status as full or part-time postgraduate students or as university or research institute staff members.
3. The awards will be judged by a committee of three persons appointed annually by the Council of the New Zealand Society of Soil Science. The committee shall have the power to seek the opinion of others to help decide whether a thesis is of outstanding merit, provided that opinion is not sought from the supervisors or examiners of the thesis.
4. The committee shall normally recommend one award in each category each year, but in exceptional circumstances the committee may recommend up to two awards in each category.

M.L. Leamy Award

This award commemorates the outstanding ability and contributions to New Zealand Soil Science of Mike Leamy, and is made to the author or authors of the most meritorious New Zealand contribution to soil science, published in the last three years. A single paper, a series of papers on a theme, a scientific paper, a map or a lecture series may qualify a person for the award. The results of joint authorship will be considered where the candidate is senior author and has other eligible publications.
Nominations must be received in writing accompanied by a statement of not more than two pages listing the candidate's achievements and publication(s) etc that are to be considered for the award. Nominations must carry signatures. No self-nominations will be accepted. The candidate and both Nominators must be fully paid members of NZSSS.

L.C. Blakemore Award

This award honours the outstanding ability and contributions to New Zealand Soil Science of Les Blakemore and is awarded to the outstanding New Zealand Soil Science Technician or support staff member of the past two years. Eligibility is open to all aspects of technical and support work that assist soil science, for example analyses, field trials, cartography, computing, data storage and manipulation, archiving etc. Candidates shall have been employed in the field of soil science for at least three years, have shown marked ability in their field of employment and have made a notable contribution to the work of their institution, field team etc.

Nominations must be received in writing accompanied by a statement of not more than two pages detailing the candidate's achievements and worthiness for the award. Nominations must carry signatures. No self-nominations will be accepted. The candidate and both Nominators must be fully paid up members of NZSSS.

Nominations should be sent to:

Dr Haydon Jones
Land and Soil Scientist
Waikato Regional Council
Private Bag 3038
Waikato Mail Centre
Hamilton 3240
New Zealand

Ph:+64 7 859 0569

Fellowship of the New Zealand Society of Soil Science

Fellowship of the Society is an honour conferred for distinction in any or all of the following areas; research, technology, teaching, extension and/or the advancement of soil science. **Nominations close on 31 July each year**.

FELLOWSHIP RULES

Rule 1. Nominees must be active members of the Society at the time of nomination.

Rule 2. Nominations must be made by two Full Members, or Life Members of the Society. Nominations cannot be made by members of the Fellowships Committee of Council.

Rule 3. Nominations for the Fellowship must be submitted to the **NZSSS Secretary by 31 July** each year, and should be accompanied by the following documents:

* Fellowship Nomination Form (available from http://nzsss.science.org.nz/awards.html);
* Three copies of the Fellowship Nomination Summary Form (available from the Secretary);
* Three copies of the nominee's curriculum vitae;
* Three copies of the nomination statement prepared by the nominators of up to 500 words, stating why, in the view of the nominators, the candidate is worthy of becoming a Fellow;
* Where applicable, three copies each of up to five of the nominee's most significant publications or other works.

Rule 4. Fellowship nominations will be judged by the Fellowships Committee of Council, consisting of the President, Vice-President, and Past-President. Fellowships will be endorsed by Council.

Rule 5. Normally up to two Fellowships may be awarded in any one year, except in the first two years when up to a total of twelve Fellowships may be awarded.

Rule 6. Fellowships will be announced at an Annual General Meeting of the Society.

Rule 7. Nominations will remain valid for 2 years.

Rule 8. Fellows will be permitted to use the letters FNZSSS after their name and will receive a certificate.

The Dirt

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

The theme of The Dirt this time is soil:biology, both in terms of things that live in and on the soil and also how the soil can help your own biology. Read on…

Snail Soap and Slug facials

This new 'technology' was broken by the NZ Herald last month. They reported that snail soap is finally available for NZ consumers. Made in Portugal ($25), the soap contains snail slime, virgin olive oil, honey and extracts from medicinal plants –sounds good enough to eat! Apparently snail slime's healing properties were first noticed in Chile, where farmers harvesting snails for the French food market noticed how quickly their cuts healed (from the sharp shells of the snails, no doubt).
Slug or snail facials are exactly what they sound like: a relaxing session of having slimy creatures crawl on your face. There may be something in it; snail slime contains lectins (a type of protein that binds to cell membranes), collagen and elastin and may have may have anti-microbial properties.

(Sources: www.nzherald.co.nz and sciblogs.co.nz; picture from http://www.huffingtonpost.co.uk)

Peat Therapy

Getting back to soil, if the idea of putting slugs and snails on your visage is unappealing, why not give peace a chance, er I mean give PEAT a chance. Not yet on offer in New Zealand, but in Europe warm peat baths have been used for ages to detoxify and alleviate arthritis pain. Just look what it's done for this chap on the left; he looks very good for his age (2000 years!).

(Source:en.wikipedia.org/wiki/Tollund_Man www.peatsociety.org/)

Clay is another traditional material that can be smeared on one's "mug", or entire body for that matter. However, there is actual evidence that some clays have anti-bacterial properties. A suspension of French green clay (smectite + illite) from volcanic ash deposits was found to kill *E. coli* bacteria, even after first heating the clay to 550°C. Additionally, the leachate from this particular type of clay was also just as effective in killing the bacteria. The authors observe that "Although the use of clays in human health has been promoted empirically and traditionally, perhaps since the beginning of mankind, our knowledge of natural mineral impacts on human pathogens is in its infancy."
(Source: Williams, L. B. and Hydel S.E. Int Geol Rev. 2010 Jul 1; 52(7/8): 745–770.)

Waikato/Bay of Plenty

Waikato University

The academic year started with significant increases in some undergraduate class sizes at year-2 and year-3 levels, the consequence of a large cohort of first-year enrolments last year. Lab streams have increased for **Louis Schipper**, **Tanya O'Neill**, and **Janine Ryburn** as a result. **David Lowe** ran his one-day second year field trip twice to cope with a class comprising over 60 students, and his third-year trip was at maximum capacity for three vans (Fig. 1).

Fig. 1. Third-year pedology students at Whakarewarewa land treatment system, Rotorua. Photo: Felicity Leydon-Davis.

"Hamilton has its faults"

On the research front, the big news here has been the identification of a fault, possibly more, extending through Hamilton city. **Vicki Moon** and **Willem de Lange** have been leading this research after discovering – with masterate student **Mel Kleyburg** – two sites with clear evidence of liquefaction caused by seismic activity within the past 20,000 years in volcanogenic alluvium in the Hamilton Basin.

Fig. 2. Willem de Lange alongside the Waikato River near the newly-discovered inferred fault. Photo: Tracey Cooper, University of Waikato.

Fig. 3. Vicki Moon. Photo: Wendy Peel, University of Waikato.

This work has been published (see Kleyburg, M.A., Moon, V.G., Lowe, D.J., Nelson, C.S. 2015. Paleoliquefaction in Late Pleistocene alluvial sediments in Hauraki and Hamilton basins, and implications for paleoseismicity. *Proceedings, 12th Australia New Zealand Conference on Geomechanics* (ANZ 2015), 22-25 February, 2015, Wellington, pp. 524-531). The discovery, together with the chance revelation of small faults within older deposits at a construction site in northern Hamilton, led Vicki and Willem to look for further evidence including geomorphic features, LiDAR imaging, and the locations of hot springs, to map the inferred fault. The fault runs from Temple View and essentially along a sharp bend in the Waikato River at Days Park, and then north to Gordonton (see http://www.stuff.co.nz/waikato-times/news/68159250/scientists-discover-potential-fault-line-under-hamilton.html). The ≤20,000-year liquefaction may or may not be related to the newly discovered fault(s).

The work resulted in a front-page article entitled "Fault line lurks below the city" in the *Waikato Times* (on 2 May 2015) and presentations by Vicki and Willem to Hamilton City Council and Waikato Regional Council staff, which met with mixed reactions, and to School of Science staff at the University soon after. To assess the age and position of the inferred fault, further funding has been sought from EQC and Waikato Regional Council.

Has the Holocene finished?

Elsewhere in this issue of *Soil News* is a request to those sufficiently interested/able to participate in a survey evaluating the possible addition of a new epoch to the Geological Time Scale, namely the Anthropocene. Possibly like me (David Lowe), you sighed inwardly when all this 'Anthropocene' material started seeping into the literature, thinking "What's wrong with 'the Holocene' we have now – it covers the development of human civilisation and impacts, surely since 11,700 years ago?" Anyway, a group of Australian and New Zealand geoscientists, led by marine geoscientist Helen Bostock, have got together and written a summary article about this topic, and it actually proved to be far more interesting than I thought. I had earlier attended a CANQUA meeting in Canada in 2013 and saw a brilliant plenary paper presented by Eric Wolfe, who was extremely clear and persuasive, showing the magnitude of human impacts on key biogeochemical cycles (even in remote areas) now exceeded the influence of the natural systems and are recognisable in the context of geological time. Wolfe advocated that the Anthropocene should be designated as beginning at the so-called 'Great Acceleration', namely c. 1950. Helen went to a meeting in Spain last year and was challenged to write an article specifically from an Australasian perspective to help advise the international committee charged with making a decision in 2016, and so the article has now been completed. Please read it and take part in the survey as described in the article.

Graduate students, other news

Jordan Goodrich has successfully defended his PhD thesis: "Magnitude and controls on the net carbon balance of a New Zealand raised bog", with two papers published so far:

Goodrich, J.P., Campbell, D.I., Roulet, N.T., Clearwater M.J., and Schipper, L.A., 2015. Overriding control of methane flux temporal variability by water table dynamics in a Southern Hemisphere, raised bog. Accepted article online, *Journal of Geophysical Research – Biogeosciences*, 120,DOI: 10.1002/2014JG002844.

Goodrich, J.P., Campbell, D.I., Clearwater M.J., Rutledge, S., and Schipper, L.A., 2015. High vapour pressure deficit constrains GPP and the light response of NEE at a southern hemisphere bog. *Agricultural and Forest Meteorology,* 203: 54-63.

Sheree Balvert has started her PhD with **Louis Schipper** looking at "Identifying natural inhibitors of nitrous oxide emissions". Another new PhD student, **Joss Ratcliffe**, will start work (with **Dave Campbell, Louis Schipper**, and **David Lowe**) on the contemporary and decadal-scale carbon balance of Moanatuatua bog which has been subjected to drainage impacts. Arriving in September, Joss graduated with an MSc from the University of the Highlands and Islands in Scotland (he also has connections to York University), where he worked on the carbon accumulation rates in afforested

peatland, using ITRAX to detect cryptotephras, as age markers. (Cryptotephras, meaning 'hidden' tephras, are glass shard concentrations insufficiently thick to be visible as a layer in the field.)

Congratulations to **Emma Bagley**, **Asaeli Tulagi**, **Olivia Jordan**, and **Melissa Kleyburg**, who have recently submitted their MSc theses, and **James Linehan**, who submitted his BSc(Hons) dissertation, earlier this year. Emma investigated causes of pasture pulling in the central North Island with support from **Gina Lucci** and AgResearch. Asaeli looked into migration of contaminants from sheep-dip sites into neighbouring waterways. Emma is off on her OE and Asaeli is currently working at Waikato Regional Council. Olivia worked on root biomass under range of pasture swards and its implications for soil carbon stocks. Mel worked on paleoliquefaction in the volcanogenic alluvial sediments (Hinuera Formation) in the Hamilton and Hauraki basins as noted above (Fig. 4) (with **David Lowe** and **Cam Nelson** as well as Vicki and Willem) and is now working for AECOM, Hamilton. James undertook a project with **Sharn Hainsworth** (Landcare Research, Hamilton) and David Lowe mapping soils in the southern Hawke's Bay greywacke foothills using a land-system approach and generating valuable new data for S-map (Fig. 5). James is currently pursuing his high-level sporting interests, being a New Zealand hockey representative.

Fig. 4. Melissa Kleyburg, discoverer of paleoliquefaction in the Hinuera Formation, with an engineering rig at Aspin Rd near Cambridge. Photo: Vicki Moon.

Fig. 5. James Linehan in his field area in the southern Hawke's Bay greywacke foothills. Photo: Sharn Hainsworth.

Louis Schipper took a group of students to present their MSc and PhD research findings to staff at DairyNZ: **Mahdiyeh Salmanzadeh** (Cadmium distribution in contrasting soil types); **Jack Pronger** (Are mixed sward pasture systems a solution to improving dry season production?); and **Jasmine Robinson** (Cycling of carbon in pasture soils: response to temperature).

Megan Balks, **Louis Schipper, Dean Sandwell** and **Tanya O'Neill** had a great time at a DairyNZ-led field day for 30 year-13 students who are considering university studies next year, possibly in agricultural sciences. Megan and Tanya introduced students to the beauty of a soil pit, putting the soil story in the context of the landscape development. Louis and Dean demonstrated automatic chambers for measuring CO_2 emissions from soils.

Megan Balks has been working with **Marianne Coleman** (graphics and design student) and **Angela Schipper** to prepare materials for supporting celebration of the International Year of Soils on behalf of the NZSSS (a new website, brochure, and stickers will be launched in the Fieldays at Mystery Creek week). Our thanks to people at the organisations who are making these available through their Mystery Creek stands! Look out for them if you are out at Fieldays.

Landcare Research

Mike Marden (Landcare Research, Gisborne), **Suzanne Lambie** (Landcare Research, Hamilton) and **Chris Phillips** (Landcare Research, Lincoln) have been busy measuring above ground and below ground characteristics of Manuka planted for honey production. The work has been undertaken in conjunction with MPI, Gisborne and Hawkes Bay Regional Councils. Manuka is not only being planted to retire marginal land and sustain land owner income through honey production, but also to mitigate erosion on susceptible land. There has been such a burgeoning interest in Manuka plantations that over 100 people attended a one day seminar held by Hawkes Bay Regional Council followed by a field trip to plantings at Lake Tutira where Mike presented preliminary results on the growth rates of plants established in 2011 and 2012.

Plantings of Manuka at Lake Tutira. Photo: Mike Marden

Mike showing the root development of a Manuka tree planted at Lake Tutira in 2011 at a one day meeting. Photo: Chris Phillips.

Scott Fraser, **Sharn Hainsworth** and **David Palmer** have been working on a joint project between Auckland Council and Waikato Regional Council to provide detailed soil information (S-map) at a scale suitable for land management decisions by farmers and growers in the Pukekohe area. Scott and Sharn have collected field data and elucidating soil-landscape relationships in the Franklin district which will be used by David (along with co-variate layers such as climate, DEM, geology, existing soil maps and radiometric data) to build relationships between co-variates and soil patterns observed in the field. David is also leading a similar project,

to see if digital soil mapping (DSM) techniques can be used to fill in some of the gaps in the S-map coverage of Southland. Scott Fraser and Andre Eger (Landcare Research, Lincoln) have just returned from a two week reconnaissance of the Catlins and Hokonui hills where they made over 700 soil observations. Sam Carrick (Landcare Research, Lincoln) also provided expertise on Southland soils. This Southland project will be at a much coarser scale than the Franklin project and hopes to provide improved soil information at a catchment scale in the Catlin and Hokonui hill country. Sharn, Scott and David are also in the final stages of completing a c. 485,000 ha Digital Soil Map (1:50,000 scale) of the southern half of the Hawke's Bay region.

Paul Mudge and **Norman Mason** have been working with DairyNZ on the Forages for Reduced Nitrogen Leaching (FRNL) experiment at Scott Farm, near Hamilton. The experiment consists of seven forage treatments (including plantain, chicory, and rye grass) and six nitrogen treatments. Paul and Norm, and their field team, have been installing pipes to a depth of 1.6 m in three of the six nitrogen treatments (0, 200 and 500 kg N per hectare per year). The pipes will be used to collect soil moisture data using a Troxler probe down the profile. The data collected will allow them to examine the effect of soil moisture on productivity for each of the species composition treatments at different levels of nitrogen application. Also allow them to test how species composition and nitrogen addition interact to affect total water use and water use efficiency (i.e. dry matter yield/water lost to evapotranspiration). This is a key component in understanding the mechanisms by which pasture composition and nitrogen addition influence pasture dry matter yields, and has the added bonus of being able to test existing water balance models.

In response to a lack of information on the effect of nitrogen-fixing weed species on N cycling, **Norman Mason**, **Suzanne Lambie**, and **Paul Mudge** have been sampling soils under gorse, pasture and forest invading gorse at 20 sites in the Waikato, King Country and Bay of Plenty. The work has been undertaken with the aid of **Bleuenn Adam**, an intern from the Université de Lorraine (France). The data collected will be used to gauge the effect of gorse invading marginal pasture on catchment N-budgets, while also allowing testing if any N-enrichment effect persists once gorse is replaced by native forest. They can then combine this with data on the probability of native regeneration in gorse to assess the long-term consequences of gorse invasion on N budgets. Further, as they are using some of the indicators from the soil quality monitoring programme, they will be able to position gorse stands along the spectrum of N-enrichment/saturation relative to other land uses.

Suzanne Lambie has been working with the Waikato River Authority to restore a large wetland system. The restoration began in May of 2014, and involved the installation of a floating wetland system and planting of the wetland and riparian zones to recreate the swamp-forest system that would have been there originally. Suzanne has recently resampled the soil within the system to determine how the earthwork, stock exclusion and restorative planting altered soil parameters. She has also collected water samples to assess the effectiveness of the floating wetland and the wetland and riparian plantings on water quality.

Suzanne collecting water samples from the area around the floating wetland. Photo: Phillippa Rhodes.

Waikato Regional Council

The big news here is **Peter Singleton** is finishing at Waikato Regional Council and will initially be contracting to Auckland Council, where he will continue working on the Seachange project. In Peter's own words "*After 14 happy and exciting years at council I've decided to answer the call of the wild and head off on another adventure. My last day is Friday 8th. This decision may be a surprise to some of you but I have been contemplating a change in lifestyle for some time and the FFP review provided a unique positive opportunity for it to happen. Hopefully I'll still be around as I intend to spend my time between part time consultancy, the bush and beach and hobbies".*

Matthew Taylor is working on the website presentation of the soil quality information to make it more easily understandable.

Justin Wyatt is organising the installation of soil moisture monitoring at various sites in the region. The intention is to eventually have a regional network providing real time soil moisture data. This data will be available online for use by farmers and also used internally for drought monitoring and forecasting.

Haydon Jones has been kept busy with the leadership of the Environmental Monitoring and Reporting (EMaR) Land project, a national-level project working toward more consistent and integrated regional/national collection and presentation of land and soil data. As part of the scoping work being undertaken by the project team this year, a workshop was recently held at MfE in Wellington to engage with a range of technical specialists around land and soil indicators for regional/national environmental monitoring & reporting.

Reece Hill continues his secondment until the end of June.
He recently represented WRC/NZSSS at the Soil Status Workshop at Teagasc, Johnstown Castle, Ireland. The Soil Status project aims to evaluate the status of soil protection in Ireland and the available research, in order to inform and inspire future policies. The workshop included a session on potential soil monitoring options for future research at national and EU level.

Alice Barnett has finished her secondment with the soils team and returned to her water allocation role.

AgResearch Ruakura

Dave Houlbrooke travelled to Uruguay in late February to undertake a consultancy visit with regards to dairy effluent management within the Uruguayan dairy industry. Land application was not a common practice in Uruguay as effluent is largely discharged to freshwater, often via poorly maintained and sediment rich treatment ponds. Typical dairy farms ranged in size from approx. 50 to 200 cows with a mean land area of 183 ha. The main dairy farming topography was flat to gentle slopes on poorly drained sedimentary soils. The main outcome of his trip was a series of recommendations on how the Uruguayan dairy industry could step through a change to the robust management of dairy effluent using land application. Dave found the Uruguayan hospitality was superb and was treated to a series of impressive cuts of steak and accompanying red wine. Uruguay is famous for producing the now rare Tannet grape which comes as a very full bodied and tannic drop, an ideal accompaniment for their red meat dishes.

Photo (above): An example of the poor soil structure typical of most of the poorly drained clay rich sedimentary soils that dairy farming land use is typically found on in Uruguay.

Jie Li (pictured left) has finished her PhD study with AgResearch, supervised by **Jiafa Luo**. Jie's study was on N_2O emissions associated with farm dairy effluent/manure. Jie has now returned to China for a brief break before she joins the OVERSEER team based in Mongolia.

Meanwhile, the New Zealand-based OVERSEER development team has been busy over the last few months in preparation for the release of OVERSEER 6.2.0. OVERSEER 6.2.0 was released to much fanfare in April and included a significant upgrade to the irrigation module along with a number of other maintenance and bug fixes.

Finally, more research on Waikato farmed peats will commence in July, thanks to a successful Sustainable Farming Fund proposal. This project will be chaired by local Waikato farmer Ian Taylor, and project managed by **Gina Lucci**, in collaboration with Landcare Research (**Scott Fraser** and **Sharn Hainsworth**).

Pastoral 21 associates have been busy with both an annual workshop and a P21 Futures workshop with investors and key scientists within the programme, organised by **Mark Shepherd** and **Alasdair Craig**. The aim was to document the key messages from the research to date and identify potential next steps for any future research programme.

Mark Shepherd is also pleased to announce that a SLMACC project proposal on the Climate mitigation co-benefits arising from freshwater reforms was successful. This proposal also includes collaboration with our colleagues at Scion and Plant & Food.

Lincoln Agritech Ltd

Investigating the subsurface environment and installing shallow groundwater wells has become much less labour-intensive for the team in the Hamilton office (Fig. 1). Our newly acquired hydraulic mast and skid-steer combo has already been brought to good use in Reporoa and in Taranaki (Fig. 2). While purchased for use in relatively soft deposits, the equipment is even capable of coring through some relatively large rocks, as we recently discovered in Taranaki (Fig. 3).

Fig. 1: Hydraulic mast and skid steer loader used for coring and well installations

Fig. 2: Brian Moorhead (right) extracting a core, while Venkat Seshasai (left) looks on.

Fig. 3: Example of a fragment of rock extracted from the corer during investigation at a Taranaki field site.

We also welcome two intern students: **Sai Venkat Naren Seshasai** from ETH in Zürich is supporting the team in various field research projects, while **Maria Elena Orduna Alegria** from Stuttgart University is pursuing a modelling project on catchment-scale water and nitrogen fluxes.

Manawatu/Hawke's Bay

Plant & Food Research – Palmerston North & Hamilton

Brent Clothier, **Roberta Gentile** and **Chris Clark** spent two weeks in Kenya in March working on Plant & Food's NZ Aid project with small-holder avocado farmers. The rains in Kenya come in two seasons: the 'short rainy' season in October-December as the avocados are flowering, and then the 'long rainy' season from March to August as the avocado fill and then get harvested during April-June. Our tree water use and soil moisture monitoring has revealed periods of water stress prior to the arrival of these rainy periods. On this trip we trialled a portable drip irrigation system using 20L plastic bottles to deliver water to the trees. For small trees, this system can supply a moderate fraction of the tree's water use, for bigger trees, it can provide some degree of relief through activating feeder roots in the drip zone. During our visit, Brent also gave a presentation on avocado water use to a group of farmers who are putting in irrigation infrastructure in their district and aim to provide enough water to irrigate 0.5 acre on nearly 300 farms.

In addition to our water work, we have surveyed soil and plant nutrient contents in the main avocado production regions to assess the fertility status of the orchards. This has enabled us to develop recommendations of how to use best the available resources of nutrients that could be applied to the trees. The majority of the small-holder farms are organic, which leaves organic materials such as plant residues, composts and animal manures to replenish the nutrients that are exported from the farms. We are developing nutrient budgets for these avocado trees using yield and fruit nutrient concentration data to provide practical recommendations on the amount of organic material (e.g., shovels of cow manure) needed to sustain soil fertility.

Mr Thomas, a small-holder avocado farmer, with our 'bottle' irrigation system

Brent speaking to members of the Muruguru B Irrigation project about the water use of avocados.

*The team (**Robyn Wells**, **Karin Müller**, **David Hunter**, **Pip Rhodes** and **Kirsty Lyall**) is preparing intact soil cores for the infiltration experiments before incubation of the cores.*

As part of the MBIE-funded project 'Maximising the value of irrigation', a group of scientists from Plant & Food Research and Landcare Research had a few busy days at the end of April collecting intact soil cores from maize plots of FAR's long-term tillage trial close to Tamahere, Waikato. We will explore how different tillage practices affect the occurrence of water repellency and water storage. Starting with the soils at field capacity, soil cores taken from different tillage systems will be progressively dried prior to measuring repellency at a range of soil water deficits. A specific goal is to determine the relationship between soil water content and subcritical repellency for modelling purposes.

Brent Clothier and **Steve Green** had 3 weeks' field work in the United Arab Emirates (UAE). Plant & Food have two large projects in the UAE funded through the Environment Agency – Abu Dhabi (EAD). It was hot during Brent & Steve's visit with temperatures in the mid 40s, although it did cool down to 30C at night!

One of the projects is on optimisation of the use of groundwater for irrigating date palm trees. **Ahmed Al-Muaini** of EAD is doing his PhD through Massey University on this project. During the field work, Ahmed, Steve & Brent instrumented 3 cultivars of dates, across two irrigation salinity treatments. This included heat-pulse measurements of palm tree water use, TDR measurements (in saline soils) of water soil content, soil EC.

The date palm orchard at the International Centre for Biosaline Agriculture (ICBA) in Dubai where we have set-up a cultivar-irrigation salinity interaction experiment.

Steve Green programming the data loggers used to record sap-flow measurements of palm-tree water use and multiplexed arrays of TDR probes (some down to 2 m). The batteries remain fully charged through using solar panels

The other project is on reducing the use of groundwater for irrigation of amenity forests and our experimental set-up is in the western desert of Abu Dhabi. This reduction will be through replacing groundwater takes for irrigation with a supply of treated sewage effluent from municipalities. This project involves **Wafa Al Yamani** of EAD who is doing her PhD on it through Massey University. This project involves 5 species of desert vegetation, and in this first year measurements are focussed on Al Ghaf and Sidr trees. They have been instrumented for sap-flow measurements of transpiration, and arrays of TDR rods have been installed to measure the changing pattern of soil water content and EC.

Brent and Steve return again to the UAE in May to continue with both projects.

The experimental set-up in the Sidr tree plots at Madinat Zayed in the western desert of Abu Dhabi. The irrigation line on the left is for groundwater, and that on the right is with treated sewage effluent.

How does the soil type influence the growth and development of a poplar root system?

SLURI scientists (**Chris Phillips**, **Mike Marden** from Landcare Research, **Grant Douglas** AgResearch and **Ian McIvor** Plant & Food Research) are investigating this question. During April-May 2015 we excavated the root systems of wide-spaced *P. xeuramericana* poplars after either 1 or 2 growing seasons and in three different soils. The soils are a pumice soil at Otoi inland from Wairoa, a sandy loam at Pahiatua and a clay loam at Bideford in the Wairarapa. The trees were planted as 3 m poles to a depth of between 0.7 m and 0.8 m on ~20° slopes. **Fernando de Oliveira** Alari (Brazil, Massey), **Antoine Auvray** (France, PFR) and **Paolo Zuccarini** (Italy, PFR) contributed to the excavations and root measurements. We were fortunate to enjoy fine weather for the excavating and the use of a woolshed at Wairoa for sorting and measuring the root systems while it rained outside. We aimed to keep the root system intact while excavating but this was not always possible. Patience, perseverance and some understanding of the quirks of root behaviour are very helpful.

Excavating on the slope at Otoi (L) and Pahiatua (R). Photos Antoine Auvray

Root system of a 2 yr poplar in pumice soil (L), a 1 yr poplar in clay loam soil (C) and a 2 yr poplar in sandy loam soil. Photos Antoine Auvray.

Mean root length of roots ≥ 1 mm diameter for 2 yr and 1 yr poplar in pumice soil was 69.8 m and 18.76 m; in sandy soil for 2 yr and 1 yr poplar was 12.63 m and 6.07 m; and in clay loam soil for 1 yr poplar was 7.88 m. Mean root mass for 1 yr poplars in pumice, clay loam and sandy loam soil was 26.4 g, 17.7 g and 9.79 g. The data are contributing to the development of a model of slope root reinforcement in relation to erosion control we are collaborating in with Massimiliano Schwartz from Bern University of Applied Sciences, Zollikofen, Switzerland.

Thanks to the three farmers who are hosting this on-farm research project. The project continues for at least another year.

Soil profile to 700 mm for sandy loam (L), and clay loam (C) and partially excavated root system in pumice soil with unidentified boots (R). Photos Antoine Auvray.

The Otoi team Fernando, Antoine, Grant, Mike and Paolo ;

Antoine and Ian (L).
We don't dress up for field work!

AgResearch Grasslands

Global Soil Security Symposium, Texas A&M University, May 19-21, 2015

Dr. **Estelle Dominati** from AgResearch Grasslands was invited to speak at the **Global Soil Security Symposium** which took place at Texas A&M University on the May 19-21, 2015.

The symposium was organised jointly by Texas A & M University (Dr. Cristine Morgan), the University of Sydney (Dr. Alex McBratney, Dr. Damien Field) and the United States Studies Centre (Andrea Koch).

The aim of this symposium was to convene economists, scientists, and politicians from academia, businesses, international organizations, national governments, and non-profit organizations to further develop the concept of soil security, and to work toward assessment and implementation strategies to raise awareness of the issue and meet soil security goals.

The symposium addressed the five dimensions of soil security:

- **Capability** - the intrinsic capacity of a soil to function dependent on inherent soil properties;
- **Condition** - the current state of the soil, including modification by human activities;
- **Capital** - economics of soil's contribution to ecosystem services provision;
- **Connectivity** - the social connection of soil managers and custodians and users of soil and ecosystem services to the soil (and to each other); and
- **Codification** - Policy frameworks: identification of policies that degrade soil security and those that secure soil.

Dr. Dominati presented in the session on Capital and talked about "linking changes in soil natural capital to the performance of ecosystem services delivery to inform investment for resource management".

In order to be able to capture the real impacts of land degradation, land use changes or management practices on soil natural capital and repercussions on land use sustainability and environmental outcomes, any evaluation needs to include the assessment of the whole range of ecosystem services provided by landscapes. Until then the information available to policy makers for decision making remains utterly incomplete.

This paper explored how the 5 dimensions of soil security are linked to the concepts of natural capital and ecosystem services.

Two on-farm examples were used to show how using economic valuation of ecosystem services when added to cost-benefit analysis can inform the suitability and sustainability of different types of investments. The first case study evaluates soil conservation practices in hill country for sheep and beef grazed pastures in the Hawke's Bay region in New Zealand, to show the impacts of an investment in ecological infrastructure on the farming system and ecosystem services delivery. The second case study examines the impacts of an investment in build infrastructure, namely the addition of irrigation to part of a dairy farm in the Manawatu in New Zealand. An ecosystem services approach to the costs and benefits of such investments makes transparent additional long-term benefits to the sustainability of farming systems, which are not currently captured in neo-classical assessments.
Finally, the use of an ecosystem's approach to resource management was discussed regarding the links between land evaluation, ecosystem services delivery and society's desired outcomes, and how it can

be integrated and used on the ground to design multi-functional farm systems which deal with resource management challenges.

The second meeting of the symposium will take place in Paris, France in June 2016; and Oceania will host the third meeting. The presentations from the Global Soil Security Symposium will be published in a Global Soil Security book published by Springer.

A nexus of 7 global challenges

Massey University, Palmerston North

The wet autumn in the Manawatu has seen drainage events from our isolated research plots on the No. 4 Dairy Unit at regular intervals since mid-April. The 'official' April rainfall of ~250mm was a record for the region, and May looks like being not far behind this amount.

The Massey Graduation Ceremonies in May were held in rainy weather, disrupting some of the processions from the Regent Theatre to the Square, but not dampening the enthusiam of the many students and their families in Palmerston North for these momentus occasions.


Isabel Tait

It was most unusual that in these May ceremonies. We did not have any PhD's conferred for the Soil Science discipline. We had one member of staff – Isabel Tait (Junior Research Officer with FLRC) graduating with BAgriSc *(Hons)*. Isabel's thesis was titled '*The Relationship of Skin Thickness, Subcutaneous Traits and Lamb Survival*' and she studied the heritabilities of skin thickness, fat depth and eye muscle depth (EMD). The relationships between these traits and lamb survival eBV were calculated. Skin thickness and fat depth were moderately heritable while EMD was highly heritble. Skin thickness and EMD of the sire had a positive correlation with survival eBV of progeny. Fat depth of the sire was negatively correlated with survival eBV. Isabels supervisors were Professors Hugh Blair and Paul Kenyan and Dr Rebecca Hickson of the Institute of Veterinary, Animal and Biomedical Sciences. Isabel is now on a one year appointment with FLRC during which we are trying to convince her that Soil Science is the way of the future.

Christine Christensen has returned to the fold, albiet part time, following the birth of Max Christensen in November. Christine will be a key member of staff for the delivery of the Advanced Sustainable Nutrient Management courses in 2015 where there are over 100 people enrolled on 4 timelines running throughout the year. Whereas for each of the last two years we have conducted one of the contact courses in Hamilton, this year in September we are due to deliver a contact course in Canterbury and will be including presentations from some of our colleagues on the Lincoln Campus. The popluarity of the Intermediate SNM course is also keeping us busy, with around 200 people likely to complete that course in 2015.

Our loyal Soil & Earth Sciences Secretary – Liza Haahoff recently took some leave to visit her home country to see her mother. This is Liza's report:

Liza Haarhoff's trip to Cape Town South Africa to see her Mum.

My holiday to South Africa didn't get off to a good start, as I was delayed in Dubai for 2 days due to Emirates over booking all their flights. Grrrr…..

Annoyed, and on my own, I took a bus tour of the city. I was surprised to discover that the city seems to be built on sand, and any sign of anything green was artificially constructed on layers of concentric water pipes. If I had been an architecture student I would have probably loved Dubai! I preferred Sunday lunch with Mum (88) at our favourite restaurant by the sea in Hermanus! South Africa is a beautiful country, but plagued by power cuts called `loadshedding'. You can never be sure when you will get your next cup of tea, petrol for your car, money from the ATM, or if the meal you have just ordered will be cooked! I got used to evenings lit by a solar powered lamp, cooking on a portable gas stove, and saving hot water in a flask!

Although very sad to say goodbye to Mum, I was glad to be home back with my family, natural green grass, and of course our wonderful electricity supply!

Canterbury

Lincoln University

Prof. Sven Sommer, from the University of Southern Denmark, has been awarded a GRASS award by the NZAGRC to work at Lincoln. Sven will be at Lincoln for 6 months and working with Prof. **Tim Clough**, Dr **Nimlesh Balaine**, **Neil Smith**, Prof. **Keith Cameron**, and Prof. **Hong Di.** He will study the effects of varying the liquid manure organic matter (OM) content and/or acidification of liquid manure on ammonia and greenhouse gas (GHG) emissions from liquid manure. The hypothesis is that reducing OM in the liquid manure will reduce the amount of substrate available for methanogens and therefore reduce CH_4 emission while acidification will create an environment that will inhibit fermentation and thus CH_4 from stored liquid manure. These treatments may also reduce N_2O production and emission from the liquid manure applied in the field.

Dirk Wallace gave his PhD proposal seminar entitled "Soil amendments to improve water retention and efficiency of shallow stony soils under arable management." Dirk will be supervised by Assoc. Prof. **Peter Almond**, Dr **Sam Carrick**, Dr Steve Thomas (Plant&Food) and Dr Nick Pyke (FAR).

Manjula Premarantne has embarked on his MSc under the supervision of Prof. **Tim Clough** and Prof. **Frank Kelliher** on the topic "Nitrous oxide fluxes and origins in agriculturally impacted drainage".

Congratulations to **Hannah Franklin** who successfully defended here PhD entitled "The Interaction of New Zealand Native Plants with Nitrogen in Canterbury's Agricultural Landscapes" under the supervision of Prof. **Nick Dickinson** and **Brett Robinson**.

Abstract of Hanna Franklin's thesis

Incorporating native plants into agricultural landscapes provides numerous benefits including increased biodiversity, shelter, supplementary stock fodder, production of essential oils or honey, wildlife-corridors, and protection of waterways. However, New Zealand's native species are adapted to low nitrogen (N) environments, in contrast to landscapes where fertilisers and effluents have led to elevated soil N. This research investigated the interaction of selected native species with soil N, and whether the rhizospheres of native species alter nitrate leaching or emissions of nitrous oxide (N_2O). Perennial ryegrass (*Lolium perenne*) was used as a reference. The research project incorporated field studies, glasshouse-based nutrient trials, and a field experiment of *Kunzea robusta* (kānuka) and N_2O fluxes. There was found to be significant inter-species variation in foliar N concentrations and of soil N concentrations in the rhizospheres of native plants. Native species tolerated high N-loading (up to 1600 kg ha^{-1}) but showed a negligible growth response to elevated N. Following effluent application to soil, *K. robusta* reduced N_2O emissions by 80 %. Farm-scale N uptake and reduction in N losses were modelled for different native planting scenarios, showing that uptake of N by ryegrass generally exceeded uptake by native species. Howevere, amongst the native plants, it is shown that monocots assimilate most N and their deeper rhizospheres have more potential to reduce nitrate leaching when planted on the margins of agricultural land. It is also suggested that stands of kānuka used as shelter in farm paddocks could be used to mitigate N_2O emissions from stock urine. These findings provide a first step towards quantifying how targeted planting of native species can contribute to the sustainable management of N

Congratulations to **Pei-Chun (Lisa) Hsu** for the successful completion of her PhD entitled "Determination of Genes Involved in Bacterial Phosphate Solubilisation" Lisa was supervised by Prof. **Leo Condron**, Prof. **Tim Clough**, Dr **Maureen O'Callaghan**, Dr **Carolyn Mander, and Dr Mark Hurst.**

Abstract of Lisa's thesis

Half of the soluble phosphate in fertiliser applied to soil is converted to sparingly-soluble minerals which are unavailable for plant uptake. It has been demonstrated that phosphate solubilising bacteria can utilise sparingly-soluble phosphate minerals in soil, but the mechanisms by which this occur remain unclear. In this project, 105 rhizobacteria were assessed for the ability to solubilise phosphate. In an attempt to identify novel genes involved, the most effective phosphate-solubilising isolates Burkholderia sp. Ha185 was subjected to random transposon mutagenesis. This enabled the identification of two unique gene clusters, hemX gene involved in haem biosynthesis and the translated product of the bxpC gene encodes a novel hypothetical protein with unknown function. Based on a combination of organic anion, qRT-PCR and bioinformatics analysis, it is hypothesised that BxpC is a potential cargo protein involved in protection and transport of the calcium bound 2-ketogluconate compound. Through the use of a Burkholderia sp. Ha185 GFP-tagged strain in conjunction with a gnotobiotic in vivo plant assay developed in this study, the colonisation pattern of Burkholderia sp. Ha185 on ryegrass roots was defined. This research provides a greater understanding of the underlying mechanisms of inorganic phosphate solubilisation in soil-plant systems.

The department welcomes two PhD students from Chile from the Universidad de la Frontera in Temuco. The students will be supervised by Leo Condron. Patricia Poblete Grant will be investigating short-term phosphorus dynamics in the rhizosphere of various plants (also working with Gustavo Boitt and Stu Larsen in the BioProtection Research Centre) and Nicole Alejandra Montalban Torres will be investigating the role and function of nanoparticles in soil phosphorus dynamics.

Congratulations to Assoc. Prof. Peter Almond, who won 1st Place in the Lincoln University Soils Society quiz night on the 7th of May.

Otago/Southland

AgResearch Invermay

Tony van der Weerden and **Alison Rutherford** have been busy in the field, putting down a new nitrous oxide emissions trial. They will be comparing emission factors from cattle urine and farm dairy effluent following deposition/application to a freely drained soil with a range of contrasting initial soil moisture contents. Getting the range of soil moisture contents took some doing, but with a combination of tarps and irrigation (see photo), along with good ol' duct tape, they achieved their goal. Following collection and application of urine and FDE in mid-April, gas and soil measurements were made – these will continue through till late winter/early spring.

Cecile de Klein had a busy few weeks attending conferences and workshops. She gave a presentation, co-authored by Keith Cameron from Lincoln University, at the New Zealand Greenhouse Gas Mitigation conference in Palmerston North, on New Zealand's research on animal and plant interventions to reduce N2O emissions. While in PN, Cecile also attended three NZAGRC project workshops and convened a national workshop on 'N efficiency in pastoral systems'. The N efficiency workshop was initiated by MPI and aimed to map current research on N efficiency and N interventions in pastoral systems and to identify gaps and future opportunities. Following four overview presentations (national, catchment, farm, urine patch scale), eight research organizations presented an overview of their N efficiency work, which was mapped to diagrams of N cycling at the four scales. The attendees then worked in small groups to discuss gaps and opportunities. The workshop was very well received and the intention is that the information gathered will be published, as a booklet and/or as a peer-reviewed paper. Cecile also attended a two-day Methanet/NzOnet workshop in Wellington and gave two presentations entitled: "Improving and building the New Zealand agricultural N_2O emission inventory – progress in the last 15 years" and "Assessment of the N_2O footprint of P21 farmlets". Finally, she attended a 3-day workshop on Bayesian Networks to learn about this probabilistic modelling approach and apply it to an N cycling case study.

The organising committee for the 2016 joint New Zealand and Australian Soil Science Conference met in Lincoln this month. Committee members include **Cecile de Klein (chair)**, **Trish Fraser**, **Seth Laurenson**, **Tony van der Weerden**, **Sam Carrick**, **Jim Moir** and **Lucy Burkitt** along with the professional guidance of Lea and team at On-Cue. The day was spent trashing out ideas on what the theme of the conference would be, themes for sessions, field trips and divvying up all the tasks to be done.

Abstracts

Deriving Seasonally Optimal Nitrogen Fertilisation Rates for a ryegrass Pasture based on APSIM modelling with a refined AgPasture Model

Iris Vogeler, Rogerio Cichota
AgResearch, Grasslands Research Centre, Palmerston North, New Zealand

Abstract
Productive pasture systems require a regular supply of mineral nitrogen (N) to replace the N removed through the export of animal products and other loss pathways such as leaching and emissions. High spatial and temporal variability of both N supply by the soil and demand by the plant means that synchronising these is challenging, and early indicators are lacking. Optimum fertilisation rates for an irrigated ryegrass pasture in Canterbury, New Zealand were determined in a simulation study with 20 fertilisation rates using the Agricultural Production Systems Simulator with a refined version of APSIM's pasture module (AgPasture). Improvements in AgPasture included ideal N concentrations for tissues of different ages (growing, mature, senescent and dead) and allowing N remobilisation to occur from all tissue stages. The critical N concentration curve (the minimum N concentration required to achieve maximum aerial biomass) was tested as an early indicator for guiding N fertilisation, which maximizes plant growth while avoiding unnecessary environmental impacts. Highest pasture yields were achieved with application rates of 20, 30, 140 and 160 kg N/ha for winter, autumn, summer and spring. These rates also minimised simulated N losses. Pasture N contents corresponding to the standing dry matter of the pastures were similar to the critical N curve in summer and spring, but lower critical N concentrations were obtained for autumn and winter. Before the critical N reference curve can be used to guide fertilisation for pastures further experimental studies, model testing and parameterisation are required. It is also possible that season specific critical N curves need to be established for pastures.

Keywords: AgPasture, ryegrass, critical N concentration curve, pasture N concentration, remobilisation

Grass and Forage Science – in print

Your soil is valuable – plant trees to keep it!

***Ian McIvor**[1]
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Abstract

Soil performs four important functions: it is a medium for plant growth; it stores, supplies and purifies water; it is a modifier of the atmosphere; and it houses organisms that decompose organic matter and release mineral nutrients for plant growth.

Soil is a finite resource. We must conserve it for the future. Soils on pastoral hill slopes need tree protection. Particular attributes (ease of establishment, quick growth, extensive lateral root system, response to management, fodder value, deciduous character) of poplars and willows make them very suitable for soil conservation in pastoral hill country.

As a general rule, the bigger the tree, the more soil it protects from slipping. A tree protect more soil when it is close to other trees. Evidence of the effect of trees in reducing slipping on hill sites compared to pasture-only hill sites is given. Evidence that larger trees provide more protection from slipping than smaller trees is also presented

Bigger trees have bigger root systems and protect more soil. The intermeshing of root systems of adjoining trees increases the reinforcement of soil and provides greater resistance to slippage of saturated soil on slopes.

Trees planted for soil conservation should be planted close together, and the spacing increased as the trees grow, by the removal of excess trees.

Conservation trees can be managed so that the loss of pasture through tree shading is minimised. Trees can be pollarded to reduce the canopy size and increase light to pasture. Trees can be pruned so that the shadow is cast further away from the tree allowing more light to the pasture. This also disperses camping stock and animal manure.

In the long term, the loss of pasture production due to the presence of conservation trees is offset by the benefits of erosion reduction, stock shading, shelter and fodder.

Abstract for the FLRC Workshop, 10-12 Feb 2015, Palmerston North, New Zealand

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

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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 0–10 and 10–20 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.

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Preliminary evaluation of three methods for detecting urine patches in the field

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Abstract
We conducted two field experiments to examine the potential of three methods to detect simulated animal urine patches after deposition, by means of soil electrical conductivity (EC) measurements, ammonia (NH_3) volatilisation measurements and soil surface temperature measurements (infrared imaging). All three techniques were successful at distinguishing simulated urine patches from non-patch areas, over varying periods of time post-deposition. Electrical conductivity measurements were effective for at least 7 days, NH_3 volatilisation measurements were effective for at least 3 days, and thermal measurements were effective for up to 140 minutes, under the ambient experimental conditions (soil surface temperatures of ~14°C and soil moisture ~40%). Further experimentation could usefully explore the range of conditions (soil type, pasture cover, moisture and temperature) under which this effectiveness extends. Practical considerations in the application of these approaches will dictate their utility.
Keywords: ammonia volatilisation, electrical conductivity, pasture, soil temperature, urine patch

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Soil total N content influences pasture fertiliser N response

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Soil nitrogen (N) supply, as one aspect of soil fertility, is important in determining the response of pasture to N fertiliser because fertiliser can be used to meet the shortfall between demand by the pasture and soil N supply. A series of sequential research projects have tested the hypothesis that N fertiliser response is negatively related to soil total N (TN) content, used as a surrogate measure of soil N supply.

In a series of glasshouse and national field trials, the variability in the TN in soils alone was able to explain between 30-70% variability in pasture dry matter yield. In spring fertiliser N response trials at Tokanui research farm, significantly more variation in pasture yield was explained by including TN in a linear combination with a scalar of N fertiliser applied in a Mitscherlich model than was by using fertiliser N alone. Consequently, the response to fertiliser N (difference between yield at 200 kg N/ha and nil-N applied) decreased with increasing soil TN concentration, with TN% explaining c. 53% of the variation in fertiliser N response ($P<0.001$); this increased to 72% when all N rates 0, 25, 50, 100 and 200) were included. A further series of national experiments comprising between 4 and 8 N fertiliser response trials per farm property generally indicated that N fertiliser response decreased at higher levels of soil TN, but was of less value comparing *between* farms, presumably due to climatic differences affecting growing conditions.

Combined, this research indicates that use of TN, as a surrogate estimate of soil N supply, can improve the estimate of pasture DM response to applied fertiliser N. Without being able to account for growing conditions, measurement of soil TN concentration probably best serves as a method to rank paddocks across a farm in terms of likely response to fertiliser N, i.e. more as a strategic tool for fertiliser N management and is not a tactical tool. Benefits will be greatest where large differences occur in soil TN across a farm. For comparisons between farms, some account of growing conditions will also be required. Further research is required to continue to develop and evaluate the approach.
Abstract for the FLRC Workshop, 10-12 Feb 2015, Palmerston North, New Zealand

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August 23 – 27 - Wageningen soil conference 2015, Netherlands.
http://www.wageningenur.nl/en/Research-Results/Projects-and-programmes/Wageningen-Soil-Conference.htm

September 1 – 5 - International field course and soil judging contest 2015, Hungary.
http://soiljudging-iys2015.com/

September 7-9
Celebrating Soils 2015 – WA Soils Conference, The Atrium, Mandurah WA
http://www.soilscienceaustralia.com.au/about-us/conference/waconference2015

September 14-18 - 20th International Soil Tillage Research Organization Conference in Nanjing China 2015.
http://istro2015.csp.escience.cn/dct/page/1

September 14-18 - Pedometrics and Soil-Landscape Modelling Conference, University of Cordoba, Spain. Cordoba
https://sites.google.com/site/pedometrics2015/registration-and-abstract-submission

September 21-24 - LuWQ2015 2nd International Interdisciplinary Conference on Land Use and Water Quality: Agricultural Production and the Environment. Vienna Austria
http://web.natur.cuni.cz/luwq2015/

September 20-24 - 5th International Symposium on SOIL ORGANIC MATTER, Göttingen, Germany. www.som2015.org

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http://www.soils.unikiel.de/de/sustain-2015

October 24-28 - International Symposium on Forest Soils 2015 (ISFS2015) Fuzhou, China. The theme of the Symposium is 'Linking Soil Processes to Forest Productivity and Water Protection under Global Change'.
Abstract submission deadline: June 4, 2015. For more details visit http://isfs2015.com/index.asp or contact Zhiqunhuang@fjnu.edu.cn

November 10 -12th November
Groundwater Modelling for Beginners - Auckland NZ
http://www.srit.com.au/course_details.php?id=114

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