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The Ability of Soil to Deliver N Following the Addition of Green Mulch

Introduction

Nitrogen is one of the most abundant elements in nature and a critical plant nutrient. Of the nitrogen present in natural soil-based systems only a small fraction is mineralised and available for plant uptake from the soil solution. The recycling of N through plant systems relies on the return of plant material to the soil. Organic matter is then consumed by soil micro-organisms which temporarily immobilise N. Once micro-organisms decompose, mineral N is returned to the soil solution as ammonia and following nitrification can be taken up by plants.

Soil temperature and moisture are major factors influencing N mineralization rates within soils (Sierra 1997). Most studies investigating the importance of these factors on N mineralization have incubated disturbed soil samples under different temperature and/or soil moisture conditions. The aeration of the disturbed soil during sieving to 2 mm will optimise N mineralization when compared to an undisturbed soil sample. This optimisation allows rapid comparison of N mineralization in contrasting soils.

Under current practice, pruning of both kiwifruit and grape vines occurs throughout the growing season to control vegetative vigour. This green material is dropped on the orchard floor where it is mulched during routine mowing of the vineyard. In general a nutrient budget that quantifies N removed in the harvested fruit helps growers to estimate replacement fertiliser levels to apply each year. However, such budgets neither take into consideration the recycling of N through the soil-plant system nor the ability of various soils to deliver N through natural soil processes.

In this study we selected four contrasting soils, two from kiwifruit orchards and two from wine grape vineyards. To each of these soils green mulch was incorporated and the rate of mineral N delivered following incubation was calculated.

Figure 1. *Emily Morrision - A local high school science student working in the HortResearch Palmerston North laboratory as part of the CREST science extension programme administered by the Royal Society of New Zealand.*

Project Description

Various productive soils from Nelson, Hawkes Bay and the Bay of Plenty were selected for this study. The soils are currently used to grow either kiwifruit (Riwaka soil, Nelson and Pukeroa soil, Bay of Plenty) or wine grapes (Omahu and Moteo soils, Hawkes Bay). Soil C and N content are outlined in Table 1. At each of the four orchard sites approximately 10 kg of soil was collected from the top 15 cm of the soil profile. The soil was sieved to 2 mm and any obvious stones removed. A significant stone fraction was only present in the Omahu stony gravel, part of the 'Gimblett Gravels', now famous for the production of wine grapes in the Hawkes Bay. This soil had 65% of its total volume as stones which contribute a unique 'terroir' to the wines produced in the 'Gimblett Gravels' region. Each of the four sieved soils was divided equally and each half placed in separate sealed 10 kg buckets (approximately 5 kg of soil per bucket, eight buckets in total). To one bucket of each grape soil (Omahu and Moteo soils, Hawkes Bay) approximately 4% by weight of freshly cut and mulched grape prunings was added.

Table 1. Soil carbon and nitrogen contents with and without mulch addition.

Soil	% C	% N	C:N
Nelson Riwaka sandy loam	3.8	0.3	12.25
Riwaka sandy loam (with mulch)	30.2	1.48	20.24
Te Puke Pukeroa sandy loam	4.7	0.4	11.75
Pukeroa sandy loam (with mulch)	26.6	1.35	19.71
Hawkes Bay Omahu gravel	0.63	0.06	10.04
Omahu gravel (with mulch)	0.92	0.09	10.46
Moteo (Poporangi ashy sandy loam)	2.21	0.24	9.35
Moteo (Poporangi ashy sandy loam, with mulch)	2.5	0.25	9.95

Approximately 10% by weight of freshly cut and mulched kiwifruit prunings were added to one bucket of each kiwifruit soil, (Riwaka and Pukeroa soils). Both grape and kiwifruit prunings were cut during the summer so the mulched prunings included leaf, fleshy shoots and lignified shoots. The proportions of each component were not measured.

Following sieving, and mulch addition soil moisture was adjusted to about 80% of field capacity in all soils and the sealed buckets placed at 20 C. Values of soil mineral N and microbial activity were determined for the incubated soils at Day 0, 14, 28, 42, 60 and 120. The optimised mineralisation of N in soils with or without green pruned material added was evaluated. Dehydrogenase test was used to measure soil microbial activity.

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Continued from page 1

The soil micro-organisms responsible for N mineralisation are also influenced by soil moisture and organic matter content.

Results So Far

Soil microbial activity was determined using a dehydrogenase assay which gave a rapid and relative measure of soil microbial activity at different stages during the incubation for the soils tested in this study. Figure 2 illustrates soil microbial activity as indicated by TPF (triphenylformazan) evolution for the kiwifruit and the grape soils. At day zero significant differences, (as indicated by standard error bars on Figure 2) in microbial activity existed between the soils. The Nelson (kiwifruit) and the Moteo (grape) soils show the highest levels of microbial activity. Interestingly, the difference between the two kiwifruit soils was similar to the difference between the Grape soils (about 50 µg/g DM) at day zero. Following incubation, dehydrogenase activity increased in soils with mulch added. This increase may be due to microbial growth being stimulated by the additional food source supplied. Alternatively, the introduction of new micro-organisms on the mulch material increased microbial activity. The increased microbial activity was maintained in the kiwifruit soils up to 120 days at 20 C. The grape soils show a sustained increase in soil microbial activity with mulch addition up to 60 days.

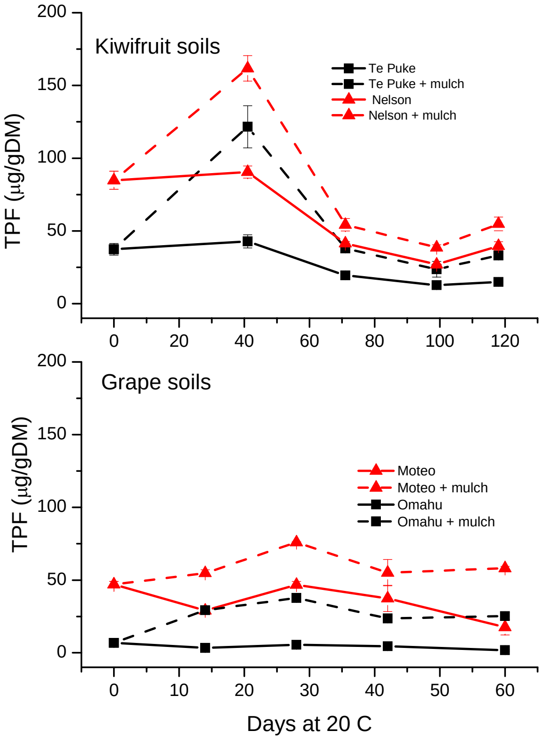

***Figure 2**. Change in soil microbial activity with the addition of compost in typical kiwifruit or grape soils.*

The increase gained is similar between the soils despite differences in the day zero microbial activity level. Peak microbial activity appears to occur between days 30 and 40 in all soils and when the difference in soil microbial activity with or without mulch is greatest. Following the first 40 days, the difference between mulch amended soils and those without mulch is generally reduced but mulch amended soil retains a difference in microbial activity for 120 days at 20 C for kiwifruit soil and 60 days for the grape soil. This prolonged increase in microbial activity will affect mineral N availability.

We expect an increase in soil mineral N following incubation at 20 C and soil moisture at about 80% of field capacity. Figure 3 illustrates the difference in soil mineral N content between the four soils and between soils with or without green mulch added.

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The Report Writer

This WISPAS we honour as our Professional – the Report Writer who enlivens our reading and listening through the innovative use of PowerPoint.

Boring

Recently published in ***Oikos*** 116:723-727 (2007) by Kaj Sand-Jensen.

How to Write Consistently Boring Scientific Literature

Abstract: Although scientists typically insist that their research is very exciting and adventurous when they talk to laymen and prospective students, the allure of this enthusiasm is too often lost in the the predictable, silted structure and language of their scientific publications. I present here, a top-10 list of recommendations for how to write consistently boring publications.

1. Avoid focus
2. Avoid originality and personality
3. Write long contributions
4. Remove implications and speculations
5. Leave out illustrations
6. Omit necessary steps of reasoning
7. Use many abbreviations and terms
8. Suppress humour and flowery language
9. Degrade biology to statistics
10. Quote numerous papers for trivial statements

… as Hell!

"Hell is sitting on a hot rock reading your own scientific publications"

Erik Ursin, Fish biologist,
(cited in Sand-Jensen, 2007)

Continued from page 2

Un-amended soils do show and increase in mineral N following incubation but in three of the four amended soils evaluated the addition of green mulch has resulted in a significant drop in mineral N content. This is an expected result early after green mulch addition as microbial biomass increases under a new food supply (Figure 2) and N is immobilised within this biomass and no longer available as mineral N. Given time the microbes will decompose and the N retained in the microbial biomass will be released and available for plant uptake or may be leached from the root zone. Nitrogen fate following mineralisation depends on seasonal timing and crop stage.

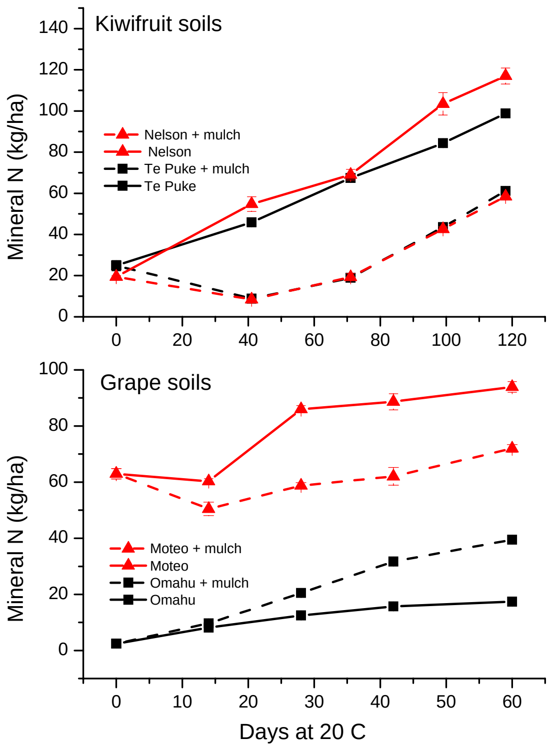

Figure 3*. Changes in soil mineral N concentration with the addition of compost in typical kiwifruit or grape soils.*

In the mulch-amended Omahu soil we see a significant and steady rise in mineral N content over the first 60 days of the incubation. Twice as much mineral N was measured in the mulch-amended soil at 60 days when compared to the un-amended control. This illustrates that in this soil, with low N delivery, green mulch addition quickly supplies N that is potentially available for plant uptake. Alternatively this N may be leached.

Despite the fresh green nature of the grape and kiwifruit material pruned and mulched the C:N ratio was still relatively high at between 25-28. At this level of C the microbial biomass has a high N demand and all of the potentially available N is immobilised in the microbial biomass in soils with a higher initial microbial activity (Mengel and Kirkby, 2003). In the Omahu soil which has low microbial activity the demand for N is less and therefore as the green mulch material begins to decompose it is not immobilised by soil micro-organisms but instead is mineralised.

The Omahu soil is characterised by low organic matter content, a high stone percentage (65%) and poor water holding capacity. Low microbial activity at day zero also indicates an impoverished soil. Microbial activity is generally correlated with soil organic matter content (Table 1). At the time of sample collection in the field, the gravimetric water content of the Omahu soil was less than 3% even after all stones greater than 2 mm were removed.

These dry conditions limit N mineralisation. When the Omahu soil was rewet to 80% field capacity mineral N is released. However microbial activity was not stimulated by increased soil moisture in the un-amended soil (Figure 2) further indicating microbial reliance on organic matter.

The Omahu data contrast with other published results that show only a small fraction, about 6%, of the N incorporated in sugarcane trash is taken up by the next season's crop. Some N is also immobilised within the trash (Meier et al., 2006) but generally the release of N from the incorporated trash is slow even in moist warm conditions where sugarcane is grown.

Incubation of all soils is continuing. We are keen to see when the release of N from the incorporated trash begins in the kiwifruit soils and in the soils from Moteo.

Conclusions

These contrasting soils demonstrate a difference in the ability to deliver N under optimum conditions and also demonstrate the lag phase of N release from fresh mulched prunings. The quality of these soils may be describes as the ability to provide the requirements of the crop. High N delivery encourages high crop vigour which may be detrimental to fruit quality especially for wine grapes. A reduced N supply may be desirable in the Moteo soil as vigour is a problem on this vineyard. On the Omahu soils berry YAN (Yeast Available Nitrogen) levels are generally low and this causes stuck ferments in the winery. The use of green mulch could be beneficial in these easily leached soils as a slow release N source as well as acting to increase soil water holding capacity. As vigour is not a problem on the Omahu soils green mulch would need to be brought in. Kiwifruit are regarded as a vigorous crop with some sever pruning regimes coming into use in the last few years. Mulch incorporation in these soils reduces mineral N concentration initially but may also act to immobilise some N over the longer term. The use of high levels of soluble N fertilisers could be significantly reduced on many kiwifruit soils if the seasonal pattern of N delivery from soils was better understood.

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Tessa Mills, Siva Sivakumaran, Ian McIvor
Sustainable Land Use team, HortResearch, Palmerston North, New Zealand

Celine Repussard
Ecole Nationale d'Ingenieurs des Travaux Agricoles de Clermont-Ferrand, Option Agronomie et Productions Végétales, Site de Marmilhat, BP 35, 63370 Lempdes, France

Emily Morrison
Palmerston North Girls High School, Palmerston North, New Zealand

A Functional Evaluation of Virtual Climate Station Rainfall Data

Introduction

A new dataset of interpolated daily climate data, called Virtual Climate Station (VCS) data, are now available from the National Institute of Water and Atmospheric Research Ltd. (NIWA). Several climate parameters, such as rainfall, air and soil temperature, radiation, and others, are estimated on a daily basis for the whole New Zealand on a 0.05° latitude/longitude grid (approximately 5 km). The daily estimates begin in January 1960 for rainfall (and in January 1972 for most of the other variables) and are automatically updated based on the latest observations every night.

Since simulation models are increasingly being used for both research and policy settings in a wide range of agricultural and environmental issues, these daily climate data might be a very useful tool for such modelling studies. However, the effect of the uncertainty in the climate data estimates on model simulations is an issue that should first be considered. In this article we analyse VCS rainfall data together with some independent rainfall data to identify the effect of the rainfall data source on the model simulations. The objective of this study is therefore to examine the differences in simulated evapotranspiration, drainage and pasture growth when using rainfall data measured or from the VCS network in a pasture simulation model. We also examined the usefulness of a simple bias correction in the interpolated rainfall to increase its agreement with the observed values.

Material and Methods

Observed daily rainfall data from three weather stations operated by HortResearch in Hawkes Bay (spanning from 01/01/2000 to 31/07/2007) and three stations in Canterbury operated by Crop and Food Research (from 01/01/1998 to 31/07/2007) were used as independent data for the comparisons. The data from these sites were contrasted to those obtained from the nearest VCS sites to these stations, and both data sources were used as input into the pasture model. Gaps in the observed data were excluded from the final comparison measures. The model used was EcoMod, a biophysical model designed to simulate pastoral and crop systems of Australia and New Zealand (Johnson et al., 2008). This mechanistic model includes, with a relatively high level of detail, the many processes that take place in soil-water-plant-animal system of pastoral farms. For the comparisons in this study, a cut trial was set up in EcoMod, with the pasture cut to 1 t DM/ha every 21 days. The model's parameters were left at their default values, but sufficient fertiliser was set to avoid N deficiency. All simulations were run using two generic soil types, a sandy soil, with high hydraulic conductivity and low water retention capacity; and a clay loam soil, less permeable and with high water retention capacity.

To compare the rainfall data and the model outputs, two statistical measures were used: the general bias (*GB*), which represents the relative difference between the averages, and the modified index of agreement (d^1) (Legates and McCabe, 1999):

$$d^1 = 1 - \frac{\sum_{i=1}^{n} |P_i - O_i|}{\sum_{i=1}^{n} \left| \left(P_i - \overline{O}\right) + \left(O_i - \overline{O}\right) \right|}$$

where P_i represent the values of rainfall or model output using the VCS data at time *i*, O_i are the values using the observed rainfall data, *n* is the number of data, and $\overline{O}$ is the average of the results using the observed data. The value of d^1 varies between zero and one, similar to R^2, but unlike the later, it can capture proportional deviations and also is less sensitive to extreme values (Legates and McCabe, 1999). The index of agreement was calculated on the daily values and the data aggregated by week and month.

Results

The comparisons of the daily rainfall data from the VCS and the observations showed varying agreement levels at the two regions analysed (Table 1). The general bias of the VCS, as compared to the observed data, is mostly positive for Hawkes Bay, while the opposite is seen for the Canterbury sites. The agreement between the two datasets on a daily basis is also lower for Canterbury. The aggregation of the data into weekly totals resulted in a significant increase to the agreement at these sites, but not for Hawkes Bay. This difference is due to differing recording times. The VCS data are estimates for the 24 hours up to 9:00 am local time, which is the same for the Hawkes Bay data, but the data from Canterbury represents the 24 hours before midnight of every day. For all sites the comparisons of the data aggregated by month did not produce any significant change compared to the weekly aggregation.

Table 1*. Mean rainfall observed at the independent weather stations and from the nearest VCS sites. Also the comparison measures for these sites are shown. HB represents Hawkes Bay and CB represents Canterbury.*

Location	Rainfall (mm year^{-1})		*GB*	d^1	
	Obs.	VCS	(%)	Daily	Weekly
HB - Longlands	602	720	19.6	0.87	0.87
HB - Havelock N.	639	731	14.4	0.88	0.87
HB - Pakowhai	748	736	-1.5	0.91	0.92
CB - Pendarves	732	621	-15.3	0.72	0.81
CB - Kerrytown	529	521	-1.6	0.76	0.89
CB - Guild Rd	609	551	-9.5	0.75	0.85

When the VCS and observed rainfall data were run through EcoMod, the differences in the drainage estimated by the model exhibited a strong correlation with the differences in rainfall, and these differences in drainage were larger for the sandy soil than for the clay loam soil (see example on Figure 1). The evapotranspiration calculated by the model, on the other hand, was much less sensitive to deviations in rainfall, with the total amounts only slightly different whether using observed or VCS rainfall data. When corrected VCS rainfall was used (i.e. the general bias between the VCS data and the observations was removed), the difference in the drainage compared with that calculated from the observed data was significantly reduced, but still the deviations were higher in the sandy soil (Figure 1).

The simulated pasture yield was less affected by the rainfall source than was drainage, but more than the effect on evapotranspiration. Pasture growth based on both the VCS and observed rainfall was significantly lower for the sandy soil, which had smaller water retention capacity, compared to the growth in the clay loam soil. Because there were no nutritional constraints to the plant growth, the differences in pasture growth modelled using the VCS and observed rainfalls over the time, such as monthly averages, were quite small, especially for the clay loam soil (Figure 1). Differences were greater for sandy soils and over the summer period.

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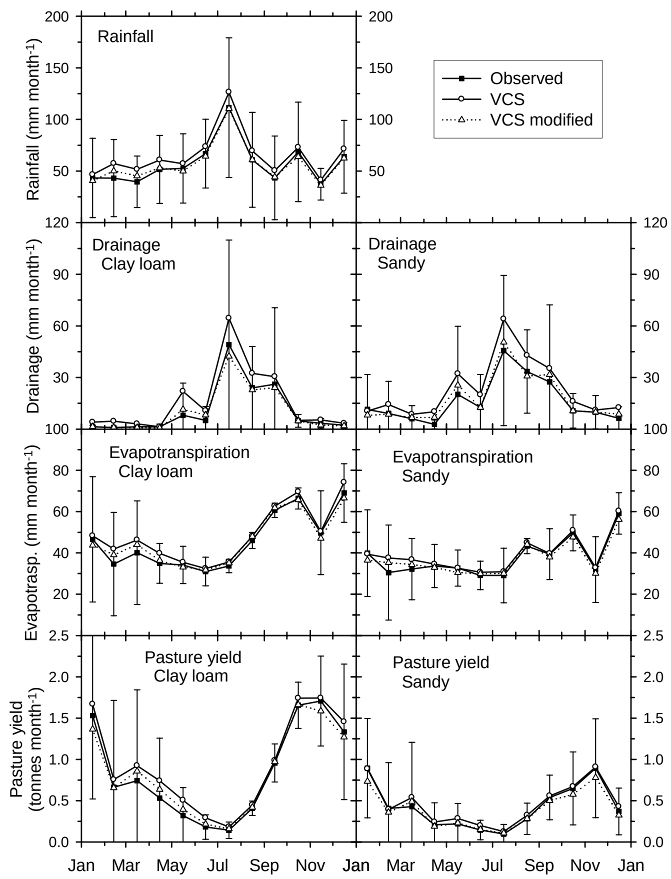

Figure 1. *Monthly averages of rainfall, drainage, evapotranspiration and pasture yield estimations from EcoMod using two generic soil types, sandy and clay loam, and the rainfall data from Hawkes Bay (Havelock North) and the nearest VCS sites. The vertical bars are the standard deviation using the observed rainfall data.*

Summary and Conclusions

Good overall agreement between VCS and measured daily rainfall for the whole of New Zealand has been found (Tait et al., 2006; Tait and Turner, 2005). However, considering the high spatial variability of daily rainfall over the country, it is not surprising that there are deviations between estimated and measured values in some locations. The observed rainfall data from Hawkes Bay (Table 1) presents an example of such high spatial variations, even though the three sites are within 10 km of each other. The knowledge of how differences between interpolated and measured daily rainfall data affect the outputs of models such as EcoMod is important to establish.

It can be seen through the examples shown here, that using estimated or observed rainfall data can affect to different extents the different model outputs. The effect of the bias in the VCS data has a much larger effect on the estimation of drainage than on estimating evapotranspiration or pasture yield. This is because drainage is more directly related to the rainfall amount. Most of this bias is removed if the VCS rainfall is corrected by the general bias to the observed values. Aggregating the data by week also increases the agreement of the comparisons, although much of this improvement is due to slightly different observation times of the datasets used here.

The VCS dataset, which has long-term and temporally-complete daily climate data at a reasonably detailed resolution for all New Zealand, has the potential to be used in a variety of models for the assessment of land use and management practices. The results shown here demonstrate that the use of the interpolated rainfall data for use in agricultural models looks promising. Variations between the VCS and observed rainfall data however, may be amplified in model outputs directly related to rainfall, such as drainage, thus measurement is still the best practice. However, where long-term measurements are not available the VCS rainfall data are a viable substitute, particularly if the interpolated data can be corrected for any bias using locally-measured (perhaps short-term) observations.

Acknowledgement

We wish to thank Dr Steve Green (HortResearch) and Dr Robert Zyskowski (Crop and Food Research) for supplying the measured rainfall data.

Rogerio Cichota and Val O Snow
AgResearch – Grasslands Research Centre, Palmerston North, New Zealand
Email: Rogerio.Cichota@agresearch.co.nz
Val.Snow@agresearch.co.nz

Andrew B Tait
National Institute of Water and Atmospheric Research, Wellington, New Zealand
Email: A.Tait@niwa.co.nz

An Evidence-Based Assessment of the 'Author Pays' Model

Much discussion of author payments as a means to Open Access lacks consideration of evidence on their potential impact on the scholarly journal system. Our recent work perhaps sheds news light on both favourable and unfavourable aspects of this option.

Although only 10 to 20% of scientists in the United States are employed in universities they account for about 75% of articles published. On the other hand, they account for less than 25% of all reading. Our 37 readership studies in industry (e.g., AT&T Bell Labs), government (e.g., National Institutes of Health) and national laboratories (e.g., Oak Ridge National Laboratory) show that the scholarly literature has substantial use, usefulness and value. This diverse nature of science communication communities will clearly affect and be affected by the author payment model.

It is useful to consider the entire science journal system, including its total cost, to provide context for discussion of Open Access. Our most recent estimate of the cost in the United States is about 45 billion in human, system, equipment, facilities and other resources. The largest contributor to this cost is scientists' time (i.e. 10% as authors and 78% as readers). Publishers contribute about 6% of the costs, and libraries and other intermediaries about 5% and new initiatives about 1%. We show that the most change in these costs due to author payment affects not publishers, but libraries and their parent organizations.

http://www.nature.com/nature/focus/accessdebate/26.html

Does Wastewater Application affect Soil Strength?

In recent years, land based treatment of treated municipal wastewater has gained popular support. However, local authorities are becoming increasingly concerned about the potential impacts of such land based treatment schemes. In addition to groundwater contamination by waste derived nutrients, wastewater irrigation has shown to change physical, chemical and biological soil properties. In the long term the loss of soil structure and reduced water infiltration are likely to lead to productivity loss that has to be compensated for through the use of more fertilizer.

Within a collaborative study between Prof. Horn's team from the University of Kiel, Germany and myself we looked at the effect of wastewater irrigation on soil strength and aggregate stability. We also measured the hydraulic conductivity, the water retention curve, the air permeability and hydrophobicity.

Two different sites within New Zealand were selected. The first site was within the Taupo Land Disposal System, at the end of Rakaunui Road, Taupo. The second site was within the Levin Wastewater Treatment Plant. Sites nearby were used as a control. The blocks will be referred to as: TW = Taupo wastewater irrigated, TC = Taupo control, LW = Levin wastewater irrigated, and LC = Levin control.

Soil Strength, Aggregate Stability and Precompression

To quantify the internal soil strength and stability the aggregate stability and the precompression value (PCV) of a soil are often used. The aggregate stability was determined by the wet-sieving method. Aggregates were separated into eight aggregate sizes of >4.75, 2.8, 2.0, 1.0, 0.5, 0.25, 0.09, and 0.053 mm, and the aggregate size distribution was determined. The aggregate stabilities were expressed as a mean weighted aggregate diameter (MWD). The aggregates in all blocks were dominated by macro-aggregates (>0.25 mm), which constituted 77-87% by weight of the soil. The mean weight diameter (MWD), as a measure of the aggregate stability, was at both sites larger in the disposal block than in the control block (see Table). This is likely to be due to the higher total carbon content of the disposal sites.

Table 1. Some physical and chemical characteristics measured for the Taupo and Levin wastewater treatment sites.

Soil Properties	Taupo		Levin	
	TW	TC	LW	LC
pH in (H_2O)	5.89	4.02	5.59	5.34
%C	7.75	5.46	2.9	2.21
MWD [mm]	1.75*	1.38	2.86*	2.16
PCV [kPa]	37	47	35	42

The PCV value shows which loads, or stresses, a soil has been exposed to in the past. Up to this level a soil can be loaded without any irreversible changes in pore system and its functioning. Thus, at that level only elastic soil deformation occurs, and soil aggregates remain intact. However, if the load is larger than the PCV, plastic soil deformation, with changes in the pore system and connectivity, occurs. Thus a soil with a higher PCV can carry heavier loads without soil deformation and a decrease in pore volume compared to a soil with a lower precompression value. During deformation the pore size distribution changes: the fraction of coarse macropores decreases, as they are transformed into smaller pores. This results in a decreased saturated hydraulic conductivity and air permeability.

Time and stress-dependent soil settlement, and the pre-compression stress value (PCV) were determined by the uniaxial confined compression "Multi Step Soil Compression Test" device. Loads of 20, 40, 70, 120, 150, 200, 300 and 400 kPa were applied stepwise, without any stress release between the loads, to the soil samples. Each pressure was applied for two hours, and the changes in settlement were monitored by strain sensors. At the end, the load was released and the measurements continued for one hour.

Figure 1. "Multi Step Soil Compression Test" device at the University of Kiel, Germany.

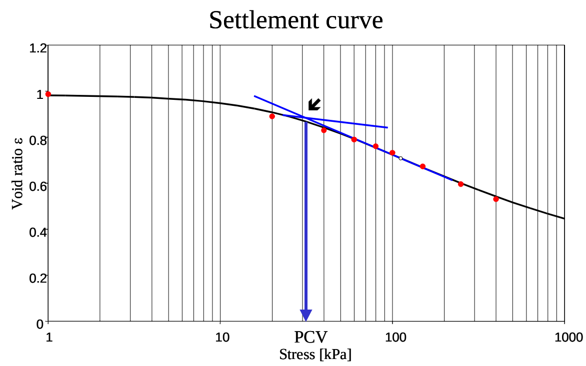

Figure 2. Settlement curve showing the calculation of the precompression value (PCV).

The soil strength can be quantified by the precompression value (PCV), which can be calculated from the settlement curve (see Figure 2).

The average PCVs found for the control blocks are at both sites higher than for the disposal block, although the differences are not statistically different, due to large variations between the six replicates. The lower PCV for wastewater irrigated blocks suggest a slight destruction of the soil structure, due to either wastewater irrigation or other management differences, including stock and cultivation practices. Horn and Fleige (2003) classified the PCV into three groups ranging from 30-60 kPa for loose soil, 60-90 kPa for well settled soil, and 90-120 kPa for dry compacted soil. According to this classification the measured PCV in all blocks indicate loose soil. The higher aggregate stability and OM content of the TW and LW blocks compared to the TC and LC blocks is not reflected in a higher PCV.

I gratefully acknowledge financial support from the Guardian Trust via a Trimble Agricultural Fellowship, and assistance and information from Nicola Church (Taupo District Council), Ken Hale (Horowhenua District Council), Markus Deurer and Tehseen Aslam (HortResearch), and Tom Speir (ESR).

Iris Vogeler
Sustainable Land Use team, HortResearch,
Palmerston North, New Zealand

Computational Methods in Water Resources

The XVII Computational Methods in Water Resources (CMWR 2008) conference will be held from July 6-10, 2008 at the new Westin Market Street Hotel, San Francisco, California, USA, continuing the tradition of 16 previous biennial meetings held in North America and Europe. The conference will be a forum for the dissemination of the latest ideas in the development and application of advanced computational techniques to problems in water resources and related fields, including surface and subsurface hydrology, contaminant remediation, petroleum exploration, carbon sequestration, climate change, and nuclear waste storage. The organizers welcome submissions that either directly involve computations for water resources or present concepts relevant to such computations. The conference will involve four days of regular and special sessions organized to address recurring, emerging, and crosscutting themes in the broader areas of computations and water resources. Several keynote speakers will highlight each of the sessions.

Special Sessions

Jan Hopmans will be chairing a session on root-soil interactions. In addition to regular sessions at the conference, the meeting will include other special sessions, which may be viewed through the website at
http://esd.lbl.gov/CMWR08/special_sessions/index.html.

The Integration of GIS, Remote Sensing, Expert Systems and Adaptive Co-Kriging for Environmental Habitat Modeling of the Highland Haggis using Object-Oriented, Fuzzy-Logic and Neural-Network Techniques

Oleg McNoleg
Brigadoon University of Longitudinal Learning, School of Holistic Information Technology, Noplace, Neverland†
(Received 31 May 1995; accepted 1 November 1995)

Abstract–A report is given on several major breakthroughs in geomatics‡, and their application is demonstration on a particularly difficult habitat modelling exercise. Results show conclusively that these techniques, when applied to GIS related problems, improve the analytical capability in absolute quantitative terms by quite a bit really. Copyright © 1996 Elsevier Science Ltd.

Key Words: Right, Grid-reference, Wrong, Planet.

†Email: oleg@bullshit.no.never
‡No, I don't know what it means either. O. McNoleg

Published in **Computers and Geosciences**
Vol. 22, No. 5, pp 585-588. True!

Heroic Legs?

"I'm a hero with coward's legs.
I'm a hero from the waist up"

Spike Milligan
Puckoon, Chap. 2 (1963)

New Book

On Borrowed Time
Australia's Environmental Crisis and What We Must Do About It
David Lindenmayer

There is no doubt that Australia's environmental problems appear huge and overwhelming. Not only is our unique natural heritage under threat but the consequences for agriculture, tourism and the economy may be catastrophic. Can anything be done to halt the destruction?

In this powerful and passionate book, *On Borrowed Time*, David Lindenmayer argues that Australia does have the knowledge and resources to tackle our environmental problems. In addition, he outlines creative and impressive solutions we can all be a part of. As one of Australia's leading ecologists, Professor Lindenmayer delivers a timely message about the scale and urgency of the crisis we face.

September 2007 CSIRO PUBLISHING/Penguin
Paperback 152 pp Colour illustrations $34.95
ISBN-13: 978 0 143 00696 1
(www.publish.csiro.au)

Book Sales Affected?

Recently, we submitted a book chapter to the Soil Science Society of America on "Infiltration, Hydraulic Conductivity and Preferential Flow". We received, by and large, positive comments from the referees, and the chapter has been accepted.

We did, however, receive one quirky comment in relation to our Figure 4 (which is reproduced below).

Figure 4. *The use of water flux meters in the field.* ***Left:*** *Installation of a water flux meter under potatoes.* ***Right:*** *A water flux meter under pasture. The protruding tubes are for the calibration of the tipping spoon (light-coloured tube) and the extraction of the soil solution (darker tube). Additionally, a CS616 soil moisture sensor (see Chapter 16) was installed to measure the soil's water content.*

One of the referees enquired "… is there another picture not showing Steve's legs, as this might decrease the sales of the book"!

Now, that's being Frank!

Markus Deurer, Brent Clothier, and Steve "Legs" Green
Sustainable Land Use team, HortResearch, Palmerston North, New Zealand

The 2008 New Zealand Trace Elements Group Conference, Hamilton New Zealand, 13-15 February, 2008.

Conference topics will include, but are not restricted to:

· Trace elements in the environment, agriculture and horticulture: from natural geochemical processes to modern anthropogenic impacts.

· Trace elements in human health: essential, non-essential, from intakes and biochemistry to epidemiology.

· Analytical techniques for measuring trace elements: from ensuring analytical accuracy and precision to state-of-the-art instruments.

The following invited speakers will attend:

· Emeritus Professor **Brian Alloway**: Emeritus Professor of Soil Science, University of Reading, UK. Professor Alloway is an internationally renowned expert on trace element chemistry in soils, and author of numerous publications, including reference texts such as: *Heavy Metals in Soils*, *Chemical Principles of Environmental Pollution*, and *Essentials of Medical Geology: Impacts of the Natural Environment on Public Health*.

· Professor **Bill Maher**: Director of the EcoChemistry Laboratory and Professor of Environmental Chemistry at the University of Canberra, Australia. Bill has extensive expertise in environmental and analytical chemistry including trace element speciation chemistry with specialist knowledge in water quality management. Bill was awarded the RACI Analytical medal for sustained excellent national and international contributions to analytical chemistry.

· Professor **Neil Ward:** Chemistry Department, University of Surrey. Neil is an expat New Zealander whose research interests centre on environment, food and biomedical analysis, with a special focus on instrumental method development for analysing samples for total multi-element and metal speciation, including ultra-trace measurements of trace elements in human fluids and tissues in relation to many human disorders.

· Associate Professor **Dave Craw**: Geology Department, University of Otago. Dave is the Chairperson of the Environmental Science Board at Otago with a special interest in relationships between water in the Earth's crust and active geological processes. He runs a PGSF-programme on environmental effects of mining which is currently focusing on heavy metal mobility in historical mine sites and shallow groundwater. In addition to extensive research publications, Dave made significant contributions to the recent book *Metal Contaminants in New Zealand***.**

A field trip to a geothermal area, with a talk about the associated trace element chemistry, will be followed by the Conference Dinner in a traditional Maori cultural environment.

Website at: http://www.tracenz.org

NZTEG Conference 2008 Organising Committee
Peter Robinson (*Hill Laboratories Hamilton*),
Nick Kim and Matthew Taylor (*Environment Waikato*),
Gavin Robinson (*Robinson Scientific*),
Michael Mucalo and Alan Langdon (*NZIC and University of Waikato*)**.**

WHO PRODUCES **WISPAS?**

WISPAS is produced by a team of five, namely the Editor and three Regional Correspondents who cover news and activities from their respective research communities and nearby institutions, plus Cathy Isles who prepares the copy and mails WISPAS out. If you have any material that you think may be suitable for the next issue of WISPAS please contact your nearest Regional Correspondent or the Editor. WISPAS is published by HortResearch.

Editor
Dr B E (Brent) Clothier
Sustainable Land Use Group
HortResearch, Private 11-030, Palmerston North, New Zealand
Phone: +64-6-356-8080, Fax: +64-6-354 6731
Email: bclothier@hortresearch.co.nz

Regional Correspondents
Dr F (Frank) Kelliher
Landcare Research, PO Box 69, Lincoln, New Zealand
Phone: +64-3-325 6700
Email: kelliherf@landcare.cri.nz

Dr G N (Guna) Magesan
ensis - Environment, Private Bag 3020, Rotorua, New Zealand
Phone: +64-7-343-5587
Email: Guna.Magesan@ensisjv.com

Dr G D (Graeme) Buchan
Soil Science Department, PO Box 84, Lincoln University, New Zealand
Phone: +64-3-325-2811
Email: buchan@lincoln.ac.nz

HortResearch

Reign Rain

Neither juggernaut
man
nor crawling thing
with saintliness and ease

can bring
a mountain weeping
to its knees
quicker than rain

that demure leveller
ocean blessed
cloud sent
makers of plains

Hone Tuwhare