



DISCOVERY

April 2008 ISSUE 21

Landcare Research's Carbon Footprinting Goes Global



Taking carboNZero to the world – Mike Tournier (L) and Professor Ann Smith (R)

New Zealand's leading solution for greenhouse gas measurement is taking its expertise to the world.

Landcare Research has signed an exciting partnership with British-based Achilles Information, the leading global provider of supplier management services, to provide the measurement, management and certification steps of the highly successful carboNZero programme to its 30,000 clients in 23 countries.

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Uncertain Times

The global credit squeeze, the unprecedented increase in dairy and oil prices, intense competition for top talent and exponential growth in investment into environmental technologies are a few of the signs that we have entered an era of rapid change and high uncertainty.



Landcare Research is embracing this dynamic operating environment with enthusiasm and some trepidation! It presents big opportunities and threats and also demands a shift in our organisational outlook and culture. We have to learn faster, become more agile and collaborate more effectively. And, more of our research has to be done 'in market' – we do not have the luxury of time to test, for example, all of the possible ramifications of an emissions trading system or more effective ways to quantify all of the impacts of land-use change.

We are now more dependent on models, in spite of their imperfections, to forecast likely outcomes over ecological time frames of 20+ years and provide a practical framework for integrating the biophysical and social sciences with economics. We also need to be more integrated with communities to understand their barriers to change and how we can provide practical information and tools to help them adjust to the new realities of higher energy and food prices and limits to previously apparently abundant natural resources such as land and water.

This edition of *Discovery* highlights some of the ways we have responded to this 'new' reality. We are delighted to have licensed our carboNZero programme to British-based Achilles Information. Carbon management is one of the fastest growing areas of the global economy and although it is barely 12 months since we certified our first firm, Grove Mill, the carboNZero programme has established its credentials as a world-leading product, with high science integrity and alignment with international standards and best practice.

Responding to requests from organisations across a diverse range of sectors – including aviation, food and events – has necessitated in-market development and rapid learning. However, in some cases – parts of the agricultural sector for example – we have had to wait for some of the basic science to catch up, such as the work we are doing on life cycle assessment for kiwifruit. Here we have been careful not to make claims that we can respond to every customer's request within a month or be the cheapest provider or access cheap carbon credits from unauthenticated sources. Our view is that product integrity and brand reputation are even more critical in turbulent times.

Thank you for the positive feedback on our increased focus on safeguarding New Zealand's natural capital. One of the mechanisms for managing natural capital is to create markets for ecosystem services – examples include water (as in Australia), nutrients (for nitrogen in the Taupo catchment), biodiversity (the Victorian bush tender) and carbon (to manage greenhouse gas emissions). Establishing a market puts a price on an otherwise free service and provides a monetary incentive to reduce waste, change management and invest in improvements and innovation. Valuation also identifies beneficiaries of services and provides economic data to direct decision making about investment options.

With our world-leading research on ecosystem processes and function, our ability to adopt a landscape perspective (rather than a single enterprise), and first-class capabilities in environmental and ecological economics, Landcare Research is at the forefront of work to develop market-based instruments and formulate policy for their successful application in New Zealand.

It is another example where the pace of change and clearly unsustainable pressures on some parts of our environment means more of the work will be done in-market than we would normally be comfortable with. I will update you on some of these challenges in the next edition of *Discovery*.

Warren Parker
Chief Executive
Landcare Research

Leading The World

Lincoln-based climate change scientists working with Scottish colleagues have undertaken what is believed to be a world first.

After three years of planning scientists from Landcare Research and the Macauley Institute in Aberdeen, Scotland, have been able to differentiate and measure respiration rates of carbon dioxide between roots and soil in an undisturbed forest system. This has been possible through international collaboration, support from the Marsden Fund, and the use of a new stable-isotope tuneable diode laser absorption spectrometer – the only one of its type in the Southern Hemisphere, which was purchased by Landcare Research last year.

‘It’s taken three years’ planning, but now we have shown we can partition how much carbon respiration comes from the roots and how much comes from the soil in an undisturbed system and we’ve never been able to do that before,’ says Dr David Whitehead. ‘Furthermore, we don’t think anyone else in the world has ever done it before either.’

Dr Whitehead says that while scientists can measure the carbon released from trees into roots, the other significant component is the mass of old carbon (historical carbon) that sits in the soil. As the temperature increases through climate change, scientists expect the respiration rate of the soil to increase.

‘The huge problem is whether that increasing temperature will unlock the large storage of historical carbon in soils. If that happens then it will add more carbon dioxide into the

atmosphere, which will enhance the temperature, leading to a runaway effect in that the concentration of carbon dioxide in the atmosphere will keep on increasing.’

Professor Peter Millard from the Macauley Institute says while scientists have been able to measure carbon dioxide emissions easily, the problem has been in understanding how much of it was carbon simply being breathed in and out of the soil and how much was historical carbon being released from the soil.

‘In the past people who measured soils and attempted to understand the old versus the new carbon had to use a major disturbance to the system to do it, which changes everything. But we’ve taken a fundamentally different approach relying on subtle differences in the carbon isotope composition of roots and soil.’

The stable-isotope tuneable diode laser absorption spectrometer accurately measures the exchange of carbon between vegetation and the atmosphere, using naturally occurring, non-radioactive isotopes of carbon and oxygen as tracers. It provides this information in unprecedented detail and in real-time.

Because the carbon exchange of individual leaves and soil can be measured, as well as the exchange of entire ecosystems, the laser provides significant information on processes at a range of scales. That means the laser will provide more certainty for greenhouse gas accounting.

Dr David Whitehead

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Dr Andy Midwood from the Macauley Institute undertaking field work at Lincoln

Landcare Research's Carbon Footprinting Goes Global

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The deal will see the carboNZero programme licensed to Achilles, with staff seconded to Britain later this year for training.

Landcare Research business manager Mike Tournier says the partnership is an example of a New Zealand organisation 'punching above its weight' by creating value to the New Zealand economy both domestically and through exports of our information technology and Intellectual property.

'This partnership shows that the world is recognising Landcare Research's carboNZero programme as being a leader in carbon accounting schemes at a time when there is generally an absence of quality providers.'

The carboNZero general manager, technical, Professor Ann Smith, agrees.

'For a global organisation like Achilles to come all the way down to the Antipodes and select our programme is testament to the credibility of the programme and the skills of our staff. It also shows a commitment from Achilles to search out the best business solutions for its clients around the world.'

The partnership will initially involve a pilot scheme within the utilities sector and then be rolled out to a wider business spectrum.

The carboNZero programme is an internationally recognised greenhouse gas scheme – commonly referred to as carbon footprinting – for organisations, products, services and events, offering optional mitigation strategies through the provision of credible and verified offsets.

The carboNZero programme is the only New Zealand carbon emissions solution that is based on solid science and able to meet the demands of emission trading schemes, carbon disclosure projects and emerging world-best-practices, the latter being most important to New Zealand exporters.

The carboNZero programme provides robust tools and processes for accurately measuring greenhouse gas emissions or carbon profiles, tracking business performance improvement of these emissions, managing the associated business risk and reduction planning with the highest level of credibility and integrity.

Achilles Group chief executive Colin Maund says those points were a key reason for the company choosing the carboNZero programme.

'Achilles was looking for a credible solution to measuring carbon emissions based on proven academic and scientific research, and that centred on the premise of reducing emissions and developing long-term strategy. In Landcare Research we have found a partner whose values reflect our own, whose services can be replicated across a whole range of industry sectors, and a programme which offers a practical way forward at a reasonable cost to our communities.'

The Achilles Group works to identify, assess and monitor suppliers on behalf of major organisations worldwide. Achilles builds and supports buyer-supplier communities in many industry sectors, creating unique and powerful global networks. Achilles' services for sustainable procurement help create opportunities for business and reduce risk in the supply chain.

Achilles currently operates in the following sectors: Oil and Gas, Utilities, Transport, Public Sector, Pharmaceuticals, Mining, Construction and Information Communications Technology (ICT).

'There has been a lot of interest generated by this programme amongst our customers who want to tackle carbon emissions in the supply chain via the unique Achilles collaborative model. The partnership with Landcare Research will enable us to provide our customers with a credible and robust solution which has already proved to be very successful across a range of industries and communities,' says Frances Darton, Achilles Group programme manager.

Measuring greenhouse gas emissions raises awareness of climate change impacts and identifies opportunities to manage and reduce emissions.

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NZ & UK Researcher Collaboration

The value of international collaboration is acutely apparent.

As a former president of the Hebrew University of Jerusalem, reflecting on how the Middle East conflict had brought about a sharp drop in foreign visitors and affected the quality of the university's research, said: 'An essential ingredient is an exchange of ideas.'

To promote the international exchange of ideas about two key areas of our research – sustainable consumption and low impact urban design and development (LIUDD) – Landcare Research teamed up with the British Council to bring together 10 young UK-based researchers and 10 counterparts from New Zealand.

The scientists and engineers representing eight universities and institutions in the UK and five in New Zealand spent 10 days together in March, discussing research, attending symposiums, and meeting other key people involved in these two critical areas for development.

A three-day retreat in the Canterbury high country spawned 12 ideas for collaborative research, as well as a commitment to develop a website to share relevant information from opposite sides of the globe.

Finally the group discussed some of its ideas with 90 representatives of government agencies, science organisations and the business community at 'Dual Dilemmas', a function held

at 'Homewood', the British High Commissioner's residence in Wellington.

In addition to the research proposals, the participants agreed that a key benefit of the programme was the opportunity to discuss sustainability issues with people beyond their usual 'silos' of expertise.

'I don't think I can do anything without a social scientist anymore!' laments University of Auckland Civil and Environmental Engineering Lecturer Elizabeth Fassman.

'As an engineer, I can build you a wetland to clean up stormwater runoff, but that doesn't mean the community will see it as anything more than a place to discard its shopping trolleys.'

'Just having this opportunity to talk with all these different people from very different disciplines over an extended period of time has been immensely beneficial,' says Landcare Research Sustainability and Society Researcher Helen Fitt.

'I was struck by just how common the issues are between New Zealand and the UK,' says Victoria University researcher Lauren Christie.

'I came here believing things would be completely different, but even though we are all doing different research, the main concerns are essentially the same.'



Face to face dialogue between UK and NZ scientists

Continues from last page

One of the New Zealand leaders for the programme, Landcare Research senior researcher Sarah McLaren is optimistic about the prospects for future collaboration, and appreciates the value of the informal networks that have been created. 'I'm still benefiting from relationships I established as a participant on a programme like this nine years ago.'

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BioBlitz as Popular as Ever

The discovery in the 10 ha reserve of Smith's Bush of at least one species new to science is just one highlight of the recent BioBlitz on Auckland's North Shore.

The yet to be named fungus, a new species of slime mould related to a rare species from South America, was discovered by amateur mycologist Clive Shirley on decayed wood.

'That specimen is likely to become the so-called "type" or name-bearing specimen of the new species. It's neat to know that Smith's Bush will thus become a scientific "type locality", further adding to its value and need for preservation,' says Peter Buchanan, one of the organisers of BioBlitz.

Dr Buchanan says Smith's Bush proved a successful venue because it was highly visible to the public and allowed large numbers of

people to engage with scientists and learn more about different life forms that occur in a city and reserves or remnants of native bush.

'The complexity of a forest is amazing. When we clear forests we think we're taking out just the trees but there's so much in a forest that gets destroyed. Even a remnant forest in a city location is much more valuable than almost anyone realises because it can harbour so many species .. but how do you know that until you do a survey to get a glimpse of that complexity?'

Almost 1,000 species were counted during the 24-hour BioBlitz survey but more importantly the event was a unique opportunity for scientists, students and the public to experience the vast array of biodiversity living in an urban reserve. It is rare for so many different types of biologists to be able to work together in the



Children take the chance to learn about science and their environment

Birgit Rhode

Continues from last page

same place, at the same time and on the same project.

The BioBlitz marquee was staffed by scientists along with their microscopes and computers and there were numerous photographic and interactive displays, field trips and opportunities to talk to scientists.

Dr Buchanan says other highlights include interaction with members of the public and the excitement of the many children who took part in the free event.

'Some of the children get really hooked on what they're seeing and doing. It's neat to see children motivated by something that is totally natural, always around them and is something they can

interact with now as well as for the rest of their life.'

BioBlitz also assists land managers – including local councils - in their ongoing work to protect biodiversity within large urban centres.

'Without reserves like Smiths Bush, cities will lack a huge amount of biodiversity so from the point of view of city and regional councils they will probably understand a great deal more about just how special these sites are once they get an idea of the huge number of species that are present.'

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The Collection – Number of different species found during 24 hours

Algae - 28	Lichens-43
Birds-28	Mammals-4
Conifers-5	Molluscs-7
Dicot plants-153 (<i>flowering plants excluding grasses</i>)	Monocot plants-63 (<i>mainly grasses</i>)
Ferns & fern allies-19	Liverworts & mosses-60
Fish-4	Nematodes-21 (<i>tiny unsegmented roundworms</i>)
Freshwater inverts-35 (<i>shrimps, larvae, and other aquatic animals without backbones</i>)	Other invertebrates-12
Fungi & bacteria-150	Reptiles & amphibians-1
Insects-229	Spiders, mites, other arachnids-84



Budding scientist Fraser Buchanan



Organiser Dr Peter Buchanan (L) with North Shore Mayor Andrew Williams

Global Leadership

Professor Surinder Saggar and Dr Donna Giltrap have been asked to establish, facilitate and lead a proposed global DNDC Network. The DNDC (denitrification-decomposition) model has emerged as a promising route to predict nitrous oxide and methane emissions from cropping, pasture and forestry and the network will enable researchers worldwide to be updated on the application and development of models for agricultural greenhouse gases.

The model enables accurate estimation of nitrous oxide emissions on regional and national scales, using available data on climate, soils, and management practices and has been modified and adapted by Landcare Research for New Zealand grazed pastoral systems. The adapted version (called NZ-DNDC) has been successfully used to simulate nitrous oxide emissions from dairy and sheep-grazed pastures. NZ-DNDC has also been used to simulate soil methane fluxes and the model was recently upscaled to produce nitrous oxide emissions estimates and a map for the Manawatu-Wanganui region.

The model assists countries to undertake efficient accounting of their greenhouse gas emissions and better plan how to reduce them.

Prof Saggar said the network will include a broad range of scientists around the world who are measuring and modeling the soil-atmosphere exchange of greenhouse gases nitrous oxide, methane and carbon dioxide, ammonia volatilisation, denitrification, nitrate leaching, changes in soil carbon status and associated controlling factors.

'By hosting a new website and co-ordinating the network, Landcare Research and New Zealand will be demonstrating its leadership role in agricultural greenhouse gas emissions research. This network will enable New Zealand researchers to be well-connected with international community interested in the application and development of models for agricultural greenhouse gases and provide future opportunities to develop international collaborative research projects.'

The network – jointly funded by Landcare Research and the Ministry of Agriculture and Forestry – is open to all researchers, scientists, Government and private agencies as well as educational institutions interested in farm greenhouse gas emissions.

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Dr Donna Giltrap (L) and Professor Surinder Saggar

Adrian Walcott

Briefs

Prestigious Honour

The Society of Wetland Scientists has selected Dr Peter Johnson as this year's recipient of their International Fellow Award. It follows Dr Johnson's extensive work on wetlands during his career with Landcare Research, and during his post-retirement role as a Research Associate.

A Fresh Start

Minister for Research, Science and Technology Pete Hodgson has announced the creation of Science NZ from the former Association of Crown Research Institutes. It will provide better cooperation and coordination among CRIs and highlight the value of science and technology in creating economic, environmental and social wealth.

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Editor: Tom Fraser
Layout: Cissy Pan
Thanks to: Christine Bezar

Published by: Manaaki Whenua - Landcare Research
PO Box 40, Lincoln 7640, New Zealand
Ph +64 3 321 9999
Fax +64 3 321 9997

ISSN 1175-7329



This newsletter is printed with vegetable inks on 9 Lives Recycled Satin 150 gsm

If you wish to be included on the mailing list for *Discovery*, contact Tom Fraser, Landcare Research, Lincoln (03) 321 9719 frasert@landcareresearch.co.nz
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