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2006 – the environmental “tipping point”?

The year 2006 will likely be remembered as a “tipping point” in the public’s mood, and a call to action for the business sector to respond with environmental stewardship and sustainable development. Many factors have contributed to this shift in outlook: extreme weather; sharp increases in fuel prices; imminent changes to water management policies; the Stern report; Al Gore’s “An Inconvenient Truth”; the dairy industry’s new environmental strategy and the Crown’s climate change policy. Indicators suggest we are approaching the biophysical limits for our natural resources; whether it is the stability of hill country for intensive pastoral production, water for irrigation or the capacity of estuaries to buffer stormwater and sediment runoff. Collectively these factors have caused many to rethink the future with a stronger focus on environmental sustainability and active management of natural capital.

It is satisfying to find forward-looking businesses planning to reduce their environmental risk and “ecological footprint” using cost-effective options such as waste minimisation, fuel-efficient vehicles and energy-saving tools. Others will benefit from their leadership in energy-neutral products, green building design, and premium branding (the New Zealand Wine Company’s award-winning Grove Mill and Sanctuary Wines have now received Landcare Research’s

CarboNZero^{Cert™} environmental certification). There is growing realisation and evidence that caring for the environment need not be an imposition on business or community. Rather, it is an investment that pays dividends through lower long-run costs to society (and firms), improved resource

productivity, new product sales, retention and/or expansion of market share, and improved staff recruitment and retention.

All of this is very encouraging for our staff who have been working at the forefront of sustainable development for more than a decade, as this edition of *Discovery* highlights. For many their research focus on sustainability, as in *Greening the Screen* (page 2) and the CarboNZero^{Cert™} programme, is now being regarded as best practice and sound policy. Although Governor-General Anand Satyanand gave a speech to mark 26 Auckland businesses successfully completing the EnviroSmart® programme (for a profile on one of these businesses, see page 5), much remains to be done to mainstream sustainable development in New Zealand – one need only see our greenhouse gas emissions profile, aging car fleet and rubbish in our streets. We can be heartened by projects such as the Beacon Pathway sustainable housing research consortium, which shows how big gains in healthier, less resource-demanding housing can be made by applying current technology and know-how. Work with raintanks is just one element of our own sustainable housing research.

We hope you enjoy this issue of *Discovery*.

Warren Parker
Chief Executive
Landcare Research



Clay Pan



I Lean, clean and setting the scene – *Greening the Screen* keeps rolling

It's Act III for a unique programme for reducing the environmental impacts of screen productions, as its key writers expand their cast, both within New Zealand and overseas.

Greening the Screen is a practical online toolkit believed to be the first of its kind in the world. Developed by Landcare Research in association with screen industry representatives, it includes guidelines, examples and solutions for improving all aspects of environmental performance in the screen production industry including reducing waste and resource consumption. There are tips on everything from reducing paper use in scripts and the amount of props and wardrobe items thrown away to recycling and energy-efficient lighting (lighting can account for up to 80% of the electricity bill for some productions). "Behind the scenes" measures include choosing environmentally friendly cosmetics, cleaners, suppliers and contractors, non-disposable crockery and cutlery, and reducing fuel consumption.

South Pacific Pictures, makers of *Shortland Street* and various film productions, has successfully piloted *Greening the Screen*, and is now certified with Landcare Research's CarboNZero* programme, which helps businesses measure, manage and mitigate emissions.

Landcare Research's Professor Ann Smith and Emma McConachy provided the impetus for the *Greening the Screen* project. The next stage is to widen the scope so that more screen production companies are participating in the project.

"We aim to sign up 10 more companies over the next year, focusing on post-production facilities and production companies," Emma says. "Also, we surveyed 100 companies and plan to work with about 30 companies who want help to become more environmentally responsible.

"South Pacific Pictures is an industry leader, and other screen production businesses are looking to their success with the programme."

South Pacific Pictures Studio Manager Karen McPherson says *Greening the Screen* has worked extremely well for them.

"Screen industries by nature produce a lot of waste through props and set production, but many think that they are more environmentally friendly than they are. *Greening the Screen* provided a fresh look at every aspect of our business.

"Any industry would benefit from this approach. It has totally saved us money."

The company has decreased recyclable glass, plastic and aluminium sent to landfill by 75%, reduced waste from disposable

paper cups by 50%, and slashed paper consumption by moving to double-sided scripts.

"Also it has been a morale boost for staff, and has provided some practical benefits for them," Karen says. "For example, we divert up to 20 kilograms of food per day to our commercial worm farm. The resulting organic 'Wonderworm' fertiliser is given to staff for free."

Karen says South Pacific Pictures chose to get involved in the programme and with CarboNZero "because we thought it was right, and because we believe that in two or three years most businesses will be forced by the Government to go carbon neutral. We wanted to be a leader, and to set a good example.

"For a year we have been measuring and managing our emissions and



Photo supplied

■ Enough to make you want a cup of tea and a lie down! Just some of the estimated 320 waxed paper coffee cups used each week at South Pacific Pictures, before the *Greening the Screen* project led to their replacement with washable thermal mugs.



mitigating our carbon emissions through regenerating native forest in Landcare Research's EBEX21* programme.

"We hope to screen the CarboNZero logo at the end of *Shortland Street*. We make upwards of 10 productions a year including *NZ Idol* and *Outrageous Fortune* as well as *Shortland Street*, and we aim to make each of these shows carbon neutral also."

South Pacific Pictures has co-produced a show with Fumes TV called *Wa\$ted!* using *Greening the Screen* and CarboNZero. The show takes 10 New Zealand families on a journey to reduce their waste and save money. *Wa\$ted!* will screen on TV3 in 2007.

Greening the Screen is also spreading its wings. Talks are underway with industry representatives in Germany, South Australia and California. Ann Smith has also delivered presentations on the project to a United Nations Environment Programme conference in Germany, to

Film London and the Mayor's Taskforce, and to the BBC.

The first overseas version of *Greening the Screen* is being developed with the Oeko Institut in Germany.

*CarboNZero is a certification mark owned by Landcare Research.

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Diana Leurfkens

■ *Rewriting old scripts – Ann Smith with a hard copy of the Greening the Screen toolkit. Ann and her colleague Emma McConachy are challenging the screen industry to act now to change the way they have always done things.*



■ *A stark message in the Shortland Street photocopy room created by the crew and printed on used scripts. Paper use was equivalent to 7.2 trees per week.*

Photo supplied

I Survey gets first overview of industry's environmental practices

A survey of food and beverage exporters shows that a large proportion have taken one or more measures to address their businesses' environmental impacts, but few are marketing the fact effectively.

In what is believed to be the first survey of its kind in this country, Landcare Research approached over 300 food and beverage businesses, producers and exporters in New Zealand Trade and Enterprise's database to evaluate their environmental management practices and requirements. The 104 respondents represented a response rate of more than 30% from 10 categories of the sector. Nearly half had a turnover greater than \$5 million per year.

Climate change issues and "food miles" are of increasing concern to our overseas markets, and given our distance from these markets, raise specific concerns that our primary exports may face trade barriers in the form of climate taxes. The food and beverage sector is facing particularly strong scrutiny. It generates about 10% of New Zealand's GDP with export sales of more than \$NZ15 billion a year but is our fifth largest energy and emissions generator, accounting for about 5% of our total energy demand and carbon dioxide emissions.

Almost three-quarters of the respondents had implemented at least one practical environmental measure. Sixty-three percent of producers and exporters have joined a recognised New Zealand or overseas environmental scheme or code of practice that would allow them to carry a label recognised and trusted by consumers. Yet only one-third of businesses had procedures to ensure compliance with overseas environmental requirements. The sector's potential to demonstrate its environmental credentials is therefore limited. Overall, only about 15% of respondents use environmental achievements in their marketing strategies.

Also, the survey showed that climate change and water management were not seen as important (only 13% listed it as a key issue).

Landcare Research scientist Cerasela Stancu says the positive perception by the sector of its own impacts and practices is surprising (70% of respondents said their activities have only a minor impact on the environment).

"This may reflect a potentially serious gap in the sector's knowledge of its environmental impacts from 'farm to fork'. There may also be an unwillingness to see impacts as a shared responsibility and collaboratively addressed by all those involved along the chain of food production and export," Cerasela says.

The already ample suite of regulations facing the industry may be a factor.

"Exporters must comply with increasingly complex food safety requirements, including sanitary and phytosanitary measures, product content and labelling, packaging rules, and specific supply chain requirements.

"Because of the stringency of these requirements, there seems to be limited capacity to take on environmental management practices not yet a condition for market access – for example, environmental management systems, eco labelling based on life cycle assessment, and greenhouse gas emissions management."

Landcare Research scientist Professor Ann Smith says New Zealand's export sector has much to gain by being more proactive in anticipating market trends and engaging in best environmental practice.

"While climate change was not specifically identified as a concern, businesses placed distance to market as their second most important challenge after food safety, due to increasing costs of transport and fuel prices.

"This alone makes a compelling business case for New Zealand producers to review their operational practices and improve fuel use, which in turn will save costs and lead to reduced carbon dioxide emissions."

More than 60% of respondents with export-related businesses said they would be likely



Wrapping Grove Mill wines to be loaded for export. The New Zealand Wine Company has redesigned its packaging, which allows them to put 12% more product on containers. The company achieved this through the CarboNZero^{Cert™} certification programme, and uses environmental labelling on its wines.



to take up more sustainable practices if more information on standards and supply chain initiatives was available. The next most important factor that would influence them is evidence of new trends in environmental requirements and their market access implications.

The next step is to follow up the survey by developing resources for exporters to improve their environmental practices

and incorporate environmental credentials, and through this add value to our exports.

The researchers have drawn up a list of practical steps businesses can take to reduce their emissions. They intend to work with interested producers and exporters on case studies that illustrate how improvements in environmental performance can increase export competitiveness. Also, research is

needed to assess how well New Zealand environmental improvement schemes and standards are recognised in international markets.

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I Works Infrastructure – being EnviroSmart®

Works Infrastructure is quite literally building a new road for its future with EnviroSmart, through greater financial and environmental benefits.

The civil engineering company, which has 200 employees at its Mt Wellington site, was part of an EnviroSmart pilot programme run in the Auckland Region and initiated by North Shore City Council. Works Infrastructure achieved Enviro-Mark®NZ Diamond accreditation – the highest possible level. Enviro-Mark NZ is an Internet-based tool for health, safety, and environmental certification, administered by Landcare Research. The EnviroSmart pilot programme, sponsored by city, district and regional councils, is a series of steps extending over two years that supports businesses through the process of certification as far as the Gold level for Enviro-Mark NZ.

Safety, Quality and Environment Manager for Auckland North Nick Watts says among the many changes made using the EnviroSmart programme was the inclusion of recycled material in new road surfaces.

Works Infrastructure installed an asphalt production plant capable of adding recycled asphalt planings into roading aggregate, and after evaluating different percentages, has found up to 25% is optimal. The plant has the added benefit of producing fewer smoke emissions.

“The use of recycled materials is our

future, and ensures consideration for the environment, and sustainability of a diminishing resource base,” Nick says.

“Our involvement with EnviroSmart has also made us focus on how we dispose of waste material. In addition to metal, plastic and paper recycling, Works ensures that items such as redundant batteries from our workshop and the filters from the truck wash are disposed of in an environmentally responsible manner by our contractors.”

Nick says despite the company achieving the top award, the programme still spurs it to continual improvement. “This line of work uses a lot of gas, electricity and water. We will keep managing these resources more efficiently and using Enviro-Mark NZ as a tool to track our performance.

“This certification isn’t just something that goes on the wall and everyone forgets about it. It’s special because it is recognised by district and regional councils

– our clients – and other clients notice it.”

Works Infrastructure is one of 26 businesses that achieved Gold certification in the Auckland pilot EnviroSmart programme. Landcare Research is now contracted by district and regional councils to deliver EnviroSmart at a national level.

www.landcareresearch.co.nz/research/sustain_business/enviromark/enviromark/

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Works Infrastructure’s asphalt production plant at Mt Wellington.

Waging war on emerging diseases

New Zealand is poised on the brink of an “epidemic of epidemics” with, for example, one disease already present having the potential to wipe out our native birds and another to kill iconic kauri. Researchers assessing the risks posed by various plant and animal diseases warn that a shift in focus is needed to pre-empting disease emergence, rather than just responding to it.

Disease emergence is tipped to worsen due to climate change, environmental disturbance through land use change, and global travel. Internationally there is an increasing trend in disease emergence, with sometimes catastrophic impacts on economies, the environment, and human and animal health. Foot and mouth disease in Britain and “bird flu” are two examples.

Landcare Research wildlife epidemiologist (epidemic specialist) Dr Dan Tompkins coordinates a team focusing on three diseases: **avian malaria** (responsible for numerous bird extinctions overseas), **Johne’s disease** (a wasting disease of farmed deer, linked to Crohn’s disease in humans) and **Phytophthora** fungal diseases (linked with the death of diverse tree species around the world).

Avian malaria is largely responsible for the extinction of 90% of Hawai’i’s native birds. If it were to spread in New Zealand, it could do even more harm. Our native birds are regarded as the most extinction prone in the world, having little resistance to new diseases.

In the first study of avian malaria in this country for more than 50 years, a survey has shown the disease to be much more prevalent and widespread than first thought.

Malarial parasites have been found here in the past, but at very low prevalence and in restricted areas. However, the mosquitoes that carry the parasites have rapidly increased their distribution over the last three decades.

Dan and his team used a new approach, a sensitive molecular test, to find out if the parasites were present in likely disease hosts – sparrows and blackbirds – in various North and South island locations.

They found that just over a quarter of more than 400 birds tested had evidence of malarial parasites. There was a clear pattern of decreasing positive results from north to south, which closely matches the known distribution of the carrier mosquito.

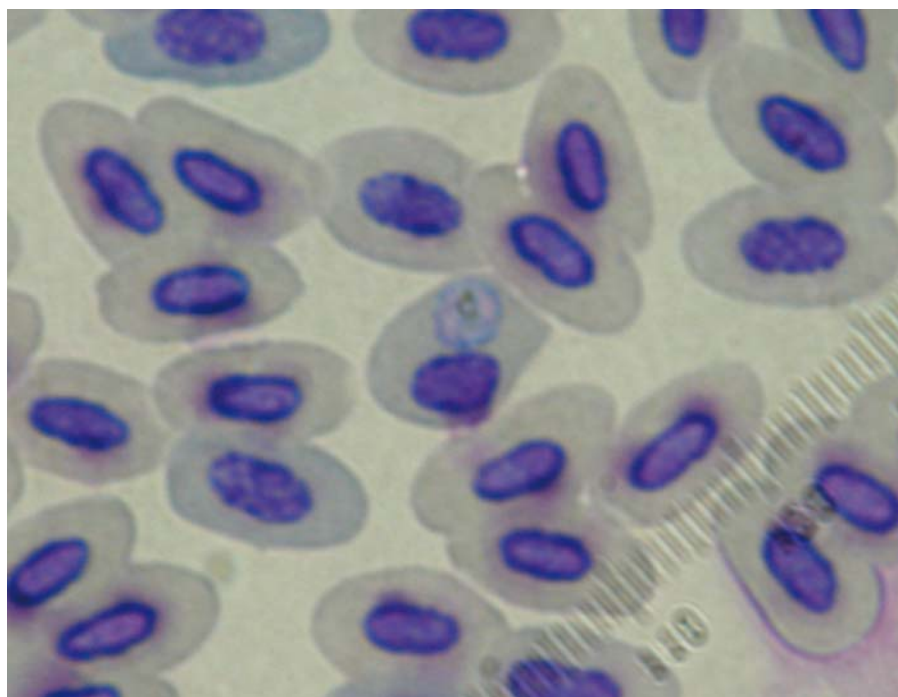
“It is clear avian malaria is becoming firmly established,” Dan says. “We found it in up to half the non-native birds in Northland, Gisborne, and Hamilton.

“It could easily spill over from the ‘reservoir’ hosts, blackbirds and sparrows, into native bird populations. Avian malaria recently

caused more than 60% mortality in captive native birds in Auckland and Christchurch, so we know the results of an outbreak could be devastating.”

The team is now studying female mosquitoes bloated from feeding on blood, “to find out which birds and animals they’ve been biting, and whether the parasite is present in the blood inside the mosquito.”

They then plan to survey further various native bird species to see what level of infection is already present, and the effects the parasite has on individuals. Next to nothing is known about this currently. After this, the team will attempt to predict likely impacts and distribution of avian malaria in New Zealand in the next 50 years.



■ A needle in a haystack: an avian malaria parasite shining blue in a sample of house sparrow blood. Magnification $\times 1000$.

Dan Tompkins

Johne's disease

Johne's disease is an incurable bacterial disease of ruminant animals, and kills up to 20% of newborn deer on some farms. The bacterium causing Johne's disease, *Mycobacterium avium* subsp. *paratuberculosis* (or MAP for short), is implicated as a cause of Crohn's disease in humans. The incidence of Crohn's has been rising in recent years, with more than 800 cases in Christchurch alone.

Landcare Research staff suspected that just as possums act as "spillover" hosts for the related disease bovine Tb (*Mycobacterium bovis*), wild animals might also be spillover hosts for Johne's disease. They recently held the first survey for Johne's, which is proving difficult to eradicate.

A team including Graham Nugent and Jackie Whitford have found that a surprisingly wide range of wild animals play a part in the spread of Johne's disease. Around infected farms they found a high prevalence of infection in scavenging animals (such as cats and hedgehogs). The disease is also likely to have a high incidence in ferrets.

The next step will be to see if wildlife away from infected farms may also be maintaining the presence of Johne's. This will show whether the disease is self-sustaining.

Researchers will also check whether infected wild animals are shedding Johne's bacteria in their faeces onto the ground, which then could be picked up by deer.

Phytophthora – a tongue-twisting cause of tree death

This plant pathogen is threatening key native trees such as kauri, and researchers are developing tools to understand and control it.

Phytophthora fungi attack the leaves, trunks and roots of plants. They are

responsible for many devastating waves of disease worldwide, including the Irish potato blight. *Phytophthora cinnamomi*, a root-attacking species, is degrading large areas of indigenous ecosystems in Australia, where it is listed under legislation as one of a small number of "key threatening processes to Australian biodiversity". In New Zealand it is associated with ill-thrift and death of kauri and other trees, as well as limiting seedling regeneration.

Recent collaborative work by scientists from Landcare Research, ENSIS and HortResearch using modern molecular methods based on DNA have identified a number of previously unrecognised species in New Zealand, including *Phytophthora kernoviae*. This species was found on diseased cherimoya trees and from soil under kauri in Northland. Biosecurity New Zealand, which funded the project, declared it an unwanted organism and is managing a national response to its presence here. Previously it was only known from Cornwall in England, where an eradication programme was initiated.

Another "new" species had been found in the 1970s causing damaging trunk lesions and occasional death of kauri on Great Barrier Island. It was identified at that time as a mainly tropical species, *Phytophthora heveae*. However, the recent DNA work indicates this species is distinct and it has been given the "tag" name *Phytophthora taxon Agathis* (PTA for short). Landcare Research plant pathologist Dr Ross Beever reports that at present PTA is only known from New Zealand and so far only in association with kauri showing trunk lesions and excessive gum bleeding. It is not clear whether or not it is a native species, but in view of its impact on kauri, Ross suggests it may have been accidentally introduced.

Ross's team will focus on the impacts of these various *Phytophthora* species in kauri ecosystems. An initial step will be to define the present distribution of the pathogens. The team will look at the role of PTA in particular, investigating whether increased climatic variability might exacerbate the disease. Such information will allow better prediction of the future impact of these threatening pathogens.



■ Dan Tompkins and Landcare Research technician Rachel Patterson collecting engorged female mosquitoes to see what (in other words, who) they have been eating.

Border control vs pre-emption

Both Ross and Dan stress the importance of pre-emption in dealing with the threat of diseases.

“Much attention has been paid to border control, and stopping incursions such as painted apple moth,” Dan says. “But no matter how effective border control is, there will always be cases where something gets in.

“We need to be aware that consequences of new diseases could be dramatic, and we need to know what systems and management should be in place to prevent or mitigate these threats. Pre-empting threats is much less expensive than dealing with what’s already established.”

Dan notes that Landcare Research is working on just a small range of high-

priority diseases that may pose a problem – there are of course, many others. He says New Zealand needs a general framework for dealing with these risks from disease-causing viruses, bacteria, fungi and parasites.

“In the meantime, our work will help us make informed decisions on whether control of invasive mosquitos is required to prevent bird declines, whether the control of wildlife is required to contain the increase of Johne’s disease in livestock, and whether phytoplasma plant diseases can feasibly be contained.”

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Ross Beever

Inspecting a kauri trunk showing excessive gum bleeding associated with PTA, an undescribed species of Phytophthora.

“Oi” commands attention

A blend of innovative science and traditional knowledge (mātauranga) is helping Hauraki Māori examine the state of a highly prized seabird.

Pterodroma macroptera gouldi is variously known as the grey-faced petrel, and by its onomatopoeic Māori name “oi”, inspired by the bird’s main flight call, “o-hi”. The oi is also called the Northern muttonbird (the tītī, found in Southland, is its counterpart).

The customary take of plump oi chicks from the rugged Aldermen Islands off the Coromandel Peninsula’s east coast is one of few remaining seabird harvests in New Zealand. Hauraki Māori gifted the islands to the Crown in 1968 on the condition they could continue to harvest oi. The harvest is small, but of great cultural significance.

Hauraki want to evaluate the state of oi

populations and various impacts on the birds, to obtain estimates for a sustainable harvest. Along with Landcare Research, NIWA and the Ministry of Fisheries, they have embarked on “Mauriora ki ngā Oi” (the life-force of the oi), a journey into the lives of the birds, which can live for more than 16 years.

Researchers will examine how fisheries by-catch, oceanic and atmospheric events, and harvest will affect oi populations. Hauraki and Landcare Research scientists will blend Hauraki mātauranga with up-to-the-minute research methods to assess any changes in the oi population over time, and the reason for those changes. They will also record traditional systems for harvest and island management.

Landcare Research ecologist Dr Phil Lyver (Ngāti Toarangatira) says the Aldermen Islands probably host 30,000–40,000 breeding pairs of oi, based on previous estimates. Staff will be leg-banding birds to determine the survival rate of breeding adults, population abundance, age to first reproduction, immigration and emigration rates, and so on.

“Typical of working with seabirds we expect our hands will get a hard time as oi have hooked beaks to help them grapple with prey such as squid, and sharp claws for digging burrows. They also have a nasty habit of throwing up when handled, but these regurgitations will be useful to identify what the birds are eating.



Graeme Taylor, Department of Conservation

■ The grey-faced petrel (oi) chick (left), and adult. The chick is at its plump, edible stage, and at up to 900 grams can be bigger than the adult, and too heavy to fly. Chicks emerge from their burrows at night late in the breeding season and sit flapping their wings to strengthen their flight muscles.

“You can’t help but be impressed by these seabirds, the huge distances they travel, the conditions they fly in, and their night foraging skills.”

Another essential research aid is a burrowscope – in this case, the intriguingly named “Peeper 2000”.

“This is an infrared camera on a flexible probe, which we use to inspect burrows to monitor egg and chick occupancy through the breeding season and determine fledging success,” Phil says. “Over time we’ll record burrow density to indicate trends in the size of the breeding population.”

“We’ll also deploy satellite transmitters and other equipment to determine foraging range and behaviour, and to monitor what breeding birds are eating.

“Working with NIWA, we’ll examine what oceanic and climatic events oi might be encountering over the course of a breeding and non-breeding season.

“We’ll also record aspects of the harvest each season, and use MFish records to assess the oi by-catch in commercial fisheries.”

As well as providing a crucial national record on oi, the study will exemplify

nationally significant research contributing to sustainable management under the collective authority of iwi and the Department of Conservation.

“It will also enable iwi and the Crown to consider, and possibly support, the re-establishment of other customary use practices around New Zealand,” Phil says.

Funding: FRST (Foundation for Research, Science and Technology), Ngā Pae o te Māramatanga

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Photo supplied

■ Inaugural “Mauriora ki ngā Oi” hui between the Aldermen Islands Trust, Aldermen Islands Working Group, Landcare Research, Department of Conservation, NIWA, and Ministry of Fisheries at Te Pai O Hauraki Marae, Paeroa, August 2005.



■ The Aldermen Islands

Photo supplied

I Precision techniques promise payoffs for our paddocks

Farmers seeking ways to improve productivity while using less water and fertiliser will benefit from the adaptation of precision agricultural techniques for New Zealand farmland.

Irrigation accounts for nearly 80% of the nation's freshwater allocations. Irrigated land area has roughly doubled every decade since the 1960s, and supports growth in agricultural production at four times the rate of the total economy. Farmers in dry areas such as Canterbury are struggling to get new irrigation water consents. Also, use of the nitrogen fertiliser, urea, soared by 160% between 1994 and 2002.

As land-users increasingly face a future with restrictions on water and nitrogen use, Landcare Research soil scientist Carolyn Hedley and her colleagues are looking for ways to use these resources more efficiently. "Precision agriculture uses global positioning systems (GPS), sensors and computers. It helps assess variability within paddocks so that farmers can apply water, fertiliser and sprays where needed, when needed and at the amount needed."

Auto-steer tractors were discussed at a recent workshop on precision agriculture and sustainable soil and land management, co-hosted by Landcare Research and Massey University. These tractors minimise overlap or gaps during farm operations, such as spreading fertiliser. GPS-surveyed paddock boundaries provide the farmer with highly accurate paddock sizes so that amounts of fertiliser, seed and sprays can be estimated accurately. Farmers are commonly finding savings of 5–10% on their fertiliser budgets, which nationally equates to \$30–60 million annually.

Also of benefit to farmers will be a rapid soil mapping system currently being developed in collaboration with the New Zealand Centre for Precision Agriculture based at Massey University.

The system consists of an electromagnetic induction sensor, GPS and field-computer, attached to an ATV bike. It maps electrical conductivity, which, in non-saline soils, changes according to texture and water content.

This equipment has also been developed to map soil water-holding capacity. Knowledge of how this varies enables a farmer to determine which zones require more frequent irrigation, and which can retain water and therefore require irrigation less frequently.

"A farmer will typically apply a blanket amount of irrigation; say 50 mm every 10 days," says Carolyn. "This equates to 500 cubic metres of water per hectare, or about the volume of a typical 25-metre public swimming pool. Effective use of this water is highly desirable.

"It's all about keeping water feeding the actively growing roots, rather than losing it as drainage. As competition increases for irrigation consents, users may have to prove they will use water effectively and with minimum waste. Precision agriculture can give them an edge."

Currently the research team is also looking at other types of sensors to collect additional information. Measurements of reflected light energy from soils are being analysed to see if they can provide information on soil moisture and organic matter content. If a link is found, then the instrument can be calibrated to map these soil properties in the field.

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■ Carolyn Hedley testing a smart sensor to measure reflected light energy from soil.

I Raintanks – a way out of Auckland’s water worries?

A possible new solution to Auckland homeowners’ water woes is one familiar from many of our childhoods. Researchers looking at potential alternative water supply systems for New Zealand’s fastest-growing city have found one that really does “hold water” – the humble concrete raintank. Raintanks are also projected to save residents money.

Auckland has 34% of New Zealand’s population, and increasing demand is putting pressure on its limited water supply and ageing pipe works. Concern for conserving water, protecting water quality and reducing the demands on the network is spurring efforts to find more sustainable alternatives to piped water supply.

As their name implies, raintanks store rain water for household use. But can they store enough? Landcare Research scientist Dr Nalanie Mithraratne used computer simulations to compare the performance of traditional piped water supply and residential raintanks made of plastic and concrete over 100 years, a period considered to be the useful life of a New Zealand house.

Water consumption by the more than 126,000 homes in Auckland city is nearly 134,000 m³ per day. Nalanie calculated that raintank systems could collect enough for 42–56% of current household water use.

“My calculations are based on the amount of rainfall and number of rain days. However, only 80–90% of rainfall can ever be collected.” The amount collected per household depends on the size of the tank and the roof area. Raintanks would not be suitable for high density housing, but on the whole, roof area of new houses is trending upwards, with the average new house size increasing by 25% since 1970.

This means that raintanks could store sufficient amounts of water to be useful.

“Studies have shown that charging for water based on metering reduces consumption by up to 50%,” Nalanie says. “But a more appealing thought to most people is the fact that simple low-tech measures such as low-flow shower heads, flow restrictors, dual-flush cisterns and efficient washing machines can also reduce water consumption by half. These efficiencies can make raintank use sustainable without any change in behaviour required by homeowners.

“Raintank water can be used for any household purpose, and if boiled for one minute, is safe for drinking, according to the Ministry of Health.”

Nalanie compared the cost of plastic and concrete raintanks to the cost of reticulated supply, and the raintanks reigned supreme – in the end.

“The plastic and concrete tanks were initially 125% and 61% more expensive respectively, at about \$6,100 and \$4,350 per house respectively. However, with the annual charges for mains supply and cost of pumping for a tank system considered, the costs are roughly equal at the end of the seventh year. By the end of their useful life, the plastic and concrete tanks are both almost 50% cheaper than reticulated supply with current consumption levels.”

As well as studying whether raintanks held enough water to be beneficial, Nalanie compared the energy use and carbon dioxide emissions for reticulated supply, plastic raintanks and concrete raintanks. She found that concrete raintanks beat

reticulated supply, but reticulated supply beat plastic tanks.

“The town water supply uses more energy because to generate potable water it requires chemical treatment, and must be transported considerable distances. Raintanks require small pumps, but not nearly as much intervention as the reticulated supply.

“Rain harvesting systems currently on the market using a concrete raintank could reduce energy use by 14% and CO₂ emissions by 16%.



■ Nalanie Mithraratne has calculated that raintanks could supply half the water needs of a household.



“Overall, the benefit to Auckland from using concrete tanks for harvesting rainwater could be significant in terms of environmental performance.”

Nalanie’s work takes a different tack to most other sustainability research. There have been many studies on sustainable *buildings*, but not on the infrastructure needed to run these buildings, and whether that could be made more sustainable. Nalanie’s future work will look at other infrastructure services including electricity and drainage.

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Robert Vale

■ A plastic raintank (left, behind shed) and concrete raintank serve houses on Waiheke Island.

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