

THE ECONOMY & THE ENVIRONMENT



ANNUAL REPORT **09**
PART ONE



Landcare Research
Manaaki Whenua

Landcare Research New Zealand Limited
(Manaaki Whenua)
Annual Report 2009

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ANNUAL REPORT 2009

This year's report is presented in two parts. Part 2 should be read in conjunction with Part 1, 'The economy & the environment'. Detailed information about our research, operational activities and impacts, and governance is available on our website.

www.landcareresearch.co.nz

KEY HIGHLIGHTS

Forest cover post-1989 is sufficient to meet
New Zealand's first

KYOTO obligations pg 10

AGRICULTURAL INTENSIFICATION has led to the
highest rate of NATIVE VEGETATION LOSS
since european colonisation pg 12

NEAR ERADICATION of possums at landscape scale
through step change in pest management pg 13

Mapping farm impacts on NITRATES in
GROUNDWATER & waterways in Canterbury pg 14

WATER QUALITY correlated to area
of catchment in native forest pg 14

Production efficiencies could
save the KIWIFRUIT INDUSTRY **\$17m/yr** pg 16

Internationally-recognised CARBONZERO
programme is managing **5.57m** tonnes CO₂
globally pg 18

SIRTRACK wins awards for its hi-tech design-led
export business pg 19

Biocontrol of weeds exemplifies BEST
PRACTICE in partnering with end-users pg 21

\$1.4m Net profit after tax
exceeds target of \$0.3m pg 26

LANDCARE RESEARCH AT A GLANCE



The Pearce building, our registered company office at Lincoln.

CORE PURPOSE:

To undertake research and development to protect and enhance New Zealand land environments and enable their sustainable use in economic development.

Our research is strongly aligned to and supports government policy, and reflects client and end-user priorities. Many of our science teams are recognised internationally for their expertise and research capability.

VISION:

Innovative science for a sustainable future

VALUES:

Collaboration, curiosity and clarity

SCIENTIFIC FOCUS:

- > Understanding the environmental and land use factors affecting greenhouse gas emissions, developing reduction and mitigation technologies, and working with policymakers, landowners, business and conservation managers to adapt to climate change.
- > Identifying, protecting and restoring New Zealand's indigenous flora and fauna to ensure their long-term resilience within both managed and natural ecosystems.
- > Reducing the impact and cost of weeds, pests and disease in productive and natural environments, and enabling international trade and the safe introduction of new materials.
- > Managing soils, landscapes and water resources at local, regional and national scales to provide economic opportunities balanced with social and environmental well-being.
- > Creating market advantage for businesses by reducing environmental impacts and optimising operations, and promoting new urban development strategies to enhance quality of life.
- > Supporting Māori enterprise in developing future economic opportunities from land and associated natural resources while respecting traditional values associated with land, water and communities.

OUR MĀORI NAME MEANS TO CARE FOR THE
MANAAKI LAND IN ALL SENSES.
MĀORI ARE TANGATA
WHENUA: WHENUA, THE INDIGENOUS
PEOPLE, WITH WHOM WE
CONSULT AND WORK ALONGSIDE.

MANAAKI WHENUA – MANAAKI TANGATA
(CARE FOR THE LAND – CARE FOR THE PEOPLE)

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CHAIR & CHIEF EXECUTIVE'S REPORT



Chief Executive Warren Parker and Chair Jo Brosnahan.

New Zealand's natural environment is at the heart of its social and economic well-being. The international competitiveness of our primary industries and the tourism sector, in particular, is critically dependent on the resources and services (natural capital) that our natural ecosystems provide. To maintain economic options for present and future generations, and retain the high quality of life that we all enjoy, New Zealand must achieve economic growth with good environmental stewardship.

Addressing this challenge aligns with Landcare Research's core purpose: to undertake research and development to protect and enhance New Zealand land environments and enable their sustainable use with economic development. Our expertise in multidisciplinary research enables us to play a key role in providing solutions to complex, multi-faceted issues such as land use intensification, water quality, climate change and control of invasive species. We are conscious of the need to demonstrate that even in tough economic times it is prudent to manage natural capital as well as financial capital.

To this end, we are working closely with our customers to identify and facilitate the uptake of opportunities to improve financial performance and market advantage through better environmental management.

FINANCIAL PERFORMANCE

Strong relationships with both our public and business sector customers underpinned a successful financial year. Our net profit after tax of \$1.4m exceeded the target of \$0.3m and equated to a return on equity (ROE) of 5.3%. Revenue of \$60.5m was recognised during the year (\$56.2m 2008). The 16% increase in non-FRST/MoRST revenues was especially pleasing given the current financial environment. Operating cashflows at \$8.9m (\$4.3m 2008) reflect a high level of activity during the year.



**NEW ZEALAND'S
NATURAL
ENVIRONMENT
IS AT THE HEART
OF ITS SOCIAL AND
ECONOMIC
WELL-BEING**



NET PROFIT AFTER TAX OF \$1.4M *EXCEEDED TARGET* OF \$0.3M
\$60.5M REVENUE RECOGNISED DURING THE YEAR
16% INCREASE IN NON-FRST/MoRST REVENUES
BACKBONE FUNDING OF \$1.8M FOR DATABASES AND COLLECTIONS
8.2% *INCREASE IN FUNDING FOR OUR OBI PROGRAMMES*

NATIONAL DATABASES & COLLECTIONS

We were also pleased to receive inaugural backbone funding of \$1.8m dedicated to the seven nationally significant databases and collections that we manage. They are used extensively to support New Zealand's biosecurity, biodiversity, export/import trade, and land management. We are committed to increasing the value of these national assets for both public and private benefit. The high-speed KAREN network, which our five main sites are now connected to, is an important component in realising this vision.

The S-map prototype, developed for the Bay of Plenty Region this year, illustrates the functionality we are able to achieve. By using visualisation tools based on GoogleEarth, we are able to make the most up-to-date digital soil information and decision support tools available at a regional, property or paddock scale. This provides a significant step change in access to the Land Resource Information System (part of the nationally significant databases we host) for end-users. Within five years we aim to make S-map accessible to every landowner in New Zealand – transforming the way they make decisions in managing their land – with supporting fact sheets for irrigation, nutrient, water quality, biodiversity and carbon management. This information will also enable environmental risks and economic opportunities (new crops for example) to be assessed by land managers quickly and cost-effectively.

REVIEW OF OUTCOME BASED INVESTMENTS (OBI)

Landcare Research hosts three OBIs and is partner in an OBI led by AgResearch. These were all established in 2005, and collectively represent a quarter of the research we undertake. Governance oversight by the major end-users of the research, and the long-term nature of funding, are positive distinguishing features. All OBIs were independently reviewed during the year, resulting in a pleasing 8.2% increase in funding.

COMMERCIALISATION OF ENVIRONMENTAL TECHNOLOGIES

Global investment in environmental technologies is growing rapidly as governments and businesses seek solutions to their environmental challenges. Commercialisation of science discoveries therefore represents a large opportunity for Landcare Research and New Zealand. With this in mind, we are building pipelines of technologies in niche areas:

Environmental certification

The carboNZero^{Cert}™ and Enviro-Mark[®]NZ programmes are the main areas of internal investment at present. These business units provide products and services for the independent certification of greenhouse gas and environmental management, respectively.

A strong performance from the carboNZero programme resulted in 75% revenue growth and a 25% increase in the number of New Zealand and offshore clients. A new service, CEMARS™ (Certified Emissions Measurement and Reduction Scheme), which enables companies to reduce greenhouse gas emissions without committing to full carboNZero certification, was launched through our licence agreement with Achilles Group in the United Kingdom in July 2008, and in New Zealand with Energy for Industry in September 2008. Enviro-Mark (a staged environmental management system specifically for New Zealand businesses) significantly increased its membership and signed important partnership agreements with PrintNZ and Telarc SAI. We plan to upgrade the product in the new financial year and work with other business organisations to drive membership growth.

Wildlife management

Investment to incubate two new business units to market some of our wildlife management expertise is promising to be rewarding. In its second year of operation, EcoGene™, which provides DNA diagnostic services, achieved revenues well ahead of budget, a reflection of its growing reputation on both sides of the Tasman.

Invasive Species International, an expert consultancy service, was established this year to consolidate and more effectively market our work in international pest management. This business draws on our world-leading expertise in pest management and eradication. During the year our scientists contributed to strategic planning meetings or completed contracts for agencies in seven countries.

SIRTRACK – OUR WHOLLY OWNED SUBSIDIARY

Sirtrack designs and produces wildlife tracking equipment, with over 90% of its products exported. Record revenue of \$5.5m and a net operating surplus before tax of \$0.15m (\$0.06m business plan) was achieved despite the difficulties imposed by a volatile exchange rate. The company relocated into completely rebuilt facilities in August 2008 and, importantly for its successful future, the product development group released a new generation of VHF transmitters, which are being integrated in standard products in the coming year.



SIRTRACK
RELEASED ITS NEW
generation
OF VHF TRANSMITTERS



OUR ORGANISATIONAL SUSTAINABILITY

We have an important role in providing leadership in corporate social responsibility (CSR). We practise what we recommend to customers. In support of this, we launched an extensive new section on our website in October 2008 to report more comprehensively and dynamically on our organisational sustainability and to improve the sharing of our learnings with others. Web-based reporting also enables us to make greater connections with our science and keep at the forefront of CSR best practice. The Global Reporting Initiative (GRI) confirmed that our reporting was at the A level. We encourage you to explore the detail on our website. Key initiatives to reduce the environmental impact of our activities and improve organisational resilience are highlighted in this report.

CONCLUDING REMARKS

We thank all staff for their enthusiasm and dedication to improving New Zealand's environmental and economic performance, and for their hard work in meeting all of the goals we set ourselves over the past 12 months. We congratulate the staff and business groups who won awards and prestigious recognition during the year.

We wish to make special recognition of the three retiring Directors. Anne Urlwin has provided eight years of service, including seven years as Chair of the Audit & Risk Committee and the last three years as Deputy Chair of the Board. Willie Te Aho (six years) in particular made a major contribution to our initiatives and relationships with Māori. Jill White (five and a half years) brought a unique in-depth understanding of public policy and local government. We wish them well in their future endeavours and look forward to welcoming Tania Simpson, John Luxton, Peter Schuyt and Vicky Taylor to the Board.

STRATEGY & PERFORMANCE

Our role is to undertake research, science and technology (RS&T) to protect and enhance the economic, societal and intrinsic value of New Zealand land environments. This includes maintaining national capability in relevant areas of science while meeting the financial targets set by our Government shareholders.

Our corporate strategy aligns with the Government's priorities for economic growth, productivity gains, and Māori economic development. Much of our work is 'public good' and supports the development of policy and better practices for managing land-based natural resources. Our principal non-FRST customers are MAF, DOC, AHB, MfE, MED and local government, with an increasing amount of our work supporting Māori groups. We regularly meet with our customers, across strategic and operational levels, to deepen relationships and maximise the value of our work.

The primary sector, industry and land developers are under increasing market and public pressure to enhance their environmental performance. Good stewardship of soil, land, water and biodiversity resources is essential to land-users' ability to increase production, retain their social 'licence-to-operate' and continue market access. Businesses that

respond proactively to climate change issues are creating a market advantage that leads to greater export success. Our contribution is to deliver new environmental knowledge, technologies and services that will support the attainment of those goals while also improving the reputation and profitability of business. Our strategy is to grow the proportion of our business focused on improving sustainability in the private sector through the provision of contract research and the commercialisation of environmental technologies.

Information technology continues to develop rapidly. Therefore we are seeking to maximise its use in making knowledge more accessible to users, and to increase our international connectedness with world-leading science groups. Global change also brings uncertainty to our stakeholders, and our strategy includes using foresight and scenarios to shape the direction of our research and provide a service to assist our customers with strategy development.

We are continuing to challenge ourselves to provide leadership in organisational sustainability and reporting. To achieve the targets in our five-year plan, we are adopting and refining management and technological approaches that are also of high potential benefit to a wide range of organisations.

PRIORITIES FOR 2008/09

PARTNERSHIPS—

We said we would:

- Strengthen strategic partnerships with key customers in central and local government, and with other research providers.
- Build a strong organisational profile with stakeholders.
- Increase the proportion of revenue from non-government customers through high-quality independent professional advice and services.

How we performed:

- Of our top clients, 81% of participants in an external survey rated us 'excellent' or 'very good' at working effectively with them.

- We won 36 of 39 contract proposals submitted to MAF under its Sustainable Land Management and Climate Change agenda.
- A total of 87 customer staff were on our advisory groups, and 41 of our staff held 67 positions on stakeholder advisory groups.
- We had 185 collaborative research projects and proposals with end-users and stakeholders.
- Our top clients contracted \$8.5m of research services, an increase of 78% from the previous year.
- Private sector customers contracted \$6.5m of research services.



Lepidopterist Robert Hoare with moths in the New Zealand Arthropod Collection.

TELARC SAI AUDITED OUR GREENHOUSE GAS EMISSIONS

OPERATIONAL SUSTAINABILITY—

We said we would:

- Enhance our performance in managing our operational sustainability (corporate social responsibility).

HOW WE PERFORMED:

- We developed an extensive new sustainability section on our website. This enables us to report more comprehensively, put our operational activities into context with our scientific research, and provide links to relevant research. We used the GRI's G3 framework to guide our reporting, with GRI confirming our reporting was at the A application level.
- We retained ISO14001 certification and our Tertiary Level status under ACC's Workplace Safety Management Practices.
- We reduced avoidable waste to landfill by a further 25% per FTE, surpassing our target of a 10% reduction.
- We purchased enough credits through the carboNZero^{Cert}™ programme to offset our unavoidable emissions from Landcare Research and our subsidiary Sirtrack to retain our carbon-neutral status.
- We contracted Telarc SAI to conduct an audit of our processes for measuring greenhouse gas emissions from our operational activities. Their report noted: 'A very pleasing feature of this verification audit was the organisation's strong focus on sustainability and improvement relating to its environmental effects.'

INVEST TO GROW—

We said we would:

- Use internal investment to stimulate innovation in environmental technologies, and the growth of the carboNZero programme and our subsidiary Sirtrack.
- Invest in science capabilities for emerging fields of national significance.

HOW WE PERFORMED:

- Sirtrack had a record year for sales of hi-tech products, and received two business export awards.
- Our carboNZero programme showed a 76% growth in revenue and a 25% growth in client numbers, and won several business awards.
- We launched CEMARS™ (Certified Emissions Measurement and Reduction Scheme) for organisations wanting to cut greenhouse gas emissions without necessarily becoming carbon neutral.
- Enviro-Mark[®] NZ programme increased membership by 17%.
- EcoGene™ and Invasive Species International were launched, with EcoGene outstripping performance targets.
- We have 10 prototype environmental technologies and services under development, 12 in developmental stages, and another 6 undergoing commercial testing. Three have patent protection.
- Capability Fund investment supported skill development and emergent areas including pest control technologies, information visualisation and web-delivery, lifecycle design in manufacturing, sustainable consumption, future weed identification, and post-2012 climate change scenarios.

COLLABORATION—

We said we would:

- Build international links with world-leaders to access future thinking and complementary capability.
- Strengthen collaboration with other CRIs and increase the value of co-location with New Zealand universities.

HOW WE PERFORMED:

- Staff were invited to present 19 keynote or plenary addresses to overseas meetings, with costs fully or partially reimbursed.
- Of the 232 conference presentations by our staff, 104 were overseas. A number of the New Zealand-based conferences were international meetings.
- Staff were also invited to participate in 50 overseas technical meetings and workshops.
- Sixty of our staff held 102 advisory positions on national and international advisory groups.
- Forty-six staff held 88 positions with editorial boards of scientific journals; of which 73 were journals published overseas.
- We relocated our Wellington office to share premises with Scion and with Science New Zealand. More than 100 staff from other agencies are co-located with us in shared premises. In addition, our Auckland, Hamilton, Palmerston North, Lincoln and Dunedin sites are located on or very close to university campuses.
- Most of our research programmes have some degree of collaboration with overseas colleagues. This year, our staff were involved in collaborative proposals and projects with 185 stakeholders and end-users. In addition, we also collaborated on work with other researchers in CRIs (68 projects), New Zealand universities (74) and with individuals or agencies overseas (44).

*Morgan Coleman about to dine with a view.
Field trip in Tutaki Valley, Buller.*

ORGANISATIONAL DEVELOPMENT—

We said we would:

- Apply workforce planning and leadership development to address increased competition for talent and workload/life concerns.
- Develop e-technology systems that enhance the productivity of support services, manage risk and lower compliance costs.

HOW WE PERFORMED:

- Direct expenditure on training courses and study grants was \$563,000 (2.2% of salary costs). In addition, \$655,000 of Capability Funds was invested in Fellowships and postgraduate study.
- We commenced an in-house year-long leadership development programme. Feedback from the first cohort of 14 participants has been positive.
- We hosted 14 postdoctoral researchers.
- Our development team delivered a number of new intranet-based 'tools' and systems following extensive consultation with staff.

More detail of our performance can be found in Part 2 of our Annual Report. We also report comprehensively on our performance on the sustainability pages of our website www.landcareresearch.co.nz/sustainability



A FOCUS ON CLIMATE CHANGE

Climate change is an issue that runs through all of the economy, the environment and our communities. Our science – from understanding the ecological and anthropogenic processes causing (and in-turn affected by) climate change through to the much wider implications for natural, productive, urban, social and business environments – underpins New Zealand's ability to reduce greenhouse gas emissions, develop mitigation options and adapt to the effects of a changing climate.

Much of our work is for national policy agencies such as MAF and MfE. We are also leading a multi-agency group to model possible policy scenarios for climate change negotiations post-2012. The group includes Motu Economics, universities (Waikato, Massey, Lincoln, Otago), NZIER, Infometrics, AgResearch, and MFAT.

LAND USE & CARBON ANALYSIS SYSTEM

Landcare Research completed a major project determining Kyoto land use changes between 1990 and 2008 for MfE's Land Use and Carbon Analysis System (LUCAS). Mapping the changes required comprehensive interpretation and analysis of satellite imagery and aerial photographs by a team of about 15 image processing and GIS specialists. Our scientists met weekly with MfE's technical team to ensure we delivered exactly what was expected, on time, and to the data quality standards expected by the Intergovernmental Panel on Climate Change (IPCC) and MfE. The results of this work are of substantial political, environmental and economic importance to New Zealand.

'These satellite data are good news in that they accurately confirm the area of post-1989 forests is sufficient to offset New Zealand's increase in emissions and meet our Kyoto obligations in the first commitment period from 2008 to 2012.'

Hon Nick Smith, Minister for Climate Change Issues.

MEASURING & MODELLING GREENHOUSE GASES

Data on biophysical functioning of ecosystems and greenhouse gas exchange processes support the development of sophisticated computer models that are essential for analysing ecosystem responses to climate change, feedback effects, and the resilience of natural and managed terrestrial systems.

While no sector can escape global change, pastoral farming is often at the centre of public debate – largely because our national emissions inventory is dominated by methane and nitrous oxide emissions from our extensive and intensive agricultural industry. Both these gases have a 'global warming potential' many times that of carbon dioxide.

We have continued to develop techniques for measuring emissions and removals of carbon dioxide, methane and nitrous oxide from grazed pasture, shrubland and forest systems. While technology is well advanced for carbon dioxide, measurements of methane and nitrous oxide are much more challenging because of the low ambient concentrations. Nevertheless, we have developed techniques that provide direct estimates of emissions for an entire herd but which are non-obtrusive for stock.

“

WE ARE DESIGNING
A NEW BIOFILTER
to mitigate
METHANE EMISSIONS
FROM FARM EFFLUENT PONDS

”



Surinder Saggar and Jagrati Singh measuring soil methane levels in pasture.

METHANE MITIGATION TECHNOLOGIES

Methane comprises 35% of New Zealand's total greenhouse gas emissions. The main source is from bacteria that digest plant material in the rumen of grazing animals, but other agricultural sources, including anaerobic decomposition of effluent from piggeries and dairy farms, are also important. There are currently no viable mitigation options to reduce agricultural methane emissions apart from reducing livestock numbers.

However, we are researching novel technologies that have the potential to significantly reduce agricultural methane emissions, including a methane biofilter to convert methane to the less potent carbon dioxide.

The biofilter uses naturally occurring soil bacteria called methanotrophs that consume methane as an energy source. Experiments in one of our laboratories revealed the huge potential of landfill-covering soils to oxidise the methane released by decomposing waste. The methanotrophs removed 98% of the methane entering the soil chamber. Even when the soils were intentionally saturated with methane, the microbe populations adapted rapidly to the high gas concentrations. This has important implications for designing biofilters that can effectively mitigate point-sources of high methane concentrations, such as at effluent ponds. The performance of a prototype for a paddock-scale biofilter at an effluent pond on Massey University's dairy farm is being assessed.

IMPROVING NITROUS OXIDE INVENTORIES

New Zealand currently reports its annual emissions of nitrous oxide from agriculture using a set of 'emission factors' set by the IPCC. These specify the fractions of total nitrogen from a particular farming activity that are converted either directly to nitrous oxide or to a precursor that subsequently causes further (indirect) emissions. Some of these factors have been quantified specifically for New Zealand conditions. Our process-based 'NZ-DNDC' (denitrification-decomposition) model not only estimates nitrous oxide emissions and identifies emission 'hot-spots' but is useful for assessing the efficacy of mitigation strategies.

A recent review, commissioned by MAF, suggests that one of these default emission factors overestimates the true indirect emissions under New Zealand farming conditions. Our measurements have contributed to reducing emissions liabilities by recommending a reduction in indirect emissions factors for nitrous oxide losses from waterways and from the use of urease inhibitors on pasture.

POST-CAPITALISM CONSERVATION

'Natural capital' – the fundamental basis of human welfare and a key component of intergenerational equity – is at the heart of most global perspectives on post-capitalist economies. Many observers of the current financial crisis believe the disconnect between real and market values reflects the loss of alignment between financial markets and the biotic and abiotic components of natural capital on which they are ultimately based.

A good example of how these disconnects have arisen is the incremental loss of biodiversity (a key component of natural capital) that has characterised economic development. The earth's landscape has been transformed from a natural matrix with islands of human activity, to an often heavily modified matrix now dominated by human activity. Nature is constrained within highly insular parcels of remaining natural habitat – artificial 'islands' of biodiversity. The success of mainland islands in halting extinction of iconic species has distracted attention from the increased risk to the ongoing supply of essential goods and services (such as clean water) provided by biodiversity, as well as its intrinsic aesthetic and intellectual value.

Fragmentation of forest ecosystems along streams and rivers increases the vulnerability of each residual patch to the effects of short-term land-use planning, invasive species, and (probably) the impending effects of climate change. Loss of individual forest patches further fragments the forest ecosystem, incrementally reducing resilience of the residual habitat islands and increasing the risk to water quality.

Analysis of change in extent of original vegetation cover confirms that agricultural intensification over the past 10 years has led to the highest rate of native vegetation loss since European colonisation.

The drive to increase the profitability of land use (usually through intensification) has largely become disconnected from the impact this has on the intrinsic and functional values of biodiversity. The most critical gap is the lack of a robust measurement system to assess and predict changes. Without it, New Zealand will continue to make policy and planning decisions that do not take full account of the influence biodiversity has on the economic, social and cultural welfare of its citizens. And, it will be difficult for New Zealand to report cohesively against its international treaty obligations under the Convention on Biological Diversity and against OECD State of the Environment indicators.

BIODIVERSITY ASSESSMENT & VALUATION TOOLS

Several years ago, Landcare Research recognised the need for biodiversity assessment tools and used internal investment to research a range of measurement systems aligned to challenges in biodiversity management and decision making. This year, collaborative work with a number of international groups produced a framework for developing relatively simple metrics for evaluating biodiversity performance. Future work with DOC and regional councils will look at applying this framework in New Zealand. We are also contributing to a successful proposal, led by DOC and MED, to develop a framework for biodiversity offsetting, which will lead to more transparent trade-offs between the impacts of land-use decisions and the mitigation measures required to offset those impacts.

AGRICULTURAL
INTENSIFICATION
OVER THE PAST 10 YEARS HAS
LED TO THE HIGHEST RATE OF
NATIVE VEGETATION LOSS
SINCE EUROPEAN COLONISATION

MANAGING CLIMATE CHANGE

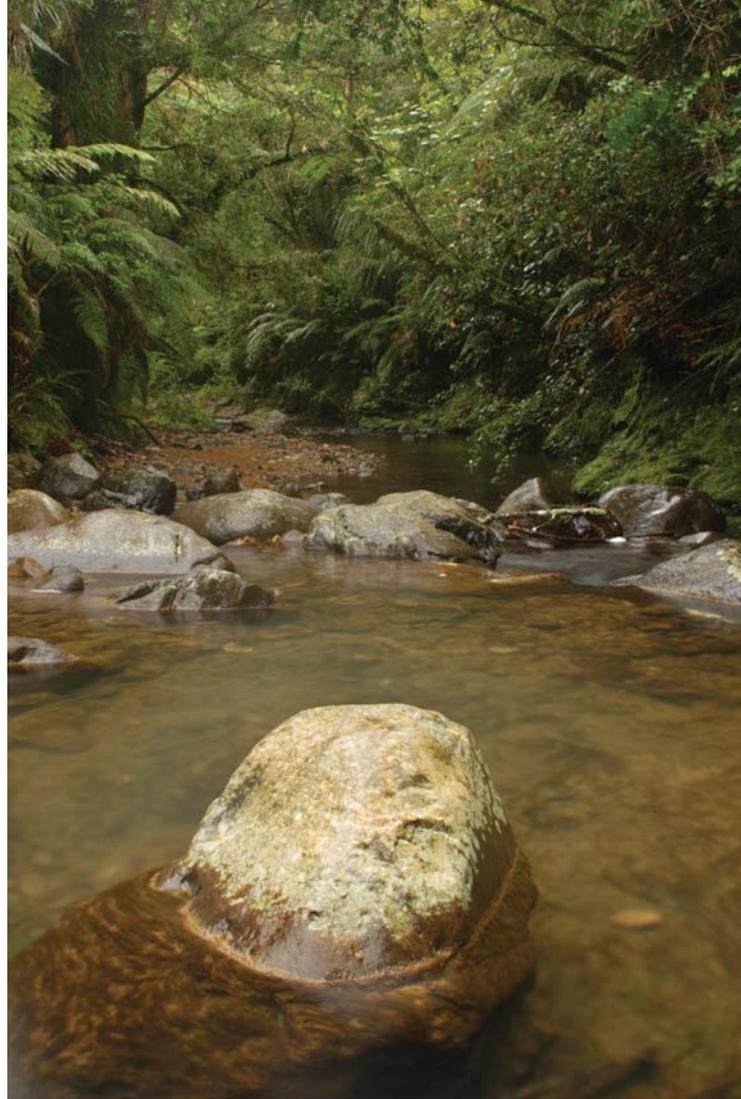
Global climate change will undoubtedly have significant impacts on the environment and create new conundrums for conservation and restoration programmes. Offsetting greenhouse gas emissions through native forest regeneration (as in our EBEX21[®] programme) provides new economic opportunities for managing marginal hill-country, protecting erosion-prone catchments and rehabilitating forest remnants in productive and urban landscapes.

OUTCOME BASED INVESTMENT REVIEWS

This year marked the four-yearly review of our three large OBI programmes. The reviews were thorough and constructive and will lead to some substantial changes in the way these programmes are integrated. One challenge is how biodiversity management should integrate compositional outcomes (focused on assemblages, occupancy and representation) with functional outcomes (focused on processes, resilience and change). Māori are significant partners with the goal of enabling iwi to effectively manage the forests they own, eventually restoring taonga values and sustainably harvesting native species.

LOCAL ERADICATION OF MAMMAL PESTS

In a project that marks a step-change in pest management, our scientists achieved near-eradication of possum populations across two landscape-scale locations at less cost than traditional broad-acre control programmes, which would have left much higher residual possum densities. This work was undertaken in collaboration with AHB and had a focus on the cost-effectiveness of Tb vector control. However, the implications of the work for what could be potentially achieved in conservation settings are very exciting. Rodents and mustelid control is particularly problematic, and the same approach might achieve similarly spectacular improvements in the efficiency and effectiveness of control programmes.



The quality of water in New Zealand's streams and rivers is much higher where headwaters and riparian zones are dominated by native trees and shrubs.

MOLECULAR BREAKTHROUGH FOR UNDERSTANDING PEST POPULATIONS

Catch–mark–release–recapture is a widely used technique for estimating population densities, understanding population demography and tracking movements. However, some animals can be difficult to catch. A significant piece of research by our Ecological Genetics Laboratory in collaboration with pest ecology teams has been development of molecular mark–recapture analysis for mammal pests. Instead of capturing live animals, hair samples caught on sticky tubes in the field were used to estimate pest density and to track movements of individual pests. This identification capability is now available through EcoGene™.

LAND-WATER CONNECTIONS

Soil, land and water – these finite resources directly underpin our economy and provide services of immense environmental, social and cultural value. With good stewardship of these resources, New Zealand will have a healthy future. Science has an important role in assuring this future.

While our databases of nationally significant resources provide excellent documentation of our land resources (what is found where), interpreting the opportunities and risks is considerably more complex. Digital initiatives, such as S-map, and sophisticated process models are clarifying the links between soils, land and water.

“
SOIL, LAND
WATER
THESE FINITE
RESOURCES
DIRECTLY UNDERPIN
OUR ECONOMY
”

SAVING WATER BY PRECISION IRRIGATION

Since the 1960s, the amount of irrigated land in New Zealand has more than doubled every decade. The relatively recent intensified land use for dairying has seen water demands surge to potentially unsustainable and hence highly controversial levels. While centre-pivot systems provide the most efficient blanket-coverage, they represent a fraction of the efficiency that could be achieved with precision irrigation, especially where variant soils exist under one irrigation system.

We have developed a sensor and GPS system to map soil variability and define management zones based on the capacity of the soil to hold plant-available water. Soil moisture information is logged hourly and transmitted wirelessly to the farm office. This ensures the required amount of water – no more, no less – is delivered to each of the soil zones, improving water-use efficiency and reducing pumping costs while maintaining maximum crop yield.

MODELLING NITRATE LEACHING TO AQUIFERS

Nitrate discharge to groundwater from agricultural and irrigation practices is an issue that threatens water quality of aquifers under the Canterbury Plains. We completed modelling of several land use and aquifer scenarios for ECan as part of their Water Management Strategy study. Knowledge of irrigation patterns is critical for assessing nitrate leaching but had proved difficult to interpret from available sources. Using satellite imagery at multiple dates, we developed new methodology to map areas likely to be irrigated.

We also significantly extended the AquiferSim model, previously developed with our partners, to produce horizontal-layer maps of nitrate contamination (before only vertical profiles were possible). It can now model complete groundwater catchments (i.e. where water enters the ground, where it travels, and where it exits) and assess the cumulative off-site impacts of various farm practices on lowland streams and rivers. The final version of AquiferSim will greatly aid ECan staff with policy development and consent decisions.



Management of the Sherry River being discussed on an ICM Motueka field trip for New Zealand and Chilean visitors.

PREDICTING FUTURE LANDSCAPES

Based on our research in the Waipaoa catchment (Gisborne), we developed principles for a four-dimensional model of landscape evolution. Presently the simulation model runs for 63,000 years through the last ice age and for 18,000 years of subsequent warming, with a digital elevation model produced for every 1,000 years. Predictions from the model correlate well with what we see in today's landscape. This is a highly significant achievement.

By piecing together the past, the research provides rare insight into how future landscapes are likely to evolve as a result of climate change and tectonic activity. These factors have potential effects on sediment generation, flood and tsunami risk, as well as on the integrity of the landscape to provide a whole range of ecosystem services.

INCORPORATING SOCIAL & CULTURAL VALUES

Māori believe their personal well-being and health is connected to their physical, cultural, and spiritual environment – an holistic worldview that sits comfortably with the integrated research–management approach being used in the Motueka Integrated Catchment Management (ICM) programme (the only New Zealand project to be recognised by UNESCO in the Global HELP programme).

The ICM programme has successfully brought the community together to resolve issues.

As part of the ICM programme we have linked cultural and scientific monitoring approaches to river and stream health and found that the cultural indicators imposed stricter environmental standards across many criteria. Results reveal, for example, a strong correlation between the cultural measures of stream health and the percentage of catchment in native forest above each site. The two approaches together provide a fuller picture of river health and a better representation of the environmental, social and cultural values we hold for our land and water resources.

AN ECOSYSTEM SERVICES APPROACH

Over the past year, we engaged with a variety of stakeholders – central government, regional councils and industry – to determine what could really make a difference in natural resource management. The answer? A framework where all the services and values provided by ecosystems are considered in a coordinated and consistent way, and across a broad range of outcomes from local to national scales. This resulted in a new FRST-funded programme 'Ecosystem Services for Multiple Outcomes' to be led by Landcare Research.

We will produce a nationwide assessment of ecosystem services, determine how services are linked to land use and management, and offer a framework for natural resource planning and policy. The landmark project will build on our extensive environmental informatics capabilities and understanding of ecosystems and the services they provide.

SUSTAINABLE BUSINESS & LIVING

For more than a decade, Landcare Research has been developing services and technologies to reduce the adverse impacts of urban development and create market advantage for business. Managing impacts on the natural environment represents a substantial economic opportunity (and a strategic and economic threat if managed inappropriately).

MARKET ADVANTAGE

Good environmental and social practices are increasingly 'business as usual' for overseas companies and several markets now demand the same of New Zealand companies. Since 2003 the Landcare Research programme Building Capacity for Sustainable Development has created a range of approaches for businesses to address this challenge. These include futuring, sustainability appraisal, stakeholder engagement, and environmental footprinting and management systems.

In a world-leading project, we worked with ZESPRI to measure the carbon footprint of New Zealand kiwifruit supplied to EU markets, from 'production to consumer to disposal'. The measurement methodology was aligned with the UK's PAS 2050 standard, currently the most widely accepted approach

for the measurement of the carbon emissions of products. ZESPRI calculated that the research (a collaboration with Plant & Food Research, Massey University, and AgriLINK NZ, and supported by funding from MAF under the New Zealand GHG Footprinting Strategy) will save the New Zealand kiwifruit industry \$17m a year through new production efficiencies.

A similar carbon footprint project for the pipfruit sector covered the entire supply chain through to key export markets in Europe, the USA and Asia. Across the 60 orchards and nine packhouses studied, only 9–14% of emissions came from the growing and packing stages, with the rest attributed to shipping, retailer repacking, distribution, and consumer use and disposal. While this highlights the efficiency of the New Zealand industry, the pipfruit industry is now working with their overseas partners to identify the 'hotspots' where further efficiency gains could be achieved. *'This modelling is one of the most sophisticated studies on apple greenhouse gas emissions completed in the world to date.'* Peter Beaven, Chief Executive of Pipfruit New Zealand.

This year, we also initiated an innovative life-cycle management project for New Zealand manufacturers to help achieve continuous environmental improvement through a 'cradle to grave' approach to product design. Resource efficiency and waste reduction can both create significant savings in operational costs and generate staff and consumer goodwill. Six companies are taking part in a pilot project that is funded by MED and MfE.

FUTURE THINKING

The FutureMakers project developed a package of deliberately provocative 'thought-starter' cards and related workshop process that have been used to stimulate strategic thinking and wide-ranging debate about future issues facing New Zealand. The project, developed collaboratively with Secondary Futures and the Institute of Policy Studies, pulls together people and information to cast some new light on the opportunities, challenges and big questions facing New Zealand over the next 20 years.

“
OUR WORK
COULD SAVE THE
NEW ZEALAND
KIWI FRUIT
INDUSTRY
\$17 million a year
”



Social researcher Kathryn Scott discussing a rain garden with local maintenance staff at Talbot Park, Glen Innes.

A biodiversity edition of the earlier Future Scenarios Game was translated into French and Spanish for an invited workshop at the IUCN2008 World Congress in Barcelona.

LOW IMPACT URBAN DEVELOPMENT

Conventional urban development practices (e.g. extensive use of impervious surfaces) have a range of adverse environmental and social impacts (e.g. loss of productive land; polluted waterways and coastal areas; loss in social connectivity) and contribute to escalating infrastructure costs (e.g. upgrading hard-engineered systems). An alternative is to use low impact urban design and development (LIUDD) principles – a sustainable living concept that integrates natural features, low-cost environmental technologies, and improved management of urban catchments.

Since 2003 our LIUDD programme has contributed to a paradigm shift in approach by developers and policy agencies to urban planning. LIUDD achievements include improved design specifications for stormwater treatment devices to meet New Zealand conditions (with up to 50% cost-savings), a new biofiltration substrate produced from inexpensive local

materials, a catchment-based stormwater treatment evaluation model (C-CALM), a life-cycle costing tool (COSTNZ) that enables developers, consultants, and councils to evaluate alternatives to conventional development, accelerated uptake of stormwater technologies (including green roofs) with indigenous biodiversity co-benefits, and the easy-to-use Urban Greening Manual that is being used by developers, planners and home owners to incorporate aesthetic and functional native plants into the urban landscape.

During the year, we organised a series of five well-attended two-day workshops ('urban safaris') around New Zealand for developers, engineers, regional and city council practitioners to learn about the LIUDD technologies and see them working.

MĀORI-DRIVEN URBAN DESIGN & DEVELOPMENT

We have been working with colleagues from Ngāi Tahu, Ngāti Whatua o Orakei and the University of Auckland through Ngā Pae o Te Māramatanga to develop urban development strategies that fit values held by Māori. The package includes restoration plans for sites of special value, incorporates traditional community housing concepts, and demonstrates low-impact environmental technologies to manage waste, water and energy. During the year, a number of hui were held with design professionals, researchers, and kaitiaki from various North Island iwi groups. A key aspect of ensuring uptake has been extension work with local government to improve urban design guidelines and district plans.

ENVIRONMENTAL TECHNOLOGIES

Businesses are demanding credible solutions to climate change issues and user-friendly systems for improving environmental performance; the market for these services is growing very rapidly. Conservation and resource management agencies are seeking more effective technologies for wildlife management, and a rapid response capability to biosecurity issues. Consequently, we have extended our range of branded, customer-focused business units and actively developed some new suites of environmental services from our research programmes. These business units showed a combined revenue growth of 24% in the last year.

ENVIRONMENTAL CERTIFICATION

The carboNZero^{Cert}™ programme (for the reduction and mitigation of greenhouse gas emissions) became the first greenhouse gas certification scheme in the world to achieve accreditation under the auspices of the International Accreditation Forum, making it one of the leading schemes in the world. Strong international (via our UK licensing partner Achilles) and national interest resulted in 76% revenue growth and 25% growth in client numbers.

We are now actively managing 5.57¹ million tonnes CO₂e of emissions across the programme (verified footprints across both New Zealand and international clients) – equivalent to 7% of New Zealand's total greenhouse gas inventory in 2007² – and a significant increase from 145,000 tonnes in 2008.

During the year, we launched CEMARS™ (Certified Emissions Measurement and Reduction Scheme) – essentially the first two steps of the carboNZero programme – for organisations wanting to cut greenhouse gas emissions without necessarily becoming carbon neutral. Energy for Industry was the first New Zealand client and United Utilities, the UK's largest listed water company, the first UK client.

www.carbonzero.co.nz

The Enviro-Mark[®]NZ programme, a stepwise approach to environmental and health and safety performance, commenced a major marketing initiative during the year to promote itself as New Zealand's leading environmental certification programme – the one that is most accessible and easiest for businesses of all sizes to use. We secured partnerships with a range of industry associations such as PrintNZ that are actively supporting and promoting the programme to their members. As a result, the business unit achieved a pleasing 11% increase in revenue.

www.enviromark.co.nz

WILDLIFE TECHNOLOGIES

Sirtrack Ltd (our wholly owned subsidiary) designs and manufactures specialist telemetry equipment for tracking wildlife. This year the business achieved record sales, with over 90% from exports. Sirtrack's business performance was recognised by winning the 2008 ASB Hawkes Bay Emerging Exporter of the Year and Westpac Hawkes Bay Exporter of the Year Awards.

The USA market continues to present the most significant growth opportunity. It is supported by a locally-based sales representative, who has extensive experience in wildlife telemetry and product development. Internal investment supported by Pre-Seed Accelerator Funds into a new generation of VHF tracking devices produced a significant improvement in performance.



In Wellington you can't miss the carboNZero logo now on all Wellington Combined Taxis.

¹ Based on the carboNZero website home page

² Based on calculation using NZ's 2007 Kyoto reported emissions (MfE, April 2009: New Zealand's Greenhouse Gas Inventory 1990-2007)



Enviro-Mark NZ Membership Manager, Kristin Flanagan (right), explaining the programme benefits to a visitor at our Bizzzone Christchurch Expo booth.

A highlight for the year was the opening of Sirtrack's extensive new manufacturing and office facilities in August. The open plan office was furnished with sustainable materials and incorporates energy- and water-efficient technologies.

www.sirtrack.com

Invasive Species International (ISI) capitalises on both New Zealand's and Landcare Research's reputations as world leaders in pest management and eradication programmes. Since we launched the ISI consultancy service in January 2009, staff have been working with various agencies and multinational network meetings in mainland United States and Hawai'i, Mexico, Australia, Chile, Japan, Ascension Island, Solomon Islands and Fiji.

www.isinz.com

EcoGene™ provides DNA-based diagnostic services for a range of wildlife research, monitoring and biodiversity/biosecurity agencies. Services include species identification, vertebrate pest-monitoring, wildlife forensics, genotyping, and disease diagnostics. In its first full year of operation, EcoGene achieved more than double its targeted turnover, with an increasing amount of work coming from Australia.

www.ecogene.co.nz

OUR NEW BUSINESS UNITS SHOWED A REVENUE GROWTH **24%** IN THE LAST YEAR

TECHNOLOGY TRANSFER

Manaaki Whenua Press is our natural history and science online bookstore. It distributes and produces a range of publications of interest to researchers, students, resource managers and the general public. This year, they published *Plants that Poison* in conjunction with the National Poisons Centre, which in 2008, received over 1800 enquiries relating to plants or fungi. The book sold 1055 copies in the first three months, an indication of strong public interest in avoiding problems with poisonous plants.

A Flora of the Liverworts and Hornworts of New Zealand vol 1, the culmination of five years' hard work, was published during the year. It was co-authored by staff from Landcare Research and the Field Museum in Chicago.

The new 3rd edition *Land Use Capability Survey Handbook* was produced this year by a team led by one of our soil scientists. The previous edition, printed in the 1970s, became difficult to source, and was out of date. The new 2009 edition has extensive new information and management tools, and is driving a renaissance in land use capability assessments, particularly at the farm scale.

PARTNERSHIPS & COLLABORATIONS

A key priority for the year was to deepen strategic partnerships with central and local government, and sector-funded agencies such as the Animal Health Board (AHB). We meet regularly with chief executives and operational staff of these agencies to ensure our science is aligned to their needs.

CUSTOMER RELATIONSHIPS

For each of the last three years we have commissioned an independent survey of a customer segment to assess their perceptions of our performance. Participants this year rated us as 'excellent' or 'very good' in regard to overall performance (70% of respondents), relationship management (81%), quality of our research work (88%), and staff professionalism (91%). We also welcomed their feedback regarding where we could improve our performance.

COLLABORATION WITH OTHER RESEARCH PROVIDERS

We undertake extensive formal collaboration with other research providers in New Zealand and most of our research programmes include valuable collaboration with overseas peers. This significantly extends our research capability and creates opportunities to provide postgraduate students with research experience. We are partners in several collaborative research centres with universities:

- The New Zealand Climate Change Centre (NZCCC) with Victoria University of Wellington, University of Canterbury, and all the CRIs. www.nzclimatechangecentre.org
- The Centre for Biodiversity and Biosecurity (CBB) with the University of Auckland www.cbb.org.nz
- The Centre for Urban Ecosystem Sustainability (CUES) with the University of Auckland
- The New Zealand Centre for Sustainable Cities with University of Otago and five other partners <http://sustainablecities.org.nz/>
- The New Zealand Centre for Ecological Economics (NZCEE) with Massey University www.nzcee.org.nz

In addition, we are members of several consortia:

- The KiwImage consortium – a multi-agency, five-year programme of investment to acquire new higher resolution, multi-purpose satellite imagery for all of New Zealand and its subantarctic islands.
- The newly established Regional Councils' Biodiversity Forum, which decides regional council priorities for biodiversity research.
- The Sustainable Land Use Research Initiative (SLURI) pools soil science expertise across three CRIs to develop new tools for regulators and land managers (failure to sustain our soil and water resources will put \$2.16 billion of our total GDP at risk).
- Integrated Research for Aquifer Protection (IRAP) involves four CRIs, DairyNZ, Lincoln Environmental, Aqualinc and Environment Canterbury. The focus is on developing agriculture and rural economies while ensuring water remains clean, available and contaminant-free. The end-user advisory group includes regional and district councils, MAF, MfE, FAR, HortNZ, Te Rūnanga o Ngāi Tahu, and Federated Farmers.
- NzOnet is a network of nitrous oxide researchers from four CRIs, Lincoln University and DairyNZ.

81% OF OUR CUSTOMERS
AGREE THAT WE WORK
EFFECTIVELY
WITH THEM



Canterbury farmer Tim Chamberlain (left) talking with Landcare Research biocontrol experts Hugh Gourlay and Helen Parish.

SECONDMENTS TO CLIENT AGENCIES

At a practical science level, we seconded staff to AHB (to assist in developing operational procedures and the design and running of several trials), Environment Waikato (to engage with individuals and groups of staff to progress key elements of the Creating Futures project) and Environment Canterbury (to provide a critical overview of ECan's soil, land and water datasets, how these could be better integrated, and what tools are available or could be developed to make better use of the data in understanding the effects of land use change).

CO-LOCATIONS

Staff at our larger sites are located alongside or nearby staff from client agencies, other CRIs and/or universities. This fosters close collaboration, facilitates sharing of expensive equipment, and provides opportunities for our staff to lecture on specialist topics and supervise students. We are pleased that DOC's Hamilton-based research staff co-located with us from March this year.

OUTCOME-BASED INVESTMENT

Landcare Research leads three Outcome-Based Investment programmes (OBIs) that are supported by strong formal partnerships with end-user organisations. These are 'Defining New Zealand's Land Biota', 'Sustaining and Restoring Biodiversity' and 'Ecosystem Resilience'. Our OBIs were very favourably reviewed this year, with special attention

drawn to the strength of the partnership model that allows them to contribute so strongly to policy and management outcomes. Partner organisations include DOC, MAF, MAF BNZ, Te Papa, the Tūhoe Tuawhenua Trust, ERMA, Queen Elizabeth II Trust, and the Regional Councils' Biodiversity Forum.

BIOLOGICAL CONTROL OF WEEDS

Our Biological Control of Weeds programme exemplifies best practice in partnering directly with end-users. New Zealand has an escalating weed problem. Even widely entrenched weeds (such as broom) have not yet reached the full potential extent of their range, costing many millions of dollars in lost production and widespread ongoing herbicide use. For these 'out-of-control' weeds, biocontrol is a cost-effective, low-impact alternative, and a practical long-term solution. We are one of the most successful organisations globally in introducing and establishing new biocontrol agents on a wide range of weeds. We work closely with overseas counterparts to locate and extensively test potential agents before importing any into quarantine. New Zealand stakeholders are consulted before any agents are approved for release. Then we mass-rear, distribute and later monitor establishment and impact of the agents with support from regional councils, DOC, farming groups and others. A large measure of our ongoing success is due to the funding and direct involvement of these end-users. Over the last five years, 18 species of biocontrol agents have been released, including eight this year.

ORGANISATIONAL DEVELOPMENT

We provide a healthy, positive work environment with a culture conducive to scientific productivity, innovative thinking and a rewarding career. At the same time, our workplace underpins our commitment to sustainability across all our activities and sets the highest standards, as expected of a good employer.

OUR WORKPLACE CULTURE

Landcare Research is a 'knowledge organisation'. Effort is ongoing to develop a high-performance, customer-focused, innovative culture that characterises our scientific work. We regularly review our capabilities as part of workforce planning and actively encourage training and career-development opportunities, reward good performance, and recruit the best employees from New Zealand and overseas. Landcare Research's core purpose is to undertake research and development to protect and enhance New Zealand land environments and enable their sustainable use with economic development. Hence 'sustainability' is an integral part of our operational culture.

In late 2008 we conducted a survey of our workplace culture: 61% of employees participated. This survey assessed a range of adaptive-culture factors associated with successful organisations: entrepreneurial, enabled workforce, proactive, experimental and stakeholder balance. We are pleased to report that staff rated Landcare Research positively against all factors. A benchmarking exercise against five other organisations of similar size showed we were above the norm across all areas.

Furthermore, the results indicated a high degree of employee engagement and alignment with our mission and purpose, and high levels of job satisfaction. Staff valued our flexible work practices, and the collegial support and inspiration obtained from their peers. Staff also had an opportunity to suggest where and how the organisation could improve – a number of these ideas have already been implemented, and further initiatives are planned for 2009/10. Focus groups will review the success of these responses.

WORKFORCE PLANNING, LEADERSHIP DEVELOPMENT

An in-house Leadership Development Programme commenced in November 2008 with 14 employees. The year-long programme consists of a series of one- or two-day workshops presented by internal and external 'mentors'. Feedback from participants has been very positive. A second cohort will commence in November 2009. We are confident that these employees, as emerging leaders, will contribute significantly to Landcare Research's future.

SYSTEMS TO IMPROVE PRODUCTIVITY

This year, we continued our focus on developing 'smarter e-systems' that reduce science administration for research teams, improve H&S management, facilitate compliance monitoring and incorporate sustainability principles into operating processes. Online shared workspaces have improved staff collaboration and information-sharing across sites and teams. Remote access to our systems now allows staff to be more flexible in when and where they work, including travelling overseas, in the field or working from home.

Our systems development team delivered a number of new intranet-based 'tools', including improvements to (electronic) timesheets, and a new electronic leave booking system; online training for our laboratory staff; online notification of fieldwork intentions, and accident and incident reporting; online guides to induction/on-boarding processes for visitors and new staff; and a new system for reporting science outcomes and achievements for multiple stakeholders. The latter was a significant project and its success reflects the extensive consultation with science staff throughout the planning, design, development and execution stages.

HEALTH & SAFETY

Landcare Research maintains a safe workplace for staff, visitors and contractors, as reflected in the retention of our Tertiary Level status under ACC Workplace Safety Management Practices. The steady decrease in time lost through work-related injuries has been particularly pleasing. This may reflect the success of two injury-prevention initiatives in recent years: our annual Field H&S Forum, which provides intensive training and opportunities for discussing field-safety-related issues; and our early reporting system for staff experiencing work-related pain and discomfort, which enables symptoms to be resolved well before they develop into more serious injury.

MAINSTREAM PROGRAMME

During 2008/09 we continued supporting the Mainstream programme, which assists people with mental or physical disabilities by providing meaningful employment and an opportunity to gain experience and skills that will better equip them in an open job-market. We were able to employ seven participants in the programme, thanks to the commitment of staff who created job positions, then encouraged, supported and mentored the participants. Our HR Manager was presented with a special merit award at the Mainstream Awards ceremony in recognition and appreciation of his ongoing commitment to the programme.

OPTIMISING THE WORK ENVIRONMENT

The primary goal of our property strategy is to provide a quality work environment for staff to ensure both their well-being and

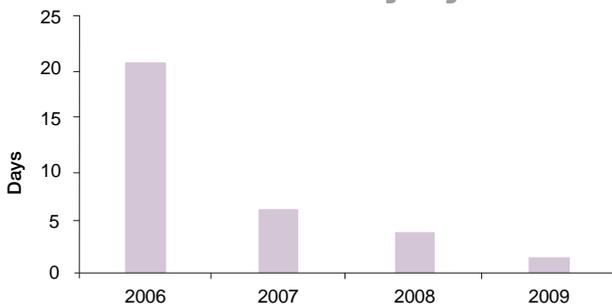
scientific productivity. At the same time, we aim to rationalise our property portfolio, optimise occupancy, and maximise effective use of resources and minimise waste.

This year, we completed major refurbishment projects to parts of our Lincoln and Auckland facilities. Both projects involved creating open-plan office environments, with improved space utilisation and high levels of natural lighting. The design and layout greatly assists with team-building and collaboration. In Auckland, additional office space was created for our ground-floor tenants (MAF Biosecurity) by filling in a large section of the central atrium. An open-plan layout was also adopted for this area. 'Sustainable' products and materials were used in all three projects, including Entropy RE Interface carpet tiles, low VOC adhesives, timber from sustainably managed forests, 100% recycled acoustic tiles, and environmentally friendly paints. Where possible, energy-efficient light fittings, windows and internal doors were reused. Sustainability requirements and low environmental impact were incorporated into tender specifications. We are delighted that 95% of the waste from the Auckland projects was recycled.

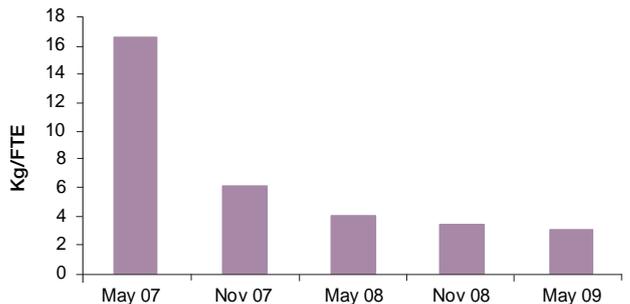
WASTE TO LANDFILL

Landcare Research's goal is 'zero avoidable waste to landfill by 2012'. We reduced our avoidable waste to landfill by 25% compared with last year, exceeding our 10% reduction target. Compared with our baseline waste-audit figures of two years ago, we have reduced waste by a remarkable 81% per FTE!

Average days lost per lost-time injury



Avoidable waste to landfill





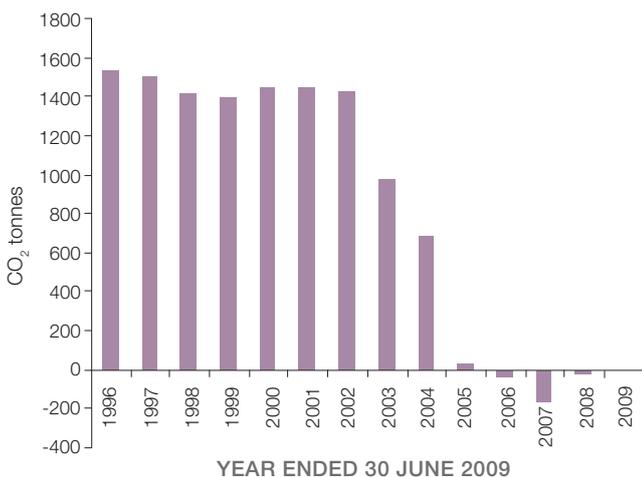
Greenhouse gas emissions involved in fieldwork are included in our overall calculation.

CARBON-NEUTRALITY

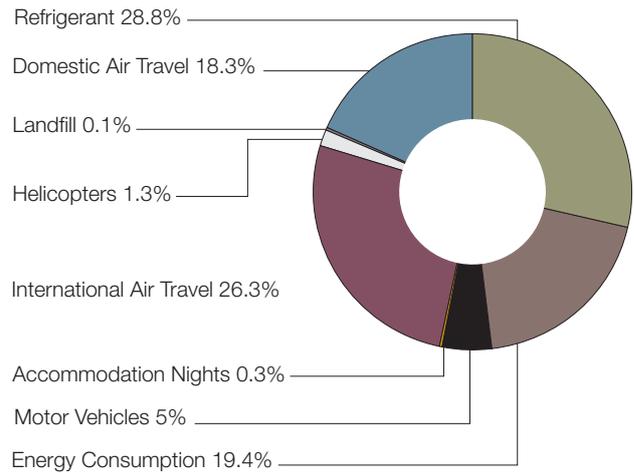
This year, we commenced the carboNZero^{Cert}TM-approved verification process for measuring greenhouse gas emissions. Following an audit conducted by Telarc SAI, we improved data collection for extra-large rental cars (e.g. mini-buses), short- and long-haul air travel, taxi travel, and hotel and motel accommodation nights. And, for the first time, we also included greenhouse gas emissions associated with compostable waste going to landfill.

Energy consumption per FTE was slightly up (2.7%) from last year; 77% of all electricity was renewable energy purchased from Meridian (60% in 2007/08 vs 61% in 2006/07). As Meridian is carboNZero certified, they offset 328 tonnes of imputed CO₂ associated with the electricity we purchased.

Imputed CO₂ net emissions



Source of our greenhouse gas emissions



We exceeded our greenhouse gas emissions target for the year. This was due to increased international travel and significantly to a refrigerant leak at our Auckland site (29% of total emissions were attributed to the leak). To cover this unexpected situation, we purchased additional carbon credits to retain our carbon-neutral position. In total, we acquired 2955 windfarm credits through the carboNZero programme (2842 for Landcare Research and 113 for Sirtrack).

CERTIFICATIONS

We maintained our various best-practice workplace certifications under ISO14001. This year's audit report stated: 'The system continues to be well managed and Landcare Research is leading the field in a large number of areas with respect to innovative systems such as rain harvesting, energy conservation and carbon zero calculations.' The auditors noted strong evidence of effective and responsible environmental management and commitment from staff.

COMPLIANCE WITH LEGISLATION

There were no material instances of non-compliance during 2008/09.

PRESTIGIOUS RECOGNITION



David Galloway, winner of Acharius medal.



Matt McGlone, Fellow of the Royal Society of New Zealand.



Ann Smith (third from left) and Mike Tournier (third from right) at the 2009 Vero Excellence in Business Support awards with Prime Minister John Key (centre).

INDIVIDUAL SCIENCE AWARDS:

Matt McGlone was made a Fellow of the Royal Society of New Zealand for his work into the nature of New Zealand's vegetation prior to human settlement. Matt's work in integrating research from macrofossils, tree rings, volcanism history, isotope data and geological history to reconstruct the vegetation cover of New Zealand since the last Ice Age provides a benchmark against which to measure how fast some plant species have been able to adapt and respond to significant changes in the environment.

David Galloway (Research Associate of Landcare Research) was presented with the prestigious Acharius Medal by the International Association of Lichenology. The medal is awarded every four years for 'outstanding contributions to lichenology' and this is only the second time the association's premier award has been made to a Southern Hemisphere lichenologist.

BUSINESS AWARDS:

The carboNZero^{Cert}™ programme

- Won a Judges' Commendation for Sustainable Design and Innovation at the recent 2008 NZI National Sustainable Business Network awards
- Won the Champion Service Award (for medium-large companies) at the Champion Canterbury Awards
- Won the Sustainable Service category for the Southern Region in the Sustainable Business Network's design and innovation awards

- Won the High Growth Sector Award at the 2009 Vero Excellence in Business Support awards
- Became the first greenhouse gas certification scheme in the world to receive international accreditation under the auspices of the International Accreditation Forum (IAF). The carboNZero programme is the only accredited ISO14065 greenhouse gas verifier outside the United States
- Ann Smith, Technical General Manager, was joint winner of EECA's Outstanding Contribution to Sustainable Energy Award

Sirtrack

- Won the ASB Hawke's Bay Emerging Exporter of the Year award
- Was named as the Westpac Hawke's Bay Chamber of Commerce Exporter of the Year. The judges recognised Sirtrack as a leader in creating wildlife-tracking devices with about 90% of its products exported to a range of diverse markets. They commended the company for its significant investment into product research and development, focusing on producing premium products customised to suit specific project needs.

FINANCIAL SUMMARY

The accounts (for parent and consolidated group) and audit report are in Part 2 of our annual report and also available in full on our website. Those accounts plus this summary sustainability report constitute our statutory annual reporting responsibilities.

SUMMARY TABLE OF FINANCIAL PERFORMANCE INDICATORS

	2007 ¹	2008 ²	2009 ³		2010 ⁴
	Achieved	Achieved	Target	Achieved	Target
Revenue, \$m	52.76	56.07	55.10	60.25	62.26
Net revenue, \$m	46.43	49.52	52.70	53.13	55.07
EBIT, \$m	1.70	1.43	0.8	2.36	2.28
EBIT margin	3.2%	2.5%	1.5%	3.9%	3.7%
Total assets, \$m	42.28	44.58	45.41	48.35	45.98
Return on equity	3.4%	2.5%	1.2%	5.3%	6.4%
Equity ratio	56%	60%	59%	58%	62%
Gearing	19%	13%	13%	13%	6%
Interest cover	4.6	3.4	2.2	7.2	9.7

**NET PROFIT
AFTER TAX OF
\$1.44 MILLION
EXCEEDED TARGET OF
\$0.3 MILLION
TOTAL REVENUE
\$60.5 MILLION**

¹ Prepared under previous generally accepted accounting practice.

² Prepared under NZ IFRS from 2008 onwards.

³ 2009 target excludes FRST subcontracts.

⁴ 2010 target, gearing is calculated based on net debt and return on equity excludes extraordinary restructuring costs.

Revenue:

Includes science research, contract work for the government and commercial clients, royalties, licence fees etc., plus income from the sale of product and the lease of assets. It excludes income from interest on investments and from finance leases, \$207k for 2009 making total revenue \$60.454m (\$60.5m).

EBIT margin:

Earnings before interest and tax, and after committed business development expenditure and commercialisation expenditure. It excludes restructuring costs.

Return on equity:

NPAT ÷ average shareholders' funds, expressed as a percentage. NPAT is net profit after tax. Shareholders' funds include share capital and retained earnings.

Equity ratio:

Average shareholders' funds ÷ average total assets.

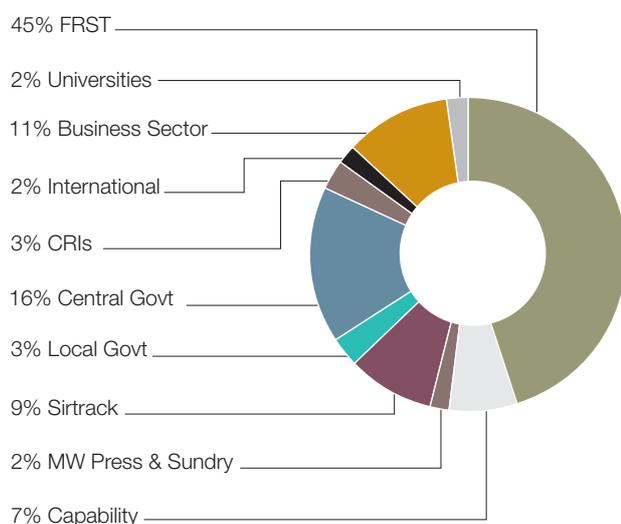
Gearing:

Financial debt includes all interest-bearing liabilities. Gearing = financial debt ÷ financial debt plus shareholders' funds, expressed as a percentage. (The Minister of Finance and Minister of Research, Science and Technology each hold 50% of the shares on behalf of the public.)

Interest cover:

Interest is the cost of debt and financial leases. Interest cover = EBIT ÷ interest.

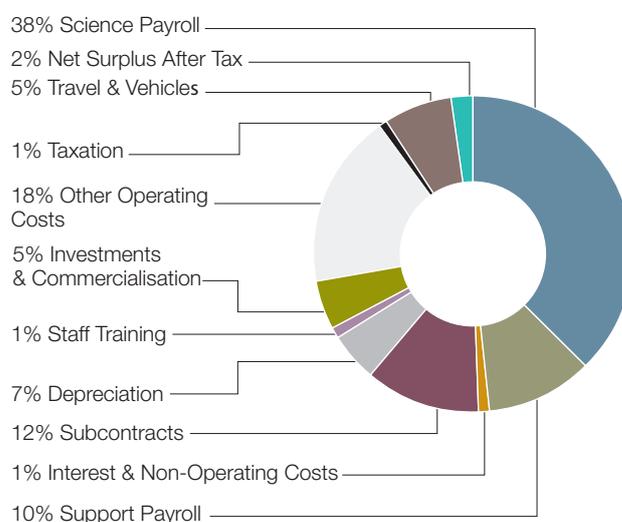
Where our revenue comes from



WHERE OUR REVENUE COMES FROM

- Foundation for Research, Science and Technology (FRST) 45% – contestably funded research programmes, negotiated funding and long-term OBIs
- Universities 2% – contracted services, some paid lecturing by our staff, and rentals for university staff located in our buildings
- Private & business sector 11% – principally contracted work for businesses and private organisations including the Animal Health Board
- International 2% – development projects funded by donor agencies, international consultancy projects
- CRIs 3% – research subcontracted to us in collaborative programmes
- Central government 16% – services contracted by government departments including DOC, MfE and MAF
- Local government 3% – contracted work for regional, district and city councils
- Sirtrack 9% – wholly owned subsidiary, which develops and produces telemetry equipment for tracking wildlife
- MW Press & sundry 2% – Manaaki Whenua Press is our natural history and science book publishing and retailing business centre
- Capability Fund 7% – MoRST funding used to maintain existing and develop new science & technology capability

Where our revenue goes



WHERE OUR REVENUE GOES

- Science payroll 38% – includes staff in science, technical and science support roles
- Travel & vehicles 5% – all vehicle and air travel by our staff, including the cost of leased vehicles. Landcare Research runs a mixed fleet of vehicles including 4WD and quad bikes for fieldwork, and cars and vans for road use
- Taxation 1%
- Other operating costs 18% – includes electricity, carbon credits, software licences, insurance, consumables, and lease costs
- Investment & commercialisation 5% – support for technologies and services including those advancing through our commercialisation pipeline
- Staff training 1% – includes conferences, training courses and support for postgraduate study (2.2% of the total payroll)
- Depreciation 7% – includes depreciation on buildings, science equipment and computers
- Subcontracts 12% – research subcontracted to other research providers, including CRIs and universities in collaborative research programmes
- Interest & non-operating costs 1%
- Support payroll 10% – includes staff in management, information services, administration, HR, finance and communication roles

DIRECTORY

DIRECTORS

Jo A Brosnahan (Chair)
Graeme S Boyd
Alastair R Lawrence
M John F Luxton (From 1 July 2009)
Robin Pratt
Peter M Schuyt (From 1 Sept 2009)
Tania J Simpson (From 1 July 2009)
Victoria Taylor (From 1 Sept 2009)
William S Te Aho (Retired 30 June 2009)
Anne J Urlwin (Deputy) (Retired 30 June 2009)
J Jill White (Retired 30 Oct 2008)

SENIOR MANAGEMENT TEAM

Dr Warren Parker: Chief Executive Officer
Carol Bellette: Chief Financial Officer
Mike Lee: General Manager Business
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COMMONLY USED ACRONYMS

ACC	Accident Compensation Corporation
AHB	Animal Health Board
BNZ	Biosecurity New Zealand
CCMAU	Crown Company Monitoring Advisory Unit
CRI	Crown Research Institute
DOC	Department of Conservation
ECAN	Environment Canterbury
ERMA	Environmental Risk Management Authority
FAR	Foundation for Arable Research
FRST	Foundation for Research, Science & Technology
GRI	Global Reporting Initiative
HELP	Hydrology for the Environment, Life and Policy
IRAP	Integrated Research for Aquifer Protection
IUCN	International Union for Conservation of Nature
MFAT	Ministry of Foreign Affairs and Trade
MAF	Ministry of Agriculture and Forestry
MED	Ministry of Economic Development
MFE	Ministry for the Environment
MoRST	Ministry for Research, Science and Technology
NZIER	New Zealand Institute of Economic Research
TPK	Te Puni Kokiri



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