



At this year's New Zealand Grassland Association Conference, AgResearch's Dr Stewart Ledgard will present a study that shows New Zealand dairy farms are slipping in terms of energy efficiency and greenhouse gas efficiency.

## NZ dairy farms losing advantage over EU

New Zealand dairy farms are slipping in terms of energy efficiency and greenhouse gas efficiency, and urgently need to focus on improved farm practices and intensification options to reverse the trend.

This is according to the first New Zealand study to look at the entire dairy system using a Life Cycle Assessment approach.

Led by AgResearch Principal Scientist Dr Stewart Ledgard, the study analysed the relevance of food-miles in the debate over the sustainability and export of New Zealand dairy products. Food-miles are defined as the distance food travels from producer to consumer.

Presently, New Zealand farm systems are ahead of those in the European Union when considering such things as on-farm energy use and food-miles. However, the trend for intensification on

New Zealand farms means that comparative advantage is diminishing, says Stewart.

"This means farmers need to start using knowledge of the main factors influencing greenhouse gas emissions to improve farm practices or plan intensification options and retain their comparative advantage.

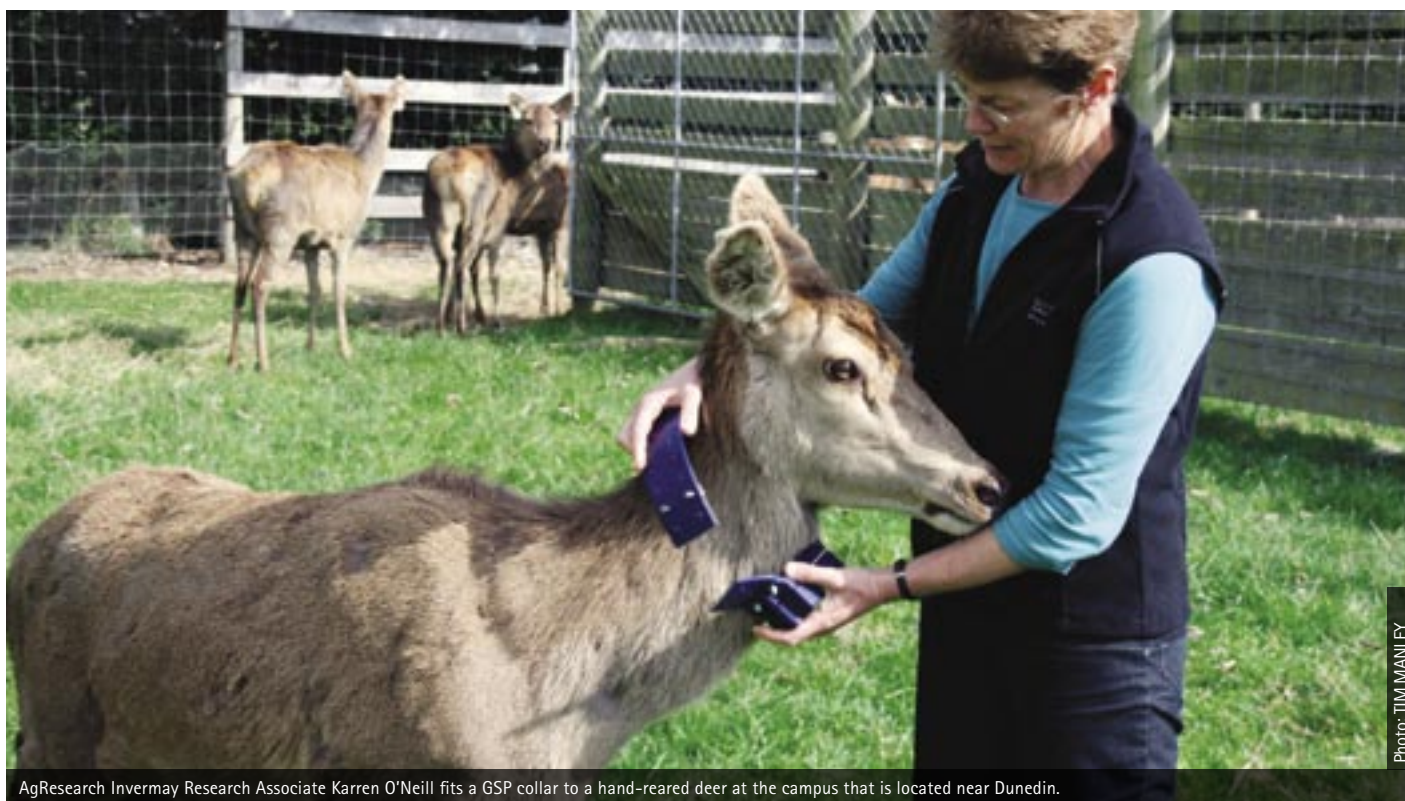
"For example, practices such as increasing productivity per animal can reduce emissions per kg animal product, and optimising use of farm dairy effluent to reduce fertiliser requirements can reduce emissions per hectare.

"Our work focuses on finding and highlighting to farmers the potential benefits of different management practices and mitigation options – not just with greenhouse gas emissions but also with water quality. We're looking for multiple gains."

Greenhouse gas efficiency is becoming a major issue for New Zealand farmers as we move toward agriculture joining the Government's Emissions Trading Scheme (ETS) in 2013. Other sectors will by then have entered the incentive-based scheme that aims to drive down New Zealand's greenhouse gas emissions.

# World's first GPS collars to track farmed deer

In a world first, scientists have developed Global Positioning System (GPS) collars for use on farmed deer in New Zealand to get a clearer picture of their behaviour.



AgResearch Invermay Research Associate Karren O'Neill fits a GSP collar to a hand-reared deer at the campus that is located near Dunedin.

AgResearch's Karren O'Neill is working with scientists from Australia's Commonwealth Scientific and Industrial Research Organisation Livestock Industries (CLI) to develop techniques that use the collars to determine deer grazing distribution. CLI is currently using GPS collars to track cattle in the Barkly Tablelands of Australia's Northern Territory while Karren uses the collars on deer that are farmed in the New Zealand high-country.

"By understanding how deer use their environment, we can give deer farmers better farm management practices that they can use on these extensive systems," says Karren who is based at AgResearch Invermay, near Dunedin.

"Our ultimate aim is to help deer farmers be more productive. By tracking the deer we can help farmers with such things as riparian management and see what vegetation the deer are eating."

The collars are expensive, so will be used as a research tool rather than being sold to farmers.

Karren has been to Australia twice to work alongside CLI's Dr Nigel Tomkins and Sam Williams. Karren says the collaboration with CLI is invaluable.

"Using GPS collars is not as straightforward as it sounds and working closely with CLI has helped me overcome many hurdles,

*continued from front cover ....*

Agriculture makes up almost 50 percent of New Zealand's total emissions – compared to less than 10 percent of most developed countries' emissions.

"Basically, under the ETS, if dairy farmers' efficiency decreases there will be a cost to the dairying sector. The approach they use to intensify can have a large effect on environmental efficiencies.

About five years has gone into his team's study that is based on comprehensive data sets from

such as how best to programme the collars to maximise the battery power and how to improve the waterproofing of the devices. We face the same hassles."

The project is an example of AgResearch's focus on increasing collaborations with Australian research organisations such as CLI.

different organisations. The findings will be presented for the first time at this year's New Zealand Grassland Association Conference being held at Taupo from November 13 to 15. AgResearch is premier sponsor of the association. This year's conference will include a speech by AgResearch chairman Rick Christie.

- More information on the conference is available at [www.grassland.org.nz](http://www.grassland.org.nz).

# Marsden grants to benefit primary sector and human health

Two AgResearch scientists awarded prestigious Marsden Fund grants will use animal models for research that could lead to important insights into human and animal embryo growth and development, and potential new treatments for cancer and heart disease.

AgResearch Ruakura-based scientist Dr Peter Pfeffer, of the Reproductive Technologies Section, was awarded nearly \$750,000 over three years for a study that focuses on gastrulation – the embryonic process during which a mammal's three body layers are laid down and the head-tail orientation of the body plan is specified. The three body layers are the outer skin and nervous system, the organs and inner skin, and the innermost lining of lungs and gut.

Peter and colleagues will investigate where the signals that induce gastrulation come from in mammals such as humans, cows, carnivores and rabbits.

"We plan to use cows as a model system to answer this fundamental question, leading to evolutionary insight into early mammalian development. Such knowledge is critical to gaining an eventual understanding of human, as well as livestock, reproductive failure and disease."

Palmerston North-based Senior Scientist Dr Ron Ronimus of the Food, Metabolism & Microbiology Section was awarded \$550,000 over three years for a study that will test the idea that a newly-discovered mammalian enzyme, ADP-dependent glucokinase (ADP-GK), is important in cellular adaptation to low oxygen conditions – known as hypoxia.

Many serious human diseases such as cancer, heart disease, and chronic lung and intestinal diseases have hypoxic regions in their associated tissues. Survival of cells during hypoxia has vital clinical implications for many of these diseases as well as physiological processes such as embryonic development and stem cell maintenance.

"Potential downstream medical benefits include the enhanced imaging of hypoxia-related disease and new therapies for improving the recovery of affected tissues, after such things as heart attacks or strokes, or the targeted killing of cancerous cells."

## AgResearch fabrics huge hit at NZ Fashion Week

A stab, cut and flame-resistant fabric being developed by AgResearch's textiles team was a hit at Air New Zealand Fashion Week, with it catching the attention of national media.

The fabric – made into a vest – was displayed on a mannequin in the main gallery, with the world's first machine-washable suit over top. The suit is made from 100 percent wool and is shrink resistant without the use of any chemicals.

AgResearch Lincoln-based developer Maree Hamilton-Chisholm was interviewed about the fabrics on Newstalk ZB and TVNZ's One News bulletins at six o'clock and midday. Dr Peter Ingham, AgResearch Lincoln's Textile Science & Technology Section Manager, was interviewed by Radio Live, while a photo-story ran in the New Zealand Herald.

The publicity led to a number of commercial inquiries from people interested in using the technology, including those from a prison authority, security firms and the forestry sector.

The stab resistant vest is made from a non-cut, ultra high-strength liquid crystal polymer

known as Vectran which is combined with short wool fibre that is packed into the outer fabric surface.

Maree says the fabric will resist cutting, puncture or knife penetration, is lightweight, comfortable to wear and has the multiple benefits of the breathability, comfort and the inherent flame resistance of wool as well as the puncture resistance of the Vectran component. She says the fabric is suitable for casual vests or jackets.

"Whilst not bullet proof, the fabric is able to resist penetration by a knife and is also cut resistant. It's been developed to protect the wearer from the ever-changing and sometimes hostile world we live in."



The vest and a suit on display at Air New Zealand Fashion Week.

# Warning NZ farming needs GM to be competitive



Drs Martina Newell-McGloughlin and Goetz Laible with some of the transgenic cows at Ruakura's containment unit.

## New Zealand is being warned it will be a third world country in 20 years time without GM technology.

The claim comes from PGG Wrightson Group General Manager of Technology Services Paul Tocker who was a key speaker at AgResearch's recent New Zealand Media Agricultural Biotechnology Workshop that was sponsored by Federated Farmers of New Zealand.

"The opportunities within GM are incredible but it's a fast-moving science and if we don't keep up with it as a nation it'll pass us by and we'll never be able to re-enter it again."

GM can be used to create plants with attributes such as drought tolerance, fewer greenhouse gas emissions and greatly improved production levels – traits that cannot readily be generated by conventional plant breeding, he says.

Another keynote speaker was Dr Martina Newell-McGloughlin, of the University of California's System Biotechnology Research and Education Program.

"Between 1996 and 2006, the benefits of GM crops worldwide included a reduction in CO<sub>2</sub> emissions that is equivalent to taking 5 million cars off the road, a cumulative net economic benefit of \$27 billion and a 14% reduction in pesticide use.

"Available agricultural land shrinks by 20,000 ha every year and, without a yield increase, land needs will double by 2050. Biotechnologies can create high-yielding, affordable, high-quality food, feed and fuel with minimum inputs."

Another keynote speaker, Paula Fitzgerald, of Agrifood Awareness Australia Limited, warned of the outcome for Australia if it continues current moratoriums on GM crops.

"A continuance of the current moratoriums, and extension to other transgenic broadacre crops, is expected to result in a loss of gross national product of \$3 billion, in net present value terms, over the next 10 years."

While the New Zealand Government continues to be cautious around GM, the Australian

Government is pushing ahead. Federal Agriculture Minister Peter McGauran recently said current GM moratoriums are damaging Australia's farming industry and he is urging state governments to lift bans on growing GM canola.

New Zealand has one of the stricter GM approvals processes in the world, overseen by the Environmental Risk Management Authority (ERMA). This reflects public concern with the technology.

However, AgResearch Science Strategy General Manager Dr Travis Glare, who also spoke at the workshop, says dismissing technologies such as GM could leave New Zealand farmers seriously disadvantaged in the future.

"GM is one of many biotechnological and management options we're exploring that could maintain New Zealand's economic advantage in agriculture. It's important that New Zealand keeps its options open."

# New sulphur test simpler and more accurate

A new sulphur soil test developed by AgResearch gives farmers a highly accurate picture of how much sulphur fertiliser their soil needs, plus makes scientific analysis easier.

"Sulphur is one of the more important major elements required for plant growth and deficiency causes yellowing of leaves and poor pasture growth," says the test's developer Dr Gordon Rajendram who developed the test as part of a PhD project.

Promoted by Ballance Agri-Nutrients, the Total Sulphur (TS) test will eventually replace two traditional soil tests that separately measure easily extractable organic sulphur (EOS) and sulphate-S ( $\text{SO}_4$ ). Currently, the TS test – which indicates the annual sulphur supplying capacity of soil – is being used in conjunction with the sulphate-S test that measures the sulphur immediately available for plant uptake.

"The new test overcomes many of the shortfalls of the current sulphur tests and will give the farmers more confidence when determining the sulphur status of their farms," says Gordon who is based at AgResearch Ruakura.

"The two tests are measured using different instruments and EOS is calculated via a difference technique. This leads to technical difficulties in the laboratory. TS can be determined using a single instrument, thus minimising errors and making it easier to analyse in the laboratory – reducing analysis costs."

AgResearch Senior Scientist Dr Anwar Ghani, also based at Ruakura, is project manager of the TS test and says it is more robust than either of the traditional tests – giving more reliable results.

"It is less influenced by the effects of leaching, urine spots and recent fertiliser inputs than the sulphate-S test, so is capable of giving a much more accurate indication of whether or not sulphur fertiliser is required, and the likely pasture response."

It has taken about four years to develop the test and get it to market, including about two years of input from AgResearch Ruakura Business Development Manager Kevin Benge. AgResearch is keen to see more farmers getting access to this new improved sulphur test and using it to maximise pasture production on their farms.

- The TS test can be completed in three to four days and is being carried out by Hill Laboratories in Hamilton: phone 07-858-2000 or email [mail@hill-labs.co.nz](mailto:mail@hill-labs.co.nz)



From left, Dr Gordon Rajendram, Te Aroha dairy farmer Jim Shallue and Dr Anwar Ghani gather soil for the new Total Sulphur test at Jim's farm that is about an hour's drive from Hamilton.

## Hopkirk Research Institute has new website

The Hopkirk Research Institute's brand new website lets users see the state-of-the-art facility, plus find out about its research capabilities, staff and employment.

Watch out for the website that is going live at <http://www.agresearch.co.nz/hopkirk/default.asp>

The Hopkirk is a joint venture between AgResearch and Massey University and has the southern hemisphere's largest concentration of health sciences for pastoral-fed animals. Its main focuses are:

- researching solutions for the control of parasitic diseases – primarily in sheep and cattle
- evaluating more effective vaccines to combat infectious disease – chiefly tuberculosis, with a growing emphasis on Johne's disease
- identifying and predicting food poisoning threats in New Zealand and devising strategies to minimise their prevalence and impact.

## ■ to contact intouch:

AgResearch's Communications Advisor, Caroline Lucas

Phone: (03) 321 8826

Email: [intouch@agresearch.co.nz](mailto:intouch@agresearch.co.nz)

Website: <http://www.agresearch.co.nz>

Intouch is produced by AgResearch Corporate Affairs

## Don't miss this!!

Hear about livestock's dark shadow – international greenhouse gas expert Henning Steinfeld will be the lead speaker in free public forums organised by AgResearch and chaired by broadcaster Kim Hill from 7pm to 9pm at:

- Christchurch: November 26, James Hay Theatre
- Wellington: November 29, Ilott Theatre
- Hamilton: November 30, venue TBC.

See our website for updates.

# Great response to AgResearch's new education service



AgResearch Education Officer Colin Nicol in the classroom with Year 13 biology students from Thames High School and Paeroa College.

## AgResearch's new Education Service is proving enormously popular with schools as it provides students with curriculum-based science experiences that most schools cannot afford.

As part of AgResearch's social responsibility programme, Education Officer Colin Nicol visits schools throughout New Zealand, free of charge. Since the service started in March, Colin has been into 80 classrooms in 45 schools and worked with almost 2000 students from primary to Year 13, along with 90 teachers.

"It's extremely valuable to schools because no-one else is doing anything like this in New Zealand," he says.

"I take in things like electrophoresis gels that the students then get to use – teaching them

the technique for checking if an animal or plant has a particular gene. Most schools can't afford the gels, so the students would never otherwise get the opportunity to use them.

"I also try to de-mystify genetic modification (GM). The Year 13 curriculum includes students researching a contemporary biological issue, so this dovetails perfectly into that."

Colin's demonstrations cover plant and animal genes, food and health, agri-technologies and sustainable resource management. He also encourages discussion about future science

education and employment options. He has received overwhelmingly positive feedback.

"It's averaging a 99% satisfaction rating from students in terms of material and resources, while teachers average a 90% satisfaction rating on such things as the quality of content and presentation, and how it meets curriculum objectives."

Colin will run a GM workshop for teachers in December where they will examine the methods used to modify plant and animal cells.