

AgScience



Inside

The ETS Forum

Is farming subsidised?

Award winners





Just Hot Air?

THE EMISSIONS TRADING SCHEME (ETS) tends to be one of those polarising subjects that either is absolutely necessary to save the planet or simply another tax that will impact initially on primary producers and subsequently be passed on to the consumers. In this edition of *AgScience* summaries from a range of talks at a recent NZIAHS Forum on the ETS are presented. The talks covered scientific approaches looking to reduce or manage emissions, policy outlines as to why and how New Zealand can approach this issue and some examples of how this will impact on the different farming sectors. It's a broad view but very topical as we look to deal with the wider issues and the details of the ETS.

The ETS is a harbinger of change, so I will take this opportunity to introduce myself, having recently been entrusted with the position of President of the New Zealand Institute of Agricultural and Horticultural Science. My name is David Lewis and I am a scientist with Plant & Food Research based in Palmerston North. My immediate research interests are plant biology, particularly horticultural crops and the pigments produced by both fruit and flowers. I count myself fortunate to have worked in horticultural science for over 20 years, initially with DSIR but then with MAFtech, Crop & Food Research and more recently Plant & Food Research. My time in horticultural science has covered the formation of the CRIs, the introduction of the competitive funding model for scientific research and some big changes in both the agricultural and horticultural industries. NZIAHS has seen some fairly big changes during this time too. Our activities have changed somewhat – for example, we no longer have one big conference week that encompasses everything from farm management to meteorology but we still

play an important role. This is illustrated by the Forum described in the following pages and the diverse groups brought together to consider this issue.

My thanks on behalf of the Institute go to Jon Hickford, the Immediate Past President. Not only has he been a strong advocate for the Institute but for agricultural and horticultural science generally. Jon has presented some forthright views on science funding, the role of universities, attracting students to agricultural and horticultural science and the uses and application of new technologies in primary production. I have appreciated his ability to hold strong views but also to consider and balance them in a wider context. I have also been impressed with his general awareness of issues in the rural community. I will be relying on him for his ongoing input to the institute and for a few gentle reminders where necessary when particular items may have escaped my notice.

My thanks also go to the members of the Canterbury section of NZIAHS for organising the Forum and highlighting the topic of the ETS. I was among the participants. While I found the presentations interesting, I left at the end of the day sure that different groups of people held very different opinions on the matter and somewhat bemused as to how these views could be reconciled and a way forward agreed on.

Some personal observations made during the day were:

- The use of natural resources for human activity does not come without cost.
- The ETS scheme is a version of user pays and while initially charges will be levied on emitters, ultimately we will all pay whether that is an actual monetary cost or in the impact on our environment.
- A contradiction is that one group can

buy another's credits while continuing to release greenhouse gases. So is there enough incentive to reduce emissions?

- There isn't a middle ground for politicians. Julia Gillard and the Australian government took much criticism for the recent introduction of an ETS scheme but for all countries this issue must be considered in longer time frames than that of the next election.

Another of my observations is that the ETS has a number of other issues tied up with it:

- Our reliance on fossil fuels and the finite nature of those fossil fuels.
- Why New Zealand would focus on emissions from livestock when the rest of the world ignores this aspect.
- What is needed to encourage investment in activities that earn credits.
- Whether smaller countries can lead the way when the superpowers are not meeting emission reduction targets.
- Increased production cannot be the only answer to schemes like ETS when this will increase the impact on the environment.

I noted a recent comment from Tim Groser, the Minister of Climate Change Issues, regarding the next round of climate change talks and the fact we need to have everybody on the mitigation bus. Sustainability and preservation of the environment can't just be goals, they must be what we actually do. We cannot laud our "clean green" image but then not take steps to protect it. So I invite you to read the summaries of the different presentations, consider the points made and to keep talking. The ETS as it stands may not be the best system but I think it is taking us in the right direction.

David Lewis
President

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Government support for R & D passes muster with the OECD

DAIRY SECTOR LEADERS, WELCOMING the Government's mid-year decision to defer agriculture's entry into the emissions trading scheme for its biological

emissions, highlighted the millions of dollars being invested in research to reduce greenhouse gases.

But they said scientists have yet to come up with effective ways of enabling farmers to reduce those emissions. Until they do, dairying's biological emissions should be exempted.

DairyNZ invests nearly \$1 million a year in programmes aimed at reducing methane and other agricultural gas emissions through funding the world-leading science being carried out by the Pastoral Greenhouse Gas Research Consortium (PGgRc).

A similar sum is being invested in a seven-year DairyNZ-led research project where dairy cows are being evaluated to see how efficiently they can convert feed into milk while reducing emissions.

Fonterra's Group GM Global Sustainability, Bruce Donnison, said farmers had contributed nearly 25% of the \$43 million being invested by New Zealand in mitigation research and want practical solutions.

The work will continue, along with the efforts being made in Fonterra's milk processing plants to drive down emissions, especially through energy efficiency.

The Government confirmed on July 2 it would defer the entry of agricultural emissions into the ETS until at least 2015, pending a review to assess whether technologies were available to reduce them.

The changes were announced after the Government considered the recommendations of the ETS Review Panel, listened to those affected by the ETS, reviewed what trading partners are doing and considered feedback through community consultation.

Some commentators doubted biological emissions will be brought within the ETS under the Key government.

Asked if they would be, Prime Minister John Key said it might but not at present and not until other countries were also making greater progress.

One issue raised by the Government's decision to delay the inclusion of biological emissions in the ETS was whether dairy farmers have been given a free pass to pollute, as Labour's Climate Change spokesperson, Moana Mackey, insisted.

Keeping agricultural emissions out of the ETS at least until 2015 "further subsidises polluters at the expense of taxpayers", she said.

Green Party co-leader Metiria Turei made the same claim, saying subsidies to polluters cost taxpayers the equivalent of \$1.5 billion last year.

William Rolleston, Federated Farmers climate change spokesman, said it was perverse to call a non-tax a subsidy.

The subsidies which were scrapped by the Lange Government in the 1980s were those that blindly increased production and distorted

markets, he pointed out.

New Zealand agriculture still had subsidies, using a broad definition, he acknowledged.

These included the government's contribution to research and development, the rural support trust to support the rural sector in times of disaster, rural broadband, irrigation infrastructure "and, if you go wider, the provision of central and local government services".

The definition of subsidy used by the OECD includes R&D. But it disapproves only of those subsidies that distort market prices for agricultural products.

Primary Industries Minister David Carter rebutted the criticism about subsidies by observing there is no commitment to Kyoto beyond the end of this year. So no cost is being incurred by government "and for the Greens to continue arguing that it's a subsidy is misinformation".

Moreover, he did not accept that the government's involvement in significant infrastructural investment was a subsidy. "We currently expect the Government to ensure there are roads to rural areas, there is electricity, there is broadband to rural areas, because that is a fundamental role for both central government and local government," he said.

"And the provision of irrigation infrastructure is the same as any other basic infrastructure. It is required to make sure the economy performs to its best advantage. So I reject that our support for irrigation is a subsidy."

OECD data show no country got less producer support from its government in 2010 than New Zealand.

Over 2008-10, New Zealand had the lowest level of support to farm receipts, at just 1% of farm income, followed by Australia (3%), and Chile (4%).

The OECD report, *Agricultural Policy Monitoring and Evaluation 2011*, points out that most government support is still given in ways that distort production and trade while doing relatively little to improve productivity and competitiveness, ensure sustainable resource use or help farmers cope with risk.

"With tighter government budgets and farmers getting top prices for their crops, governments should begin to shift from payments that further support farm incomes and move to policies that have long-term benefits for the global food economy," said OECD Director for Trade and Agriculture Ken Ash. "The time is ripe for reforming farm support."

The OECD says countries should focus on improving farm productivity, sustainability and long-term competitiveness, rather than policies that distort markets.

Farm policy should also offer greater support to research, innovation and education. ☒

— Bob Edlin

Acknowledgement: The editor of Dairy Exporter has kindly given permission to publish this condensation of two articles in the August issue of that magazine.



Blue and green views of the ETS

BECAUSE OF THE BROAD implications of climate change, the Government is trying to balance a wide range of economic and environmental factors in formulating climate change policies. Simon Bridges, Associate Minister of Climate Change Issues, championed this policy at the Lincoln Forum. Green Party MP Kennedy Graham explained why the Government's measures fall far short of what is needed.

Simon Bridges (Associate Minister of Climate Change

Issues) outlined the latest changes to New Zealand's Emissions Trading Scheme, how they will affect the agriculture, horticulture and forestry sectors, and how the Global Research Alliance on Agricultural Greenhouse Gases can contribute.

The main purpose of the new legislation is to ensure the ETS effectively supports the Government's economic growth priorities by keeping carbon costs at a level appropriate for the current economic situation and in line with other countries' climate

change action. The amendments will mitigate the short-term costs for businesses and households and ensure the ETS is flexible enough to cater for a range of future international scenarios.

Among key features:-

- Transitional measures reducing the impact of the ETS on households and businesses are being extended beyond 2012, subject to review in 2015.
- The start date for surrender obligations for biological emissions from agriculture is deferred. National Party policy is that surrender obligations for biological emissions from agriculture should not be introduced until technologies are available to reduce agricultural emissions and international competitors are taking sufficient action on their emissions.

Under current ETS settings, agricultural processors (mainly milk and meat) report on the greenhouse gas emissions for the agricultural sector. The Government intends to move reporting to farm level and is examining how this can be done. It will involve bringing at least 40,000 additional participants into the ETS, creating significant administrative, compliance and reporting challenges.

Some horticultural growers (such as tomato growers) are eligible for free emission units under industrial allocation. Legislative amendments make two more emission sources eligible for industrial allocation – the direct use of liquid fossil fuel in stationary equipment and fugitive coal seam gas.

Another important change is the introduction of offsets for pre-1990 forestry in the ETS, giving owners of pre-1990 forest land more flexibility so they can change to a more profitable land use without ETS deforestation liabilities, as long as a new forest is established elsewhere. Several technical changes make forestry rules more

workable and flexible, too.

Mr Bridges acknowledged that carbon foresters would be disappointed the Government won't intervene to push up carbon prices in the ETS. This may reduce the incentive for forest planting in the short term, but "no one expects carbon price to be \$5 in 20 years' time".

The Government meanwhile is investing in finding ways to mitigate emissions – particularly in agriculture – most notably as an active member of the Global Research Alliance on Agricultural Greenhouse Gases. Mr Bridges expects the alliance will build New Zealand's agricultural science capability to benefit the primary sector and create new international market opportunities for our scientists and for resulting technology.

The Government has allocated \$45 million (to June 2016) to support alliance activities, focusing investment especially on research to reduce greenhouse gas emissions from pastoral livestock production.

Kennedy Graham (Green Party MP) said the National view was to calibrate New Zealand

policy in the context of what others are doing – we will do our fair share and be in the middle of the herd. The Green approach is to look primarily at what is happening to the environment and what is required.

Another difference is that National regards the requirement to reduce greenhouse gas emissions as a burden "that we have to stagger our way through". The Greens regard it as an opportunity to switch to a low-carbon, new-tech economy.

The Greens most fundamentally see climate change as an element of an ecological crisis. We have to learn to say no to fossil fuels and we have to switch to a low-carbon economy in the next few decades.

Dr Graham said New Zealand's climate change pledges are no better or worse than those of other governments. But no country is doing enough. "We have done only half of what is required".

The Kyoto Protocol was "manifestly inadequate" because it focused only on developed countries, it covered only 29% of global emissions, and it was aimed theoretically at lowering global emissions by just 3%.

Addressing the government's ETS legislation, Dr Graham said it further weakened a weak Act and ensured the ETS better supported the Government's economic priorities. "This is where we differ philosophically".

The Greens don't accept that agricultural emissions can't be reduced, citing the examples of policies in Sweden and Ireland.

"We believe our emissions can reduce without undue hardship to farmers, with farmers participating along with the business sector in opportunities for a switch to a low-carbon high-tech economy," he said. "It can happen if we take a positive approach". ☑



ETS challenges for farmers and foresters

DAIRY

Willy Leferink, Federated Farmers Dairy chairperson, talked from his own experience as a dairy farmer. The imposition of the ETS, he said, would undoubtedly lead to a change in dairy farming practices, the outcome likely being further intensification which possibly will call for the housing of dairy cows for part of the year in loafing barns. The precedents have been established both locally and in China, where even calves reside in barns at Tangshan Farm, the Fonterra property in the Hebei Province. Leferink expects a revolutionary change to a housed-cow dairy systems with many more cows in cubicles and better waste-management systems that enable better greenhouse gas management.

The barn approach will also be amenable to the establishment of automated feeding and milking systems. The change to further intensification is needed to increase productivity and remain profitable. Leferink said change was imminent, even though emissions per kilogram of milk solids are reducing.

He said it was critical that the “point of obligation” for any ETS scheme is at individual farms, to ensure farmers who strive to achieve “best-practice” are rewarded. If the point of obligation resides with dairy companies, he warned, all farmers would be treated the same and the incentive to reduce the GHG (Greenhouse Gas) footprint would be lost.

Farmers would adapt provided they benefitted from making the necessary changes and adaptability was a necessary quality to turn to dairy farming.

ARABLE

Stuart Wright, chairman of the Foundation for Arable Research (FAR), said when you work with nature it is hard to believe that an individual can change the climate. He reminded the Forum that New Zealand has a unique emissions profile: in most other developed countries, agricultural emissions are typically less than 10% of total emissions. Despite the proportionately higher agricultural emissions, however, milk solid output per cow per year over the last two decades had increased from an average 260kg to 320kg, while emissions had dropped 10%. While total cow numbers had risen, those figures illustrated the importance of productivity gains.

Efficiency was being improved in other sectors. Wheat yields in New Zealand had increased around 400% since the 1940s to an average 8 tonne/ha, but the world record (held by a New Zealander) was nearly twice this at 15.637 tonne/ha. This raised the question of whether crop establishment emissions could be lowered without reducing crop yields and margins. FAR is committed to research to improve crop yields without increasing the GHG footprint and by optimising nitrogen use on specific crops to maximise yield



SHEEP

Peter Chamberlain, sheep farmer from Norwood, addressed the Forum as a mixed cropping/sheep/beef farmer who still runs sheep on flat land. He talked about the typically low engagement in ETS mitigation at the farmer level, except for hill-country sheep farmers involved in farm forestry. He thought this was surprising given the ETS scheme may have a major effect on the profitability of sheep and beef operations. Land use changes with costs and benefits for GHG reduction was happening anyway in both intensive (conversion to dairying) and extensive (forest planting) sheep and beef systems.

Chamberlain felt that any tax on beef and sheep farmers would ultimately be passed on to consumers. This would be acceptable provided international competitors in sheep production were taxed at the same level, especially as Chamberlain knew of no simple means of stopping ruminants from emitting GHG other than starving them or slaughter.

Sheep and beef farmers could only resort to R&D through the Pastoral Greenhouse Gas Research Consortium (PGgRc), funded by Beef and Lamb levies; productivity improvements (the sheep industry has made immense gains in such things as carcass weights and lambing percentages); improved processing to reduce waste; and improved farm-systems efficiencies. Sheep farmers were highly engaged in new technology developments to improve productivity including improving genetics and reducing production inputs, and now were promoting the recycling of products like carpet.

Chamberlain suggested a sense of perspective was needed regarding GHG mitigation, because more immediate challenges could have a much greater effect on sheep farming viability. He was alluding to living within walking distance of the 4 September 2010 earthquake epicentre.

FARM FORESTRY

Patrick Milne, a registered forest consultant with Southern Cypresses Ltd, described how conventional forestry and farm-forestry had coped with the ETS. Both had been participants in the ETS since 1 January 2008 and both were coping well, but participation is complex.

Before 2008 forestry had lobbied hard to be excluded from the ETS. Since then forestry had put a big effort into understanding the legislation and participating in the scheme. This had taken dedicated staff time in the forestry companies. The NZ Farm-Forestry Association (NZFFA) had put a similar effort into helping members understand the ETS, including branch meetings, workshops, field days, newsletters and email updates.

New Zealand farm and forest land had the potential to produce 15-40 or more tonnes carbon (NZUs) per hectare per year, depending on location and tree species. Cash flow could be positive from three years



How science

onwards, so for foresters and farm foresters the ETS offered another income stream to their business. The main financial benefit of trading carbon credits came from the “time value of money”. In other words, income from the sale of carbon credits earned as the forest grows can be invested in more trees, something else, or be used to repay debt. As with any venture there were risks, but these were manageable.

At June 2011 there were 1,200 post-1989 entrants to the scheme comprising a handful of corporates, but mostly farmers and small forest growers. Approval had been given to 200,000ha of forestry, 32% of the eligible area, and 14.4 million carbon credits had been claimed.

Milne recommended good advice be sought from a registered forest consultant.

FEDERATED FARMERS



Dr William Rolleston, vice-president of Federated Farmers, summarised ETS issues from a farmers’ perspective, calling for climate-change policies to be based on good science, be practical and cost-effective and allow New Zealand farming to remain economically viable and internationally

competitive. He suggested that for the past 20 years New Zealand agriculture had been a leader in reducing GHG emissions (by around 1.3% each year for each of the past 20 years when productivity gains are factored in). Moreover, through the Agricultural Greenhouse Gas Research Centre, New Zealand was leading the global effort to reduce biological emissions from the agricultural sector.

Rolleston said the challenge for New Zealand and globally was to develop commercially viable mitigation technologies in a world where only New Zealand had proposed putting the biological emissions of primary food production into an ETS-type framework.

Federated Farmers insists the biggest myth is that farmers and agriculture are exempted from the ETS. Farmers, like everyone else, pay ETS imposts daily on everything they consume, such as fertiliser, feed, fuel and electricity.

Federated Farmers believes agricultural biological emissions should be enrolled only when competitors in other countries have similar schemes or face similar emissions costs, when commercially viable mitigation technologies are available for widespread uptake and when international rules allow New Zealand to recognise the uptake of such technologies. ☒



Dr Suzi Kerr, Senior Fellow from Motu Economic and Public Policy Research, said everyone with a stake in agriculture – government, businesses, farming representatives, individual farmers and consumers – has a responsibility to act on reducing greenhouse gas emissions. This responsibility needs to be taken seriously if we are to sufficiently reduce the country’s emissions effectively and at low cost.

Kerr said NZ was too small for its emission reductions to matter. But it had an important role to play in showing other countries what can be done and how they can do it. We must show emissions can be mitigated without incurring serious adverse consequences.

New Zealand wanted to demonstrate it is clean and green. Creating that perception must be based on real action. Mitigating GHGs could have secondary benefits including to water quality.

Modelling showed land use change driven mostly by forestry would lead to a reduction in agricultural GHG emissions. She stressed that this reduction would be slow and on already marginal farms.

Describing some of the existing tools for GHG reductions, Kerr presented evidence that in dairy production there is considerable variation in GHG production per kg of milk solids (MS) between farms, spanning a range greater than 60-120kg MS per tonne of CO₂ equivalent. This spread suggests there is already plenty of scope to improve the individual GHG footprint of dairy farms, even when correcting for physical differences between farms. Just a small shift in the distribution would have a significant impact on national GHG emissions.

She illustrated what she called the 3 Cs for creating action to reduce emissions: first, there must be a sufficient level of knowledge and “concern” about the problem; then appropriate parties must have the “capability” to take action (such as access to capital and technology) and finally we need “contracting”, whereby emitters are required to act or given rewards or penalties through legal agreements or regulation. In the longer term Kerr envisages :–

- A stable and sufficiently stringent international agreement;
- NZ’s policies and mitigation practices are understood, known to be credible and effective and are imitated;
- Within NZ the “full climate cost” is imposed on marginal emissions;
- Fair compensation has been given for land value changes and/or the by-then-historical grievance is accepted;
- Communities and workers have fully adjusted to the carbon economy;
- Farmers are knowledgeable and research and dissemination of ideas are on-going.

The alternative is high cost to New Zealand and/or international failure to address climate change. She believes this long-term future probably involves a farm-scale ETS.

Dr Peter Janssen, from AgResearch, presented a summary of the technologies being developed to reduce ruminant methane emissions. The work is being undertaken through the funding and direction of the PGgRc and the NZ Agricultural Greenhouse Gas Research Centre (NZAGRC). The research has several themes including breeding sheep and cattle that have lower methane emissions, identifying improved feeds that reduce methane production, developing vaccines to inhibit rumen methanogens and producing inhibitors of rumen methanogens. They all target the outcome of reducing methane emissions from ruminants without negatively impacting their productivity.

Because up to 12% of available rumen energy is consumed by

is meeting the challenge

methane production, any reduction in methane output could have a production benefit. But this still remains to be proven.

Janssen explained the complexity of the rumen environment, illustrating how methane is a natural product of fermentation. As a consequence the rumen may always produce some methane, but the amount can likely be manipulated given the variation in methane output that is observed between individual ruminant animals.

The first target for reducing rumen methane output is to exploit this natural variation in methane output by individual animals, by assessing whether there is reproducible genetic variation in methane emission (eg are low emitters always low emitters?), whether the low-methane trait is linked to production traits, whether there are genetic markers for low methane and whether these can be made available to assist breeding. To date the research has revealed that methane emissions (g methane/kg DMI) is heritable in sheep and that the low-methane phenotype doesn't appear to be correlated with production traits. The animals involved have been genotyped with SNP chips and, given that sufficient numbers of animals can be measured and genotyped, it will be possible to select animals based on their genotypes. Similar work is under way in dairy cattle.

It has been shown that ruminant methane emissions from eating some forage brassicas are lower than from eating ryegrass. Experimentally, methane emissions from some brassicas were 20-25% lower than on ryegrass. The research is now being expanded to verify these findings under "production conditions" and to ascertain whether this has consequences for productivity and/or is able to be exploited in other ways.

In the complex rumen environment methane is produced by a group of Archaea. These anaerobic microbes constitute about 1% of the rumen microbial population or 109 cells per millilitre. They are evolutionarily and biochemically distinct from bacteria and from eukaryotes. Emphasis is being placed on trying to curtail their production of methane through the use of a vaccine or inhibitor. To date the methanogens have been shown to be immunogenic and vaccination against them inhibits methane production in vitro. Next these vaccines will be tested in vivo. Methanogen inhibitors have also been identified and demonstrated to have an effect in vitro. Inhibitor development will also move to in vivo testing.

Professor Tim Clough, Department of Soil & Physical Sciences at Lincoln University, discussed various initiatives for nitrous oxide mitigation in NZ. He illustrated the massive increase in atmospheric nitrous oxide concentration in the past two centuries relative to historic levels. It is one of the "worst" greenhouse gases (298 times the global warming potential of CO₂). Agriculture is contributing directly to the nitrous oxide problem with roughly 2% of annual manure N production and 2.5% of fertilizer N production being converted to the gas.

The production of nitrous oxide gas comes about because of nitrification. Urinary ammonia can be oxidised to nitrite and then nitrate, with both of the oxidised products able to produce nitrous oxide. Ultimately the nitrous oxide will be reduced to nitrogen gas (N₂), but at the expense of it being a potent greenhouse gas.

Nitrous oxide accounts for 34% of greenhouse gas emissions from NZ agriculture, a 27% increase from 1990 levels. By comparison methane accounts for 64% of greenhouse gas emissions from NZ agriculture, but this is only a 10% increase on 1990 levels.

In grazed pastures, urine patches are the main sources of nitrous oxide emissions and also nitrate leaching that can enrich ground-water.

Urinary nitrogen is applied at a rate of 1,000 kg N per hectare in a urine patch, which is equivalent to 2 t of urea per hectare. Typically urea fertiliser is only applied at a rate of 30 kg N per hectare. Urinary "loading" is therefore of major significance.

The available solutions to nitrous oxide and nitrate problems include housing cows in covered feed and loafing pads. Waste streams are accordingly more manageable. Research is also focussing on producing low nitrogen pasture plants. In research funded by the NZAGRC, Dr Susanne Rasmussen is focussing on the feasibility of growing high-yielding pasture species with lower nitrogen content and species that don't reduce pasture productivity.

Nitrification inhibitors slow the rate of nitrate production and thus reduce nitrogen losses. These inhibitors restrict ammonia oxidising bacteria (AOB) population growth in soil and reduce soil nitrate content. In one study the nitrification inhibitor DCD reduced nitrous oxide emissions by 81% in the Waikato Horotiu soil, but an analysis of 45 NZ trials under a wide range of soil, environment and management conditions, gave an average nitrous oxide reduction with DCD use, of 57%.

Clough also detailed the effects of DCD on nitrate leaching with "paddock scale" reductions in nitrate leaching per hectare per year of 10-30% in the North Island and 25-40% in the South Island. He and his colleagues have shown that DCD's last longer in cooler soils.

Dr Mike Beare, Soil Scientist at Plant & Food Research, discussing carbon sequestration in soil, drew attention to the "elephant in the room". While NZ produced agricultural emissions in 2010 of 6.3 Mt CO₂-Ce (equivalent to 6.3 million tonnes of CO₂) of methane and 2.7 Mt CO₂-Ce of nitrous oxide, there is an estimated soil carbon stock of 2,562 million tonnes. Key questions are therefore: what are the losses and gains from the soil and how do they impact on the country's net greenhouse gas emissions?

Beare explained that soil carbon is only proportionally a small component of total environmental carbon, compared with the carbon found in the oceans, the earth's crust and fossil fuel reserves. It is the product of organic matter input from plants, animal excreta and organic matter decomposition. This has important implications for the global carbon balance. But while agricultural soil carbon is not included in the ETS, it is included in international greenhouse gas accounting protocols. International interest in soil carbon as a source and sink for atmospheric CO₂ is growing, but it is not known when or if soil carbon will be traded in the future.

Beare described the immense technical challenge in measuring soil carbon. Sampling to a fixed depth and known volume is essential, with international carbon accounting and trading based on 0-30 cm deep samples. Because NZ data is based on different depths of sampling and different protocols, he called for a standard and universally accepted sampling protocol. As an example, a correction for soil bulk density would be needed as worked soils have lower density, than unworked soils.

Beare graphically illustrated how NZ's soil carbon stocks differ sharply, depending on land uses and across major soil orders. "High producing grassland" that comprises about 5.8 million hectares of our land in 2010 was now storing 2.49 million tonnes more soil carbon than 20 years earlier. The ability to store carbon differs depending on the underlying soil type.

While there are many ways in which carbon could be sequestered in the soil, theoretically, the potential to increase soil carbon storage seems small. 🌱

Awards



NZIAHS Jubilee Medal

Dr John Palmer

John Palmer has made an outstanding contribution to primary resource science, bringing together the applied field of research directly focused on the needs of fruit growers with a mechanistic understanding of how the fruit tree works. The country's pipfruit industry today shows how successful he has been in applying his scientific knowledge to meet growers' needs.

John has also served our scientists and the wider community. He has been an active member of the NZIAHS, including a period as president, and has made a significant contribution to raising its standing.

AGMARDT Technology Transfer Award

Shane Max

Shane Max has been employed a Zespri for 10 years and holds the positions of Orchard Productivity Manager - Global Supply and Kiwifruit Vine Health Technical Advisor - Spray Products. He was seconded for two years to HortResearch to improve the flow of science outputs into the orchard and has made significant contributions in advising the kiwifruit industry in the production of both green and gold varieties.

Shane epitomizes the definition of "technology transfer expert", being equally at home in detailed scientific discussion and debate and on-orchard discussion about how best to optimise productivity

Bill Kain Science Award

Dr Björn Oback

Björn Oback, an award-winning embryologist, leads the MARSDEN programme AI3815 ('Cloning mutant Mommies') and several objectives in the MSI-funded research programme CI0X0303 ('Livestock from pluripotent stem cells'). He has expertise in stem cell technology (human and mouse ePSCs, neural stem cells) and the full range of molecular cell biology techniques to analyse ePSC pluripotency.

Fellowship of the NZIAHS

Dr Jon Hickford

Jon Hickford, Associate Professor in Animal Breeding and Genetics at Lincoln University and Director of the Lincoln University Gene-Marker Laboratory, is examiner for two 300 level and two 600 level courses at Lincoln, has twice won the Lincoln University 'Top Teacher' award and is chief supervisor for seven PhD students. His research involves the molecular genetics of livestock including sheep, goats and cattle, with a particular emphasis on gene-marker technology to breed healthier livestock, and he has developed an international reputation for the development of gene-marker tests for livestock breeding. Jon has served the NZIAHS at regional and national levels, and was president from 2009 until this year.



Fellowship of the NZIAHS

Prof Surinder Saggar

This fellowship acknowledges Surinder Saggar's contribution to agricultural and horticultural science research, from basic research on soil chemical biological and physical processes in relation to nutrient transformations and their management for sustainable land use, to applied aspects of soil and nutrient management. He has played a leadership role within Landcare Research and at scientific bodies nationally and internationally. His recent research in agricultural greenhouse gases has been leading-edge in modelling, verifying and mitigating trace gas emissions.



NZIAHS Postgraduate Award

Paul Cheng

A PhD student at Lincoln University, Paul Cheng will use his award to attend the 2012 Australasian Dairy Science Symposium in Melbourne in November.

He has submitted two abstracts for presentation. His work has been carried out in collaboration with DairyNZ. He is engaged, too, in collaborative research ventures with AgResearch and in Ireland, UK and China and he has in preparation or has already published 10 papers. He has completed 11 presentations on his research findings and has received eight scholarships and fellowships.



New members We welcome

Robert Findlay (Auckland)
Chris Everitt (Waikato)
Simon Budd (Bay of Plenty)
Fadhilnor Abdullah (Manawatu)
Alistair Black (Canterbury)
Hamish Mulcock (Canterbury)
Erin Sinclair (Canterbury)
Alister Hedley (Otago)

Corporate members

- AGMARDT
- AgResearch
- Ballance Agri-Nutrients
- Catalyst R&D
- Plant & Food Research
- DairyNZ
- Federated Farmers of New Zealand
- Horticulture New Zealand
- Lincoln University
- Massey University
- PGG Wrightson Seeds
- Ravensdown Fertiliser Co-op

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