



Early summer at 2500m up a valley called Val d'Herens, Canton Valais in Switzerland. I know it looks as if I am on holiday but I'm really checking out the Swiss mountain farming systems to see what could be applied on the Lammerlaws in Central Otago. (Wouldn't it be easy if legumes grew as naturally at home at the altitudes they do here in the Alps where vetches, white and red clovers are in full flight at 2000m.)



This newsletter includes an article on Soil carbon written by Tony Parsons, AgResearch and Jacqueline Rowarth from Massey University. It is a follow up to the article in our last newsletter and sets out the complexities of not only the interactions of Carbon in the soil, but the difficulties of assessment and of aligning soil carbon with the Kyoto Protocol. It is an excellent background piece and helps set the scene for the Wednesday morning session on global warming and the management of carbon at our Northland Conference in November. Check out the Conference programme elsewhere in the newsletter.

reorganised our administration systems, provided an efficient and helpful on-call service for members and was a much appreciated sounding board for me as an incoming President. As Ross pointed out in his farewell message to you all, the effects of Parkinson's and its treatment had reached a stage where it had become difficult for him to carry on – we are so sorry to lose Ross's services and our best wishes go out to Ross and Marion as they deal with the next stage.

I imagine you were all as surprised and saddened by Ross's sudden resignation, as we were on the Executive. Ross has been a great asset for the NZGA since he was employed four and a half years ago and his genial approach, his wit and his administrative skills will be sorely missed. He

The last few months have been hectic for the Executive as we adjusted to the sudden and unforeseen gap in our administration. It has meant a considerable workload needed to be shouldered by Executive members but we have been given great assistance by Marie Casey who works for PGG Wrightson in Dunedin. (go to page 6)

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Soil Carbon – rates, stocks, monitoring and cost

Tony Parsons (AgResearch) and Jacqueline Rowarth (Massey University)

Each announcement from the Government on New Zealand's obligations under the Kyoto Protocol seems to change the game. The latest suggests that instead of being in debt by \$546 million, the country is over \$240 million in profit. The reason for the change is said to be destocking due to drought, and unanticipated activity in the forestry sector. These swings in net liabilities show how sensitive a carbon (C) economy can be to management and environment, as well as to the rules around the issues.

Accounting

The intent of the International Panel on Climate Change (IPCC), and the binding international agreements under the Kyoto Protocol, is said to be to encourage a *change* in behaviour, so that GHG emissions in future will be less than they would have been if 'business as usual' had continued.

For land-use-based mitigations (offsets), such as the sequestration of C from the atmosphere in biomass (e.g., trees), Kyoto Protocol Articles (rules) require that a country shows its rate of C sequestration over a given period is *greater* than some 'baseline' or since some starting point. Under this concept, the amount of C stored (C stocks) prior to 1990 receives little positive recognition at present.

The Kyoto Protocol accounting and interpretation is as complicated as the biology affecting C cycling. In C accounting there is a difference between *sequestering* (building up) C and *sequestered* (built up) C. As an example, newly-planted forestry pine trees are biologically *sequestering* carbon, for about 20-30 years. This is the they take up more C (storing it as wood) than they emit. All through this period they offer the prospects for receiving 'C credits'. Once the trees are fully grown, however, they reach a steady state – a dynamic equilibrium with carbon being taken up and emitted at the same rate. Although C has been *sequestered* (there is

now a greater C stock in tree trunks than at the start of the planting) there is no reward under current rules for sustaining C stocks beyond that time. No further C credits will be given. Indeed the *sequestered* C can be considered as a liability. If the trees are felled or lost in a storm, C debits must be paid. Furthermore, replanting will be seen only as sustaining the C stock. For trees the C sequestration 'baseline' was in effect set at zero in 1990. This is because Article 3.3

applies only to a *change* in land use to trees, planted *since* 1990. No credit is given for C in trees planted before 1990, although, controversially, forestry trees planted before that date still became a major liability under Article 3.3.

New Zealand has made no commitments as yet for other forms of C sequestration, and indeed as yet no commitments to agriculture (as opposed to forestry) being involved in C trading before 2013. There is much discussion however of the benefits of including soil C sequestration after that date. How could this be done and what are some of the issues?

If similar rules were to be applied for soil C, as for trees, after 2012, farmers could be rewarded for *sequestering*

ing, soil C (*changing* their management system to build up soil C), but not for any stock of C that had already been *sequestered*. Soil carbon is more likely to be included under a different article, Article 3.4, in which case farmers might have to prove what the C stocks were in, for example, 1990, and/or that they are *sequestering* C *faster* than they were in 1990. If so, farmers whose current managements were already *sequestering* soil C, might be rewarded only if they increase the rate of sequestration even further.

This raises the possibility that farmers on low organic matter soils (where rates of C sequestration in the past are likely to have been low) would have good prospects to gain credits by improving management to build soil C.



Tane mahuta

"C sequestered but not sequestering":



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Conference Update 09

Well it's June and the Winterless North has just had its first frost. That will tickle up those subtropical grasses—obviously one of the topics of the Conference.

We are holding this years Conference in conjunction with the NZ Association of Resource Managers (NZARM) so it'll be a good opportunity to have the resource planners and managers along side of the productive part. The full programme will be discussed elsewhere in this Newsletter.



*Laurie Copland,
LOC*

There'll also be opportunities, pre and post conference and for partners during Conference, to do the touristy stuff: fishing, golfing at Kauri Cliffs and tours to North Cape etc. We'll include some contacts with the package prior to registration.

Looking forward to seeing you up at the Copthorne Waitangi on the 3rd of Nov.

Laurie Copland

Chairman LOC

NZ Grasslands

Planning for the field days is well advanced. On the Tuesday afternoon we're visiting two farms in the Bay of Islands. Firstly, a dairy farm and we will be discussing why this farm has increased milk production on the same amount of grass grown.

Then on to a beef farm where we'll be looking at regrassing vs old pasture, discussing Kikuyu management challenges and looking at intensive beef on steeper country.

On the Wednesday afternoon we'll be going to a Ballance Environment Farm Award winner, again a beef farm (sorry but there aren't that many sheep in Northland). Topics will include management of once bred heifers, soil types and uses, and environmental issues.



Beef cattle on a Northland farm

Professional Partnerships

New Zealand Grassland Association has linked with the New Zealand Institute of Primary Industry Management to further increase the power of our technology transfer efforts.

The New Zealand Institute of Primary Industry Management has offered to host a series of guest seminars at their branch meetings to extend the transfer of technology from our Blenheim conference.

The papers chosen are both relevant to various regions around New Zealand and to adding to emerging practical knowledge.

This series has grown from the initial initiative developed by previous executive committee member, Jeremy Savage, also an NZIPIM member, that began after the Ashburton conference.

This year's series will include venues from Northland to Southland and cover topics from

Arrowleaf clover to new biocontrols of nematodes.

The series starts with Grant Edwards addressing the National NZIPIM conference in Christchurch as a guest speaker. His paper, co-authored with Glenn Judson, will cover the agronomy and use of kale on Canterbury dairy farms.

The format of 40 minute presentations and 20 to 30 minute question time provides an ideal platform for New Zealand Grassland Association members to convey detailed information about their research, while also providing context of the practical implications of that research.

We welcome this significant outlet for New Zealand Grassland Association members to participate in transferring technologies to our agricultural sector at all levels.

**71st ANNUAL CONFERENCE
COPTHORNE HOTEL AND RESORT
BAY OF ISLANDS, WAITANGI,
NOVEMBER 3-5 2009**

“NORTHLAND IS THE FUTURE: SEE IT HERE FIRST”

PROPOSED SESSION THEMES:

- Global warming—with guest speakers David Wratt (NIWA) and Willem de Lange (Waikato University)
- Carbon farming opportunities or conundrums
- Managing pastures in a Subtropical environment
- Forage crop options
- Managing pests
- Pasture feed quality

FIELD TRIPS: These will be the afternoons of Tuesday 3 Nov and Wednesday 4 Nov starting promptly at 12:15 pm.

This conference is run in conjunction with the NZ Association of Resource Managers so there will also be access to their sessions.

Check the website for more details as they become available — at www.grassland.org.nz

Renovating the Website

Now is the time for renovation!

New Zealand Grassland Association moved into the new era of communication several years ago with the launch of our website.

As is the case with all building, there comes a time for renovation to keep up with new innovation. The Executive are looking toward the future with a major renovation of the web site.

The aim is to generate a new look, and, along with that, an increased range of functionality.

Features may include web searchability of publications, a shopping basket approach to purchasing, hosting of agricultural applications and on-

line editorial and paper submission.

In the background, significant changes in the administration of the Association is also envisioned. Our previous EO, Ross White, provided us with excellent ideas on improving the administrative power of the website including improved membership database management, accounting and communication.

The web design team are still working on the specifications of the website, so any further suggestions from the members are welcome. Please send them to david.stevens@agresearch.co.nz

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Visit our website www.grassland.org.nz.

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In contrast, those farmers having C-rich soils (where past C-sequestration rates have been high), would have less prospect. Indeed their soils might be a liability in that any worsening of environment or change in management might result in C being lost. A severe drought, for example, or any failure to sustain the rate of C sequestration, could lead to soil C liability. The situation in New Zealand is very different from the situation in Australia and parts of the USA, where there are vast areas of heavily degraded soils. In these soils restoration projects would offer great prospects to increase soil C. New Zealand soils already have high soil C and so offer less prospect for increasing the rate of C sequestration.

The method of monitoring soil C sequestration schemes is also uncertain. The Kyoto Protocol Article 3.4 makes clear that, unlike the case for trees, changes in soil-C stocks must be related to the baseline stock and/or rate of sequestration in an identified baseline-start year. Few farmers have a solid measurement of what their soil C stocks were in, for example, 1990. Even fewer are likely to have a measure of the *rate* of sequestration. Hardly any are likely to have the *evidence* that a monitoring scheme might need to show they had increased their soil-C sequestration rate. It is easier to measure the girth of a growing pine tree trunk than it is to measure changes in soil C. Of further concern is that at a national or regional level, there is already evidence that soil C may well have been declining over the last 17-30 years. We need to (a) know what changes in behaviour would reverse this decline, (b) have methods in place to monitor soil C and (c) provide evidence that this stock is now being increased. Without these, New Zealand pasture farmers might face ongoing liabilities rather than being able to gain credits from pasture C sequestration. It is clear that more effort is needed to negotiate more practical parameters for the second Kyoto commitment period (beyond 2013) before committing New Zealand to the regulations for soil C.

Biology, Chemistry and Dollars

In our previous article we outlined some funda-

mental insights into how some components of pasture management (high vegetation cover/residuals, pasture species, fertiliser inputs) might increase the flow of C into soils, and how other components (notably high stocking rates) decrease that flow, and so the prospect for optimum management to build or at least sustain high soil Carbon.

There is a second problem concerned with the *economics* of the amount of C sustained in the soil. Changes in soil C are largely to do with altering the amount of organic matter (OM) in the soil. This is not made up of C alone, but contains considerable amounts of other minerals such as nitrogen (N), phosphorus (P) and sulphur (S). For every 1 tonne/ha of C sequestered in soil OM, that same OM typically also contains approximately 80kg N/ha, 16 kg/ha of P and 12 kg/ha S. Hence, unlike with trees where the wood sequesters few minerals other than C (and hydrogen and oxygen), to get a 1 tonne/ha increase in the amount of C stock sustained in the soil, means explaining the source of the *extra* 80 kg/ha of N and other minerals sequestered with it.

One suggestion is that the change in management that stimulated photosynthesis and plant growth also stimulated the rate of supply of nutrients from decomposition of OM in root litter, exudation, leaf litter and dung. Improvements in soil 'quality' can themselves increase plant growth rates and so the supply of C and other minerals potentially cycling into the soil. However, increased *recycling* cannot explain increases in the total amount of, for example, N and P stored in soil OM. This requires explaining the source of the *extra* inputs. Legumes can play a major role in supplying N to pasture systems, but in many less-intensive pasture systems in New Zealand, legumes are already present, and their function is already limited by availability of P. To provide a major increase in soil OM would require major extra inputs of P and N.

If this need had to be met with fertiliser, the costs of providing N and P for each extra tonne of C sequestered would far outweigh the value of that tonne C on a C market.



(Continued from page 1)

We managed to persuade Marie, at very short notice, to take over as Acting Secretary of the Association and we are most grateful to Marie for stepping into the breach. She can be contacted at the same telephone no: 0800 GRASSLAND and email address: eo@grassland.org.nz.

We will be advertising in July/August for a replacement for Ross but we would like to first set in motion an upgrade of the website. This will streamline some of the more time-consuming chores within the administrative workload and

could influence the nature of the job description. A website sub-committee has been set up to manage this process and a report is included elsewhere in this newsletter.

Conference Northland plans are well advanced thanks to John Caradus, who has taken on the job of organising the speakers for the Conference, and Laurie, Chair of the Local Organising Committee.

See you at the Conference in November!
Pat Garden

(Continued from page 5)

Similar calculations led Dr Mark Peoples, an Australian scientist with CSIRO (Commonwealth Scientific and Industrial Research Organisation) to conclude that while there are many good reasons for farmers to increase soil carbon, carbon trading for profit might not be one of them.

Soil Physics

There are inherent difficulties associated with obtaining a reasonable estimate of soil carbon because it is spatially variable. Difficulties are further increased by the need to measure small changes (for example 1 t C/ha/year) against a very large background (for example 50 t C/ha, depending upon what depth is being considered). Yet more problems occur because of differences in measuring depth in the past. Most soil carbon measurements have been done to 75 mm or 150 mm. In the Kyoto protocol carbon stock estimations for 0-300 mm are likely to be required.

This raises two further problems. Soil C can be increased by putting more C into a given soil horizon (raising the concentration), and/or by increasing the depth of the soil that contains C. Measuring only the top 300 mm, means that no credit can be given for increasing soil C at depth. Conversely, other ways of improving soil, such as turning the top 100 mm of compacted soil into a well-aerated layer (now fluffed up to, say, 200 mm) builds soil 'upwards'. Harvesting the top 100 mm of this layer could result in a false report of a decrease in soil C stocks. (This should be apparent if the result was corrected

for the decreased soil bulk density.)

Conclusions

Although there are many advocates in New Zealand for including soil carbon in the Kyoto Protocol agreement, there are also advocates for not including it until more is known about the drivers that encourage build up or depletion.

Research is urgently required not only to assess the potential for carbon gain on soils which are already relatively high carbon, but also to investigate the mechanisms, processes and factors that create gains or losses*. Once the biological systems are re-investigated and better understood, scientists will be able to provide the information that will allow policy analysts and economists to assess the impacts on New Zealand's carbon liability and primary production viability.

Of particular concern in New Zealand must be the fact that the farmers who have inherited or achieved high organic matter soils (through having had high rates of C sequestration in the past) will be most at risk for payment if they lose carbon – just as those who have forests will incur liabilities when their trees are felled. Research is vital. It always is. Being forewarned is being forearmed.

* This essential knowledge is lacking, because previous 'end-user' and government strategies greatly reduced the New Zealand science priority for work on soils and soil C. Wanting the answers 'now' means someone had to do that work before it was topical and fundable.

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