Victorian Farmers Federation submission

Inquiry Contents

On 2 September 2009, the Environment and Natural Resources Committee received terms of reference from the Legislative Assembly to inquire, consider and report no later than 31 August 2010 to -

(a) explore possible benefits to the agricultural industry;

(b) explore possible environmental benefits;

(c) consider methodologies for measurement of the effects of carbon sequestration, including any potential issues associated with the measurement of benefits;

(d) identify the costs;

(e) identify any possible harms or detriments;

(f) identify linkages with the proposed carbon pollution reduction scheme and other relevant Federal Government policies;

(g) identify linkages with existing Victorian Government policies; and

(h) Explore options for the Victorian Government to support the benefits (if any) of soil sequestration.

If you would like further information, please contact the Committee Secretariat on (03) 8682 2803 or enrc@parliament.vic.gov.au.

Soil Sequestration in Victoria

Soil sequestration of carbon is seen by some to be a potentially significant contributor to the reduction of $C0_2$ concentrations in the earth's atmosphere. Soils are a major reservoir of carbon containing three times more carbon than the atmosphere[i1]. While soils are a substantial 'sink' for carbon, managing additions and preventing losses of soil carbon is difficult, complex and very hard to measure. This makes the practical and measurable use of soil sequestration as a tool in reducing atmospheric carbon problematic.

There are many factors operating in what is a complex soil carbon system. Carbon in soils comes in different forms with varying degrees of stability. While terminology for these various types of soil carbon varies in the literature, for the purposes of this submission the stability of the carbon in the soil is an important factor.

Soil carbon can be in an inorganic form, such as calcium carbonate, or an organic form. Organic carbon in soils is living, i.e. carbon contained in soil organisms, fungus, plants nematodes etc, or non living, which is the carbon contained in organic matter in the process of decomposition[2].

Table 1 shows a summary of the types of organic carbon found in soil and the estimated time frame of sequestration for the particular type. These varieties of organic material containing carbon are not necessarily isolated pools with different origins. As decomposition occurs some carbon is lost in the process and some is transformed into other more stable forms. The rate and degree at which this transformation occurs will also vary considerably depending on many factors such as temperature, moisture level and soil type.

Table 1. Organic Carbon

Type of organic carbon	**Life span**
Crop residues on the soil surface	weeks-months
Buried crop residues and roots	months - years
Particulate organic matter	years-decades
Humus	decades-centuries
Resistant organic matter	centuries –millennia

For the purposes of green house gas mitigation it is the forms of soil carbon that will remain relatively stable in the soil for decades that is important.

[1] Walscott J, Bruce S, and Sims J. (2009) Soil Carbon Sequestration and trading: a review of issues for agriculture and forestry: Bureau of Rural Science

[2] M. Bell and D. Lawrence (2009) Soil carbon sequestration - myths and mysteries The State of Queensland, Department of Primary Industries and Fisheries.

Benefits for Agriculture

There are two possible benefits of sequestering soil carbon for agriculture. Firstly, increasing carbon levels in soils generally has a positive impact on agronomic productivity; secondly there is potential for soil carbon to be sold as an offsets.

Productivity Gains

Increasing the level of carbon in soils generally has a positive impact on agricultural production. Increasing organic carbon in soils benefits by promoting soil the growth of soil biota, provides nutrients for plant growth through better nutrient storage and exchange, can bind soil particles together to produce erosion resistance, acts as buffer against soil Ph change and can increase soil aeration and capacity for water retention[3].

The agronomic benefit will be dependent on a range of factors such as soil type, location or agronomic system is difficult and proportion of organic carbon already present. Australian soils are generally low in soil carbon and have been depleted over the past century and therefore there would be some production benefit in improving soil carbon levels.

Carbon Offsets

While the Carbon Pollution Reduction Scheme legislation had not been passed at the time of writing, the negotiated deal with the Liberal opposition suggests that farmers will be able to provide carbon sequestration offsets to Green House Gas emitters. However the current Kyoto protocol arrangements to which Australia has signed does not allow soil carbon to be used as an offset for other emissions.

The current accounting rules for soils carbon require countries to account for losses through natural disturbance as well as changes to management practices. The natural causes include Green House Gas releases to the atmosphere as a result of bushfire and drought. Australia has a land mass subject to regular and significant droughts and substantial fire events which would lead to substantial liabilities for landholders.

The Australian Government has flagged that at the Copenhagen Climate Change Conference it will seek changes to the international Green House Gas accounting rules to facilitate the inclusion of soil carbon in Australia's accounting. It will do so by pushing for the exclusion of GHG release from natural events and climate variability are excluded[4].

At this stage it is difficult to say what the benefits from soil sequestration will be through carbon trading as the rules are uncertain. In addition the capacity to measure, monitor and control soils carbon to a level that would satisfy a carbon market is uncertain.

Environmental Benefits

The environmental benefits are relatively obvious with the main one being the removal of carbon from the atmosphere. As stated in the introduction soils are a major carbon reservoir and a small percentile increase in soil carbon levels would result in a substantial volume of carbon being removed from the atmosphere.

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[3] Bureau of Rural Sciences (2009) Science for Decision Makers. Soil Carbon Management and Trading

[4] Minister For Climate Change (2009) Answer to Question on Notice, Budget Estimates Hearing

There would also be other more immediate benefits as soil health improves through increases in organic carbon. As stated above reductions in erosion and the biodiversity of soil biota are likely outcomes.

Measurement

Measuring the effects of soils sequestration of carbon is difficult, mainly because it is difficult to measure carbon soil content to a level of accuracy that is meaningful in assessing benefits that result from small changes in soil carbon. Organic carbon in soil is generally less than 5% of the soil mass and current measurement technology is not accurate in measuring changes of less than 10%[5].

The other complexity in a field trial format is the variation in carbon content that is likely across any particular site. Soil carbon content will vary with depth, soil type across the landscape. This can lead to significant variations in carbon content at any measurement time across an individual farm and even across an individual paddock.

Translating changes in productivity or other potential benefits into a verifiable response to changes in soil carbon is therefore problematic. While laboratory trials would provide better control and capacity to infer potential benefits in field situation the correlation from lab result to paddock result will remain difficult.

Time and research will most likely result in refinement of the technology to enable meaningful measurement of soil carbon and attribution to beneficial outcomes. 'New processes are being developed but are not yet at a stage that would prove useful to a conventional carbon trading scheme. While there is much interest in using molecular techniques to measure changes in soil microbial diversity, there is a lot of work to be done before these techniques are available and measures of diversity can be linked to soil health and functionality.'[6]

Costs

The costs to soil sequestration come in three categories; those involved in meeting trading requirements; the risks of providing sequestration; and those that are brought about by management practices to sequester carbon.

The trading requirement costs will be the cost of measuring, monitoring, and reporting changes in soil carbon and the trading fees. Until the requirements of a trading scheme are established it is difficult to estimate these costs.

It is also uncertain whether less formal schemes, such as that used in the Chaco Carbon Exchange, will be established in Australia. The main concern with these less rigorous schemes, in a compliance sense, is that sequestration provided through these mechanisms would not be able to be incorporated into Australia's formal international accounting system.

The risks of soil sequestration are in to the design of the scheme. If the accounting rules do not exclude natural disturbances a farmer who has worked to build soil carbon levels and has on-sold the offset would be liable for the loss of soil carbon in the event of a drought.

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[5] Bureau of Rural Sciences (2009) Science for Decision Makers. Soil Carbon Management and Trading

[6] M. Bell and D. Lawrence (2009) Soil carbon sequestration - myths and mysteries The State of Queensland, Department of Primary Industries and Fisheries.

The other cost is the costs associated with changing management practices. In some cases, as we have seen with the widespread adoption of minimum and no till cropping systems the agronomic benefits have outweighed the costs. It is accepted that minimising soil disturbance reduces emission from soils in cropping systems.

Changes from a cropping system to permanent pasture would lead in most instances to increased soil carbon. The costs in this instance would be mainly in the difference in annual nett returns from the different systems. In some areas and I some years the returns from a pasture based system would be greater than from a cropping system and vice versa. Calculating this cost or benefit would very much be dependent on many factors including the

- particular characteristics of a farm,
- seasonal conditions,
- management expertise
- market conditions
- soil types
- industry support

Biochar

It is worth mentioning at this point the use or potential of Biochar. Biochar has been portrayed by some as 'the' solution to carbon sequestration. The VFF believes that significant uncertainty remains on the feasibility of wide spread use of Biochar.

In general the soil health benefits of Biochar application are positive, as discussed earlier increasing soil carbon produces a positive benefit in Australian conditions. However the scale of these benefits is not universal to all soil type, climates and all form of Biochar.

Biochar is more chemically stable than carbon from which it is made and therefore will be remain in soils for considerable periods. However the physical properties of Biochar vary according to the materials it is made and the conditions of the pyrolysis[7].

The other concern is the cost of producing the Biochar on a large scale. For example the processing of crop residue across a cropping district even with a mobile pyrolysis plant would still entail significant cost in transporting the crop residue to the plant. The capacity to recoup this cost in carbon sales and increased productivity from applying the Biochar to the soils is not yet proven.

It is generally accepted that considerable research is needed on the production and use of Biochar before it could be adopted as a carbon sequestration system on a wide scale.

Detriments

The VFF is not aware of any particular environmental detriment from increasing carbon levels in soil. Soils do have a saturation threshold where adding more carbon will not increase soil health but as discussed Australian soils are generally low in carbon. One study of NSW soils found that losses of the order of 10t/ha are common as a consequence of clearing on the Red Kandosol soils in the western parts of the NSW wheatbelt.[8]

[7] CSIRO Land and Water (2009)Biochar Information Brochure

[8] **Brian Murphy** et al. (2004)Soil carbon densities in the cropping areas of NSW with emphasis on the Red Soils of the Western Wheatbelt.

There is potential detriment in the risks associated with the trading soil carbon were the capacity to control the losses is limited. This could lead to significant liabilities for landowners who manage parcels of land where a carbon loss is incorporated into an accounting system. The reality and scale of this potential detriment is not knowable until accounting and trading rules are established.

Linkages with Federal Government

There would be no linkages with the Federal Government CPRS unless Australia changes it commitment to the non-mandatory soil carbon sections of the Kyoto protocol and/or manages to negotiate changes at the Copenhagen meeting.

Linkages with Victorian Government Policies

At the risk of sounding repetitive, until the rules around soil carbon in the international trading framework and Australia's level of engagement with the framework are resolved it is difficult to provide clarity. However the VFF is aware of research conducted by the Department of Primary Industries into the potential for agriculture to engage in carbon trading. Additional work on this area would facilitate better capacity to provide soil sequestration as a measurable and tradeable offset.

It is possible, again depending on the trading system, that land tenure systems may have to recognises that soil sequestration that has been provided into an off set market. There will be questions at the point of land sale as to the transfer of any carbon obligation. This may be a contractual matter outside of a land transaction but there clarity on the obligation being attached to the land or the land owner may require State Government involvement.

Victorian Government support

The area of most need at the moment is efforts on research and development of soil sequestration and the production and use of Biochar. The Australian Government has committed $20 million for soil carbon research and a coordinated program would prevent duplication and waste.

The R&D should focus on the agronomic benefits of soil carbon in different production systems; measuring and monitoring movements in soil carbon to obtain a better understanding the natural causes of change in soil carbon levels and the capacity of management practices to add to and prevent losses of, soil carbon; and the benefits and economic viability of Biochar.

Caroline Williams/ParlOfficer/PARL
07/12/2009 07:00 AM

To Karen Taylor/ParlOfficer/PARL@PARL
cc
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Subject Fw: Submission from the Victorian Farmers Federation - Soil sequestration in Victoria

another one!

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04/12/2009 04:49 PM

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Subject Submission from the Victorian Farmers Federation - Soil sequestration in Victoria

Please see Submission from the Victorian Farmers Federation. Questions should be directed to Mr Graeme Ford (gford@vff.org.au , 03 9207 5523).

Kind regards

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Victorian Farmers Federation

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