Australian Dairy Industry Council Inc.

Soil Carbon Sequestration and Dairy

Messages for dairy farmers

Background

The debate on climate change (and the role of human activity) will continue for many years. It will take several decades of observations and hindsight to determine accurately whether small changes are occurring – placed against a background of large and poorly understood climate variability.

However, a basic view that climate change is occurring, backed up by recent examples of extreme weather events, is fundamentally influencing government policy and consumer choice around the world.

Therefore, unless the fundamentals of climate science changes in the next decade it is very likely:

- Most governments around the world will introduce policies aimed at reducing national and global carbon emissions.
- Governments and retailers will require explicit information on the 'carbon content' of food sold. The dairy industry is already preparing carbon footprint information for some markets.
- Both emissions reduction and carbon sequestration will be priorities.

These policy developments can have as great an influence on the future structure and viability of dairy farm systems as physical climate change itself.

Carbon sequestration on-farm

The following issue has become prominent in the discussion on how carbon reduction policies may apply to agriculture.

What is the potential role for on-farm sequestration of carbon in reducing national greenhouse emissions?

- Carbon sequestration through tree-planting is already supported by government and allowed under the Kyoto Protocol rules.
- Carbon sequestration in soil also features as an element of the draft carbon policies put forward by both the Australian Government and Federal Opposition and by governments overseas (e.g. USA draft legislation).
- Some groups are openly advocating soil carbon sequestration as a means for farmers to profit from the introduction of carbon reduction polices in Australia.
- The carbon cycle in soil (i.e. how soil captures, converts, stores and releases carbon) is well understood. Because of this there is clear agreement that;
    - Australian soil is a major storage point for carbon.
    - Soils with high carbon content are generally more productive.
    - Well managed pasture can build soil carbon levels much more than cropping systems because of the continuous growth in plant matter, minimal disturbance and erosion levels.

Messages - soil sequestration and the dairy farm

However, in considering the ability of dairy pastures to sequester additional carbon or whether dairy farmers can benefit from carbon sequestration credit schemes the following points are important. (*Note:* these comments are based on an independent review of soil carbon science and pastures undertaken for Dairy Australia by McKenzie Soil Management February 2010).

Under Kyoto Protocol rules for soil carbon sequestration to count as a reduction in national carbon emissions (therefore earn credits) claimants must be able to prove that the carbon they are claiming meets three tests:

- **Additional** - soil carbon has actively increased from the business as usual level.
- **Permanent** - carbon will be stored in the soil for up to 100 years.
- **Measureable** - carbon can be accurately measured and is open to independent audit.

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Additionally, to claim carbon credits countries must agree to be accountable for all soil carbon changes – eg carbon lost in bushfires. It is for this reason, Australia has not signed up for soil carbon under the Kyoto Protocol. *Note*: there are other international markets for carbon (including soil carbon) that are not Kyoto compliant but the value of this carbon is very low.

In terms of the Kyoto Protocol rules:

- Well managed dairy pastures are generally regarded to be close to their physical storage capacity - so significant permanent addition is unlikely.
- Australian soils are relatively warm and dry – this significantly limits the ability to build carbon content in the soil.
- Soil carbon can be increased by growing additional dry matter, or for already highly producing pastures, by allowing more pasture to decompose. Adding carbon (eg biochar) is also possible but that would be a cost to dairy farmers (not a source of income).
- Raising soil carbon in the top 10cm of soil by 1% over 5 years would require adding to the soil more than 10 t DM/Ha above current levels – this is clearly impossible even for dairy pastures.
- The potential price of carbon would need to be very high (over $200/t) to deliver a better return as soil carbon compared to using it for feed in milk production / hay making.
- Building soil carbon requires significant nutrient inputs (especially N, P, S). If these have to be applied to raise soil carbon the fertiliser cost must be taken into account in any analysis.
- Under certain climate conditions soil carbon increases could lead to higher emissions of nitrous oxide (another powerful greenhouse gas). This could see greenhouse emissions from participating farms increase.
- It is expensive to accurately measure soil carbon with current technology and if the farmer has to pay for this verification then cheaper methods would need to be developed.
- Soil carbon can change significantly with changes in weather, soil moisture, land use etc. This raises the (unresolved) question of what is the risk for farmers claiming credits at one point in time if they are audited later under different climate / land use and have to repay.
- The requirement to retain claimed carbon in soil for many decades has implications for long term land use options, the value of land, and the passing of obligations across generations. For example, a shift from perennial pasture to annual cropping in response to other factors such as water availability, temperature, markets etc can reduce soil carbon and hence may lead to an obligation on farmers to re-purchase carbon permits for ‘claimed carbon credits’ that are subsequently ‘lost’.

Message of caution for dairy farmers

All the scientific evidence suggests that pasture-based dairy farmers should approach the issue of soil carbon sequestration with considerable caution.

The basic science strongly indicates:

- It is very unlikely that dairy farmers would be able to benefit significantly from soil carbon sequestration even if carbon prices operate at or above the highest current estimates.
- There are significant long term (including intergenerational) risks associated with selling soil carbon sequestration when the future of that soil carbon is unknowable.

Future work required

Additional work is required in the following areas:

- Soil carbon measurement.
- Impact on soil carbon of changing weather conditions across different soil types.
- Long term liabilities associated with farmers selling soil carbon credits would allow a more definitive industry position.