Dairy Australia
Your Levy at Work

Profitable dairying FAQ

Soil carbon in dairy systems

This Frequently Asked Questions (FAQ) on soil carbon in dairy systems has been developed as part of the *Profitable Dairying in a Carbon Constrained Future* project.

It is one in a series of resources developed to profile practices that profitably reduce greenhouse gas emissions from dairy farm systems, embedded in the context of every-day farm management decisions.

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What is the hype around soil carbon and emissions reduction?

Soil contains a complex mixture of organic compounds at different stages of decomposition. Soil organic carbon (SOC) is divided into different 'pools' that are classified according to their rate of decomposition.

Soil carbon sequestration is the process of transferring carbon from atmospheric carbon dioxide into plant material, some of which is added to the soil carbon store as dead plant material or animal waste.

Soil carbon sequestration is an approved Emissions Reduction Method and has the potential to generate additional income in some circumstances. Generation of credits relies on direct measurement of soil carbon to estimate sequestration.

How can I measure soil carbon on my farm?

It is expensive to accurately measure soil carbon with current technology. Cheaper methods would need to be developed for 'verification' of soil carbon levels to be economically viable for most dairy farm businesses.

Is there potential for me to increase soil carbon on my dairy farm?

The amount of carbon in the soil depends on the climate, soil fertility, production system and management practices employed on farm. For example, fertile soils in high rainfall zones (or with irrigation) can support high levels of plant growth and therefore have the potential to return large amounts of organic matter to the soil. However, production systems (pasture or cropping) and associated practices can have positive or negative impacts on soil carbon levels.

Dairy farmers have no control over their climate, little effective control over their soil fertility (most dairy soils are already highly fertile) and have a production system based on grazed pastures.

Management is therefore the only significant option if dairy farmers wish to increase soil carbon.

Practices to increase soil carbon

Soils under well managed dairy pastures are generally regarded to be close to their physical storage capacity - so significant permanent addition of carbon is unlikely.





Practices that MAY increase soil carbon include:

- Fertiliser application (but see Note below),
- Improved rotational grazing,
- Improved irrigation management,
- Improved pasture species,
- Application of dairy effluent and sludge to pasture.

The impacts of the above practices can be small and slow.

Soil carbon can be increased by growing additional dry matter - or for already highly producing pastures by allowing more pasture to decompose on site.

For those dairy farmers who grow crops and make silage, minimum tillage systems will reduce the rate of soil carbon decline in cropping paddocks.

Note: Relationship between nitrous oxide and soil carbon

Under certain climate conditions soil carbon increases could lead to higher emissions of nitrous oxide (another powerful greenhouse gas). This could result in a net increase in greenhouse gas emissions from farms implementing practices to sequester soil carbon.

Economics of soil carbon in dairy

Increasing soil carbon (through practices that boost soil fertility and/or pasture production) is good business management for dairy farmers.

The potential of earning additional income from soil carbon sequestration on dairy farms is currently limited, due to the current low value of carbon credits.

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 additional pasture for feed in milk production.

What does the research say about the potential for soil carbon?

A summary of outcomes from the National Soil Carbon Program has been provided below:

For dairy farms with some cropping:

Conversion of marginal cropland to permanent pasture may increase SOC stocks by 0.1 -0.2 t/ha per year over 20 years depending on the cropping history but conversion may also have economic implications.

For sandy soils:

Increasing amounts of clay application (≥40% clay content) provides increased SOC stocks but the economics of transport and application need to be considered.

Ground cover and soil carbon:

Most dairy pastures have close to 100% ground cover but, if relevant, for every 10% increase in ground cover in areas prone to SOC loss by erosion, SOC stocks in the top 10cm may show an increase of 0.7 t/ha.

Rates of change in soil carbon:

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 biologically difficult even for dairy pastures.

Nutrient input requirements:

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.

Recommendations for dairy farmers considering soil carbon sequestration

Activities to increase soil carbon stocks are already 'best practice' on most Australian dairy farms because of the impact that increasing soil fertility and pasture production has on farm profit.

Any soil carbon sequestration that occurs as a result of what is already considered good or best practice, does not meet the requirement for 'additionality'.

Therefore, while some farmers may have the option of implementing these management practices, for most the opportunities to significantly boost soil carbon will be limited.

Where can I go for more information on this topic?

For more on this topic see:

Dairy Climate Toolkit – Soil carbon

Dairying for Tomorrow – Soil fertility tips

Soil carbon sequestration in Australian dairy regions (2010)

Australian Soil Resource Information System - compilation of publically available land and soil resources

Agriculture Victoria - soil types for different dairy areas

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