03 6333 7777
nrmnorth.org.au

Top 10 Tips to Build Soil Carbon Knowledge

Top tips and terminology to support your carbon farming literacy

#1 – Carbon Stocks vs Carbon Fluxes

The actual amount of carbon present in the soil is defined as the carbon stock. The rate of change that this soil carbon stock undergoes over time is the carbon flux. Fluxes need to shift for soil carbon stocks to adjust.

#2 – Carbon Losses

Soil biological activity consumes (mineralises) organic matter and emits carbon dioxide from the soil. Although carbon is lost as a result, this process is vital as it releases nutrients for plant growth. Management practices, such as tillage, where the soil is agitated/turned over will cause the breakdown of organic matter and greater losses of carbon. Erosion will also result in a carbon loss as topsoil is moved off the farm, taking soil carbon with it. Any process that results in the loss of soil carbon will negate soil carbon stocks.

#3 – Maximum Soil Carbon Stocks

The maximum potential of carbon stocks in soil is heavily influenced by clay content, climate, plant root depth and the presence or absence of soil microbiota (i.e., fungi, bacteria, protozoa etc.). Clay soils in a wet, cold place will retain carbon more easily than sandy soils in a hot, dry place.

#4 – Depth

The percentage of soil organic carbon tends to be highest in topsoil and decreases rapidly with depth. However, the bulk density of soil (and often gravel/rock content) increases with depth. The presence of hard pans or subsoil root barriers (i.e., rocks or boron layers) in paddocks can prevent root penetration, leading to the accumulation of soil carbon stocks at depth.

#5 – Increasing Soil Carbon Stocks

To increase soil carbon, more carbon will need to be going into the soil than is lost as it is a continuing cycle. Organic matter entering the soil through green manure tillage practices, earthworms, dung beetles, etc., is a carbon input. Dead plant roots are also a carbon input. Living plant roots deposit labile carbon into the soil, particularly at the growing tips. This feeds soil microbes that assist with plant growth.

Minimising cultivation, improving soil fertility and plant diversity (including deep-rooted plants), and increasing plant growth all contribute to maximising carbon input and long-term storage potential.

Increasing soil carbon by a small percentage can result in sequestering many tonnes of carbon. This can take decades to build due to the significant amount of carbon required to achieve gains. Noting that drought events will set back carbon stock gains.

For more interventions to increase soil carbon stocks, watch Dr Matthew Harrison's Webinar, *Pathways to Carbon Neutral (or Net Zero) Agricultural Systems*, here: youtu.be/jnNNfFbY7Nw?t=980

#6 – Liming

The carbon in lime is not counted as a soil carbon input as it breaks down quickly and is not considered a supplementary production activity. Lime will emit

Figure 1. Multi-species pastures at NRM North's Soil Carbon in Pastures Trial at Jetsonville. Diversifying pastures is important to increasing soil

Australian Government | National Landcare Program

The Soil Carbon in Pastures sub-project is supported by NRM North through funding from the Australian Government's National Landcare Program.

small quantities of carbon dioxide as it increases soil pH. Lime application should be limited to acidic soils.

#7 – Converting % C To Tonnes C per Hectare

Soil organic carbon (SOC) is reported as a percentage result of a soil test. To change the percentage result into tonnes of carbon, use the following calculation:

Soil carbon tonnes/ha = depth of soil x bulk density of soil x % SOC

For a more in-depth explanation and assumptions of this calculation, please see Fact Sheet 4 in this series.

#8 – Carbon Credits

In terms of carbon credits, tonnes of SOC are multiplied by 3.67 to calculate tonnes of CO_2 equivalent. The Australian Carbon Credit Units (ACCU) are based on this conversion, where 1 ACCU = 1 tonne carbon dioxide equivalent.

For example, 4,410 tonnes of soil organic carbon would equate to 16,184 potential ACCUs.

#9 – Credit Fees, Discounts and Market Value

In soil carbon projects under the Emissions Reduction Fund (ERF), a range of reductions in ACCUs can apply. These reductions can occur when: a shorter permanence is opted for, e.g. 25 years; there is high variability in soil organic carbon test results; an increase in carbon emissions from intensified livestock and/or fertiliser use; 5 per cent reversal risk discount, in case of carbon loss due to drought, and; carbon service provider commissions and/or fees.

The ACCUs delivered after discounts and fees can then be sold into government or private markets. Market value is dictated by many factors including supply and demand. The value of carbon credits (ACCUs) will vary much like other commodity prices.

#10 – Drought Resilience

Increasing soil carbon stocks can increase the water-holding capacity of soils, improving the farm's resilience to dry periods and drought. For example, a one percent increase in soil carbon stocks can increase water holding capacity by more than 140,000 litres per hectare.

More Information

The Carbon Farming Series Fact Sheets have been produced to support carbon farming literacy. Download more in the series from nrmnorth.org.au/resources/

Acknowledgements

Thank you to Associate Professor Matthew Harrison from the Tasmanian Institute of Agriculture for providing constructive advice on this fact sheet series.

Figure 2. Soil carbon stocks in cropping is important in maintaining plant health. Increasing the soil organic carbon percentage by a small percent i.e., 1 or 1.5 %, can equate to multiple tonnes of carbon sequestered in the soil.

NRM North

03 6333 7777

nrmnorth.org.au

admin@nrmnorth.org.au