Interpreting The Metric

Soil Carbon

Why It Matters

The importance of soil health cannot be emphasized enough. When a soil is healthy, it is able to fulfill the vital functions required of it by plants and other living organisms while staying resilient to climatic and environmental changes. The health of soil relies on the relationship between soil physical and chemical characteristics and the living organisms within the soil, and soil should be managed to protect and maintain these relationships. Part of building, improving, or maintaining these relationships is managing the soil's organic matter. Soil organic matter is made up of nutrient-rich, decomposing and/or weathered materials and is beneficial in soils because it:[1]

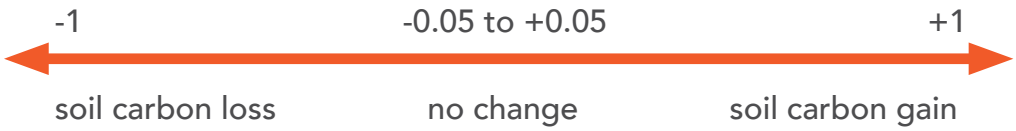
- Is a reservoir for plant nutrients that become gradually available over time, decreasing the amount of applied fertilizer needed to meet crop requirements. as a reservoir for plant nutrients that become gradually available over time, decreasing the amount of applied fertilizer needed to meet crop requirements;
- Stores water that is available to plant roots, reducing irrigation water requirements and improving resilience to drought; and
- Causes aggregates to form, thereby improving soil structure and water infiltration.

Soil organic matter also acts as a source and sink of carbon, and the amount of carbon in the soil is a good indicator of soil health. Investing in increasing soil carbon is a long-term investment in the productivity and ultimately, profitability of the land.

Carbon dioxide, a greenhouse gas, is removed from the atmosphere through photosynthesis and is sequestered in living organisms in the soil. By increasing the frequency that soils are covered with growing or decomposing plants and supporting the living microorganisms in soils, more carbon dioxide can be removed and sequestered from the atmosphere. Because plant and soil health support carbon removal, farmers play a crucial role in reducing greenhouse gases and reducing the impacts of climate change.

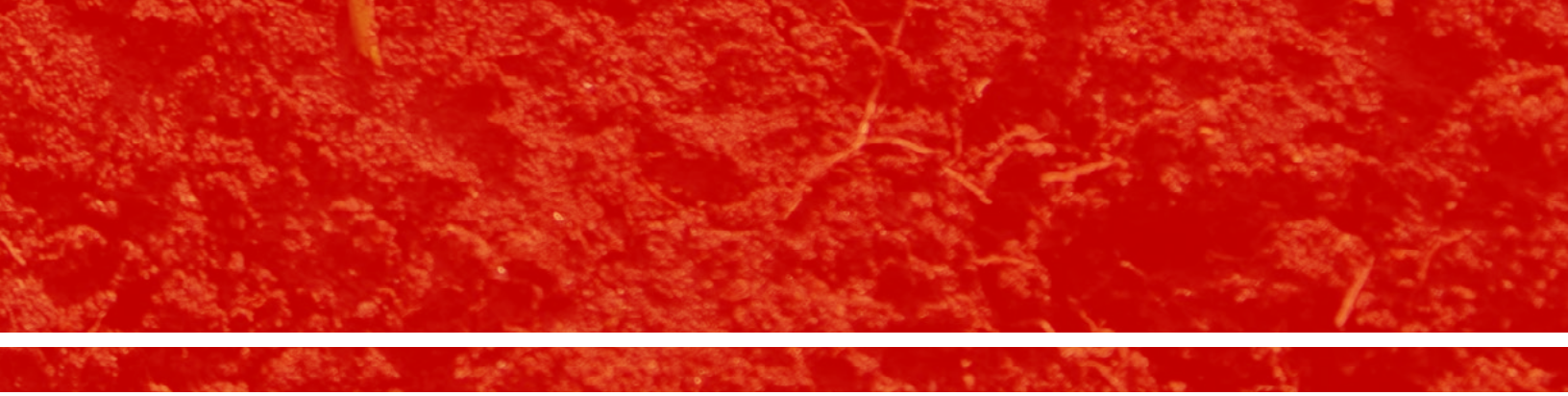
How It Is Measured In The Fieldprint® Platform

The Soil Carbon metric in the Fieldprint Platform® is measured using the NRCS Soil Conditioning Index. Scores ranges from +1 to -1 and are unitless, relative, and crop specific.



Positive values (>0.05) indicate that soil carbon is increasing. As the value approaches +1 the confidence that there is a gain in soil carbon increases. Inversely, as negative values (<-0.05) approach -1, the confidence increases that soil carbon is being lost. Positive numbers are desirable. An additional tool available in the Fieldprint Platform to quantify soil carbon is the COMET-Planner tool, which can be used by projects to estimate the soil carbon sequestration potential of practice interventions for corporate impact assessment and reporting needs.

Developed by USDA–NRCS and Colorado State University as a metamodel, COMET-Planner evaluates generalized impacts certain conservation practices have on reducing greenhouse gas emissions and increasing carbon sequestration. The tool uses conservation implementation scenarios to calculate potential emissions and carbon sequestration against a fixed baseline for typical management practices in a given region. Greenhouse gas emissions are calculated and expressed in their metric tons of CO_2 equivalent.



Positive results indicate a decrease in emissions and increase in carbon sequestration, while negative results indicate an increase in emissions and a loss in carbon sequestration. If multiple practices are implemented, results of potential reduction will be combined to calculate the field's total emissions potential. COMET-Planner is unique from the Soil Conditioning Index in its ability to not only quantify soil carbon sequestration but also factor in the co-benefits of estimated emissions reductions from various nutrient management scenarios. For a more in-depth and detailed examination of field specific emissions and sequestration potential, growers can assess their farm using the COMET-Farm tool, which evaluates conservation scenario analysis against a user-generated baseline based on historical management data for up to 20-years.

Strategies to Increase Soil Carbon

While strategies to support a farmer in increasing soil carbon will vary by crop and region, there are several practices that can lead to improved outcomes across multiple cropping systems and geographies, including:

- Increasing soil organic matter by growing cash or cover crops with high residue that can be left on the soil or by adding animal manure and other organic material to the soil.
- Minimizing soil disturbance and implementing strip- or no-till to conserve soil carbon and prevent release of CO2 from organic matter decomposition.
- Keeping soil covered to prevent erosion and manage tillage, planting date, harvest timing, row spacing, crop residues and cover crops to maintain constant coverage.

Other Factors For Farmers to Consider

Some factors that affect soil carbon are easily within the power of the farmer to manage, others are not. For example, a farmer can reduce soil disturbance, plant cover crops and improve crop residue retention to increase soil carbon. Field characteristics such as slope and soil texture affect soil erosion and therefore soil carbon. Other factors that affect the Soil Carbon metric include:

- **Wind barriers** - usually trees or shrubs planted to provide a break from prevailing winds, barriers reduce wind erosion and conserve soil and the carbon stored within.
- **The crop type and variety** - some produce more carbon-rich residues than others.
- **Field characteristics** - slope, slope length and surface soil texture are estimated from USDA soil surveyrotation be adjusted to increase the amount of vegetative cover on the fields each month?

Farmers face agronomic and financial risks when adopting new conservation practices. While some practices that reduce input and energy use can lead to immediate cost savings, many practices require up-front investment. An essential component to supporting farmers in building soil carbon is designing effective incentive strategies to support farmers and help share in the agronomic and financial risk inherent in transitioning to new practices. Please note more detailed strategies for increasing soil carbon by crop will be available Fall 2021.

[1] Funderburg, E. 2001. What Does Organic Matter Do In Soil? Available from www.noble.org/news/publications/