

# Soil Carbon: A Multi-Tool for Farms

## What is Soil Carbon?

Soil carbon may not be familiar to all. Carbon is an element that is present in all living organisms. Have you ever heard a sci-fi movie refer to ‘carbon-based life forms’? Humans and all living organisms are carbon-based.

On a soil test report from the Nova Scotia Analytical lab soil carbon is captured in the organic matter percentage. Organic matter is anything that is or was living or part of a living organism. This includes plant material, microbes, and root exudates (carbon-rich material that leaks out of plant roots). About half of organic matter is made up of carbon. So, to roughly convert a soil test report’s organic matter into soil carbon you can divide it in half.



*Soil rich in organic matter is dark and has a crumbly soil texture.*

## The Many Benefits of Soil Carbon

Soil carbon plays many roles in the functions of soil.

### Improving Soil Structure

Soil carbon can act like a glue, holding soil particles together. It can also encourage microbial populations

which produce material that also hold soil particles together. This improves soil aggregate stability; a measure of how strongly held soil particles are. Strong aggregate stability means soil is more resistant to wind and rain erosion. It also helps create the spaces between soil particles which allows air and water into the soil, improving water infiltration and reducing standing water.

### Improving Soil Fertility

As organic matter breaks down it releases nutrients into the soil. These nutrients then become available for plant uptake. If soil organic matter can be increased, the increase in available nutrients can mean less fertilizer is required, potentially leading to cost savings.

### Increasing Water Holding Capacity

Organic matter absorbs water. This means in soils with high organic matter that water can be released when the soil has low moisture content to provide moisture to roots, making crops more resilient in times of drought. Combined with the increased water infiltration mentioned above, organic matter helps both when there is not enough water or too much water.

### Increasing Carbon Sequestration

Carbon sequestration is an important role agricultural soils can play in combatting climate change. Climate change is caused by an increase in gases in the atmosphere, mainly carbon dioxide. If more of that carbon is stored in the soil through increased organic matter, there is less to enter the atmosphere.

### Managing for Soil Carbon

Many farming practices can influence the amount of carbon in your soil and can help increase the benefits listed above.

### Reduce Tillage

Tillage can break organic matter into smaller particles and expose it to decomposers. This allows the breakdown of the organic matter to happen faster and the carbon can be lost to the atmosphere as carbon dioxide. Using methods to decrease tilling frequency or intensity (e.g. shallower tillage) can help protect the organic matter and keep more in the soil.

### Include Amendments Rich in Organic Matter

Manure and compost are two soil amendments that are very high in organic matter. Because they can also impact nutrient levels in the soil, it is important to test your soil and also the amendment to understand how much to put on your field without creating too much of any one nutrient.

### Incorporate Cover Crops

Cover crops can help reduce erosion. The top layer of soil, which is what erodes first, has the highest concentration of soil carbon. Cover crops can also add organic matter through their root exudates and the plant material itself, which is typically left on the field or tilled in. To learn more about cover cropping visit

<https://nsfa-fane.ca/cover-crops/>.



*A clover cover crop covering the soil between rows of wheat stubble.*

### Addition of Livestock

Pastures and forage fields often have more soil carbon than annual crop rotations. This is due to the lower levels of disturbance and the constant presence of living plants. Soil carbon in Atlantic Canada has been decreasing for decades and one of the suspected reasons is the decrease in livestock farming in favour of annual cropping systems. To learn more about one potential way to incorporate livestock into an annual cropping system visit <https://nsfa-fane.ca/land-swap/>.



*Using a soil auger to take a soil sample for testing. Soil augers can be borrowed from NSFA or NSDA agriculture reps.*

### Soil Testing

Regular soil testing is one of the best tools to understand soil carbon on your farm. Testing every few years can give a picture of whether soil carbon is increasing or decreasing. You can learn more about soil testing from the [NS Analytical Lab](#) and how to take a soil sample from this [Perennia factsheet](#).

### For more information:

Learn about the work being done on soil carbon in our Living Lab – Nova Scotia project at: <https://nsfa-fane.ca/livinglabs/>

Or you can email Cheryl Ritz, Environment and Climate Change Manager at [critz@nsfa-fane.ca](mailto:critz@nsfa-fane.ca).

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