Increasing Soil Health in Horticulture Fields Through Land Swapping

Highlights:

- **Our land swap turned a horticulture field into a temporary pasture to increase soil health.**
- **This brief covers four soil heath measurements; active carbon, soil respiration, aggregate stability, and biological nitrogen availability.**
- **We saw the clearest improvement with aggregate stability and some improvement in soil respiration with the land swap BMP.**

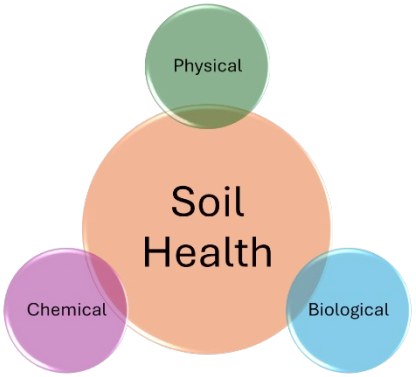
Apr 18, 2026

What is soil health?

Soil is not one thing, but a whole ecosystem. A healthy soil is soil that can function to sustain plants, animals, and humans and has the capacity to continue to provide this function in the future. Because of the complexity of soil and that soil health is more than just a snapshot in time, soil health is difficult to measure.

Soil health needs to incorporate the chemical, biological, and physical properties of soil. The debate over how to best do this is still ongoing, but The Soil Health Institute recommends three measurements for soil health:

1. Soil Organic Carbon
2. Carbon Mineralization Potential
3. Aggregate Stability



In Atlantic Canada, the PEI government provides soil health testing at their analytical laboratory. The tests include:

1. Soil Organic Matter (similar to Soil Organic Carbon)
2. Soil Respiration (similar to Carbon Mineralization Potential)
3. Aggregate Stability
4. Active Carbon
5. Biological Nitrogen Availability

6. Phosphorus Saturation Index
7. Available Water Capacity (detailed package only)

The soil ecosystem includes soil, plant roots, and many organisms, large and small.

The three measures recommended by The Soil Health Institute are included along with four others. Soil carbon will be presented in a separate research brief, but for this brief we will use active carbon, soil respiration, aggregate stability, and biological nitrogen availability. For more information on how these tests are performed and how to interpret them, please refer to the PEI Analytical Laboratory's website.

To best understand soil health, measurements should be taken every few years. Because a large part of soil health is its continued ability to function, looking at the trends in soil health is very important. If soil health is decreasing, it may soon lose its ability to perform some of its functions. Understanding the trends in soil health on your farm can help you evaluate the impacts of your management practices.

This brief covers soil health in our land swap beneficial management practice (BMP). This BMP installs a temporary pasture (3-years) on a horticulture field. Horticulture fields tend to have lower soil health due to high levels of disturbance, low crop residue returns, and exposed soil. The temporary pasture should improve soil health by having soil cover, living roots, and livestock to cycle the organic matter.

How we assessed soil health

Collecting soil with an auger.

For our land swap BMP soil health was measured before pastures were installed and again right before the pasture was removed. For two of our fields the first samples were collected in the fall of 2022 and the third was collected in the spring of 2023. The second samples were collected in the spring of 2025 for one field and late summer 2025 for the other two. This was due to different timings of pasture planting and termination.

Soil was collected using a soil auger to a depth of 15 cm. Fields were divided into 5 zones and 10 soil augers were collected per zone and combined. For this report samples are averaged across all 5 zones to give a picture of the whole field.

Samples were sent to the PEI Analytical Lab operated by the provincial government. Farms are represented by a random two letter code to anonymize the data (AF, DW, and NV). Reported here are the active carbon, soil respiration, aggregate stability, and biological nitrogen availability data. Briefly, these can be interpreted as:

Active Carbon: the microbially active portion of soil carbon, related to overall soil carbon but more sensitive to management in the short term.

Soil Respiration: indicates overall microbial activity.

Aggregate Stability: indicates the stability of the soil structure and resistance to forces such as erosion.

Biological Nitrogen Availability: a measure of how well soil can provide plant-available nitrogen during the growing season.

How did our temporary pasture impact soil health?

Active carbon did not vary across treatments or years in two of our fields (AF and DW, Figure 1a). For the NV field the active carbon was higher in the treatment (pasture) field for 2023 and 2025, but there was no impact of our treatment and high levels are likely related to field characteristics or past management. Soil respiration also did not vary in two of the pasture fields, although it did slightly decrease in the business-as-usual fields, indicating that it continues to decrease while the treatment field did not (DW and NV, Figure 1b). Soil respiration did increase after treatment in the AF field.

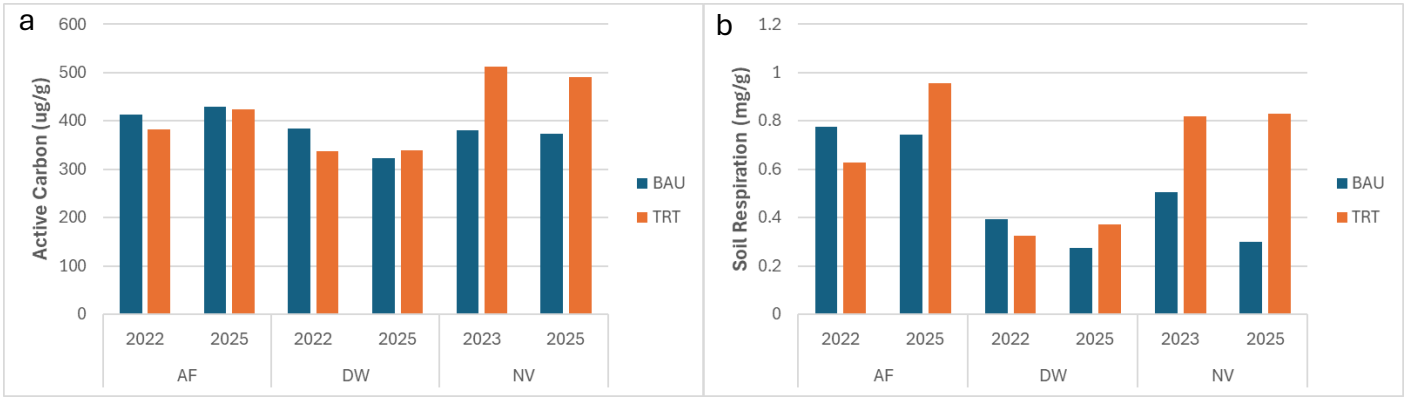


Figure 1. a) Active carbon and b) soil respiration measured before the land swap BMP and at pasture termination. BAU = business-as-usual (horticulture), TRT = treatment (temporary pasture).

Aggregate stability increased with the land swap BMP only slightly in the AF treatment field but had a larger increase in both the DW and NV fields (Figure 2a). Biological Nitrogen Availability showed variation across fields and year but no clear improvements with the land swap BMP are shown. The AF field showed an improvement with the land swap BMP, but the business-as-usual field also had an increase.

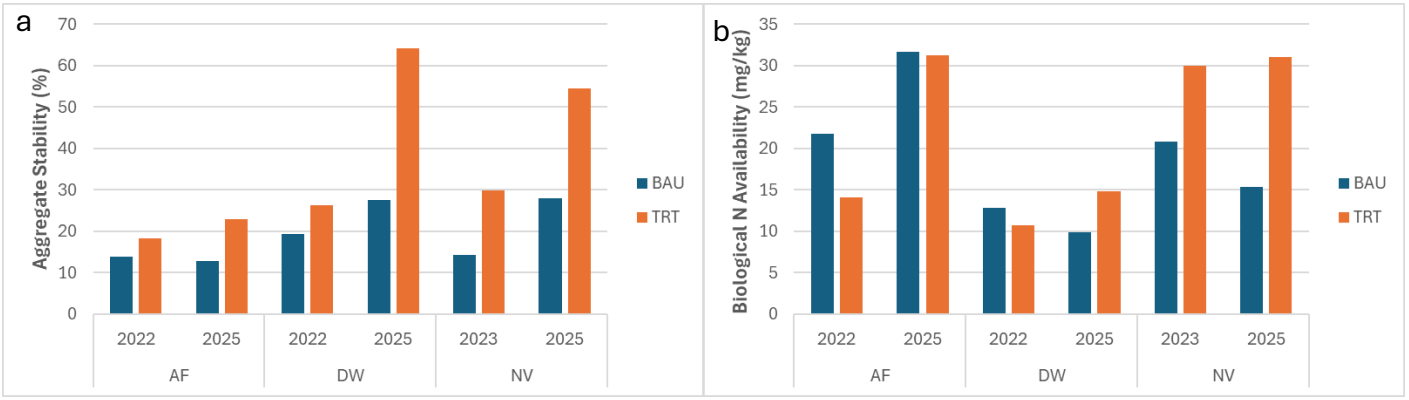


Figure 2.a) Aggregate stability and b) biological nitrogen availability measured before the land swap BMP and at pasture termination. BAU = business-as-usual (horticulture), TRT = treatment (temporary pasture).

Across the four soil health measures included in this research brief only aggregate stability showed a clear improvement with the land swap BMP. There was some increase in soil respiration, but only in one field, although there is some indication it could be preventing further degradation compared to remaining in horticulture production. The lack of response in the other measures to the land swap treatment could be a condition of time. These parameters may require more time to show responses to treatments. However, the improvement in aggregate stability is an important soil health measure. Higher aggregate stability means the soil is more resistant to erosion (an issue in Nova Scotia), less susceptible to compaction, and has better water infiltration.

How can this research be used?

Horticulture production can lead to decreased soil health. This could impact the long-term ability of that field to continue to produce crops. Our land swap BMP was able to increase the aggregate stability of our horticulture fields through a temporary pasture. Soil respiration was either improved or signs of a decrease were detected without the BMP. These key measures of soil health can help ensure the continued functioning of these fields.

Regularly measuring soil health gives the best picture of whether soil health is decreasing or increasing. Signs of decreasing soil health are a call to try BMPs such as the land swap, but other practices can help such as increasing organic matter inputs through manure or compost applications, changing rotations to include periods of less disturbance, and incorporating cover crops.

Want to Learn More?

For any questions on this research contact Alexandre Loureiro, our Living Lab Coordinator, at aloureiro@nsfa-fane.ca.

Check out our other research briefs, our fact sheet on the land swap, and learn more about the Living Lab Project at nsfa-fane.ca/livinglabs.

Funding for this project has been provided by Agriculture and Agri-Food Canada through the Agricultural Climate Solutions – Living Labs program.

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

NOVA SCOTIA NSFA FEDERATION OF AGRICULTURE

Canada