

SOIL HEALTH BENCHMARK REPORT

Supplemental Information

DEFINITIONS, CALCULATIONS & DATA LITERACY

Soil health indicators included in this study

Soil organic matter (OM) is the fraction of the soil that consists of plant, animal and microbial cells and tissue in various stages of decomposition. OM is approximately 68% carbon, and microbial necromass (i.e. dead microbes) can make up more than half of the OM of your soil. The higher your OM the better.

Active carbon (AC) is an indicator of the small portion of OM that is a readily available (i.e. labile) food and energy source for the soil microbial community. AC responds relatively quickly to changes in management. For this study, we measured permanganate oxidizable carbon (POX). The higher your AC the better.

Water infiltration is the process by which water enters the soil. Infiltration is an indicator of the soil's ability to allow water movement into and through the soil profile vs. pooling or eroding the soil. In general, the higher your infiltration rate the better.

Statistical definitions

n refers to sample size, or how many replicate bags you sampled for each site/field/area. If you followed the soil health benchmark protocol, you took n=3 replicate bags of soil for each site/field/area.

Mean refers to average value for the replicate bags that you sent in from each site/field/area.

Standard error is a measure of the statistical accuracy of the mean for a site/field/area. For each site/field/area, the more your replicate samples differed from each other, the higher the standard error. In general, if standard error bars for two sites cross or come close to crossing, the areas are likely not statistically different.

P-value is the probability that your sites are not different with respect to the specific measurement. Said another way, the p-value is the probability that your results are due to random chance or natural variation. **High P values** = high probability that your fields are not different; **low P values** = low probability that your fields are different from each other. In general, we use a cut-off of 5%, meaning P less than 0.05 indicates that your fields are different and P greater than 0.05 indicates that your fields are the same. However, for many farms we used a cut-off of 10% (P=0.10) because soil is inherently heterogeneous.

Water infiltration calculations

Convert infiltration time to hours and divide by 1.08 inches, which is the depth of water in the ring. You added 500 mL water to a 6 inch diameter ring = 15.24 cm = 184.41 cm in area; 500 mL / 184.41 cm = 2.74 cm-high volume of water in ring = 1.08. inches.

How to read the graphs

For all figures, **green bars** refer to the mean for each area/field, and the **number above each bar** is the mean value (n=3). **Lines with bars** refer to the standard error.

TRACKING SOIL HEALTH IN THE FUTURE

In order to improve - and regenerate - the health of your soil, you want to see an increase in the three soil health indicators used in this study. Specifically, you want to see greater soil organic matter, active carbon and water infiltration.

When to sample next:

In 2019, you took baseline soil health measurements. When to sample next depends on your management practices and changes in practices. As a general rule of thumb, you could see changes in AC every three (3) years and in OM every five (5) years. You can measure water infiltration annually. As you did for the baseline samples, remember to take at least 3 *replicate samples for each site/field/area* for OM, AC and water infiltration.

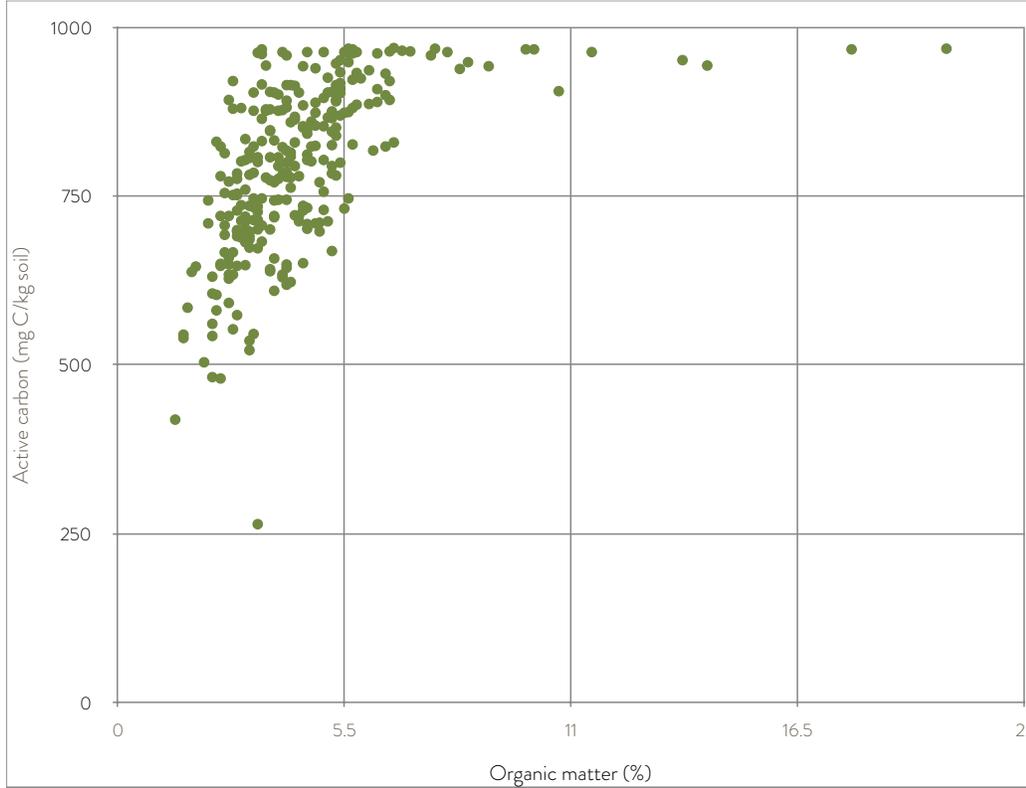
Value of a fencerow comparison:

While fence rows are not a perfect estimate of maximum - because they often catch eroded soil and are not undisturbed, etc. - they do give you a rough estimate of maximum potential of OM for your specific location.

SUMMARY OF GROUP DATA

Supplemental Table 1. Summary statistics of the group's organic matter and active carbon data for 31 farms. Note that not enough data was collected to provide summary statistics of water infiltration data at this time.

Statistic	Organic matter (%)	Active carbon (mg C/kg soil)	AC : OM (ratio)
Minimum value	1.4	264	48
Mean	4.4	794	201
Maximum value	20.1	970	354



Supplemental Figure 1. A scatter plot of the group data that you can use to locate your results relative to the entire dataset. OM is on the x-axis (bottom) and AC is on the y-axis (left). You can see how the AC values level out at 1000 mg C/kg soil, which indicates that the lab test reached its detection limit. Therefore, samples that measured around 1000 mg C/kg soil may have had higher AC levels than reported. The lab has been notified of this issue and will correct its procedure for future samples by reducing the amount of soil they use for the analysis, thereby increasing the detection limit.

REFERENCES

- Fine et al. 2017. Statistics, Scoring Functions, and Regional Analysis of a Comprehensive Soil Health Database. <https://access.onlinelibrary.wiley.com/doi/epdf/10.2136/sssaj2016.09.0286>
- New Horizons: Ontario's Agricultural Soil Health and Conservation Strategy. <http://www.omafra.gov.on.ca/english/landuse/soil-strategy.pdf>

DATA OWNERSHIP AND SHARING

You own all data generated on your farm as part of EFAO's Soil Health Benchmark Study. By participating in the EFAO Soil Health Benchmark Study, you grant EFAO access to your data to use to calculate group statistics, and EFAO will **only ever use your data anonymously**. You can notify EFAO at any time to remove your data from the group statistics and/or as an anonymous example. To opt out of sharing your data, please contact Sarah Hargreaves via email (sarah@efao.ca) or mobile (226-582-0626).