EFAO's Pilot Soil Health Benchmark Study: Part 1

In 2019 EFAO piloted a Soil Health Benchmark Study. Modelled off of Pasa Sustainable Agriculture's Soil Health Benchmark Study, it was funded by the Canadian Agricultural Partnership (CAP) for farmers in the Lake Erie Basin, and in collaboration with NFU Local 316 for farmers in the Kingston area.

In this two-part series, we will summarize the usefulness of benchmark studies and detail EFAO's Soil Health Benchmark Study (Part 1 – this issue); and then share the group's results from 2019 and next steps for continuing this program (Part 2 – Fall 2020).

What is a benchmark study and how can they help us?

The initial year of data collection for a benchmark study provides **baseline information from which to track – or benchmark – future change and regeneration.** In the case of EFAO's Soil Health Benchmark Study, participants can compare 2019 data to follow-up samples in 3, 5, 10 years, etc, and measure regeneration as an increase in soil health relative to the baseline benchmark.

When a benchmark study includes replicate samples from different sites in the same year, information from a single year can be used to **compare among sites.** In the case of EFAO's Soil Health Benchmark Study, participants took three replicate samples on three different fields so they are able to draw conclusions about whether the three fields differ with respect to soil health.

When benchmark data is collected by a group using a standard protocol, information can be combined to **provide information about the system.** For EFAO's Soil Health Benchmark Study, we were able to use the group's data anonymously to gather information about the state of soil health on ecological farms in Ontario and, ultimately, the benefits of ecological agriculture in Ontario. There are other important benefits of collecting benchmark data as part of a group (hint: community building!), and we will discuss these further in Part 2.

EFAO's Soil Health Benchmark Study

Thirty-two farmers participated in the study, 24 as part of EFAO's CAP grant and 8 in collaboration with NFU-O Chapter 316 in Kingston. Sandy to clay soils and fields in vegetable production, field crops and pasture were all included.

For indicators, EFAO's study focused on biological and physical attributes of soil, including organic matter, active carbon and water infiltration. While we recognize the importance of chemical attributes to soil health (e.g. sufficient and balanced micronutrients, cation exchange capacity), we chose OM and AC because they are two of the most sensitive, consistent and repeatable measurements of overall soil health (1,2); and we chose water infiltration because it is a good in-field measurement of the soil's physical attributes.

Following the group's protocol, farmers selected three fields or areas of interest and chose three representative plots in each area, for a total 9 plots. Using kits sent from EFAO, farmers sampled soil from each of their 9 plots after they sowed a fall cover crop, finished fall field operations or their final rotation for the season. They mailed their samples to A&L Canada Laboratories Inc. in London for analysis of OM (as part of the Basic S1B package) and AC; and conducted water infiltration in-field.

EFAO staff crunched the numbers this spring and sent Soil Health Benchmark Reports to each participant farmer.

In Part 2, we will dive into the group's results using anonymous data and discuss our learnings and what you can expect next from this program. ■

- You can find a Soil Health Benchmark Report in the Research Library at efao.ca/research-library.
- You can find details of the pilot program and links to the protocols at efao.ca/soil-health-benchmark-study.

Footnote:

1. Fine et al. 2017, accessed online at: https://acsess.onlinelibrary.wiley.com/doi/full/10.2136/sssaj2016.09.0286
2. Hargreaves et al. 2019, accessed online at: https://www.nrcresearchpress.com/doi/10.1139/cjss-2019-0062#.Xwc8mS0ZMh8

Soil Health Indicators

Organic Matter, OM

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. We measured OM via loss on ignition. The higher your OM the better.

Active Carbon, AC

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. We measured AC via permanganate oxidizable carbon or POX. The higher your AC the better.

Water Infiltration

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. We measured water infiltration using a field method with 6" rings. In general, the higher your infiltration rate the better.