

# What is the Soil Health Assessment & Plan (SHAP)?

Jake Munroe, Sebastian Belliard, Christine Brown, & Danny Jefferies, OMAFA Soil Team

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*Soil health describes how soil functions respond to applied management practices interacting with inherent soil properties. Healthy soil functions contribute to improved crop productivity and resilience. Measuring soil health enables farmers and farm advisors to identify areas for improvement. A comprehensive approach has been developed to assess soil health in Ontario.*

## The simple answer

SHAP is a new tool from OMAFRA that allows you to measure soil health on your farm. At its core is a laboratory soil health test (SHAP Test) that evaluates key physical and biological indicators of soil functions. Optional modules can be added on to further evaluate management and assess risks, including compaction, erosion, tillage intensity, living roots, and soil structure. SHAP guides users through sampling, evaluation, and interpretation of results to come up with a tailored soil health management plan.



*Figure 1. Soil sampling tools: soil probe, bucket, sample container.*

## A little more information

While samples can be sent to the lab along with a simple paper submission form, SHAP is designed to be completed through Survey 123, which can be used as an app or through a browser. Survey 123 simplifies data entry, performs calculations, and can automatically pull information from soil maps based on a GPS location (Figure 2).

SHAP is divided into two parts. The Soil Management Survey collects background information about the soils, current management practices, soil health issues and goals for the field to be tested. The In-field Data Collection form guides the sampling process and collects information on the time, specific location, and texture of the sample.

In the field, composite samples from 15-20 regular 6" (15 cm) cores are collected within a 3-meter radius of the point selected for assessment. Point sampling is recommended over zone or traditional composites for better consistency with future re-sampling. Inherent soil characteristics like texture and drainage are automatically collected by the Survey 123 app from soil map data of the sample location, or paper submission forms can be used instead. The soil sample is then sent to a laboratory using the standard SHAP package, which includes:

- Soil organic matter (SOM)
- Active carbon (POXC)
- Soil respiration
- Potentially mineralizable nitrogen (PMN)
- Aggregate stability

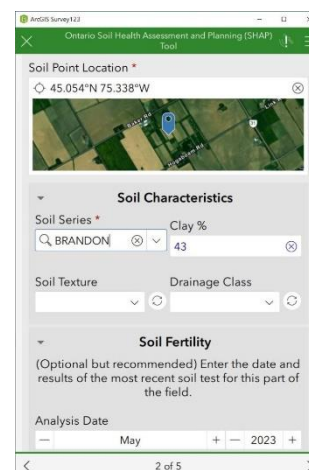


Figure 2: Screenshot from Survey 123. Soil characteristics automatically load in app.

Soil health indicators from each sample are [scored](#) (0-100) according to how they compare to the laboratory measured values are scored against other similar textured soils in a growing database of over 1500 results from samples of fields across southern Ontario (Figure 3).

Good Yield Region			Poor Yield Region		
Indicator	Measured Value	Score	Indicator	Measured Value	Score
SOM (%)	4	63	SOM (%)	3	27
Aggregate Stability (%)	91	80	Aggregate Stability (%)	88	65
Active Carbon (ppm)	470	21	Active Carbon (ppm)	400	10
Respiration (mg CO <sub>2</sub> )	18	32	Respiration (mg CO <sub>2</sub> )	18	32
Potentially-mineralizable Nitrogen (ug N / g dry soil /week)	7	32	Potentially-mineralizable Nitrogen (ug N / g dry soil /week)	2	6

Figure 3: Example SHAP test measurements from a good yield vs poor yield region and their corresponding score (100 = Best)

## The full story

### Choose your own adventure

The modular design of SHAP makes it possible to use it as a simple test, a comprehensive assessment, or to select only the evaluations most relevant to your situation. Your own goal(s) for performing SHAP will determine how and where to sample, and which modules to add. Common goals include:

- setting a benchmark to compare to future assessments for identifying trends
- understanding the most important limitations and risks to soil productivity
- comparing zones or good and poor areas in a field

## Add-on modules

There are several optional modules which can be added on top of the SHAP Test. These provide additional information and a more in-depth view of soil health challenges and options for improved soil management. Current modules include:

- **Tillage disturbance index** – rates the tillage system by the intensity of soil disturbance
- **Living roots index** – measures the proportion of the year with living roots in the soil
- **Water erosion risk assessment** – calculates risk of water erosion across a field based on landscape, tillage, and cropping factors
- **Compaction risk assessment** – estimates risk of subsurface compaction based on equipment and soil characteristics
- **Soil structure assessment** – scores the quality of the soil surface and of topsoil structure in the field (Figure 4)



Figure 4. An example of a soil being evaluated using the visual evaluation of soil structure (VESS) within the soil structure assessment module.

## Soil Health Management Plan

Refer to this table for management practice recommendations to address your most-limiting soil health factors.

	Recommendations	Factors to consider	Soil concerns addressed
Early Wins (implement next season)	Identify and set permanent tramlines to control manure tanker traffic	Make sure A-B lines are loaded into each tractor	Soil compaction
	Reduce maturity of soybean varieties to ensure earlier seeding of winter wheat – to achieve improved wheat yields and thicker soil cover over winter	Ensure soybean variety is adapted for your region and strong performance in Ontario variety trials	Water erosion
Short Term (next 2-5 seasons)	Consider replacing tires with higher flexion technology.	Upgrade when current tires are replaced (or sooner)	Soil compaction
	Consider investment in a Central Tire Inflation System to optimize tire pressure for both in-field and road conditions	Central Tire Inflation System (CTIS) likely have greatest impact on manure tanker, then sprayer	Soil compaction
	Further incorporate cover crops in your crop rotation	Consider custom application of cereal rye into grain corn in late August-early September prior to soybeans	Soil surface structure Water erosion
Long Term (5+ seasons)	Maintain water and sediment control basin to ensure it continues to function properly	Seed to grasses and keep trim; avoid tree establishment	Water erosion
	Consider a controlled traffic farming system (for all equipment)	Equipment width matching is critical; opportunity to address when there is equipment turnover. Partial controlled traffic system is beneficial if full system not possible	Soil compaction Soil surface structure
	Continue diverse crop rotation and use of annual forages	Continue use of high-yielding, adapted varieties and nutrient planning	All

These modules will require additional user inputs. They provide different types of information, different ways to assess soil health, and different spatial scales than the SHAP Test. Combined, they address soil health issues that can't be evaluated in a lab and allow for greater detail and specificity in the management recommendations resulting from SHAP.

### **Interpreting and using results**

The Soil Health Management Plan (Figure 5) is the key to providing value from the results of SHAP to the farm operation. It recommends specific management actions that should be taken in the immediate, short, and long-term to address any concerns identified over the course of the assessment. A good plan integrates knowledge of the operation's current management and objectives, and includes enough detail in the considerations to ensure successful implementation.

### **For more information**

A SHAP Guidebook has been published by the OMAFRA Soil Team. It contains detailed information and step-by-step instructions for conducting SHAP. You can access it on the [SHAP landing page](#) on [fieldcropnews.com](http://fieldcropnews.com).

*Figure 5. An example Soil Health Management Plan derived from interpretations of SHAP.*