

# Comprehensive Assessment of Soil Health

The Cornell Framework Manual

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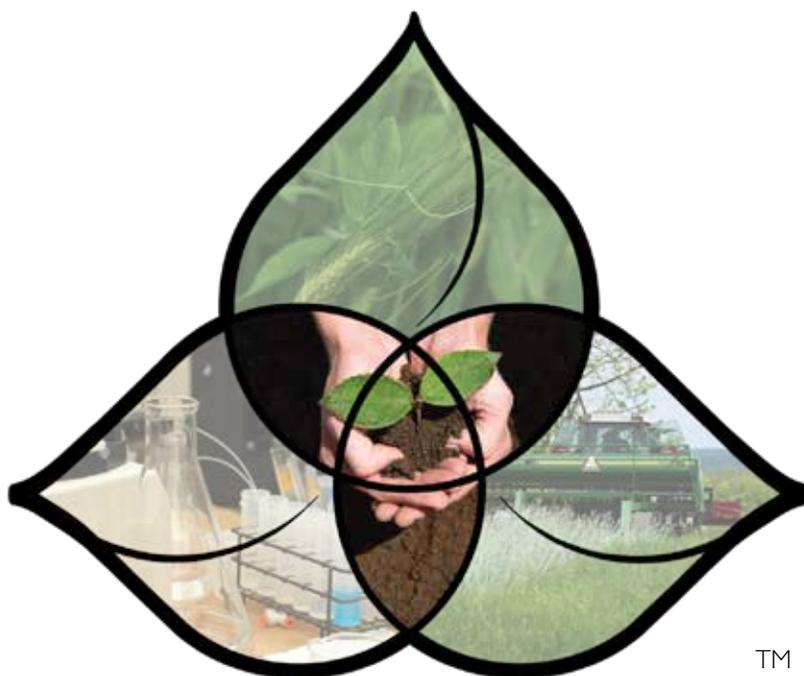
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# Introduction

Soil health, or the capacity of the soil to function, is critical to human survival. Soil health constraints beyond nutrient limitations and excesses currently limit agroecosystem productivity and sustainability, resilience to drought and extreme rainfall, and progress in soil and water conservation. With mounting pressure to produce food, feed, fiber, and even fuel for an increasing population, soil health is gaining national and international attention.

Research on both assessment and management of soil health, as well as farmers' innovations in soil health management approaches have matured over the decades. Multiple regional, national, and global efforts are now leveraging that work to reach new stakeholder audiences, so that soil health management is expanding into mainstream agriculture. Public recognition of the critical importance of maintaining and rebuilding healthy soils for long term sustainable agricultural production is growing. But while much progress has been made, there is much more to be done.



The more comprehensive assessment of soil health described in this manual is available to the public on a fee-for-service basis, and provides field-specific information on constraints in biological and physical processes, in addition to standard soil nutrient analysis ([soilhealth.cals.cornell.edu/](http://soilhealth.cals.cornell.edu/)). In essence, the assessment expands on a well understood approach that has been foundational to high agricultural productivity. Just as standard soil testing has informed nutrient management based on identified deficiencies and excesses since the 1900s, the assessment developed here, similarly, identifies constraints to biological and physical soil functioning. This information then guides land managers in making targeted management decisions to plan and implement systems of soil health management practices to alleviate identified constraints and maintain healthier soils. The current (2016) version of the assessment and its interpretive scoring was developed for the Northeastern United States. However, the concepts, framework and indicators for soil health



assessment and management planning described here can be expanded and adapted for national and global applications. The most relevant components of the framework are 1) measurement of indicators that represent critical soil processes, 2) scoring of measured values that allows for interpretation, and 3) linkage of identified constraints with management practices. The main benefit of this approach is that the identification of physical biological and chemical constraints prompts farmers to seek improved and more sustainable soil and crop management practices. We hope that this framework will evolve and be used widely to measure and monitor soil health status. It is expected that a more comprehensive understanding of soil health status can lead to better, regenerative, and sustainable management of soils through holistic, adaptive, and data-driven approaches.

This manual is laid out in four parts:

- I. Soil Health Concepts (1–18)
- II. Soil Health Assessment (19–78)
- III. Soil Health Management (79–101)
- IV. Additional Resources (102–108)

The purpose of this manual is to:

- Provide an overview of soil health concepts.
- Provide an overview of Cornell University laboratory methods used to assess the health status of soil, the report generated from this more comprehensive assessment of soil health, and its interpretation.
- Present a framework for soil health management planning and implementation based on information gained from soil health assessment that can be adapted for use in other land management systems, soils, and climates.
- Provide a brief overview of in-field qualitative soil health assessment.
- Provide a how-to guide for proper soil health sampling.
- Describe soil constraints and soil health issues common to soils in the Northeast region, especially in vegetable and field crop production systems.
- Identify management strategies for improving soil health based on measured constraints.
- Provide guidelines for standardized and quantitative laboratory-based soil health assessment.
- Provide links to additional soil health assessment and management resources.

