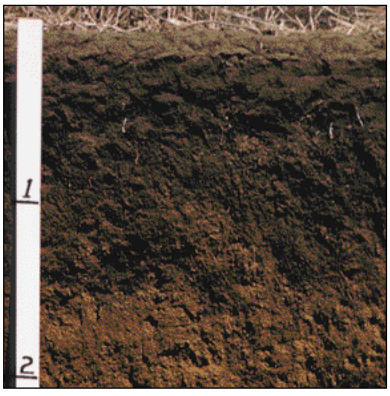

The Soil Conditioning Index
and improving your score

What is the Soil Conditioning Index?

The Soil Conditioning Index (SCI) is a tool that can predict the consequences of cropping systems and tillage practices on soil organic matter. Organic matter is a primary indicator of soil quality and an important factor in carbon sequestration and global climate change.

The SCI has three main components:
1) **OM or Organic Matter**. This accounts for the amount of organic material returned to the soil. Organic material from plant or animal sources may be either grown and retained on the site or imported to the site.
2) **FO or Field Operations**. This accounts for the effect of field operations which stimulate organic matter breakdown. Tillage, planting, fertilizer application, spraying and harvesting crush and shatter plant residues and aerate or compact the soil. These effects increase the rate of residue decomposition and affect the placement of organic material in the soil profile.
3) **ER or Erosion**. This accounts for the effect of removal and/or sorting of surface soil material by the sheet, rill, and/or wind erosion processes which are predicted by water and wind erosion models. It does not account for the effect of concentrated flow erosion such as ephemeral or classic gullies. Erosion contributes to loss of organic matter and decline in long-term productivity.

The SCI gives an overall rating based on these components. If the rating is a negative value, the system is predicted to have declining soil organic matter. If the rating is a positive value, the system is predicted to have increasing soil organic matter. The model is designed to aid Natural Resources Conservation Service (NRCS), landowners and Conservation District staffs in planning and designing cropping systems and residue management practices to resolve low organic matter, poor soil tilth, and other soil quality-related problems during conservation planning. The Revised Universal Soil Loss Equation Version 2 (RUSLE2) is the official NRCS tool that is used to calculate SCI.

Why is the SCI important?

The SCI is a quick way to characterize the organic matter dynamics of a farming system. Organic matter is a critical component of soil function for several reasons. Surface residue protects soil from the impact of rain and wind. As residue decays, it feeds microbes that improve soil structure and water infiltration, and thus reduces runoff. Soil organic matter contributes to nutrient and water holding capacities. Regular varying inputs of organic material foster a diverse microbial community that supports plant health and productivity.

The SCI along with RUSLE2, the NRCS soil erosion prediction model, can help assess two basic components of good soil management: building organic matter and controlling erosion.

SCI and the 2004 Conservation Security Program

The SCI plays a critical role in the implementation of the Conservation Security Program (CSP). It is used to determine the basic eligibility of cropland for CSP. Cropland must have a score of greater than 0.0 to be eligible for the program. Once an application is accepted into CSP, the SCI is one of the tools used to help determine the potential payment amount. All CSP applications will be assigned an enrollment category, which is partially based on the SCI score.

The Index is also used to help calculate some of the enhancement payment component of the CSP contract. Another NRCS tool, the Soil Tillage Intensity Rating (STIR), is also used to help determine enhancement payments. STIR, also automatically calculated by RUSLE2, measures the amount of soil disturbance based on tillage operations.

NRCS
Natural Resources
Conservation Service

Other SCI Uses

The SCI is a component of several practice standards in NRCS technical guides. It is designed to help plan and design conservation crop rotations and residue management practices when low organic matter, poor soil tilth, surface crusting, or erosion are identified as concerns.

What do the numbers mean?

The SCI does not indicate a desirable or target level of soil organic matter, but it will predict if a particular management system will have a positive or negative effect on SOM. For example, a near-zero SCI value indicates that soil organic matter levels are probably being maintained, but soil health may still be poor if the soil organic matter is being maintained at a low level.

If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

Cautions

Organic matter is an important factor determining soil quality in many systems, but it is not the only factor. Other important aspects of soil quality include quality of organic matter, sedimentation, soil biota, nutrient management, contaminants, soil pH, bulk density and infiltration rate. These are not directly reflected in the Soil Conditioning Index, but can be improved to some extent with gains in organic matter.

Improving your score

Consider some of the following to help increase your SCI score.

- Raise crops that produce high amounts of residue that are retained on the field
- Utilize cover crops when possible to increase organic matter.
- Utilize manure or crop mulch to add organic matter to the soil
- Limit the number of tillage operations.
- Limit the amount of soil disturbance each operation created--A field cultivation operation normally disturbs less soil than a chisel type operation.
- Minimize the amount of wind and water erosion occurring on the field.
- Use production techniques that will increase crop and residue production.

Helpful websites

For SCI:

- http://soils.usda.gov/sqi/soil_quality/land_management/sci.html

For CSP:

- http://www.nrcs.usda.gov/programs/csp/
- http://www.ia.nrcs.usda.gov/programs/csp.html

For RUSLE2:

- http://fargo.nsert.purdue.edu/rusle2_dataweb/RUSLE2_index.htm