USDA Midwest Climate Hub

U.S. DEPARTMENT OF AGRICULTURE

Re-carbonizing Row Crop Farms

By Justin Mount, NRCS Natural Resource Specialist, Liaison Midwest Climate Hub

The 2019 Natural Resources Conservation Service (NRCS) Liaison is working with the Midwest Climate Hub to improve crop producers' understanding of crop system planning tools, ultimately helping producers become more financially resilient. The goals of this work are to:

Pic 1. Crop management and soil management go hand-in-hand.

- Provide universal crop system analysis based on the Integrated Erosion Tool (IET) simulation results in order to assist farmers with improved cost benefit analysis related to changes in their cropping systems for water and wind induced erosion risk, rainfall use efficiency, soil carbon trend and crop productivity.
- Improve understanding of the interactions relative to inputs and outputs of process-based, event-driven models for consistent risk-based resource assessment and conservation planning for croplands.
- Explain Soil Condition Index (SCI) and why SCI is a the best foundational soil health metric positioned to empower annual row crop farmers be consistently profitable.
- Illustrate the interaction of soils and climate, to include increasing soil carbon effects on crop production, soil erosion impacts of changing rainfall timing and intensity plus crop system evaluation leading to farmer-driven soil health improvement opportunities.

A primary focus in achieving these goals is to engage the Integrated Erosion Tool to define Soil Conditioning Index (SCI), understand impacts of climate on modeled cropping systems and improve farmer profitability.

Re-Carbonizing of annual row lands enables more internal regulation and will lead to less external inputs

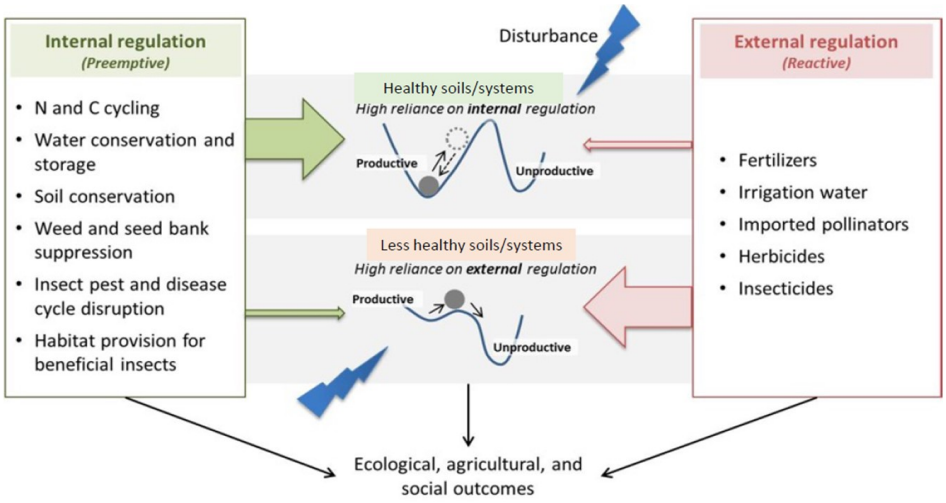


Figure 1. Image shows the outcomes of regulatory mechanisms within the row crop system. (Credit: Peterson et al._2019_Agricultural systems).

Increasing cropland soil carbon results in:

- less soil crusting and soil sealing
- reduced soil erosion of all forms
- improved water infiltration
- increased water holding capacity
- enhanced nutrient cycling
- better soil structural stability equals more days farmer can access field with equipment
- improved air and water quality in your community
- more internal regulation decreases need for some external inputs
- consistently higher crop yields

For more information on the Midwest Climate Hub, please visit:
https://www.climatehubs.oce.usda.gov/hubs/midwest

The Soil Conditioning Index

OM = Organic Matter

FO = Field Operations

ER = Erosion

SCI ● = Soil Conditioning Index

Soil Conditioning Index (SCI) formula is:
(OM x 0.4) + (FO x 0.4) + (ER x 0.2) =SCI

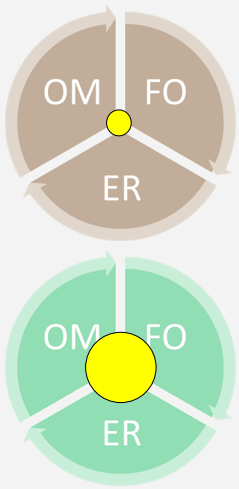


Figure 2. Soil Conditioning Index (SCI) values typically range from –2.0 through +2.0. Negative values indicate loss of soil carbon, near zero values indicate a non-discernable trend and strongly positive values, such as ≥0.5, represent a positive soil carbon trend.

Soil Conditioning Index Variables

OM accounts for **organic material** returned to the soil (as a function of biomass produced)

FO represents **field operation** effects

ER is the sorting and removal of surface soil material by sheet, rill and/or wind **erosion**

To increase and maximize SCI value on croplands adhere to this guidance:

- Use tillage and soil disturbing field operations only for emergency purposes, crop establishment and nutrient placement
- Reduce all forms of erosion to less than 1 ton per acre per year
- Increase the time living roots are present in the soil profile

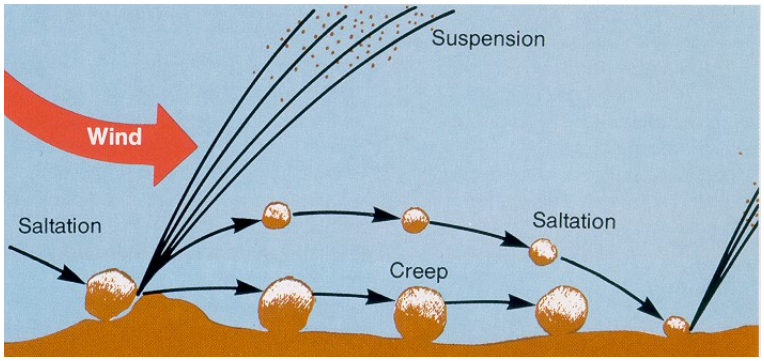
The Integrated Erosion Tool (IET)

The Integrated Erosion Tool (IET) was developed to directly meet NRCS' business goal to deploy information technology which effectively supports and aligns delivery of conservation technical assistance. Anyone can utilize IET and work with agricultural producers to document, create and evaluate cropping systems to address natural resource concerns on crop and pasture lands. IET is a web-served modeling platform which uses a digital map for farm field-level analysis of benchmark and planned cropping systems and provides results for:

⇒ Wind and water induced erosion timing and amount
⇒ Soil condition & air quality trends
⇒ Energy use as fuel per acre
⇒ Climate impacts on modeled cropping system to include erosion and runoff risks in extreme events
⇒ Natural rainfall capture and hillslope runoff
⇒ Soil evaporation and plant transpiration

For More Information, Please Contact:

Justin Mount, NRCS Liaison
Midwest Climate Hub
justin.mount@usda.gov
970-295-5473



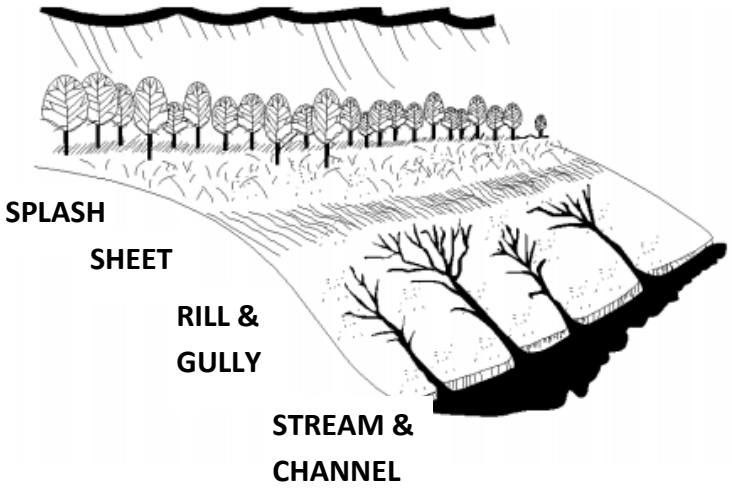


Figure 3 & 4. IET models both wind and water induced erosion.