GO BEYOND "T", MANAGE FOR "C"-- USING THE SOIL CONDITIONING INDEX TO ASSESS PROGRESS

Bobby G. Brock, George C. Naderman, retired Soils Extension Specialist, NC State University, Raleigh, NC; Susan Andrews, Leader, Soil Quality Team, USDA-NRCS, East National Technical Support Center, Greensboro, NC; Mike Hubbs, National Agronomist, USDA-NRCS, Washington, DC; John Hassell, Executive Director, Conservation Technology Information Center, West Lafayette, IN; and David Lightle, Conservation Agronomist, USDA-NRCS, NSSC, Lincoln, NE
bobby.brock@nc.usda.gov

ABSTRACT

Cropland erosion control has long been considered to be sufficient when sheet and rill erosion rates are reduced to a level known as "T", or soil loss tolerance. This level supposedly maintains a steady-state condition in which productive capacity is maintained in perpetuity. While this is a very useful management target, there are questions as to whether "T" soil loss rates are sufficient. Further, it is not uncommon for organic matter levels to trend downward, even though erosion rates are at or below "T", because erosion removes disproportionate amounts of organic matter.

As we strive to streamline soil management and production systems, organic matter improvements are critical to realize both on and off-site benefits. For example, recent and on-going studies show a strong inverse relationship between soil organic carbon and soil bulk density. Also, soil aggregates are positively correlated to organic matter/glomalin levels, yielding on and off-site benefits.

Recent improvements to a soil condition evaluation tool, the Soil Conditioning Index, provides reasonable estimates as to whether the all-important soil organic matter level is trending upward, downward, or level. The degree of erosion control and the amount of plant biomass added are two of the three sub-factors used in a weighted calculation to estimate the trend. A recently completed 5-year demonstration using differing amounts of soil surface biomass with continuous no-till demonstrated the importance of these two factors for soil carbon accrual. A treatment with average annual additions of 2,330 lbs/ac biomass and an erosion rate of 3.0 tons/ac/yr (well below T) gave a -0.17 erosion sub-factor and a -0.46 organic matter sub-factor in the SCI. The overall SCI is barely positive, with only +0.2. The use of 8,140 lbs/ac biomass resulted in a +0.73 erosion sub-factor and a +0.1 organic matter sub-factor. The higher biomass additions gave a +2.0 overall SCI. These results show that soil carbon can be lost (or negligibly accrued) with acceptable erosion rates, even under no-till, without adequate additions of plant biomass.

While reducing soil losses to "T" is certainly a desirable goal, it is no longer appropriate to presume that this is sufficient for today's resource management needs. Fortunately, there is now a tool available to guide decision-makers in the selection and use of environmentally/economically sustainable systems. Calculations of the SCI are automatically made as a part of RUSLE2 soil loss calculations.