School of Environment and Natural Resources

Soil Carbon Changes in Northwest Ohio

Changes in carbon storage in NW Ohio agricultural soils can be related to changes in land use and management.

SITUATION

The soil is an important source and sink for carbon, and consequently plays an important role in the global carbon cycle and in moderating atmospheric greenhouse gases and climate change. Soil management interventions, such as land clearing, drainage, tillage, crop rotation and fertilizer application, significantly impact the amount of stored soil carbon. Farmers and land managers need reliable information on these impacts. Increasingly, there are efforts to offset industrial greenhouse emissions with soil carbon sequestration. However, there is uncertainty about the real effects of land use and land management alternatives on soil carbon storage. Real world data are needed to validate commonly used simulation models that predict the dynamics of soil carbon under various management regimes.

RESPONSE

For 60 years, OARDC researchers have developed a database of more than 6000 analyzed soil profiles, perhaps the largest local soil database available. Selective resampling of hundreds of sites in northwest Ohio has enhanced the value of this database. Changes in soil organic carbon content in these soils have been related to the history of land use and land management change. OARDC researchers have established that major losses of soil carbon resulting from land clearing and drainage have been somewhat offset recently. While most carbon loss occurs in poorly drained soils, increases in carbon sequestration have occurred recently in better-drained soils.

IMPACT

Analysis of changes in soil organic carbon over time suggest that reduced or no-till management appears to concentrate carbon closer to the surface, without significantly increasing the amount of total profile carbon storage, contrary to some previous modeling studies. Changes in carbon concentrations associated with tillage appear to be related to the greater depth of mixing; the incorporation of residues may increase carbon storage over time. Carbon storage in drained soils stabilizes at a lower level, but improves with optimal crop rotation and strategic tillage practices. These results provide a more reliable basis for assessing impacts of land management on carbon sequestration and hence will guide decisions by land managers and policy makers, and illustrate the value of legacy soil data.

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