

Effects of removing corn stover from no-till fields on soil quality

A. What is this research project?

- The Ohio State University and the North Appalachian Experimental Watershed (NAEW) at Coshocton, OH, determining the effects of removing differing levels of corn stover on soil quality at the plot scale.
- Effects of corn-stover removal (removal rates of 100% - 0%) on soil-quality measures of soil-organic carbon, bulk density, aggregate stability, soil hydraulic properties, and aggregate tensile strength were investigated.
- This project addresses the sustainability of harvesting crop residues for biofuels production, considering the impacts of residue removal on runoff, and soil and water quality.

B. What problem does it address?

- The benefits of no-till corn production to drastically reduce runoff and erosion from hill lands have been demonstrated at the NAEW.
- The no-till conservation practice has significant benefits for runoff and water quality. A key component of the no-till practice is crop residues left on the ground. They contribute to soil-carbon levels, provide raindrop protection, and provide an environment for macrofauna (e.g., worms) that create large soil pores. These factors result in increased soil water-holding capacity, increased infiltration, and reduced runoff volumes and erosion.
- Crop residues may be a feedstock for production biofuels. However, the potential loss of environmental benefits (e.g., improved water quality) due to removal of the residues has not been widely studied. While the NRCS offers payments to producers for implementing the no-till practice to improve water quality, removing the surface residues can negate the environmental benefits of no till.

C. How is the project different from or how does it enhance other projects?

The project addresses limitations of crop-residue removal for sustainable biofuels production while preserving environmental benefits of no-till farming. The results have been incorporated into practices recommended by the Natural Resources Conservation Service for farmers in billion dollar, national conservation programs.

D. What are the potential benefits of partnering with ARS on this research?

- The NAEW at Coshocton, Ohio is a unique 1050-ac facility, consisting of an infrastructure of gauged experimental watersheds with 70 years of runoff data under varying agricultural practices.
- A gauged no-till watershed, characterized by large soil-organic carbon and crop surface residues, is available.
- This watershed is the only one like it in the world. Partnering with the NAEW on biofuels-related issues will enable the NAEW resource to be fully utilized to address environmental aspects of national energy concerns.

E. Who are the potential customers?

Agricultural producers, action agencies, and scientists will benefit from knowing often overlooked negative environmental consequences to removal of surface residue for biofuels production.



Comparison of dark no-till soil with lighter conventionally plowed soil

Stage of Development

Studies to date have focused on small-areas at the plot scale. There are several publications on this and other work related to the environmental effects of the no-till agricultural practice.

Moving Forward

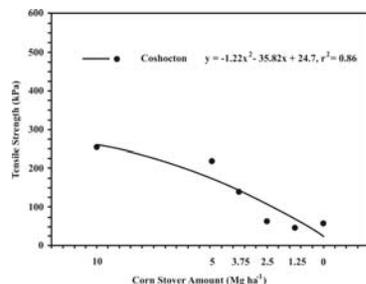
The studies so far have been conducted at the plot scale. Watershed-scale studies are needed to determine the effects of crop-residue removal on runoff and water quality leaving a watershed.

Researchers

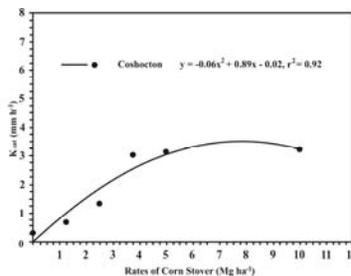
Lloyd Owens, ARS, Coshocton, OH
Martin Shipitalo, ARS,
Rattan Lal, Ohio State University
Humberto Blanco-Canqui, Ohio State University

Contact Information

Lloyd Owens, North Appalachian Experimental Watershed
(740) 545-6349; lloyd.owens@ars.usda.gov



Tensile Strength of soil aggregates vs rates of corn stover.
5 Mg ha⁻¹ = 100% stover



Saturated Hydraulic Conductivity (Ksat), i.e. the rate that water flows through saturated soil, vs rates of corn stover.
5 Mg ha⁻¹ = 100% stover."

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