

# CROP RESIDUE REMOVAL EFFECTS ON SOIL PROPERTIES

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## Abstract

Three large challenges facing mankind are the need to feed a rapidly growing population, increasing concentration of greenhouse gases in the atmosphere, and reliance on fossil fuels. Expectations from agriculture include production of food and fiber to meet demands, management of agricultural systems to sequester carbon and reduce emission of other greenhouse gases, and provision of feedstock for a rapidly expanding biofuels industry. Some discussions involving use of crop residue for biofuel feedstock have occasionally labeled crop residue as waste products, making them an ideal good candidate for biofuel production. These discussions fail to acknowledge the role crop residues play in maintaining critical soil functions. Crop residue provides physical protection from water and wind erosion, serves as a source of energy and nutrients for soil biota, and is essential for maintaining soil aggregation, organic matter content, and nutrient cycles and availability. Crop residue required to sustain soil function is dependent on inherent soil properties, management, and the conservation goal. For many fields, crop residue requirements will vary spatially.

For this work crop residue requirements for erosion protection and maintenance of soil organic matter content for several soils used for corn production in the north central US were first assessed. This assessment calculated corn residue requirements for soils under continuous corn or a corn – soybean rotation and under tillage or no-tillage. This assessment determined that greater amounts of residue are required to sustain soil organic matter than to protect against erosion; greater residue must be retained in tilled systems than in no-tillage systems; and residue requirements are greater in a corn – soybean rotation than in continuous corn.

The second portion of this study was initiated in 2006 which involved comparing soil properties and crop response to residue removal within a spatially variable field near York, NE. Eight 24-row strips representing four replications of two treatments (residue removal vs. residue retained) were established in a ridge-tilled irrigated continuous corn field. An apparent electrical conductivity (ECa) survey was conducted and the ECa survey used to select 20 soil sampling locations within each strip. Soils were analyzed for soil organic matter, particulate organic matter, labile carbon, microbial biomass carbon, and pH. Annual grain yield and residue removal rates are also being measured. Soil samples will be collected again after five residue harvests and soil properties compared.

Results from the initial soil analysis exercise represent a baseline dataset that will be compared to comparable data collected in the future after residue removal treatments have been in place for some period of time. This information will be used to develop residue retention recommendations within spatially variable fields. For example, at this study site soils in the eroded portion of the field will require residue in quantities necessary to prevent erosion. In the southern part of the field where the topography is relatively flat residue requirements will need to be sufficient to maintain soil organic matter status.

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