Variation in Soil Properties and Crop Yield Across an Eroded Prairie Landscape. (4797)

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Abstract:

Intensive tillage moves large quantities of soil, resulting in a pattern of soil redistribution where topsoil is depleted from convex slope positions and deposited in concave positions. In these experiments, the variation in surface soil properties and crop yield were determined in an undulating landscape subject to annual moldboard plowing. Soil properties and crop yield (4 yr) were determined at 288 points in a grid with a 10-m spacing. Tillage erosion was estimated using the tillage erosion prediction (TEP) model. Correlation analysis indicated that areas with high tillage erosion (shoulder slope positions) had high inorganic carbon contents in the surface soil due to the incorporation of subsoil material with high carbonate contents. Wheat yields in 2000, 2001, and 2003 were lowest in these areas. Conversely, wheat yields were highest in areas in which soil translocation by tillage results in a net deposition of soil (depressions). These areas had a deeper A horizon, and the surface soils had lower pH and inorganic carbon contents. Soybean yields in 2002 did not show a strong dependence on location within the landscape. These results indicate that the observed variation in crop yield in undulating landscapes may be significantly influenced by removal of topsoil through repeated intensive tillage, and point to opportunities for landscape restoration to reduce yield losses.

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