BRC Science Highlight
April 2019

Litter Quantity, Litter Chemistry, and Soil Texture Control Changes in Soil Organic Carbon Fractions under Bioenergy Cropping Systems of the North Central U.S.

Background/objective

Our objective was to better understand how and why the establishment of bioenergy cropping systems affects soil organic carbon (SOC) storage.

Approach

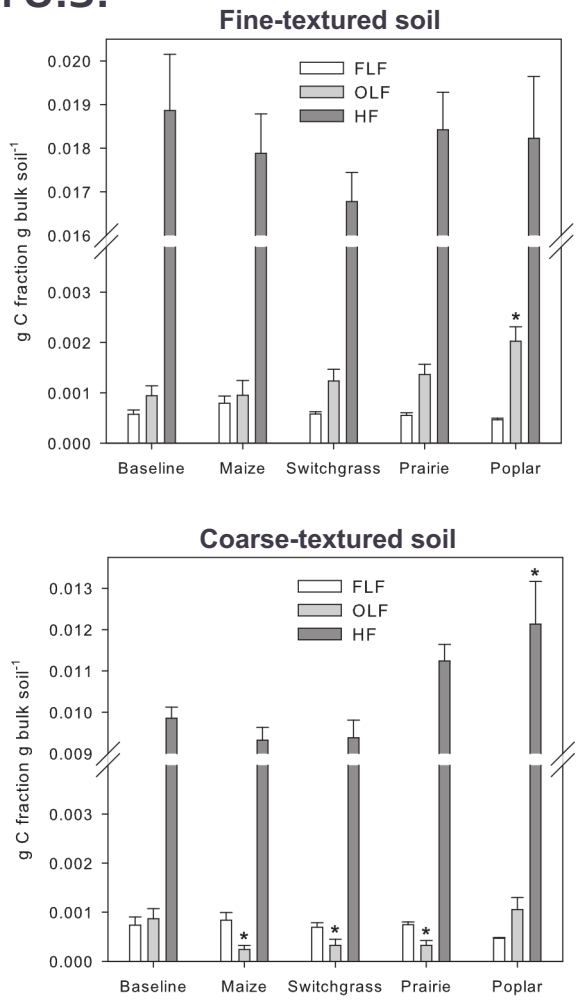
- We collected soil samples during establishment (baseline) and five years after the establishment of biofuel cropping systems (no-till maize, switchgrass, prairie, and hybrid poplar) at two temperate sites with fine- and coarse-textured soils, respectively.
- Soil samples were separated into three fractions that vary in protection from decomposition: free light fraction (FLF), particulate SOC in the inter-aggregate soil matrix; occluded light fraction (OLF), SOC contained within aggregates; and heavy fraction (HF), SOC associated with minerals.

Results

- SOC changes were most prominent in the OLF and HF fractions (figure).
- SOC fraction changes varied between fine- and coarse-textured soils (figure).
- Litter C:N ratio was negatively related to OLF and HF changes, while litter input quantity was positively related to HF changes.

Significance

- Increasing litter input quantity and promoting plant species with low C:N litter might improve SOC storage in the aggregate and mineral-associated soil fractions that are protected from decomposition.
- Knowledge of SOC changes in different bioenergy cropping systems and on contrasting soil types will help determine which management practices could most improve our ability to stabilize atmospheric CO_2.



SOC fraction concentrations at sites with contrasting soil texture. Asterisks indicate significant changes from baseline.

*Von Haden, A., et al. 2019. "Litter quantity, litter chemistry, and soil texture control changes in soil organic carbon fractions under bioenergy cropping systems of the North Central U.S." **Biogeochemistry**, DOI: 10.1007/s10533-019-00564-7*

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