Estimating Regional Changes in Soil Carbon with High Spatial Resolution: Integrating Field Measurements, Inventory Data, and Remote Sensing Products

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Abstract

To improve estimates of regional carbon dynamics, it is important to better represent landscape heterogeneity and local land management. We are currently developing a carbon accounting framework that can estimate carbon dynamics and net greenhouse gas emissions associated with changes in land management at a high spatial resolution. One component of this framework integrates field measurements, inventory data, and remote sensing products to monitor changes in soil carbon at a sub-county level (900m² resolution) caused by inter-annual changes in tillage and crop management. We applied this framework component to a mid-western region of the US that consists of 679 counties approximately centered around Iowa. We estimate the 1990 baseline soil carbon change estimated using different (spatially-explicit land-use data and delineation of sub-county soil series). These results indicate that we are maintaining the national cropping survey data, which we consider best represents actual field conditions.

Overall project summary and future work

- We have completed the soil component of our overall carbon accounting framework (presented here).
- We are near completion on other components, including CO₂ emissions from production inputs, analyses of yield changes associated with carbon management strategies, and development of socio-economic drivers representing real and potential risk associated with the adoption of carbon management strategies.
- Future work includes integration of all components with the POLYSYS agricultural economic model, and the enhanced use of remote sensing products in all components of our carbon accounting framework.

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Possibilities for collaboration

We are interested in collaborating with others to complete the following:
- Use different remote sensing products that spatially represent crops and land management.
- Use different carbon accounting methods or biogeochemical modeling components.
- Compare estimates of net carbon flux and other final products with other relevant estimates based on top-down or bottom-up carbon modeling and socio-economic drivers of land-use change.