Agricultural soil monitoring of carbon storage with varying tillage practices

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Problem Statement

An average of 50 billion tons of topsoil is being lost globally each year, mostly due to agricultural activities. This leads to a reduction in:

- Quantity of soil
- Crop yields
- Organic matter & carbon stored in soil
- Infiltration potential
- Soil stability
- Buffering capacity

Tillage practices have one of the greatest impacts on soil composition from one season to the next.

Objectives

- Estimate the change in storage of carbon in the soil using varying land management practices.
- Develop a relationship between soil respiration and soil moisture.
- Provide a spatial distribution of stored carbon

Methodology

Step 1: Perform field experiments on constructed corn, soybean, and bromegrass plots to mimic common farm practices.

Step 2: Perform greenhouse experiments to isolate key parameters.

Step 3: Use numerical models to verify experimental results and allow estimation for larger global scales.

Experiments

Measurements
- Soil respiration
- Soil organic carbon
- Soil Temperature
- Soil Moisture
- Litter fall rate
- Sediment flux
- Canopy height & cover

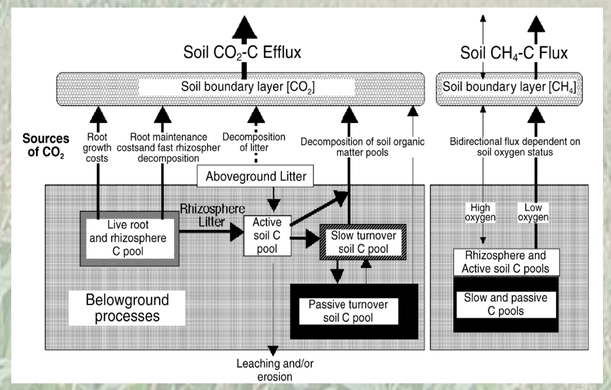
Test crops planted

Plants mature

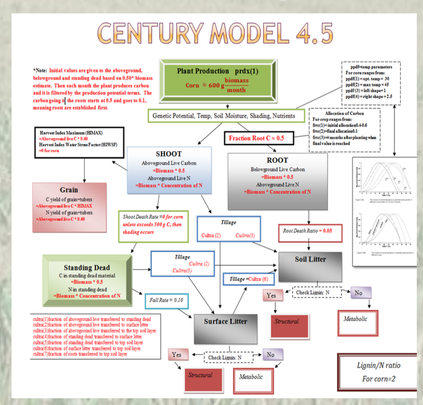
Rainfall simulation

Respiration measurement

Numerical Modeling



Carbon flowchart



Plant production component of CENTURY

Input data
- Land management
- Tillage practices
- Weather data
- Decomposition rates
- Soil properties
- Residue

Conclusion

This study will provide the following:

✓ Estimation of soil organic carbon changes with various land management practices

✓ Ability to use plot scale results in conjunction with numerical modeling to scale up to watershed levels.