United States Department of Agriculture
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Measurement of GHG (CO_2, CH_4, N_2O) Emissions from Different Agroecosystems in the Southern Great Plains

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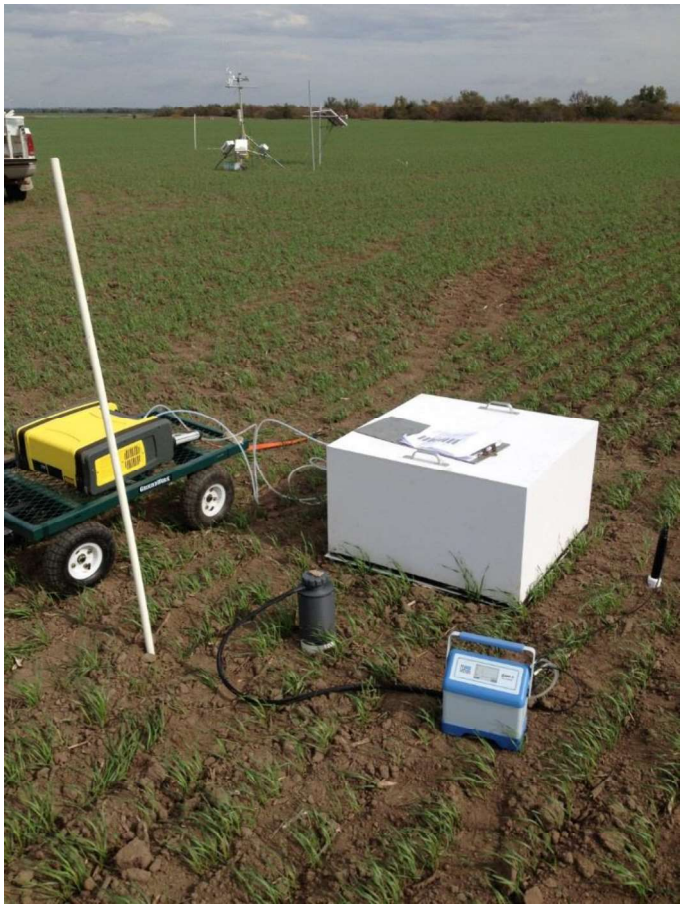
Rationale: Conventional agriculture, which includes regular tillage and fertilization, contributes substantially to total terrestrial greenhouse gas (GHG) emissions. Conservation agriculture such as no-till and cover crops, however, may provide options to mitigate GHG fluxes. Winter wheat is a major cash crop in Southern Great Plains (SGP). In recent decades, no-till is increasingly practiced for winter wheat cultivation in the region. Summer-grown cover crops such as pigeon pea, cowpea, and soybean in rotation with winter wheat cropping system are being evaluated as management options to increase net income to producers. The legumes cultivated as cover crops increase total green periods, fix atmospheric carbon and nitrogen to soil, and reduce leaching of nutrients and soil erosion. When cover crops are incorporated in the soil or left in the field, the decomposing biomass may release nitrogen which may be available for subsequently planted winter wheat. Although no-till and inclusion of cover crops have normally shown positive impacts on crop yield and soil health in the long run, overall GHG budgets in conventional and conservation agriculture are not well documented in the SGP. Monitoring of these systems for GHG emissions will help to understand impact of such conservation practices in overall annual GHG budgets and their GHG mitigation potential.



Objective: The main objective of this study is to understand effects of soil type, tillage management, crop type and rotation, and fertilizer type and rate of application on GHG emissions, and to quantify annual GHG balances.

Comparisons:

1. Crops and managements: Wheat (grain-only, graze and grain, and graze-out) and canola in rotation on large plots (n =8) representing individual watersheds.
2. Tillage: Conventional and no-till
3. Nitrogen rates and sources: Mineral (0, 45 and 90 kg N ha^{-1}) and organic (e.g., cowpea cultivated as a summer cover crop) in small replicated plot experiments.

Measurements:

The following measurements are being made biweekly to develop annual GHG budgets:

1. Fluxes of CO_2 with plants (gross primary production and ecosystem respiration).
2. Fluxes of CO_2 without plants (soil respiration)
3. Fluxes of CH_4 and N_2O
4. Supporting environmental variables: Soil moisture, soil temperature, air temperature, photosynthetically active radiation
5. Supporting crop development measurements: Canopy spectral reflectance, biomass yield, root/shoot ratio

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