Tuesday, 8 November 2005
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This presentation is part of: SOM, C Dynamics, and GHG Emissions: II

Greenhouse Gas Emission from Contrasting Management Scenarios in the Northern Midwest.

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To identify and develop economically viable and environmentally sustainable farming systems, the risks and benefits associated with various management strategies need characterization. We hypothesized that minimized tillage and diversified crop rotation can improve soil quality and enhance sustainability. Long-term cropping systems field plots were established in 2002 in central MN, to compare tillage, rotation and fertilizer treatments. We measured greenhouse gas emission in a subset of treatments selected to represent three different scenarios: "business as usual", "maximum C sequestration" and "optimum greenhouse gas benefits." The business as usual scenario has conventional tillage (chisel or moldboard plow), and receives high fertilizer inputs in a corn-soybean rotation. The 'maximum C sequestration' scenario is strip tilled with a mole-knife, and receives high fertilizer inputs in a corn-soybean-wheat/alfalfa-alfalfa rotation. The 'optimum greenhouse gas benefits' scenario is strip tilled with a mole-knife but receives no fertilizer inputs in a corn-soybean-wheat/alfalfa-alfalfa rotation. Nitrous oxide and carbon dioxide emission were monitored using vented static chambers, from early April through late November 2004, sampling resumed in February 2005. Collateral information collected included weather data, soil temperature and volumetric soil moisture at time of sampling. We observed largest fluxes in March, when the surface 1 to 3 cm of soil was thawing, even though air temperatures were below freezing. The flux varied by the previous season crop, and likely is related to available nitrogen. Carbon dioxide fluxes correlated with below ground biomass.

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