76-3 Nitrous Oxide Emissions From Arable Soil: Effects of Crop Rotation, Tillage and Manure Management.

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Recorded Presentation Audio File

Soil carbon storage and nitrous oxide (N_2O) emissions are both important for the greenhouse gas balance of agricultural soil, but difficult to verify under field conditions due to high spatial and temporal variability. Emissions of N_2O from arable soil are derived mainly from the short-term (<1 yr) turnover of fertilizers, manure and crop residues, which indicates that mitigation options may be found with a better understanding of management effects on soil C and N cycling and N_2O emissions. This presentation will describe N_2O studies within long-term crop rotation experiments which allow side-by-side comparisons of contrasting management strategies. A tillage experiment on a sandy loam soil, established in 2002, was used to study effects of residue management and tillage, and interactions with manure, on N_2O emissions. With removal of crop residues there was no difference between three tillage strategies, but with residue retention there was significantly higher N_2O emission from ploughed soil compared to non-inversion tillage. Cover crops are particularly needed in organic farming systems where the N supply is limited. Another long-term experiment with eight four-crop rotations was established on three soil types in 1996 to investigate strategies to improve crop yields. Estimates of N_2O emission from the same crop (winter wheat) in four different rotations, and from all crops (winter wheat, grass-clover, spring barley, potato) of a selected rotation, suggest that emissions should be considered at the crop rotation level. Although short-term N_2O emissions appear to be driven by organic inputs and fertilizers, long-term effects of crop rotation may also interact with environmental drivers such as rainfall or freeze-thaw events. Laboratory results with intact soil cores from four rotations will be used to discuss the relative importance of carbon and nitrogen availability and soil gas diffusivity.
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