Threshold Responses of Nitrous Oxide Flux to Added N in Intensively Managed Ecosystems. (S11-mcswiney151129-Oral)

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Abstract:

In long-term studies at the Kellogg Biological Station, nitrous oxide fluxes were greatest in plots with high N availability, whether N was introduced as fertilizer or by N-fixing plants. In order to better understand the relationship between N availability and nitrous oxide flux, we added ammonium nitrate to 4 replicate fields in continuous corn at 9 levels, ranging from 0-260 kg N/ha/yr and measured surface nitrous oxide fluxes before and after fertilization. Soil mineral N was determined at each flux determination and corn yields were determined at harvest. The threshold for nitrous oxide flux occurred at 134 kg N/ha/yr, which is just above the rate at which corn is fertilized for normal yields at KBS. Gains in grain yields decreased at N addition rates above 101 kg N/ha/yr. Soil inorganic N pools increased at the N addition rates where increases in yield declined and nitrous oxide fluxes increased. If these patterns are representative of other crops and growing seasons, nitrous oxide mitigation in cropping systems could be achieved without yield penalty by adjusting N fertilizer addition to crop needs.

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