

Objective

The winter fallow period in annual cropping systems leaves soils vulnerable to erosion and nutrient loss, especially to nitrogen (N) leaching. Perennial crops can help mitigate these problems, but the mechanisms, magnitude, and consistency with which these crops increase N retention are unknown. Researchers designed an experiment to compare N leaching and mineralization between perennial (*Miscanthus x giganteus*) and annual (maize) crops under different environmental and management conditions.

Approach

- ❖ Experimental design included three crossed factors: 1) cropping system (maize, juvenile miscanthus, mature miscanthus); 2) N fertilization (0 or 224 kg N ha⁻¹); and 3) environment (four site years in two locations in Iowa, USA).
- ❖ Measured N cycling dynamics, including inorganic soil N, *in situ* N mineralization (N_{min}), N leaching, and crop N uptake, then calculated system N use efficiency.

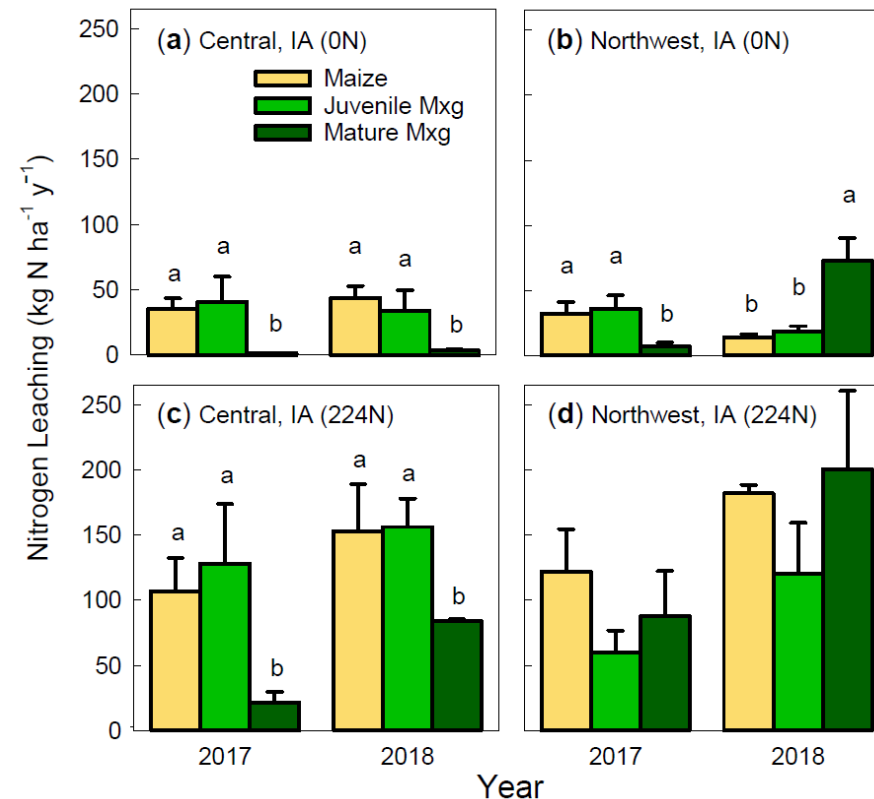
Results

- ❖ Cumulative N_{min} for juvenile miscanthus was 111% greater than maize and was not different between mature miscanthus and maize.
- ❖ N leaching was the same between juvenile miscanthus and maize, but mature miscanthus decreased leaching by 42% and 88% compared to maize (with and without N fertilization, respectively).
- ❖ Across all treatments, there was no relationship between N_{min} and N leaching.

Significance

This work demonstrates that miscanthus shows promise as a tool to reduce N losses in areas dominated by annual row crops.

Soil Net Nitrogen Mineralization and Leaching under *Miscanthus x giganteus* and *Zea mays*



N leaching (>94% nitrate-N) from continuous maize, juvenile miscanthus (1st-2nd year of establishment), and mature miscanthus (3rd-4th year of establishment). Means with standard errors shown (n = 4). Letters above bars indicate significant differences among treatments within the site-year.