# The effect of crop diversity on inorganic N under drought conditions

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## Background

Global warming is forecasted to lead to larger rainfall events and longer intervals between events. Soil nitrogen (N) is highly sensitive to changes in rainfall. Ammonium ($NH_4^+$) and nitrate ($NO_3^-$) make up the bulk of soil inorganic nitrogen and are the principle forms available for plant growth. Crop rotation can increase agroecosystem functions and alleviate the negative effects of climate change in agricultural systems.

**Research question.**
Could crop rotation diversification affect inorganic N during more intense soil wet/dry cycles?

## Methods

Soil (0-10 cm) was collected from Kellogg Biological Station, Biodiversity Gradient Experiment in the late spring of 2016.

Table 1: crop rotation treatments.

| | | | | | |
|---|---|---|---|---|---|
| **Cc-S-Wc** | corn | x2 | soy | wheat | x2 |
| **C-S** | corn | soy | | | |
| **C-c** | corn | x2 | | | |
| **C** | corn | | | | |

corn soy wheat cover crop

***Incubation***.
❑ **Control**: consistent soil moisture, irrigated every 2-3 days.
❑ **Drought**: received half of the water as the control once a week.

**Harvest**: at the driest point of the last wet/ dry cycle.

**Experimental design**: 32 experimental units (4 crop rotation treatments x 2 water regimens x 4 replications) arranged in a randomized complete block design.

**Measurement** of $NH_4^+$ and $NO_3^-$ in soil extracts of KCl by colorimety.

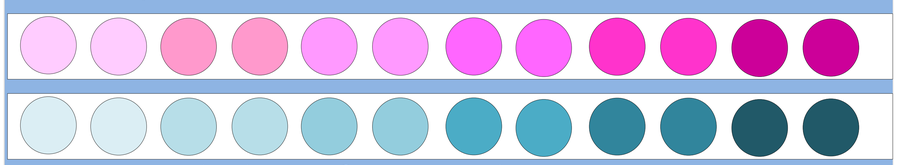

Figure 1. Standard curve for $NH_4^+$ and $NO_3^-$

## Results and Discussion

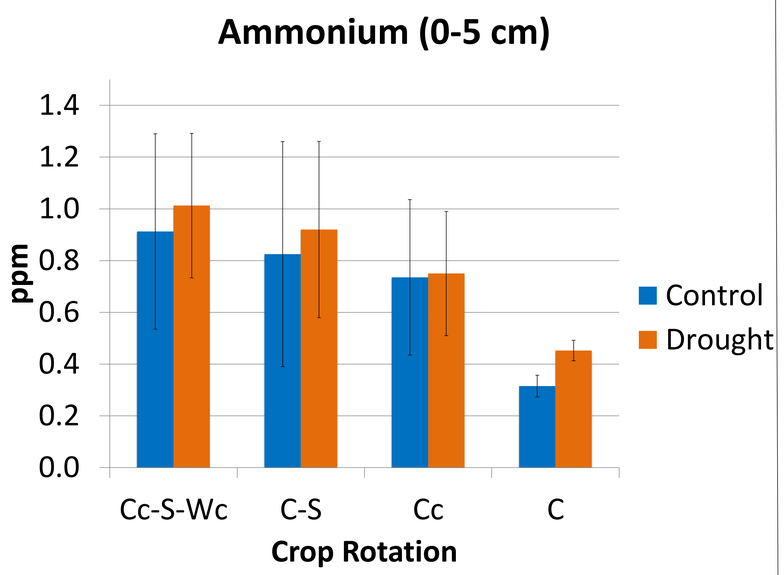


Figure 2. There is no effect of drought in the high diversity treatments. Ammonium increased under drought treatment in a corn monoculture.

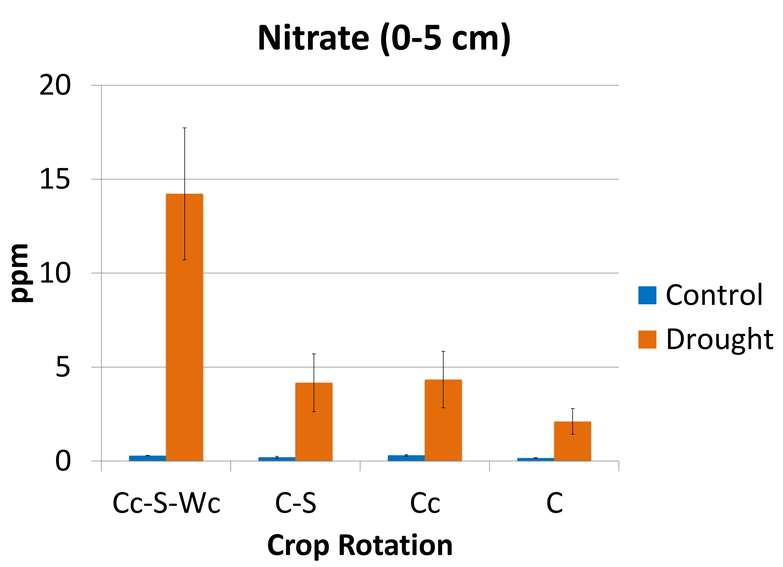


Figure 3. Nitrate increased in the high rotation diversity treatments under drought compared to low rotation diversity treatments.

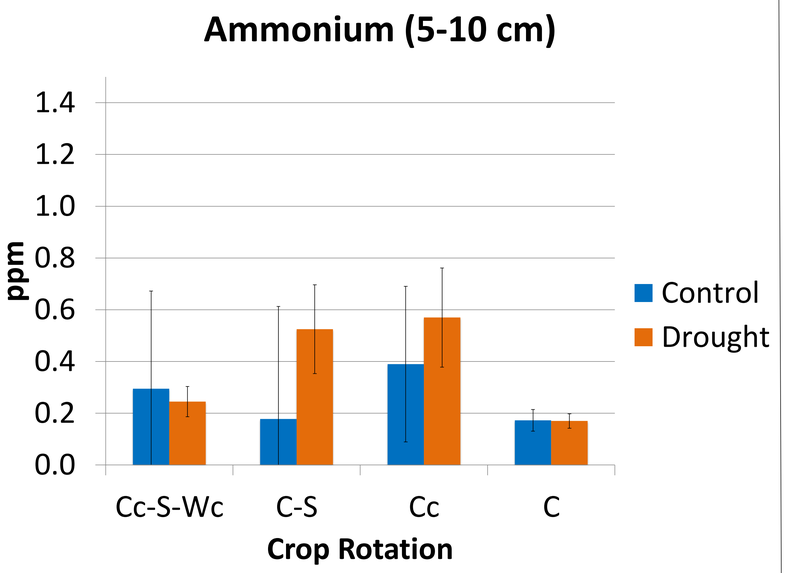


Figure 4. There is no difference between treatments.

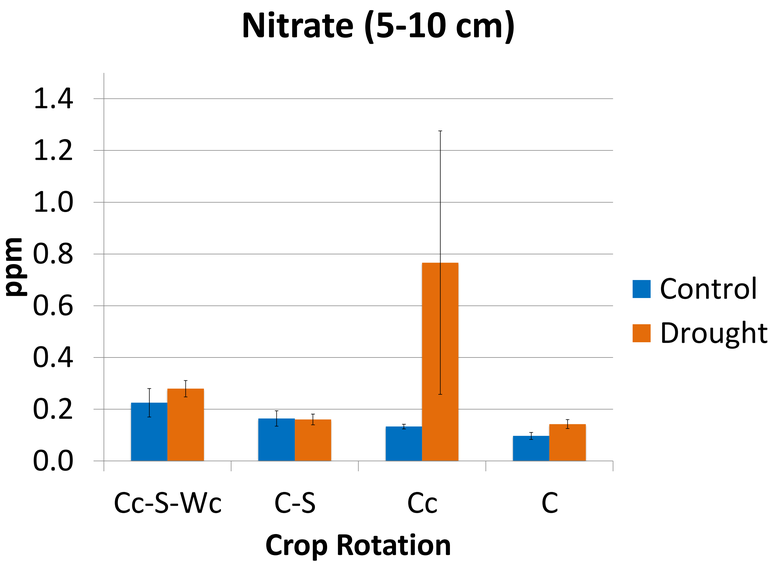


Figure 5. There is no difference between control and drought but there is a trend toward increased nitrate under drought.

**Conclusions**.
❑ More diverse crop rotation is capable of supplying more nitrogen under wet/dry cycles.
❑ Leguminous used as cover crop is a key species which would lead to increase N availability.
❑ Nitrate is the N form more utilized by all crops, but its also more susceptible to leach.