Impact of Irrigation Environment and Nitrogen Management on Corn Yield

Trial Objective

- High Plains farmers face many different irrigation environments when irrigating corn fields, such as limited amounts of pumping water, allocated amounts of water, and, in some cases, no restrictions on the amount of water that can be used.
- Nitrogen management strategies are employed by farmers to determine when and how much nitrogen to apply.
- This study was conducted to determine if the irrigation environment impacts how the corn plant uses nitrogen under different nitrogen management strategies.

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Gothenburg, NE	Hord silt loam	Corn	Strip-till	05/01/18	10/17/18	220	35K

- The study was set up as a split-plot with irrigation environment as the whole plot and nitrogen management as the sub plot with three replications.
- A 111 RM Brand Blend Corn product was planted.
- Four different irrigation environments, via a sub-surface drip irrigation system, were used:
  - Dryland – no supplemental irrigation
  - 100% Full Irrigation (FI) – irrigated to meet the evapotranspiration needs of the crop (3 inches)
  - 50% FI – half the amount of irrigation applied over the growing season (1.5 inches)
  - V14 to R2 (corn growth stage) – 100% FI applied between the V14 to R2 growth stages with no irrigation for the remainder of the growing season (1 inch)
- All plots were strip-tilled before planting with 19 lb/acre of nitrogen (N), 40 lb/acre of P_2O_5, 17 lb/acre of sulfur, and 0.25 lb/acre of zinc.
- Five different N management strategies were used:
  - Zero N – no additional N applied
  - Low N – 30 lb/acre of N applied preseason and 30 lb/acre applied at V9 (6/22/18)
  - Medium N – 60 lb/acre of N applied preseason and 60 lb/acre applied at V9
  - Medium Upfront – 120 lb/acre of N applied preseason
  - Moderate N - 120 lb/acre of N applied preseason and 60 lb/acre applied at V8
  - High N - 120 lb/acre of N applied preseason and 120 lb/acre applied at V8
- All weeds were controlled as needed. No fungicide or insecticide was applied in-crop.
- The study was conducted in collaboration with the University of Nebraska with faculty at the West Central Research and Extension Center.

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Understanding the Results

- There was no significant interaction of the irrigation environment with the nitrogen management strategy on yield but there was an interaction for test weight as recorded in Table 1.
- For a majority of the nitrogen management treatments, higher test weights were observed when the crop was only irrigated from V14 to R2, with the exception of the Medium N treatment where test weight was higher for the 50% FI environment (Table 1).
- The 100% FI treatment had the highest yield with next highest yield recorded with the targeted FI during the V14 to R2 growth stage (Figure 1).

Table 1. Average test weights by irrigation environment and nitrogen management.

Nitrogen Management Strategy	Irrigation Environment			
	Dryland	100% FI	50% FI	V14 to R2
Zero N	58.6	58.3	58.0	59.3
Low N	58.2	58.0	58.6	59.0
Medium N	58.6	57.6	58.8	58.3
Medium Up-Front	58.0	57.7	58.4	58.5
Moderate N	57.7	58.2	58.1	58.1
High N	58.9	58.1	58.3	59.1
	LSD (0.1) = 0.6			

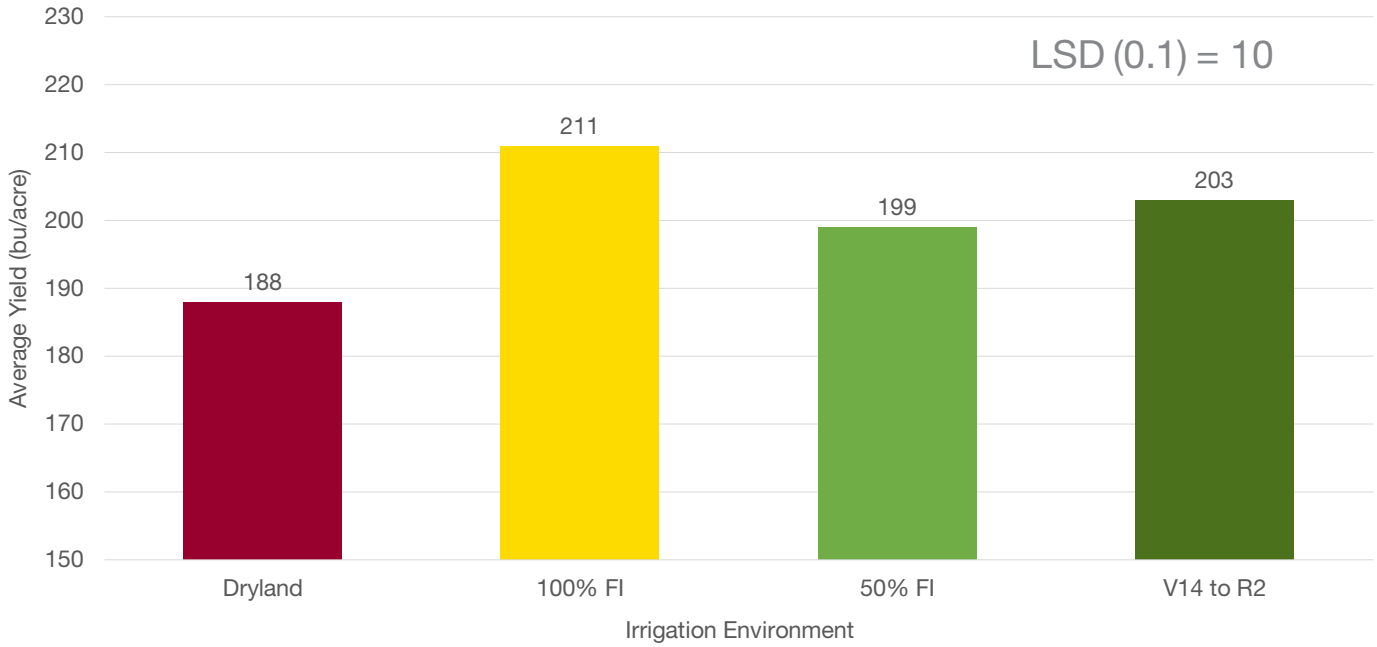

Figure 1. Average yields by irrigation environment.

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- In a tough corn-on-corn environment, the nitrogen management treatments did impact yield with higher yields observed at higher application rates (Figure 2). However, the Medium Up-Front treatment did not have significantly different yields compared to the High N treatment and used 120 lb/acre less nitrogen, which would be a considerable cost savings.

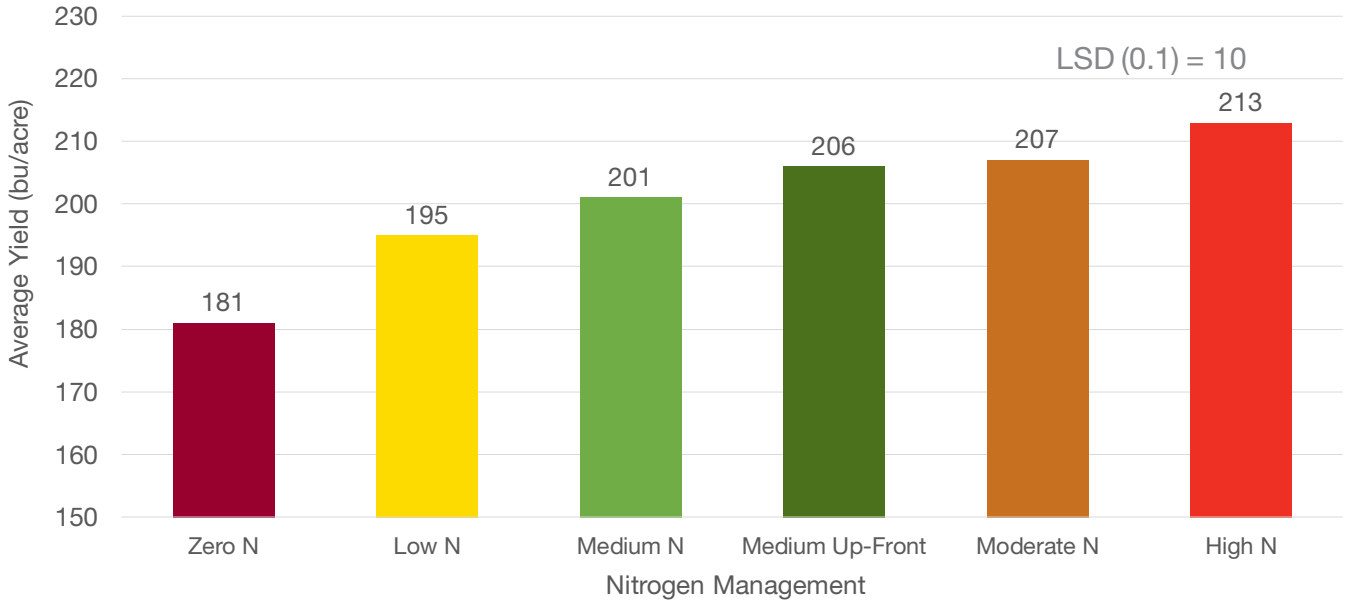

Figure 2. Average yields by nitrogen management strategy.

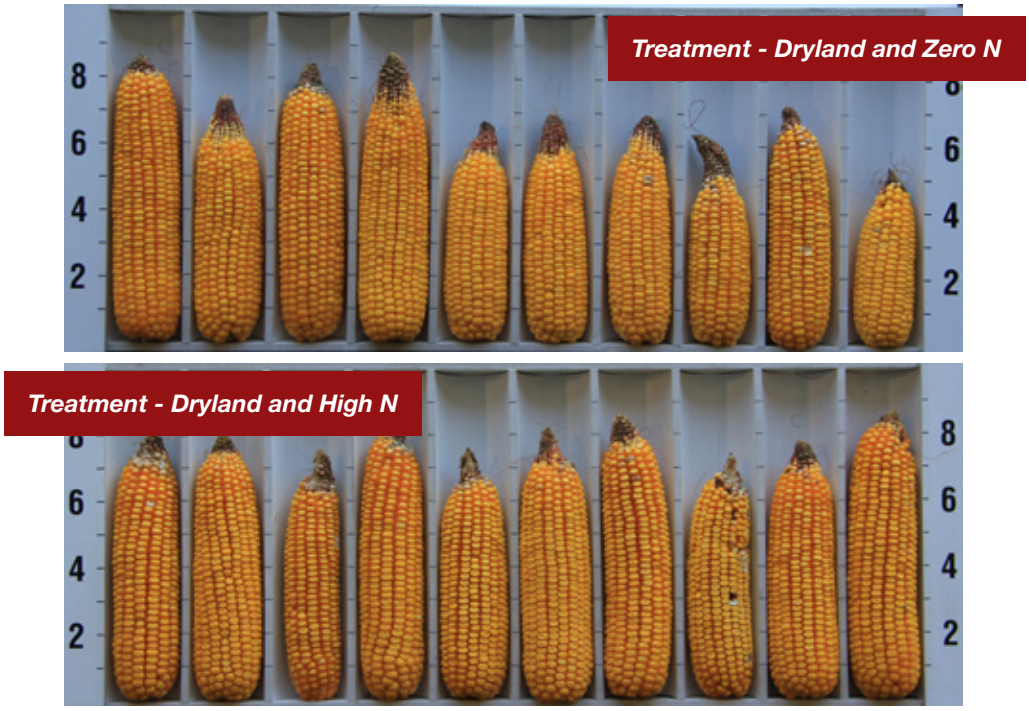

Figure 3. Representative corn cobs from dryland irrigation and nitrogen treatments.

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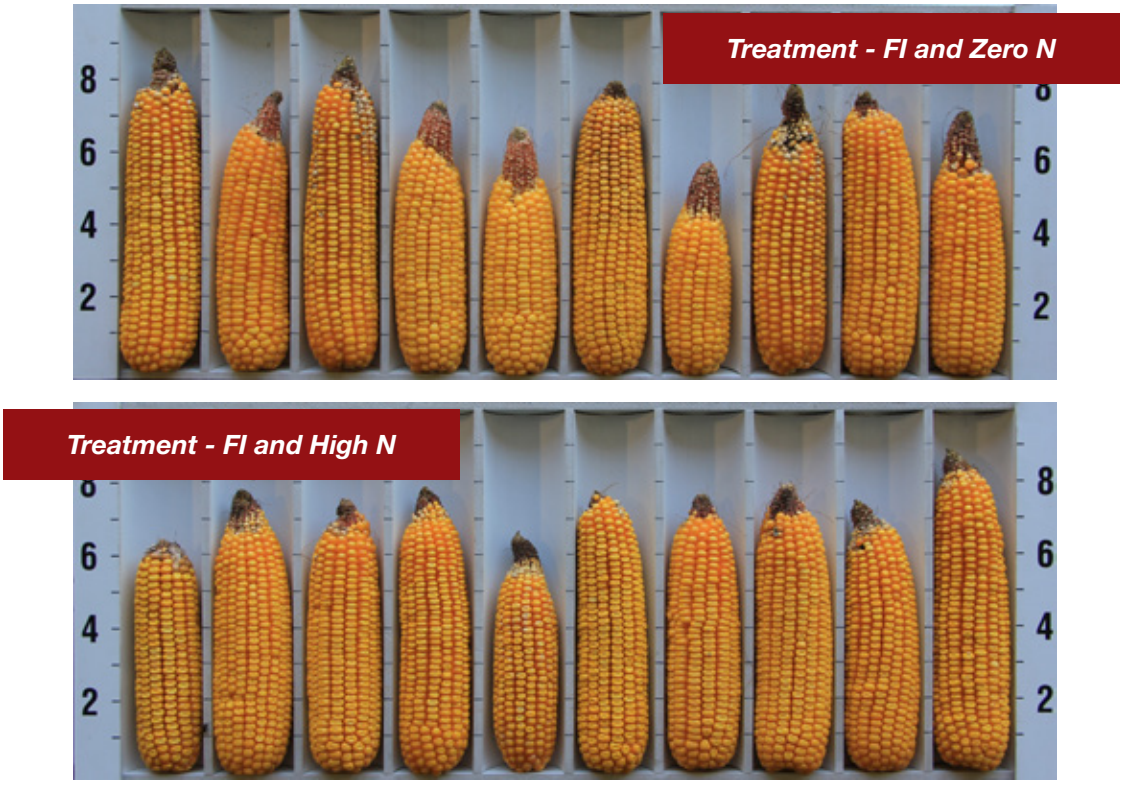

Figure 4. Representative corn cobs from FI irrigation and nitrogen treatments.

What Does This Mean for Your Farm?

- The irrigation environment did not impact how nitrogen was used by the corn crop.
- Producers should choose the nitrogen management system that works best for their operation.

Legal Statements