



# CORN DENSITY AND NITROGEN IMPACT ON YIELD

## PURPOSE

Interest in matching nitrogen rates to corn population has grown in response to the increased ability to measure yield to changing various inputs. Understanding corn product response to nitrogen rate may help to be more profitable in the future. This study looks at the interaction of various populations and nitrogen rates.

| LOCATION         | PLANTING DATE | PRODUCTS                | HARVEST DATE | TILLAGE      | PREVIOUS CROP |
|------------------|---------------|-------------------------|--------------|--------------|---------------|
| Christian Co, KY | 4/21/18       | 8E623RIB<br>Brand Blend | 9/17/18      | Conventional | Soybeans      |
| Clinton Co, OH   | 5/7/18        | S750<br>Brand           | 9/17/18      | Minimum till | Soybeans      |

## METHODS

Site treatments were replicated 2X at the KY site and 3X at the Ohio site.<sup>1</sup>

Planting populations of 26, 33, and 40K were planted using commercial planters in strips.

Preplant nitrogen was applied uniformly across all treatments. Nitrogen was sidedressed with a low, medium and high rate as either 28% or 32% UAN prior to V7.

Sidedress nitrogen was applied via streamer bars at the KY site and via Y-Drop system at the Ohio site.

Yields were taken from calibrated yield monitors and the Climate FieldView™ platform.

## DETAILS OBSERVED

- Both sites enjoyed favorable weather and plentiful rainfall for the most part.
- Both sites were on silt loam soils with OM contents 2.0-3.0 % The Ohio site was on a somewhat poorly drained Reesville silt loam while the Kentucky site was on a well-drained Pembroke silt loam.
- With good moisture available, it's likely both soils mineralized nitrogen at a higher than normal rate this year.
- Standability was good at both sites and yields were above average at both sites.

## SUMMARY

- Net profit was calculated using \$.40/lb for nitrogen, \$230/unit<sup>2</sup> cost and a corn price of \$3.20/bu.<sup>3</sup>
- Positive yield responses were seen in response to increasing population at both sites.
- The highest yielding combination was 40K population and 250 units N yielding 250.2 bu/a.
- The lowest yielding combination was 26K at 130 units N yielding 225.6 bu/a.
- Taking nitrogen costs and seed costs into account, economically the most profitable combination was the 33K at 130 units of N while the least economical was the 26K at 250 units of N.
- Using ANOVA (Analysis of Variance; a tool comparing two or more independent variables), there was little significance to the differences between treatments outside of the 40K/130lb and 40K/250lb combinations.

## RESULTS - 2 SITE AVERAGE

| YIELD/A             |                  |        |        |       |
|---------------------|------------------|--------|--------|-------|
| Planting Population | NITROGEN APPLIED |        |        |       |
|                     | 130 lb           | 190 lb | 250 lb | Avg   |
| 26,000              | 225.6            | 231.4  | 233.6  | 230.2 |
| 33,000              | 239.0            | 240.2  | 249.8  | 243.0 |
| 40,000              | 238.0            | 250.2  | 253.0  | 247.1 |
| <b>Avg</b>          | 234.2            | 240.6  | 245.5  | 240.1 |

| NET PROFIT (\$/A)   |                  |          |          |          |
|---------------------|------------------|----------|----------|----------|
| Planting Population | NITROGEN APPLIED |          |          |          |
|                     | 130 lb           | 190 lb   | 250 lb   | Avg      |
| 26,000              | \$607.17         | \$601.73 | \$584.77 | \$597.89 |
| 33,000              | \$629.93         | \$609.77 | \$616.49 | \$618.73 |
| 40,000              | \$606.60         | \$621.64 | \$606.60 | \$611.61 |
| <b>Avg</b>          | \$614.57         | \$611.05 | \$602.62 | \$609.41 |

## RECOMMENDATIONS

- At very high populations, there was some evidence there was a need for increased nitrogen based on yield.
- However, the economic costs reflected in these trials showed that diminishing returns dimmed the benefit or the additional bushels.
- These results also illustrated an advantage to monitoring weather influence on nitrogen mineralization and utilizing sidedress applications to fine tune rates as growth conditions dictate.
- In drier growing conditions, results could have favored a different combination.
- Additional testing is needed to continue to quantify population/N rate influence.



Ears on left were 26K @ 130 units N. Ears on right were 40K @ 250 units N sidedressed. Photo taken July 20 - Christian Co, KY

<sup>1</sup> All other inputs, such as herbicides, were the same across all treatments.

<sup>2</sup> Unit = bag of seed.

<sup>3</sup> Net profit was calculated using average cooperator costs of \$.40/lb for nitrogen, \$230/bag corn cost and corn commodity price of \$3.20/bu. Those costs would be representative of an average grower cost on those inputs in our region.