



# IRRIGATION STRATEGIES FOR SOYBEAN PRODUCTION IN NEBRASKA

## TRIAL OVERVIEW

- There are many different irrigation environments across the Great Plains. In some areas, water applications are restricted by pumping capacity or by allocation, but there are still many fully-irrigated fields.
- Farmers need information on how soybean products perform in various irrigation environments to help them choose the best products for their fields.

## RESEARCH OBJECTIVE

- To determine the effects of different irrigation strategies on the final yield and profitability of soybean in various irrigation environments.

| Location         | Soil       | Previous Crop | Tillage Type  | Planting Date | Harvest Date | Potential Yield/Acre | Planting Rate/Acre |
|------------------|------------|---------------|---------------|---------------|--------------|----------------------|--------------------|
| Battle Creek, NE | Loamy sand | Corn          | Conventional  | 05/23/2017    | 10/12/2017   | 90 bu/acre           | 140,000            |
| Gothenburg, NE   | Silt loam  | Winter wheat  | Strip tillage | 05/15/2017    | 10/17/2017   | 80 bu/acre           | 160,000            |
| Bruning, NE      | Silt loam  | Corn          | Conventional  | 05/16/2017    | 09/30/2017   | 80 bu/acre           | 160,000            |

### SITE NOTES:

- Rainfall totals and irrigation amounts by location were as follows:
  - Battle Creek, NE: rainfall = 12.3 in., full irrigation = 7.0 in.
  - Gothenburg, NE: rainfall = 10.83 in., full irrigation = 6.25 in.
  - Bruning, NE: rainfall = 12.3 in., full irrigation = 8.4 in.
- Two Roundup Ready 2 Xtend® soybean products were planted in four irrigation blocks at each location with 1 repetition per location, so the site was used as a repetition when analyzed.
- Irrigation treatments included:
  - Full irrigation (FI) to meet the evapotranspiration needs of the crop
  - Irrigation only from the R1 growth stage through physiological maturity (R1-PM)
  - Irrigation only from the R3 to R6 growth stages (R3-R6)
  - Dryland
- Each trial location was irrigated with an overhead irrigation system equipped with variable rate technology.

## UNDERSTANDING THE RESULTS

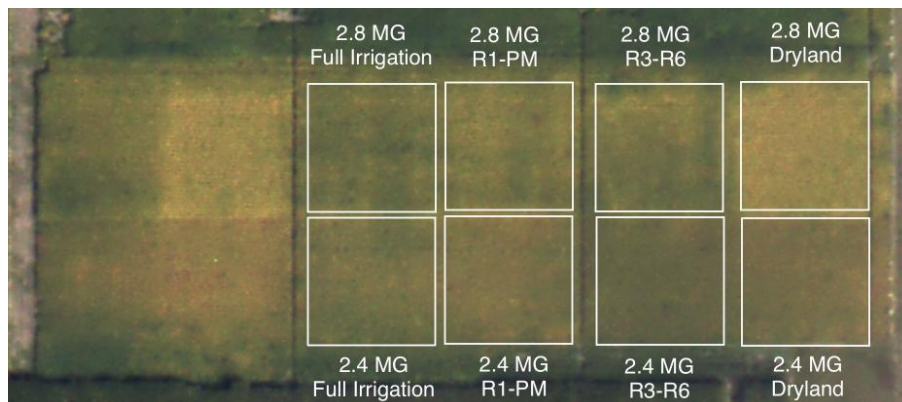


Figure 1. Aerial image of the trial at Gothenburg, NE. This image was taken on September 13th, 2017 and displays how the plots were laid out and the earlier senescence (yellowing) in the dryland treatment blocks.



# DEMONSTRATION REPORT

MONSANTO LEARNING CENTER AT GOTHENBURG, NE

| Soybean product     | Trt     | Bruning                 | Gothenburg  | Battle Creek | Trt x P*    | Trt avg                    |
|---------------------|---------|-------------------------|-------------|--------------|-------------|----------------------------|
|                     |         | Average yield (bu/acre) |             |              |             |                            |
| 2.4 MG              | FI      | 75.3                    | 78.2        | 85.6         | <b>79.7</b> | <b>77.5 a</b>              |
| 2.8 MG              | FI      | 75.2                    | 73.6        | 77.3         | <b>75.4</b> |                            |
| 2.4 MG              | R1-PM   | 68.6                    | 73.4        | 81.5         | <b>74.5</b> | <b>72.4 ab</b>             |
| 2.8 MG              | R1-PM   | 69.1                    | 70.7        | 71.2         | <b>70.3</b> |                            |
| 2.4 MG              | R3-R6   | 67.9                    | 69.0        | 76.0         | <b>71.0</b> | <b>68.9 bc</b>             |
| 2.8 MG              | R3-R6   | 63.0                    | 66.6        | 71.0         | <b>66.9</b> |                            |
| 2.4 MG              | Dryland | 47.4                    | 67.3        | 78.1         | <b>64.3</b> | <b>64.5 c</b>              |
| 2.8 MG              | Dryland | 58.8                    | 60.8        | 74.4         | <b>64.7</b> |                            |
| <b>Location avg</b> |         | <b>65.7</b>             | <b>70.0</b> | <b>76.9</b>  |             | <b>70.8</b><br>(LSD = 6.4) |

Table 1. Soybean yields across locations, treatments, and products (\*treatment x soybean product average across locations)

| Soybean product | Trt     | Trt x P* (bu/acre) | Gross return at \$9.00/bu | Irrigation (inches) | Energy cost/inch of irrigation | Net return after energy costs | Net return by treatment |
|-----------------|---------|--------------------|---------------------------|---------------------|--------------------------------|-------------------------------|-------------------------|
| 2.4 MG          | FI      | <b>79.7</b>        | \$717.30                  | 7.2                 | \$7.28                         | \$664.88                      | <b>\$645.38</b>         |
| 2.8 MG          | FI      | <b>75.4</b>        | \$678.30                  | 7.2                 | \$7.28                         | \$625.88                      |                         |
| 2.4 MG          | R1-PM   | <b>74.5</b>        | \$670.50                  | 5.8                 | \$7.28                         | \$628.28                      | <b>\$609.53</b>         |
| 2.8 MG          | R1-PM   | <b>70.3</b>        | \$633.00                  | 5.8                 | \$7.28                         | \$590.78                      |                         |
| 2.4 MG          | R3-R6   | <b>71.0</b>        | \$638.70                  | 4.25                | \$7.28                         | \$607.76                      | <b>\$589.31</b>         |
| 2.8 MG          | R3-R6   | <b>66.9</b>        | \$601.80                  | 4.25                | \$7.28                         | \$570.86                      |                         |
| 2.4 MG          | Dryland | <b>64.3</b>        | \$578.40                  | 0                   | \$0                            | \$578.40                      | <b>\$580.20</b>         |
| 2.8 MG          | Dryland | <b>64.7</b>        | \$582.00                  | 0                   | \$0                            | \$582.00                      |                         |

Table 2. Economic analysis – net return by treatment after pumping costs, averaged across all locations (\*treatment x soybean product average yield across locations)

- No significant difference was found in yields between the FI treatment or when delaying the first irrigation until the R1 growth stage (R1-PM).
- Yields in the dryland treatment did not differ significantly from yields in the R3-R6 treatment.
- No statistically significant yield difference was found between delaying initial irrigation until the R1 growth stage compared to the R3 stage.
- Starting irrigation in the vegetative stages (FI) resulted in increased plant height and lodging in both products at the Bruning, NE location (data not shown).

## WHAT DOES THIS MEAN FOR YOUR FARM?

- Growers may want to consider delaying the initial irrigation of soybean at least until the R1 stage of growth (beginning flowering).



# DEMONSTRATION REPORT

MONSANTO LEARNING CENTER AT GOTHENBURG, NE

- Irrigating soybean during the vegetative stages can lead to increased plant height and potential lodging.
- Growers should consider the price per bushel of soybean when developing a strategy for irrigating their crop.
- Monsanto intends to repeat these trials to evaluate the yield response to irrigation strategies for the 2018 season. Readers should keep in mind that these results are from only one year, and that additional data collected in future trials may provide additional insight into this research topic.

## LEGAL STATEMENT

The information discussed in this report is from a multiple site, replicated demonstration. This information piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

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**Individual results may vary,** and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

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