MONSANTO LEARNING CENTER AT GOTHENBURG, NE

2017 DEMONSTRATION REPORTS

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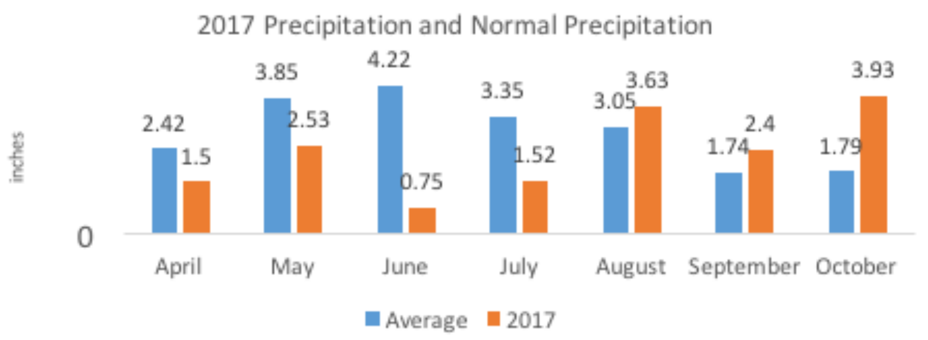
Welcome...

to the 2017 Demonstration Reports from your Learning Center in Gothenburg, NE. The site started off the growing season with good soil moisture and fair weather in May. In June, temperatures were excessive with 10 days over 90 F. Temperatures in July and August were more typical. Monthly rainfall during the growing season as seen Figure 1 was not normal. Both June and July had significantly less moisture compared to average rainfall for these months. There was also a minor hail event on July 2 that took off the top end yield potential for the irrigated crops. Irrigated corn yields were good with 290 bu/a corn recorded while dryland corn was above 200 bu/a. Soybean yields were off for irrigated soybeans with top end yields of 85 bu/a and dryland yields of around 70 bu/a. Wheat yields were also behind what has recently been seen in the past but this was likely due to the warm temperatures during late grain fill in June.



During the tour season, we took the opportunity to discuss various corn, soybean, and wheat research projects and traits like Roundup Ready 2 Xtend® Soybeans, as well as new pipeline products soon to be released. Farmers from Kansas, Colorado, and Nebraska were are primary tour guests, but we also hosted guests who had travelled from Ukraine and Argentina.

Currently, we are hard at work developing research and demonstrations that will be valuable to your operation and look forward to your visit in 2018.

Thanks,

The Gothenburg Learning Center Team

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CORN PRODUCT PERFORMANCE INFLUENCED BY SEEDING AND IRRIGATION RATE

TRIAL OVERVIEW

- Managing irrigated corn production is intensive and demanding as farmers try to extract value out of every input.
- There are many interactions in the field that impact yield potential, including seeding rate, irrigation environment, and corn product. This study was designed to evaluate the interaction of these factors on the yield potential of different corn products.

RESEARCH OBJECTIVE

- Evaluate the effect of different seeding rates under full and limited irrigation on corn product yield potential to aid producers in selecting the optimal corn products and planting populations for the irrigation environment on their farm.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Corn	Conventional	05/07/2017	11/01/2017	240 bu/acre	24K, 30K, 36K, and 42K

SITE NOTES:

- 21 corn products were tested with RM ranging from 105 to 116.
- Two irrigation rates were used:
  - 100% full irrigation (FI) to meet the evapotranspiration demands of the crop (totaling 6 inches)
  - 50% of FI (totaling 3 inches)
- Irrigation treatments were applied using a variable rate irrigation system.
- The study design was a split-split plot with irrigation as the whole plot, corn product as the first split, and planting density as the second split.
- Watermark granular matrix soil moisture sensors were installed before tassel to track soil moisture.
- Weeds were controlled uniformly across the study and no fungicides or insecticides were applied.

UNDERSTANDING THE RESULTS

- There was a general trend across corn products for higher yields at the 36,000 or 42,000 seeds/acre seeding rates.
  - For the 100% FI treatment, 42,000 seeds/acre provided the highest yield potential.
  - For the 50% FI treatment, 36,000 seeds/acre provided the highest yield potential.
- The response of some corn products differed from the generalized trend. For example, the 114RM-B product yielded the highest at 30,000 seeds/acre at both irrigation rates.

WHAT DOES THIS MEAN FOR YOUR FARM?

- Farmers should select corn products that have shown good performance in the seeding rate and irrigation environments on their farm.
- Producers should work with their local seed sales team to identify how their branded corn products performed in this study.
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Corn product	Seeding Rate (seeds/acre)				Average yield
	24K	30K	36K	42K	
105RM-A	**200**	**207**	**216**	**214**	**209**
100% FI	202	217	217	230	216
50% FI	196	187	214	182	195
105RM-B	**202**	**215**	**225**	**231**	**218**
100% FI	207	232	231	248	229
50% FI	198	197	219	214	207
106RM-A	**197**	**214**	**231**	**232**	**218**
50% FI	197	214	231	232	218
106RM-B	**202**	**206**	**226**	**225**	**215**
100% FI	202	223	235	243	226
50% FI	201	190	217	208	204
108RM-A	**206**	**220**	**215**	**210**	**213**
100% FI	213	235	233	229	228
50% FI	198	204	196	192	197
108RM-B	**209**	**240**	**232**	**225**	**226**
100% FI	217	247	239	253	239
50% FI	200	232	224	197	213
109RM	**194**	**214**	**213**	**225**	**212**
100% FI	211	237	231	252	233
50% FI	176	192	194	199	191
110RM-A	**210**	**230**	**240**	**235**	**229**
100% FI	219	245	261	253	245
50% FI	201	215	218	217	213
110RM-B	**205**	**227**	**233**	**235**	**225**
100% FI	208	228	235	242	228
50% FI	203	227	231	228	222
110RM-C	**194**	**206**	**209**	**209**	**204**
100% FI	196	209	198	212	204
50% FI	192	203	220	206	205
112RM-A	**193**	**205**	**205**	**202**	**201**
100% FI	183	204	219	194	200
50% FI	203	206	191	210	202
112RM-B	**205**	**220**	**230**	**214**	**217**
100% FI	218	234	249	229	232
50% FI	192	206	210	198	202
112RM-C	**203**	**232**	**228**	**228**	**223**
100% FI	211	247	251	265	243
50% FI	194	218	205	191	202
113RM-A	**204**	**232**	**231**	**225**	**223**
100% FI	212	239	240	243	233
50% FI	196	226	222	207	213
113RM-B	**187**	**204**	**199**	**194**	**196**
100% FI	179	213	211	199	200
50% FI	196	195	188	189	192
113RM-C	**207**	**223**	**208**	**223**	**215**
100% FI	219	246	233	263	240
50% FI	195	200	183	184	190
113RM-D	**210**	**220**	**240**	**219**	**222**
100% FI	207	212	230	216	216
50% FI	213	228	250	222	228
114RM-A	**220**	**234**	**244**	**249**	**237**
100% FI	237	260	253	268	255
50% FI	203	208	235	231	219
114RM-B	**212**	**241**	**234**	**240**	**232**
100% FI	222	253	246	252	243
50% FI	202	230	221	227	220
115RM	**223**	**244**	**256**	**261**	**246**
100% FI	232	247	259	274	253
50% FI	214	241	252	249	239
116RM	**233**	**257**	**260**	**262**	**252**
100% FI	234	265	271	294	262
50% FI	232	250	249	245	244
Average	**206**	**224**	**228**	**227**	**221**

Table 1. Corn product performance influenced by seeding rate and irrigation

LEGAL STATEMENT

The information discussed in this report is from a single 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.
For additional agronomic information, please contact your local seed representative. Developed in partnership with Technology Development & Agronomy by Monsanto.
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IMPACT OF IRRIGATION ENVIRONMENT ON CORN PRODUCT PERFORMANCE

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 corn products perform in various irrigation environments to help them choose the best products for their fields.

RESEARCH OBJECTIVE

- This study was set up to evaluate corn product performance in various irrigation environments.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Corn	Conventional	05/07/2017	11/01/2017	240 bu/acre	34,000 seeds/acre

SITE NOTES:

- Four irrigation rates were used: 100% full irrigation (FI) to meet the irrigation needs of the crop, 70%, 50%, and 20% FI.
- The irrigation rates were achieved using a variable rate irrigation system installed on a linear move overhead sprinkler system.
- Rainfall amounted to: May 2.53 in., June 0.75 in., July 1.52 in., August 3.63 in., and September 2.4 in., totaling 10.83 in.
- 15 corn products were tested with RM ranging from 101 to 116.
- The study design was a split plot with irrigation rate as the whole plot with two replications.
- Weeds were uniformly controlled across the study and no insecticides or fungicides were applied.

UNDERSTANDING THE RESULTS

Irrigation treatment	Irrigation amount	Total moisture (irrigation + precipitation)
	------- Inches -------	
100% FI	6.0	16.83
70% FI	4.2	15.03
50% FI	3.0	13.83
20% FI	1.2	12.03

Table 1. Irrigation treatments

- As expected, corn product performance was impacted by irrigation rate with higher yields observed under 100% FI, indicating that water stress reduced yield.
  - On average, 70% FI yielded 93% of the 100% FI treatment.
  - On average, 50% FI yielded 89% of the 100% FI treatment.
  - On average, 20% FI yielded 75% of the 100% FI treatment.
- The corn products that provided consistent performance across irrigation treatments were 105RM-A, 110RM-B, and 113RM-A (highlighted in Table 2).
- Corn product 106RM-A had consistent performance at the 70% and 50% FI treatments, but yield decreased significantly at the 20% FI treatment when compared to 100% FI (highlighted in Table 2).
- Corn product 116RM had a high yield at the 100% FI treatment, but had reduced yields at the other irrigation treatments. This product should be well suited for fully-irrigated ground.

Corn product	Yield 100% FI (bu/acre)	70% FI		50% FI		20% FI		Product average (bu/acre)
		Yield (bu/acre)	% of 100% FI	Yield (bu/acre)	% of 100% FI	Yield (bu/acre)	% of 100% FI	
101RM	178	142	80	148	83	111	63	**145**
105RM-A	218	198	91	210	97	209	96	**209**
105RM-B	231	209	90	201	87	160	69	**200**
106RM-A	237	240	101	211	89	156	66	**211**
106RM-B	238	229	96	190	80	166	70	**205**
108RM	231	214	93	186	81	168	73	**200**
109RM	234	210	90	198	85	174	74	**204**
110RM-A	242	233	96	208	86	181	75	**221**
110RM-B	210	225	107	191	91	188	89	**206**
112RM-A	245	224	91	242	99	178	73	**222**
112RM-B	243	225	92	222	91	178	73	**223**
113RM-A	230	216	94	228	100	207	90	**220**
113RM-B	209	205	98	189	90	156	74	**190**
114RM	249	237	95	214	86	159	64	**215**
116RM	259	218	84	225	87	208	80	**227**
Treatment average	**230**	**215**	**93**	**204**	**89**	**173**	**75**	

Table 2. Corn product performance affected by irrigation environment (average of the two reps)

WHAT DOES THIS MEAN FOR YOUR FARM?

- As new corn products come to the market, this type of research provides valuable information on the correct placement of these products to provide the best opportunity for a successful crop.
- Branded information to identify these corn products can be acquired from your local Monsanto seed sales team.

CORN HAIL DAMAGE

TRIAL OVERVIEW

- Every year, many acres of corn are hailed on. Depending on the growth stage and severity of the hail damage, minor to significant losses can be incurred. For example, a pea-sized hail event with light intensity at the R6 stage will likely bruise the corn ear but not cause significant yield loss, while a golf ball-sized hail event with moderate intensity at VT would cause significant yield loss.
- To help farmers understand their options to mitigate yield loss incurred after a hail event, a study was initiated to evaluate whether various amendments, such as fertilizer or a fungicide, could reduce yield loss from a simulated hail event on corn at the V14 growth stage.

RESEARCH OBJECTIVE

- This study was conducted to evaluate the impact of applying fertilizer and/or a fungicide following a hail event at the V14 corn growth stage.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Cozad silt loam	Corn	Strip tillage	04/27/2017	11/13/2017	230 bu/acre	34,000

SITE NOTES:

- Three levels of hail damage, measured by plant defoliation, were simulated on July 14, 2017 using a string trimmer to corn at the V14 growth stage; simulation levels were 0%, 30%, and 60% defoliation.
- Foliar treatments were applied on July 17, 2017, three days after the simulated damage. The foliar treatments included:
  - A) Ammonium thiosulfate 12-0-0-26S (ATS) at 5.19 gal/acre
  - B) Headline AMP® fungicide at 12 oz/acre
  - C) Headline AMP fungicide at 12 oz/acre with ATS at 5.19 gal/acre
  - D) KS2075 (20-0-7.5-5S) liquid fertilizer at 1 gal/acre
  - E) KS2075 liquid fertilizer at 1 gal/acre with Headline AMP at 12 oz/acre
  - UT) Untreated control
- ATS was diluted to a 100 gal/acre application rate to prevent crop phytotoxicity.
- The study was set up as a randomized complete block with three replications.
- Yields and plants that died prematurely were recorded.

UNDERSTANDING THE RESULTS

- Simulated hail damage impacted yield as expected, with significant yield loss at the 30% damage treatment compared with the 0% damage treatment and even higher losses at the 60% damage level (Figure 1).
- 18% more plants died prematurely in the 60% hail damage treatment compared to the 0% and 30% treatments.
- None of the foliar treatments reduced yield loss compared to the untreated control (Figure 2). These results were similar to research completed in 2015 and 2016 where no benefit was realized when applying a fungicide 7 days after a hail event at two different corn growth stages.

WHAT DOES THIS MEAN FOR YOUR FARM?

- Over the last three years of testing, no treatment has been found to reduce yield loss in corn from a simulated hail damage event.
- Small plot research like this allows for comparison of many corn products at different growth stages or levels of damage. However, small plot research cannot account for field-level environmental influences, such as humidity or application from an airplane, which could alter results.

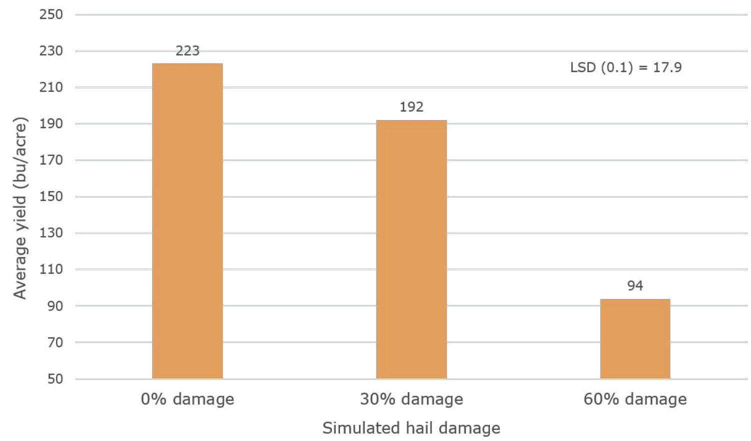

Figure 1. Average yield across all foliar treatments for each hail damage treatment

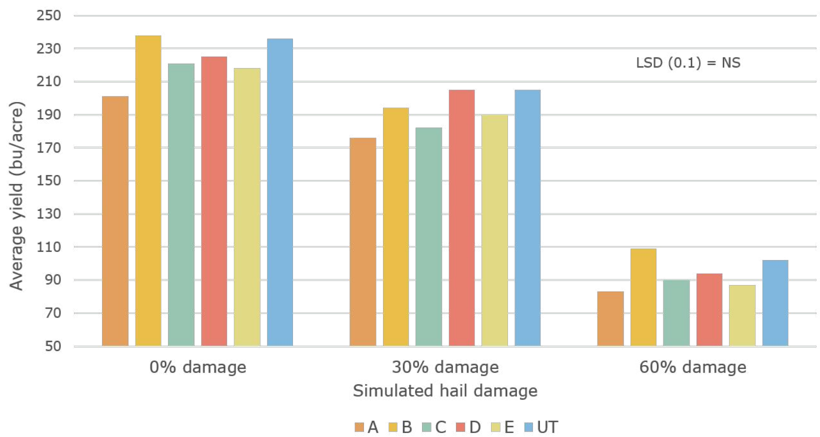

Figure 2. Average yield in each foliar treatment at each hail damage treatment. Treatment A) ATS only, B) fungicide only, C) ATS + fungicide, D) KS2075 only, E) KS2075 + fungicide, UT) untreated control.

Figure 3. A 60% simulated hail damage plot in the foreground. The 0% hail damage plot can be observed further down the row where the canopy is denser.

HIGH INPUT CORN MANAGEMENT

TRIAL OVERVIEW

- Every year, farmers question which inputs will give the highest return on their investment. To assist farmers with these decisions, a high input corn study was set up to evaluate the potential benefits of various inputs.

Treatment	Fertility	Planting density (seeds/acre)	Fungicide
Normal management (NM)			
Base NM	180 lb/acre N at planting with coulter 60 lb/acre P, 25 lb/acre S, and 0.5 lb/acre Zn at planting with strip tillage	32K	None
Increased planting density	180 lb/acre N at planting with coulter 60 lb/acre P, 25 lb/acre S, and 0.5 lb/acre Zn at planting with strip tillage	**38K**	None
Reduced fertility (S and Zn)	180 lb/acre N at planting with coulter 60 lb/acre P at planting with strip tillage **No S or Zn applied**	32K	None
Split N application	**100 lb/acre N applied pre-plant with strip tillage, 80 lb/acre N sidedress injected at V7** 60 lb/acre P, 25 lb/acre S, and 0.5 lb/acre Zn at planting with strip tillage	32K	None
Added fungicide	180 lb/acre N at planting with coulter 60 lb/acre P, 25 lb/acre S, and 0.5 lb/acre Zn at planting with strip tillage	32K	**10 fl oz/acre Headline® AMP applied at VT**
Intensive management (IM)			
Base IM	Split N: 160 lb/acre N applied pre-plant with strip tillage, 80 lb/acre N sidedressed at V7 90 lb/acre P, 25 lb/acre S, and 0.5 lb/acre Zn applied with strip tillage	44K	10 fl oz/acre Headline AMP applied at VT
Decreased planting density	Split N: 160 lb/acre N applied pre-plant with strip tillage, 80 lb/acre N sidedressed at V7 90 lb/acre P, 25 lb/acre S, and 0.5 lb/acre Zn applied with strip tillage	**38K**	10 fl oz/acre Headline AMP applied at VT
Reduced fertility	Split N: 160 lb/acre N applied preplant with strip tillage, 80 lb/acre N sidedressed at V7 90 lb/acre P applied with strip tillage **No S or Zn applied**	44K	10 fl oz/acre Headline AMP applied at VT
N applied all upfront	**240 lb/acre N applied with strip tillage** 90 lb/acre P, 25 lb/acre S, and 0.5 lb/acre Zn applied with strip tillage	44K	10 fl oz/acre Headline AMP applied at VT
No fungicide	Split N: 160 lb/acre N applied pre-plant with strip tillage, 80 lb/acre N sidedressed at V7 90 lb/acre P, 25 lb/acre S, and 0.5 lb/acre Zn applied with strip tillage	44K	**None**

Highlighted text indicates difference from previous treatment. N = nitrogen, P = phosphorus (P_2O_5), S = sulfur, Zn = zinc

Table 1. Treatment list

RESEARCH OBJECTIVE

- To determine which inputs maximize irrigated corn yields and economic return.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Soybean	Strip tillage	04/20/2017	10/26/2017	280 bu/acre	32K, 38K, 44K

SITE NOTES:

- This study consisted of low input (normal management, NM) and high input (intensive management, IM) base treatments with different inputs added or removed (Table 1).
- Three corn products were assessed: one 116 RM corn product and two 114 RM corn products. Each product was tested with each treatment totaling 30 treatments.
- Treatments were randomized with four replications.
- Weeds were managed uniformly across the study and no insecticide was applied.
- Soil test: organic matter 3.0%, pH 6.6, nitrogen (N) - 40 lbs/acre residual in 2 ft., phosphorus (P) - 39 ppm MP3, sulfur (S) - 26 ppm, zinc (Zn) - 2.0 ppm.
- Plants that died prematurely, green-snapped plants, stalk-lodged plants, and root-lodged plants per plot were recorded prior to harvest.

UNDERSTANDING THE RESULTS

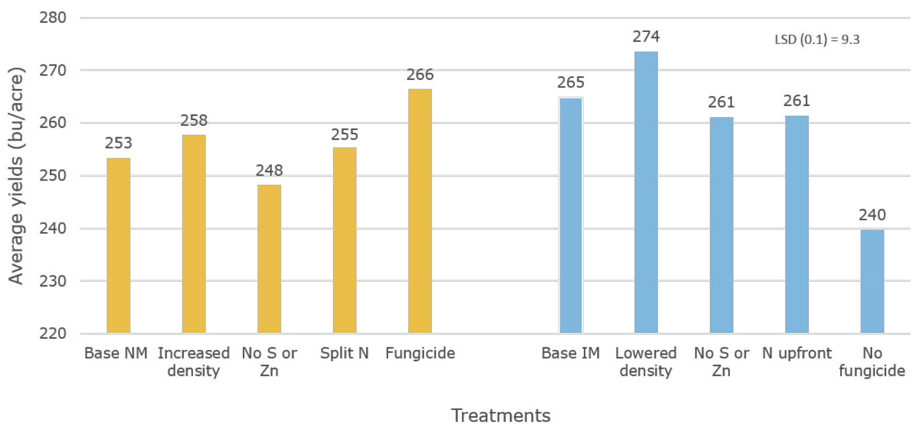

Figure 1. Average corn yields in the different treatments

- **Yields**
- Individual corn products did not respond differently to treatments so results are summarized across treatments.
- A fungicide application at VT provided the most value in terms of yield.
  - When added, the fungicide application increased yield by 13 bu/acre over the base NM system.
  - When the fungicide application was removed from the base IM system, yields decreased by 25 bu/acre.
  - A fungicide application at VT also increased yields in 2015 and 2016 demonstration trials as documented in previous Learning Center Reports.
- Neither the split N application nor additional S and Zn significantly affected yields.
  - In a 2015 Learning Center Report, adding S and Zn increased yields.
  - In a 2017 Learning Center Report, a split application of N increased yield when applied through a subsurface drip irrigation system.
  - The soil in this trial had relatively high fertility levels based on the soil test, indicating that corn products may not respond much to additional fertility.
- Across the different seeding rates, 38,000 seeds/acre provided the best performance.
  - In a 2016 Learning Center Report, the 44,000 seeds/acre rate increased yield significantly.
- **Plant Quality**
- No differences were observed across treatments for green-snapped plants, plants that died prematurely, or stalk-lodged or root-lodged plants.
- **Economics**
- When using current corn prices of $3.00/bu, the treatment that provided the highest return over investment was the NM plus fungicide treatment. If corn prices increase, this treatment would continue to provide the greatest economic advantage up to a corn price of $9.00/bu.
- For the IM options, the IM without fungicide treatment would cost the farmer close to $140/acre relative to the NM plus fungicide treatment.

WHAT DOES THIS MEAN FOR YOUR FARM?

- Farmers should consider using a fungicide application at the VT growth stage as it has consistently provided value across multiple corn products and multiple years.
- Increasing seeding rate can increase yield and provide more value to the farmer as long as the seeding rate is increased on an appropriate corn product. Please consult your local seed sales team for individual corn product seeding rate recommendations.
- The value of other inputs, such as a split N application or additional S and Zn, have been more variable over the years.

DROUGHTGARD® HYBRIDS TECHNOLOGY COMPARISON

TRIAL OVERVIEW

- Dryland/rainfed environments can be highly variable. Farmers look at the long-term weather forecast, stored soil moisture, and production practices to make the best decision they can on what crop will be the most viable and profitable in the environment.
- Farmers look for corn products that can adapt to and yield across a wide range of environments.
- DroughtGard® Hybrids corn products were developed for this type of situation. They combine drought-tolerant germplasm with the industry's only biotech trait for drought tolerance, which improves the ability of the corn plant to handle water stress.
- The biotech trait was released in 2012 and has been deployed in various corn products since.

RESEARCH OBJECTIVE

- To evaluate the performance of DroughtGard® Hybrids corn products compared to AQUAmax® competitive corn products in a dryland environment in south central Nebraska.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Winter wheat	No tillage	05/13/2017	11/10/2017	210 bu/acre	22,000 seeds/acre

SITE NOTES:
- In 2016, winter wheat yields were approximately 90 bu/acre, providing excellent residue cover for water conservation in the trial. Approximately 4 feet of stored soil moisture was available at planting amounting to about 8 inches of plant-available water. Rainfall amounted to: May 2.53 in., June 0.75 in., July 1.52 in., August 3.63 in., and September 2.4 in.
- The study was a randomized complete block with three replications.
- Study plots were large strips - plot length was 435 feet long by 10 feet wide.
- Weeds were controlled uniformly across the study and no fungicides or insecticides were needed to control other pests.

UNDERSTANDING THE RESULTS

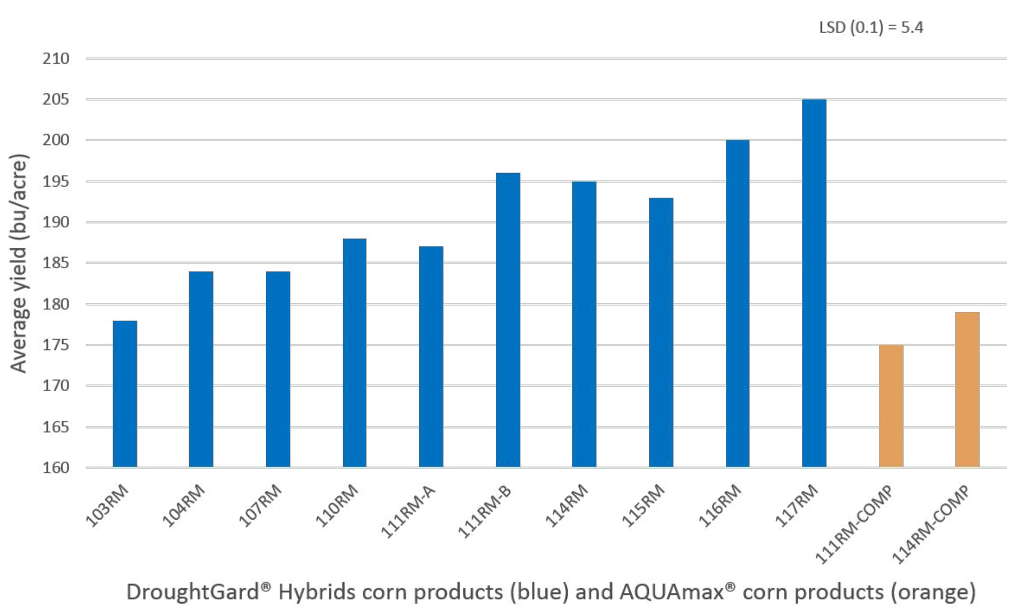

Figure 1. Average yields of DroughtGard® Hybrids corn products and competitor products

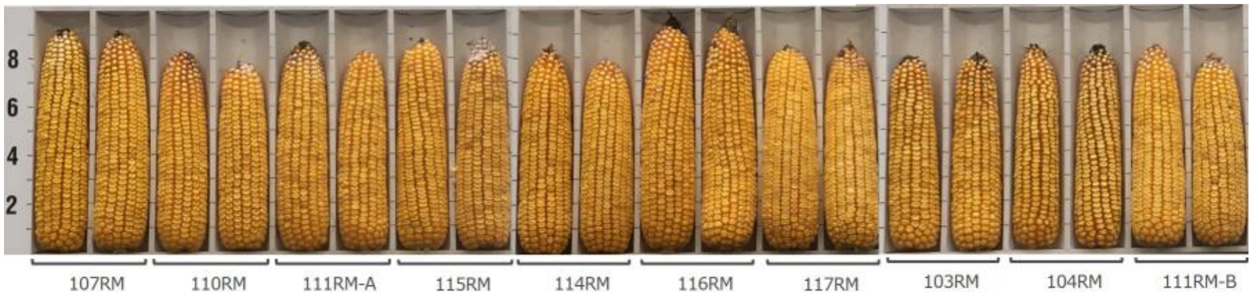

Figure 2. Images of corn ears from the different DroughtGard® Hybrids products

- DroughtGard® Hybrids corn products had high yields in an environment that saw early-season moisture stress, with the month of June having 10 days that were 90 ºF or warmer.
- All DroughtGard® Hybrids products yielded more than the 111RM-COMP AQUAmax® product, and nine of the products yielded more than the 114RM-COMP AQUAmax product.
- The only DroughtGard® Hybrids product that did not out yield the 114RM-COMP product was a 103RM product that had significantly less time to grow before maturing and endured a longer period of stress between the initiation of flowering and the minimal rains in late July that relieved some moisture stress.
- The top four DroughtGard® Hybrids products yielded, on average, 21 bu/acre more than the competitor's products.

WHAT DOES THIS MEAN FOR YOUR FARM?

- Farmers can have confidence that DroughtGard® Hybrids corn products can obtain high yields in dryland environments, protecting yield potential from a risk of yield loss from drought stress.
- Farmers should work closely with their local seed sales team to select a corn product that best fits their yield goals and management operation.

CORN PRODUCT RESPONSE TO NITROGEN STRATEGY

TRIAL OVERVIEW

- Questions about how corn products respond to different management strategies can be perplexing as information gleaned from discussions with neighbors about product performance may not provide a complete story as to why a corn product did or did not yield as expected.
- A study was initiated to evaluate two different nitrogen (N) application strategies on multiple corn products to help provide a few answers to farmers about the impact of N strategy on corn yield.

RESEARCH OBJECTIVE

- The objective of this study was to investigate if the N application strategy impacted corn products differently. Two N application strategies were used: all upfront prior to planting or fertigation over the growing season.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Soybean	Strip tillage	04/26/2017	10/24/2017	270 bu/acre	36,000 seeds/acre

SITE NOTES:

- A standard formula was used to determine N application rates:
  - N need = (yield goal * 1.1) - (soil N) - (legume credit)
  - 194 lbs/acre = (270 bu/acre * 1.1) - (63 lbs soil N in 2 ft) - (40 lbs/acre)
- N treatments were applied as all N upfront or via fertigation consisting of eight applications of 15 lbs of N/acre.
- The study was a split-plot design with N strategy as the whole plot with four replications.
- Corn products were grown under full irrigation using a subsurface drip irrigation system. Total irrigation applied to all products was 9.2 inches over the growing season.
- Barren plants, green-snapped plants, and plants that died prematurely were recorded.

UNDERSTANDING THE RESULTS

	N application rates (lbs/acre)	
	All N upfront	Fertigation
Residual N	63	63
Strip-till N	19.3	19.3
Legume N credit	40	40
At-planting N	174.7	40.7
Fertigation N	0	120 (8 applications of 15 lbs N/acre)
Total N	297	283

Table 1. Nitrogen application rates and timing along with residual soil N and legume credits. Note that total N is slightly lower in the fertigation treatment.

- Corn products responded differently to N strategy with 9 out of the 24 corn products tested having significantly increased yield in response to fertigation with a 12 bu/acre or more difference observed (Table 2).
- The positive response to fertigation was not limited to a specific RM. Instead, the response was recorded in two 105 RM products all the way to the 117 RM product.
- There was no interaction between N strategy and corn product for the incidence of barren plants, green-snapped plants, or plants that died prematurely.

Corn Product	Corn Product Yield (bu/acre) All upfront	Fertigation	Response to fertigation (bu/acre)
100RM-A	228	228	0
103RM-A	255	251	-4
104RM-A	235	241	6
105RM-A	225	238	13
105RM-B	236	251	15
106RM-A	267	279	12
108RM-A	257	265	8
108RM-B	245	271	26
109RM-A	264	270	6
110RM-A	254	260	6
110RM-B	268	266	-2
111RM-A	263	266	3
111RM-B	265	270	5
111RM-C	267	280	13
112RM-A	263	270	7
112RM-B	248	268	20
112RM-C	258	283	25
113RM-A	278	287	9
113RM-B	251	260	9
113RM-C	266	268	2
114RM-A	283	286	3
114RM-B	269	280	11
116RM-A	263	278	15
117RM-A	277	306	29
LSD (0.1) = 11.9			

Table 2. Corn product yield in response to N application strategy. Highlighted products indicate a significant response.

WHAT DOES THIS MEAN FOR YOUR FARM?

- This research provides farmers with another question that they should ask when choosing a corn product to make sure that the product fits their management practices. Whether they apply all the N upfront or can fertigate the N over the growing season, there are corn product options that can meet their needs.
- Farmers should work closely with their local seed sales team to properly choose and place corn products to maximize environment and management potential.
- Seed sales teams can identify how their corn products performed in this trial.

THE IMPACT OF CORN SEED SIZE AND SHAPE ON YIELD POTENTIAL

TRIAL OVERVIEW

- Every year, farmers must turn their attention to the seed they will be planting.
- Many farmers prefer a particular seed size and/or have had issues with a particular seed size in the past. However, as planters have improved in their ability to handle many different seed sizes, the question arises, "Does seed size and shape impact yield and stands?"

RESEARCH OBJECTIVE

- To determine if corn product seed size and shape has an impact on seedling emergence and yield.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Corn	Strip tillage	04/21/2017	10/24/2017	270 bu/acre	34,000 seeds/acre

SITE NOTES:

- The following seed shapes and sizes were used in the study: AF (medium flats) 34.5 lb. unit, AF 40.0 lb. unit, AR (medium rounds) 43.0 lb. unit, AF2 (large flats) 48.5 lb. unit, and AR2 (large rounds) 59.0 lb. unit.
- A 110 RM SmartStax® RIB Complete® corn blend product was used.
- The study was conducted as a randomized complete block design with five treatments and six replications.
- Corn was seeded with a precision plot planter at a depth of 2.25 inches.
- Emergence stand counts were taken at five dates: May 11, May 12, May 13, May 15, and May 22, 2017.
- During the growing season, final stand count, barren plants, green-snapped plants, and the number of plants that died prematurely were recorded.
- Weeds were controlled uniformly throughout the season and no insecticides or fungicides were needed to control insects or diseases.

UNDERSTANDING THE RESULTS

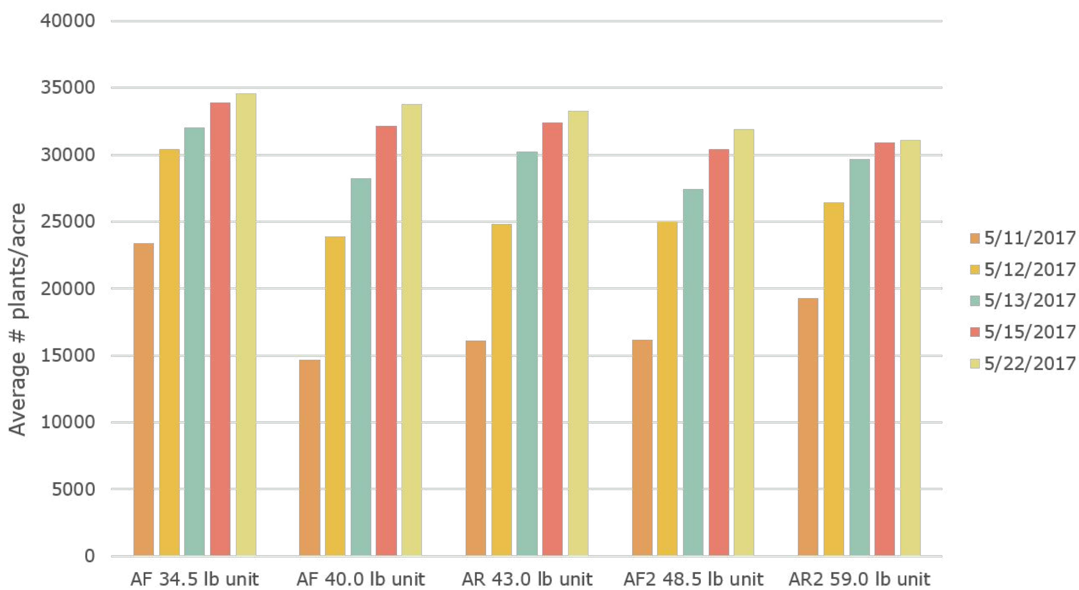

Figure 1. Average number of plants per acre counted on the five different dates

Seed Size	Average Yield (bu/acre)	Final Stand (plants/acre)
AF 34.5 lb unit	269.5	34,881
AF 40.0 lb unit	266.0	33,827
AR 43.0 lb unit	263.9	34,101
AF2 48.5 lb unit	268.6	33,173
AR2 59.0 lb unit	264.7	31,870*
LSD (0.1)	NS	1,641

Table 1. Impact of seed size on yield and final stand count. *The larger seed may not have been planted properly by the planter. NS = non-significant.

Figure 2. Plot photos: AF 34.5 lb. unit (left), AR 43.0 lb. unit (middle), and AR2 59.0 lb. unit (right)

- No difference was observed in the number of barren plants, green-snapped plants, or plants that died prematurely between the different seed sizes.
- There were some differences in initial corn emergence between the different seed sizes, especially between the May 11 and May 12 stand counts (Figure 1), but the emergence numbers taken on May 22 were similar to the final stand count numbers reported in Table 1.
- There was a slight reduction in final stand counts when using the larger seed size.

WHAT DOES THIS MEAN FOR YOUR FARM?

- This was a limited study evaluating seed size from one corn product at one location with six replications. However, the results from this study indicate that there was no difference in yield performance between the various seed sizes.
- For additional information on this subject, please read the Spotlight, *The Impact of Corn Seed Size on Yield Potential*.

CORN PRODUCT RESPONSE TO NITROGEN AND HIGH DENSITIES

TRIAL OVERVIEW

- Every year, corn products are subjected to less-than-ideal situations in the field, resulting in stress.
- Farmers and agronomists need to know how their corn products react in stressful situations to better understand the implications on yield potential and general plant health.

RESEARCH OBJECTIVE

- This study evaluated the effect of nitrogen (N) strategy and planting density on corn product performance. The N rates utilized and the planting densities, which ranged from normal to very high, were intended to induce stress that would negatively impact yield, standability, and plant health.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Corn	Strip tillage	04/27/2017	11/10/2017	260 bu/acre	28K, 36K, 44K, 52K

SITE NOTES:

- This study was set up as a randomized complete block design with three replications.
- Six corn products with RM ranging from 110 to 116 were assessed.
- Two N treatments were assessed:
  - 120 AP: 120 lbs/acre N applied at planting (AP) with no additional N
  - 120 AP + 100 V7: 120 lbs/acre N applied at planting plus 100 lbs/acre N side dressed at the V7 growth stage
- Four planting densities were used: 28K, 36K, 44K, and 52K (K = 1,000) seeds/acre.
- Soil tests indicated 45 lbs/acre residual N in the top 2 ft. of soil, low phosphorus and sulfur levels, and adequate levels of potassium and micronutrients.
- Nutrients applied besides the N rates specified above were: 60 lbs/acre P_2O_5, 0.5 lbs/acre zinc, and 25 lbs/acre sulfur with strip tillage.
- A total of 6.6 inches of irrigation was applied during the growing season to meet crop needs.
- No fungicides or insecticides were applied to the trial and weeds were uniformly controlled across the study.
- Grain yield, stalk lodging, and plants that died prematurely were measured.

UNDERSTANDING THE RESULTS

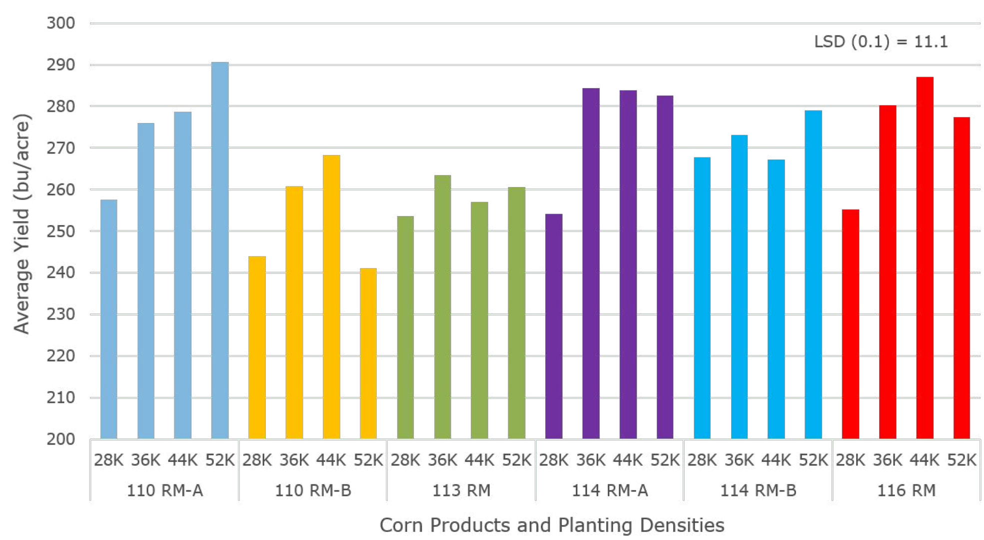

Figure 1. Yields by product and planting density

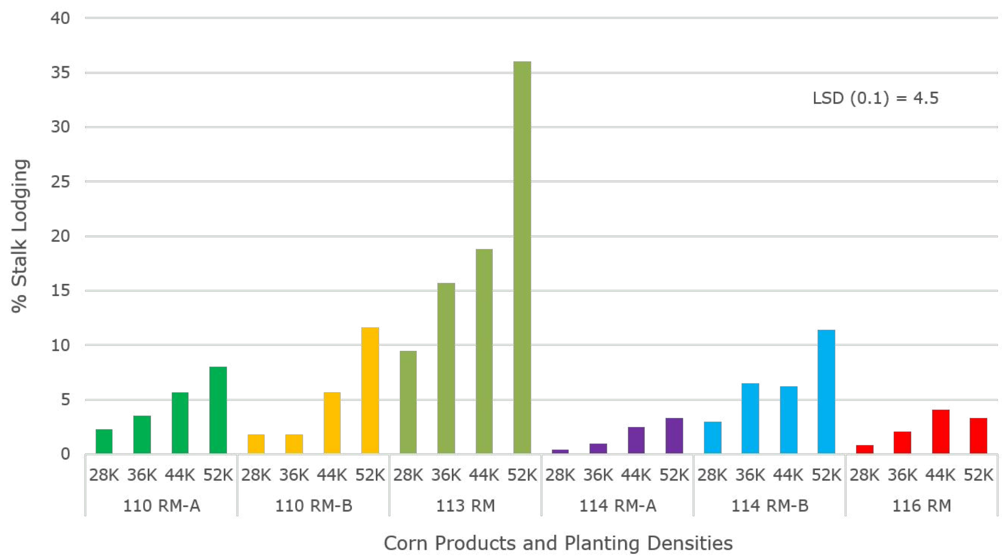

Figure 2. Late-season stalk lodging by product and planting density

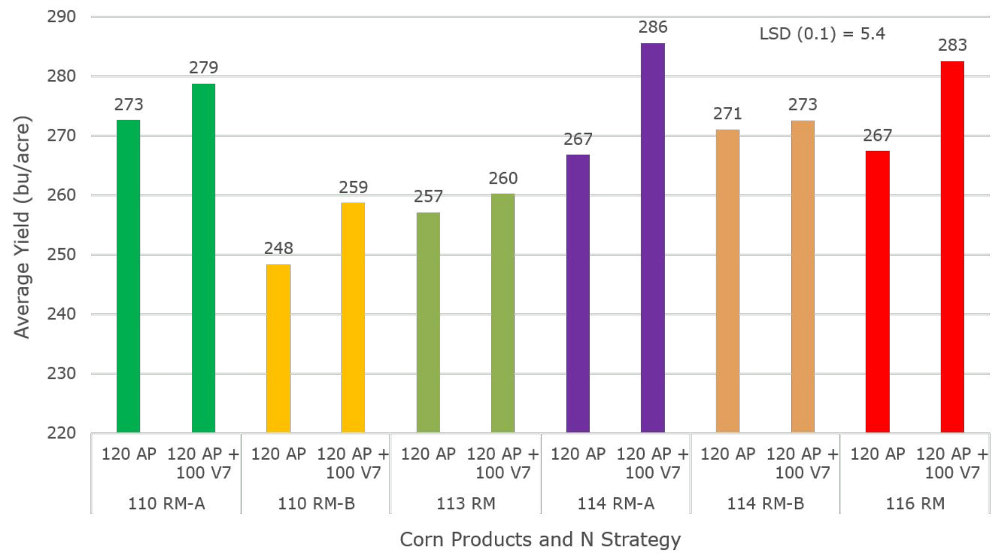

Figure 3. Corn product yield by nitrogen strategy

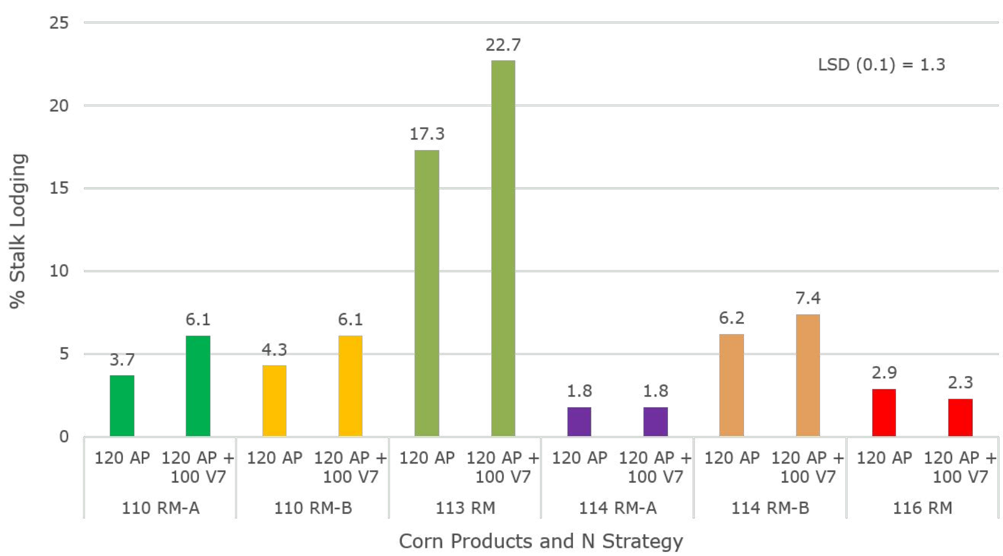

Figure 4. Late-season stalk lodging by nitrogen strategy and corn product

- **Yields by planting density**
- The corn products differed in their responses to planting density with respect to yield. The 110 RM-A product responded with increased yields up to the highest density, while yields of most other products trended downward at the highest density (Figure 1).
- **Stalk lodging by planting density**
- Higher planting densities resulted in higher rates of stalk lodging for nearly all products. Some corn products had higher lodging rates overall, particularly the 113 RM product. Conversely, stalk lodging in two products, 114 RM-A and 116 RM, remained below 5% in all treatments (Figure 2).
- **N application strategy and yields**
- Changing the N application strategy from the 120 AP treatment to the 120 AP + 100 V7 treatment significantly improved yields in four of the six corn products, indicating that the extra sidedressed N helped alleviate some of the N stress in most products (Figure 3).
- **N application strategy and stalk lodging**
- The N application strategy also impacted stalk lodging. The 110 RM-A, 110 RM-B, and 113 RM products had significantly increased stalk lodging in the 120 AP + 100 V7 treatment (Figure 4). The reason for this wasn't clear, but even with the increased lodging, higher yields were usually achieved.
- **Premature plant death**
- There was a significant difference among corn products for premature plant death, while the planting density and the N strategy had no impact on this measurement.

WHAT DOES THIS MEAN FOR YOUR FARM?

- The corn products had varying responses to the growing environments, which could be applied to field situations.
- Yield and standability can become issues in stressful growing environments. Further research is critical for understanding corn product performance in varying environmental conditions.
- Branded information to identify these corn products can be acquired from your local Monsanto seed sales team.

CORN PRODUCT RESPONSE TO IRRIGATION MANAGEMENT

TRIAL OVERVIEW

- Farmers use a variety of irrigation management practices to irrigate their corn crop based on the water availability of their irrigation systems. There may be limitations on the amount of water that can be pumped by the well or the irrigation water may need to be shared across multiple crops.
- Regardless of the reason, farmers would like to know how corn products respond to different irrigation management strategies.

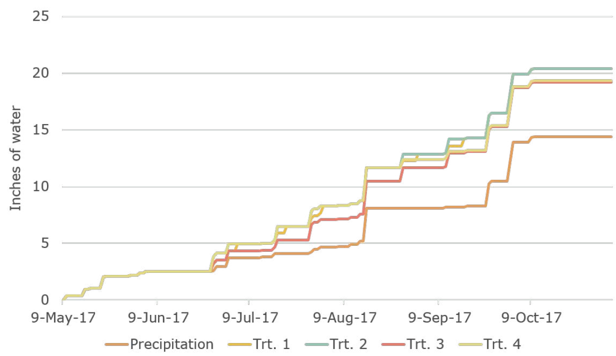

Figure 1. Precipitation and irrigation accumulated in each treatment throughout the growing season

RESEARCH OBJECTIVE

- The study evaluated the impact of different irrigation management strategies on multiple corn products.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Corn	Conventional	05/09/2017	10/27/2017	240 bu/acre	34,000

SITE NOTES:

- 22 corn products with RM ranging from 100 to 114 were planted on irrigated, conventional-tilled ground previously planted to corn.
- Four different irrigation treatments were applied:
  Treatment 1: 100% full irrigation (FI) to meet the evapotranspiration demands of the corn crop; 10 applications of 0.6 inch/pass totaling 6.0 inches.
  Treatment 2: 100% FI; 5 applications of 1.2 inch/pass totaling 6.0 inches.
  Treatment 3: 60% FI early (up to V16) followed by 100% FI late; 5 applications totaling 4.72 inches.
  Treatment 4: 100% FI early followed by 60% FI late (after R2); 5 applications totaling 4.92 inches.
- The trial was set up as a randomized split-plot with irrigation treatment as the whole plot and corn product as the subplot with 4 replications.
- Weeds were controlled uniformly across the study and no insecticide or fungicide applications were needed.

UNDERSTANDING THE RESULTS

- Corn products performed differently in the irrigation treatments. Some corn products lost a significant amount of yield if they were stressed early. Other corn products showed no difference in yield across the irrigation treatments.
- Corn product performance was classified into five categories based on yield:
  A) Avoid early-season water stress
  B) Avoid late-season water stress
  C) Consistent response across all irrigation treatments
  D) Handles late-season water stress
  E) Prefers 0.6 inch/pass applications and handles late-season water stress

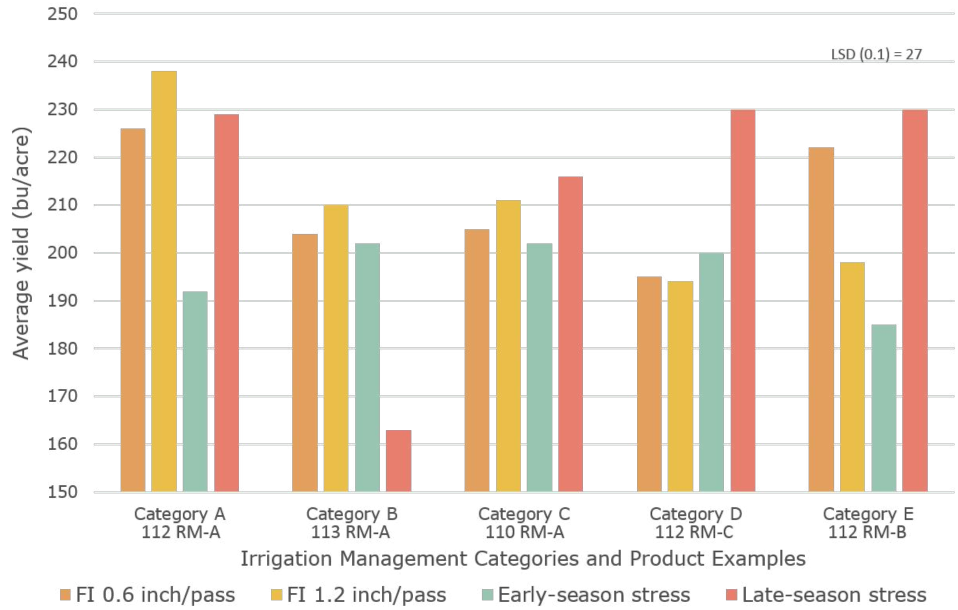

Figure 2. Corn product examples for the five irrigation management categories

Category A	Category B	Category C	Category D	Category E
106 RM	113 RM-A	110 RM-A	105 RM-A	112 RM-B
112 RM-A		110 RM-B	112 RM-C	111 RM-A
105 RM-B		113 RM-B	103 RM	
109 RM-A		114 RM-A		
114 RM-B		100 RM		
111 RM-B		113 RM-C		
108 RM-B		104 RM		
		111 RM-C		
		108 RM-A		

Table 1. Categorization of the different corn products based on average yield in the different treatments

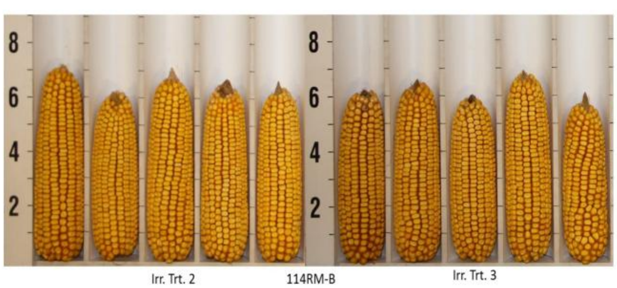

Figure 3. Performance of the 114 RM-B corn product across two irrigation treatments, Treatment 2. 100% FI with 1.2 inch/pass and Treatment 3. 60% FI early (up to V16) followed by 100% FI late. The 114 RM-B corn product was grouped into Category A (avoid early-season water stress).

Figure 4. Corn ears from the 104 RM corn product showing performance across treatments. The 104 RM corn product was grouped into Category C (consistent response across all irrigation treatments).

- A majority of corn products fell into category A, where the product had a negative response to early-season stress, or category C, where the product had a consistent response across irrigation treatments (Figures 3 & 4).
- The lone corn product in category B was unique as all other corn products could handle late-season stress.
- For categories D and E, there were some slight differences, but the corn products in both categories had high yields when the corn product was exposed to late-season stress. The corn products in category E also yielded higher when 0.6 inch of water was applied per pass compared with all the other categories.

WHAT DOES THIS MEAN FOR YOUR FARM?

- Corn products do respond differently to different irrigation management strategies.
- Producers should work with their local seed sales team to identify a corn product that will work with their irrigation system.
- Ask your agronomist how their branded corn products performed in this study.

MANAGEMENT STRATEGIES FOR IMPROVING SUCCESS IN DRYLAND CORN SYSTEMS

TRIAL OVERVIEW

- The success of dryland corn production depends upon the environment and management strategies employed by the farmer. The availability of soil moisture on rainfed acres is always a big driver of yield.
- Dryland farmers have no control over how much moisture the environment provides through rainfall; however, they can significantly influence how much moisture is retained by the soil, is available to the crop, and how that limited water can directly impact yield.

Treatment	Planting date	Tillage	Corn products	Weed control	Seeding rate (seeds/acre)
Poor management	6/09/17	Conventional tillage	111RM RRC2	Basic weed control program*	21,000
Early planting	**5/13/17**	Conventional tillage	111RM RRC2	Basic weed control program	21,000
Improved weed control	5/13/17	Conventional tillage	111RM RRC2	**Enhanced weed control program****	21,000
No tillage	5/13/17	**No tillage**	111RM RRC2	Enhanced weed control program	21,000
Insect protection traits	5/13/17	No tillage	**111RM VT2PRIB**	Enhanced weed control program	21,000
DroughtGard® Hybrids corn blend product	5/13/17	No tillage	**114RM DGVT2PRIB**	Enhanced weed control program	21,000
Increased population	5/13/17	No tillage	114RM DGVT2PRIB	Enhanced weed control program	**24,000**

Highlighted text indicates difference from previous treatment.
*Basic weed control program: PRE - 1 lb/acre atrazine; POST – 0.5 lb/acre atrazine + 0.25 lb/acre 2,4-D ester + 32 oz/acre Roundup PowerMAX® herbicide.
**Enhanced weed control program: PRE – 32 oz/acre Roundup PowerMAX herbicide + 0.5 lb/acre 2,4-D ester + 0.02 lb/acre saflufenacil; POST- 1 lb/acre atrazine + 2.5 pt/acre Harness® Xtra herbicide + 0.09 lb/acre mesotrione + 32 oz/acre Roundup PowerMAX herbicide.
RRC2 = Roundup Ready® Corn 2, VT2PRIB = VT Double PRO® RIB Complete® corn blend, DGVT2PRIB = DroughtGard® Hybrids with VT Double PRO® RIB Complete® corn blend

Table 1. Dryland corn treatments

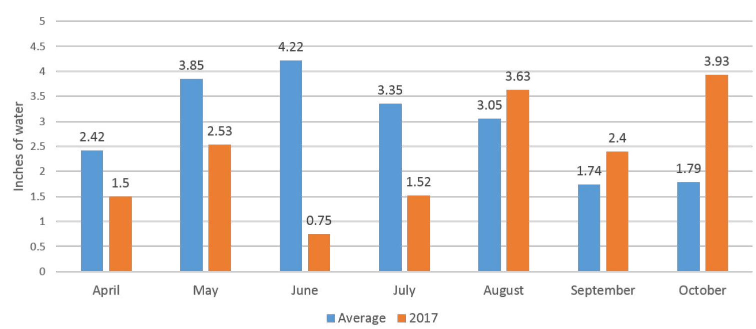

Figure 1. Precipitation in 2017 and average precipitation at the Gothenburg Learning Center, Gothenburg, NE

RESEARCH OBJECTIVE

- A multi-factor study was initiated to evaluate the additive effects of various management components to manage water and help farmers produce high-yielding corn in a dryland system.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Winter wheat	Conventional tillage, no tillage		11/16/2017	175 bu/acre	21,000 and 24,000

SITE NOTES:

- This study consisted of various dryland management practices that can help improve yields and soil water retention. Subsequent treatments included the previous treatment plus an additional treatment creating a building block approach (Table 1).
- The study was a randomized complete block design with four replications.
- No insecticides or fungicides were applied.
- The number of barren plants, dropped ears, and lodged stalks per plot were assessed prior to harvest.

UNDERSTANDING THE RESULTS

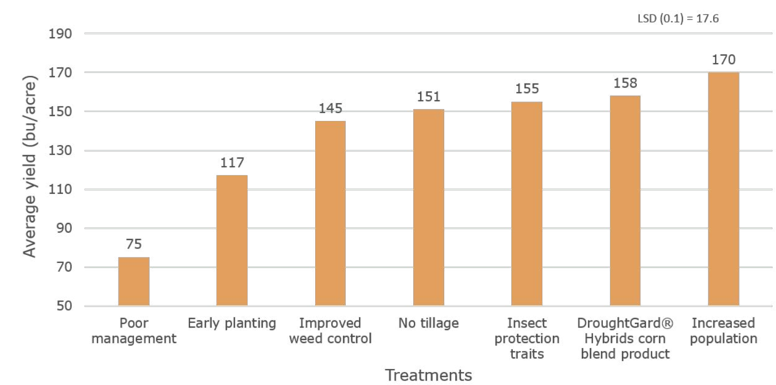

Figure 2. Average corn yield from the different treatments corrected to 15% moisture

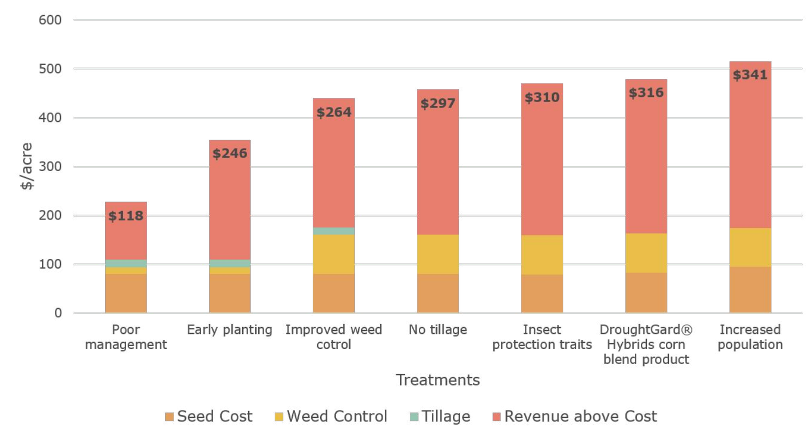

Figure 3. Input costs and net profits in $/acre for each treatment. Data labels reflect grain revenue at $3.03/bu minus the costs for seed, weed control, and tillage.

Figure 4. Corn ears from the Poor Management (top) and Increased Population (bottom) treatments

Figure 5. Excellent end-of-season weed control in the Increased Population treatment

- A significant increase in yield was observed from the earlier planting date, improved weed control, and increased population treatments (Figure 2).
  - **Early planting:** higher yields are typically observed from mid-May plantings compared to early to mid-June plantings. This was especially true in this case as dry conditions stressed plants early in the season due to below normal precipitation in June and July.
  - **Weed control:** an enhanced, layered weed control approach with a pre-emergence application with multiple modes of action followed by a post-emergence application with multiple modes of action provided the best opportunity to control weeds that compete with corn for soil moisture.
  - **Increased population:** the DroughtGard® Hybrids corn blend product performed well at the higher seeding rate in this challenging dryland environment.
- No differences were observed between treatments for the number of barren plants, dropped ears, or lodged stalks per plot.
- Better management not only led to higher yields, but also to higher profits in the study (Figure 3).
  - An earlier planting date increased revenue by more than $100/acre.
  - The remainder of the treatments produced smaller, yet still beneficial yield benefits.
- Weed control costs had the sharpest increase by going to a program with multiple modes of action, but revenue gains more than offset costs because of improved yields.

WHAT DOES THIS MEAN FOR YOUR FARM?

- Potential success for dryland corn systems involves managing all components of the system to maximize their benefit.
- Often, decisions in dryland fields can be more impactful than in irrigated fields because water cannot be applied to make up for moisture losses from tillage and poor weed control.
- Corn product selection and placement along with planting date and an enhanced weed control program are critical for success.

CORN PRODUCT YIELD ADVANCEMENTS

TRIAL OVERVIEW

- Corn products are being commercialized at a fast pace as Monsanto's robust breeding pipeline delivers new products that are designed to increase yield potential and decrease the risk of issues like disease, lodging, and poor emergence. Products may only be on the market for three to five years before they are replaced with a new advancement.
- This study was designed to address the question of whether more recent products are significantly better than older products under the growing conditions on the Great Plains.

Newer corn products	Year of launch	Trait package	Older corn products	Year of launch	Trait package
110RM-A	2016	SSRIB	113RM-B	2006	CONV
114RM-A	2016	SSRIB	111RM-A	2007	VT3
110RM-B	2013	SSRIB	113RM-C	2011	VT3PRIB
113RM-A	2017	SSRIB	106RM-B	2011	SSRIB
106RM-A	2016	SSRIB	110RM-C	2001	CONV
114RM-B	2013	SSRIB			

CONV = Conventional, SSRIB = SmartStax® RIB Complete® corn blend, VT3 = YieldGard VT Triple®, VT3PRIB = Genuity® VT Triple PRO® RIB Complete® corn blend

Table 1. Corn product details

RESEARCH OBJECTIVE

- To evaluate the performance of older corn products (released between 2001 and 2011) and more recent corn products (released between 2013 and 2017) under two irrigation treatments and two seeding densities.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Soybean	Strip tillage	05/08/2017	10/24/2017	250 bu/acre	28,000 and 36,000 seeds/acre

SITE NOTES:

- The study was a split-plot design with irrigation as the whole plot and seeding rate as the subplot and had four replications.
- Eleven corn products were utilized with RMs ranging from 106 to 114 (Table 1).
- Two irrigation treatments were utilized: 100% full irrigation (FI) to meet the evapotranspiration needs of the crop and 25% of FI, amounting to 9.2 and 2.7 inches of irrigation, respectively.
- The number of barren plants and plants that died prematurely were counted in each plot prior to harvest.

UNDERSTANDING THE RESULTS

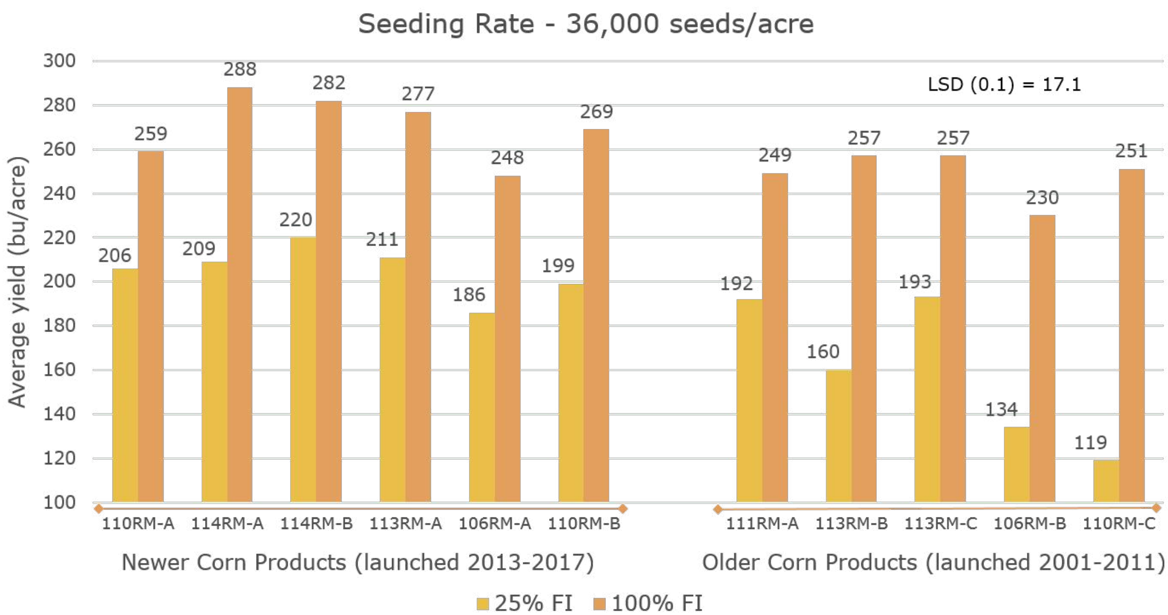

Figure 1. Yields by irrigation treatment at the 36,000 seeds/acre seeding rate

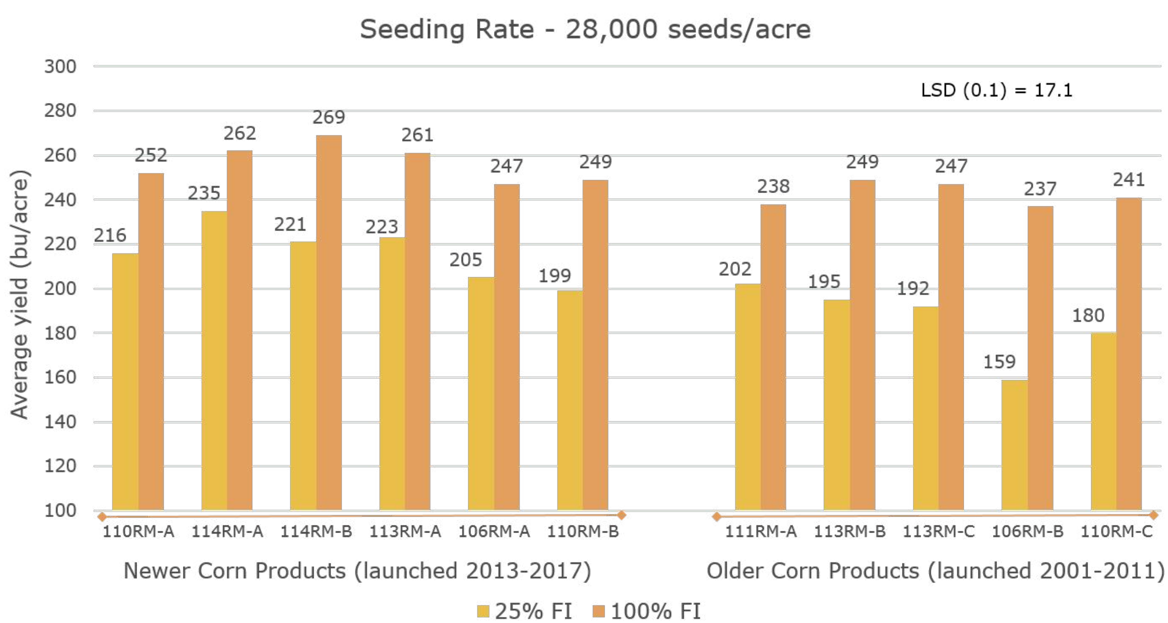

Figure 2. Yields by irrigation treatment at the 28,000 seeds/acre seeding rate

Figure 3. Comparison of ears from the newer (bottom, launched between 2013-2017) and older (top, launched between 2001-2011) corn products

- Overall, average yield was higher for the newer corn products compared to the older corn products at the 100% and 25% FI treatments.
- The newer corn products tested yielded more at higher seeding rates regardless of irrigation environment.
- Corn product stability improved for the newer products in both seeding rates. This is highlighted in the 25% FI environment in which the older 110RM-C product yielded 119 and 180 bu/acre at the 36,000 and 28,000 seeds/acre seeding rate, respectively, while the newer 110RM-B product yielded 199 and 199 bu/acre at the 36,000 and 28,000 seeds/acre seeding rate, respectively. In this example, the newer corn product had higher yields overall and did not have a significant reduction in yield at the higher seeding rate like the older corn product did.
- There was an interaction between corn product, seeding rate, and irrigation environment for barren plants and plants that died prematurely. The general trends across seeding rates and irrigation environments were that:
  - Newer corn products had less barren plants, ranging from 0.6 to 1.8 barren plants/plot compared to the older corn products that had 1.4 to 6.5 barren plants/plot.
  - Newer corn products had less plants that died prematurely, ranging from 0.3 to 0.8 dead plants/plot compared to the older corn products that ranged from 0.8 to 6.3 dead plants/plot.

WHAT DOES THIS MEAN FOR YOUR FARM?

- Farmers can be confident that newer corn products will likely perform better than older corn products across different irrigation environments and seeding rates. Proper placement of these products will provide a better opportunity for farmers to realize higher yield potential.
- Significant improvement has been made in the ability of the newer corn products tested to yield more in water-limited environments compared to older corn products. This is visually demonstrated in Figure 3 in which ears were collected from 17 feet of row for the newer 110RM-B product (bottom) and the older 110RM-C product (top) in the 25% FI treatment. The newer product had larger ears and a greater number of completely filled ears compared to the older product. This likely stems from the newer product's ability to better pollinate under stressful conditions.

SOYBEAN RESPONSE TO REPRODUCTIVE STAGE-APPLIED POTASSIUM

TRIAL OVERVIEW

- Potassium levels are generally considered to be at sufficient levels to achieve good yields on the Great Plains.
- Soybean plants need approximately 205 lb of potassium/acre to produce yields of 60 bu/acre; however, as yield levels increase, more potassium is needed.[1]
- Soybean removes about 1.4 lb of potassium/bu with the grain compared to 0.26 lb/bu for corn.[2]

RESEARCH OBJECTIVE

- This study evaluated the impact that different application rates of potassium have on soybean yield when applied at different growth stages to determine if additional potassium fertilizer will impact irrigated soybean yield.
- This study came about from farmers asking questions during the Learning Center tours in 2016.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Corn	Strip tillage	05/24/2017	10/13/2017	90 bu/acre	160K seeds/acre

SITE NOTES:

- Potassium was applied as 0-0-60 at 15, 30, and 45 lb K_20/acre at the following growth stages: R1, R3, and R5.
- Potassium was applied by a 360 Y-Drop® applicator (R1) or dry spread (R3 and R5).
- A 2.4 and a 2.8 MG soybean product were evaluated.
- Potassium levels on site were 594 ppm, organic matter was 3.2%, and the pH was 6.8.
- The research was conducted as a randomized split-split plot with application growth stage as the whole plot, application rate as the subplot, and soybean product as the sub-subplot. There were 18 treatments and 4 replications.

UNDERSTANDING THE RESULTS

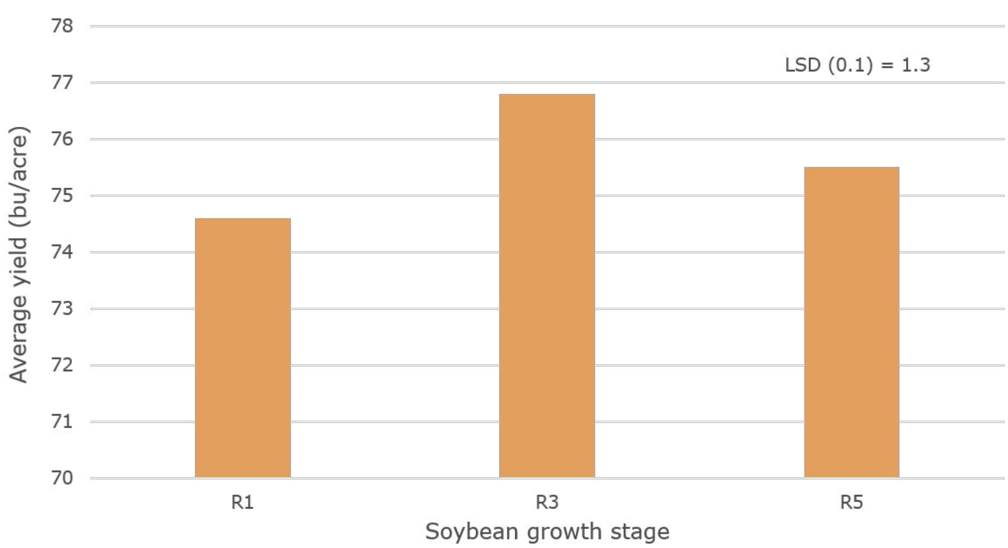

Figure 1. Soybean yield in response to potassium application at different growth stages

- The application rate had no effect on the soybean yield response to potassium.
- There was no difference in how the soybean products responded to the potassium applications.

- The timing of the application did impact yield (Figure 1). The difference in yield was 2.2 bu/acre between the R1 application and the R3 application. This difference was consistent across both products and application rates, which was somewhat surprising.

WHAT DOES THIS MEAN FOR YOUR FARM?

- There may be a marginal, yet consistent benefit in applying 15 lb/acre of potassium to soybean at the R3 growth stage.
- The information gathered from this study is only from one site in one year but the results are compelling and warrant further investigation.
- In 2018, research will be initiated to compare an application of potassium to an untreated check on six to eight soybean products.

SOURCES

1 Potassium in plants. Mosaic Crop Nutrition. www.cropnutrition.com/efu-potassium.
2 Potassium Management. Kansas State University. www.agronomy.k-state.edu.

YIELD IMPACTS OF DRYLAND SOYBEAN MANAGEMENT DECISIONS

TRIAL OVERVIEW

- Managing dryland soybeans is a challenge on the High Plains because highly variable moisture conditions make it difficult to determine whether an input or practice will be profitable.
- This trial evaluated several practices to determine how effective they are in improving dryland soybean yield.

RESEARCH OBJECTIVE

- To evaluate the yield effects of manageable inputs on a dryland soybean crop.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Cozad silt loam	Corn	Conventional tillage or no-till	06/01/2017	10/19/2017	65 bu/acre	130K and 220K

SITE NOTES:

- A 3.1 RM soybean product was planted on a dryland field with nine different treatments including tillage type, planting rate, row spacing, and fungicide and herbicide applications (Table 1). *Note that treatment 9 was intended to evaluate an earlier planting date (5/15/17), but poor weather prohibited the pre-emergence herbicide application, which was a key treatment element. Therefore, we evaluated poor weed control instead.
- The study was designed as a randomized complete block with five replications.
- Fertilizer was broadcast applied prior to planting and amounted to 24 lbs/acre nitrogen, 40 lbs/acre phosphorus, and 26 lbs/acre sulfur.
- Rainfall amounted to: May 2.53 in., June 0.75 in., July 1.52 in., August 3.63 in., and September 2.4 in.

UNDERSTANDING THE RESULTS

Treatment	Tillage	Planting density (seeds/acre)	Row spacing	Fungicide	Pre herbicides	Post herbicides
1. Low management	Conv.	220K	30-inch	None	32 oz. Roundup PowerMAX® herbicide	32 oz. Roundup PowerMAX herbicide
2. Pre residual + XtendiMax® herbicide with VaporGrip® Technology	Conv.	220K	30-inch	None	32 oz. Roundup PowerMAX herbicide **14 oz. Authority® MTZ** **22 oz. XtendiMax with VaporGrip Technology**	32 oz. Roundup PowerMAX herbicide
3. No tillage	**No-till**	220K	30-inch	None	32 oz. Roundup PowerMAX herbicide 14 oz. Authority MTZ 22 oz. XtendiMax with VaporGrip Technology	32 oz. Roundup PowerMAX herbicide
4. POST application of XtendiMax with VaporGrip Technology	No-till	220K	30-inch	None	32 oz. Roundup PowerMAX herbicide 14 oz. Authority MTZ 22 oz. XtendiMax with VaporGrip Technology	32 oz. Roundup PowerMAX herbicide **22 oz. XtendiMax with VaporGrip Technology**
5. Post residual	No-till	220K	30-inch	None	32 oz. Roundup PowerMAX herbicide 14 oz. Authority MTZ 22 oz. XtendiMax with VaporGrip Technology	32 oz. Roundup PowerMAX herbicide 22 oz. XtendiMax with VaporGrip Technology **48 oz. Warrant® Herbicide**
6. Lower planting rate	No-till	**130K**	30-inch	None	32 oz. Roundup PowerMAX herbicide 14 oz. Authority MTZ 22 oz. XtendiMax with VaporGrip Technology	32 oz. Roundup PowerMAX herbicide 22 oz. XtendiMax with VaporGrip Technology 48 oz. Warrant Herbicide
7. 30-inch twin row	No-till	130K	**30-inch twin row**	None	32 oz. Roundup PowerMAX herbicide 14 oz. Authority MTZ 22 oz. XtendiMax with VaporGrip Technology	32 oz. Roundup PowerMAX herbicide 22 oz. XtendiMax with VaporGrip Technology 48 oz. Warrant Herbicide
8. Disease control with fungicide	No-till	130K	30-inch twin row	**6 oz./acre Headline® fungicide**	32 oz. Roundup PowerMAX herbicide 14 oz. Authority MTZ 22 oz. XtendiMax with VaporGrip Technology	32 oz. Roundup PowerMAX herbicide 22 oz. XtendiMax with VaporGrip Technology 48 oz. Warrant Herbicide
9. Missed weed control* (planted 5/15/17)	No-till	130K	30-inch twin row	6 oz./acre Headline fungicide	32 oz. Roundup PowerMAX herbicide	**None**

XtendiMax® herbicide with VaporGrip® Technology is a restricted use pesticide for retail sale to and use only by Certified Applicators or persons under their direct supervision.

Table 1. Treatment list. Application rates were on a per-acre basis. Highlighted text indicates difference from the previous treatment.

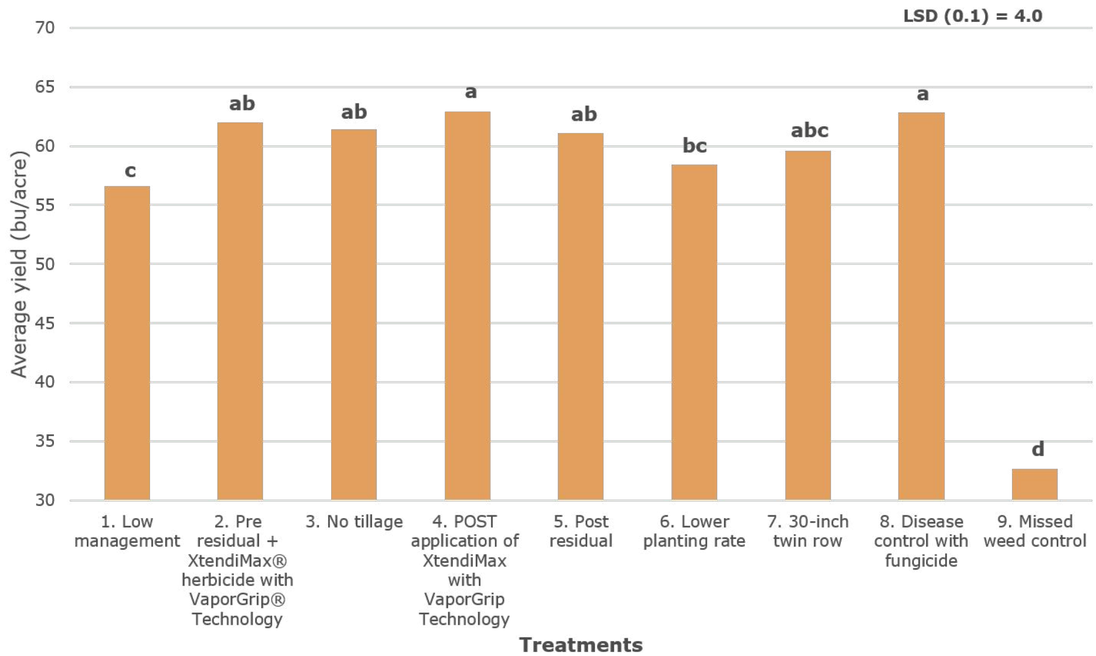

Figure 1. Dryland soybean yields in the different management treatments.

Treatment	Costs in dollars									
	Seed	Weed Control	Application	Fungicide	Tillage	Total costs	Yield bu/acre	Soybean Price	Total Return	Net Profit
1. Low management	102.14	12.50	20.00	0.00	15.00	149.64	56.6	9.00	509.40	359.76
2. Pre residual + XtendiMax® herbicide with VaporGrip® Technology	102.14	49.03	20.00	0.00	15.00	186.17	62.0	9.00	558.00	371.83
3. No tillage	102.14	49.03	20.00	0.00	0.00	171.17	61.4	9.00	552.60	381.43
4. POST application of XtendiMax with VaporGrip Technology	102.14	61.06	20.00	0.00	0.00	183.21	62.9	9.00	566.10	382.89
5. Post residual	102.14	76.44	20.00	0.00	0.00	198.58	61.1	9.00	549.90	351.32
6. Lower planting rate	60.36	76.44	20.00	0.00	0.00	156.79	58.4	9.00	525.60	368.81
7. 30-inch twin row	60.36	76.44	20.00	0.00	0.00	156.79	59.6	9.00	536.40	379.61
8. Disease control with fungicide	60.36	76.44	30.00	28.13	0.00	194.92	62.8	9.00	565.20	370.28
9. Missed weed control (*planted 5/15/17)	60.36	6.25	10.00	28.13	0.00	104.73	32.7	9.00	294.30	189.57

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Table 2. Cost analysis of the different management treatments.

- Due to the dry conditions during the vegetative and early reproductive stages, uncontrolled weeds competed with the plants for moisture.
- Weed control was the factor that influenced yield the most with all residual weed control programs having significantly higher yields than treatment 1 (low management) or treatment 9 (missed weed control) (Figure 1).
- A reduction in the planting rate (treatment 6) significantly reduced yields relative to the highest yielding treatment planted at 220K seeds/acre (treatment 4), but the combination of using twin rows and fungicide (treatment 8) helped yields rebound.

WHAT DOES THIS MEAN FOR YOUR FARM?

- On irrigated acres, weeds are still damaging, but irrigation can replace some of the moisture taken up by the weeds. In dryland production, soil moisture management is paramount to achieving high yield potential.
- To achieve maximum profitability in dryland soybean production, focus on excellent weed control programs that include strong pre- and post-emergence weed control components.

SOYBEAN WEED CONTROL SYSTEM COMPARISON

TRIAL OVERVIEW

- Multiple herbicide-tolerant trait systems are available for weed management in soybean.
- Optimizing the use of effective residual and post-emergence herbicides within a weed management system contributes to season-long weed control.

Treatment	Soybean Trait	Herbicide Treatment
1	Roundup Ready 2 Xtend® soybeans	Non-treated
2	Roundup Ready 2 Xtend soybeans	2 oz. Rowel® Herbicide PRE* 22 oz. XtendiMax® herbicide with VaporGrip® Technology POST** 32 oz. Roundup PowerMAX® herbicide POST
3	Roundup Ready 2 Xtend soybeans	2 oz. Rowel Herbicide PRE 22 oz. XtendiMax with VaporGrip Technology **PRE and POST** 32 oz. Roundup PowerMAX herbicide POST
4	Roundup Ready 2 Xtend soybeans	2 oz. Rowel Herbicide PRE 22 oz. XtendiMax with VaporGrip Technology PRE and POST 32 oz. Roundup PowerMAX herbicide POST 48 oz. Warrant® Herbicide POST
5	LibertyLink® soybeans	Non-treated
6	LibertyLink soybeans	2 oz. Valor® SX herbicide PRE 29 oz. Liberty® herbicide*** POST
7	LibertyLink soybeans	6.4 oz. Authority® Maxx herbicide PRE 29 oz. Liberty herbicide*** POST
8	LibertyLink soybeans	6.4 oz. Authority Maxx herbicide PRE 29 oz. Liberty herbicide*** POST 2 oz. Zidua® herbicide POST

*PRE = Pre-emergence; **POST = Post-emergence; ***AMS was added. Application rates were on a per-acre basis. XtendiMax® herbicide with VaporGrip® Technology is a restricted use pesticide for retail sale to and use only by Certified Applicators or persons under their direct supervision.

Table 1. Treatment list

RESEARCH OBJECTIVE

- Evaluate weed control and soybean yield under different herbicide treatments in the Roundup Ready Xtend® Crop System and the LibertyLink® system.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Silty Loam	Wheat	Strip tillage	05/26/2017	10/15/2017		130,000
North Platte, NE	Silty Loam	Soybean	No tillage	05/15/2017	10/26/2017		140,000
Brookings, SD	Silty Clay Loam	Corn	Conventional	05/26/2017	10/11/2017		140,000
Fargo, ND	Silty Clay Loam	Soybean	Conventional	05/10/2017	10/05/2017		150,000

SITE NOTES:

- The study was arranged as a split plot design with two factors, herbicide-tolerance trait and herbicide program, with each treatment replicated 4 times.
- The Roundup Ready 2 Xtend® soybeans used in the trial had RMs of 3.1 at Gothenburg, 2.8 at North Platte, and 0.9 at Brookings and Fargo. The LibertyLink® soybeans used in the trial had RMs of 3.2 at Gothenburg and North Platte, 1.8 at Brookings, and 0.8 at Fargo.
- PRE-herbicide treatments were applied within 1 day of planting and POST-herbicide treatments were applied at the V3 stage.
- All plots were irrigated with sprinkler systems. Row spacing was 30 inches in Gothenburg, North Platte, and Fargo, and 22 inches in Brookings. All other agronomic practices were the same for the region.

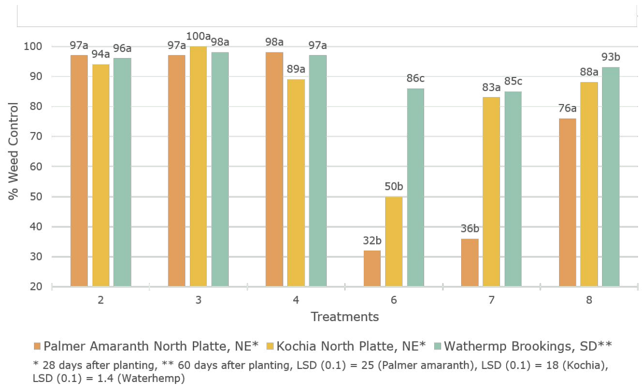

Figure 1. Palmer amaranth, kochia, and waterhemp control

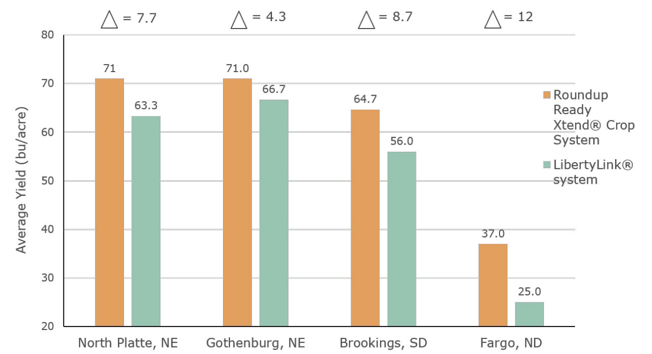

Figure 2. Yields in the Roundup Ready Xtend® Crop System over the LibertyLink® system across treatments by location. Yield deltas show the yield advantage of the Roundup Ready Xtend® Crop System over the LibertyLink® system

	Treatment	Average yield (bu/acre) Gothenburg, NE	North Platte, NE	Brookings, SD	Fargo, ND
		Roundup Ready Xtend® Crop System			
1	Roundup Ready 2 Xtend® soybeans non-treated	67 ab	14 b	-	-
2	Rowel® Herbicide PRE + XtendiMax® herbicide with VaporGrip® Technology POST + Roundup PowerMAX® herbicide POST	71 ab	74 a	65 a	36 a
3	Rowel Herbicide PRE + XtendiMax with VaporGrip Technology PRE and POST + Roundup PowerMAX herbicide POST	72 a	72 a	64 a	37 a
4	Rowel Herbicide PRE + XtendiMax with VaporGrip Technology PRE and POST + Roundup PowerMAX herbicide POST + Warrant® Herbicide POST	70 ab	67 a	65 a	38 a
		LibertyLink® system			
5	LibertyLink® soybeans non-treated	63 b	7 b	-	-
6	Valor® SX herbicide PRE + Liberty® herbicide POST	65 ab	73 a	51 c	17 c
7	Authority® Maxx herbicide PRE + Liberty herbicide POST	67 ab	58 a	57 b	28 b
8	Authority Maxx herbicide PRE + Liberty herbicide POST + Zidua® herbicide POST	68 ab	59 a	60 ab	30 b
	LSD (0.05)	5	16	5	4

Means followed by a different letter are significantly different (P = 0.05). XtendiMax® herbicide with VaporGrip® Technology is a restricted use pesticide for retail sale to and use only by Certified Applicators or persons under their direct supervision.

Table 2. Average soybean yield in the different treatments and locations

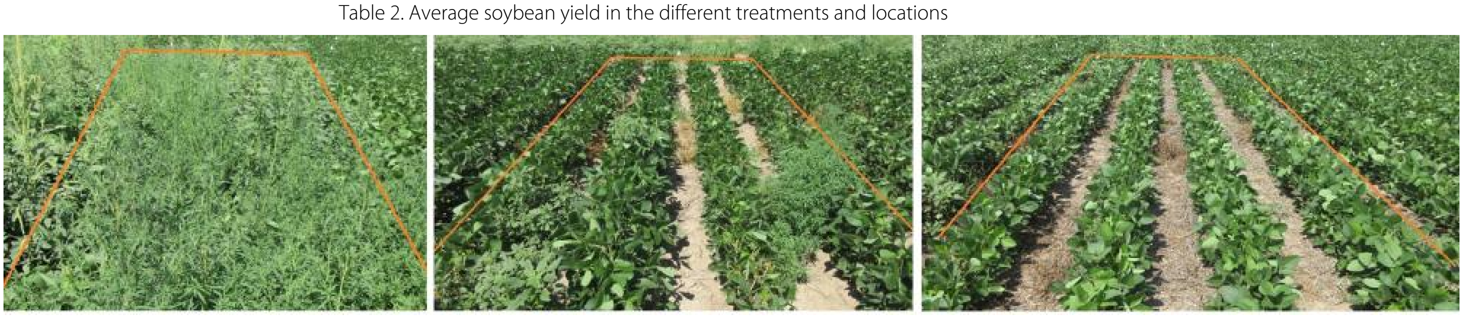

Figure 3. Weed control at Gothenburg, NE. The untreated Roundup Ready 2 Xtend® soybeans plot (left). LibertyLink® system with Valor® SX herbicide followed by Liberty® herbicide 30 days after application (middle). Roundup Ready Xtend® Crop System with Rowel® Herbicide followed by XtendiMax® herbicide with VaporGrip® Technology + Roundup PowerMAX® herbicide 30 days after application (right).

UNDERSTANDING THE RESULTS

- Consistent control of palmer amaranth, waterhemp, and kochia was obtained using XtendiMax® herbicide with VaporGrip® Technology, whereas weed control with Liberty® herbicide was variable.
- Combining effective residual and POST herbicides provided the greatest weed control late into the season.
- Yields did not necessarily correspond to the intensity of the herbicide program, but yields in the Roundup Ready Xtend® Crop System were significantly greater across treatments compared to the LibertyLink® system at each location (Figure 2).

WHAT DOES THIS MEAN FOR YOUR FARM?

- Season-long weed control and minimization of the weed seedbank are important components for maximizing yield and improving long-term weed management.

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

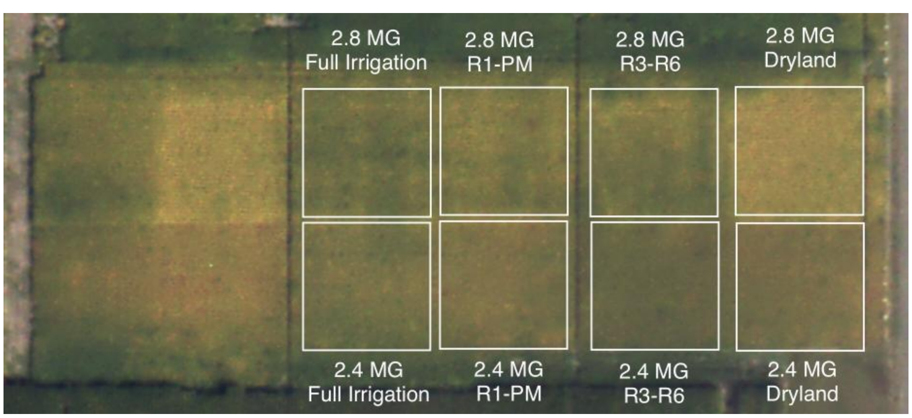

Figure 1. Aerial image of the trial at Gothenburg, NE. This image was taken on September 13th, 2017 and displays how the plots were laid out and the earlier senescence (yellowing) in the dryland treatment blocks.

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	**79.7**	**77.5 a**
2.8 MG	FI	75.2	73.6	77.3	**75.4**	
2.4 MG	R1-PM	68.6	73.4	81.5	**74.5**	**72.4 ab**
2.8 MG	R1-PM	69.1	70.7	71.2	**70.3**	
2.4 MG	R3-R6	67.9	69.0	76.0	**71.0**	**68.9 bc**
2.8 MG	R3-R6	63.0	66.6	71.0	**66.9**	
2.4 MG	Dryland	47.4	67.3	78.1	**64.3**	**64.5 c**
2.8 MG	Dryland	58.8	60.8	74.4	**64.7**	
Location avg		**65.7**	**70.0**	**76.9**		**70.8** (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	**79.7**	$717.30	7.2	$7.28	$664.88	**$645.38**
2.8 MG	FI	**75.4**	$678.30	7.2	$7.28	$625.88	
2.4 MG	R1-PM	**74.5**	$670.50	5.8	$7.28	$628.28	**$609.53**
2.8 MG	R1-PM	**70.3**	$633.00	5.8	$7.28	$590.78	
2.4 MG	R3-R6	**71.0**	$638.70	4.25	$7.28	$607.76	**$589.31**
2.8 MG	R3-R6	**66.9**	$601.80	4.25	$7.28	$570.86	
2.4 MG	Dryland	**64.3**	$578.40	0	$0	$578.40	**$580.20**
2.8 MG	Dryland	**64.7**	$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.
- 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).

- 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.

INTERACTION OF SOYBEAN PLANTING DATE AND SEEDING RATE

TRIAL OVERVIEW

- Soybean yield and the potential for lodging can be highly variable depending on a number of factors including environment, soybean product, nutrient management, irrigation, and planting rate and date. With this in mind, a study was designed to evaluate the interaction of soybean planting date and seeding rate.

RESEARCH OBJECTIVE

- To assess the effects of planting date and seeding rate on soybean yield.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Corn	Strip tillage		10/13/2017	90 bu/acre	Varied

SITE NOTES:

- This study was a randomized split-plot trial with date as the whole plot and seeding rate as the subplot. The study had 4 replications.
- A 2.8 MG soybean product was planted into strip-tilled, irrigated ground that was previously planted to corn with an application of 29.3 lbs/acre nitrogen, 60 lbs/acre phosphorus, 25 lbs/acre sulfur, and 0.25 lbs/acre zinc that was applied during the strip-till operation.
- Planting occurred at six dates (4/11/17, 4/21/17, 5/5/17, 5/24/17, 6/7/17, and 6/19/17) with six seeding rates (80K, 120K, 160K, 200K, 240K, and 280K seeds/acre).
- Weeds were controlled uniformly throughout the season and no insecticides or fungicides were needed.
- The April 11 and April 21 planting dates were exposed to freezing temperatures and six inches of snowfall at the end of April.
- Yield and the incidence of lodging and stem borer were measured.

UNDERSTANDING THE RESULTS

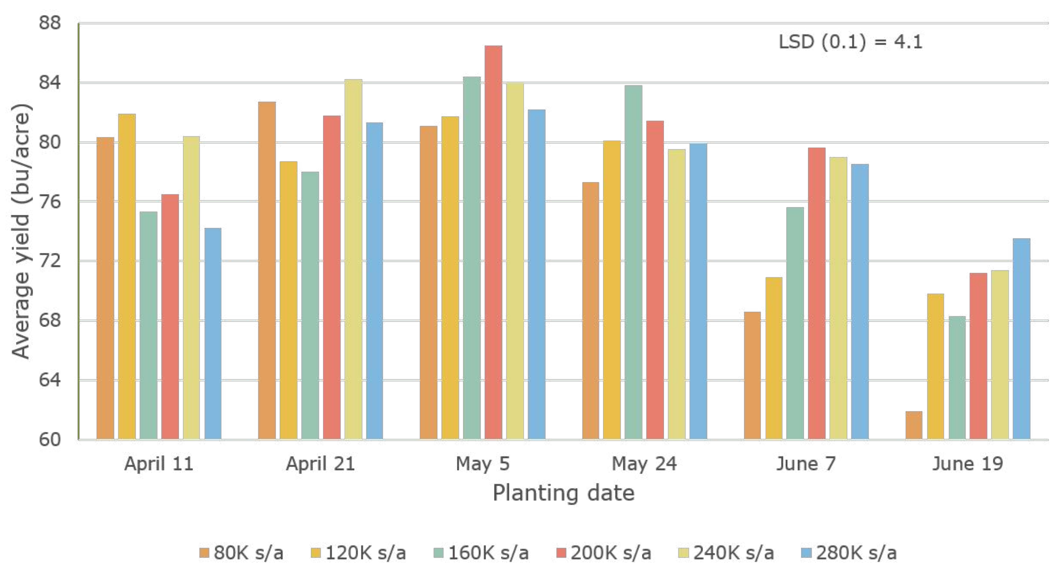

Figure 1. Soybean yields by planting date and seeding rate

Figure 2. Soybean plants from three planting dates and three seeding rates. Each image shows a plant from the 80K seeds/acre (left), 160K seeds/acre (middle), and 280K seeds/acre (right) seeding rate.

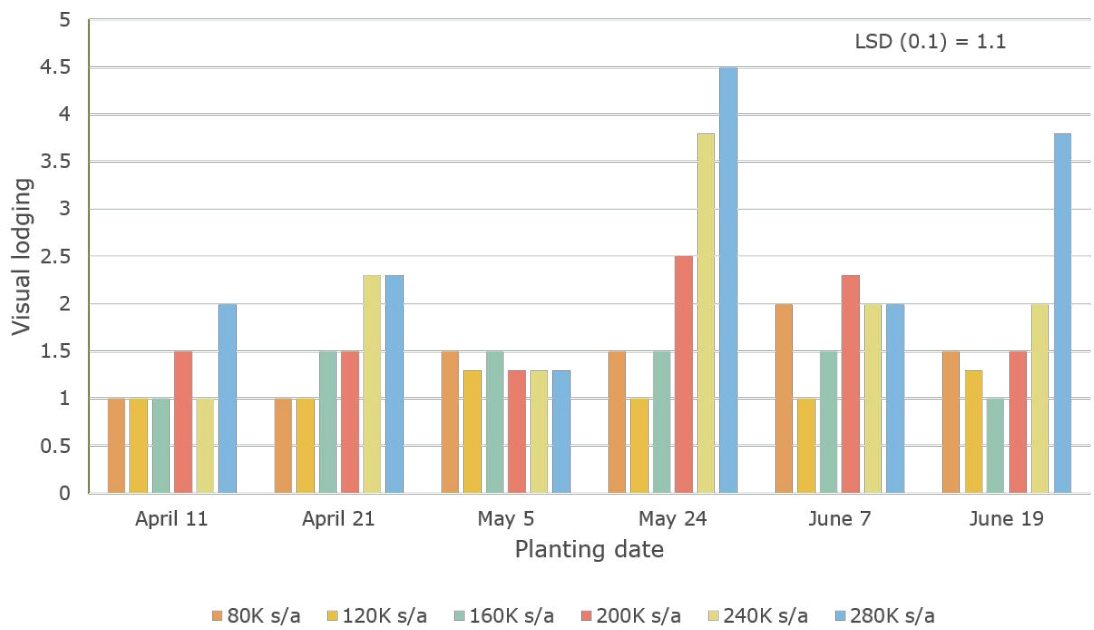

Figure 3. Soybean lodging by planting date and seeding rate. Soybean lodging was rated on a scale of 1 to 9 with 1 = no lodging and 9 = extreme lodging.

- **Yield**
- The seeding rate impacted yield differently across planting dates (Figure 1).
- For the April 11 and 21 planting dates, the impact of seeding rate was highly variable with high yields observed at both high and low seeding rates. The variability in these results could partially be attributed to the freezing temperatures and snowfall that occurred at the end of April.
- For the May 5 and 24 planting dates, higher yields were observed with either the 160K or 200K seeds/acre rate, with lower yields observed at the lower and higher seeding rates.
- For the June 7 and 19 planting dates, the higher seeding rates had higher yields.
- **Lodging**
- The seeding rate and date impacted the extent of soybean lodging differently (Figure 3).
- For the April 11, April 21, May 24, and June 19 planting dates, higher lodging was observed with higher seeding rates.
- For the May 5 and June 7 planting dates, higher lodging was observed at the higher and lower seeding rates.

- **Stem borer**
- Infestation of soybean stem borer was impacted by planting date but not seeding rate, with the May 5 planting date having high levels of stem borers and the other planting dates having little to no stem borers.

WHAT DOES THIS MEAN FOR YOUR FARM?

- Typically, a soybean crop is planted after corn; this can be three to four weeks after the optimal soybean planting date for the area, which can significantly reduce yield potential by 10 to 15 bu/acre. Soybean planted too early can be affected by freezing temperatures, which can reduce yield potential. Farmers should work with their local seed sales team to determine the optimum planting date for their area.
- The early spring freeze and snowfall probably caused some variability in the results for seeding rate. To that end, farmers should expect a more typical response to seeding rate as what was observed with the May 5 and May 24 planting dates, with high yields observed at the 160K to 200K seeds/acre rates.
- For late-planted soybean, higher seeding rates (200K to 280K seeds/acre) should give the best opportunity for high yields.
- Earlier-planted soybean crops have a greater risk of infestation with stem borer.

THE EFFECT OF NITROGEN RATE ON WHEAT YIELD

TRIAL OVERVIEW

- As farmers push grain yields higher, are there differences in how wheat varieties respond to increased nitrogen rates?
- Do wheat yields plateau or continue to increase at higher nitrogen rates?

RESEARCH OBJECTIVE

- This study evaluated the yield response of winter wheat varieties to differing nitrogen rates in order to optimize best management practices for dryland production systems.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Soybean	Vertical tillage	10/11/2016	07/15/2017	90 bu/acre	1.4M

SITE NOTES:

- Five wheat varieties from three maturity groups were used in this study: WB4462 (early-medium maturity), WB4458 (early-medium maturity), WB4721 (medium maturity), WB4303 (medium maturity), and WB-Grainfield (medium-late maturity).
- This study was conducted on a dryland field, planted into vertically-tilled soybean residue.
- Nitrogen (N) rates were 0, 60, 90, 120, and 150 lbs/acre of N, which was applied in the spring as 32-0-0 with stream bars.
- The study was designed as a randomized split plot with four replications, with N rate as the whole plot and variety as the subplots.
- Weeds were controlled uniformly throughout the season and no insecticides or fungicides were needed.
- Soil test results: pH – 6.6, organic matter – 4%, residual N – 37 lbs/acre, residual P – 40 ppm.
- Yield was the only factor measured at harvest.

UNDERSTANDING THE RESULTS

Month	Gothenburg, NE	
	2016-17 total	Average
	Inches	
September	0.61	1.55
October	2.69*	1.41
November	0.55	0.89
December	0.38	0.45
January	0.7	0.45
February	0.43	0.51
March	2.7	1.41
April	1.5	2.26
May	2.53	3.71
June	0.75	3.67
July	1.52	3.23
Total	**14.36**	**19.54**

Table 1. Accumulated moisture at Gothenburg. *Two inches of irrigation water was applied on October 21, 2016 to ensure good stand establishment.

- Wheat varieties responded differently to N rates. The highest yield was observed in four of the five varieties at 120 lbs/acre of N while the highest yield for WB4458 was at 150 lbs/acre of N (Figure 1).
- The lowest yields across all varieties was at the 0 lbs/acre of N treatment, which was between 18 to 30% below the highest yield observed for each variety.

WHAT DOES THIS MEAN FOR YOUR FARM?

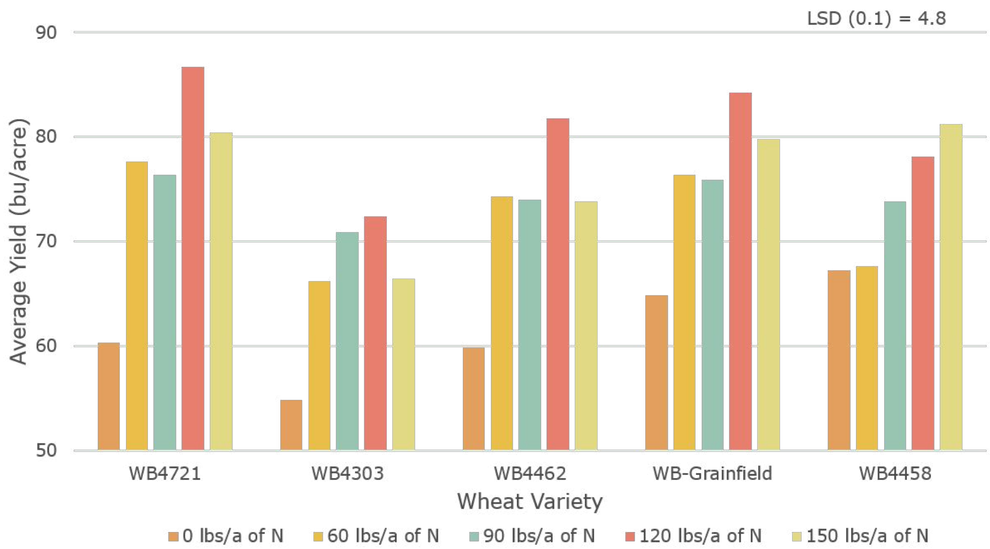

Figure 1. Wheat yields by nitrogen rate

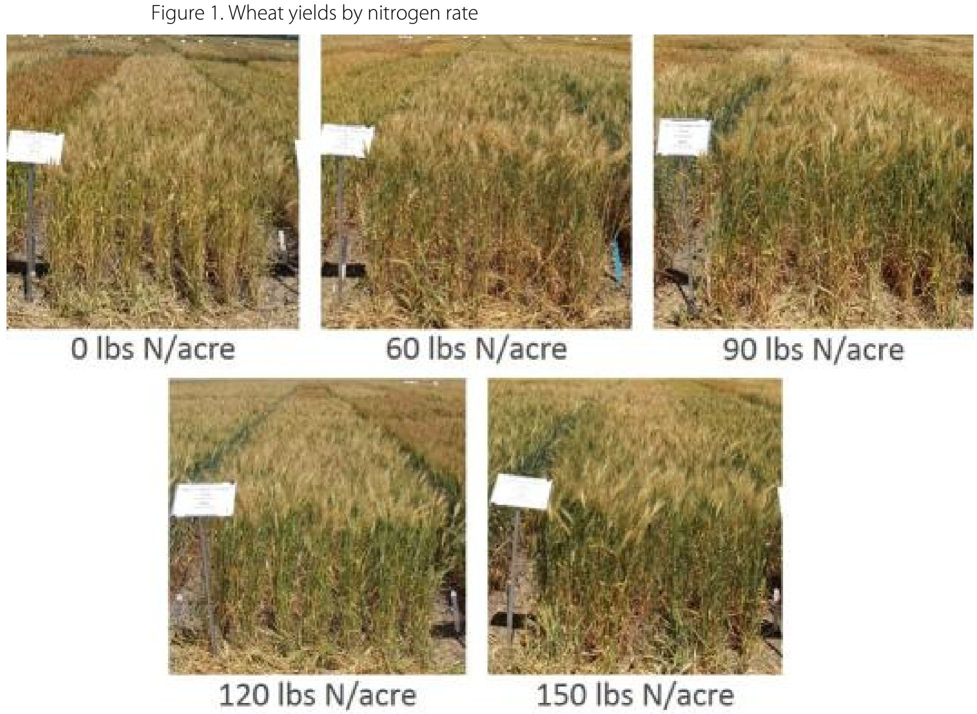

Figure 2. Plant growth at the various nitrogen rates in WB-Grainfield

- The results from this study were not conclusive to understand if wheat varieties respond differently to increased rates of nitrogen. Further research will be completed during the 2017-2018 season.
- Excessive foliage was observed in the 150 lbs/acre of N treatment, which likely caused more water to be used earlier in the growing season, thus decreasing yield. Split applications of N could potentially reduce excessive vegetative growth.

IMPACT OF PLANTING DATE AND SEEDING RATE ON WHEAT VARIETIES

TRIAL OVERVIEW

- How is wheat yield potential affected when planting too early or too late?
- Can an increased seeding rate compensate for less tiller development and help maintain yield potential in late-planted wheat?

RESEARCH OBJECTIVE

- The objective of this study was to evaluate the influence of planting date and seeding rate on yield potential in rainfed winter wheat in west-central Nebraska.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
Gothenburg, NE	Hord silt loam	Soybean	Vertical tillage			85 bu/acre	0.8M, 1.4M, 2.0M
Grant, NE	Kuma silt loam	Wheat	Conventional tillage			40 bu/acre	0.8M, 1.4M, 2.0M

SITE NOTES:

- Four wheat varieties were used: WB4303 (medium maturity), Winterhawk (medium maturity), WB4721 (medium-late maturity), and WB-Grainfield (medium-late maturity).
- The study was designed as a split-split plot blocked by planting date as the main effect, seeding rate as the split plot, and wheat variety as the split-split plot at both sites. There were four replications.
- At the Gothenburg site, wheat was planted in vertical-tilled dryland soybean stubble at three different seeding rates and four different planting dates: 9/30/16, 10/14/16, 11/01/16, and 11/16/16.
- At the Grant site, wheat was planted in conventional-tilled dryland wheat stubble at three different seeding rates and four different planting dates: 9/30/16, 10/14/16, 10/28/16, and 11/11/16.
- Weeds were controlled uniformly throughout the season and no insecticides or fungicides were needed to control insects or diseases at either site.
- Soil test results at the Gothenburg site: pH – 6.6, organic matter – 4%, residual N – 37 lbs/acre, residual P – 40 ppm.
- Soil test results at the Grant site: pH – 6.6, organic matter – 2.1%, residual N – 134 lbs/acre, residual P – 50 ppm.
- At both sites, yield was the only factor that was measured at harvest.

UNDERSTANDING THE RESULTS

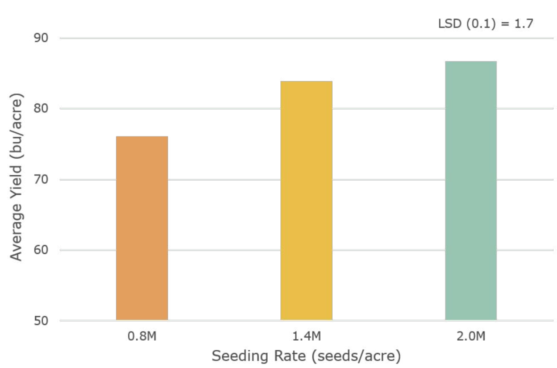

Figure 1. Average wheat yields by seeding rate at the Gothenburg site

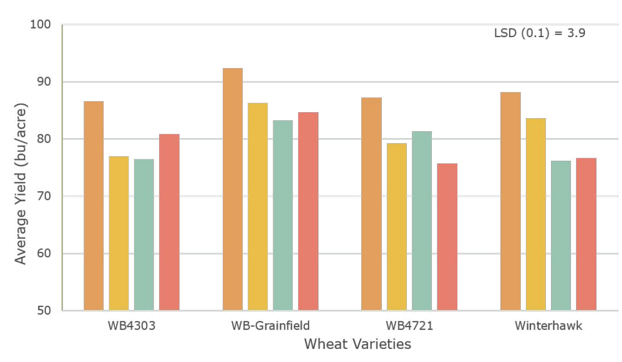

Figure 2. Average wheat yields by planting date at the Gothenburg site

- **Gothenburg**
- Higher yields were consistently obtained with higher seeding rates across all planting dates and wheat varieties (Figure 1).

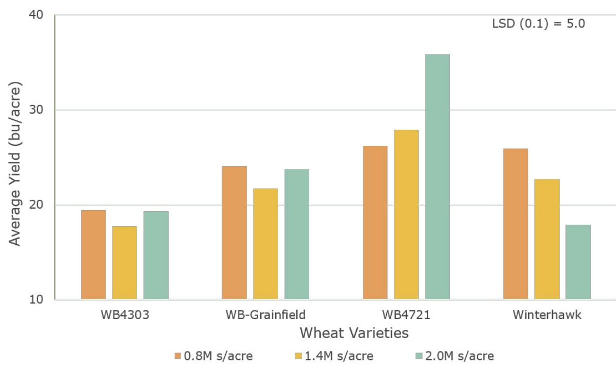

Figure 3. Average wheat yields by seeding rate at the Grant site

Figure 4. Average wheat yields by planting date at the Grant site

Month	Gothenburg, NE		Grant, NE	
	2016-17 total	Average	2016-17 total	Average
	Inches			
September	0.61	1.55	1.4	1.5
October	2.69*	1.41	0.6	1.3
November	0.55	0.89	0.0	0.8
December	0.38	0.45	0.1	0.4
January	0.7	0.45	0.4	0.5
February	0.43	0.51	0.0	0.7
March	2.7	1.41	1.8	1.4
April	1.5	2.26	2.1	2.2
May	2.53	3.71	3.3	3.2
June	0.75	3.67	0.4	3.1
July	1.52	3.23	3.0	3.1
Total	**14.36**	**19.54**	**13.1**	**18.2**

Table 1. Accumulated moisture at Gothenburg and Grant. *Two inches of irrigation water was applied on October 21, 2016 to ensure good stand establishment.

- There was a significant interaction between planting date and wheat variety. Higher yields were observed for all varieties at the earliest planting date. However, varieties responded differently to later planting dates (Figure 2).
- Across seeding rates, there was no significant difference in yield for two of the varieties, WB4303 and WB-Grainfield, whereas WB4721 had increased yield with increasing seeding rate and Winterhawk had decreased yield with increasing seeding rates (Figure 3).
- The earliest planting date (September 30) had the highest yields across all varieties; however, the magnitude of the yield increase varied. Three of the four varieties had significantly higher yields for the earliest planting date (Figure 4).

WHAT DOES THIS MEAN FOR YOUR FARM?

- The impact of planting date affects yield potential with typically higher yields observed with planting dates that allow for sufficient tiller development without excessive foliage growth in the fall. Planting dates from mid-September to the first part of October are reasonable for the central Great Plains.
- The results of this study suggest that in high-yielding environments (above 75 bu/acre), higher seeding rates may result in higher yield potential. In lower-yielding environments (below 35 bu/acre) wheat varieties may have more variability in regards to yield potential.

Notes

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