Corn Yield Response to Crop Inputs

Trial Objective

- Crop inputs can always be added to a corn production system, but it is important to know which ones have the biggest impact on yield. Being able to compare the yield from various inputs and the costs associated with the inputs provides a means to decide the potential return on investing in specific inputs to boost corn yields.
- The objective of this study was to evaluate how corn yield is influenced by six different inputs added to a corn system, including adding each one to a base treatment or subtracting one from a treatment with all other inputs included.

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Gothenburg, NE	Hord silt loam	Soybean	Strip-till	4/27/2022	10/17/2022	300	34,000 & 42,000

- A 118 RM VT Double PRO® RIB Complete® corn blend was selected for the trial based on proven high yield potential.
- The study was a randomized complete block design with four replications and 12 management treatments (Table 1).
- Weeds were controlled uniformly across the study with an application of 32 fl oz/acre Roundup PowerMAX® herbicide, 5 fl oz/acre Corvus® herbicide, 32 fl oz/acre Harness® herbicide, and 32 fl oz/acre Atrazine 4L herbicide on May 10, 2022.
- A base fertilizer application of 30 lb nitrogen (N)/acre, 60 lb phosphorus (P)/acre, 25 lb sulfur (S)/acre, 0.25 lb zinc (Zn)/acre was strip-tilled across appropriate treatments on April 21, 2022.
- 30 lb N/acre, 60 lb P/acre, 25 lb S/acre, 0.25 lb Zn/acre, 0.5 lb boron /acre was strip-tilled across appropriate treatments on April 22, 2022.
- 4 fl oz of Delaro® 325 SC fungicide was sprayed on appropriate treatments on June 12, 2022.
- 40 lb of N/acre was applied with Y-drops on appropriate treatments at V7 on June 16, 2022.
- 153 lb of N/acre was applied with Y-drops on appropriated treatments at V7 on several treatments on June 17, 2022.
- 8 fl oz of Delaro® Complete Fungicide was applied on several treatments on July 22, 2022.
- A total of nine inches of irrigation was applied to meet the evapotranspiration needs of the crop.
- Stalk lodging and final stand counts were taken just prior to harvest.
- Plots were combine-harvested. Grain moisture content, test weight, and total weight were determined. Statistical analysis for Fisher's LSD was performed.

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Table 1. Site Soil Test Information

Sample Depth	Soil pH	Sol Salts	Org Matter	Nitrate	P	K	Ca	Mg	Na	Sulfate
	1:1	mmho/cm	LOI-%	Lbs N/A	M-3P	ppm	ppm	ppm	ppm	ppm
0-8 in	7.0	0.17	33.0	22	32	323	1863	343	38	8.3
8-24 in				18						

Sample Depth	Zn	Fe	Mn	Cu	B	CEC	% Base Saturation				
	ppm	ppm	ppm	ppm	ppm	me/100	H	K	Ca	Mg	Na
0-8 in	1.56	11.4	5.6	0.33	0.53	13.2	0	6	71	22	1
8-24 in											

Table 2. Management treatments

Treatment	Inputs
LM (Low Management)	34,000 seeds/acre
LM + Density	Seeding rate increased to 42,000 seeds/acre
LM + VT Fungicide	8 fl oz/acre Delaro® Complete Fungicide at VT growth stage (7/22/2022)
LM + V6 Fungicide	4 fl oz/acre Delaro® 325 SC fungicide at V6 growth stage (6/12/2022)
LM + Nitrogen	40 lb/acre N side-dressed at V6 plus 25 lb N/acre side-dressed at R2 growth stage
LM + Boron	Micronutrient boron included with base strip till mix at 0.5 lb/acre
HM (High Management)	42,000 seeds/acre; Delaro® 325 SC fungicide was applied at 4 fl oz/acre at V6 growth stage; 8 fl oz/acre Delaro® Complete Fungicide applied at VT growth stage, 40 lb N/acre side-dressed at V6 growth stage plus 25 lb N/acre side-dressed at R2 growth stage; Micronutrient boron (B) included with base strip till mix at 0.5 lb/acre
HM - Density	Seeding rate decreased to 34,000 seeds/acre
HM - VT Fungicide	Removed application of Delaro® Complete Fungicide applied at 8 fl oz/acre at VT
HM - V6 Fungicide	Removed application of Delaro® 325 SC fungicide applied at 5 fl oz/acre at V6
HM - Nitrogen	Removed application of 40 lb/acre N side-dressed at V6 plus 25 lb/acre N side-dressed at R2
HM - Boron	Removed application of micronutrient boron of 0.5 lb/acre from base strip till mix

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Understanding the Results

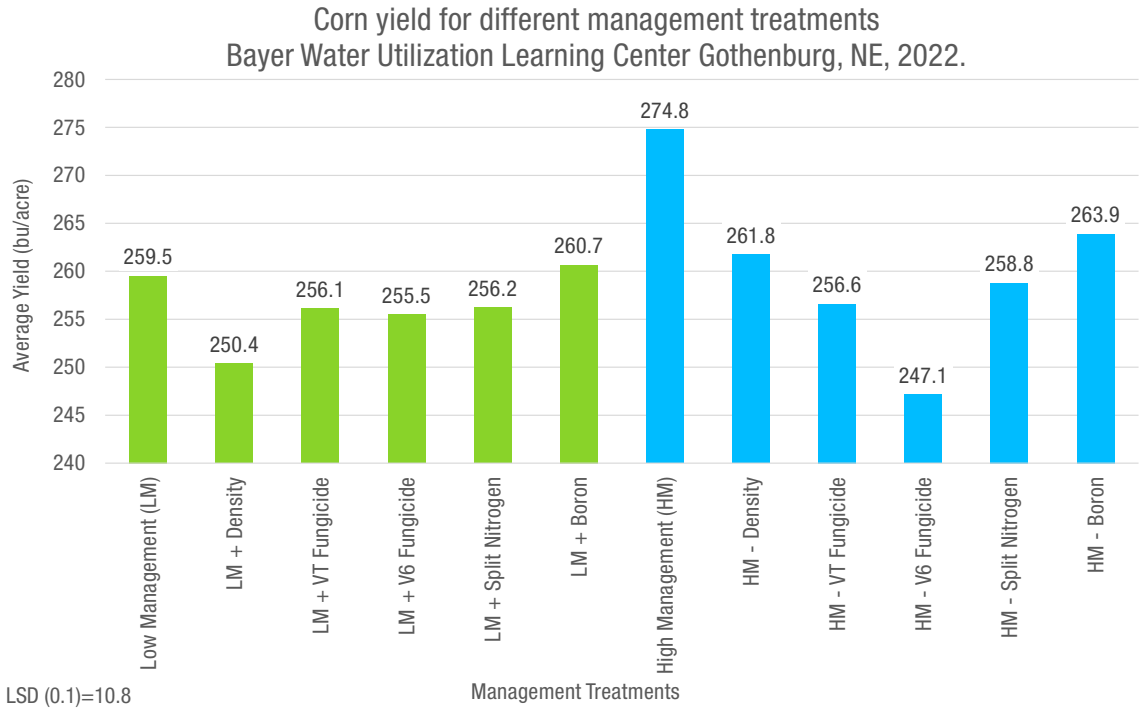

Figure 1. Impact of management treatments on average corn yield. Bayer Water Utilization Learning Center at Gothenburg, NE. 2022.

Impact on Yield

Low Management (LM) –

- The yield of 42,000 seeds per acre was lower than the 34,000 seeds per acre under the LM treatment.
- While overall additions to the LM system saw decreased numerical yields, yields were not significantly different compared to the base LM treatment.
- The addition of 0.5 lb/acre of boron only increased yield by of 1 bu/acre over the base LM treatment.
- Comparing the two systems, the low management (LM) system yielded about 15 bu/acre less than the high management (HM) system.

High Management (HM) –

- The impact on yield by subtracting treatments from the high management system, ranged from a reduction of 11 to 27 bushels per acre depending on the treatment.
- The removal of the V6 and the VT applications of a fungicide to the base HM resulted in the highest reduction in yield, at 27 bu/acre. While the removal of the application of a fungicide at the resulted in an 18 bu/acre reduction.
- While addition of boron provided about the same yield as the base LM system, the removal of the boron application in the HM system resulted in an 11-bushel reduction in yield when compared to the HM system.

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Figure 2. Ears harvested in five feet of row. Top eleven ears from corn planted at 42,000 seeds/acre in High Management treatment. Bottom nine ears harvested from the High Management – density treatment planted at 34,000 seeds/acre. Note very stable ear size even at the high seeding rate. Gothenburg, NE 2022.

Key Learnings

- In the low management system increasing the seeding rate from 34,000 seeds per acre to 42,000 seeds per acre numerically reduced yield about 10 bu/acre. Compared to the high management system by reducing the seeding rate to 34,000 seeds per acre saw a significant reduction in yield of 13 bu/acre.
- While disease pressure was not apparent removing a either a V6 or a VT fungicide application in the HM system, had a significant decrease in yield of 28 bu/acre and 18 bu/acre, respectively.
- Moving from the base low management system to the high management system returned a net increase of 15 bu/acre.
- Carefully weighing the cost of additional inputs to the expected returns is important in making economical decisions on the levels of management inputs, as grain prices and input prices fluctuate.

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