

# 2020 Illinois Soybean Management Yield Potential Preliminary Report

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## Research approach

The goal of this research is to provide farmers and agronomists with information on a soybean variety's yield response to critical agronomic management practices, or its management yield potential. Practices include reduced row spacing, foliar protection, and different fertilizer nutrient combinations added in a stair step fashion to see the additive effects of combining management practices into a systems approach. Using this approach, varieties can be identified that are best suited to an individual farmer's level of agronomic management.

## Trial implementation

The experimental plots were planted using a precision plot planter (SeedPro 360, ALMACO). They were sown on June 4 at Yorkville, IL (41°35'25.64"N, 88°23'43.53"W), on June 1 at Champaign, IL (40°3'24.24"N, 88°13'59.20"W), and on June 7 at Nashville, IL (38°18'34.39"N, 89°20'11.00"W). Plots were 16 feet in length and two rows in width. For weed control, pre-plant applications of Boundary (Syngenta) (24 oz acre<sup>-1</sup>) and Authority First (FMC Corporation) (5 oz acre<sup>-1</sup>) were made at Champaign. Nashville received Liberty (BASF Corporation) (40 oz acre<sup>-1</sup>) in addition to Authority First and Boundary, while Zidua (BASF) (3 oz acre<sup>-1</sup>) and Fierce (Valent) (0.5 oz acre<sup>-1</sup>) were used at Yorkville. At all three locations, in-season weed control was achieved at the V1 growth stage with Xtendimaxx (Bayer) (22 oz acre<sup>-1</sup>), Dual 2 Magnum (Syngenta) (16 oz acre<sup>-1</sup>), RoundUp (Bayer) (32 oz acre<sup>-1</sup>), with Intention Advance (GROWMARK Inc.) (0.5% v/v), and Class Act NG (WinField United) (19.2 oz acre<sup>-1</sup>) for Nashville and Yorkville. Nashville received a second herbicide application at the V4 growth stage using AnthemMaxx (FMC Corporation) (3.5 oz acre<sup>-1</sup>) and RoundUp (Bayer) (32 oz acre<sup>-1</sup>) applied with methylated seed oils (MSO) (13 oz acre<sup>-1</sup>). Champaign post-emergence weed control consisted of a single application of FlexstarGT (56 oz acre<sup>-1</sup>) and Fusilate (6 oz acre<sup>-1</sup>) (Syngenta), with methylated seed oils.

## How varieties were tested

The 38 commercial varieties (26 at each location) listed in Table 1 were assessed for their responses to the increasing levels of agronomic management. Varieties were grown in two row spacing arrangements: 30 inches between rows (Standard control) or 20 inches (all other treatments), as shown in Table 2. Foliar protection (fungicide and insecticide) was achieved by applying Miravis Top (13.7 oz acre<sup>-1</sup>) and Endigo ZC (3.8 oz acre<sup>-1</sup>) (Syngenta) with MasterLock (6.4 oz acre<sup>-1</sup>) (WinField) as the adjuvant at the R3 growth stage (beginning pod development). Phosphorus (P) and sulfur (S) fertility was achieved by applying 100 pounds acre<sup>-1</sup> of MicroEssentials S10 (Mosaic) broadcasted at planting. Potassium (K) and boron (B) fertility was achieved by applying 103 pounds acre<sup>-1</sup> of Aspire (Mosaic) broadcasted at planting. Both fertility treatments were not incorporated after broadcasting. Rates of the nutrients provided with the fertility treatments are shown in Table 3. Foliar sprays were applied August 19 (Yorkville), August 10 (Champaign), and August 18 (Nashville). Each variety was planted at 160,000 seeds acre<sup>-1</sup>. Lastly, because environmental and geographical factors influence agronomic performance, 15 varieties were planted across all three Illinois sites representing a wide range in inherent soil fertility levels (Table 4) and different weather characteristics (Table 5).

## Growing conditions

April and May were wetter and cooler than normal (Table 5) with heavy rainfall events across the state in late April and mid-May delaying the planting of these studies. However, the late-planted crop quickly accumulated growing degree days with warmer temperatures in June and July (Table 5).

Total precipitation over the summer months (June-September) was higher than normal at the Nashville site and slightly drier than normal at Champaign and Yorkville (Table 5). However, season totals do not reflect the extreme rainfall variability experienced in 2020. For instance, Champaign and Yorkville were mostly dry in June-August apart from a few large rain events. Champaign recorded 2.5 inches of rain on June 3<sup>rd</sup> followed by two weeks of dry weather. Similarly, the first two weeks of July in Champaign were dry except for a severe storm on July 11<sup>th</sup>

which brought 2 inches of rain and 1.5-inch hail. Similar precipitation variability was experienced in Yorkville. Lack of rain in Champaign and Yorkville in August (Table 5) resulted in abnormally dry conditions in Champaign and Yorkville and a moderate drought, while Nashville was abnormally dry in September. The derecho experienced in parts of northern Illinois on August 10<sup>th</sup> caused variable instances of plant lodging at Yorkville.

**Table 1. Variety Entries and Distribution.**

Brand	MG	Variety	Yorkville	Champaign	Nashville
Asgrow	2.4	AG24X7	X		
Asgrow	2.4	AG24X9	X		
Asgrow	2.5	AG25X9	X		
Asgrow	2.6	AG26X0	X		
Asgrow	2.6	AG26X8	X		
Asgrow	2.7	AG27X0	X		
Asgrow	3.0	AG30X9	X	X	
Asgrow	3.1	AG31X0	X	X	
Asgrow	3.3	AG33X0	X	X	X
Asgrow	3.4	AG34X0	X	X	X
Asgrow	3.4	AG34X6	X	X	X
Asgrow	3.4	AG34X9	X	X	X
Asgrow	3.6	AG36X6	X	X	X
Asgrow	3.7	AG37X0	X	X	X
Asgrow	3.8	AG38X8	X	X	X
Asgrow	3.9	AG39X0		X	X
Asgrow	3.9	AG39X7		X	
Asgrow	4.1	AG41X8		X	X
Asgrow	4.2	AG42X9		X	X
Asgrow	4.3	AG43X0		X	X
Asgrow	4.6	AG46X0			X
Asgrow	4.6	AG46X6			X
Asgrow	4.8	AG48X9			X
Golden Harvest	2.3	GH2329X	X		
Golden Harvest	2.7	GH2788X	X	X	
Golden Harvest	3.1	GH3195X	X	X	X
Golden Harvest	3.5	GH3546X	X	X	X
Golden Harvest	3.7	GH3728X	X	X	X
Golden Harvest	4.2	GH4240X		X	X
Golden Harvest	4.3	GH4307X		X	X
Golden Harvest	4.6	GH4628X			X
NK	3.0	S30-M9X	X	X	
NK	3.3	S33-D7X	X	X	X
NK	3.7	S37-A4X	X	X	X
NK	3.9	S39-G2X	X	X	X
Pioneer	3.3	P33A53X	X	X	X
Pioneer	3.4	P34A79X	X	X	X
Pioneer	3.9	P39A58X			X

### Data collection and analysis

Plots were harvested on November 3 (Yorkville), November 4 (Champaign), and October 10 (Nashville). Grain yield is reported as bushels per acre at 13% moisture in the individual location reports (Tables 6-8). Treatments were arranged in a split-split-plot experimental design, with row spacing (n=2) as the main plots and foliar protection and fertility in the 20 inch row blocks (n=3) as the subplots, with variety (n=26) randomly assigned within each treatment block. Statistical analysis was performed using a linear mixed model approach with PROC MIXED in SAS (version 9.4), and means were separated using Fisher's protected LSD test at the 0.10 level of significance.

**Table 2. Agronomic Treatments.**

Treatment Description	Row Spacing	R3 Foliar Protection <sup>1</sup>	P and S Fertility <sup>2</sup>	K and B Fertility <sup>2</sup>
Standard	30	None	No	No
+ Narrow Rows	20	None	No	No
+ R3 Foliar Protection	20	Yes	No	No
+ P and S Fertility	20	Yes	Yes	No
+ K and B Fertility	20	Yes	Yes	Yes

<sup>1</sup>Miravis Top and Endigo ZC applied at 13.7 and 3.8 oz/acre, respectively.

<sup>2</sup>P & S supplied as MicroEssentials S-10 and K & B as Aspire at planting.

**Table 3. Supplied Nutrients.**

Treatment Description	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	S	B
	pounds acre <sup>-1</sup>				
Standard	-	-	-	-	-
+ Narrow Rows	-	-	-	-	-
+ R3 Foliar Protection	-	-	-	-	-
+ P and S Fertility	12	40	-	10	-
+ K and B Fertility	12	40	60	10	0.5

**Table 4. Preplant Soil Test Levels for Locations in Illinois.**

Location	OM	CEC	pH	P	K	Ca	Mg	S	Zn
	%	Meq/100g		ppm					
Yorkville	5.7	23.6	5.7	50	170	2618	599	12	2.9
Champaign	4.4	25.3	6.8	45	132	3503	760	9	1.5
Nashville	2.4	10	6.4	19	108	1488	124	8	1.2

Soil samples were taken from the 0-6 inch depth before planting and extracted using Mehlich III.

**Table 5.** Weather (Precipitation and Average Temperature) During the Production Season at Yorkville, Champaign, and Nashville, Illinois, in 2020 Compared to the 30-Year Average. Values are from the Illinois State Water Survey.

Month	Yorkville				Champaign				Nashville			
	Precipitation		Temperature		Precipitation		Temperature		Precipitation		Temperature	
	2020	30-Year Average	2020	30-Year Average	2020	30-Year Average	2020	30-Year Average	2020	30-Year Average	2020	30-Year Average
	inches		Fahrenheit		inches		Fahrenheit		inches		Fahrenheit	
April	3.6	3.0	46	49	5.3	3.7	50	53	4.7	4.4	54	56
May	6.1	3.8	58	60	4.7	4.7	61	63	4.3	4.9	64	66
June	3.3	3.8	61	70	5.8	4.4	74	72	4.0	3.9	77	74
July	4.4	3.2	74	72	4.6	4.1	77	75	9.1	3.3	80	77
August	0.9	3.4	58	70	1.3	3.4	73	74	7.5	3.3	75	75
September	5.1	3.0	61	63	2.9	3.1	65	67	0.6	2.9	68	68

**Table 6.** Yield of 26 Soybean Varieties in Response to Increasing Levels of Management at Yorkville, Illinois, in 2020.

Brand	MG	Variety	Yield <sup>1</sup>						
			Average	Standard	Treatments are cumulative from left to right				
					+Narrow rows	+Foliar protection	+P and S fertility	+K and B fertility	
bushels acre <sup>-1</sup>									
Asgrow	2.4	AG24X7	74.0	74.4	64.5	79.9	77.6	72.7	
Asgrow	2.4	AG24X9	67.8	69.5	63.7	66.9	70.9	68.1	
Asgrow	2.5	AG25X9	74.6	73.2	67.7	70.8	79.1	82.4	
Asgrow	2.6	AG26X0	73.7	71.5	72.5	70.4	79.7	74.7	
Asgrow	2.6	AG26X8	70.9	73.1	67.0	71.0	71.6	72.0	
Asgrow	2.7	AG27X0	76.7	75.0	77.4	77.5	74.2	79.5	
Asgrow	3.0	AG30X9	77.4	72.6	76.1	78.5	79.1	80.5	
Asgrow	3.1	AG31X0	70.6	67.8	63.3	69.4	76.5	75.8	
Asgrow	3.3	AG33X0	74.0	68.8	73.7	74.7	80.7	72.0	
Asgrow	3.4	AG34X0	71.2	68.1	69.2	73.7	73.3	71.8	
Asgrow	3.4	AG34X6	75.8	69.4	70.7	77.6	80.2	80.6	
Asgrow	3.4	AG34X9	72.5	68.7	68.1	76.5	75.9	73.4	
Asgrow	3.6	AG36X6	72.9	74.6	70.5	71.7	77.5	69.9	
Asgrow	3.7	AG37X0	70.9	68.2	67.9	73.6	74.0	70.6	
Asgrow	3.8	AG38X8	69.4	69.6	64.2	68.6	73.9	70.6	
Golden Harvest	2.3	GH2329X	69.3	72.0	69.7	66.7	70.8	67.3	
Golden Harvest	2.7	GH2788X	77.6	78.4	70.9	79.2	76.6	82.4	
Golden Harvest	3.1	GH3195X	75.4	72.1	76.2	78.0	78.3	72.2	
Golden Harvest	3.5	GH3546X	84.3	77.7	82.6	87.3	85.3	88.4	
Golden Harvest	3.7	GH3728X	73.8	68.3	69.3	81.8	74.2	75.0	
NK	3.0	S30-M9X	78.0	76.2	80.7	76.7	79.5	77.3	
NK	3.3	S33-D7X	69.7	68.9	66.3	70.5	72.5	70.2	
NK	3.7	S37-A4X	80.8	74.6	79.9	78.8	87.9	83.3	
NK	3.9	S39-G2X	67.4	60.6	65.3	68.4	75.5	67.2	
Pioneer	3.3	P33A53X	76.2	77.5	74.2	75.0	75.7	78.6	
Pioneer	3.4	P34A79X	75.0	75.8	76.2	74.9	75.7	72.2	
<b>LSD (<math>P \leq 0.10</math>)</b>			3.2	6.2	7.4	7.3	7.4	7.0	
<b>Mean</b>			73.8	71.8	71.1	74.5	76.8	75.0	
<b>Range</b>			67.4-84.3	60.6-78.4	63.3-82.6	66.7-87.3	70.8-87.9	67.2-88.4	

<sup>1</sup>Values are presented with 13% moisture.

**Table 7.** Yield of 26 Soybean Varieties in Response to Increasing Levels of Management at Champaign, Illinois, in 2020.

Brand	MG	Variety	Yield <sup>1</sup>					
			Average	Standard	Treatments are cumulative from left to right			
					+Narrow rows	+Foliar protection	+P and S fertility	+K and B fertility
bushels acre <sup>-1</sup>								
Asgrow	3.0	AG30X9	54.7	50.1	52.5	56.1	56.4	58.3
Asgrow	3.1	AG31X0	57.4	55.0	55.6	62.7	55.4	58.4
Asgrow	3.3	AG33X0	62.6	55.0	55.4	68.2	68.6	65.7
Asgrow	3.4	AG34X0	63.3	54.5	56.0	69.4	68.5	68.4
Asgrow	3.4	AG34X6	61.1	48.4	62.6	67.4	60.9	66.3
Asgrow	3.4	AG34X9	59.6	53.1	53.1	65.3	61.5	64.9
Asgrow	3.6	AG36X6	60.0	57.1	56.5	66.9	54.7	65.1
Asgrow	3.7	AG37X0	64.0	57.2	55.6	67.5	73.3	66.6
Asgrow	3.8	AG38X8	55.5	50.1	53.1	59.0	56.7	58.7
Asgrow	3.9	AG39X0	60.0	51.2	54.9	69.3	63.1	61.3
Asgrow	3.9	AG39X7	53.3	49.8	49.7	63.4	50.5	53.0
Asgrow	4.1	AG41X8	55.1	50.5	52.9	58.7	55.0	58.6
Asgrow	4.2	AG42X9	53.1	45.8	54.8	64.3	45.0	55.8
Asgrow	4.3	AG43X0	56.2	50.3	55.6	60.4	54.4	60.2
Golden Harvest	2.7	GH2788X	48.4	44.5	44.8	54.3	45.0	53.4
Golden Harvest	3.1	GH3195X	53.1	45.7	48.2	63.8	51.5	56.3
Golden Harvest	3.5	GH3546X	61.9	52.3	60.9	67.6	64.9	64.1
Golden Harvest	3.7	GH3728X	68.2	60.8	64.8	76.8	72.3	66.5
Golden Harvest	4.2	GH4240X	67.4	55.8	66.2	76.4	66.4	72.1
Golden Harvest	4.3	GH4307X	59.3	56.6	51.6	63.1	68.8	55.9
NK	3.0	S30-M9X	63.3	55.0	61.3	70.9	63.4	66.1
NK	3.3	S33-D7X	56.2	43.9	52.5	67.9	60.7	56.0
NK	3.7	S37-A4X	67.6	58.9	65.1	72.9	73.0	67.9
NK	3.9	S39-G2X	67.2	63.2	65.2	72.3	63.1	72.0
Pioneer	3.3	P33A53X	65.9	57.5	61.5	70.2	68.4	71.9
Pioneer	3.4	P34A79X	61.2	56.1	56.7	63.4	63.4	66.2
<b>LSD (<math>P \leq 0.10</math>)</b>			3.4	6.0	6.5	6.2	8.6	7.8
<b>Mean</b>			59.8	53.0	56.4	66.1	61.0	62.7
<b>Range</b>			48.4-68.2	43.9-63.2	44.8-66.2	54.3-76.8	45.0-73.3	53.0-72.1

<sup>1</sup>Values are presented with 13% moisture.

**Table 8.** Yield of 26 Soybean Varieties in Response to Increasing Levels of Management at Nashville, Illinois, in 2020.

Brand	MG	Variety	Yield <sup>1</sup>					
			Average	Standard	Treatments are cumulative from left to right			
					+Narrow rows	+Foliar protection	+P and S fertility	+K and B fertility
bushels acre <sup>-1</sup>								
Asgrow	3.3	AG33X0	65.3	52.3	64.9	72.0	68.8	68.5
Asgrow	3.4	AG34X0	66.8	65.8	62.4	68.0	69.9	66.8
Asgrow	3.4	AG34X6	65.9	57.0	64.6	68.7	69.9	69.1
Asgrow	3.4	AG34X9	65.4	57.2	62.9	69.6	67.9	68.7
Asgrow	3.6	AG36X6	70.9	62.5	70.8	76.1	71.6	73.3
Asgrow	3.7	AG37X0	69.7	68.0	62.8	75.8	74.1	68.0
Asgrow	3.8	AG38X8	65.8	63.0	64.9	67.1	67.6	66.4
Asgrow	3.9	AG39X0	72.1	64.9	71.7	75.1	74.1	75.0
Asgrow	4.1	AG41X8	65.4	59.4	66.9	68.5	65.3	67.0
Asgrow	4.2	AG42X9	70.9	66.1	68.6	74.3	72.9	72.5
Asgrow	4.3	AG43X0	67.3	62.3	63.2	71.0	70.2	69.6
Asgrow	4.6	AG46X0	70.2	61.5	67.5	76.1	71.7	74.4
Asgrow	4.6	AG46X6	72.1	62.6	70.7	77.3	77.7	76.1
Asgrow	4.8	AG48X9	68.2	62.5	66.6	74.1	70.1	70.9
Golden Harvest	3.1	GH3195X	63.4	56.2	65.1	67.7	61.5	66.6
Golden Harvest	3.5	GH3546X	69.0	61.5	69.2	73.2	73.5	71.2
Golden Harvest	3.7	GH3728X	72.0	65.2	70.4	74.5	74.5	75.5
Golden Harvest	4.2	GH4240X	73.8	68.1	69.6	78.6	77.5	79.0
Golden Harvest	4.3	GH4307X	70.5	62.9	68.9	72.9	74.5	73.4
Golden Harvest	4.6	GH4628X	71.5	64.7	69.9	75.4	75.0	72.6
NK	3.3	S33-D7X	63.2	56.6	62.4	67.8	66.1	63.1
NK	3.7	S37-A4X	70.4	65.1	67.3	75.6	73.4	70.5
NK	3.9	S39-G2X	76.9	67.5	75.5	81.6	76.0	83.9
Pioneer	3.3	P33A53X	65.0	60.9	63.3	66.5	70.0	67.6
Pioneer	3.4	P34A79X	70.9	64.2	69.4	72.7	73.4	74.4
Pioneer	3.9	P39A58X	72.8	60.8	69.9	77.2	78.1	77.6
<b>LSD (<math>P \leq 0.10</math>)</b>			2.7	5.0	5.2	5.2	5.7	5.8
<b>Mean</b>			69.1	62.2	67.3	73.0	71.7	71.6
<b>Range</b>			65.3-76.9	52.3-68.1	62.4-75.5	66.5-81.6	61.5-78.1	63.1-83.9

<sup>1</sup>Values are presented with 13% moisture.