

2020 Illinois Corn Management Yield Potential Trial

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The Illinois Corn Management Yield Potential Trial is conducted to help understand the interactions between commercial corn hybrids and different agronomic management factors to maximize corn productivity. Our goal is to provide information for a hybrid's management yield potential that can help farmers and agronomists better select hybrids for an intended level of crop management.

Research approach

In our research approach, hybrids with above average yield responses to intensive agronomic management [i.e. supplemental in-season nitrogen (N), broadcast or banded fertilizer, fungicide, high plant density, and/or narrow row spacing] are considered responsive hybrids, which we expect would have remarkable yield potential when managed appropriately. On the contrary, hybrids demonstrating exceptional yield under standard management conditions or minimal response to intensive agronomic management are considered optimal for a non-intensive management system.

Trial implementation

In 2020, the trial was planted using a precision plot planter with variable rate capability (SeedPro 360, ALMACO, Nevada, IA) at Yorkville, IL (41°36'32"N, 88°22'44"W; 5 June), Champaign, IL (40°03'05"N, 88°14'03"W; 31 May), and Nashville, IL (38°19'04"N, 88°20'10"W; 8 June). Plots were 17.5 feet in length and either two 30-inch or four 20-inch rows in width. Force 3G insecticide was applied at planting for below-ground insect protection and preplant applications of Acuron (3 qt/acre) and Atrazine (20 oz/acre) were used for weed control. Additionally, the trial area at each site received 160 lbs N/acre as UAN (32-0-0) broadcast applied and incorporated prior to planting.

How hybrids were tested

The 56 commercial corn hybrids (36 at each location) listed in Table 1 were assessed for their responses to the different agronomic management levels outlined in Table 2. Hybrids received either all their N preplant with no supplemental sidedress N or the preplant application plus an additional 60 lbs N/acre as UAN-32 applied mid-row with a coulters on 26 June, 2 July, and 6 July in Champaign, Yorkville, and Nashville, respectively. Hybrids received either no P and K fertilizer or MicroEssentials SZ (12-40-0-10S-1Zn) and Potash (0-0-60) applied either broadcast incorporated prior to planting or banded 4-6" beneath the future crop row. Nutrients applied for each treatment level are totaled in Table 3. Miravis Neo (13.7 oz/acre; Syngenta) and Warrior II (1.6 oz/acre; Syngenta) was applied at VT/RI (pollination stage) to assess hybrids for their responses to foliar protection. Fungicide/insecticide spray dates were 31 July, 4 August, and 5 August at Champaign, Nashville, and Yorkville respectively. Hybrids were planted at 36,000 or 44,000 plants/acre and in 30- or 20-inch row arrangements to assess their tolerance to increased crowding stress and narrowing row spacing. Lastly, because hybrid performance can largely be controlled by environmental factors, hybrids were planted across three sites in Illinois representing a wide range in inherent soil fertility levels (Table 4).

Growing conditions

Although not as challenging as 2019, the 2020 growing season experienced its own obstacles including another late spring, wet and dry spells, and a derecho across the northern part of our state. 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 3rd followed by two weeks of dry weather. Similarly, the first two weeks of July in Champaign were dry except for a sever storm on July 11th 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 a moderate drought in Yorkville.

Nashville remained far wetter than normal in July and August (Table 5). The wet and warm conditions experienced in Nashville favored severe development of southern rust disease (caused by the fungus *Puccinia polysora*). Conversely, September was very dry in Nashville (Table 5), resulting in abnormally dry conditions finishing out the season.

The most notable weather event during 2020 was the derecho experienced in parts of Iowa and Illinois on August 10th. This weather system brought very strong straight-line winds to the Yorkville research site, resulting in some crop damage. Hybrids that were most susceptible to green snap were removed from analysis.

Data collection and analysis

At maturity, plots were harvested with a two-row plot combine and grain yield was reported as bushels/acre at 15.5% moisture in individual location reports (Tables 6-8). The percentage of erect plants at the time of harvest were considered the proportion of total plants not leaning at an angle more than 45 degrees or broken below the ear. The experimental design was a strip-plot with a split-plot arrangement in four randomized complete blocks within each environment. Statistical analysis was performed using a linear mixed model approach with PROC MIXED in SAS (version 9.4; SAS Institute, Cary, NC) and means were separated using Fisher's protected LSD test at the 0.10 level of significance. The normalities of residuals were assessed using PROC UNIVARIATE and the assumption of homoscedasticity was tested using the Brown-Forsythe modification of the Levene Test in PROC GLM.

Table 1. Hybrid Entries and Distribution (1 of 2)

Brand	RM	Hybrid	Yorkville	Champaign	Nashville
Channel	109	209-06STXRIB	X	X	X
Channel	112	212-04STXRIB	X	X	X
Channel	114	214-22STXRIB	X	X	X
Dekalb	108	DKC58-64RIB	X		
Dekalb	109	DKC59-81RIB	X		
Dekalb	109	DKC59-82RIB		X	
Dekalb	110	DKC60-80RIB	X	X	
Dekalb	111	DKC61-40RIB	X		
Dekalb	111	DKC61-41RIB		X	X
Dekalb	112	DKC62-52RIB			
Dekalb	112	DKC62-53RIB			X
Dekalb	113	DKC63-57RIB	X	X	X
Dekalb	113	DKC63-90RIB	X		
Dekalb	113	DKC63-91RIB		X	X
Dekalb	114	DKC64-34RIB	X	X	
Dekalb	114	DKC64-35RIB			X
Dekalb	114	DKC64-64RIB	X	X	X
Dekalb	115	DKC65-94RIB	X		
Dekalb	115	DKC65-95RIB		X	X
Dekalb	116	DKC66-17RIB	X		
Dekalb	116	DKC66-18RIB		X	X
Dekalb	117	DKC67-37RIB			X
Dekalb	120	DKC70-27RIB		X	X
Golden Harvest	105	G05K08-5122A	X		
Golden Harvest	106	G06Q68-5222	X		
Golden Harvest	108	G08D29-5122A	X	X	X
Golden Harvest	109	G09A86-3000GT	X	X	X
Golden Harvest	110	G10D21-3330	X	X	X
Golden Harvest	110	G10T63-3122	X	X	X
Golden Harvest	111	G11V76-5122	X	X	X
Golden Harvest	112	G12S75-5122	X	X	X
Golden Harvest	112	G12U17-3010		X	
Golden Harvest	112	G12U17-3120	X		
Golden Harvest	113	G13H15-3120	X	X	X
Golden Harvest	113	G13M88-3110			X
Golden Harvest	113	G13T41-5122		X	
Golden Harvest	114	G14N11-5222	X	X	X
Golden Harvest	115	G15J91-3220	X	X	X
Golden Harvest	115	G15L32-5222	X	X	X
Golden Harvest	118	G18D87-3111			X
NK	108	NK0886-5122	X	X	X
NK	110	NK1082-5222A	X	X	X
NK	113	NK1354-5222	X	X	X

Table 1 Continued. Hybrid Entries and Distribution (2 of 2)

Brand	RM	Hybrid	Yorkville	Champaign	Nashville
Pioneer	110	P1055Q	X		
Pioneer	110	P1077AM		X	X
Pioneer	110	P1099Q	X	X	
Pioneer	111	P1108Q	X	X	
Pioneer	112	P1298AM		X	X
Pioneer	113	P1353Q	X		
Pioneer	114	P1464AML			X
Pioneer	115	P1587Q			X
Pioneer	115	P1563AM		X	
Stone	106	0621SS	X		
Stone	109	0931SS	X	X	X
Stone	110	6078RIB	X	X	X
Stone	115	1521SS		X	X

Table 2. Agronomic Treatments

Treatment Description	N rate ¹ (lbs/ac)	Fertility ²	Foliar Protection ³	Population (plants/ac)	Row Spacing
Standard	160	None	None	36,000	30
+N Sidedress	160+60	None	None	36,000	30
+Broadcast Fertility	160+60	Broadcast	None	36,000	30
+Banded Fertility	160+60	Banded	None	36,000	30
+Foliar Protection	160+60	Banded	Yes	36,000	30
+High Population	160+60	Banded	Yes	44,000	30
+Narrow Rows	160+60	Banded	Yes	44,000	20

¹UAN-32 broadcast incorporated preplant + sidedress mid-row at the V6 growth stage.
²200 lbs/ac MicroEssentials SZ and 100 lbs/ac Potash [24 N, 80 P₂O₅, 60 K₂O, 20 S, and 2 Zn (lbs/ac)] broadcast applied or banded beneath the future crop row.
³Miravis Neo fungicide (13.7 oz/ac) and Warrior II insecticide (1.6 oz/ac) applied with 6.4 oz/acre Masterlock at flowering (VT/R1).

Table 3. Supplied Nutrients

Treatment Description	N	P ₂ O ₅	K ₂ O	S	Zn
	----- lbs/acre -----				
Standard	160	0	0	0	0
+N Sidedress	220	0	0	0	0
+Broadcast Fertility	244	80	60	20	2
+Banded Fertility	244	80	60	20	2
+Foliar Protection	244	80	60	20	2
+High Population	244	80	60	20	2
+Narrow Rows	244	80	60	20	2

Table 4. Soil Test Levels

Location	OM	CEC	pH	P	K	Ca	Mg	S	Zn
	%	Meq/100g				----- ppm -----			
Yorkville	5.5	21.6	6.6	203	126	2811	680	12	9.3
Champaign	3.3	17.4	6.5	14	102	2275	469	10	1.0
Nashville	2.0	9.6	7.2	32	88	1706	97	11	1.6

Soil samples taken from the 1-6 inch depth prior to planting and extracted using Mehlich III.

Table 5. Weather Summary

Month	Precipitation (inches)		Temperature (°F)	
	2020	Normal ¹	2020	Normal
Nashville				
April	4.7	4.4	54	56
May	4.3	4.9	64	66
June	4.0	3.9	77	74
July	9.1	3.3	80	77
August	7.5	3.3	75	75
September	0.6	2.9	68	67
Champaign				
April	5.3	3.7	50	53
May	4.7	4.7	61	63
June	5.8	4.4	74	72
July	4.6	4.1	77	75
August	1.3	3.4	73	74
September	2.9	3.1	65	67
Yorkville				
April	3.6	3.0	46	49
May	6.1	3.8	58	60
June	3.3	3.8	61	70
July	4.4	3.2	74	72
August	0.9	3.4	58	70
September	5.1	3.0	61	63

¹Monthly total precipitation and average temperature during the production season at Nashville, Champaign, and Yorkville, IL in 2020 compared to the 30-year average (Normal). Values obtained from the Illinois State Water Survey

Table 6. Yorkville, IL Hybrid Performances

Brand	RM	Hybrid	Average Performance ¹			Yields (bu/acre) ²						
			Moisture (%)	Erect (%)	Yield (bu/acre)	Standard	+N sidedress	+ Broadcast fertility	+Banded fertility	+Foliar protection	+High population	+Narrow rows
Channel	109	209-06STXRIB	17.2	80	202	216	223	221	205	189	187	174
Channel	112	212-04STXRIB	20.5	81	187	166	206	181	172	196	205	192
Channel	114	214-22STXRIB	21.0	91	215	196	204	227	209	220	235	217
Dekalb	108	DKC58-64RIB	17.8	88	218	216	218	209	238	213	221	213
Dekalb	109	DKC59-81RIB	19.5	92	216	225	225	225	220	210	213	196
Dekalb	110	DKC60-80RIB	21.0	80	195	190	198	238	189	207	186	157
Dekalb	111	DKC61-40RIB	19.5	89	216	207	220	227	214	217	213	214
Dekalb	113	DKC63-57RIB	20.7	85	190	200	191	191	175	205	209	157
Dekalb	113	DKC63-90RIB	20.1	89	233	227	237	234	231	241	236	223
Dekalb	114	DKC64-64RIB	21.1	91	212	205	210	225	224	210	199	211
Dekalb	115	DKC65-94RIB	21.7	87	198	194	213	195	206	192	192	195
Dekalb	116	DKC66-17RIB	22.3	88	200	190	191	196	203	187	210	219
Golden Harvest	105	G05K08-5122A	16.7	88	185	190	195	186	181	193	192	160
Golden Harvest	106	G06Q68-5222	17.5	95	187	177	180	183	181	203	174	214
Golden Harvest	109	G09A86-3000GT	18.9	81	191	188	201	182	204	192	211	164
Golden Harvest	110	G10D21-3330	20.0	87	206	215	208	206	202	193	206	215
Golden Harvest	111	G11V76-5122	21.5	92	201	193	195	207	205	207	190	209
Golden Harvest	112	G12S75-5122	23.5	86	176	184	181	193	171	182	166	156
Golden Harvest	112	G12U17-3120	23.3	83	184	183	195	182	181	177	180	190
Golden Harvest	113	G13H15-3120	22.1	93	231	235	230	227	235	232	232	229
Golden Harvest	114	G14N11-5222	21.0	94	209	214	213	221	217	188	195	221
Golden Harvest	115	G15J91-3220	25.7	94	205	213	187	215	200	216	216	190
Golden Harvest	115	G15L32-5222	23.7	87	191	183	179	200	186	200	192	198
NK	108	NK0886-5122	19.5	88	209	189	199	199	208	217	241	211
NK	110	NK1082-5222A	20.4	91	230	230	227	237	236	238	226	218
NK	113	NK1354-5222	24.2	91	198	197	201	198	180	216	207	189
Pioneer	110	P1055Q	21.4	92	227	207	225	224	215	242	245	234
Pioneer	110	P1099Q	21.9	95	223	219	235	213	242	245	205	213
Pioneer	111	P1108Q	20.8	93	217	221	225	222	220	223	208	202
Pioneer	113	P1353Q	24.0	97	199	197	202	221	212	189	178	193
Stone	106	0621SS	18.3	92	212	223	219	200	196	226	227	196
Stone	109	0931SS	20.6	93	216	223	235	209	210	224	204	209
Stone	110	6078RIB	21.4	92	216	224	236	219	216	216	212	192
LSD ($P \leq 0.10$)			0.6	4	11	22	22	22	22	22	24	24
Mean			20.9	89	206	204	209	209	205	209	206	199
Range			16.7-25.7	80-97	176-233	166-235	179-237	181-238	171-242	177-245	166-245	156-234

¹Average Moisture, Erect, and Yield across six agronomic management treatments.

²Values are the average of four replications.

Table 7. Champaign, IL Hybrid Performances

Brand	RM	Hybrid	Average Performance ¹			Yields (bu/acre) ²						
			Moisture (%)	Erect (%)	Yield (bu/acre)	Standard	+N sidedress	+ Broadcast fertility	+Banded fertility	+Foliar protection	+High population	+Narrow rows
Channel	109	209-06STXRIB	15.8	90	179	167	171	176	149	192	195	203
Channel	112	212-04STXRIB	19.4	92	212	207	207	212	199	211	229	220
Channel	114	214-22STXRIB	20.6	95	217	195	218	216	213	221	224	231
Dekalb	109	DKC59-82RIB	16.6	92	204	197	208	201	201	212	211	195
Dekalb	110	DKC60-80RIB	17.8	93	208	196	206	211	195	219	217	211
Dekalb	111	DKC61-41RIB	16.3	93	204	190	191	201	191	199	224	234
Dekalb	113	DKC63-57RIB	18.4	94	217	195	220	208	211	227	230	225
Dekalb	113	DKC63-91RIB	17.9	91	210	197	210	217	184	205	214	238
Dekalb	114	DKC64-34RIB	22.2	97	217	193	218	223	208	211	230	234
Dekalb	114	DKC64-64RIB	20.2	95	216	197	206	218	204	206	223	260
Dekalb	115	DKC65-95RIB	20.8	96	202	179	196	210	189	215	215	216
Dekalb	116	DKC66-18RIB	19.9	91	199	188	199	202	194	189	213	206
Dekalb	120	DKC70-27RIB	23.7	92	217	189	209	217	223	216	234	229
Golden Harvest	108	G08D29-5122A	17.2	88	199	174	194	196	185	199	205	239
Golden Harvest	109	G09A86-3000GT	15.8	95	188	173	189	198	180	185	193	201
Golden Harvest	110	G10D21-3330	17.7	95	204	201	197	194	193	207	212	225
Golden Harvest	110	G10T63-3122	19.4	95	208	211	209	201	203	215	214	207
Golden Harvest	111	G11V76-5122	19.2	97	201	189	181	185	189	217	229	221
Golden Harvest	112	G12S75-5122	19.6	97	211	197	190	192	190	229	244	235
Golden Harvest	112	G12U17-3010	16.8	95	209	178	196	197	196	227	230	239
Golden Harvest	113	G13H15-3120	19.3	95	209	180	195	202	198	218	227	241
Golden Harvest	113	G13T41-5122	19.7	99	214	190	202	208	215	225	239	219
Golden Harvest	114	G14N11-5222	17.7	91	182	182	168	176	181	174	193	202
Golden Harvest	115	G15J91-3220	22.5	97	214	189	202	208	200	223	227	253
Golden Harvest	115	G15L32-5222	21.2	97	219	193	202	216	219	226	236	240
NK	108	NK0886-5122	17.4	95	195	178	182	196	182	212	201	212
NK	110	NK1082-5222A	17.8	94	216	196	208	211	192	227	222	257
NK	113	NK1354-5222	19.2	99	205	199	195	188	188	204	230	229
Pioneer	110	P1077AM	18.4	96	217	219	231	227	219	215	223	194
Pioneer	110	P1099Q	18.5	94	220	194	207	217	199	230	237	246
Pioneer	111	P1108Q	20.1	95	196	173	190	190	183	201	206	236
Pioneer	112	P1298AM	19.9	99	217	187	193	222	217	228	242	230
Pioneer	115	P1563AM	20.6	97	227	208	217	236	239	228	237	226
Stone	109	0931SS	18.2	95	203	183	191	198	210	210	228	203
Stone	110	6078RIB	18.9	91	194	183	194	189	186	195	212	203
Stone	115	1521SS	21.4	98	216	195	194	206	210	213	240	250
LSD (P ≤ 0.10)			0.6	2	9	15	15	15	15	15	14	14
Mean			19.1	95	207	191	200	205	198	212	222	225
Range			15.8-23.7	88-99	179-227	167-219	168-231	176-236	149-239	174-230	193-244	194-260

¹Average Moisture, Erect, and Yield across seven additive levels of agronomic management.

²Values are the average of four replications.

Table 8. Nashville, IL Hybrid Performances

Brand	RM	Hybrid	Average Performance ¹			Yields (bu/acre) ²						
			Moisture (%)	Erect (%)	Yield (bu/acre)	Standard	+N sidedress	+ Broadcast fertility	+Banded fertility	+Foliar protection	+High population	+Narrow rows
Channel	109	209-06STXRIB	13.3	99	169	151	163	158	148	174	177	212
Channel	112	212-04STXRIB	14.4	98	178	158	165	160	158	178	185	239
Channel	114	214-22STXRIB	16.0	99	184	165	160	167	168	191	198	240
Dekalb	111	DKC61-41RIB	13.1	96	164	155	150	150	155	160	163	214
Dekalb	112	DKC62-53RIB	15.0	97	170	162	151	158	154	179	169	218
Dekalb	113	DKC63-57RIB	16.0	97	194	196	198	191	178	180	182	233
Dekalb	113	DKC63-91RIB	13.1	97	170	163	169	160	148	161	159	232
Dekalb	114	DKC64-35RIB	20.4	96	193	174	175	181	184	209	205	221
Dekalb	114	DKC64-64RIB	14.9	98	175	153	155	152	156	182	197	229
Dekalb	115	DKC65-95RIB	17.5	99	193	175	180	181	188	184	186	259
Dekalb	116	DKC66-18RIB	16.7	99	197	179	178	178	183	206	212	244
Dekalb	117	DKC67-37RIB	20.9	99	220	219	225	216	213	213	205	251
Dekalb	120	DKC70-27RIB	21.2	100	225	200	208	206	215	232	237	279
Golden Harvest	108	G08D29-5122A	14.8	97	177	137	151	156	165	205	205	216
Golden Harvest	109	G09A86-3000GT	13.4	97	187	172	164	172	171	208	204	219
Golden Harvest	110	G10D21-3330	14.0	99	188	176	172	171	174	206	200	220
Golden Harvest	110	G10T63-3122	14.8	98	200	192	179	178	170	214	218	253
Golden Harvest	111	G11V76-5122	15.3	99	159	142	149	150	150	155	147	218
Golden Harvest	112	G12S75-5122	14.5	97	181	167	176	172	161	183	185	221
Golden Harvest	113	G13H15-3120	15.7	99	201	171	185	181	185	205	212	270
Golden Harvest	113	G13M88-3110	15.8	99	191	180	174	168	170	205	202	243
Golden Harvest	114	G14N11-5222	15.1	98	192	167	172	172	171	213	210	237
Golden Harvest	115	G15J91-3220	16.3	99	180	169	162	165	167	191	179	227
Golden Harvest	115	G15L32-5222	16.9	99	202	179	189	193	182	215	214	243
Golden Harvest	118	G18D87-3111	18.9	96	206	183	188	185	175	230	236	243
NK	108	NK0886-5122	15.1	99	189	171	173	170	184	202	209	217
NK	110	NK1082-5222A	16.3	99	214	196	193	190	193	221	247	257
NK	113	NK1354-5222	15.4	98	183	176	160	170	174	184	187	228
Pioneer	110	P1077AM	15.3	99	193	178	176	181	183	191	194	248
Pioneer	112	P1298AM	16.9	99	194	165	171	167	168	221	213	260
Pioneer	114	P1464AML	16.9	98	185	162	169	161	165	215	208	216
Pioneer	115	P1587Q	17.2	100	209	192	190	192	193	233	226	238
Stone	109	0931SS	13.9	98	155	134	129	125	134	169	185	209
Stone	110	6078RIB	15.9	98	198	182	202	184	178	209	203	228
Stone	115	1521SS	17.1	99	194	174	180	182	179	194	204	248
LSD ($P \leq 0.10$)			0.8	1	9	15	15	15	15	16	19	19
Mean			15.9	98	189	172	174	173	172	198	199	235
Range			13.1-21.2	96-100	155-225	134-219	129-225	125-216	134-215	155-233	147-247	209-279

¹Average Moisture, Erect, and Yield across seven additive levels of agronomic management.

²Values are the average of four replications

