

2021 Illinois Corn Management Yield Potential - Initial Report

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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 much greater yields when managed appropriately. On the contrary, hybrids demonstrating exceptional yield under standard management conditions or a minimal response to intensive agronomic management are considered optimal for a non-intensive management system.

Trial implementation

In 2021, three field trials were planted using a precision plot planter with variable rate capability (SeedPro 360, ALMACO, Nevada, IA) at Nashville, IL (38°19'17"N, 89°20'15"W; 22 April), Champaign, IL (40°03'50"N, 88°14'11"W; 27 April), and Yorkville, IL (41°35'02"N, 88°24'34"W; 6 May). Soybean was the previous crop and tillage practices consisted of conventional deep ripping followed by field cultivation. Plots were 17.5 feet in length and either two 30-inch or four 20-inch rows in width. At planting, Force 3G soil insecticide was applied in-furrow for below-ground insect protection. 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 before planting.

How hybrids were tested

The 43 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 coulter on 1 June, 4 June, and 8 June at Nashville, Champaign, and Yorkville, 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 before planting or banded 4-6" beneath the future crop row. Nutrient totals supplied for each treatment level are listed in Table 3. Miravis Neo (13.7 oz/acre; Syngenta) and Warrior II (1.6 oz/acre; Syngenta) were applied at VT/RI (pollination stage) to assess hybrids for their responses to foliar protection. Fungicide/insecticide spray dates were 7 July, 9 July, and 20 July at Nashville, Champaign, 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 narrower row spacing. Lastly, because hybrid performance is largely controlled by environmental factors, hybrids were planted across three sites in Illinois representing a wide range in inherent soil fertility levels and weather conditions (Tables 4-5).

Data collection and analysis

At maturity, plots were harvested with a two-row plot combine and grain yield is reported as bushels/acre at 15.5% moisture in individual location reports (Tables 6-8). 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 in 2021

Brand	RM	Hybrid	Nashville	Champaign	Yorkville
DEKALB	107	DKC57-71RIB	X	X	X
DEKALB	111	DKC61-40RIB			X
DEKALB	111	DKC61-41RIB	X	X	
DEKALB	112	DKC62-69RIB			X
DEKALB	112	DKC62-70RIB	X	X	
DEKALB	112	DKC62-89RIB	X	X	X
DEKALB	113	DKC63-57RIB	X	X	X
DEKALB	113	DKC63-90RIB	X	X	X
DEKALB	113	DKC63-91RIB	X	X	X
DEKALB	114	DKC64-34RIB	X	X	X
DEKALB	114	DKC64-64RIB	X	X	X
DEKALB	114	DKC64-65RIB	X	X	X
DEKALB	115	DKC65-84RIB	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	X	X
DEKALB	117	DKC67-94RIB	X	X	X
DEKALB	120	DKC70-27RIB	X	X	X
Golden Harvest	103	G03B96-5122			X
Golden Harvest	107	G07G73-5122	X	X	X
Golden Harvest	108	G08R52-3220	X	X	X
Golden Harvest	110	G10D21-3330	X	X	X
Golden Harvest	110	G10L16-5222A	X	X	X
Golden Harvest	111	G11V76-5122	X	X	X
Golden Harvest	112	G12S75-5122	X	X	X
Golden Harvest	113	G13D55-3220	X	X	X
Golden Harvest	113	G13P84-3120	X	X	X
Golden Harvest	113	G13Z50-5222	X	X	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	116	G16Q82-5222A	X	X	
NK	107	NK0748-5122	X	X	X
NK	110	NK1026-5332	X	X	X
NK	116	NK1661-5222A	X	X	X
Stone	105	0512SS			X
Stone	111	1122SS		X	X
Stone	111	1132TRE	X	X	X
Stone	113	1332SS	X	X	X
Stone	115	1512TRE	X	X	
Stone	118	1812DP	X		

Table 2. Sequential 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 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 4-6" 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 in 2021

Location	OM	CEC	pH	P	K	Ca	Mg	S	Zn
	%	Meq/100g				----- ppm -----			
Nashville	1.7	8.4	6.2	16	65	1235	99	6	1.0
Champaign	3.8	15.5	6.8	27	111	2097	495	7	2.5
Yorkville	5.9	23.1	6.9	55	158	3171	769	9	14.1

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)	
	2021	Normal ¹	2021	Normal
Nashville				
April	4.5	4.4	57	56
May	4.1	4.9	64	66
June	2.8	3.9	77	74
July	9.8	3.3	77	77
August	3.1	3.3	78	75
September		2.9		67
Champaign				
April	2.1	3.7	53	53
May	3.4	4.7	61	63
June	7.6	4.4	75	72
July	4.2	4.1	74	75
August	4.1	3.4	76	74
September		3.1	65	
Yorkville				
April	1.9	3.0	50	49
May	3.4	3.8	59	60
June	6.6	3.8	73	70
July	2.7	3.2	71	72
August	1.1	3.4	72	70
September		3.0		63

¹Monthly total precipitation and average temperature during the production season at Nashville, Champaign, and Yorkville, IL in 2021 compared to the 30-year average (Normal). Values were obtained from the Illinois State Water Survey.

The Yorkville site experienced extreme storm damage in 2021, and was not harvest-able.

Table 6. Nashville, IL Hybrid Performances in response to Sequential Agronomic Management Increases in 2021.

Brand	RM	Hybrid	Average Performance ¹		Treatment Yields (bu/acre) ²						
			Moisture (%)	Yield (bu/acre)	Standard	+N sidedress	+ Broadcast fertility	+Banded fertility	+Foliar protection	+High population	+Narrow rows
DEKALB	107	DKC57-71RIB	14.0	302	286	289	293	293	309	316	324
DEKALB	111	DKC61-41RIB	14.6	317	303	298	313	302	327	340	333
DEKALB	112	DKC62-70RIB	19.1	318	304	302	321	310	330	337	325
DEKALB	112	DKC62-89RIB	16.4	308	285	293	294	300	319	335	334
DEKALB	113	DKC63-57RIB	16.6	313	290	295	307	297	318	325	355
DEKALB	113	DKC63-90RIB	14.2	306	294	295	300	297	308	319	331
DEKALB	113	DKC63-91RIB	14.3	306	295	279	306	301	317	309	336
DEKALB	114	DKC64-34RIB	17.9	323	305	317	328	317	321	337	332
DEKALB	114	DKC64-64RIB	15.7	311	299	292	300	296	318	335	338
DEKALB	114	DKC64-65RIB	15.6	308	293	283	299	297	322	321	340
DEKALB	115	DKC65-84RIB	17.2	317	302	305	314	312	323	326	339
DEKALB	115	DKC65-95RIB	17.6	321	302	318	313	316	330	331	333
DEKALB	116	DKC66-18RIB	16.9	320	313	306	310	320	315	330	340
DEKALB	117	DKC67-37RIB	18.7	325	315	309	319	320	319	341	353
DEKALB	117	DKC67-94RIB	17.9	319	301	295	321	315	327	330	342
DEKALB	120	DKC70-27RIB	20.0	336	315	334	335	326	338	342	360
Golden Harvest	107	G07G73-5122	13.8	291	277	283	286	288	297	306	304
Golden Harvest	108	G08R52-3220	15.8	282	270	272	271	267	288	304	303
Golden Harvest	110	G10D21-3330	15.1	305	290	299	301	297	303	317	328
Golden Harvest	110	G10L16-5222A	14.8	302	277	291	297	305	309	304	334
Golden Harvest	111	G11V76-5122	15.8	295	272	284	283	285	315	306	319
Golden Harvest	112	G12S75-5122	15.3	311	294	298	305	309	314	323	333
Golden Harvest	113	G13D55-3220	17.3	291	292	292	286	288	296	290	304
Golden Harvest	113	G13P84-3120	16.8	287	270	276	277	283	287	309	307
Golden Harvest	113	G13Z50-5222	16.4	283	260	264	271	274	292	299	320
Golden Harvest	114	G14N11-5222	15.5	281	272	256	280	268	283	293	316
Golden Harvest	115	G15J91-3220	17.4	300	290	282	288	304	305	312	323
Golden Harvest	115	G15L32-5222	16.7	307	293	295	308	297	316	325	313
Golden Harvest	116	G16Q82-5222A	19.2	295	280	280	295	286	299	312	314
NK	107	NK0748-5122	13.9	288	272	266	285	282	280	309	323
NK	110	NK1026-5332	15.3	294	282	284	288	286	293	306	322
NK	116	NK1661-5222A	19.6	294	285	281	295	287	302	302	304
Stone	111	1132TRE	14.9	322	313	319	308	319	327	331	335
Stone	113	1332SS	17.5	326	311	317	321	316	317	344	352
Stone	115	1512TRE	18.7	311	291	296	302	301	316	332	339
Stone	118	1812DP	16.2	342	330	320	341	336	345	357	363
LSD ($P \leq 0.10$)			0.5	6	9	9	9	9	9	10	13
Mean			16.5	307	292	293	302	300	312	321	330
Range			13.8-20.0	281-342	260-330	256-334	271-341	267-336	280-345	290-357	303-363

¹Average moisture and yield across seven additive levels of agronomic management.

²Values are the average of four replications

Table 7. Champaign, IL Hybrid Performances in response to Sequential Agronomic Management Increases in 2021.

Brand	RM	Hybrid	Average performance ¹		Treatment yields (bu/acre) ²						
			Moisture (%)	Yield (bu/acre)	Standard	+N sidedress	+ Broadcast fertility	+Banded fertility	+Foliar protection	+High population	+Narrow rows
DEKALB	107	DKC57-71RIB	11.7	279	269	282	274	271	284	270	302
DEKALB	111	DKC61-41RIB	12.2	281	261	265	272	266	287	288	329
DEKALB	112	DKC62-70RIB	14.1	266	258	249	265	269	285	243	293
DEKALB	112	DKC62-89RIB	14.3	270	254	257	265	250	301	267	296
DEKALB	113	DKC63-57RIB	14.8	277	276	260	254	256	292	291	312
DEKALB	113	DKC63-90RIB	13.7	284	257	262	282	273	306	287	324
DEKALB	113	DKC63-91RIB	12.6	273	279	264	267	258	264	264	313
DEKALB	114	DKC64-34RIB	18.3	308	299	291	312	308	304	333	306
DEKALB	114	DKC64-64RIB	14.3	264	256	261	255	234	275	273	299
DEKALB	114	DKC64-65RIB	12.7	260	247	244	259	262	273	244	292
DEKALB	115	DKC65-84RIB	15.7	290	285	281	289	288	292	297	301
DEKALB	115	DKC65-95RIB	16.0	285	274	285	271	273	294	285	315
DEKALB	116	DKC66-18RIB	15.2	283	258	262	278	282	291	290	321
DEKALB	117	DKC67-37RIB	19.3	305	283	290	294	301	313	323	330
DEKALB	117	DKC67-94RIB	16.8	282	268	265	264	272	287	285	321
DEKALB	120	DKC70-27RIB	21.0	318	307	312	317	318	311	339	322
Golden Harvest	107	G07G73-5122	14.1	287	275	269	287	279	290	296	313
Golden Harvest	108	G08R52-3220	14.4	256	257	245	248	251	258	258	276
Golden Harvest	110	G10D21-3330	13.7	287	281	281	274	283	296	293	304
Golden Harvest	110	G10L16-5222A	14.3	296	297	285	286	299	301	305	297
Golden Harvest	111	G11V76-5122	15.6	293	284	290	289	290	297	296	307
Golden Harvest	112	G12S75-5122	17.3	302	289	286	291	311	311	303	320
Golden Harvest	113	G13D55-3220	17.3	284	271	280	286	283	310	273	284
Golden Harvest	113	G13P84-3120	19.0	284	274	266	278	286	282	288	314
Golden Harvest	113	G13Z50-5222	15.6	281	279	260	266	262	301	283	317
Golden Harvest	114	G14N11-5222	15.4	262	260	245	250	262	262	247	311
Golden Harvest	115	G15J91-3220	18.5	294	277	282	292	285	296	311	316
Golden Harvest	115	G15L32-5222	18.0	293	275	268	286	289	309	295	330
Golden Harvest	116	G16Q82-5222A	20.7	290	283	280	282	278	292	304	312
NK	107	NK0748-5122	14.2	274	268	255	267	273	271	280	305
NK	110	NK1026-5332	15.0	281	265	278	271	280	281	272	317
NK	116	NK1661-5222A	20.9	290	280	280	288	285	289	308	297
Stone	111	1122SS	13.6	281	283	284	272	268	277	267	310
Stone	113	1132TRE	12.7	279	263	262	274	285	292	274	303
Stone	113	1332SS	16.8	302	297	296	309	300	315	294	302
Stone	115	1512TRE	18.2	274	269	261	268	284	282	263	294
LSD ($P \leq 0.10$)			0.6	10	18	18	18	16	16	20	20
Mean			15.8	284	274	272	277	278	291	286	309
Range			11.7-21.0	256-318	247-307	244-312	248-317	234-318	258-315	243-339	276-330

¹Average moisture and yield across seven additive levels of agronomic management.

²Values are the average of four replications.