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Managing Corn for Greater Yield Potential: 4 Lessons From 2020 NCGA Winners

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KEY POINTS

- Improved hybrids and production practices are helping corn growers increase yields. Over the past 20 years, U.S. yields have increased by an average of **1.9 bu/acre/year**.
- NCGA winners in the non-irrigated yield contest classes have increased their yields at more than double the rate of the national average. What are they doing differently?
- The NCGA National Corn Yield Contest provides a benchmark for yields that are attainable when conditions and management are optimized.
- The 2020 contest had 180 entries that exceeded 300 bu/acre, which was up from 130 entries in 2019 and second only to the record high of 224 entries in 2017.

4 LESSONS FOR INCREASING CORN YIELD

1. Selecting the right hybrid can affect yield by over 30 bu/acre, making this decision among the most critical of all controllable factors.
2. High-yielding contest plots are usually planted as early as practical for their geography. Early planting lengthens the growing season and moves pollination earlier.
3. Rotating corn with another crop generally reduces its susceptibility to yield-limiting stresses.
4. Maintaining adequate nitrogen fertility levels is critical in achieving highest yields. In-season applications can help supply nitrogen when plant uptake is high.

BENCHMARKING YOUR CORN YIELD

Since the introduction of hybrid corn nearly a century ago, corn productivity improvements have continued through the present day. Over the last 20 years, U.S. corn yield has increased by an average of 1.9 bu/acre per year. These gains have resulted from breeding for increased yield potential, introducing transgenic traits to help protect yield, and agronomic management that has allowed yield potential to be more fully realized.

As growers strive for greater corn yields, the National Corn Growers Association (NCGA) National Corn Yield Contest provides a benchmark for yields that are attainable when

environmental conditions and agronomic management are optimized. The average yields of NCGA winners are about double the average U.S. yields.

2020 NCGA National Corn Yield Contest Trends

The 2020 growing season was generally an improvement over the widespread challenges of the 2019 season. However, corn yield outcomes varied widely, with highly productive soils often yielding very well, while performance often dropped off on less productive and more drought-prone acres. Results of the 2020 NCGA National Corn Yield Contest reflected recent yield trends. The number of high-yield entries – defined for the purposes of this discussion as all entries yielding over 300 bu/acre – increased considerably from 2019 but was still short of the all-time high set in 2017 (Figure 1).

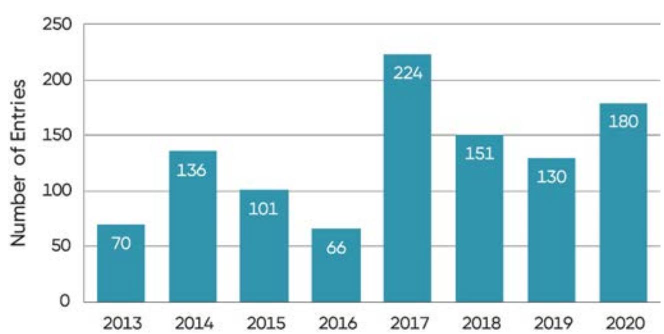

Figure 1. Total entries in the NCGA National Corn Yield Contest exceeding 300 bu/acre by year from 2013 to 2020.

The geographic distribution of high-yield entries in 2020 was, to some extent, an inversion of the pattern observed in 2019. In 2019, yield results were relatively poor in the central Corn Belt, while the Mid-Atlantic states of Pennsylvania, Delaware, New Jersey, and Virginia posted their best-ever results. In 2020, the central Corn Belt rebounded, with Illinois, Indiana, Nebraska, Ohio, Minnesota, and Wisconsin all showing strong results. No entries topping 300 bu/acre were recorded in either Pennsylvania or Virginia (Table 1).

Table 1. Number of NCGA National Corn Yield Contest entries over 300 bu/acre by state, 2016-2020.

State	2016	2017	2018	2019	2020
	number of entries				
AL	1	3	3	5	4
AR	1	2	1	0	1
CA	2	0	3	3	2
CO	2	4	1	0	1
DE	2	0	0	6	0
FL	0	0	0	0	0
GA	4	7	0	7	5
IA	7	16	8	3	6
ID	1	0	8	1	3
IL	5	25	18	6	19
IN	1	26	17	8	23
KS	1	2	3	2	6
KY	0	17	4	3	3
MA	1	1	2	4	1
MD	4	4	2	5	3
MI	1	7	1	4	3
MN	0	1	0	0	5
MO	1	12	4	3	11
NC	1	0	1	3	0
NE	1	41	39	7	37
NJ	0	1	1	9	9
NM	2	2	0	1	0
NY	0	4	0	0	0
OH	0	1	2	2	6
OK	3	2	2	0	2
OR	1	3	4	7	0
PA	0	0	0	15	0
SC	5	9	0	4	3
SD	0	2	0	0	2
TN	3	9	2	3	3
TX	4	3	7	1	2
UT	3	7	6	0	2
VA	3	5	2	9	0
WA	2	2	9	7	3
WI	1	6	1	1	13
WV	2	0	0	1	2
Total	**66**	**224**	**151**	**130**	**180**

The average yields among national winners tend to be skewed by a small number of very high yields, particularly in the irrigated classes. Therefore, as a yield performance benchmark, it can be useful to look at a larger set of contest entries. Table 2 shows the median yield of the top 100 yielding entries in the irrigated and non-irrigated classes. Median yields of top entries in both the irrigated and non-irrigated classes exceeded 300 bu/acre for the fourth year in a row, which is about 75% greater than the current U.S. average. Median yields of the top 100 non-irrigated entries and irrigated entries in 2020 were both short of the highs achieved in 2017.

Table 2. Median yields of the top 100 irrigated and non-irrigated NCGA National Corn Yield Contest entries, and the USDA average U.S. corn yields from 2014 to 2020.

Year	Non-Irrigated	Irrigated	U.S. Average
	bu/acre		
2014	299	306	171
2015	292	288	168
2016	283	294	175
2017	312	317	177
2018	300	315	176
2019	302	311	168
2020	307	310	172

SELECT THE RIGHT HYBRID

Hybrids tested against each other in a single environment (e.g., a university or seed company test plot) routinely vary in yield by at least 30 bu/acre. At contest yield levels, hybrid differences can be even higher. **That is why selecting the right hybrid is likely the most important management decision of all those made by contest winners.**

The yield potential of many hybrids now exceeds 300 bu/acre. Realizing this yield potential requires matching hybrid characteristics with field attributes, such as moisture supplying capacity; insect and disease spectrum and intensity; maturity zone, residue cover; and even seedbed temperature. To achieve the highest possible yields, growers should select a hybrid with:

1. **Top-end yield potential**. Examine yield data from multiple, diverse environments to identify hybrids with highest yield potential.
2. **Full maturity for the field**. Using all of the available growing season is a good strategy for maximizing yield.
3. **Good emergence under stress**. This helps ensure uniform stand establishment and allows earlier planting, which moves pollination earlier to minimize stress during this critical period.
4. **Above-average drought tolerance**. This will provide insurance against periods of drought that most non-irrigated fields experience.
5. **Resistance to local diseases**. Leaf, stalk, and ear diseases disrupt normal plant function, divert plant energy, and reduce standability and yield.
6. **Traits that provide resistance to major insects**, such as corn borer, corn rootworm, black cutworm, and western bean cutworm. Insect pests reduce yield by decreasing stands, disrupting plant functions, feeding on kernels, and increasing lodging and dropped ears.
7. **Good standability** to minimize harvest losses.

Pioneer® brand products were used in 13 national winning entries (Table 3), as well as 219 state-level winning entries – more than any other seed brand. State-level winners included a total of 79 different Pioneer brand products from 53 different hybrid families ranging from 70 to 120 CRM (Appendix).

Table 3. 2020 NCGA National Corn Yield Contest national winning entries using Pioneer brand products.

Category	Rank	State	Hybrid/Brand[1]
A: Conv. Non-Irrigated	2nd	SC	**P1847VYHR** (AVBL, YGCB, HX1, LL, RR2)
A: Conv. Non-Irrigated	3rd	NJ	**P1197**
C: NT Non-Irrigated	1st	SC	**P1847VYHR** (AVBL, YGCB, HX1, LL, RR2)
C: NT Non-Irrigated	2nd	NJ	**P1464AML™** (AML, LL, RR2)
C: NT Non-Irrigated	3rd	WV	**P1197**
D: NT Non-Irrigated	3rd	IA	**P1563AM™** (AM, LL, RR2)
E: Strip-, Min-, Mulch-, Ridge-Till Non-Irrigated	1st	NJ	**P1197AMT™** (AMT, LL, RR2)
G: No-Till Irrigated	1st	NE	**P1138AML™** (AML, LL, RR2)
G: No-Till Irrigated	2nd	NE	**P1138AML™** (AML, LL, RR2)
H: Strip-, Min-, Mulch-, Ridge-Till Irrigated	2nd	NE	**P1828AM™** (AM, LL, RR2)
I: Conventional Irrigated	1st	MI	**P0720AM™** (AM, LL, RR2)
I: Conventional Irrigated	2nd	WI	**P0720Q™** (Q, LL, RR2)
I: Conventional Irrigated	3rd	NE	**P1563AML™** (AML, LL, RR2)

The brands of seed corn used in the highest yielding contest entries in 2015 through 2020 are shown in Figure 2. In all years, Pioneer brand products were used in more entries exceeding 300 bu/acre than any other individual seed brand.

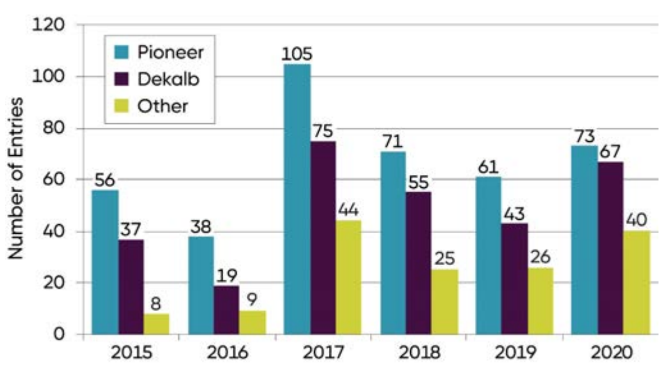

Figure 2. Seed brand planted in National Corn Yield Contest entries exceeding 300 bu/acre from 2015 to 2020.

Yields exceeding 300 bu/acre have been achieved using Pioneer brand products from 66 different hybrid families over the past six years, ranging from 91 to 121 CRM. The top-performing Pioneer hybrid families in the National Corn Yield contest are shown in Table 4. The [Pioneer brand P1197 family of products] has had the best performance in the contest by far, topping 300 bu/acre 84 times since its debut in the contest in 2014. Pioneer brand P1185 and P1563 families of products were top performers in the 2020 yield contest.

Table 4. Pioneer hybrid families with the most entries over 300 bu/acre in the NCGA National Corn Yield Contest over the past six years.

Hybrid Family	2015	2016	2017	2018	2019	2020	Total
	——— number of entries ———						
P1197	13	10	33	11	11	6	**84**
P2088	7	5	14	5	1		**32**
P1366			8	10	9	3	**30**
P1828				8	4	6	**18**
P0801	1	1	9	5	1		**17**
P1563				3	1	11	**15**
P1870			4	1	9	1	**15**
P1151	5	1	3	1	1		**11**
P0157	2	1	3	2	2	1	**11**
P1185						10	**10**
P1311	1	5	3			1	**10**
P1370			1	5		2	**8**
P0574			3	2	2		**7**
P1751	1	3	2	1			**7**
P9840		1	1	2	2		**6**

HIGH-YIELD MANAGEMENT PRACTICES

Top performers in the NCGA yield contest not only have produced yields much higher than the current U.S. average, they have also achieved a higher rate of yield gain over time. Over the past 20 years, U.S. corn yields have increased at a rate of 1.9 bu/acre per year while winning yields in the non-irrigated yield contest classes have increased by 5.1 bu/acre per year. Contest fields are planted with the same corn hybrids available to everyone and are subject to the same growing conditions, which suggests that management practices are playing a key role in capturing more yield potential. The following sections will discuss management practices employed in contest entries yielding above 300 bu/acre.

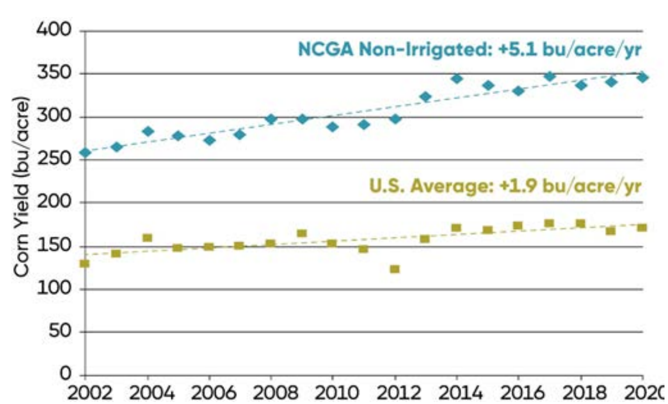

Figure 3. Average yields of NCGA National Corn Yield contest non-irrigated class national winners and U.S. average corn yields, 2002-2020.

OPTIMIZE PLANTING PRACTICES

Establish Sufficient Population Density

One of the most critical factors in achieving high corn yields is establishing a sufficient population density to allow a hybrid to maximize its yield potential. **Historically, population density has been the main driver of yield gain in corn** – improvement of corn hybrid genetics for superior stress tolerance has allowed hybrids to be planted at higher plant populations and produce greater yields.

Harvest populations in irrigated and non-irrigated national corn yield contest entries over 300 bu/acre from 2016 through 2020 are shown in Figure 4. The average harvest population of irrigated entries (36,720 plants/acre) was slightly greater than that of non-irrigated entries (36,550 plants/acre) over five years. However, yields over 300 bu/acre were achieved over a wide range of populations, from 28,000 to 56,000 plants/acre, demonstrating that exceptionally high populations are not necessarily a prerequisite for high yields. Although population density is important in establishing the yield potential of a corn crop, it is just one of many factors that determine yield.

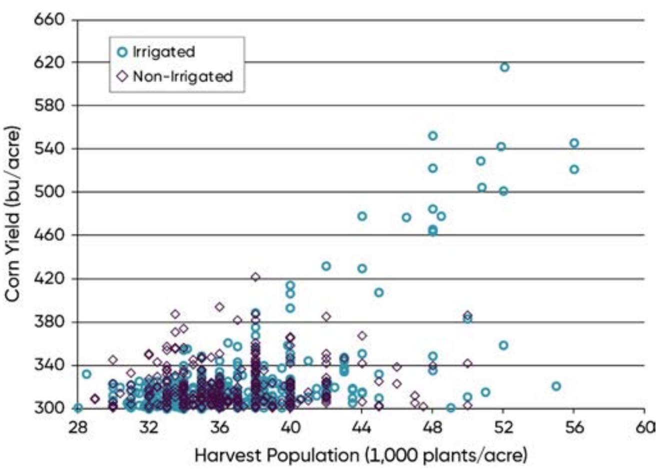

Figure 4. Harvest populations and corn yield of irrigated and non-irrigated NCGA National Corn Yield Contest entries exceeding 300 bu/acre, 2016-2020.

Plant Early

High-yielding contest plots are usually planted **as early as practical for their geography**. Early planting lengthens the growing season and more importantly, moves pollination earlier. When silking, pollination and early ear fill are accomplished in June or early July, heat and moisture stress effects can be reduced.

Planting dates for entries exceeding 300 bu/acre ranged from March 15 to June 3 in 2020. Mid-April to early-May planting dates have typically been the most common for high-yields in the central Corn Belt. The 2020 contest had several high-yield entries planted in mid- to late-May (21 entries over 300 bu/acre were planted after May 15), demonstrating that high yields can still be achieved under favorable conditions if planting is not delayed for too long.

Determine Row Width

The vast majority of corn acres in the U.S. are currently planted in 30-inch rows, accounting for over 85% of corn production. **A majority of 300 bu/acre contest entries over the past five years have been planted in 30-inch rows** (Figure 5). This proportion has increased slightly in recent years as wider row configurations (most commonly 36-inch or 38-inch) have declined and narrower row configurations (15-inch, 20-inch, 22-inch or 30-inch twin) have largely remained steady.

Row spacings narrower than the current standard of 30 inches have been a source of continuing interest as a way to achieve greater yields, particularly with continually increasing seeding rates. However, research has generally not shown a consistent yield benefit to narrower rows outside of the northern Corn Belt (Jeschke, 2018).

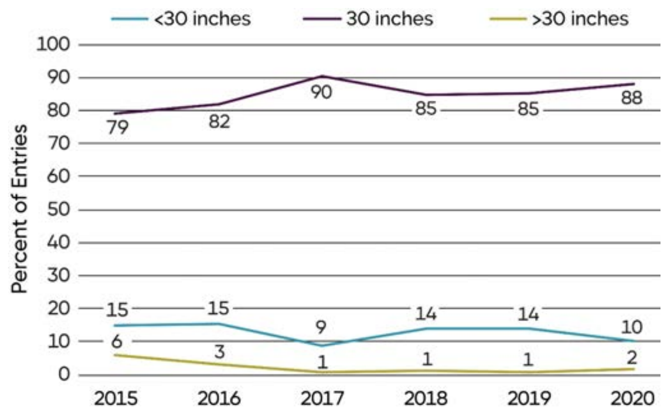

Figure 5. Row width used in NCGA National Corn Yield Contest entries exceeding 300 bu/acre, 2015-2020.

ROTATE CROPS

Rotating crops is one of the practices most often recommended to keep yields consistently high. Rotation can break damaging insect and disease cycles that lower crop yields. Including crops like soybean or alfalfa in the rotation can reduce the amount of nitrogen required in the following corn crop. **A majority of the fields in the 300 bu/acre entries were planted to a crop other than corn the previous growing season** (Figure 6).

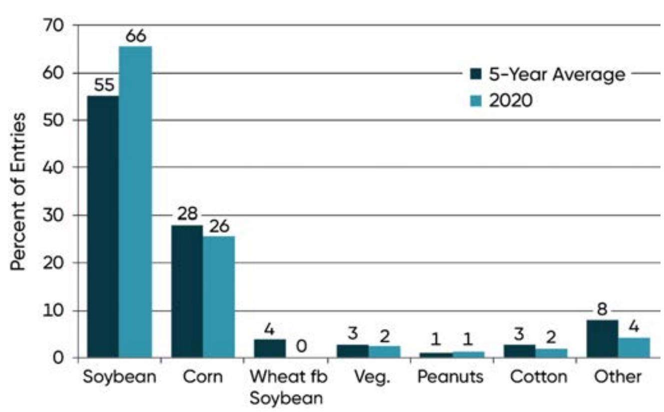

Figure 6. Previous crop in NCGA National Corn Yield Contest entries exceeding 300 bu/acre in 2020 and 5-year averages.

The so-called "rotation effect" is a yield increase associated with crop rotation compared to continuous corn even when all limiting factors appear to have been controlled or adequately supplied in the continuous corn. This yield increase has averaged about 5 to 15 percent in research studies but has generally been less under high-yield conditions

(Butzen, 2012). Rotated corn is generally better able to tolerate yield-limiting stresses than continuous corn; however, yield contest results clearly show that high yields can be achieved in continuous-corn production.

TILLAGE

Over the past five years, close to half of the high yield entries in the NCGA contest have used conventional tillage, with the other half using no-tillage or some form of reduced tillage (Figure 8). The proportion of high-yield entries using conventional tillage has declined over time, offset by increases in no-till and strip-till.

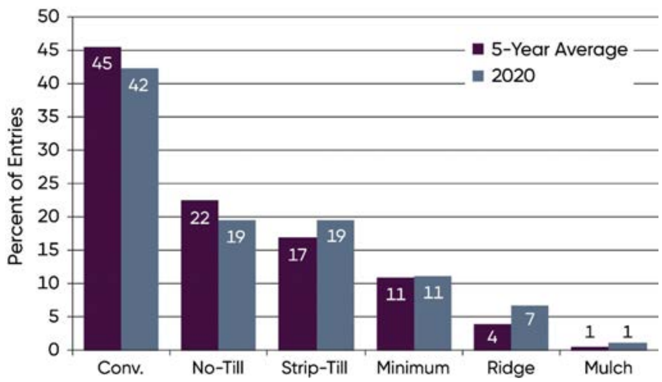

Figure 7. Tillage practices in NCGA National Corn Yield Contest entries exceeding 300 bu/acre in 2020 and 5-year averages.

OPTIMIZE NUTRIENT MANAGEMENT

Achieving highest corn yields requires an excellent soil fertility program, beginning with **timely application of nitrogen** (N) and soil testing to determine existing levels of phosphorous (P), potassium (K), and soil pH.

Nitrogen

Corn grain removes approximately 0.67 lbs of nitrogen per bushel harvested, and stover production requires about 0.45 lbs of nitrogen for each bushel of grain produced (IPNI, 2014). This means that the total N needed for a 300 bu/acre corn crop is around 336 lbs/acre. Only a portion of this amount needs to be supplied by N fertilizer; N is also supplied by the soil through mineralization of soil organic matter. On highly productive soils, N mineralization will often supply the majority of N needed by the crop. Credits can be taken for previous legume crop, manure application, and N in irrigation water. Nitrogen application rates of entries exceeding 300 bu/acre are shown in Figure 8.

The N application rates of 300 bu/acre entries varied greatly, but over half were in the range of 200 to 300 lbs/acre. Some entries with lower N rates were supplemented with N from manure application. As corn yield increases, more N is removed from the soil; however, N application rates do not necessarily need to increase to support high yields. Climatic conditions that favor high yield will also tend to increase the amount of N a corn crop obtains from the soil through increased mineralization of organic N and improved root growth.

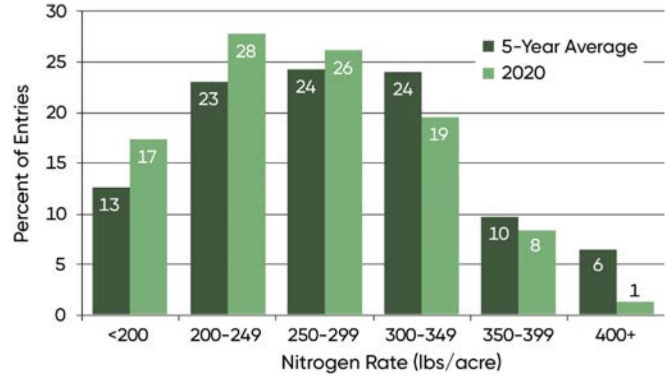

Figure 8. Nitrogen rates (total lbs/acre N applied) of NCGA National Corn Yield Contest entries exceeding 300 bu/acre in 2020 and 5-year averages.

Timing of N fertilizer applications can be just as important as application rate. The less time there is between N application and crop uptake, the less likely N loss from the soil will occur and limit crop yield. Nitrogen uptake by the corn plant peaks during the rapid growth phase of vegetative development between V12 and VT (tasseling). However, the N requirement is high beginning at V6 and extending to the R5 (early dent) stage of grain development.

Timing of N fertilizer applications in 300 bu/acre entries is shown in Figure 9. Very few included fall-applied N. Many applied N before or at planting. Around 90% of 300 bu/acre entries included some form of in-season nitrogen, either side-dressed or applied with irrigation. Multiple nitrogen applications were also used in around 90% of high-yield entries.

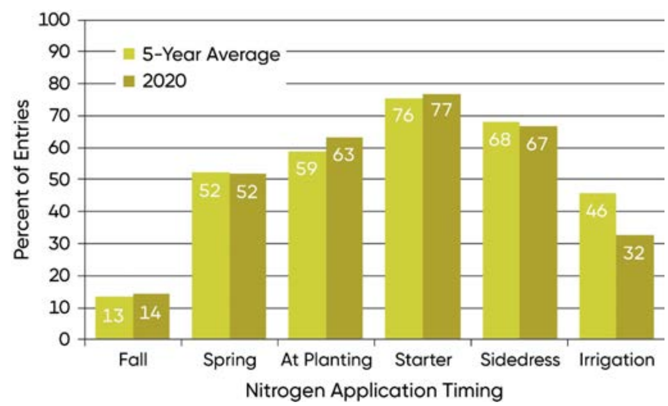

Figure 9. Nitrogen fertilizer application timing of NCGA National Corn Yield Contest entries exceeding 300 bu/acre in 2020 and 5-year averages.

Micronutrients

Micronutrients were applied on nearly half of the 300 bu/acre entries (Figure 10). The nutrients most commonly applied were sulfur (S) and zinc (Zn), with some entries including boron (B), magnesium (Mg), manganese (Mn), or copper (Cu). Micronutrients are sufficient in many soils to meet crop needs. However, some sandy soils and other low organic matter soils are naturally deficient in micronutrients, and high pH soils may make some micronutrients less available (Butzen, 2010). Additionally, as yields increase, micronutrient removal increases as well, potentially causing deficiencies.

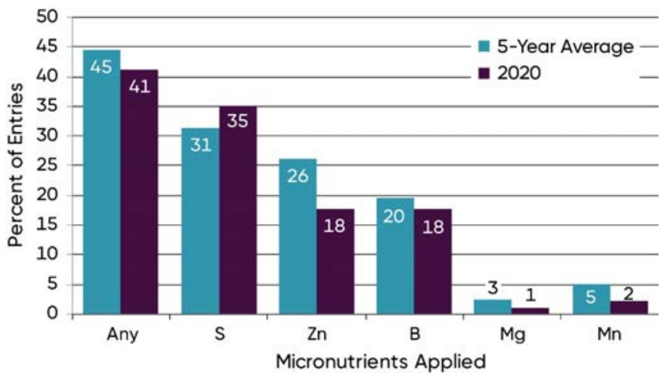

Figure 10. Micronutrients applied in NCGA National Corn Yield Contest entries exceeding 300 bu/acre in 2020 and 5-year averages.

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APPENDIX

2020 NCGA National Corn Yield Contest state-level winners using Pioneer® brand products.

Hybrid/Brand[1]	Winners
Alabama	
P1464VYHR (AVBL, YGCB, HX1, LL, RR2)	1
P1847AML™ (AML, LL, RR2)	1
P1847VYHR (AVBL, YGCB, HX1, LL, RR2)	2
P1870AM™ (AM, LL, RR2)	1
P1870YHR (YGCB, HX1, LL, RR2)	1
P2089VYHR (AVBL, YGCB, HX1, LL, RR2)	3
Arkansas	
P1847VYHR (AVBL, YGCB, HX1, LL, RR2)	1
P2089VYHR (AVBL, YGCB, HX1, LL, RR2)	1
Arizona	
P1464AML™ (AML, LL, RR2)	1
California	
P1197AM™ (AM, LL, RR2)	1
P1464AML™ (AML, LL, RR2)	1
Colorado	
P0339AM™ (AM, LL, RR2)	1
P0622AML™ (AML, LL, RR2)	2
P0622Q™ (Q, LL, RR2)	1
Delaware	
P1442AM™ (AM, LL, RR2)	1
P1847AML™ (AML, LL, RR2)	1

Hybrid/Brand[1]	Winners
Florida	
P1662YHR (YGCB, HX1, LL, RR2)	1
P1847VYHR (AVBL, YGCB, HX1, LL, RR2)	3
P1870 YHR (YGCB, HX1, LL, RR2)	2
Georgia	
P1662YHR (YGCB, HX1, LL, RR2)	1
P1870AM™ (AM, LL, RR2)	1
P1870YHR (YGCB, HX1, LL, RR2)	2
Iowa	
P1185AM™ (AM, LL, RR2)	3
P1185Q™ (Q, LL, RR2)	2
P1366AM™ (AM, LL, RR2)	2
P1366Q™ (Q, LL, RR2)	1
P1563AM™ (AM, LL, RR2)	2
Idaho	
P0046AM™ (AM, LL, RR2)	1
P0075Q™ (Q, LL, RR2)	1
P0157AM™ (AM, LL, RR2)	1
P0157AMX™ (AMX, LL, RR2)	1
P0157R (AM, LL, RR2)	1
Illinois	
P1099Q™ (Q, LL, RR2)	1
P1108Q™ (Q, LL, RR2)	1
P1185AM™ (AM, LL, RR2)	1
P1185Q™ (Q, LL, RR2)	1
Indiana	
P1077AM™ (AM, LL, RR2)	1
P1359AM™ (AM, LL, RR2)	2
Kansas	
P1108Q™ (Q, LL, RR2)	1
P1366AML™ (AML, LL, RR2)	1
P1464 AML™ (AML, LL, RR2)	1
P1563 AM™ (AM, LL, RR2)	2
P1572AM™ (AM, LL, RR2)	1
P1828AM™ (AM, LL, RR2)	2
P1828Q™ (Q, LL, RR2)	1
P2089AML™ (AML, LL, RR2)	1
Kentucky	
P1077 AM™ (AM, LL, RR2)	1
P1656WAM™ (AM, LL, RR2)	1
P1847 AML™ (AML, LL, RR2)	1
P1870	1
P2089AML™ (AML, LL, RR2)	1
Louisiana	
P1077YHR (YGCB, HX1, LL, RR2)	1
P1366VYHR (AVBL, YGCB, HX1, LL, RR2)	1
P1506YHR (YGCB, HX1, LL, RR2)	2
P1870R (RR2)	1
P1870YHR (YGCB, HX1, LL, RR2)	2
P2042VYHR (AVBL, YGCB, HX1, LL, RR2)	2

Hybrid/Brand[1]	Winners
Massachusetts	
P0306AM™ (AM, LL, RR2)	1
Maryland	
P1197AM™ (AM, LL, RR2)	3
P1213AM™ (AM, LL, RR2)	1
P1506AM™ (AM, LL, RR2)	1
P1847AML™ (AML, LL, RR2)	1
Michigan	
P0075AM™ (AM, LL, RR2)	1
P0306AM™ (AM, LL, RR2)	1
P0720AM™ (AM, LL, RR2)	1
P0806AM™ (AM, LL, RR2)	2
P0843AM™ (AM, LL, RR2)	1
P1197AM™ (AM, LL, RR2)	1
Minnesota	
P0589AM™ (AM, LL, RR2)	1
P0688AM™ (AM, LL, RR2)	1
P0720Q™ (Q, LL, RR2)	1
P1108Q™ (Q, LL, RR2)	1
P1185Q™ (Q, LL, RR2)	1
P1366AM™ (AM, LL, RR2)	1
Missouri	
P1077AM™ (AM, LL, RR2)	1
P1197	2
P2042VYHR (AVBL, YGCB, HX1, LL, RR2)	1
Mississippi	
P1464VYHR (AVBL, YGCB, HX1, LL, RR2)	1
P1870R (RR2)	1
P1870YHR (YGCB, HX1, LL, RR2)	1
P2042VYHR (AVBL, YGCB, HX1, LL, RR2)	1
P2089VYHR (AVBL, YGCB, HX1, LL, RR2)	2
P2089YHR (YGCB, HX1, LL, RR2)	1
Montana	
P8989AMXT™ (AMXT, LL, RR2)	2
P9188AMXT™ (AMXT, LL, RR2)	2
P9211AM™ (AM, LL, RR2)	1
North Carolina	
P1464VYHR (AVBL, YGCB, HX1, LL, RR2)	3
P1870YHR (YGCB, HX1, LL, RR2)	3
North Dakota	
P0046AM™ (AM, LL, RR2)	1
P9301AM™ (AM, LL, RR2)	1
P9772AM™ (AM, LL, RR2)	1
P9880AM™ (AM, LL, RR2)	1
Nebraska	
P1138AML™ (AML, LL, RR2)	2
P1185AM™ (AM, LL, RR2)	2
P1563AML™ (AML, LL, RR2)	1
P1563AM™ (AM, LL, RR2)	1
P1572AM™ (AM, LL, RR2)	1

Hybrid/Brand[1]	Winners
Nebraska (continued)	
P1828AM™ (AM, LL, RR2)	1
P2042AML™ (AML, LL, RR2)	1
New Jersey	
P1197	1
P1197AMT™ (AMT, LL, RR2)	1
P1213AM™ (AM, LL, RR2)	1
P1464AML™ (AML, LL, RR2)	1
Nevada	
P1055AM™ (AM, LL, RR2)	1
New York	
P0843AM™ (AM, LL, RR2)	1
P1197AM™ (AM, LL, RR2)	1
Ohio	
P0720AM™ (AM, LL, RR2)	1
P1077AM™ (AM, LL, RR2)	1
P1197AM™ (AM, LL, RR2)	1
P1197YHR (YGCB, HX1, LL, RR2)	1
P1359AM™ (AM, LL, RR2)	1
Oklahoma	
P1108Q™ (Q, LL, RR2)	1
P1311AMXT™ (AMXT, LL, RR2)	1
P1572AM™ (AM, LL, RR2)	1
P1828AM™ (AM, LL, RR2)	1
P1828Q™ (Q, LL, RR2)	3
Oregon	
P1077AM™ (AM, LL, RR2)	1
P1089AM™ (AM, LL, RR2)	1
P1366AM™ (AM, LL, RR2)	1
Pennsylvania	
P0720AM™ (AM, LL, RR2)	1
P1077AM™ (AM, LL, RR2)	1
P1197AM™ (AM, LL, RR2)	1
P1415Q™ (Q, LL, RR2)	1
P1442AM™ (AM, LL, RR2)	1
P1847AML™ (AML, LL, RR2)	2
South Carolina	
P1197YHR (YGCB, HX1, LL, RR2)	1
P1847VYHR (AVBL, YGCB, HX1, LL, RR2)	2
P1870R (RR2)	1
P1870YHR (YGCB, HX1, LL, RR2)	2
P2089YHR (YGCB, HX1, LL, RR2)	2
South Dakota	
P0339Q™ (Q, LL, RR2)	1
P0507Q™ (Q, LL, RR2)	1
P1082AM™ (AM, LL, RR2)	1
P1185AM™ (AM, LL, RR2)	4
P1366AM™ (AM, LL, RR2)	3
P9880AM™ (AM, LL, RR2)	1

Hybrid/Brand[1]	Winners
Tennessee	
P1464VYHR™ (AVBL, YGCB, HX1, LL, RR2)	1
P1656WAM™ (AM, LL, RR2)	1
Texas	
P1366AML™ (AML, LL, RR2)	1
P1464VYHR (AVBL, YGCB, HX1, LL, RR2)	1
P1828Q™ (Q, LL, RR2)	2
P1847VYHR (AVBL, YGCB, HX1, LL, RR2)	2
P2089VYHR (AVBL, YGCB, HX1, LL, RR2)	1
Utah	
P1055AM™ (AM, LL, RR2)	1
Virginia	
P1077AM™ (AM, LL, RR2)	2
P1197AM™ (AM, LL, RR2)	2
P1283AM™ (AM, LL, RR2)	1
P1847AML™ (AML, LL, RR2)	1
P1903YHR (YGCB, HX1, LL, RR2)	2
Vermont	
P0075Q™ (Q, LL, RR2)	2
P7005AM™ (AM, LL, RR2)	1
Washington	
P9998R (RR2)	1
Wisconsin	
P0421AM™ (AM, LL, RR2)	1
P0720AM™ (AM, LL, RR2)	1
P0720Q™ (Q, LL, RR2)	2
P1185Q™ (Q, LL, RR2)	1
P1366Q™ (Q, LL, RR2)	1
P1563AM™ (AM, LL, RR2)	1
West Virginia	
P1197	1
P1197AMT™ (AMT, LL, RR2)	1
P1197AM™ (AM, LL, RR2)	2
P1298AM™ (AM, LL, RR2)	1
Wyoming	
P0339Q™ (Q, LL, RR2)	2
P0421Q™ (Q, LL, RR2)	1
P8989AM™ (AM, LL, RR2)	1
P9608AM™ (AM, LL, RR2)	1
P9870AM™ (AM, LL, RR2)	1

AM - Optimum® AcreMax® Insect Protection system with YGCB, HX1, LL, RR2. Contains a single-bag integrated refuge solution for above-ground insects. In EPA-designated cotton growing counties, a 20% separate corn borer refuge must be planted with Optimum AcreMax products. **AMXT** (Optimum® AcreMax® XTreme) - Contains a single-bag integrated refuge solution for above- and below-ground insects. The major component contains the Agrisure® RW trait, the YieldGard® Corn Borer gene, and the Herculex® XTRA genes. In EPA-designated cotton growing counties, a 20% separate corn borer refuge must be planted with Optimum AcreMax XTreme products. **YGCB,HX1,LL,RR2** (Optimum® Intrasect®) - Contains the YieldGard® Corn Borer gene and Herculex® I gene for resistance to corn borer. **AMT** - Optimum® AcreMax® TRIsect® Insect Protection System with RW,YGCB,HX1,LL,RR2. Contains a single-bag refuge solution for above and below ground insects. The major component contains the Agrisure® RW trait, the YieldGard® Corn Borer gene, and the Herculex® I genes. In EPA-designated cotton growing counties, a 20% separate corn borer refuge must be planted with Optimum AcreMax TRIsect products. **AVBL,YGCB,HX1,LL,RR2** (Optimum® Leptra®) - Contains the Agrisure Viptera® trait, the YieldGard Corn Borer gene, the Herculex® I gene, the LibertyLink® gene, and the Roundup Ready® Corn 2 trait. **HX1** - Contains the Herculex® I Insect Protection gene which provides protection against European corn borer, southwestern corn borer, black cutworm, fall armyworm, western bean cutworm, lesser corn stalk borer, southern corn stalk borer, and sugarcane borer; and suppresses corn earworm. **HXX** - Herculex® XTRA contains the Herculex I and Herculex RW genes. **YGCB** - The YieldGard® Corn Borer gene offers a high level of resistance to European corn borer, southwestern corn borer and southern cornstalk borer; moderate resistance to corn earworm and common stalk borer; and above average resistance to fall armyworm. **LL** - Contains the LibertyLink® gene for resistance to Liberty® herbicide. **RR2** - Contains the Roundup Ready® Corn 2 trait that provides crop safety for over-the-top applications of labeled glyphosate herbicides when applied according to label directions. **Q** (Qrome®) - Contains a single-bag integrated refuge solution for above- and below-ground insects. The major component contains the Agrisure® RW trait, the YieldGard® Corn Borer gene, and the Herculex® XTRA genes. In EPA-designated cotton growing counties, a 20% separate corn borer refuge must be planted with Qrome products.

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[1] All Pioneer products are hybrids unless designated with AM1, AM, AMT, AMRW, AMX, AMXT, AML, and Q in which case they are brands.

Harvest photo courtesy of CNH.

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January 2021