

# Corn Seeding Rate in Illinois

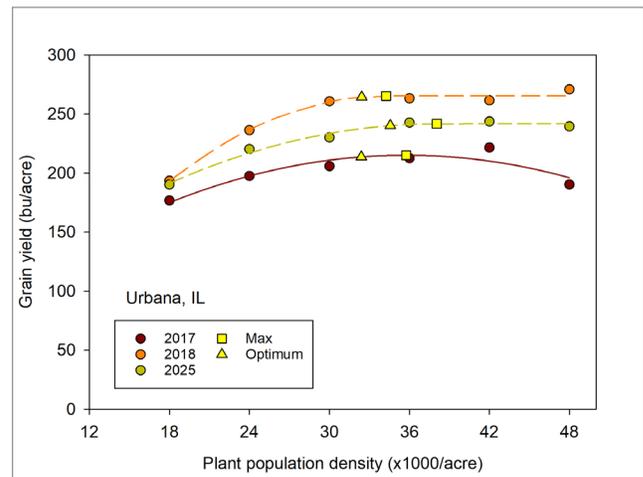


Corn yield has significantly increased in the hybrid era thanks to improved genetic yield potential and the ability of planted seeds to emerge and establish productive plants. Since 1996, corn yields in the United States and Illinois have increased by 1.8 and 2.7 bushels per acre per year, respectively. Increased plant population density has been one contributor to these gains. However, seed costs have also risen considerably in recent years and remain a major expense, accounting for roughly 26% of direct production costs under current practices. Optimizing seeding rate is how to maximize return on the investment in seed.

## Seeding Rate and Plant Population

Seeding rate is the number of seeds planted per acre, while plant population, or stand, is the number of plants that successfully establish. The goal is to establish enough plants to maximize sunlight interception and yield potential, then choose seeding rates to help meet this goal. Because we cannot precisely predict the percentage of planted seeds that will produce healthy plants, choosing a seeding rate to get to a particular stand always involves some guesswork.

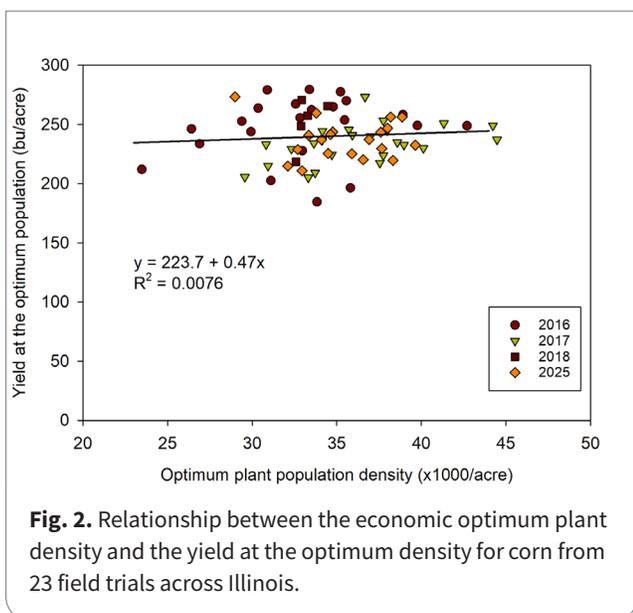
Advances in corn genetics have improved stress tolerance and standability, allowing growers to aim for populations high enough to maximize yield without much risk of having too many plants. USDA-NASS survey data show that corn plant populations in Illinois increased by about 430 plants per acre per year from 2000 through 2014, but by only 110 plants per acre per year from 2015 through 2024. Stand counts at harvest have averaged about 32,000 plants per acre in recent years.



**Fig. 1.** Corn yield response to plant population density at trials conducted in Urbana, IL. The yellow square and yellow triangle indicate the agronomic maximum and the economic optimum plant density (EOPD). The EOPD was estimated using \$4 per bushel and \$4 per thousand seeds.

## Yield Response and Economic Optimum

Figure 1 shows an example of how corn yield responded to plant population in trials conducted at the University of Illinois Urbana-Champaign. Yield typically increases with plant population up to a point, then levels off or plateaus, and often remains flat as plant population increases to high levels. Populations much higher than those needed to maximize yield can occasionally lower yield, for example, due to lodging or stress-related reductions in kernel numbers or kernel weight. However, this development has become rare with newer hybrids, especially in productive soils. In the examples shown in Figure 1, corn yield followed a “quadratic-plus-plateau” pattern in 2025, yet going to 48,000 plants per acre lowered yield under higher late-season dryness in 2017.



Much like researchers do with nitrogen recommendations for corn using the [Maximum Return to Nitrogen approach](#), they can use the same approach to fit curves to population response and determine the Economic Optimum Plant Density (EOPD). This approach establishes the Illinois Extension guidelines for seeding rate. The EOPD is the number of plants that maximizes profitability rather than absolute yield. The EOPD takes into account both seed cost and crop value or price per bushel. It is the point at which the last increment of seeds or plants adds just enough yield to offset the cost of that amount of seed.

Unless the seed is free, the EOPD is lower than the population needed to maximize yield. But because yields rise slowly with population up to the maximum, the yield at the EOPD is only slightly less than the maximum yield. Across 23 Illinois trials between 2016 and 2025, the population needed to maximize yield exceeded the EOPD by an average of 4,000 plants per acre, but the yield at the EOPD was only 1.7 bushels per acre less than the maximum yield.

Contrary to what growers might expect, high corn yields do not require extremely high plant populations. Illinois trials show no correlation between optimum plant density and yield level, even with yields ranging as high as 280

bushels per acre, as seen in Figure 2. High-yielding sites often achieved maximum returns at moderate populations, while low-yielding sites sometimes needed higher populations. An example is when stress limits the number of kernels per ear at pollination, but kernels then fill normally under better conditions. NCGA National Corn Yield Contest data support this: between 2020 and 2024, entries over 300 bushels per acre had harvest plant populations ranging from about 27,000 to 50,000 plants per acre, with an average of 35,400 plants per acre. Many seed company recommendations are in line with these rates, not because higher populations may hurt yields, but because they are not needed to maximize yields of newer hybrids.

## Determining Seeding Rate

Table 1 provides estimated EOPD values for a range of corn prices and seed costs, based on the average of the response curves across 23 Illinois field trials. Corn seed quality and the equipment used to plant corn seed have improved substantially over recent decades, resulting in greater consistency between the desired plant population and seeding rate. Research in Illinois and other Midwest states shows that corn stand establishment success typically ranges from 90 to 95%.

For example, at a seed bag cost of \$300 per 80,000 units and a corn price of \$4 per bushel, the EOPD is about 34,100 plants per acre. To calculate seeding rates from these values, divide by the expected percent establishment. For instance, 34,100 plants per acre divided by 95% establishment equals about 35,900 seeds per acre.

Seed cost per 80k unit	\$3.00 per bushel	\$3.50 per bushel	\$4.00 per bushel	\$4.50 per bushel	\$5.00 per bushel	\$5.50 per bushel
<b>\$150</b>	35,400	35,800	36,100	36,600	36,600	36,700
<b>\$200</b>	34,500	35,100	35,400	35,800	36,000	36,200
<b>\$250</b>	33,600	34,300	34,800	35,100	35,400	35,700
<b>\$300</b>	32,700	33,500	34,100	34,500	34,900	35,200
<b>\$350</b>	31,800	32,700	33,400	33,900	34,300	34,700
<b>\$400</b>	30,900	31,900	32,700	33,300	33,800	34,200

**Table 1.** Economic optimum plant population density for combinations of market corn price per bushel and seed cost per 80,000 seed unit.

Note: To calculate seeding rates from the values in this table, divide by the expected percent establishment. For instance, 35,000 plants per acre divided by 95% establishment equals approximately 36,850 seeds per acre.

## Authors

[Giovani Preza Fontes](#), field crops agronomist and Extension specialist, University of Illinois Urbana-Champaign

[Emerson Nafziger](#), professor emeritus, University of Illinois Urbana-Champaign

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