

## UPDATE

### 2007 POPULATION STUDY FOR EASTERN ONTARIO

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#### Summary

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- Corn growers continue to increase plant populations. Average planting rates are above 30,000 seeds/acre in most of Canada and the United States.
- Pioneer has conducted research for many years to measure how hybrids respond to plant populations. During the last 4 years, studies were conducted across 165 environments in 17 states and 3 provinces.
- “Early” hybrids (CRM<100 or CHU <3050) showed a steeper population response curve than later maturities. Past studies have shown that early hybrids require higher populations for optimum yields.
- Optimum economic planting rates ranged from 32,000 to 33,300 seeds/acre. Early hybrids were most profitable at rates of 34,700 plants/acre.
- In the Eastern Ontario study conducted this year, in 7 trials, the maximum economic rate was 33,100 plants/acre.
- In addition to plant population, hybrid stand ability can be affected by hybrid, crop management and environment. Results of Pioneer research suggest that addressing those factors may be more important than reducing plant population in order to improve hybrid stand ability.

38M59, 38N87, 37Y13 and 37Y17. These hybrids range in maturity from 2650 to 2950 CHU's.

Plant populations were varied at 28,000, 32,000 and 36,000 seeds per acre. Stand counts were taken at yield measurements at harvest time. Final harvest stands were slightly higher suggesting variable emergence.

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#### Pioneer Agronomy Sciences Study

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##### Results by Yield Level



In order to determine the optimum planting rate, it is important to understand the yield potential of the field. Pioneer Agronomy Sciences researchers have studied population responses across multiple environments for the last 20 years. The goal of these studies is to determine the optimum population of hybrids to maximize harvestable yield.

Corn hybrid response to plant population is affected by yield level at very low yields. However, at yield levels over 130bu/ac, grain yield response to plant population is similar regardless of yield level (Figure 1).

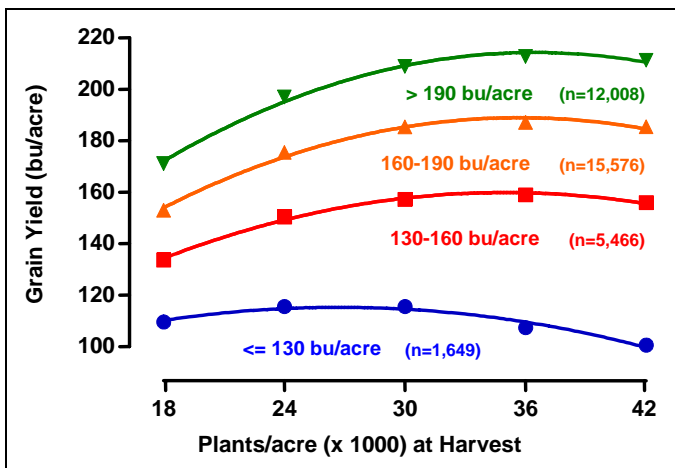
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#### Introduction

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Repeatedly corn growers ask the question “What population should I be planting at?” To help address this issue in Eastern Ontario, a corn population study was conducted in 2007. The focus of this study was on hybrids <3000 CHU.

Seven population trials were conducted across Eastern Ontario to assess the effects on yield, moisture, bushel weight and population. The hybrids used were: 38B13,



**Figure 1.** Corn grain yield response to plant population by location yield level, 2004 to 2007 (n is the number of observations within a yield range.)

As the graph indicates, optimum yields occurred at harvest populations of 35,000-36,000 plants/acre where average yield levels at the test site were 130bu/ac or more. At low yielding (<130bu/ac) environments, the optimum yields occurred at between 24,000 and 30,000 plants/ acre. Therefore, in low yielding areas of fields, a variable rate seeding would be beneficial, according to these results.

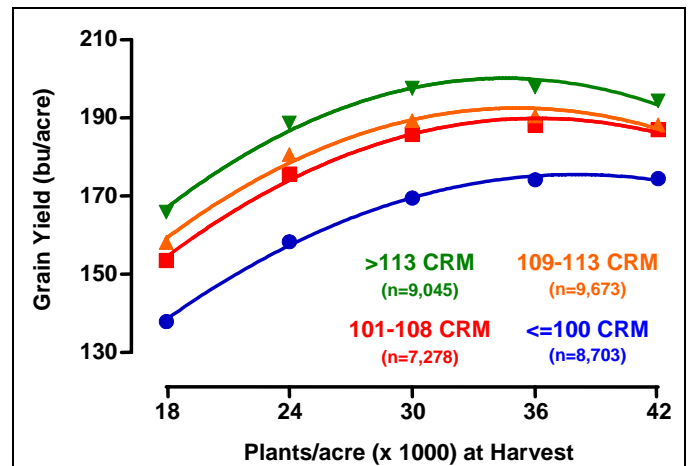


Pioneer researchers conduct corn plant population trials in multiple locations across Canada and the U.S. each year.

At all yield levels, considerations for determining a recommended planting rate should include not only the expected yield level but also the economic return. Optimum economic seeding rate based on the cost of seed and the price of grain will be addressed later in this article.

## Results by Hybrid Maturity

When hybrids are grouped by maturity, the results from the long term Pioneer study are displayed below in Figure 2.



**Figure 2.** Grain yield response to plant population for corn hybrids from four maturity (CRM) ranges, 2004 to 2007.

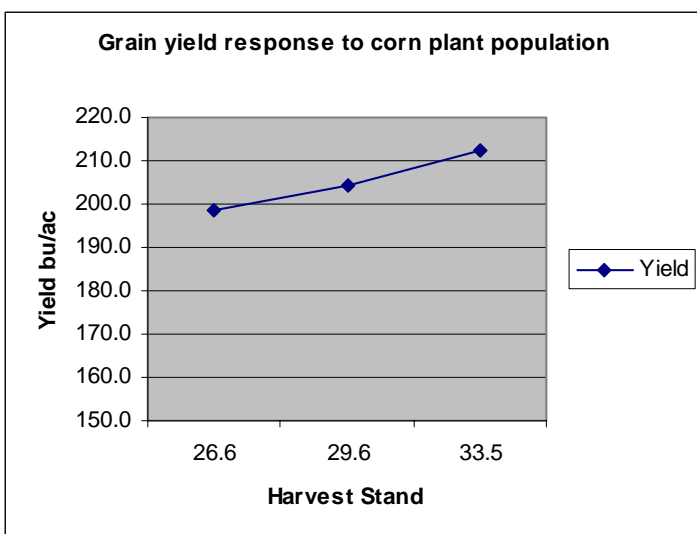
This four-year data summary shows a similar response of hybrid maturities (CRMs) to plant population. However, there are slight differences in optimum plant populations by CRM. The earliest hybrid group (< 100 CRM) shows the steepest response curve with a population optimum of about 38,000 plants/acre. The middle two CRM groups have an optimum of around 35-36,000 plants/acre, while the latest hybrids are slightly lower, at about 34,500 plants/acre. Past studies have also shown that very early hybrids require higher populations for optimum yields. Researchers theorize that the disadvantages of smaller stature and lower leaf area index of early maturity hybrids are overcome by higher populations.

## 2007 Study Results

The results from the 2007 Eastern Ontario trials are reported in Table 1 and Figure 3.

**Table 1.** Results of 2007 Eastern Ontario trials.

Population	Yield	Moist.	Test Wt.	Harvest Stand	Income/ Acre
28,000 ppa	198.6	23.4	55.8	26.6	\$661.1
32,000 ppa	204.3	22.9	55.8	29.6	\$689.8
36,000 ppa	212.2	22.9	56.4	33.5	\$715.3



**Figure 3.** Grain yield response to plant population averaged over locations for hybrids ranging in maturity from 2675 to 2950 CHU in 2007.

Overall, yield increased as plant populations increased. There was no significant difference in moisture or test weight. The highest yield of 212.2bu/ac being at the target population of 36,000 plants/acre, with a harvest stand of 33,500 plants/acre.

The yield trends found in the 2007 Eastern Ontario study reflect long term research conducted by Pioneer's Agronomy Sciences division.

### The Bottom Line

Taking into account a seed cost of \$2.11/1000 seeds and a corn grain price of \$3.72/bu and a drying cost of \$0.04/pt/bu the increase in income is:

Change in Population	\$/Acre income
Increasing from 28-32 ppa	\$20.20
Increasing from 32-36 ppa	\$17.10

## Agronomic Considerations

### Hybrid Late-Season Standability Research

Increased stalk lodging is sometimes observed with high plant densities, as average stalk diameter is reduced. For this reason, Pioneer researchers conduct "late-season standability" trials across North America each year. In these plots, hybrids planted at 18,000 to 42,000 plants/acre are left in the field past normal harvest dates. This allows researchers to evaluate hybrid standability

responses to plant population after exposure to adverse environmental conditions.

The results showed that in these high stalk-lodging environments percent stalk lodging increased approximately 0.5% for each 1000 plant/acre increase in population.

## Considerations

- Differences in soil type, moisture holding capabilities and management practices may not warrant higher populations.
- Average stand losses due to insects; diseases and weather can equal 5 -10%.
- Ideal plant populations should be based on the hybrid's ability to yield at high populations.
- Growers should check their harvest stands and compare to actual planting rates.
- A well-tuned planter can increase yields by as much as 5 – 10 bu/acre.
- Delays in plant emergence can affect yield by 4 - 6% for a 10 – 14 day delay and as high as 10 - 15% for a 21 - 24 day difference in emergence.

## Conclusions

Based on Pioneer Agronomy Sciences studies, the optimum economic plant population for areas under 3000 corn heat units (<100 CRM) is between 34,000 and 35,000 plants per acre as a final stand count. However, depending on yield environment, the optimum economic planting rate will change. For each of our leader hybrids, population graphs are available. Contact your Pioneer Sales representative for more details.

## Special Thanks

Special thanks to the following plot co-operators for making this study possible: Brian and Bruce Hudson, Buckstop Farms, Ryan Baird, Greg Millard, Shane Mowat, Hog Haven Inc., Marty Gareau as well as Paul Sullivan and Drew Thompson.