

Corn Populations for the Northern Corn Belt

By D.R. Hicks

Crop production systems are extremely interactive. We must continually watch for needed refinements induced by subtle changes in genetics and standard management practices. This article indicates that many corn producers may need to reevaluate the plant populations they're using in today's higher yield potential systems.

EVEN THOUGH corn populations have increased during the past few years, higher economic yields can be obtained with higher plant populations in the upper Corn Belt. In Minnesota, the average plant population is about 24,000 plants per acre (ppa). The economic **optimum** harvest population is about 28 to 30,000 ppa.

Several factors affect the optimum plant population: the hybrid, maturity of the hybrid, management practices, and soil type. Growers should begin thinking of a final stand of 28 to 30,000 ppa; this would require a seeding rate of 31 to 33,000 viable kernels per acre. This population should be considered the optimum for today's hybrids grown under good management conditions and should be adjusted upward or downward depending on the factors discussed here.

Hybrid

After corn farmers have chosen the hybrid(s) they intend to grow, they should ask the dealer or company agronomist for a population recommendation for that hybrid(s). Companies have tested the hybrids under many different environments and can give precise population recommendations for each hybrid.

Farmers should give a "lot of weight" to the recommendation of the company for a particular hybrid, but they should challenge the hybrid if the recommended population is appreciably below the range of 28 to 30,000 ppa.

Hybrid Maturity

The target population of 28 to 30,000 ppa is for full season hybrids. Hybrids that are less than full season for a growing zone will generally require higher populations to reach their yield potential. Harvest populations should be increased 1,000 ppa for every five (5) relative maturity (RM) units earlier. For example, if a grower considers 100 RM to be "full season" for his/her farm and wants to plant a 95 RM hybrid, the target population should be 29 to 31,000 ppa.

Management Practices

When management practices other than plant population are limiting yield, the target population can be reduced below the 28 to 30,000 level without reducing yield. One cannot expect a yield response to higher plant populations if fertility (any nutrient) is limiting, or if weed control is poor, or the crop is planted too late (after May 10). Under these conditions, maximum yield has been predetermined and a yield response to higher populations, particularly an economic one, is less likely to occur.

Soil Type

Soil type affects water holding capacity; coarse textured soils cannot hold as much available water. In areas with limited rainfall or coarse textured soils, one can reduce the target population to 24 to 26,000 ppa.

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Research Results

Corn grain yields for a population trial conducted at the Southwest Experiment Station at Lamberton, MN are presented in **Figure 1**. The trial was conducted from 1984 through 1989; the experiment was abandoned in 1987 because of a prolonged early season drought. Rainfall was higher than normal for all other years, except 1988, which was a very dry year. The upper line in **Figure 1** is the 5-year yield average (including the dry year of 1988) and the lower line is the 1988 dry year results. For the 5-year average, grain yields continued to increase with increased plant populations up to 40,000 ppa.

These results were surprising and caused us to follow with more plant population trials at other locations and with more corn hybrids. Results of those trials are given in **Figure 2** for each location, averaged across six hybrids at each location. The hybrids were the same at Rosemount, Waseca, and Lamberton locations. The response to plant population was not as pronounced as in the earlier trials at Lamberton. Highest yields were produced

with harvest populations of 28 to 33,000 ppa for all six hybrids, at all four locations.

There's always the concern about "what happens in dry years with high plant populations?" The yield response in the dry year 1988 at Lamberton is the lower line in **Figure 1**. Yields increased similar to that in other years with more rainfall. Yields were limited because of dry weather at Morris in both 1990 and 1991 (**Figure 2**). There was very little effect of population on grain yield, but more importantly **yields did not decline appreciably**, even at very high populations. This response is typical in dry years with today's hybrids.

Growers need to ask themselves if they are pushing corn plant population to reach maximum economic yields? They may not be if harvest populations are below 28,000 ppa. With good management programs using early planting, good weed control, optimum fertility, and proper hybrid selection, corn harvest populations should be in the 28 to 30,000 ppa range for maximum profitable corn yields in the northern Corn Belt. ■

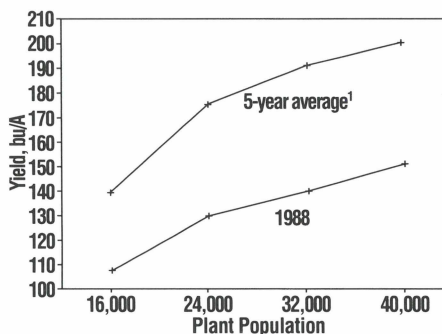


Figure 1. Corn grain yield as affected by plant population at Lamberton, MN, 1984-89. Years 1984 through 1989 (except 1987).

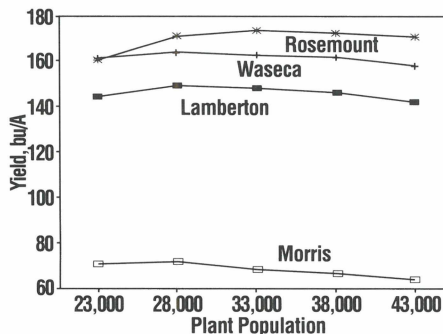


Figure 2. Corn grain yield as affected by plant population at four locations in Minnesota, 1990-91.