

Many factors contribute to advancing corn yields

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CHICAGO — Increasing corn yields in the U.S. are a result of a number of factors.

"We are very blessed in the U.S. with high corn yields, which is not the case for corn in much of the world," said Tony Vyn, professor of agronomy at Purdue University, during a presentation at the Corn and Sorghum Seed Research Conference organized by the American Seed Trade Association. "Our average yields at 155 to 165 bushels per acre are double those when you look at corn production on a world basis."

Some of the factors contributing to increasing corn yields are higher plant densities, adoption of strategies such as seed treatments, and fungicide protections and automatic guidance systems.

"These management changes are in addition to genetic changes," Vyn said.

"The trend in acreage in terms of plant density has been interesting to observe over the last decade or two," he noted. "Higher plant populations are typically observed in Iowa and Minnesota. Higher densities tend to be grown in



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Tony Vyn, professor of agronomy at Purdue University, speaks during a presentation at the Corn and Sorghum Seed Research Conference organized by the American Seed Trade Association.

shorter maturity regions."

But, the agronomy professor added, "not all is well when it comes to the presumption that we will get to 300-bushel corn by planting 60,000 plants per acre by 2030."

Some recent trials have documented there has almost been a flat response to increasing plant density.

"This was shown in 12 trials that had densities

ranging from the high 20,000 to low 40,000 plants per acre," Vyn said.

"A large part of our yield gain has come about because of earlier planting," he added.

For example, in Iowa, 90 percent of planting in 2010 was completed by April 30.

"From 1975 to 1979, 90 percent wasn't achieved until May 20," Vyn said. "So for the most part, we

moved much of our planting three weeks earlier and a large part of that is due to capability of planters, improved drainage and better seed treatments."

Optimum nitrogen rates are another important factor for corn yields.

"There's a very good effort in the Corn Belt states to look at optimum nitrogen rates," Vyn said.

"Up until last year for Indiana, the average corn nitrogen requirement was 186 pounds per acre for corn following soybeans," he reported. "What's really improved is the realization that a lot of our nitrogen recommendations need to be much more specific than a state average."

For some soils in Indiana, the optimum N rate is 177 pounds, and for other soils the optimum rate is 200 pounds, Vyn said.

"This recommendation will be revised again with the incorporation of lots of data from this year, mainly because we lost so much nitrogen," the Purdue professor reported. "The average nitrogen rate for Indiana will move from 186 pounds to 194 pounds."

One way to think about potential corn

yields is to consider the basic physiological processes that are involved in yield, including sunlight, water and nutrients.

"Yield gap is the difference between what is achieved and what is physiologically the true potential," Vyn explained.

"Temperature has a lot to do with kernel growth rate during the grain-filling period," he said. "That is a key reason for the yield reductions we experienced in 2010."

From studies conducted on irrigated acres in Nebraska, "the yield increase has been about 2.2 bushels per acre, and that's a little higher than 1.86 bushels per acre that is projected for the U.S. as a whole," Vyn said.

The yield potential for this region of Nebraska is about 250 bushels, he said.

"Under really optimum conditions, the maximum yield potential could be as much as 285 bushels," he added.

"The last eight years, over 700 fields of irrigated corn, the yield was 193 bushels," Vyn said. "So from this analysis, the best we can do is perhaps get within 80 percent of the maximum yield potential when the limiting factors are sun, water and nutrients."

Vyn highlighted some of the management practices that are important

to achieve higher corn yields.

"Insect-resistant traits are a clear advantage when pests are present," he said. "But if there is below threshold infestations, you don't experience much of a yield advantage."

Nitrification inhibitors are beneficial to enhance plant available nitrogen in certain environments, Vyn said.

"That's especially true today because about 40 percent of our total plant nitrogen uptake is occurring after flowering," he added. "The more post flowering nitrogen we have going in the corn plant, the more we need to think about delaying the availability of mineral nitrogen to the corn crop."

Vyn noted that some people may argue that the maximum leaf area on a corn plant has already been achieved.

"The question is not getting more leaf area, but perhaps maintaining the photosynthesis capabilities at a higher rate during the grain-filling period," he said.

The goal is to do everything possible to attain high crop growth rates during the critical period from approximately 10 days before flowering to two weeks after flowering, Vyn said.

"This is the period that has the greatest impact on kernel number development as well as kernel weight," he added.