

## NEW THINKING REGARDING NITROGEN RATES FOR CORN

*by Bruce Erickson*

With the fall nitrogen season upon us and record high nitrogen fertilizer prices, farmers are rethinking their nitrogen decisions. To go along with that are new guidelines from the universities that have traditionally been providing much of the information regarding those decisions.

For a corn producer, fertilizers are their single-highest variable cost, and nitrogen is the biggest chunk of that—last year estimated at around \$40/A for a typical Indiana corn field. But nitrogen is not a straight-forward crop input. Nitrogen is applied to the soil which supplies the crop, and soil is a dynamic medium. Soils are a reservoir of nitrogen, but inputs and outputs do not always add up as one might predict. N applied to soil can be immobilized by microbial action, or even lost through processes such as leaching and denitrification. Thus crop responses to nitrogen are variable and somewhat unpredictable. But by combining many years and locations of nitrogen rate studies in different cropping situations, rate response curves can be developed and serve as a guide for determining economically optimum input rates.

Recommended nitrogen rates have largely been based on yield expectations in years past, adjusted for previous crops, manure applications, and the like. Since fertilizer has been relatively cheap compared to returns, fertilizer costs and grain prices have not caused much change in past N guidelines.

The University of Illinois has an extensive research base and experience in working with nitrogen fertilizer issues in corn, and they are in the process of a significant overhaul in nitrogen guidelines. New Illinois guidelines will consider an optimum range vs. a single rate recommendation as has been done in past years. Recommendations in Indiana, Ohio, and Michigan appear to be changing in similar fashion as well.

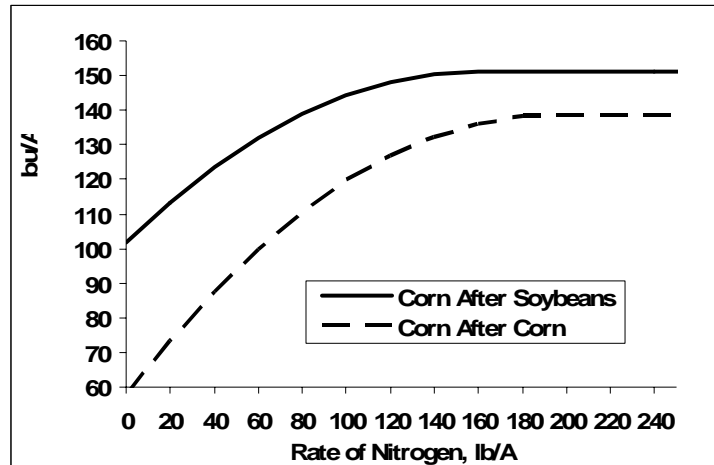
At ammonia prices of \$450/T (about \$0.27/lb N) and corn at \$2.00/bu, the rate that maximizes



*Applying anhydrous ammonia in the fall. (Iowa State University).*



return to N for corn following soybeans in Illinois is 147 lb/A, according to agronomists Emerson Nafziger and Robert Hoelt. For corn following corn, the economic optimum is 159. Their calculations show that for every \$0.06/lb increase in N, the recommended rate goes down about 10 lbs. Since N response curves are relatively flat near economic optimums, the 147 lb/A rate is the optimum, but returns to N are within \$1.00/A in a range of 127 to 169 lb/A of N, the new range being proposed.



*Nitrogen response curves for two crop rotations based 34 site/years, 1999-2003 (University of Illinois).*

The new Illinois economic optimum rate for corn following corn differs from that of corn following soybeans by 20 lb/A, not the expected 30 or 40 lb/A “credit” associated with the soybean rotation effect. This is partially due to the fact that the database supporting the guidelines did not have both crop rotations in the same field. Also, there is a tendency for corn following corn to occupy more productive soils than corn following soybeans, soils that may have a greater ability to supply nitrogen to crops.

Another group of University of Illinois researchers have developed a soil nitrate test that may help further refine nitrogen fertilization practices. Richard Mulvaney says the traditional method of using predicted yields as a base in nitrogen rate recommendations is incorrect. He says that crop responses to N are usually lowest in higher-yielding areas, and what is most important is how much nitrogen comes from the soil—rich soils need less N, poorer soils need more.

Mulvaney and associates have developed the Illinois Soil Nitrate Test (ISNT). The ISNT is a soil test that measures the amount of organic nitrogen available for mineralization, which is the process that generates inorganic nitrogen for crop uptake. Soil samples are collected and then heated with an alkaline solution to convert the potentially mineralizable nitrogen to ammonia gas, which is measured.

Fertilizer prices are up, but there is some good news. In areas affected by last year’s drought, the University of Illinois recommends crediting back some of the nitrogen applied to last year’s crop if going back to corn. When yields are low, corn following a low corn yield will have an easier time, with less residue and some leftover N. Subtract the harvested corn yield from the amount of nitrogen applied, then half that number. For instance, a farmer that applied 180 lbs/A of N but had a 120 bu/A yield in 2005 can credit back a 30 lbs/A N to next year’s corn crop. In severe drought areas, there may be enough carryover nitrogen to justify considering corn again in those fields.



The University of Illinois recommends that when applying fall nitrogen, to not make applications until soil temperatures have settled below 50 F, and use N-Serve, a nitrogen stabilizer. At the time of this writing, 4-inch 10:00 a.m. bare soil temperatures in the Eastern Corn Belt were just above 50 degrees F.

#### FOR MORE INFORMATION

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