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## High nitrogen fertilizer prices -- again

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## **Abstract**

I am often asked what N rate should be applied for corn production. I hesitate to give too simple of an answer, but actually a straightforward rate of 125 lb N/acre for corn following soybean (SC) and 175 lb N/acre for corn following corn (CC) (continuous, second-, or third-year) with good N management works well. If you have followed Iowa State University Extension publications regarding N management over the years, these rates are in the middle of suggested rate ranges provided since at least 1979 (100--150 lb N/acre for SC and 150--200 lb N/acre for CC).

## **Keywords**

Agronomy

## **Disciplines**

Agricultural Science | Agriculture | Agronomy and Crop Sciences

# INTEGRATED CROP MANAGEMENT

## High nitrogen fertilizer prices -- again

### Corn N fertilization

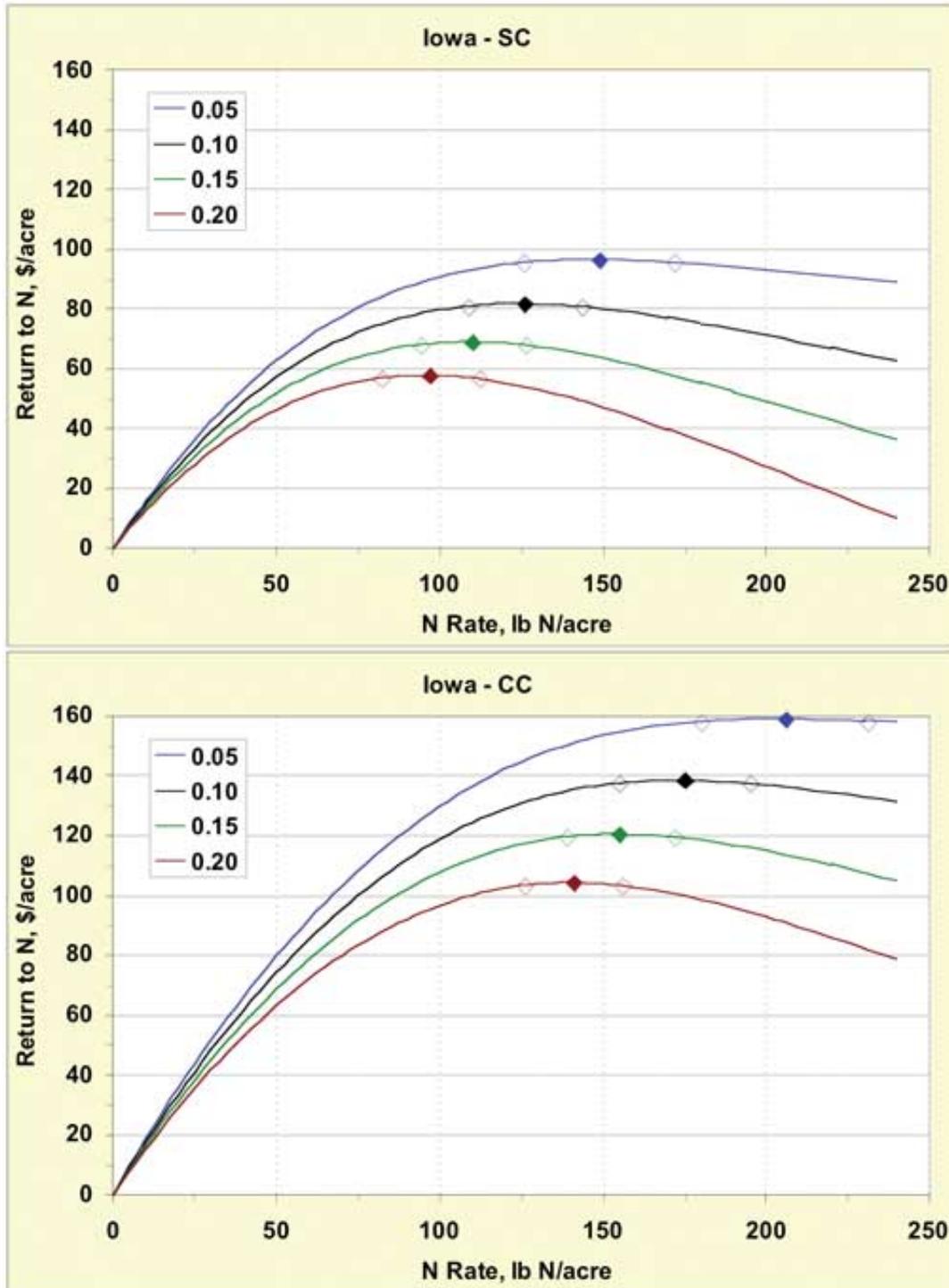
I am often asked what N rate should be applied for corn production. I hesitate to give too simple of an answer, but actually a straightforward rate of 125 lb N/acre for corn following soybean (SC) and 175 lb N/acre for corn following corn (CC) (continuous, second-, or third-year) with good N management works well. If you have followed Iowa State University Extension publications regarding N management over the years, these rates are in the middle of suggested rate ranges provided since at least 1979 (100--150 lb N/acre for SC and 150--200 lb N/acre for CC). An analysis of recent data from many N rate trials conducted in Iowa since 1991 indicates these "straightforward" rates are still correct. Figure 1 shows the economic net return to N for SC and CC at four different price ratios of N price:corn grain price (\$/lb N:\$/bu corn grain). For the figure, the corn price was held constant at \$2.20/bu and N prices were varied from \$0.11, 0.22, 0.33, and 0.44 per lb N. These give price ratios of 0.05, 0.10, 0.15, and 0.20, respectively at the four N prices. The point of maximum return to N (MRTN) is the N rate where the greatest economic net return to N occurs. This is indicated by the solid symbols on each price ratio line. As you can see, at the 0.10 price ratio the maximum return occurs at 123 lb N/acre for SC and 174 lb N/acre for CC, at the middle of currently suggested N rate ranges.

Also remember that corn following established alfalfa most often requires no N application, with an occasional response to a small amount of N, around 30 lb N/acre. Second-year corn after alfalfa is more responsive to applied N, with response up to 60--90 lb N/acre. Second-year corn following soybean is gaining acreage in Iowa. Nitrogen rate trial data is limited from across Iowa; however, based on a long-term and on-going N rate-crop rotation study conducted at the Iowa State University Northeast Research Farm located at Nashua, second-year corn appears to have N fertilization requirements similar to continuous corn (see above discussion).

### How much should rates be adjusted when N prices are high?

As the lines in Figure 1 indicate, the net return is pretty flat around the maximum return. This is due to the small yield change at N rates near optimum N. The open symbols on each line indicate net return that is within \$1.00/acre of the maximum, and can be considered a range of N rates that provides similar profitability. The width of each range varies somewhat depending upon the price ratio, but generally is within about 20 lb N/acre of the rate at the maximum return. This range of similar net return points out the flexibility available when choosing application rates. These net return curves, point of maximum net return, and profitable N rate ranges can be used as a guide for N rate adjustment based on corn and N

prices. Or, as a general rule, start with the 125 or 175 lb N/acre rate for the SC and CC rotations, and then for each one cent (\$0.01) change in N price from \$0.22/lb N, change the N rate by 1.5 lb N/acre for SC and 1.7 lb N/acre for CC. For example, if you have to purchase N at \$0.40/lb N, then the N rate to apply to corn following soybean would be 27 lb N/acre less than 125 lb N/acre, which is 98 lb N/acre. If the N price you pay is \$0.15/lb N, then the N rate to apply to corn following soybean would be 11 lb N/acre more than 125 lb N/acre, which is 136 lb N/acre.



[1]

Figure 1. Maximum net economic return to N (MRTN indicated by solid symbols) and profitable N rate range (indicated by open symbols) for corn following soybean (121 SC sites) and corn following corn (56 CC sites) in Iowa at different N:corn price ratios. Net return is the value of corn grain produced minus the N fertilization cost. Corn grain price held constant at

\$2.20/bu, and N prices varied at \$0.11, \$0.22, \$0.33, and \$0.44/lb N to give price ratios of 0.05, 0.10, 0.15, and 0.20, respectively.

## **Additional considerations**

As you think about changing N application rates, you also should take into account your risk tolerance or aversion. As application rates are lowered in response to higher N prices, the chance of having deficient N does increase. You may well be comfortable with a greater chance of either some N shortage or greater occurrence of deficit N. Or, if capital for purchasing production inputs is limited, then increased risk from lowered N application may be unavoidable. Or, you may wish to apply N at rates that provide good yield but are more environmentally benign. In these cases you would choose rates at the lower end of the profitable ranges. With limited capital or shortage of N fertilizer materials, it would be better to apply lower N rates to all production fields than not applying any to some.

## **In summary**

Nitrogen application to corn should reflect rates determined to be economically profitable from research trials. Rates also can be adjusted for changing economic conditions. However, decisions also should consider effects on production and environmental risk.

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