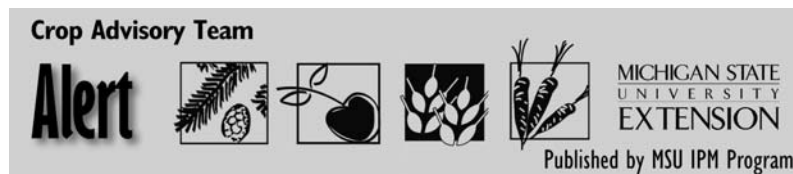


Special Field Crop CAT Alert edition: Another look at fertilizers



Articles compiled by the [MSU Extension Field Crops Area of Expertise Team](http://www.ipm.msu.edu/fertilizer2009.htm) and Natalie Rector, issue coordinator. Visit <http://www.ipm.msu.edu/fertilizer2009.htm> to read the issue online.

Too little or too much nitrogen on corn: MSU's new guidelines

The economic risk of applying too much nitrogen (N) on corn is just as dramatic as applying too little. In 2004, university agronomists from the North Central region began a project to determine maximum agronomic production of corn at the most efficient economic level. The Maximum Return to Nitrogen (MRTN) approach to corn N recommendations represents the combined efforts of six states to develop the most efficient and profitable system of N management based upon site-year information. The recommendations utilize the latest hybrid genetics, soil productivity qualities, and best N management practices.

This new method will probably seem radical to many and risky to most. If it does nothing other than make you rethink your N rates and contemplate the price of corn, it will be worth the time to see how your current thinking compares to the following charts.

Michigan's corn N response database includes 47 site locations over the last ten years, including 30 in the last three years. Statistical modeling is used to fit response curves to each individual site's corn grain response to N. Response to N is calculated at 1 lb N rates along that curve to find the most economic application rate. All sites are then combined to generate the most profitable N application rate, or MRTN. These trials were conducted with spring pre-plant, sidedress, or split preplant/ sidedress applied N, and sites were not irrigated. The current MSU guidelines from these trials are shown in Table 2.

Calculating the N:corn ratio and the price of N per pound

The multitude of possible N and corn grain price ratios make computer spreadsheets an ideal tool to determine specific corn N rate recommendations. Visiting this calculator, <http://extension.agron.iastate.edu/soilfertility/nrate.aspx>, will stretch everything you thought you knew about economics and corn's response to nitrogen. **The Michigan data will be at this site by mid-February.** An example of the type of data generated by this calculator is shown in Table 1.

The N rate calculator begins by calculating the **N:corn price ratio** by dividing the price per pound of nitrogen by the price per bushel of corn.

First calculate the price of N on a per-pound-of-nutrient basis.

To compute the actual cost per pound of nutrient of various fertilizers, use the following formulas:

Material price per ton \div (2000 x % analysis of product) = nutrient cost in \$ per pound of nutrient

For example: urea at \$350 per ton \div (2000 x 0.46) = 38 cents per pound of N

Another example: 28% at \$200 per ton \div (2000 x 0.28) = 35 cents per pound of N

When nitrogen is calculated on a per-pound basis, you can also compare the major N sources on a cost per pound of nitrogen. If anhydrous is \$750 per ton, 28% UAN is \$250 per ton and urea is \$420 per ton, the result for all of them is about \$0.46 per pound of actual N.

Next, compute the N:corn price ratio.

Example: Urea at \$370 per ton is \$0.40 per pound of N \div \$4/bu. expected corn price = 0.1 N:Corn price ratio.


Once you have the N:corn ratio, use the MSU chart below (Table 2) to see what rate of nitrogen is considered the Maximum Return to Nitrogen, considered the most economical rate of nitrogen to use for the given yield potential.

Table 1. Range of Economic Optimum N Rate values (lbs/ac applied N) for corn following soybean as influenced by N cost per lb. N and grain price per bushel.

N cost	Price of corn grain						
	\$3.00	\$3.50	\$4.00	\$4.50	\$5.00	\$5.50	\$6.00
\$0.40	93	97	100	102	104	105	107
\$0.45	90	94	97	100	102	104	105
\$0.50	87	91	95	98	100	102	103
\$0.55	84	89	92	96	98	100	102
\$0.60	80	86	90	93	96	98	100
\$0.65	77	83	87	91	94	96	98
\$0.70	xx	80	85	89	92	95	97
\$0.75	xx	77	82	87	90	93	95
\$0.80	xx	xx	80	84	88	91	93

This is the average N recommendation. For +/- \$1 of the MRTN, the recommended N rate will range from 10 lbs less to 15 lbs more than the value in the table.

Table 2.

Michigan State University Corn Nitrogen Recommendations						
N:Corn Price Ratio 	0.10		0.15		0.20	
Yield Potential Previous Crop	Recommended lbs. of N per acre					
Medium/Low	Rate	Range	Rate	Range	Rate	Range
Corn	130	115-145	120	105-135	110	95-125
Soybean	100	85-115	90	75-105	80	65- 95
Very High/High						
Corn	150	135-165	135	120-150	120	105-135
Soybean	115	100-130	105	90-120	95	80-110
<i>Range: approximates ± \$1.00 of the Maximum Return to N rate</i>						

Be sure to credit N from previous sources

Response data for these N recommendations was based on soybeans or corn as a preceding crop. Other crops in rotation with corn will require adjustments in the N credits applied to this recommendation. Be sure to credit all potential nitrogen that may be available for corn production.

Alfalfa

Even a worn out alfalfa crop has N value to the following corn crop. A 50 percent stand should contribute 90 lbs per acre of N to the following corn crop, but the better the stand of alfalfa, the more N potential.

Clover

Clover cover crops often provide 50 to 70 lbs per acre of N the following season. The thicker the stand and the more growth that occurs before it is killed, the more N potential left to the following crop. To learn about frost seeding clover into wheat, visit

www.animalagteam.msu.edu/LandApplication/CoverCrops/tabid/215/Default.aspx

Soybeans

Soybeans are generally credited for 30 lbs per acre of N to the following corn crop. However, when using the MRTN data base for corn after soybeans (Table 1), no additional N credit should be taken -- that would be double dipping. This N benefit is because soybeans are N fixers and have less residue compared to corn after corn. Therefore, less N is tied up in decomposing the residue and more N is readily available for the following crop. Corn following soybeans should need less N than corn following corn.

Wheat

When planting corn after wheat, the corn/corn rotation N recommendations should be followed.

Manure

Manure has several years worth of slow release organic N. The application rates and manure analysis can be used to estimate these amounts while pre-sidedress nitrate soil tests will measure the plant available nitrogen for the current season with greater accuracy. More specific information on manure can be found at www.animalagteam.msu.edu.