



Optimal Nitrogen Rate Calculator

It's easy to see yield differences when comparing yields from nitrogen strip trials. What's more difficult is determining whether the yield differences we see translate into economic differences.

In most cases, On-Farm Network strip trials have compared a normal rate with 50 lbs. per acre less. Because of the increase in nitrogen prices we've seen in the past two years, it may take more of a yield difference to make higher rates more profitable.

It's easy to calculate optimum economic nitrogen use rates from these trials with a calculator put together by Dr. Peter Kyveryga, an Iowa State University postdoctoral researcher, and former student of Dr. Alfred Blackmer. This Microsoft Excel based spreadsheet allows you to enter your own numbers for nitrogen application rates, nitrogen costs, and yields from your strips. It allows you to enter a percentage return on your nitrogen investment, as well. Then, using yield returns from a range of nitrogen

INFORMATION INPUT		Corn after soybean	
1	Corn grain price	2.20	\$/bu
2	Fertilizer N price	0.25	\$/lb
3	High N rate	125	lb N/acre
4	Low N rate	75	lb N/acre
5	Yield at high N rate	170.0	bu/acre
6	Yield at low N rate	165.0	bu/acre
CALCULATOR OUTPUT			
7	Bushels of grain required to buy extra N	5.7	
8	Midpoint of the high and low N rates	100	lb N/acre
9	Discrete Marginal Product (DMPs) per 50-pound N fertilizer increment	5.0	bu/ 50lb N
10	Slope of the relationship between DMPs and N rates	-0.0684	
11	N optimal (N rate at which the value of resulting yield increase equals the cost of the last 1-lb increment of N)	90	lb N/acre
12	Enter the desired rate of profit on the last 1 lb of N	25	%
13	N optimal for the desired rate of profit (N rate that gives the desired rate of profit on the last 1-pound increment of N)	69	lb N/acre

application rates studied over several years, it calculates the optimal rate.

This calculator assumes that yields will be higher with higher nitrogen application rates. Thus, if yields from the lower rates are equal to or higher than those from higher rates, the calculator won't work. But then, if this is the case, you don't need a calculator to tell you that the lower rate is the more economic rate.

Kyveryga produced two versions of the calculator: one for corn after soybeans and one for corn after corn. Both are available at the On-Farm Network™ website www.isa-farmnet.com or by following the links from the Iowa Soybean Association website at www.iasoybeans.com.

responses to nitrogen were assessed using remote sensing and through yield measurements at the end of the season.

For fields averaging less than 200 bu. yields, the 125 lb. rate produced an average of only about 6 bu. more, which was barely enough to pay for the extra nitrogen, particularly at today's nitrogen prices. The higher rate was profitable at some sites, but the higher profit is attainable only if you could identify those sites before putting on the fertilizer.

For fields where yields averaged more than 200 bu. an acre, the higher fertilizer application rate was generally profitable, but here again, you'd have to be able to identify those fields where yields would go over 200 bu. prior to fertilizer application. (See table 1.)

In studying aerial imagery of the fields, it was apparent that response to nitrogen was greater in some parts of the field than others. Analysis of these patterns could help predict where additional nitrogen would be beneficial in the future.

From these studies, it appears that 100 lbs. of nitrogen is usually sufficient when applied at a time when losses are predictably low and when the crop can take it up quickly. Remember, though, that use of strip trials on your own farm will verify whether lower rates will work for you.

Another point, from Table 2, is that a higher yield response to higher nitrogen rates may be related to rainfall events about the time of application. ■