

ECONOMIC EVALUATION OF VARIABLE RATE NITROGEN APPLICATION ON COTTON

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Abstract

Precision farming consists of 1) gathering information to identify areas of a field where the crop needs different amounts of an input, 2) determining amounts of the input needed by the crop in those areas, and 3) applying the needed amounts of the input in each area. This study shows that gathering site-specific information about a field can help a farmer make more economically sound decisions and that variable rate nitrogen application potentially can increase yield, decrease nitrogen use, and increase net return. These benefits are shown for a cotton farmer who wants to maximize profits from a cotton field where yield response to nitrogen is poor on 50% of the field and good on the other 50% of the field.

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When a uniform nitrogen rate of 102 lb/acre is applied to both the poor and the good land, cotton lint yield on the good land is 1333 lb/acre and return above nitrogen cost is \$806.21/acre. On the poor land, yield is 619 lb/acre and net return is \$358.53/acre. Without site-specific information, the low yield and net return on the poor land is masked by the field average yield of 976 lb/acre and the average net return of \$582.37/acre.

When nitrogen is variable rate applied on the two land classes at the rates needed by the cotton crop for maximum profit, the good land receives 121 lb/acre of nitrogen, yields 1360 lb/acre, and provides a net return above nitrogen cost of \$817.63/acre. The poor land receives 75 lb/acre of nitrogen, yields 632 lb/acre, and provides a net return above nitrogen cost of \$374.51/acre. Average nitrogen use

is 98 lb/acre, average yield is 996 lb/acre, and average net return is \$596.07/acre.

Net return for variable rate nitrogen application is \$13.70/acre more than when the uniform nitrogen rate is applied. This increase in net return comes from a combination of an average yield increase of 20 lb/acre and an average nitrogen decrease of 4 lb/acre. This \$13.70/acre increase in net return is \$9.20/acre more than the \$4.50/acre cost of hiring variable rate application services. The owner of this field can increase net return \$9.70/acre on this field by hiring variable rate nitrogen services.

Another question that might interest farmers is, "How variable does yield potential have to be on my field for variable rate nitrogen application to pay?" In this example, the cotton field has to be between 11.5% and 92% poor land for variable rate nitrogen application services to be profitable. For example, using variable rate services on a field with 10% poor land and 90% good land costs more to hire the services than would be gained from their use. The same is true for a field with 95% poor land and 5% good land. Yield variability in these fields is not enough to warrant variable rate nitrogen application.

The question of whether variable rate nitrogen application pays is field specific because each cotton field is different. The results obtain for the field in this example will differ for other fields depending on variability in yield potential, variability in yield response to nitrogen, prices of cotton and nitrogen, and the cost of hiring variable rate nitrogen application services.