

Variable Rate Nitrogen (VRN) Application On Wheat Using The Greenseeker On A Field Basis



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The objective of this experiment is to determine if the algorithms for variable rate nitrogen applications found from small plot research in Kentucky will result in improved nitrogen applications and yield when plant sensors are used on a commercial applicator in a large wheat field.

The Greenseeker is a real-time, on-the-go sensor/applicator that senses the health of the wheat crop at the time nitrogen is applied and then simultaneously adds the precise amount of nitrogen that is determined to be needed by the machine. The sensing and application technology part of the machine has been very accurate and reliable. The weak part of the process has been the algorithm (formula) that is placed in the software of the machine to tell it how much nitrogen to add based on the plant health Normalized Difference Vegetation Index (NDVI) readings. Basic field research has resulted in reliable algorithms for use on field application.

METHODS

A replicated (6 replications) field trial in Christian County was done with the Greenseeker in a large field with the help of Brandon Hunt, Phillip Needham and Jason Head. The Hunt

farms bought 4 Greenseeker units and placed them on a sprayer with a 60 foot boom. The Greenseeker units were assembled to give an average NDVI reading across the 60 foot boom and N rates changed across the entire boom as called for by the NDVI readings. The 2008 algorithm was used for this trial. The sprayer only used pressure to change 32 percent VRN solution volume. So the change was limited to a 50 lb/a N range (30 to 80 lb/ac N) and the rate of change was slow, especially at 12 mph.

RESULTS

The N rate used by the Greenseeker averaged 23 lb/ac N higher than the farmer practice, flat rate chosen by the Hunts and the wheat consultant. The visual observations beginning about 2 weeks after the N application showed the Greenseeker plots to be greener with less color differences within the stripes. They definitely looked a little better.

The final yields showed the Greenseeker plots to yield about 5 bu/acre more. This statistically significant increased yield could be due to a better N distribution, a higher N rate or a combination. Table 1 gives the specifics of N application and the yield. The economics in the Table show about a \$14/acre advantage for the use of the Greenseeker not considering the cost of the initial investment. Δ

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TABLE 1. GREENSEEKER FIELD TRIAL ON THE HUNT FARM IN CHRISTIAN COUNTY - 2010

1) N applied to all plots on 2-17-10 = 63# N/acre
2) N applied to farmer flat rate strips (6) on 4-6-10 = 45# N/acre
3) N applied total to farmer flat rate strips (6) = 108# N/acre
4) Avg. N applied to VRN strips (6) on 4-6-10 = 69# N/acre
5) Range of VRN applied 4-6-10 = 32 to 87# N/acre
6) Avg. total N applied to VRN strips (6) = 131# N/acre
7) Average yield of farmer practice strips (6) = 79.3 bu/acre
8) Average yield of VRN strips (6) = 84.2 bu/acre
9) Difference in yield = 4.9 bu/acre
10) Difference in total N applied = 23# N/acre
11) Cost of increased VRN applied @ \$0.45/lb = \$10.35/ac
12) Return of increased VRN yields @ \$5.00/bu = \$24.50/ac
13) Economic advantage to VRN = \$14.15/ac