Cornell University
Cooperative Extension
Northwest New York Dairy, Livestock & Field Crops Team

New Technology for Corn Nitrogen Needs

Farmers and agronomists are constantly looking for better tools to improve crop production, and corn nitrogen is no exception. In an effort to account for the spatial variability within every field and the temporal variability of nitrogen due to weather farmers are beginning to use two new tools, GreenSeeker and Adapt-N, on a small scale in northwestern NY. While these tools have great potential to improve corn nitrogen management it is important to understand what they require to work well and the situations where their use may not be warranted until more experience is gained with them.

GreenSeeker

What is it? The GreenSeeker was developed at Oklahoma State University for use in wheat. It uses the normalized difference vegetation index (NDVI) values (0 to 1) to determine crop health status. Over time it has been adapted for use in corn. Generally recommended nitrogen fertilizer levels are low at low NDVI values, increase in the middle range, and decline again as NDVI values continue to increase The idea is that the low NDVI plants have lower yield potential so there is no need to apply much nitrogen. Corn plants in the mid-range of NDVI values have higher yield potential, and require more nitrogen reach those yields. Finally the high NDVI corn plants have higher yield potential, but already have more of the nitrogen they need to finish producing those yields. This technology easily allows for variable rate nitrogen management. Boom mounted and handheld sensors are available,

http://www.trimble.com/

The OptRx system is similar to the GreenSeeker, but there are some subtle differences. The OptRx system does not require a high nitrogen reference strip (it recommends growers scan a healthy area of the field first as the reference strip instead). It also uses a red edge light wave for scanning in addition to the infrared

Mike Stanyard, PhD, CCA
Regional Field Crops Specialist
NWNY Dairy, Livestock, and Field Crops Team
Cornell Cooperative Extension
(585) 764-8452 cell
http://www.nwnyteam.org/

Bill Verbeten, MS, CCA
Regional Field Crops Specialist
NWNY Dairy, Livestock, and Field Crops Team
Cornell Cooperative Extension
(585) 313-4457 cell
http://www.nwnyteam.org/
billsforagefiles.blogspot.com

wavelengths. The OptRx system may also be used beyond nitrogen application to apply other materials at variable rates. Experience with this system is still in the early stages in northwestern NY.

What is required? A nitrogen rich strip at corn planting, the GreenSeeker sensors, and high clearance equipment for a later sidedress nitrogen application (past V6) are needed to effectively use the GreenSeeker in corn. The nitrogen rich strip (placed in fields with different soil types, varieties, planting dates, etc.) is necessary to calibrate NDVI readings.

When does it work? For a GreenSeeker to effectively measure corn health there needs to be a high enough leaf area index (LAI) to have the sensors not be biased by bare soil. This occurs around the V6 stage in corn. Wheat did not have this problem as it covers the soil more quickly.

When does it fail? Early adopters in Ontario, Canada have found that scanning at the traditional early sidedress timing (V4-V5) biases the GreenSeeker because too much bare soil is present, which results in lower NDVI values regardless of corn nitrogen status. Scanning and applying sidedress nitrogen after V6 overcomes this issue.

How much does it cost? For each GreenSeeker unit mounted on a spray boom/toolbar a farmer can expect to pay between $3000 and $4000. Farmers in our region are placing them every 10-20 feet on their equipment, requiring a $20,000+ investment for using this technology. Handheld GreenSeekers sell for around $500 and we are currently using them for some ongoing nitrogen response research trials.

Current use and research: About half a dozen GreenSeeker equipped applicators are in commercial use in northwestern NY. A collaborative research project between Agrinetix, Quirine Ketterings of Cornell University, regional farmers, and our Extension team is being conducted during the 2014 season.

Mike Stanyard, PhD, CCA
Regional Field Crops Specialist
NWNY Dairy, Livestock, and Field Crops Team
Cornell Cooperative Extension
(585) 764-8452 cell
http://www.nwnyteam.org/

Bill Verbeten, MS, CCA
Regional Field Crops Specialist
NWNY Dairy, Livestock, and Field Crops Team
Cornell Cooperative Extension
(585) 313-4457 cell
http://www.nwnyteam.org/
billsforagefiles.blogspot.com

Adapt-N

What is it? Adapt-N is a web-based, modeling software developed by Harold Van Es at Cornell University. It uses farmer/agronomist inputs along with weather data to estimate the corn sidedress nitrogen needs. For detailed information about this tool, check out the instructional videos and Adapt-N manual on our website.

What is required? An Adapt-N account and a lot of accurate information are needed to effectively use this tool to determine corn nitrogen needs. If inputs are constant within a management zone in a field, then variable rate nitrogen is possible, but each zone needs to be modeled separately.

When does it work? If the model inputs are accurate then the Adapt-N software usually gives a reasonable sidedress nitrogen recommendation in corn. As the old saying goes if you put "garbage in" you will get "garbage out." Adapt-N gives better recommendations with later sidedress nitrogen application timing (V6 or later) because more of the growing season is in the model. Checking the model with traditional nitrogen soil tests, GreenSeeker technology (see above), or potentially tissue testing can help validate/calibrate the model. Cash grain farmers have been the majority of early adopters in our region along with some of the consulting agronomists.

When does it fail? If the input data is inaccurate, Adapt-N will not give an accurate corn sidedress recommendation. Challenges encountered by early adopters have included underestimating corn yield (often due to not having accurate records), problems documenting manure inputs (variable nutrient analysis, un-uniform application rates, losses during incorporation, etc.), over estimating root depths (plow pans and poor drainage limit root growth), and incorrect soil OM levels (these can be highly variable across a field). Do not use default values in the program for your field inputs. Nitrogen credits from cover crops are not currently modeled in Adapt-N. Dairy farms have generally had more difficulty in using Adapt-N than their cash-grain counterparts, but it can still be used if the input information is accurate.

How much does it cost? Farmers can expect to pay $2-3 per acre to run the Adapt-N model unless a volume discount applies. Full product descriptions are available at http://www.adapt-n.com/products/.

Current use and research: Individual farmers and consultants are continuing to use Adapt-N in our region. Like any new tool some farmers have tried it and have moved on to other tools for various reasons. It has been used by Extension specialists in other regions with mixed success. We will continue to monitor and evaluate Adapt-N as part of our ongoing on-farm research efforts. Questions about Adapt-N should be directed to Bianca Moebius-Clune at bnm5@cornell.edu.

Mike Stanyard, PhD, CCA
Regional Field Crops Specialist
NWNY Dairy, Livestock, and Field Crops Team
Cornell Cooperative Extension
(585) 764-8452 cell
http://www.nwnyteam.org/

Bill Verbeten, MS, CCA
Regional Field Crops Specialist
NWNY Dairy, Livestock, and Field Crops Team
Cornell Cooperative Extension
(585) 313-4457 cell
http://www.nwnyteam.org/
billsforagefiles.blogspot.com