

Crop Sensors Come of Age

Crop sensing via air or ground isn't new. But now both technologies offer management efficiencies for growers with open minds . . . and wallets.

BY KURT LAWTON

PHOTO: KURT LAWTON



Andy Hart says of his two years' experience with Greenseeker, "You really notice the results of variable rates when the weaker areas in a field that got an extra shot of nitrogen actually catch up to the healthier portions of the field."

Mention remote sensing to a group of farmers and you'll see many skeptical eyebrows raised. You know the overpromised and underdelivered story sometimes attached to these aerial photographs and on-the-go plant health readings.

Experts who work with these two sensor-based technologies readily admit that "magic bullet" sales talk raised expectations beyond what is real.

However, innovative companies and ag retailers are now beginning to redefine the best use of both the remote-sensed aerial photographs and the sensor-based sprayer technology that applies variable-rate fertilizer, plant-growth regulators, defoliants and more.

Today, given the right research, timing, cost and expectations, some growers are finding success with this coming wave of the future.

Improved sensors and improved software

algorithms are being designed to detect specific crop deficiencies on the go. And improved analysis of aerial imagery throughout the growing season, combined with optimized scouting, can deliver valuable records to improve future profitability based on better management decisions.

AERIAL PHOTO OBSTACLES. John Deere's exit from the field after a brief two-year foray into selling nitrogen management programs using aerial imagery (OptiGro program) may have added to prior skepticism of this technology. However, Deere proved that high-quality imagery coupled with quick image turnaround time can deliver value to the grower.

But barriers to adoption often go beyond the technology. "It requires a change in mind-set, to split-apply nitrogen based on reading the crop or paying for aerial imagery to make scouting more effective and efficient. And those grower mind-set changes

don't happen overnight," says Tom McGraw, who owns Midwest Independent Soil Samples based in Buffalo Lake, Minn.

McGraw successfully used the OptiGro system last year to correct early-season crop deficiencies. Now his company markets the technology—which Deere sold back to original owner GeoVantage after the 2007 season—through the new distributor Pinnacle Ag Technologies in North Bend, Neb. The program is called Crop Assure.

GROUND SENSOR OBSTACLES. Sprayer-based on-the-go sensor technology such as the Greenseeker from N Tech (marketed/distributed by Redball LLC) and the Crop Circle from Holland Scientific (to be marketed/distributed by AgLeader in 2009) requires that growers plant a nitrogen-rich strip in every field to calibrate.



Greenseeker technology allows Andy Hart to apply variable rates of nitrogen using drop nozzles.

PHOTO: JIM PATRICO

This has been one barrier to the practice, because it's asking growers to go beyond the norm. Growers also worry whether they'll have cooperation from the weather to apply nitrogen before corn gets too tall or whether rain will fall to get the nitrogen into the soil profile.

Another challenge with this type of sensor is trying to obtain readings that depict only nitrogen shortages. Tracy Blackmer, research director for the Iowa Soybean Association, has tested the Greenseeker through the On-Farm Network of growers

and determined that "the science is clear because the sensors do detect deficiencies; they also can increase yields and reduce nitrogen.

"But the challenge is how to calibrate for differences in nitrogen that are independent from other deficiencies such as zinc, moisture stress or field variability," Blackmer says. View the Greenseeker trials and more at www.isafarmnet.com/striprial.html.

Kyle Holland, owner of Holland Scientific, is developing a second-generation Crop Circle sensor that "uses three bands instead of two to help researchers further pinpoint stresses and crop characteristics in a much better way," he says.

And the company is refining their system to remove the need for a nitrogen-rich strip for calibration. This sensor will be incorporated into Ag Leader's technology and is planned for introduction in 2009.

There are obviously still pros and cons to both sensing systems, and neither is a magic bullet. But both technologies have fans who believe these tools

have a proper place in a farmer's arsenal.

GREENSEEKER BELIEVER. Elgin, Minn., grower Andy Hart has used the Greenseeker on a total of 3,500 acres of corn in 2007 and 2008. He has committed to applying 40 to 50% of estimated nitrogen during strip-till building. Then he puts another 20% of 28% nitrogen on at planting (as a herbicide carrier), and finally comes in with the Greenseeker to apply the final shot as a variable rate.

"After four years of yield mapping, along with variable-rate application success of potassium, phosphorus and lime, I desired an efficient method to apply variable-rate nitrogen. I had found tissue testing and soil testing not as reliable as I wanted because nitrogen moves fairly easily through the soil profile," Hart says.

"I liked the concept of a technology that can read which plants are not as vigorous, then can quickly change nitrogen application rates on the go.

"After using the Greenseeker the first season, I closely watched the technology and could see that it did change rates as plant health changed," Hart says.

"And thanks to variable-rate nozzles, the system can apply 10 gallons per acre just as well as 25 gallons and switch within a fraction of a second."

Another feature that Hart uses with the Greenseeker is its mapping ability. "Even when we're not applying variable-rate nitrogen, I run the Greenseeker to build a map that gives us a snapshot of field health at that time, such as when I'm spraying weeds.

"This extra layer of information is almost worth the cost of the technology, in and of itself," he says. "Then I can put my plant-health maps (at knee-high and waist-high) side by side with my harvest yield map and truly make some valuable decisions for future crops based on patterns and causes I find."

Speaking of economics, Hart firmly believes the system will pay for itself. "I don't know if I have saved a lot of nitrogen yet, but I'd say it has shifted the nitrogen around in fields to plants that need it more than others.

"You really notice the results of variable rates when the weaker areas in a field that got an extra shot of nitrogen actually catch up to the healthier portions of the field," he says.

Jack Gerhardt, a Minnesota farmer who first used the technology in 2005, became the Greenseeker product manager for Redball. He likes the Greenseeker because of his extensive use of manure as a base fertilizer.

"This tool helped us spot deficiencies and supplement the crop," Gerhardt says. "We have been able to cut 45 pounds of nitrogen out of our corn/soybean rotation, and we now achieve 200-bushel corn on an average of 125 pounds of nitrogen, ▶

which used to take us 170 pounds. But some areas of the field still need that 170 pounds," he says.

"Our goal with this technology is not about saving nitrogen; it's about aligning nitrogen with the true yield potential of a field, not with a hypothetical yield goal. And that is where the value of a nitrogen-rich strip comes in," Gerhardt adds.

"It gives you the peak value of your yield potential in any given growing season. University research has shown there is a proven correlation between sensor readings and [growing degree day units] since the seed went in the ground, which delivers a remarkably accurate yield prediction."

Holland says second-year trials of the new Crop Circle sensors used in European wheat and barley are showing a savings of \$32 per acre. "And we're helping vintners use sensors to segment the highest value grapes within a vineyard to produce ultra-premium wines that capture huge profits."

COTTON BENEFITS. Gerhardt says cotton growers also have achieved great savings with variable-rate application of both plant-growth regulators and harvest aids.

"Growers have seen that less defoliant is applied to areas of a field where leaves are dropping and bolls are opening naturally. Growers have literally saved one application of defoliant, or \$15 per acre."

SHIFTING GEARS WITH AERIAL IMAGERY. Nick Emanuel, CEO of Pinnacle (who used to work in the John Deere program), has changed the focus of aerial imagery from late-season nitrogen applications to helping retailers deliver real future benefits to growers.

"While we can't shoot images until close to corn canopy closure, we can detect problem areas of a field easier than running sensors over every acre.

"Then scouts can quickly go to only those problem areas, determine the best remedy and either make a late-season application when feasible or use the information for future management decisions," he says.

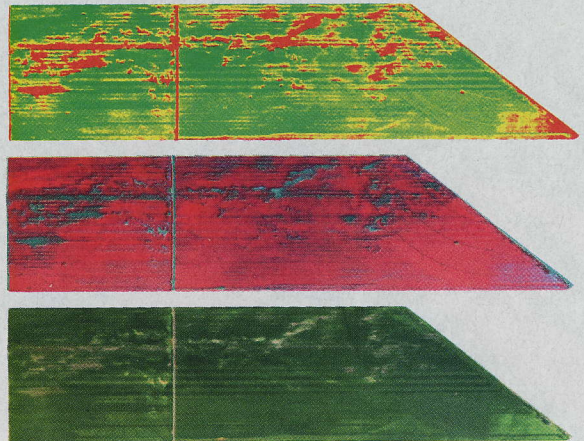
Indiana-based Co-Alliance Cooperative is using aerial imagery as a season-long scouting/recordkeeping/history/management tool. Justin Welch, who has managed the co-op's precision technology department for 15 years, used John Deere's OptiGro system on 4,000 acres last year to investigate the pros and cons of the technology.

"The Deere program helped us, and customers understand that a \$3-per-acre fee per photo and quick image turnaround (in four to five days) can deliver improved crop success.

"This year, with the help of GeoVantage along with our AgSure imagery program, we have moved grower

expectations of imagery to a proactive approach rather than a reactive approach," Welch says.

"Once growers see the value of a set of three images taken during the season [at corn V6 or less, then at tassel, then in August] compared with their harvest yield map . . . the knowledge gained is invaluable.



Digital aerial imaging can help interpret what is happening in a field. These three images are (from top) color infrared, NDVI (which shows vegetative growth) and true color.

"Not only can they save scouting dollars and time by correcting issues in portions of fields, they can effectively evaluate different management decisions [trials between different hybrids, fertility levels, fungicide or insecticide applications]. This helps save big dollars in future years which we help them quantify," Welch adds.

DOCUMENTED SAVINGS. "We proved to one customer that the compaction caused by working a field two days too early cost him \$17 per acre.

"And we easily have saved numerous customers more than \$180 per acre (30-bushel difference at \$6 per bushel) on matching the right hybrids to the right soils, because hybrids respond to different soils and stresses differently," Welch adds.

"Growers gain a huge appreciation for aerial imagery when we sit down and evaluate every field and write down every issue, and what decisions can and should be made to improve production in that field," he continues.

"And as farms get larger and are spread farther geographically, snapshots of fields 30 miles away—e-mailed within days to growers—add incredible scouting and management decision efficiency," Welch says.

"Our yield estimates in August, thanks to this imagery and crop scouting, give growers confidence to go to their banker in August with a balance sheet to get the necessary operating loan in order to take advantage of early-season prices." ●