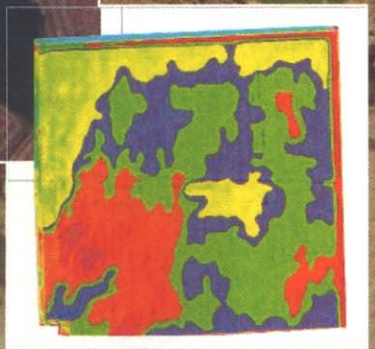
TAKE YOUR PICK

Site-specific technology is getting more precise

Tom McGraw thought he had seen it all when it came to remote imaging. He had worked with everything from tractor-mounted sensors to hanging out of an airplane snapping pictures to using satellite images. There always seemed to be complications. Clouds, time of day, and angle of the camera to the earth all affected clarity and quality of the image. And then there were the time delays associated with getting a plane in the air, much less having a satellite overhead when you needed it.

Although he hadn't given up on imaging, the owner of Midwest Independent Soil Samplers wasn't terribly excited when friends asked him to take a look at a "new" system called OptiGro from John Deere.

"I saw the stuff the pilot shot, and it was okay, so I asked them to make two flights on about 40 fields over a 3,000-acre nitrogen (N) evaluation area," recalls McGraw. "I saw the first imagery come back, and it popped my eyes. We were at one meter accuracy."



Light aircraft equipped with OptiGro sensors plus GPS and relative aircraft position data allows collecting one-meter accurate imaging. Information is immediately processed and sent to an agronomist for use in field analysis for VRT applications.

—Remote or Not So Remote

■ By Jim Ruen, Contributing editor

OptiGro differs in several ways from previous remote imaging McGraw had worked with for determining crop nitrogen needs. The OptiGro system combines aerial technology with on-the-ground expertise for using the results of new technology.

Rather than simply selling images, John Deere Agri Services works with full-service ag retailers and independent crop consultants and other service providers such as McGraw. It is those traditional channels that sell the service to customers. Once the service has been sold, the agronomist and his OptiGro contact put together a flight plan for image gathering at the appropriate growth stage (V-10 to V-12) and at the optimum time of day.

Key to the program's success is turnaround that puts images in the hands of the consulting agronomist within hours. This is accomplished by the pilot downloading digital images and information collected by a location sensor that tracks air craft movement every 1/10 of a second.

"To integrate the image with GPS for a prescription map, you have to have digital elevation and know how the camera was relative to the ground," explains Jeff Keiser, account manager sales/marketing, John Deere Agri Services. "Once on the ground, the information and the image are downloaded and automatically processed on site within an hour."

Also key to the program's success is that the image is not intended as a solution in itself, but rather as a guide to the consulting agronomist to aid him in ground truthing a field, which is a process in which a pixel on a satellite image is compared to what is there in reality in order to verify the contents of the pixel on the image. Then the correct course of action can be determined. "What we are doing is helping the agronomist or crop consultant focus on areas of the field that need to be investigated," says Kaiser. "OptiGro identifies the stressed areas, whether in response to insect, disease, N deficiency or other pressures."

In the case of nitrogen management efforts, McGraw is in the field within 48 hours with a handheld Minolta SPAD, collecting information at zero distance at four to five spots in the field that were selected based on the OptiGro image. It is the correlation between the two sets of data and university recommendations on how the crop will respond to additional N that is then used to determine a prescription for side dress application of N across the field.

Although the quality of the images grabbed McGraw, it was what they illustrated that made him a believer. When he saw regular lines throughout the fields, it begged the question... "What is causing them?"

"The answer was straw spreaders," says McGraw. "We have a huge issue with residue management, and that just jumped off the page with these images. We were seeing things we simply hadn't seen before."

He notes that there isn't a straw spreader in the combine market that evenly spreads residue over the width of the header. The result is differences in the seedbed, soil moisture, soil temperature and compaction. These affect nitrogen losses and tie-up and therefore have everything to do with understanding the crop system. As McGraw began looking at the images for nitrogen management in the field, he found a new way to see the field.

OTHER PRODUCTS AVAILABLE

Jack Gerhardt also found more than what he was looking for when he turned to remote sensing, though he measured the distance between sensor and crop in inches versus thousands of feet. With a large hog feeding and crops operation just north of the Iowa border in south central Minnesota, he and his brother Dick were looking for a better way to manage manure. Two years later, he found himself working as precision ag business development manager with Redball LLC. Redball is the distributor for GreenSeeker, an on-the-

The boom-mounted GreenSeeker gets a close-up view of the crop, comparing it to a pre-selected portion of the field, an N-rich strip in the case of N application.

go optical sensor and fertilizer application system developed initially at Oklahoma State University.

GreenSeeker uses a nitrogen-rich strip in the field to develop a prescription for application of N across the rest of the field. The boom-mounted chlorophyll reading sensors compare the Normalized Difference Vegetation Index (NDVI) of the N-rich strip and the rest of the field. The difference between the two suggests how much N has been made available from organic matter and commercial fertilizer and the applicator controller modifies the rate based on average NDVI readings across zones in the field.

"We saw a story about GreenSeeker, and it seemed to be the tool we were looking for to use with a manure program on about two-thirds of our corn acres," recalls Gerhardt. "In the past, we hadn't applied any commercial fertilizer on those acres as we felt we had a full analysis, but it was apparent there were some tie-up issues. Over the course of the season, the stand would even out, but looking back, we could see there was damage done to the yields."

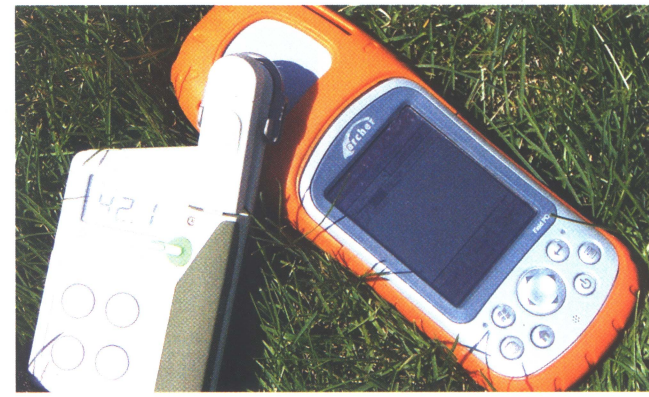
Using GreenSeeker on about 2,500 acres, the Gerhardt brothers averaged 20 pounds of 28 percent nitrogen side dressed in 2005 on manured acres. In 2006, they averaged about 28 pounds of 32 percent liquid nitrogen side dressed. The stand was more even and so was yield.

For Gerhardt, two things stood out. It was clear that even though they had applied more than sufficient manure for the crop, some areas in the field did not make it available when it was needed the most. With GreenSeeker, they could spoon feed the crop at a critical time. Knowing they could fill in N where needed created an opportunity to cut back on manure rates, spreading it over more acres and taking advantage of its low cost.

Gains didn't stop with manured acres. "On our conventional fertilizer program, GreenSeeker allowed us to cut about 45 pounds out of total nitrogen needs," says Gerhardt. "In many cases we find we are applying at our sprayer's minimum rate, even though the prescription calls for even lower rates. This suggests even greater potential for reductions in early applications."

GOING BEYOND CORN

Although Gerhardt has since moved from practitioner with GreenSeeker to promoter, he continues to keep tabs on the savings it offers the family farming operation. He also has seen interest in the technology expand beyond nitrogen application on corn and wheat acres to other small grains, canola and other crops in Canada and cotton in the southern U.S. The sensors are also being used



Remote images are a powerful tool when combined with ground truthing tools like these.

in application of growth regulators, boll openers and defoliators in cotton.

"The operator can select a prescription from a menu or develop a custom prescription from the cab of the applicator," explains Gerhardt. The applicator for cotton collects NDVI values for unopen, half open and nearly all open areas in a field. He does simple custom setting on the monitor, and in about two minutes he has a prescription. As the sensor reads the crop, it adjusts the rate.

Keiser also reports growing interest in OptiGro as a tool in reducing input costs in cotton. Here too, ground truthing is essential. The consultant uses the images to identify areas of the field with the greatest biomass, identifying where the crop is already stressed prevents stressing it more with a growth regulator application but allows a full rate to be applied in other areas. Similar results are achieved with defoliant rate adjustments.

After two years of field testing and introduction, OptiGrow is entering its first year of full commercialization. Keiser says John Deere Agri Services will be active in 36 states and coast to coast.

Gerhardt reports spending the past six months establishing a dealer base in the northern Corn Belt and in the Cotton Belt. He is working with both ag retailers and machinery dealers, noting that full-service ag retailers may offer the service on their own application equipment or, like a machinery dealer, sell systems direct to farmers.

With both the aerial remote and ground-level image capture systems, users are continuing to refine how they work with them to obtain better response to crop inputs. Gerhard expects interest in remote sensing of the growing crop to expand rapidly as producers aim at higher yields and researchers increasingly acknowledge the reality of N management.

"They are recognizing that optimum N rates are a function of N mineralization rate," he says. "If we knew that, we would know what incremental amount we need to add. GreenSeeker allows the plant canopy to tell us what the rate has been." AG

Whether aerial image initiated or boom sensor instigated, remote imaging can identify differences in a field and make effective variable rate application possible, as suggested by this photo and mapping.