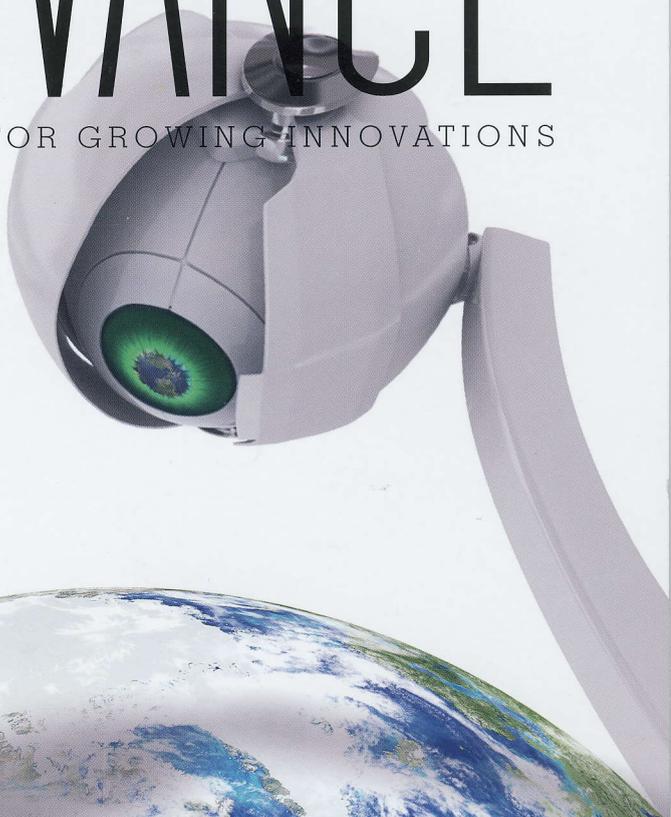




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JOURNAL FOR GROWING INNOVATIONS



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Greenseeker

pays dividends in first year

By Bill Strautman

Lee Moats applied about 40 pounds of N per acre at seeding time to this canola field, then used his Greenseeker to apply an additional average of 35 lb N/acre when the canola was bolting. He ended up with a 70 bu/acre canola crop on the field, the best canola yield he's ever had on his farm.

The objective of Greenseeker technology is to maintain crop production levels while reducing nitrogen input costs. Rather than applying a full rate of nitrogen at seeding time, producers apply a lower initial rate, then top up nitrogen with a variable rate in-crop application.

In-crop rates are based on real-time NDVI readings taken by Greenseeker sensors mounted on the liquid fertilizer spray boom and calculated in the field, based on the yield potential of the crop on that specific day.

Laurie and Lee Moats, who crop 2,660 acres of durum, winter wheat, canola and lentils near Riceton SK, committed to the new technology in the hopes of managing nitrogen cost risk and maximizing return on inputs.

Growing pains

"Like any new technology, there were some startup issues and we had a few of those. But overall, the thing worked great," says Lee Moats.

"N-Tech Industries, the makers of Greenseeker, were absolutely fantastic on product support. Whenever we had a problem there was somebody to call, and they knew what to do. They provided the best support of any company we've dealt with. And that's good, because there's a lot of technology in this thing."

Moats mounted his Greenseeker on a 100-foot pull-type Case IH suspended boom sprayer – a FlexiCoil in Case colors. The first issue he ran into was the auto rate controller.

"It wasn't compatible with what we had to run, so we had to find a rate controller we could convert our sprayer to. So we took part of our new sprayer, threw it out and purchased something that would work," he says.

"A second issue for installation was cabling. The cable provided would have worked great on a self-propelled sprayer, but the extra length on the pull-type meant we were eight feet short of cable."

Then he needed to upgrade his nozzles to

something that would apply nitrogen from zero to 40 gallons per acre.

"Pattison Liquid Systems, the dealer for Greenseeker in Western Canada, sold us some VariTarget nozzles, which are quite amazing nozzles. They're expensive – about \$60 apiece – but they did the job," says Moats.

"The bottom rate was actually about five gallons, because any lower than that and we couldn't generate enough pressure to run the nozzles. Even with four shutoffs on the sprayer, our minimum was about five gallons."

"This year we decided five gallons/acre was the minimum and programmed that into the Greenseeker, so anything less than five gallons was five gallons. Had I made five gallons or less to be zero, I'd have had an additional savings of nitrogen. For 2010, we have to decide if we go with an actual zero rate in some spots, or still put on a bit."

Moats had to mount six Greenseeker sensors on his boom, which was a bit of a challenge to ensure the boom could fold up without damaging any of the units. A few other parts were added to the sprayer, including a hand-held Nomad computer, mounted in the tractor cab.

Pre-programmed controller

"The computer captures information from the Greenseeker sensors and the GPS system, then it drives the auto rate system. It's a Trimble Nomad computer. It's a ruggedized, hand-held unit with a touch screen and a mini edition of Windows," he says.

"It comes preloaded with the Greenseeker software to run everything you need. Included in the software are all the algorithms and equations developed for all the crops – in our case canola, durum, barley and hard red spring wheat in the brown and black soil zones. We're waiting for a winter wheat equation."

"The Canadian side of that was developed by Dr. Guy Lafond and Chris Holzapfel and his group at the Indian Head research farm." I can't say enough about the good work of Guy and his co-workers who have pioneered the use of this technology in Western Canada. If it weren't for them we wouldn't be able to make the Greenseeker work here."

Staging for the in-crop application is fairly specific – the six leaf stage in durum and right before bolting in canola. Moats expected he'd move directly from herbicide spraying to fertilizer application, but when he finished spraying, the crop growth was delayed because of the cool temperatures last spring. He ended up waiting a while for the crop to reach the right stage.

Part of the Greenseeker system includes applying a nitrogen-rich strip – 1.5 or 2x the recommended rate – to ensure that zone is not nitrogen deficient. The unit then calibrates application rates based on that strip.

"When we went out after spraying, I thought we'd see a big difference between the crop and the N-rich strip, but the difference wasn't there. At the supposed 'ideal' stage, we didn't see any nitrogen deficiency, but four or five days after this ideal time, we started to see the deficiencies showing up," says Moats.

"But they seemed quite conservative to us. Because our growing conditions had gone from cold to almost ideal, we got optimistic and in terms of canola we pretended we were black soil zone instead of brown and used the curves for the black soil zone that apply a higher level of nitrogen. We also reduced the nitrogen use efficiency settings in the Greenseeker program, to move the curve up and apply more N. At the end of the year, those decisions turned out to be the right ones."

Moats says he was quite bullish about the year, but it was also hard to imagine he would grow a crop on the low levels of nitrogen Greenseeker was calling for.

"We really had to get our heads around 'doing the same with less.' For the previous 20 years, it's been 'spend money to make money' on this farm," he says.

The system did as promised, doing a calibration procedure, then developing a nitrogen application curve to drive the auto rate controller.

Surprising variation

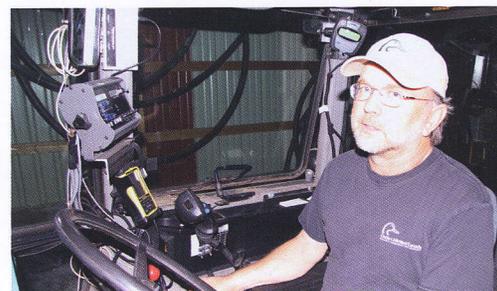
"It worked phenomenally well. The surprise for me was how much variation there was in the crop according to the Greenseeker, when to the naked eye it hardly looked different at all. And the level of variation was pretty wide," says Moats.

"The rate controller got a real workout. You'd drive 100 feet and the rate would change three times, so we were happy how that worked."

Moats side-banded 40 lb N/acre with a ConservaPak at seeding time, to both canola and durum. Normal application rates would be 80 lb/acre for canola and 70 lb/acre in durum.

With the Greenseeker, he top-dressed an average of 27 lb N/acre on the durum, for a total of 67 lb/acre. Canola fields averaged an extra 22 lb N/acre or 35 lb N/acre, depending on the field, for total N rates of 62 or 75 lb N/acre.

The tractor cab is already crowded with technology, but Moats had to add a yellow Nomad computer to control the Greenseeker on his spray boom.



With both durum and canola, the Greenseeker application range would have varied from around 12.5 lb N/acre up to more than 60 lb N/acre.

Best ever yields

"In the durum, our yield was over 50 bu/acre. But the exciting part is we have 14 percent protein. We're reasonably certain that because we got such a high level of protein, we didn't sacrifice any yield for lack of nitrogen," says Moats.

"There were durum yields in the area that were higher than that, but for us that's a tremendous yield and the high protein is something we've never grown on our farm. So we're excited by that. We're attributing it to low lying areas of the fields that would normally be high yielding but low protein. We think in areas where the NDVI readings were high, it would up the additional N and those areas ended up being high yielding and high protein."

Some of Moats' canola fields were hit pretty hard by frost in the spring, so in June and early July he wasn't too optimistic. But that turned around big-time.

"The canola was off the charts for us. Our canola that on July 1 the Greenseeker was suggesting 25 bu/acre ended up yielding 45 to 48 bu/acre. Those fields yielded more than we've ever had on our farm, except we had a couple of fields that weren't frozen as bad," says Moats.

"The high end average rate of nitrogen on our InVigor canola was 75 lb/acre, which is 5 to 10 pounds lower than what we would have applied normally across the board and our highest yielding field was very close to 70 bu/acre. I think we averaged 64 or 65 bu/acre on those fields. That's a once in a life time yield I'm sure"

Moats is still not sure where the nitrogen came from to produce those yields. He says he can claim 20 years of zero till and lentils in the rotation, but he feels he got production he shouldn't have, relative to the nitrogen level applied.

Not an inexpensive upgrade

The move to adopt Greenseeker technology did not come cheap for Moats.

"By the time we got done paying for the Greenseeker, the vari-rate nozzles and the auto rate controller upgrade, we're at about \$22,000. On our 2,660 acre farm, that's about eight dollars an acre spread across the farm. For an eight dollar capital investment, we're able to get variable rate application that's sensing our crop in real time," he says.

"The \$22,000 might sound like a lot, but relative to the capital we have invested in our farm, it's nothing! We think we saved about \$6,000 in nitrogen costs this year, but we feel we were more efficient with what we did use. Had we used this in 2008, which was extremely dry here, we'd have saved enough to pay for the Greenseeker in just one year."

Moats says he was able to use the Environmental Farm Plan Farm Stewardship program to help fund part of his Greenseeker purchase.

"In terms of the Greenseeker, a 30 percent grant for that is helpful in covering the expense. It certainly makes the payback period a lot less."

Fine-tune in 2010

For the 2010 growing season, Moats plans to fine tune a few things and try to overcome some of the software glitches.

"We'll do a better job of laying out our nitrogen-rich strips. We're going to get a yield monitor, so we can keep track of what we're doing," he says.

"We're probably going to reduce the amount of nitrogen we put down at seeding time. We want to make sure that we're not applying more than our crop would use on a relatively bad year. That's the risk - if we put on a bunch of nitrogen like we did in 2008, then don't get a return on it because of weather conditions."

"The whole idea with this is how do you maintain your production yet reduce your inputs. But you've got to reduce your inputs in order to test that."

While there are other ways to manage fertilizer inputs and do variable rate applications, Moats feels this system makes the most sense for him.

"We're not using satellite imagery, or last year's information. We're not calibrating this thing around soil testing. We're looking at it relative to how the plant is, right now, today," he says.

"The response rate is as fast as that information can transfer electronically and as fast as your auto rate can react, which is just a few feet. On a 100-foot sprayer, you're incredibly responsive to the health of your current year's crop, as it's growing."

"If you compare that to some of the annual, per acre fees that you have to pay for some of the other services, for information that isn't real time, I think it makes Greenseeker look like something that's cost effective and responsive."

The one down side is that it's a split application. You need rainfall after you apply the nitrogen.

"Some people will say 'What happens if it doesn't rain?' but, if you're applying all your N at seeding time, you're risking the whole load then. That's a much bigger risk," he says.

"By applying some nitrogen at seeding time and some later in the season, your ability to have confidence in what kind of crop you're producing is so much better on July 1 than it is on May 1. So I think this has a good fit for variable rate and it's cost effective, as well."

Other uses

Moats says there's also potential to use the technology for other applications. He could use the NDVI readings to set up variable rate fungicide applications.

"You could fiddle with the software once you understand what the NDVI reading is relative to plant growth and where your disease risk is at, then make application decisions accordingly," he says.

"The same thing with desiccants in lentils. If you've got a high rate of growth, you put more desiccant on. The dry hilltops might require less."