GreenStar and Advanced Farming System

by

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During the mid-nineties the 'new' concept of precision agriculture (sometimes called GPS because it uses the Global Positioning System) jumped into the limelight when both John Deere and CaseIH introduced yield monitoring and mapping systems on their combines. Since then a lot of water has passed under the bridge. Initially, a mixture of media hype and manufacturers' claims of the potential benefits drove interest in the new technology. Farmers were eager to find out what those benefits might be. But as the dust settled it became clear that a significant investment of time, effort and cash would be required to become a 'precision' farmer. With no clear proof of its profitability readily available, interest in precision agriculture became the domain of the risk-taker. For many farmers low commodity prices, as well as other pressing agricultural problems, pushed the issue of precision agriculture into the background. As a result, the field has settled back into a more gradual growth mode.

Other factors have also contributed to the slow acceptance of precision agriculture. First, to date there has been a lack of hard data on its profitability. Second, the number of farmers who are comfortable with the use of computers and software is still limited, although it is growing faster than the adoption rate of precision agriculture. Finally, the technologies associated with precision agriculture--both hardware and software--are still maturing. That maturing process can be seen in the periodic updates to virtually all the yield monitor systems currently available.

Although adoption of precision agriculture by Canadian farmers lags that of farmers south of the border, some industry sources believe as many as five hundred yield monitors were in use during the 1999 harvest in western Canada. Most of these systems were factory-installed systems sold on CaseIH and Deere combines. A smaller number were aftermarket systems. To date factory installed systems have proven to be more popular than aftermarket systems, for two main reasons. In general, farmers and farm equipment dealers have not developed a high enough comfort level with the technology to pursue installing it on existing combines. Also, farmers who typically short-term lease, or trade up every couple of years, do not want to make the physical modifications necessary to install aftermarket systems. (And this is the type of farmer who is typically willing to try to implement precision agriculture technology.) The result has been that most yield monitoring/mapping systems are acquired when the farmer buys or leases a new combine.

Although Deere and Case took different routes in the development of their systems, both have required continuous improvements since their introduction. Complaints with earlier systems ranged from

lack of accuracy to difficulty in calibrating and configuring to problems with maintenance of the measurement sensors.

The Deere GreenStar System

Deere's GreenStar System has proven to be a credible contender in the yield monitor 'wars' considering the fact that it was largely engineered from the ground up by Deere itself. Bob Nunweiller, who farms near Rosetown, Saskatchewan, has used the GreenStar System (including the mapping option) for two years. Before that he had a MicroTrak (aftermarket) yield monitor (yield indication only).

He says this about using the GreenStar System. "We can take 'snapshots' of the field or areas of the field and see what is happening. It lets us try new chemicals and see what has happened with the yield monitor. We also mark Canada thistle patches with the marker feature." Nunweiller grows peas, canola, cereal grains and lentils on more than ten sections of land. He enlists the help of Dennis Bulani from Bulani Agro for variable rate application of fertilizer. "We're working closely with Dennis," Nunweiller says. "We haven't found much variance of nutrients in our soil except for sulphur. Last spring we had him variable rate fertilize half of a 320 acre field. When we combined it the yield monitor showed an extra yield of 8 to 10 bushel per acre on the side that was fertilized using variable rate. The crop was very even."

Nunweiller has found other, unexpected uses for the system. "We find it makes it easy to split up fields," he says. "You just use the GPS bearing and straight cut across the field. The yield display also helps with crop sharing and keeping track of loads. Using the yield maps we could see how in the past discers had pushed nutrients toward the outside of the field. That sped up our decision to buy an air seeder."

Nunweiller's experience with the GreenStar has not been without its problems, however. "The first year we had it, if you combined over an area you had already done it would erase the previous data." Apparently that problem was corrected in a software update provided before the second season of use. Deere also made some improvements on the calibration of the monitor prior to this season. In the past, two problems have compromised the accuracy of the system. First, the system uses a 'single point' calibration system. For any given type of grain calibration is accomplished by harvesting a load, weighing it and entering the weight information into the display unit. This is a fairly simple process and typically produces good accuracy if the yield variations are not extremely wide. Unfortunately the grain flow sensor does not have a completely linear response. This means that as the yield rate gets farther from the calibration point the less accurate the reading becomes.

The second problem involves the 'zero' point of the yield sensor calibration. With the combine running empty the yield monitor should indicate zero flow into the grain tank. Sometimes build up of dirt or other material on the sensor, or mechanical or electrical drift in the system can cause a 'zero offset' in the measurement. Earlier models required that the operator run the system empty once or twice a day to check for zero offset, and reset it if necessary. The latest refinement in the system requires changing the clean grain elevator chain to one that has a paddle removed. As the grain is thrown off the top

of the clean grain elevator the missing paddle causes the measurement to drop to zero for a short period of time. The system detects this and automatically re-calibrates the zero point on each revolution of the elevator.

Another modification made to the current GreenStar model is in the operation of the moisture sensor. Deere's moisture sensor samples grain from the side of the clean grain elevator, measures the moisture and then returns the grain to the elevator. A small electric motor driving a paddle wheel moves the grain through the sensor. Control of the motor has been changed at least twice in previous versions of the system. The current modification controls the motor speed based on the flow rate of the grain hitting the yield sensor. Heavy flow into the grain tank causes grain to move more quickly through the moisture sensor.

Nunweiller has a few suggestions of features he would like to see on the GreenStar system. "I'd like to see another counter that I could use to show the total bushels since the last time I reset it. I would also like to be able to add my own crop names to the display. Another problem is that when you export data it doesn't have the marked thistle data. They also need some accessories, like a handheld GPS that can use the thistle data to do spot spraying."

"We got into this to try to increase productivity," Nunwieller says. "We wanted to find ways to increase yield. After you use it a while you find other uses as well. To this point I don't think we have enough years of data to use yield maps for variable rate application." As to his overall assessment of the GreenStar System: "I have no regrets at all."

The Case Advanced Farming System

Case's approach to development of a yield monitor/mapping system was to license and/or purchase existing technology and then develop it further. The Case AFS system uses a yield monitor manufactured to Case specifications by Ag Leader, the industry leader in aftermarket yield monitors. Early models of the AFS used GPS receivers manufactured by Satloc. Later they switched to Trimble. A company called Agri-Logic, which is now owned by Case, produces Case's mapping software.

The AFS system has encountered many of the same challenges experienced by its competitors. Calibration difficulties due to build up and inaccuracy at low temperatures appear to have been addressed over the last few years. The calibration method used by the AFS system has both advantages and disadvantages. For best calibration results the operator should run at least four calibration loads, at different flow rates, through the combine. After each load is weighed the data is fed into the monitor. Although this requires more work to obtain the calibration data, it provides several calibration points, which compensates for non-linearities in the response of the sensor. Overall, this should give better accuracy at all yield rates.

Earlier versions of the Case AFS used the DMC moisture sensor, which is installed in the clean grain auger. Although this sensor is simple and fairly reliable, dirt and green weeds cause build up that can cause errors in moisture readings. It also requires modifications to the combine if installed as

an aftermarket unit. Case now offers a non-intrusive elevator mount moisture sensor that features an easy clean-out option that is controlled directly from the in-cab display.

This year's most significant improvement in the AFS system was the addition of two new universal display options. Whereas the old AFS system used an operator interface similar to the Ag Leader, with multiple buttons and simple displays, the new version offers the choice of a 5 1/2 inch or 9 inch display. The new displays are touch screens which display much more information and make configuration and calibration easier. Case says the display is entirely software driven which means that any future changes to its operation can be accomplished by replacing its software. The display can be used for seeder controllers for variable rate application

Elmer Enns farms 3000 acres near Rosthern, Saskatchewan. His crop rotation includes canola, red spring wheat, and peas. He has been involved in precision agriculture for three years and has experimented with variable rate application of fertilizer as well as yield mapping. He has used the older versions of the Case AFS system and this years used the new system with the nine inch display.

"Set up on this new system is quite nice," he says. "It's very easy to edit the field names. You can write in custom names and keep track of where loads go." He likes the weed marking function, which required an extra box with buttons on it on the previous version. On the new version weed marking is available on the touch screen display. The new system also incorporates a different kind of memory card for holding the yield mapping data. "The new memory card holds a lot more data. I was able to store my whole crop on one card instead of four of the old ones," Enns said.

Configuration (setting up field names, etc.) of earlier AFS systems was done using the yield monitor box. The procedure could be done in the combine or the box removed and the set up done at another location. The new system can be configured using a personal computer. Enns said, "That feature might be good for bigger farms but I just set up it up in the combine. It only took about 15 or 20 minutes."

Enns had one suggestion he would like to see on future versions of the AFS system. "I wouldn't mind if the display would let me see where I am on the field, based on the GPS data. That would be handy. . ."

Where is Yield Mapping heading?

With each harvest season farmers and manufacturers alike learn a bit more about what is required to make yield mapping systems an effective tool for agriculture. Both Deere and Case appear to be working hard to fix the weaknesses of the current systems and make them easier to use at the same time as they bring in new features. While these efforts certainly move the technology in the right direction, adoption of that technology still largely waits for clear evidence that precision agriculture will deliver the profitability farmers require.