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— Brian Jergenson, Glenwood, Minn., producer

Cloud Cover

The Big Picture on Big Data

By Joel Schettler

Minnesota farmer Brian Jergenson thought he knew his corn and soybean fields well. That is until data gave him an even closer look.

“We started grid sampling five or six years ago,” says Jergenson. “Now we are doing a second round of sampling and we’re finding that my ground doesn’t call for as much fertilizer as we needed in the past. So my costs for fertilizer are going down.”

Fertilizer levels are just one piece of the information farmers gather from their fields today.

Jergenson’s relatives have farmed the same fields near Glenwood, Minn., since 1898. While his great-grandfather may have hitched up a team of animals instead of a tractor, for generations the outcome measure was the same — a farmer didn’t really quantify what was happening in the fields until harvest time. No longer.

Jergenson has added a yield monitor to map the most and least productive areas of his fields and auto-steer equipment to make planting easy and efficient. Each new piece of equipment has produced a more accurate picture of his fields and, more important, has steadily increased average yield.

“My dad is completely surprised every year with production off the property that he owns, or used to own,” Jergenson says. “It’s been good.”

Today, farmers are inundated with data. Every tractor, combine and planter is fitted with sensors and modems that gather important information. Data tells a story, and it is helping farmers make key decisions. “Big” data? That’s another story altogether.

What turns data into big data is the potential that greater understanding of analytics brings to disparate information. Big data encompasses information beyond precision ag data already being gathered on any >



North Dakota farmer Bob Runck, left, and CHS YieldPoint® Specialist Nathan Kosbau use data analysis to determine where to boost management inputs for maximum return on investment.

➤ given farm. Tapping outside sources for analysis, such as area weather information, government data or even yield information from neighboring acres, can paint an even clearer picture of what's happening at the farm to help owners make better decisions and greater profit. Today, talk of the "cloud" is more than just about the rain.

Plotting Innovation

How would you define big data? Multi-farm data integration is one way, says David Black, senior vice president and chief information officer, CHS. Much of big data's potential has yet to bear fruit, but many of the larger agricultural companies, including Deere & Company and The Climate Corporation, recently acquired by Monsanto, are investing in the infrastructure and analytics to make it happen.

Even if they are successful, such agriculture giants might only do one thing well, says Black. "They are using big data to make a seeding recommendation only, or a fertilizer recommendation only.

The reality is that there is so much complexity for a farmer to deal with, and farmers don't make any of those decisions independently. In fact, when they look at yield at the end of the year, they don't look back and say it was just because of seed, or just because of chemistry, or just because of the weather — it was because of all those things."

The average farmer makes more than 35 important decisions each year, says Black, which begin in the planning stage and continue throughout preplanting, planting, in season and harvest. Each of those decisions affects the others. That's where CHS comes in, he says, as the cooperative develops its plan for big data.

"Often we're right there with them whenever they're making those decisions," says Black, "and that can occur either through our retail channel or through the agronomist network. And if you layer on top of that a set of tools based on analytics and all the information that can be aggregated, that's

the value CHS brings."

At his farm one mile north of Casselton, N.D., fourth-generation farmer Bob Runck has gathered harvest data from his combine to measure yield on his 2,000 acres of corn and soybeans. Working with Nathan Kosbau, CHS YieldPoint® specialist, Runck has identified the sweet spots on his field and has begun to use variable-rate fertilizer applications and variable-rate planting populations according to the data.

"It was hard for me to take that concept, because I truly didn't believe there was much difference in my land," says Runck. "But we are finding differences, so we're trying to use that information to make us better farmers."

To learn how some of the pieces of big data might fit together, CHS created the CHS Innovation Plot. Using 620 acres of Runck's land, CHS Key Agronomist Tim Swanson and

says Swanson. "The technology is going to open doors to verify and quantify our findings, and we aren't just randomly going about it. We can go back and monitor one spot throughout the season if we choose."

Mature Decisions

As data volume and analytics capabilities grow, so will information value, says Black. Current capabilities put agriculture at step two on a five-step graph he dubs "the maturity of decision making." Today's data technology reports what has happened, such as yield. It also allows users to analyze why something happened: Did weather, crop inputs or farming practices impact my results?

In the future, increased access to information will allow farmers to predict yield outcomes from the right mix of inputs, measure what is happening at the field in real time and act on prescriptive farming to maximize yield.

"Farmers are overwhelmed with data as opposed to being overwhelmed with information to make decisions."

— David Black

Kosbau created zones to be tested using multiple variables of seed, fertilizer and other applications. More than 400 treatments will be evaluated using data directly collected from John Deere and Case IH equipment, among others. Overlaid atop that data will be YieldPoint information "to get one big picture," says Kosbau.

This first effort at collecting and analyzing specific information will begin to show big data's promise to agronomists and farmers alike,

"As a cooperative, we exist to do things for farmers they can't do for themselves. It's fundamental," says Black. "This big data and analytics space is right in our wheelhouse. Farmers are overwhelmed with data as opposed to being overwhelmed with information to make decisions. We can play a role in helping them sort through that noise. It is core to what a cooperative is."

Yet as agriculture moves faster to take advantage of big data, some barriers remain.

For example, 71 percent of farmers do not use the "cloud" to store information, according to a mid-2014 *Farm Journal* survey. One reason, says Black, is that access to data stored on a server requires broadband Internet access. Rural America is becoming more connected

something I'm not doing, I'd love to know that, just as much as they'd love to know if I'm doing something that's working for me. I guess it's all how you judge it. At my age, 57, and being in the business as long as I have, sharing data for people to become better farmers is fine

"What's important is who gets the data and then to rely on it,"

— Brian Jergenson

every day, he says, but there's usually not a strong connection.

More critical to adoption are concerns over sharing data. Nearly 92 percent of farmers who responded to the survey said they were collecting data, yet only 49 percent were sharing their information with any firm or individual specializing in data aggregation or analysis. For many farmers, sharing data has become a contentious issue.

Runck doesn't see it that way. "Obviously it's a competitive world out here. Everybody wants an edge," he says. "But if somebody else is doing

in my book. It may not be for younger farmers."

Only 35 percent of farmers are aware that, when aggregated, their data is made anonymous so that it can't be traced back to their site or operation, according to a 2014 survey conducted by the American Farm Bureau Federation. Data privacy is an issue many farmers fear when considering new technologies, but only until they fully understand the issues.

"To me, that's not a concern. It's my data, but if they don't use my name in front of it, that's fine," says Jergenson. "If

they can make life better for me and everybody else, I'm for whatever helps my production."

Other concerns from the big data survey include fear of regulators or government agencies (77 percent) and fear that others will use their data for market speculation (76 percent). More than 80 percent of farmers surveyed said they have a right to retain ownership of their data, which has been a major concern in calling for industry standards.

Such concerns are muted, however, when analysis is good for both farmers and trusted advisors, especially when recommendations come from a local agronomist.

"What's important is who gets the data and then to rely on it," says Jergenson.

"I have people who help me. Jeremy Drewitz, the Prairie Lakes Cooperative precision ag specialist, works with me on my sampling grids and yield maps.

"That has been big for me. You do what's best for yourself and pick the best technology that will work for you. Align yourself with good people and go from there."

Large or small, all farm operations want their investments with big data to pay off. The majority of farmers believe precision ag and big data analysis has the potential to create \$10 to \$50 of incremental value per acre, says Black, once initial obstacles are overcome.

"Our goal is to maximize profits on the farm," says Runck. "And this technology that is at our fingertips provides some of that opportunity, although we all understand that Mother Nature is really in charge of the outcome." ■



4 Trends Transforming Agriculture

David Black, senior vice president and chief information officer, CHS, says these four information technology trends are having the greatest effect on agriculture.

1

Cloud computing. By storing data on centralized servers, large and often disparate pieces of information can be gathered and analyzed with greater efficiency, says Black. "The ability to process and manage all of this information is becoming more economical, so you are no longer limited by a data center or equipment costs."

2

Social media and the Internet of things. Computing today gains its power through connections, says Black. "It's collaboration — people connecting or machines connecting," he says. "In agriculture, it might be a water sensor in the soil that is automatically telling a center pivot when to turn itself on and off." Or a drone may use information it has gathered to adjust another piece of equipment without human intervention.

3

Consumerism of IT. "This is just the notion of being able to get to information, anywhere and everywhere, on your mobile device, on your television and on your laptop," says Black. "You are no longer tethered to a PC."

4

Data explosion. "Today's drone running across the field is creating more data than the satellite just because of the number of passes it makes," says Black. "There is an amazing statistic: Of all the information around the globe that is digitized, 90 percent of it has been created in the past 24 months."