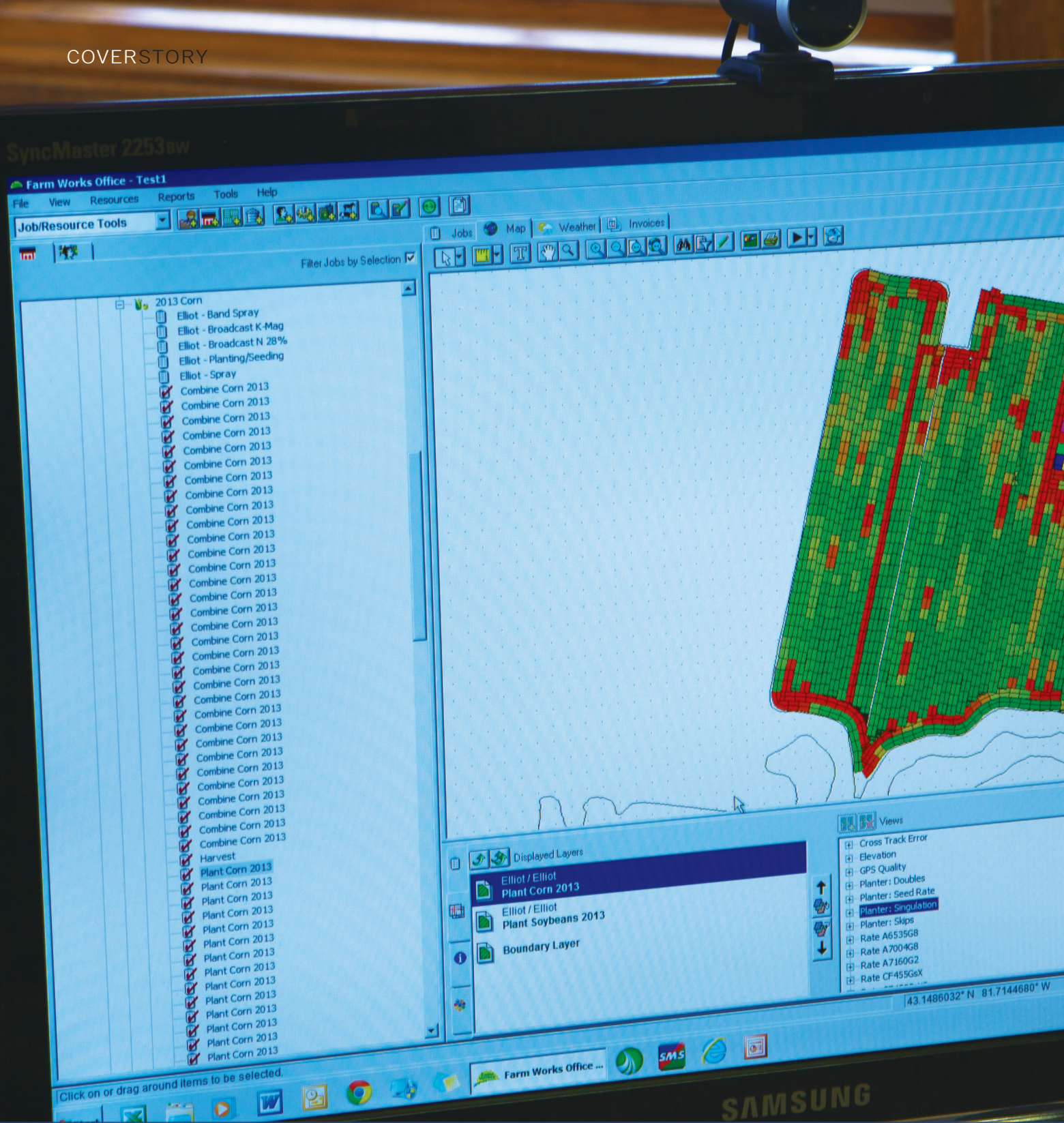


PRECISION TECHNO

Who owns the farm

Precision agriculture with cloud-based storage of farming data has taken a huge leap forward in the last 18 months, and with it have arisen concerns about security, compatibility and who owns the data – the farmer or the technology company?

by DON STONEMAN

LOGY ON THE FARM

data on the new cloud servers?

Rick Willemse leans back in the seat of the 325 h.p. articulated Ford New Holland tractor he is "driving," crosses his arms over his chest and lets auto steer take him in a dead straight line across a field near Parkhill, northwest of London.

Willemse is "deep ripping" where he combined soybeans earlier in the fall. When he finishes, a cellular modem on the tractor will upload his field work information to a "cloud," an offsite computer server maintained by the maker of the GPS and site-specific farming equipment Willemse has installed on the tractor. He can download that tillage information via the Internet to his desktop computer, along with yield maps, fertilizer applications, pest control and other data and use it to decide where and how much fertilizer he needs to apply next year, and maybe make hybrid decisions as well. He thinks he will get some pretty good yields from his corn crop, if the November weather let him get to it.

Willemse grows corn, soybeans and some wheat on 1,300 acres in northwestern Middlesex County. He's also a precision farming pioneer in Ontario. He's been tinkering with it since he was in high school in the mid-1980s and turned Raven sprayer components into an anhydrous ammonia applicator that was accurate even when the tractor pulling it was slipping while going uphill.

Today, Willemse runs two identical Trimble units. One records planting and harvesting, the other does spraying, planting, fertilizer, fall tillage "and anything else I can use it for."

While he doesn't want to sound like a conspiracy nut, his skepticism about who else accesses information that he sends to the cloud runs as least as deep as the ripper that his tractor is pulling across the field. "They are really anal about passwords and their security and all that crap," Willemse says of Trimble, the company that hosts his data on a server.

"My experience from working with (computer programmers) is that when you create software you always create a back door. And if you are the programmer who writes the software and controls the back door, then any data that comes in is basically your candy store. When people say 'oh, no, we are not sharing your data,' I think that is a load of hooey. Because if you've got it, you are going to use it, and there will be some sort of clause (in the terms of use) that says you can."

In response, Mike Martinez, Trimble's marketing director for Connected Farm, says that the farmer who paid for the service owns the data. "We don't share data with any third parties at all; no seed companies, no government agencies." He adds that "we do hear these types of comments, but not as frequently as I would think. So far it is a minority. We try to be as open and clear as possible. I don't think we can be clear enough."

Martinez says precision agriculture, with cloud-based storage of farming data, has taken a huge leap forward in the last 18 months, and with its growth have arisen concerns about security, compatibility and who owns the data on those cloud servers.

Here's how *PC* magazine described cloud computing in its March 2013 issue. "In the simplest terms, cloud computing means storing and accessing data and programs over the Internet instead of your computer's hard drive. The cloud is a metaphor for the Internet."

Companies associated with precision farming have been quick to jump into this technology.

Trimble, the company that supplied Willemse with his equipment, launched its Connected Farm platform two years ago.

Early in 2014, DuPont Pioneer formalized the precision farming work it has been doing for many years under the title of ENCIRCA Services. The seed company has already signed a wireless transfer agreement with tractor maker John Deere in late 2013 and a similar agreement with AGCO last spring. That technology allows farmers to turn around yield maps and make variable rate fertilizer prescriptions, based on nutrients removed with a crop, in a remarkably short amount of time.

"What used to take weeks now takes an hour or two," says Chip Donahue, the strategic alliance manager for John Deere's Intelligent Solution Group, which has its own cloud-based technology.

At the end of a job like deep ripping, above, information from Willemse' tractor cab is transmitted to a Trimble cloud computer.

Goodbye to memory sticks?

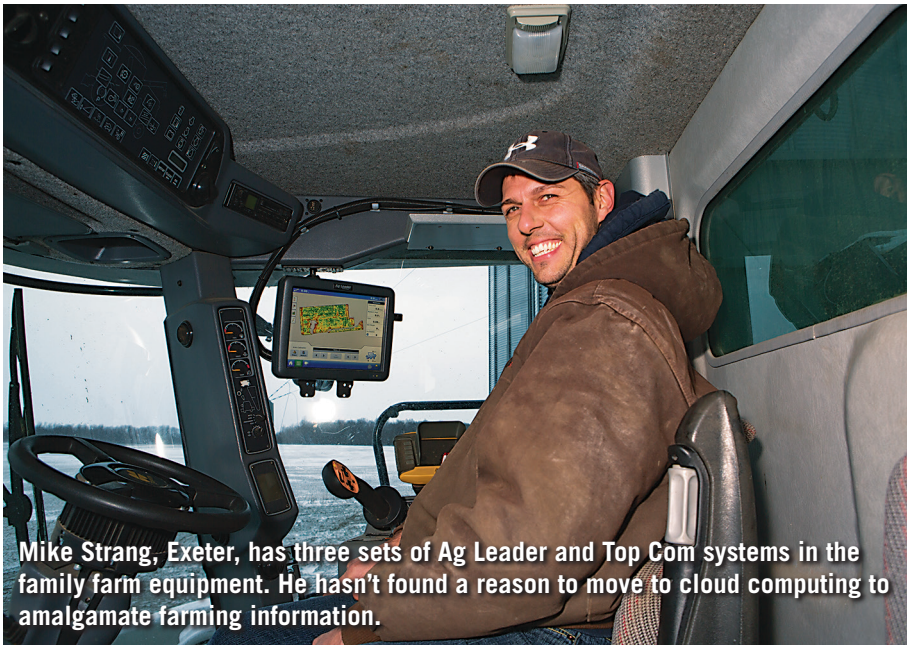
In February, the farming technology company Ag Leader launched AgFiniti, a web-based cloud platform for wireless transfer of data. Ag Leader claims that it's goodbye to the memory sticks that were the weak – meaning slow – link in the transfer of yield maps and other data from implements to farm offices and to agronomists who made the maps and the fertilizer prescriptions.

The industry is aware that not everyone is happy. "We do not analyze, share or use your data in any way. We are simply providing you with the cloud-based tools to make your operation more efficient," intones the invisible announcer in an online tutorial on the use of the new Ag Leader program, posted last July.

Exeter area cash crop farmer Mike Strang hasn't bought in yet. He's still using USB memory sticks to transfer data collected from nearly 1,600 acres he operates with his father Keith and brother Geoff. There's 13 years of crop yield data on his computer. "I haven't quite seen the value in the cloud for this," he says. He does, however, back up "sensitive" farming data and accounting information to a cloud.

The Ag Leader Integra display and Top Com system, which provides the auto steer, guide the Versatile tractor pulling the strip tiller, the Massey Ferguson planter tractor, the Spray-Coupe 7560 sprayer and the New Holland combine.

Ag Leader's claim that it doesn't share data with anyone sounds a lot like the claims made by Case IH for its newly updated Advanced Farming System, available in 2015 model year tractors. (Case IH uses Trimble software and hardware under licence.) Typically, a terms of use agreement (TOU) for any computer software goes on for many pages of dense legalese. At the Farm Progress Show in Iowa last August, Case IH handed to the media copies of their

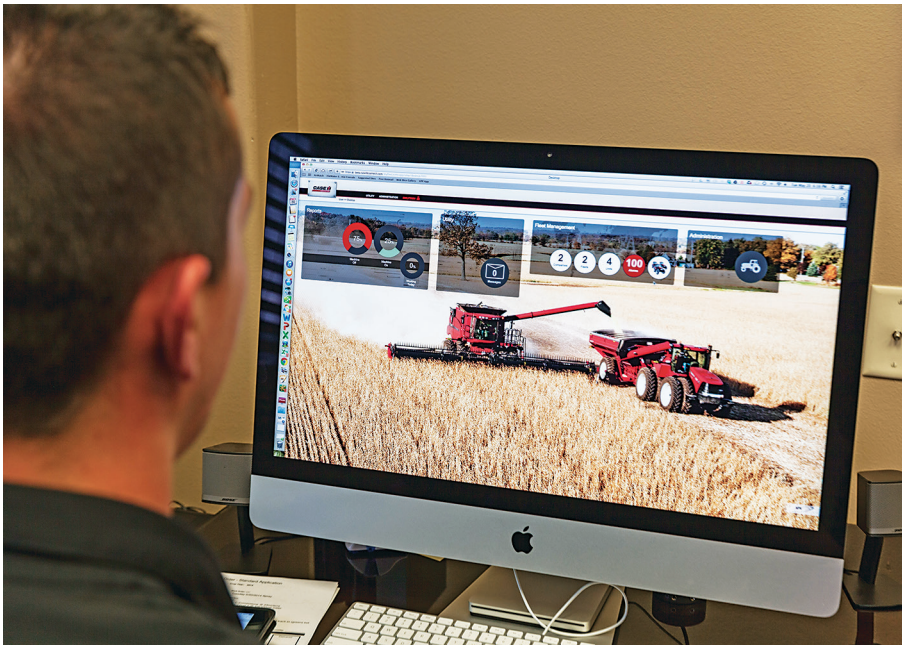


Mike Strang, Exeter, has three sets of Ag Leader and Top Com systems in the family farm equipment. He hasn't found a reason to move to cloud computing to amalgamate farming information.

modest eight-page TOU, which states: "You are the owner of the agronomic data generated from the Assets (tractors and combines.) CNH Industrial will only share agronomic data with third parties in order to provide the services You (sic) subscribe to." Advertisements for the new Case IH AFS system in the farm press touted "My data is mine, not mined."

Case IH says it wants to reassure customers. "We started to hear about data three years ago," before cloud computing became a catch phrase, says Mike Klein, Case IH's North American marketing manager for advanced farming systems. The biggest concern, raised by American farmers in focus groups, is security of their yield data. (No Canadian farmers were interviewed in focus groups; however Case IH did seek input from precision farming specialists from Canada.)

On an aggregate level, where anonymous data, analyzed from many farmers and farming acres, might be collected "farmers have said they are very concerned about the Chicago Board of Trade getting their yield information and using it to drag the price down," Klein says. On a personal level, if a neighbour "got a hold of your yield data," he might use it to outbid you for the most productive land coming up for sale or rent.



Case IH's AFS support software, above. The systems are designed to be secure in maintaining or transmitting information without compromising the producer's privacy or sensitive information and still be updated or transferred to other similar systems.

The issue heats up as the industry strives to standardize systems so that

Big tractor data or Big Brother?

John Deere, Case IH and Trimble offer some sort of fleet management service through their various connectivity farm services. Last year, Exeter-area farmer Mike Strang sat in a meeting with a small group of farmers interested in precision agriculture and watched John Deere representatives demonstrate the new machine monitoring tools that their wireless monitoring system had to offer. As Strang recalls, they clicked on a leased John Deere tractor that was operating somewhere and brought up the machine's physical location, together with a wealth of diagnostic measurements including fuel levels, consumption per hour, and engine temperature.

Strang was bothered. He admits he "gets a little queasy when I hear about tractor data being available online. It makes me a little uncomfortable. I don't think they need to know all about that.

"It's certainly presented as a benefit to the tractor owner, which is fine by me so long as it's a choice for the farmer. If he wants the manufacturer's assistance in maintaining the machinery and allows them intimate knowledge of its activities, then that's fine. But he should have the choice to turn it off as well," Strang says. "I don't see the benefits for the farmer even though they try to sell it as that."

"It's Big Brother at its worst," says Parkhill farmer Rick Willemse, referring to George Orwell's classic novel "1984" about a police state where government saw and heard everything, and brooked no dissent. "That is a lot of power in someone's hands."

The Case IH system is something that farmers pay extra to subscribe to, and if they don't pay they don't get it. John Deere's spokesman was not able to immediately reply as to whether it is possible to opt out of the company's machine monitoring system. However, Barry Nelson says there are three pillars to Deere's data policy.

"(1) When we deal with data, we need to provide value.

"(2) Transparency. We want the customer to know where his data is going.

"(3) Control, so that if he has a crop consultant that he really trusts, then he will have a secure platform on which that crop consultant can access information and develop a field prescription."

Trimble's Mike Martinez, manager of marketing for Connected Farm, says farmers can opt out of the tractor diagnostic management

information can be shared. Karon Cowan, the principle at AgTech GIS in Embro, Oxford County, says "the big companies seem to be scrambling to suck a lot of data in. When they talk about standards, they want things standardized so it is easier to suck it in."

Data hassle

Two different organizations are working towards standards that will ease all sorts of incompatibility situations.

One of them is the fledgling Open Ag Data Alliance (OADA), of which Case IH is a founding member and a promoter. Heading it is Aaron Ault, a computer engineer from Purdue University and a serious farmer. He feeds 3,000 beef cattle, and crops 3,000 acres of corn soybeans and wheat at Rochester, Indiana. The OADA project, he says "is about bringing interoperability, privacy and security to ag data."

He believes that the way that farmers deal with data now can be summed up in one word, "hassle, and we get very little benefit out of it. You need to bring the data that resides in corn dryers, tractors, sprayers and so on together in a system. But it means that farm managers won't get alerts, for example, if a tractor engine temperature exceeds a pre-set level.

Karon Cowan's advice to farmers engaging in an agreement with a company is that they should set up a plan to disengage. "It's like having a good prenup."

- Keep a copy or have access to a copy of all of your farming data.
- Know what your two-way obligations are with that data share.
- Know what your obligations are if you decide to go elsewhere.
- Back it up and only give it to trusted advisors.

Producers who take their data seriously will get the most out of them eventually. "Even if I don't have 100 per cent value today, it is an open-ended benefit as time goes on." **BF**

meaningful way in order for it to be useful."

Moreover, the fact that all the different systems couldn't work together has been holding farmers back, he argues. "We have had yield maps for how long now? We can't even solve fundamental questions like which is better – no till or conventional tillage. These are like religious debates among farmers. You'd think we would have an answer by now and we don't."

Aaron Ault: "If a cloud storage company substantially mishandles customer data, that would be a death sentence since customer trust is their core business." Because cloud storage companies hire security experts, Ault maintains data is likely safer there than on your farm's computer connected to the Internet.

No 'right answer' to the TOU question

While Purdue University professor Aaron Ault acknowledges that groups like the American Farm Bureau and commodity groups are working on a definitive vision for a terms of use agreement, he doesn't think there is any "right answer."

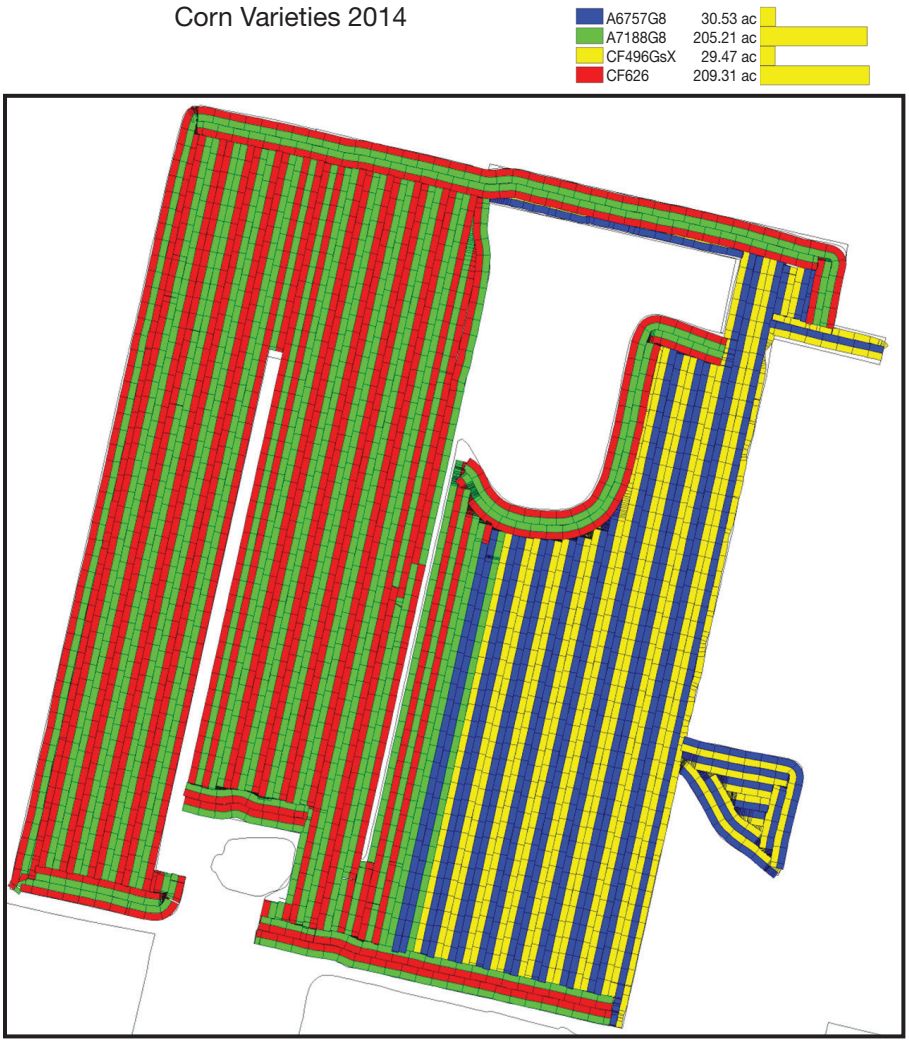
"The thing that we learned at Open Ag Data Alliance is that, for the most part, farmers are not a monolithic group. They don't all have the same opinions on what they want their data used for and what they don't want their data used for. What farmers don't like is being surprised.

"We don't like to buy a telematics unit that we thought was going to eliminate those darn USB sticks going back to some desktop computer somewhere and then we learn that in the fine print of that user agreement, they are selling that data to the Environmental Defense Fund or something without our knowledge."

The approach at OADA, which Ault heads, is to let the market solve the problem. "When there are problems without right answers, let the market solve it," he says. "Experiment with terms of use agreements. Experiment with privacy and figure out if different farmers want that or not.

"We want to make it possible that, if a farmer does share data, he has some hope of knowing what will happen to it."

When it comes to ownership of data, Mike Klein, manager of Case IH's advance farming systems for North America, says farmers need to read their terms of use agreement carefully when they are buying or using new technologies on their farm. Klein's advice: "Recognize who you are dealing with and point blank ask them 'what are you going to do with my information?'" **BF**



Rick Willemse' map, above, shows where different corn hybrids were planted on more than 450 acres. It shows up as a background map on his yield monitor. "I know which variety I am harvesting at any one time." He can compare results later.

continued from page 18

As of Nov. 1, 18 companies had signed on as supporters of OADA and agreed to become compliant once standards are set. (See list page 24.) Some observers in Ontario feel that John Deere and DuPont Pioneer are conspicuous by their absence.

Deere was already involved in a precision agriculture project with AgGateway, an agricultural standards organization, before OADA was started, according to Chip Donahue, Strategic Alliance Manager for Deere's Intelligent Solution Group. Donahue says AgGateway was established in 2005 and boasts a broad-based membership of more than 200, which includes software providers, equipment manufacturers, input providers, ag retailers and agronomists. "There is a framework for collaborating on industry problems so that we don't create issues. We try to work on particular problems and try to solve those problems."

The Precision Ag Council within AgGateway is working on the Standardized Precision Ag Data Exchange (SPADE) project. Donahue says one of the outcomes is a toolkit that will enable software companies to convert a company's format to a common one that would allow it to be passed on to that of another company.

SPADE will allow information to be

moved both ways and will lower the cost of software development. "We are pretty close to producing something after the first of the year to enable the software companies to do that," Donahue says.

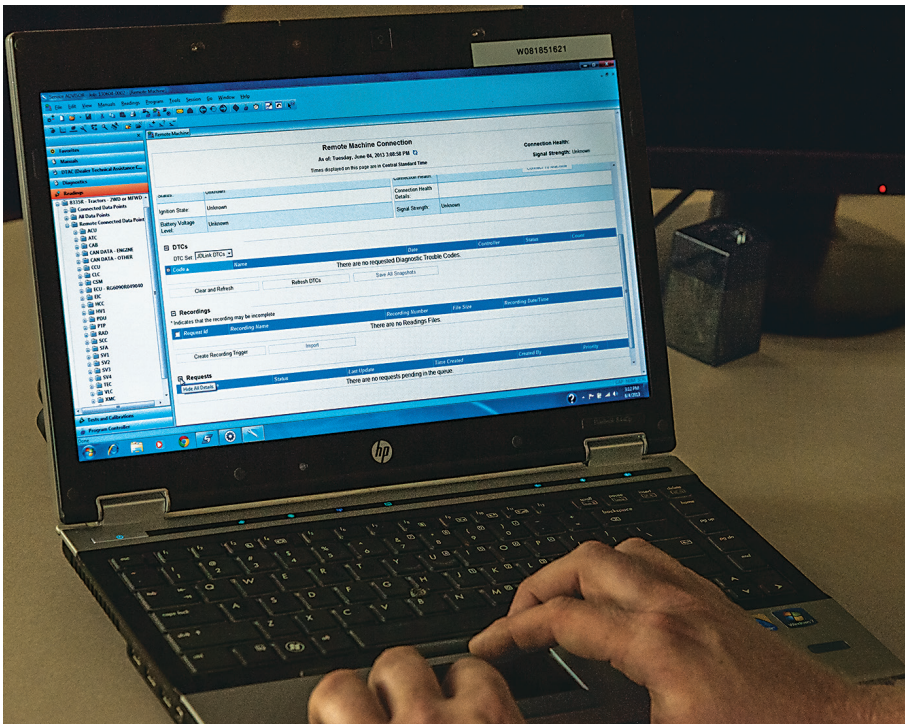
Deere's newest tractors sport an integrated system, a Greenstar 2630 display that records the machine's operation and implements a prescription that a farmer might get from a crop consultant. Case IH claims that it is the only tractor company which promises that users of its technology "own" the data that is collected.

So what does Donahue say about who owns the data Deere machines produce? He pauses before answering: "It is (the farmers') information. It is in his (MyJohnDeere) account and he can choose to do with it what he wants to. And his ability to control it is completely within his control."

Barry Nelson, media relations manager for Deere, adds: "We like to use the word 'control' because there are some complications when you talk about a farmer going to somebody who owns the ground; you start talking about data ownership. It is complicated, but the person operating the machinery or buys the John Deere system is in control of where that data goes."

So, if AgGateway has this mission already, why was OADA created? Ault says most OADA members also belong to AgGateway and any perception of conflict between AgGateway and OADA is just that, a perception. The organizations complement each other.

"I've been working with (AgGateway) very closely," he says, and it is "focused on trying to get everyone to use the same format for data and on a standard way to get data between clouds. (OADA) is an open source project," which means that software developers are invited to take part and have access to the original code that is the base for the project. "We are just a large, distributed, development team, building things and getting it out to the industry."



The customers that use the fleet management tool "really like it," says Deere's Barry Nelson. They are able to monitor their equipment, analyze performance, and proactively service the machines before issues occur in the field.

Much of this involves developing APIs (application programming interfaces), a software intermediary that allows different software programs to interact.

"Most standards organizations define success as 100 per cent acceptance," Ault says. "These are extremely slow processes and they take a long time to achieve consensus. Our process does not have to define success that way. The goal is to make data simpler so it works better for farmers. If three or four companies don't choose to become OADA-compliant and the rest of them do, that is still a tremendous success."

Trimble's Martinez says a Trimble user can opt out of sending some information to the cloud, but some

Working towards seamless interoperability and data exchange

According to a July 2013 press release, the companies committed to the SPADE project were Ag Connections, Ag Leader, AGCO, AgIntegrated, Agrian, Agtelligent, Brandt, CNH, Co-Alliance, CropIMS, GeoSys, GROWMARK, Helena Chemical, John Deere, Monsanto, ProAg, Raven Industries, Software Solutions Integrated, Syngenta, SST, Topcon, Winfield Solutions LLC, XS Inc, and ZedX, with additional companies pending. (An updated list can be found at www.AgGateway.org.)

SPADE is working to allow seamless interoperability and data exchange between hardware systems and software applications that collect field data across farming operations. This ability to share data will simplify mixed-fleet field operations, regulatory compliance, crop insurance reporting, traceability, sustainability assessment and field or crop-scale revenue management.

It will also make it easier for growers to share data with their trusted advisors, suppliers and other value partners, and will lower the cost of entry for growers and ag retailers who want to use precision ag technology. **BF**

options won't be available to the user for technical reasons. So there is a tradeoff.

"Ownership" of data is a give and take, Karon Cowan adds. "There are benefits to taking advantage of some of the really cool offerings these companies have. If (a company) can make a better product or advise me on what product best suits me, that is a 'knowing trade.' Big data has lots of value to big companies. They have the energy and the money to look for patterns. It will benefit the industry."

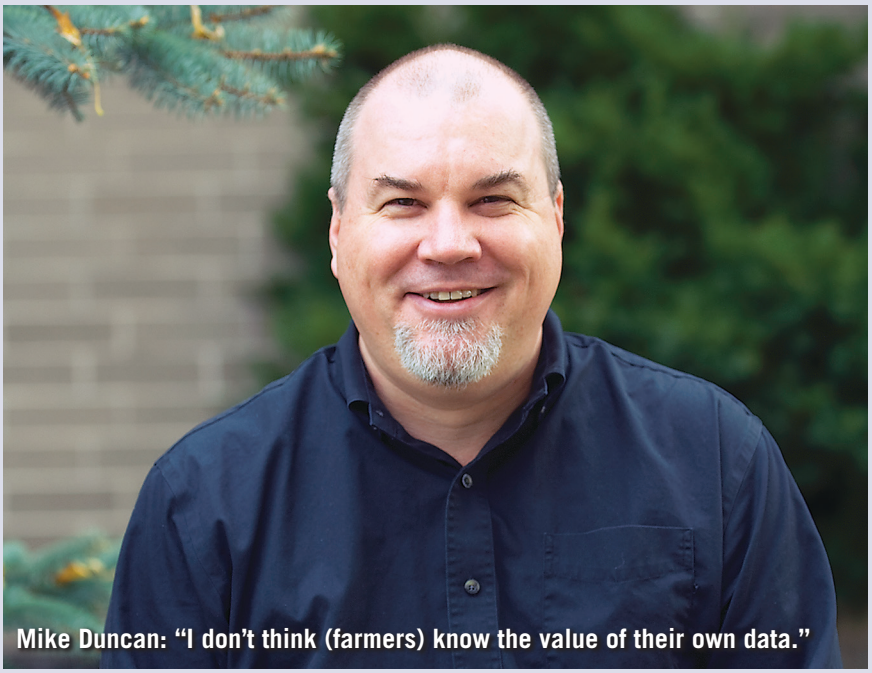

Karon Cowan

Not everyone agrees that farmers benefit. "It's pretty powerful stuff," says Exeter farmer Mike Strang. "A seed company can use it to improve their hybrids. They can make their company more profitable and they charge you to use your data. It's a great business model, but I think they are taking advantage of the situation."

Terms of use are key

Nearly everyone to whom *Better Farming* spoke points out that the terms of use agreements are key.

Ault agrees that farmers need to read


Mike Duncan: "I don't think (farmers) know the value of their own data."

Directing fertilizer to where it counts

Mike Duncan, NSERC Industrial Research Chair for Colleges in Precision Agriculture and Environmental Technologies, based at Niagara College, is working with 27 co-operating farmers on a project called Precision Agriculture Advancement for Ontario, funded by Grain Farmers of Ontario and Growing Forward 2 federal money.

The program aims to create a mechanism for almost any farmer to quickly and accurately create effective management zones that can be used for variable rate applications. It will allow them to make much more use of their yield data by directing them to apply fertilizer where it counts most – and away from areas where it will be wasted.

Trimble's Mike Martinez hears that farmers don't want to "reveal their unique farming practices that have made them successful, their secret sauce. They don't want that recipe getting out to the world. We get it. We totally understand that."

Duncan says farmers he speaks to are mostly concerned about keeping their own input costs private. "The deals they get from fertilizer people are critically private. No two farmers pay the same for fertilizer." Their yield data isn't a concern.

When Duncan hears that, he cringes. "I don't think they realize the value of their own data," Duncan says. Farmers wouldn't be offering to give it away "if you knew what I can do with it."

Farmers used to specify a farm for perhaps 170 bushels an acre, but that is now an anachronism. There's no longer one target yield, he says. The field will be divided into zones that have their own target yields. The project is expected to be completed in the fall of October 2017. BF

OADA partners as of Nov. 1, 2014

360 Yield Center,
Ag Reliant Genetics (Pride Seed)
AgSpace
AgriCircle
AgRecs
Ayrstone Productivity
CNH Industrial
Centricity
The Climate Corporation
Growmark
Granular
Monsanto
OnFarm Grower Informed
Purdue University
tierra telematics design
Valley (precision irrigation)
Wilbur-Ellis
WinField BF

carefully the terms of use agreements that they click on when they download new software for their computers and farm machines. It's not easy, and it comes down to trust, he says. Recently, he updated his iPhone and there was a TOU that surpassed 40 pages. "I didn't read it," he says.

"The best thing you can do is to read these things" and complain to the company if you don't like them. It starts a conversation with the company, Ault says. "That is the only way things get changed."

But not everybody thinks there is much to be worried about. Wayne Black with Precision Planting and Dewolder Farms in Chatham disagrees that ownership of the data is "that big of a deal." It generally bothers older farmers more than those under the age of 40, he says. "Does Monsanto care about what Don Stoneman's yields are on a field? No."

Black uses a number of analogies to support his point that information needs to be shared with someone you trust. "If you don't share information, your doctor can't fix you. So share your data with someone you trust who is going to help you get better yields. There is a lot of fear-mongering out there that I don't like and which is counter-productive for agriculture."

Security is paramount, says DuPont Pioneer, and there is a data privacy policy for the information that is shared between Pioneer and its precision partner, John Deere. But ownership of data is not what Pioneer's farmer customers are talking about. "I've probably been on 40 calls with our sales team since July and (ownership) has not come up once," says Joe Foresman, director of ENCIRCA services for DuPont Pioneer. He credits Pioneer's 85-year business history and use of a local person in the community representing the company and its brand. Customers "know what to expect," Foresman says, "but we aren't naïve when we see the things that have gone on with the retail industry in the United States and even government."

Pioneer entered into a cloud-sharing venture with Deere after "joint custom-

ers" asked the companies to work together. If, as is typical, a memory card from a yield monitor isn't translated to a prescription for a fertilizer application for two months, a lot of value is lost because the farmer has been unable to order and apply fertilizer and has already made seed buying decisions, Foresman says.

The antidote is sharing between the seed company and the machinery maker. Foresman cites the example of a farmer in northern Illinois who was able to get a variable-rate phosphorus and potash prescription based on actual yield from the field spread within hours of the combine leaving the field. It was based on data being communicated to John Deere and, with customer authorization, to DuPont Pioneer's certified agent. The farmer then sends the prescription to his local ag retailer.

"That is a demonstration of the technology today that is practical and that enables a customer to make decisions using their data when it matters financially to them," Foresman says. "In order for that to work, the industry needs standards. That's where we believe the industry is going."

OADA's Ault agrees that "if a cloud storage company substantially mishandles customer data, that would be a death sentence since customer trust is their core business." He adds that OADA uses "industry best security protocols to ensure data is as secure as possible."

He says concerns about cloud technology are common because of the way it is presented in the industry. "In general, 'the cloud' is presented as an end in itself rather than a means" and they are missing the point. "The cloud is simply a tool that makes the other tools you use on your farm simpler."

As far as security is concerned, "If the terms of service explicitly forbid a company from sharing your data and you think they are, you should take immediate action to stop it."

A farmer might be stuck unwillingly sharing data for two reasons, says Ault. One is that he might have signed a TOU that allows that without reading it. The other reason is that a farmer read the TOU and felt he didn't have a choice because he wants to use the software and there isn't anything else and a switch is impossible because the software is proprietary. Ault makes a pitch for OADA, which he says will increase competition "by enabling a farmer to choose whatever data solutions he or she would like with the ability to transfer data to any other provider should the terms of service ever become untenable."

If so inclined, a farmer could even install the open source OADA software on his own farm and keep his data onsite, but Ault warns it will not be as secure that way. "A cloud provider has security professionals constantly monitoring network traffic, upgrading software, applying security patches, and all sorts of other things that minimize the potential of data breaches. On your farm, these things probably aren't getting done."

Between one weather delay after another and a fire in his soybean dryer that required the local fire department to put it out, Willemse has had a rough fall. A few days after ripping that field, sub-freezing temperatures let him finish his last 100 acres of soybeans and then he was into corn in a big way, harvesting 10,000 bushels in one 12-hour overnight combining binge. It wasn't glitch-free. The map on the Trimble unit in his combine failed. He called his dealer, Jordan Wallace of GPS Ontario, based in North Gower, south of Ottawa.

"I was able to log in using the Connected Office and the DCM-300 modem and rebuild a variety map using (Willemse') name and password. Rick still owns that data. I was able to assist him in assuring that data was correct. It took about eight minutes," says Wallace.

The next day, after a few hours' sleep, how does Willemse feel about Trimble having his data in its cloud after Wallace fixed his yield map wirelessly? Willemse replies via text message on his cell phone with a "smiley."

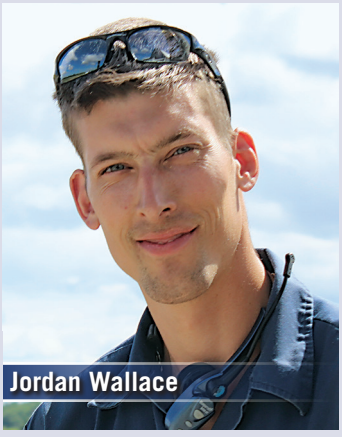
"It has its pros and cons. I think I would feel differently if I was the one with the data and allowed them access to it. If the data was on Google Drive where I had control, I would feel better. At least then I would know that no one else had access to it.

"But it is pretty cool how he can fix my problem from Ottawa." BF

Traceability benefits of information capture

Collecting detailed information about farming operations has any number of benefits to farmers. It's also about accessing and securing markets, says North Gower Trimble dealer Jordan Wallace of GPS Ontario.

Supermarkets want this information for traceability purposes, says Wallace, citing a fruit and vegetable grower who failed the first traceability audit by a grocery retailer. "He couldn't prove when he planted, where he planted, how much he planted and what products were put on. We were able to clean up some of the data sets for him so that he could present a valuable map to the Walmart Loblaws buying group, and prove to them what they were doing."


Jordan Wallace

As the information and the regulations become more stringent, a lot of the different buying groups are starting to ask for this information.

What is a dataset and how detailed is it? In the case of agriculture, Wallace describes a dataset as a field job or task. Planting corn could be a data set, including latitude and longitude, start and stop times, acres covered and elevation. "In some of the data sets we are working with, there are 50 pieces of information captured five times a second." BF