Inventions, projects & ideas that are changing Canadian agriculture

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A revolution is coming

What is the future of agriculture? Disruption and chaos. There’s a revolution coming, according to agricultural innovation experts, but it will come with opportunities.

BY BARB GLEN, LETHBRIDGE BUREAU

Farmers of the future will be innovators,” said Aidan Connolly, chief innovation officer at Alltech, a U.S.-based company interested in the intersection of technology and innovation.

“Think about the innovations of the supply chain for that, and that differentiates them from their competition,” said Shelman.

Providers will be increasingly required to differentiate their products and meet specific consumer needs. Technology will help them provide the desired traceability and transparency that consumers increasingly demand, but the economics of doing that aren’t moving in lockstep.

“We need new talent to come in. They can only come in if there’s attractive returns in the sector.”

Shelman emphasized the importance of millennials in shaping the food production system. Those born between 1980 and 2000 are having families and increasing their incomes. They’re used to getting information in different ways and intent on buying food that reflects their values.

“Food actually reflects their values and this is the thing that perhaps poses the biggest challenge to the traditional food industry, because not only do they want products that meet a certain price point and a certain safety point, they want products that have a purpose. They want products from an industry that has the same values as they do,” Shelman said.

“I think it’s putting a very interesting twist on the system right now.”

Big data

The data that can be collected via farm equipment, drones, satellites and other technologies will play a big role in agriculture’s future, the experts agreed.

“You have a tool here to look at millions and billions of observations, whether it’s productivity... the way we grow our crops, how much rain we get, all of this can be integrated into very precise models and that’s going to be the big change in agriculture,” said Karl Dawson, chief science officer at Alltech.

“We’re talking about moving to armchair farming. We’re going to be making decisions from a site, sitting in front of the computer, looking at what we can predict in the future. That’s a tremendous tool that we’ve never had before.”

Michael Boehlje of Purdue University says big data can be used not only at the farm level, but by every part of the agricultural production chain. It can allow the sector to track and evaluate processes as never before.

“Any revolution is not a revolution if you don’t tell people what you’re going to do,” said Shelman. “The data comes in and tells you what the market is, but farmers also have a personal, economic incentive to grow more. It’s going to take education, but it is going to happen.”
and trucks are already being tested on our roads.

They will also address labour and safety issues, he added.

“I think it is difficult to find labour on farms. When you find labour, you want labour to be well trained and well prepared. You have safety opportunities also. I think there’s just going to be a lot of factors that are going to drive for these autonomously driven tractors and harvesters to become part of our future.”

Boehlje agreed.

“It’s going to be coming much more rapidly than we realize and it has the opportunity to profoundly change the agricultural sector, so it’s a really, really important development.

“My belief is we’ll see this in the fields in five years, not 10 years, and rapidly adopted.”

**Nutrigenomics**

In simplest terms, nutrigenomics is the study of food nutrients on gene expression in the body that consumes them — “you are what you eat” at the genetic level.

Dawson sees major potential in the technology, which can reveal the effects of food and various ingredients on basic livestock physiology.

“We are starting to narrow in … on the gap between genetic potential and what the animal can do,” he said.

“We have a tool that allows us to actually measure what happens when we make a nutritional change. It’s a very powerful thing.”

He sees a future where animals can be selected for the specific nutrition they can provide, as has long been done in plant breeding.

Through nutrigenomics, producers can potentially measure animal productivity as well as immunity and disease resistance, and alter livestock diets to improve expression of those traits.

He said it could also reduce nutrient needs through more efficient use and lower the effect on the environment.

MEET THE EXPERTS: Aidan Connolly is chief innovation officer at U.S.-based Alltech, Mary Shelman is former director of the Harvard Business School’s agribusiness program, Michael Boehlje is a researcher specializing in farm and agribusiness management at Purdue University and Karl Dawson is chief science officer at Alltech.

“Who’s your farmer & what does he do?”

Farmer demographics are likely to change in coming years, the experts say.

“I think what we’re looking at now is again a fundamental change in what that person’s going to look like,” Connolly said.

“They won’t necessarily have the skills of maybe understanding animals or understanding plants. They’ll understand data. They’ll understand analytics. They’ll understand equipment. They’ll understand decision making between all of the various technologies of what a person should buy and what they shouldn’t invest in.

“So those are dramatically different skills than we used in the last thousand years, you might say hundred years … to decide who is it that’s a farmer.”

It’s also going to require keen abilities in data management.

“Some farmers abhor record-keeping,” said Boehlje. “We are going to increasingly have to develop that skill and feel comfortable with that skill of looking at numbers, looking at information, trying to understand what they say, the story they tell.”

Besides those attributes, Shelman said the next generation of farmers will have to pay close attention to consumer desires and figure out how to deliver on them.

“It’s not just about producing at the lowest price, but producing what the market wants … and being able to sell into those channels, connect with those channels. So, this is a very big basket now, a very big ask,” she said.

Boehlje also said farmers will have to forego their desire to be completely independent, and instead forge relationships with others in the supply chain.

Connolly summarized it thus: “If anybody thinks that agriculture is going to be the same way in 20 or 30 years’ time, they’ve got their head in the sand.”

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Nanotechnology to alter animal health, food systems

Networked biosensors could offer a key advantage during disease outbreaks

BY ROBIN BOOKER SENSATION-NEWSROOM

By biological sensors based on nanotechnology are being developed by Canadian researchers and may soon be commonplace on farms.

A biosensor device relies on a biological element such as an enzyme or bacterium to react with a target substance such as a spore or virus. This reaction is monitored by a transducer that converts the biological response into an electrical signal.

For instance, research scientist Susie Li is developing a biosensor that can differentiate sclerotinia spores from other spores in the air. Li, who works at Alberta Innovates Technology Futures, developed the biosensor’s chip with gold nanoparticles bonded to it. These nanoparticles are also attached to antibodies that only attach to sclerotinia spores.

When the antibodies attach to a sclerotinia spore, the gold nanoparticle sends a signal to a transducer connected to wireless technology. “You transmit that signal to a little box, like Bluetooth technology, and then that can transfer to an electronic device like a cellphone. You just need to download an app and then you can use it,” Li said.

This sensor can send farmers text messages when a specific threshold of sclerotinia spores has been reached in their fields.

“I hope it could be a revolution because right now, you have to go to the field to find out and it’s time consuming. It’s also because you have to pick up a diseased leaf or petals and then you send that back to a lab,” Li said.

It currently takes days to get results back from a laboratory when testing for sclerotinia, and the spraying window for the disease is very short in canola.

The sclerotinia detector Li built can detect as few as five sclerotinia spores.

Suresh Neethirajan, director of the Bio Nano Laboratory at the University of Guelph, holds a device he helped develop that uses nanobiosensors on paper test strips at the University of Guelph, holds a device he helped develop that uses nanobiosensors on paper test strips at the University of Guelph, holds a device he helped develop that uses nanobiosensors on paper test strips at the University of Guelph, holds a device he helped develop that uses nanobiosensors on paper test strips at the University of Guelph, holds a device he helped develop that uses nanobiosensors on paper test strips at the University of Guelph, holds a device he helped develop that uses nanobiosensors on paper test strips at the University of Guelph, holds a device he helped develop that uses nanobiosensors on paper test strips at the University of Guelph, holds a device he helped develop that uses nanobiosensors on paper test strips at the University of Guelph, holds a device he helped develop that uses 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Currently, when there’s an avian flu outbreak in a Canadian poultry barn it takes days to know exactly which disease is present because samples have to be shipped to the centralized animal health laboratory.

“The biosensors enable the farmers to know the results by bringing down the time for the results from several days to a few minutes, so that’s one of the key advantages,” Neethirajan said.

The biosensors offer another key advantage when it comes to infectious disease outbreaks because they can be linked in a network.

“The sensors are also much easier on animals when it comes to testing because only a droplet of blood or saliva is needed.

The biosensors can also be integrated into existing monitoring systems in barns.

“That will enable the farmers to basically download an app and then periodically or in a specific frequency, it can record data in a noninvasive way.

“For example, when a bird pecks to take water, or pecks to take a grain or a seed, based on the interaction of the beak to a particular zone, we have some trace of the oral swab in fluids left over that is good enough to be able to call up in terms of screening for specific pathogenic micro-organisms,” Neethirajan said.

Biosensors are also being integrated into robot milkers in dairy barns, and can be installed in wearables such as a dairy cow’s collar.

The hand-held device developed by the Bio Nano Laboratory has biosensor cartridges that can screen for a variety of allergens such as peanut, shrimp, and gluten in food, which is particularly useful in areas with limited resources, such as remote communities.

The Bio Nano Laboratory has also developed paper-based biosensors that children with food allergies can use.

“They can dip the paper in the food solution, based on the colour change they can decide whether to eat or not to eat,” Neethirajan said.

Food processors can integrate these nano-biosensors into production lines to look for specific materials, which could dramatically change how food manufacturers test, he said.

Suresh Neethirajan, director of the Bio Nano Laboratory at the University of Guelph, holds a device he helped develop that uses nanobiosensors on paper test strips to detect multiple kinds of virus, bacteria and food allergens. | PHOTO SUPPLIED BY SURESH NEETHIRAJAN
GM POLLEN: IT GETS AROUND

BY SEAN PRATT
SASKATCHEWAN INTELLIGENCE

Rebecca Tyson has developed a mathematical model to determine the appropriate isolation distance between genetically modified and conventional crops.

"Numbers tend to get thrown around and until this paper came out there wasn’t a lot of very good research saying what that distance should be," said the associate professor of mathematics at the University of British Columbia.

Tyson was challenged by W. David Lane, an Agriculture Canada biologist working at Summerland, B.C., to see if she could devise a way to scientifically determine how far GM pollen from apple trees travels.

Her light bulb moment occurred when Lane’s son mentioned that GM pollen and regular pollen were like hot and cold.

“Your model movement of heat by the diffusion equation and I knew how to do that," said Tyson.

She knew the pollen drift study would be similar to determining how far embers travel from a fire.

What she needed was data to plug into the model and Lane supplied her with all she required.

For two years, he had conducted an experiment where he had a row of GM apple trees planted in an orchard. He harvested seeds from the surrounding trees and figured out how many of them carried the transgene.

Tyson plugged the data into her fractional diffusion model and was able to calculate a safe distance to plant a conventional orchard next to a GM apple orchard with a cross-pollination rate of less than 0.9 percent.

It depends on the relative size of the crop. If the conventional crop is two times the size of the GM crop, the ideal distance is 51 metres. Crops of identical size should be separated by 72 metres and if the GM crop is twice as big as the conventional crop the safe distance is 88 metres.

“Our results suggest that separation distances of several hundred metres proposed by some European countries is unnecessarily large but separation by 40 metres is not sufficient,” said Tyson.

Tyson’s model also provided a mathematical answer to a conundrum that had previously puzzled biologists.

Put a GM plant in the midst of a lot of conventional plants and see how far the pollen travels.

But put a GM plant all by itself and place a conventional trap plant a long distance away and, lo and behold, the pollen spreads all the way to the trap plant.

So far, the model has been used only for GM apple orchards.

The Arctic apple, non-browning Golden Delicious and Granny Smith apples developed by Okanagan Specialty Fruits, received Health Canada approval in 2015.

Groups like CBAN and some British Columbia orchardists protested the field-testing of the Arctic apple in Canada.

So, the company established orchards in the U.S. and began test-marketing its sliced apples in U.S. grocery stores this year.

Tyson said her mathematical model could be adapted to determine isolation distances for other GM crops such as canola and alfalfa but the model would have to be tweaked because apple trees rely strictly on bees for pollination, while canola pollen can be spread by wind as well.

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A TECHNOLOGY company based in the United Kingdom has developed a new product that monitors temperature and moisture levels in stored grain and sends wireless data to a smartphone, laptop or home computer.

BeanIOT is a bean-sized remote sensing device that can monitor conditions in stored grain and warn the user of potential spoilage inside the bin.

The sensors are roughly the size of a kidney bean and are capable of monitoring grain temperatures, humidity levels, insect movements and other conditions that could affect the value of stored grain. Digital data generated by the beans is sent wirelessly and can be displayed graphically for quick and easy assessment.

The rechargeable units can be deployed throughout stored grain masses and have a battery life of up to 14 months. The beans are reusable and can be put to use quickly with limited set-up time. They are currently being tested commercially in the United Kingdom.

Andrew Holland, founder and chief operating officer of RF Module and Optical Design Limited, the Cambridge-based company that developed the Bean IOT system, said the beans can be deployed throughout stored grain, providing information from numerous points within the storage area.

"Density of deployment is key," said Holland.

"Our system provides lots of physical locations across the grain stack, so the farmer is not going to miss any untoward activity like hot spots, mould growth, insect infestation and so forth." Although BeanIOT has yet to prove its value in the North American marketplace, the technology is an example of how remote data collection systems with wi-fi connectivity can be used to make informed farm management decisions.

Developers say data collected by the beans is displayed in a user-friendly visual format that allow managers to identify problems quickly and take preventive action before spoilage occurs. For example, grain temperature data collected at various points in a stored grain mass can be displayed as a thermal map that shows hot spots where spoilage is most likely to occur.

Additional data generated by the beans can be overlaid, providing additional insights about potential trouble spots. Users decide what type of data to collect, and the display interface is customizable, depending on the user’s preferences.

Data collected is transferred wirelessly to a local hub, eliminating issues that could potentially be caused by poor cellular or internet coverage in rural or remote areas. Users can also receive alerts via Twitter or email, informing them that problems are arising and may need to be addressed.

"The system provides a compound image of what’s going on, and the farmer can tell which sensor is pinpointing the actual point where there is an issue with the grain," Holland said.

"We’re putting all of the information anybody would ever need to know up in front of them…. it’s those high level decisions that we’re trying to assist with." Data collection devices with wi-fi connectivity are already being used on many Canadian farms to boost productivity and manage production risks. In the near future, wireless data collection and transmission systems will continue to expand, giving producers access to a wide variety of products that simplify farm management.
Ken Jackson, a Saskatchewan entrepreneur and founder of Intelliconn Communication Solutions, said the ability to monitor farm operations and make management decisions remotely is critically important for today’s large farm operators.

“Most rural business and residents have some access to the internet, but there’s also a growing need for enhanced wireless access ... on farms (that allows farm managers) to connect to grain bins, to monitor tanks and to be able to turn pumps and fans and lights on and off,” Jackson said.

“With agricultural operations growing larger, the management of those operations (through a smartphone or remotely) is becoming increasingly more important.” Intelliconn, based in Saskatoon, offers a wide range of wireless monitoring and control products that are connected under a wireless ethernet dome.

The dome allows for the establishment of numerous wi-fi hot spots, providing connectivity to numerous devices across the largest farmyards and bin sites. Intelliconn’s systems are fully customizable and can be tailored to the specific needs of the farmer, Jackson said.

Systems typically include cameras that monitor activity within the farmyard, but they can also include devices such as temperature sensors, motion detectors and infrared sensors. The company has already installed more than 30 farm-based systems in Western Canada. It is also close to rolling out a new grain monitoring and sampling system that automatically collects representative samples for binned grain and tests the samples for moisture.

Jackson said all of Intelliconn’s products are designed to increase farm productivity, profitability, safety and security. Intelliconn starter kits will be available through selected farm retail outlets beginning this year with prices beginning at around $2,500 plus installation fees.

“We’re putting all of the information anybody would ever need to know up in front of them.... It’s those high level decisions that we’re trying to assist with.”

— With files from Angela Lovell brian.cross@producer.com

INTELLICON COMMUNICATION SOLUTIONS PHOTO

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New genetic tools offer way to restore cattle vigour

Beef genomics information can help producers with strategic crossbreeding programs

BY BARBARA DUCKWORTH
CALGARY BUREAU

DOUG WRAY assumed he had a Red Angus-Simmental cow herd on his Alberta ranch but DNA testing revealed an interesting mix. Similar to the concept of ancestry.com where people can trace their ethnic heritage, DNA breed analysis of Wray’s commercial cows showed they were Angus, Simmental, Charolais, Limousin, Hereford and Gelbvieh. Included in this mix was a cow with a smattering of Galloway even though that breed has not been on the ranch for more than 10 years.

Wray tries to match cows to the appropriate bulls that produce calves capable of thriving in his intensive grazing program and produce quality beef.

He agreed to DNA testing and also adopted an intensive record-keeping system called HerdTrax. He can record birthdates, breed of sire, identification of the mother, weaning and yearling weights, calving performance of offspring, health treatments, carcass data and any other pertinent information.

The challenge is converting data into information. “When you get in this game you really need someone who is number savvy and computer savvy and who likes to do it. That is probably our Achilles heel,” he said.

Scientists like John Basarab of Alberta Agriculture have been looking at beef genomics for a long time. The next step is to transfer what has been learned about purebreds into something useful for commercial producers. Genomics can determine breed composition and new tools can also show where to make improvements. One area for improvement is hybrid vigour.

“Depending on how genetic recombination occurs, still, crossbreeding is a good way to produce greater hybrid vigour in animals, which affects how well they grow and thrive,” he said. “People also want to build a uniform herd, but that may not be happening.”

“Genomics testing can determine breed composition and new tools can also show where to make improvements. One area for improvement is hybrid vigour,” he said.

“Technology can help breed better cattle.

REGINA — Keeping up with technology could be the biggest challenge facing purebred cattle breeders.

Genetically enhanced expected progeny differences, genetic databases and new algorithms are complicated and hard to understand but all are necessary to improve cattle and make better selection decisions, said Bob Weaber, cow-calf extension scientist at Kansas State University.

“People also want to build a uniform herd, but as herds grow larger, they can not take on too much risk. They do not want to take on a new breed that could introduce vigour but may also cause calving difficulty that a large herd cannot cope with. The right combination can make a cow herd more productive. “These animals with more heterozygosity (hybrid vigour) have more resilience, they can handle changes in climate, changes in diet, changes in management and they stay in the herd longer,” he said.

A two percent improvement in the calving rate means the young female was not removed for a variety of reasons like bad attitude, poor body structure or failure to get pregnant. Herds with lots of hybrid vigour tend to have a low culling rate.

“Over 30 years, nutrition technology has improved, vaccination, health and grazing management has all improved but we haven’t done a damn thing about our calving rate,” said Basarab.

Producers want vigorous cows but as herds grow larger, they can not take on too much risk. They do not want to take on a new breed that could introduce vigour but may also cause calving difficulty that a large herd cannot cope with. The right combination can make a cow herd more productive.

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“We go towards a more uniform cow herd and do get uniformity of type but mostly it is uniformity of colour,” he said. “Our herd has migrated over those 20 years to be a herd of red and black animals.”

This could affect sustainability and profitability of the western Canadian beef population.

In 1990, about 6,200 herds were surveyed in Alberta.

Included in the study was calf crop percentage. This is the number of calves weaned per 100 cows exposed to breeding. At that time, 84 percent of the calves survived to weaning. Subsequent studies showed no real improvement in calving percentages have been made.

“We are not doing anything about the fertility of our cow herd,” he said.

People often think they can check the pedigree to check background composition but the genetic makeup is not always clear.

“If a purebred Hereford cow is bred to a purebred Angus there is a 50-50 split. If a Simmental bull is added, a three-way combination is created but the genetic makeup is not always clear.

DNA is not transferred evenly but moves in chunks. It is expected a three-way cross cow would be 50-25-25 but the animal could end up being 50 percent Simmental, 15 percent Angus and 35 percent Hereford depending on how genetic recombination occurs.

Still, crossbreeding is a good way to produce greater hybrid vigour in animals, which affects how well they grow and thrive. People also want to build a uniform herd, but that may not be happening.

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People often think they can check the pedigree to check background composition but the vast majority of commercial producers do not maintain pedigrees or records.

Knowing the breed composition and hybrid vigour is called Envigour IX, offered by Delta Genomics. It can generate a hybrid vigour score to help producers develop a more strategic breeding plan. It does not recommend specific breeds.

Armed with this information, a producer can decide to use an Angus bull, for example, on the cows that have the least amount of Angus in their background to improve hybrid vigour.

Besides improved fertility, the cattle could become more feed efficient.

“The complexities of explaining what we do to our commercial customers is getting more difficult and probably more important,” he said.

“If we don’t keep up with technology and progress in terms of genetic improvement, what happens to the status quo? Status quo is not standing still but actually backing up and the longer you wait to adopt or change or implement, the further behind you are,” he said.

Commercial producers need to be convinced of the value of the new science, he said.

Producers can improve commercial herds by knowing the sires of calves and their ancestries, but they have to see value in it, said geneticist John Crowley, based at the University of Alberta.
Crowley works with the Canadian Beef Breeds Council, which represents 16 cattle breeds. “They don’t see the merit in spending $20 on doing a parentage test on a commercial animal when his profit margin may only be $20 to $30 depending on the year,” Crowley said.

Knowing the breed composition at the commercial level helps determine the level of hybrid vigour. Commercial producers may think they know what breeds are present in their herd, but DNA does not lie. DNA from each parent is not transferred evenly and desired traits can sometimes disappear or diminish.

“We have known for a long time in using genomics that every relationship between grandparents and progeny differs a lot from what you expect it to be,” Crowley said.

The rate seedstock producers are adopting these new genetic technologies also varies. Not everyone is comfortable in using EPD information or selection indexes, said Weaber.

The concept of genomically enhanced EPDs where genomic information is blended with traditional EPDS is fast-moving technology and can be complicated. Genomic information adds to the knowledge collected on individuals sooner rather than measuring merit later in life.

“The definition of the tool hasn’t changed; the implementation hasn’t changed, but the data that goes into it is changing rapidly,” said Weaber.

When following EPDs, there is an expectation of what the average progeny should look like. The progeny is never average so more information is needed to develop the true genetic merit of an individual and better predict what the offspring might do.

When genomes were first sequenced, there was high expectation the technology was going to work out where specific genes might be connected to valuable traits. Now researchers know there are interactions among thousands of genes that can affect a single trait.

“The technology continues to improve and significant changes are expected over the next four or five years in the seedstock business. ‘If we don’t figure out how to make better critters, then we are asleep at the wheel,’ Weaber said.

Genomic data accumulation offers a chance to better document common traits for factors such as fertility, longevity, feed efficiency and beef quality.

A further advantage is selecting younger animals of high genetic merit. Using standard tests, it takes a long time to collect information on bulls. A DNA test could speed that up.

“Increasing accuracy early in an animal’s life shortens the generation interval on the bull side,” he said. “If you are a nucleus beef breeder and you don’t adopt the technology, you will not be able to keep up.”

Those selling bulls may argue they are not going to get paid enough to cover the cost of the testing and results. It is going to come down to the progressive and informed commercial producers. They understand the value of reducing error in decision making, said Weaber.

Besides tracking the bulls, more information is needed on cows. Genomic data accumulation offers a chance to better document common traits for factors such as fertility, longevity, feed efficiency and beef quality.

Selection of replacement heifers could also be easier if they were genotyped before they were put into breeding programs. Producers could also make more informed decisions about which bulls to use.

Traditional EPDs versus genomically enhanced EPDs can improve heifer selection by about 50 percent by using more precise information.

“If I can put a group of heifers together where I know their genetic potential when they are weaned, I should do that,” said Weaber.

The dairy industry is already doing this and since 2009, it has quadrupled genetic change with higher fertility, lower somatic cell counts, calving ease, conformation and a longer productive life.

“A gap is growing between those who adopted the technology and those who did not in the dairy industry,” he said.

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Send wishes for a joyous season, and a prosperous New Year.

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Biotech companies prospecting for microscopic gold mines

BY BRIAN CROSS
SASKATCHEWAN RESEARCH COUNCIL PHOTOS

Indigo, a Massachusetts-based biotech company, is using gene sequencing tools and artificial intelligence platforms to study endophytes and the role they play in plant development. [SASKATCHEWAN RESEARCH COUNCIL PHOTOS]

A microscopic endophyte increase crop yields on your farm? Indigo, a Massachusetts-based biotech company, thinks so and is investing tens of millions of dollars in research and development to prove that claim.

Indigo specializes in the identification, isolation and commercial production of beneficial endophytes. An endophyte is a microbe that lives in the tissues of a plant. Until recently, the relationship between endophytes and the plants in which they live was not well understood.

But with the assistance of new gene sequencing tools and artificial intelligence platforms, interest in endophytes and the role they play in plant development has expanded, along with the development of new commercial products.

Indigo, for example, has already developed a number of commercial products, which according to the company have the ability to boost yields in winter wheat, cotton and soybeans. It is also working on a product for rice.

Indigo’s concentrated endophyte products are applied as a seed coat along with other crop inputs such as insecticides or fertilizers. Indigo products that have been field tested in Kansas under stressful growing conditions.

“In the example of winter wheat, we’re using a bacterial endophyte … that clearly enhances seedling growth,” said Kevin Kephart, head of industry relations with Indigo.

“We see faster coleoptile growth in wheat, faster root growth and after just a few days of germination, we’ll see a larger root mass … that allows the plants to capture resources out of the soil, whether that’s water or phosphorus or potassium or nitrogen.”

“We’re also seeing a greater number of … head bearing tillers in wheat and we see a greater number of spikelets per head as well.”

Indigo products that have been field tested in Kansas under stressful conditions such as excess heat and drought have demonstrated a yield increase of eight to 16 percent relative to winter wheat crops that were not treated.

In corn, certain hybrid varieties that were treated with Indigo growth promotants produced yields 70 percent higher than those of untreated corn fields sown with the same seed variety, again under drought conditions.

“We don’t see as much of a benefit under irrigation,” Kephart said.

“One hybrid that is most resistant to herbicides is the best choice for crops affected by drought or heat stress and looks for plants that appear to be thriving under adverse conditions. Communities of microbes contained in those plants are then analyzed to determine which endophytes are most beneficial to the plant’s health.

Potentially beneficial bacteria are isolated and multiplied in commercial fermentation facilities and field tested before commercialization. The end result is a concentrated product that can be applied as a seed coating along with other crop inputs such as insecticides or fertilizers.

Indigo’s products for corn, winter wheat, cotton and soybeans are already being used in the United States.

Kephart said additional products are likely to be developed in the future for growers in Western Canada. In Saskatoon, the Saskatchewan Research Council works with private sector clients such as Indigo to scale up beneficial microbes, isolating them and multiplied to the point where it can be field tested and taken to the next stage of commercialization.

“For growers in Western Canada, the project team, using bio-prospecting … has identified potentially beneficial microbes for different crops — some of them pertinent to Saskatchewan, like wheat, for instance — and they’re looking at how those microbes, working as endophytes … can optimize plant growth,” Gervais said.

“It (commercializing endophytes) is about finding the right microbe … and then figuring out how to grow or multiply that microbe in a way that will be cost effective enough to apply it back as an input into agriculture.”

In many ways, endophytes are similar to rhizobia-based inoculants that are widely used by pea producers in Western Canada.

The main difference is that rhizobia-based inoculants are derived from soil-borne organisms, whereas endophytes exist within plants themselves.

Gervais said endophytes can promote plant growth in a variety of ways, such as conferring disease resistance, improving water use efficiency or enhancing tolerance to abiotic stresses.
Researchers in Missouri use small microphones to measure the quantity of bee noises

**BY JEREMY SIMES  EDMONTON BUREAU**

Farmers may soon have a better idea on how well their crops are being pollinated, thanks to new research into the buzzing of honeybees. In 2014 and 2015, researchers in Missouri were monitoring bee noises in the Colorado Rocky Mountains by using small microphones called acoustic listening systems. Researchers in Missouri were monitoring bee noises in the Colorado Rocky Mountains by using small microphones called acoustic listening systems.

In findings published last June, researchers in Missouri used small microphones to measure the quantity of bee noises in their fields. They found that if the acoustic systems were picking up more bees buzzing, the bees were doing a lot more pollinating. “It’s not rocket science, but it is informative,” said Nicole Miller-Struttmann, who was part of the research team and currently teaches at Webster University in St. Louis, Mo.

“The more bees there are, the better the pollination services.”

Knowing this buzzing activity would be extremely helpful for farmers, she said, because many rely on bees or other pollinators to grow successful crops. For instance, if buzzes are low, farmers would know they need to bring in more honeybees. If buzzes are high, they might not need to bring in any. “If wild populations are doing enough pollinating, farmers might not need to spend lots of money and time,” Miller-Struttmann explained. “On the flip side, it can be an early warning signal, where they can take action and bring in more bees if they need to.”

So, to get this technology in the hands of farmers, the research team plans to develop an app that would work in conjunction with acoustic listening systems, which would be available for purchase.

“The more information the producer has, whether it’s for wild bees or imported ones, would be great,” said Miller-Struttmann.

Miller-Struttmann added the technology could help build relationships between farmers and conservation workers.

“There’s a lot of ways we can support native and local bee populations,” she said. “So, a little bit can go a long way in terms of things like planting hedgerows. If people could see the numbers in their own fields that would be really meaningful.”

Kevin Serfas, a director with the Alberta Canola Producers who farms near Turin, Alta., said this technology would be particularly helpful for canola seed producers who buy pollinating services from beekeepers.

“If you’re able to tell what the activity is like on the field, you’ll be able to bring in more bees, or import them if needed,” Miller-Struttmann said, “and therefore they help farmers with how they manage their farm.”

A St. Louis, Mo., research team plans to develop an app that would work in conjunction with acoustic listening systems that producers could use to track pollinator activity in their fields.

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**A St. Louis, Mo., research team plans to develop an app that would work in conjunction with acoustic listening systems that producers could use to track pollinator activity in their fields. | NICOLE MILLER-STRUTTMANN PHOTOS**
A natural fungus is showing remarkable abilities to promote plant growth under stressful conditions while nursing polluted soils back to health.

Researchers are finding the multi-talented fungus called TSTh20-1 (TSTh), short for Trichoderma harzianum 20-1, could increase agricultural yields and decontaminate some of the most polluted petrochemical places on the planet.

“I think this is a huge innovation at this point…. This is a game changer,” said Tim Repas, one of several University of Saskatchewan researchers involved in finding plausible mechanisms for how the fungus functions.

“TSTh does everything at once. It saves a lot of steps and a lot of work,” he said. “Think once we get the field trials completed, we’ll be able to show that this is the way forward.”

The inspiration for the innovation was a humble dandelion growing by itself in some coarse tailings in Fort McMurray’s oilsands region.

“It just happened to be this plant surviving somewhere where it shouldn’t have been, and the thought occurred to check it for this,” said Repas. “If that plant can do it, can we transfer that tolerance mouldability to anything else?”

Susan Kaminskyj at the University of Saskatchewan College of Arts and Science led the research team that discovered the innovation. The group isolated an entophyte fungus from the roots of the plant in the tailings.

When its spores are applied to plants, those plants grow and thrive on the material that lacks detectable levels of plant nutrients and is also water-repellant.

“Plants that TSTh colonizes grow vigorously on coarse tailings as well as on oil-contaminated soil without additional fertilizer or extra water,” said Kaminskyj.

Repas said when they added the endophyte fungus to places where seeds were not germinating or poorly germinating, they suddenly saw 90 percent germination, comparable to potting soil.

“That’s what intrigued us so much about this. It’s cutting down the number of steps to get from a problem site back to something functional.” In Kaminskyj’s laboratory, tomato seedlings treated with the fungus flourished on tailings without fertilizer.

The fungi are not transmitted through seed so each seed must be individually colonized. “It turns out that it doesn’t have to be just dandelions. It can be tomatoes, squash, wheat, flax, lots of different things,” Kaminskyj said.

Repas said researchers favour agricultural species because they tend to be more sensitive, so if a tomato can survive in the harsh environment of a contaminated oil spill, then larger agronomic species should be better because of their larger rooting systems and greater resilience.

Researchers now hope to learn whether harvested plants from the

CONTINUED ON NEXT PAGE ››

IN HIGH-STRESS FIELD TESTS, SEEDS TREATED WITH TSTh INCREASED CROP YIELDS BY

10-50 PERCENT
A fungus called TSTh20-1 could increase agricultural yields and decontaminate some of the most polluted petrochemical places on the planet.

Researcher Timothy Repas explores the Beatton River Valley near Fort St. John, B.C.  |  AARON MACKAY PHOTO

A fungus called TSTh20-1 could increase agricultural yields and decontaminate some of the most polluted petrochemical places on the planet.

Researcher Timothy Repas explores the Beatton River Valley near Fort St. John, B.C.  |  AARON MACKAY PHOTO

If you’re growing tomatoes, for example, on a reclaimed well site, are they just as safe to consume and nutritious as the ones in the field?” asked Repas.

In terms of oilfield reclamation, scientists are most interested in establishing a cover crop on coarse tailings and other petrochemical-containing soils. It’s hoped that could help reduce erosion, increase petrochemical mobilization and degradation, and begin to create a healthy soil.

Future research will likely explore growing perennial forages such as alfalfa, which is deep rooting and increases soil nitrogen.

“It would also be interesting to test the honey compared to other alfalfa honey,” said Kaminskyj.

However, future tests would need to determine if feeding these remediation crops to animals is safe. Researchers at Adaptive Symbiotic Technologies in the United States have conducted field trials around the world to enhance crop yields using TSTh and a proprietary mixture of microbes and fungi.

After five years of testing, they have documented success at growing plants exposed to stresses such as drought, salinity and temperature. They have reported that after high-stress growing seasons, their treated seeds increased crop yields an average of 10 to 50 percent.

“They are growing a wide range of things including wheat, corn and leafy greens. One of the nice things having grown these crops is they’ve found the fungus doesn’t cause problems for consumption,” said Kaminskyj.

These innovative uses for TSTh could have far-reaching impacts on large scale farming operations across Western Canada for growing food and feed, as well as the bioremediation of plants on dry, low-nutrient, hydrocarbon-contaminated soils.

“We grow a lot of wheat and imagine if we could increase wheat yields by 50 percent on the same amount of land. “Wheat could potentially be grown on contaminated soils. The next question, of course, is could you eat that wheat?” Kaminskyj said.

Added Repas: “When you’re talking huge agricultural scales, even a yield increase of five to 10 percent is, of course, massive.”

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Knowing the total genetic makeup of an insect allows scientists to design plants that repel the bad bugs

**Cracking the megapest genetic code**

BY RON LYSENG

AUSTRALIAN researchers have spearheaded an international effort to decipher and map the entire genome makeup of two major megapests threatening crops around the world. The Commonwealth Scientific and Industrial Research Organization announced in a recent news release that it had identified more than 17,000 protein coding genes in two closely related pests considered to be the world’s greatest caterpillar enemies of broad acre crops. It’s estimated that the cotton bollworm (Helicoverpa armigera) and the corn earworm (Helicoverpa zea) cost the world’s farmers $5 billion a year in North America, Australia, Africa, Asia and Europe. As part of the research, CSIRO updated a distribution model to highlight the global invasion threat with emphasis on the risks to North American crops. Researchers also documented how these insect genetics have changed over the years. Understanding how insects adapt to become resistant to chemicals is the key to keeping one step ahead of crop-killing pests. Armed with these genetic codes, plant breeders can continue developing new B.t. varieties that the insects don’t eat.

The CSIRO release said that genetic mapping has the potential to significantly reduce insecticide use worldwide, thus saving the agricultural community billions of dollars a year and reducing the volume of chemicals escaping into the environment. At the same time, this innovative technology can provide better protection for crops. “The bollworm is the single most important pest of agriculture in the world, making it humanity’s greatest competitor for food and fibre,” said CSIRO scientist John Oakeshott, adding that it attacks more crops and develops better pesticide resistance than its cousin the earworm. “Its genomic arsenal has allowed it to outgun all our known insecticides through the development of resistance, reflecting its name — armigera, which means armed and warlike.”

According to the release, the bollworm has been spreading rapidly in Brazil and there are cases of it hybridizing with the earworm. This poses a real threat because the “new and improved superbug” could migrate up the continent to North America. CSIRO and Australian cotton breeders incorporated B.t. insect resistance genes in their varieties in the mid-1990s to try tackling the bollworm. The B.t. cotton plants emit a natural insecticide that’s toxic to the caterpillar.

The use of chemical pesticides that were previously required to control bollworms dropped by 80 percent within a decade of introducing B.t. varieties. But the bollworm fought back. A small percentage developed resistance to B.t. cotton, forcing scientists to develop newer and stronger chemical insecticides to manage the problem.

Karl Gordon, another CSIRO researcher, said a combination of B.t. and some chemical products was working well in Australia, but it’s costly. It’s important to study the pest itself if producers expect to manage the problem worldwide, he added. “We need the full range of agricultural science,” said Gordon. “Our recent analyses and mapping of the complete genome is a huge step forward in combatting these megapests.”

Identifying pest origins and the countries of origin is important in developing a global resistance management strategy. Gordon said the strategy must include risk analyses at biosecurity hot spots such as national seaports and airports. Partners in the genome mapping project include the University of Melbourne, Baylor College of Medicine in Texas, the French National Institute for Agricultural Research, Max Planck Institute of Chemical Ecology in Germany and the U.S. Department of Agriculture’s Agricultural Research Service.

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People mistakenly use “genetic mapping” and “genome sequencing” interchangeably without a second thought. However, the two technologies are as different as planting wheat with a stick and planting wheat with a SeedMaster.

True, both technologies will yield some sort of a final product, but that’s where the similarity stops, says James Schnable, a geneticist at Berkeley College.

“For basic science, a genome sequence is generally more useful than a genetic map. On the other hand, from a breeding or crop improvement perspective, a genetic map is probably more important than an actual sequenced genome, especially from a cost-benefit perspective,” Schnable said.

“Genetic maps describe the order of markers along the chromosomes of a genome. In the oldest maps, these markers would be whole genes. Modern genetic maps use smaller markers, but the principle is the same. It’s a map of the order of landmarks on a chromosome along with some kind of information that can be used to tell them apart.”

A massive global project is currently underway, aimed at sequencing the genomes of 5,000 insects. The project is titled the “i5k Initiative” and it’s been called the Manhattan Project of entomology. It seeks to sequence the genomes of potentially damaging insects, thus improving our lives by contributing to a better understanding of insect biology. This information will enhance our ability to manage arthropods that threaten our health, food supply and economic security.

Susan Brown, a genomics researcher at Kansas State University and one of the founders of i5k, said sequencing is the highest resolution map that can be created.

“Today, we can look at places where enzymes cut, for instance,” she said. “It used to take teams of researchers and two or three years of work to do that for even a tiny genome. Now, for example, we can sequence a human gene in 24 hours with these new optical mapping techniques.”

The Genome News Network, an online magazine that covers important developments in genomics research, said a genome map is less detailed than a genome sequence.

“Sometimes mapping and sequencing are completely separate processes. For example, it’s possible to determine the location of a gene — to ‘map’ the gene — without sequencing it. Thus, a map may tell you nothing about the sequence of the genome and a sequence may tell you nothing about the map.”

Schnable said there’s nothing new about mapping. The real breakthrough was the technology to closely examine genomes and sequence them. The first sequencing research began in 1979, and by 2000 most research organizations around the world were using it.

“Barbara McClintock published a map of the order of three genes and the fact they were genetically linked to a physically observable feature on one of the maize chromosomes back in 1931, more than 20 years before the structure of DNA was discovered,” he said.
THE INNOVATION ISSUE

BY RON LYSENG
WINNIPEG BUREAU

The Tibot Spoutnic prowls chicken coop floors all day, every day, keeping chickens on their toes and at the peak of efficiency.

Spoutnic, a small autonomous robot, debuted this fall at SPACE, an annual French livestock show that focuses on new technologies. Spoutnic is designed to take the place of people who monitor chickens, regularly walking the coops to keep hens moving so they lay their eggs in nest boxes instead of on the floors.

In coops dedicated to raising broilers for the table, operators try to prevent the birds from staying dormant for too long for similar productivity reasons. Broilers experience greater weight gains when they're more active.

Employing a robot for this drudgery has obvious health benefits for the chickens and for the people, although displaced chicken coop walkers may not see it that way.

Spoutnic is the brainchild of Tibot Technologies, a French company founded by a pair of poultry farmers who did not like walking coops and bending over hundreds of times a day to pick up eggs in an environment of dust and ammonia. Tibot says that a 24-7 Spoutnic reduces floor eggs by 23 percent. Floor eggs that aren’t gathered by human workers right away end up wasted because of food safety protocols.

Globalization has forced biosecurity into a priority issue. An animal raised in Canada may end up on a table in China or Europe. Even in developing nations where food takes a larger cut of families’ budgets, consumers are concerned about the safety of imported food.

The machine also performs more serious tasks, such as spraying vaccinations, spraying disinfectants, monitoring chicken performance and marking locations of dead chickens. It produces a map depicting where it has worked and what it accomplished during each shift.

“The potential for this technology is tremendous,” says Lisa Bishop, spokesperson for the Chicken Farmers of Canada. “Farmers are always innovating and looking for new ways to take care of their birds, so this robot is a tremendous tool.”

Bishop says Chicken Farmers of Canada has a mandatory on-farm food safety program plus a mandatory animal-care program, that requires farmers to walk their barns three times a day.

“If this robot can make a real-time map of where the birds are, it can tell us if they’re congregating in one spot. It can tell us how they’re interacting. It can provide our birds with the extra engagement the animal rights activists are searching for.”

Spoutnic programmers have to strike a delicate balance when it comes to keeping the chickens moving. They need to gently rile the birds to prevent lethargy, but they don’t want to cause panic. If they can get them to do the chicken dance, all the better.

The robot never stops moving. To prevent the chickens from becoming accustomed to a certain routine, Spoutnic is programmed to constantly change its playlist of music, lights, sounds and dance steps.

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Spoutnic is about the size of an automated round Roomba vacuum cleaner. It weighs 20 pounds, has four-wheel drive, six speeds and an eight-hour battery life. It’s expected to cost about $1,300.

Leonard and Kim Klassen have one barn full of layers and a second barn full of broilers at their farm near Grunthal, Man. They do a lot of barn walking. Kim thinks Spoutnic might be a good idea, but she’s skeptical.

“A thousand dollars (U.S.)? Is there a money back guarantee?” asks Kim. “I’d like to see how it runs over straw and how it reacts with all that high humidity and corrosive manure. I’m doubtful.”

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Like a fox in the henhouse, Spoutnic keeps chickens on their toes. Preventing chickens from becoming lethargic means broilers put on weight quicker and layers have fewer floor eggs. | TIBOT TECHNOLOGIES

French robot prowls the chicken coop so you don’t have to

BY RON LYSENG
WINNIPEG BUREAU

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Globalization has forced biosecurity into a priority issue. An animal raised in Canada may end up on a table in China or Europe. Even in developing nations where food takes a larger cut of families’ budgets, consumers are concerned about the safety of imported food. Keeping boots out of the coops goes a long way toward protecting chicken health by reducing potential exposure to outside pathogens.

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Like a fox in the henhouse, Spoutnic keeps chickens on their toes. Preventing chickens from becoming lethargic means broilers put on weight quicker and layers have fewer floor eggs. | TIBOT TECHNOLOGIES
Alternatives to livestock antibiotics are difficult to assess

Natural antimicrobials such as garlic may prevent infection in some animals, but some other ‘natural’ antibiotics do not

BY ROBERT ARNASON
BRISBANE BUREAU

I

NOCTEMBER, a sales represen-
tative for an American company sent an email to reporters at The Western Producer. The email touted a new product that could replace or reduce the use of antibiotics in livestock production.

The product was made from compounds found in the allium family of plants, which includes onions and garlic, that may have natural antimicrobial properties. The founder of the company used extracts from garlic to create a feed additive that he said controls pathogenic bacteria and increases the population of beneficial bacteria in livestock.

That means the product could potentially replace antibiotics and prevent infection in herds of cattle, pigs and poultry.

Natural antimicrobials like this garlic product may actually work, but some other “natural” antibiotics definitely do not.

“The problem is that some of them do have a level of credibility and others have absolutely no credibility,” said Tim McAllister, a nutrition and microbiology expert with Agriculture Canada in Lethbridge.

“But it’s very difficult to differentiate between the two ends of that spectrum.”

Farmers around the world are under pressure to reduce the amount of antibiotics they give to livestock to prevent and treat disease.

In November, the World Health Organization delivered a direct message to the livestock trade, saying farmers are overusing antibiotics and contributing to the growing threat of antibiotic resistance.

“WHO strongly recommends an overall reduction in the use of all classes of medically important antibiotics in food-producing animals, including complete restriction of these antibiotics for growth promotion and disease prevention without diagnosis.”

The strongly worded WHO recommendation is part of a broader trend in the livestock sector, McAllister said.

“The most recent stuff I’ve seen suggests the pressure on the use of antimicrobials in livestock production is only going to increase, even at more rapid rate then it has,” he said. “A lot of the pressure is coming from the McDonald’s, the Burger Kings. Those guys are the ones driving the change.”

If Canadian livestock producers are forced to minimize or eliminate the preventive use of antibiotics, it’s certain that new players will step in to fill the void with alternative treatments.

A quick internet search shows that many companies have already entered the natural therapy market for livestock.

One site promoted using winter savory and thyme to treat mastitis, anudder infection common in dairy cows. Another website hyped essential oils as a way to treat intestinal parasites in sheep.

“You’re talking health food store for cattle,” McAllister said.

Some companies are trying to adapt natural human remedies and sell them into the livestock market, but other firms are devising novel alternatives to antibiotics.

ZIVO Bioscience, for example, is developing products from strains of Actinomycete bacteria that has been testing its compounds to see if they can prevent mastitis in dairy cows.

A number of the natural and innovative products entering the market might be effective, but how can a producer distinguish the good from the snake oil? That’s not easy, partly because Canada has loose rules around marketing natural therapies.

“If the company wants to make a claim for disease treatment or disease prevention, then it is (regulated as) a drug,” McAllister said.

“It’s not the Wild West from a regulatory perspective, but it is from a marketing perspective.”

If a firm sells its product as a feed additive it can talk to potential buyers about the antimicrobial properties.

However, it can’t put those claims on the label, in brochures or on its website, which means the companies with skilled sales reps who can build trust with livestock producers will likely have the most success.

McAllister said he and his Agriculture Canada colleagues are interested in alternatives to antibiotics.

But being scientists, they want to know how a compound works and see evidence that it does work. Their attitude to such products can be summed up with a quote that’s familiar to most scientists.

“In God we trust, all others bring data.”

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THE INNOVATION ISSUE
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ROWERS AT a British Columbia orchard are using new laser technology to deter birds from eating their cherry crops, an effort they say has so far paid off. “It’s been very successful,” said Gayle Krahn, the horticulture manager with Coral Beach Farms in Lake Country, B.C. The device called an Agrilaser projects green beams just above the orchard canopy when activated. The laser isn’t harmful, but when birds see it, they view it as a barrier. “They see it as a danger zone,” Krahn said. “They would stay sitting on the post and watch it. When they did come in, they were confused and would fly just above the ground because they didn’t know how to get out.”

Coral Beach growers have been using the lasers for about three years as part of a pilot project with the Investment Agriculture Foundation of British Columbia. In their first year of testing, Krahn said the laser worked great. But in year two, growers noticed the birds became used to it. “We realized we had to double-up in our bird control that year,” she said. “There really is no single silver bullet.”

In year three, however, growers programmed the lasers so that they would beam in different directions every few hours. This way the birds couldn’t get used to the beams being in one spot, Krahn said. “That worked a lot better for us because there was a lot less birds coming through.”

Even with the lasers beaming, Krahn and her team had to control the birds by other means as well. Some were patrolling the posts and shooting the pests, while others set up bird guards. “What I want to make 100 percent clear is that you have to double up; you can’t just use a laser,” she said. “It’s when we doubled up that we found we were successful.”

But she still stands by the product, which costs about $8,000 and requires solar power to operate. She said the orchard that was equipped with the lasers lost only about two percent of its cherry crop, while the orchard that didn’t have them lost about 25 percent. “It’s not cheap but it was worth it,” she said. “Losses can be very devastating so cherry growers have to do something.”

As well, other growers have taken an interest in the product. Glen Lucas, general manager of the B.C. Fruit Growers Association, said more growers are becoming interested because the current method of solely trapping or scaring birds doesn’t work too well. “The starlings are still causing damage, despite the fact that we trap and humanely euthanize about 50,000 per year,” he said. “Damage hasn’t gone down, so it seems like growers are interested in adding something like this (lasers) to what they currently do.”

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European starlings are known varmints in British Columbia. They can decimate cherry crops if not managed. | INVESTMENT AGRICULTURE FOUNDATION OF BRITISH COLUMBIA PHOTOS

New laser technology proves successful for B.C. orchard
High-tech deterrent devices protect crops from ... intruding elephants?

The deterrent they developed is called Vertebrate Pest Detect-and-Deter, or VPDaD for short. It’s a motion sensor device equipped with cameras that can take regular photos and heat images.

When the device realizes an elephant is nearby, it emits light and makes noises, which are things elephants don’t like, according to CSIRO’s website.

But the VPDaD goes one step further. If an elephant gets used to the noise that the device is making, it will sound off another noise, and keep sounding off different noises until the elephant is truly scared.

The device then remembers to use that same noise again if an elephant returns. After doing tests in Gabon, Africa, researchers determined the VPDaD was a success.

Now, they’re going to see if the devices can work in Australia to deal with pests there by conducting trials with businesses and farms. If it works, animals like rabbits, feral pigs, wallabies, foxes, and dingoes may no longer be taking massive bites out of farmers’ fields and pocketbooks.

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Researchers are developing safe light and noise-based deterrents to keep unwanted animals such as elephants from devastating crops. | GETTY PHOTO
THE DIAMONDBACK moth project at Cornell University isn’t a normal research project.

Cornell has created a detailed website for the project, the university has a media contact person specifically for the research and there is a Frequently Asked Questions link on the website.

Cornell entomologist Tony Shelton is testing a novel approach to control diamondback moths, a major pest of brassica crops including cabbage, broccoli and canola.

The caterpillars of diamondback moths feed on the leaves of brassica crops, stunting growth or killing plants.

Shelton and his team are working with a British company called Oxitec. Scientists at Oxitec discovered a method to alter the genetics of a male diamondback moth so that it passes on a “self-limiting gene” when it mates. Cornell is evaluating the effectiveness and safety of the technology.

The self-limiting gene in the genetically modified moths produces a toxin in their female offspring. That kills the females before they reach adulthood and reduces the number of female moths that can reproduce.

The idea is to release genetically modified moths on cropland and with repeated releases, the population of diamondback moths in the area shrinks to nothing.

Diamondback moths are well suited for this approach because they breed rapidly and there is a short time between generations. As well, they are becoming resistant to a long list of insecticides.

“(It) is one of world’s most damaging insect pests,” Shelton said, noting that diamondback moths cause about $4.5 billion worth of damage to crops every year.

That may be true but research on moths normally doesn’t warrant a dedicated website or detailed videos explaining the science.

Cornell has gone the extra mile because changing the genetics of moths in the state of New York has generated a media frenzy in New York City.

The Atlantic magazine, Wired, Forbes, Bloomberg and the New York Times have all reported on the Cornell project.

Environmental groups and the public have raised alarms about the research. A comment on a United States government website, regulations.gov, summarizes their position: “Future ramifications are unknown and could be dangerous to the entire world.”

Many have questioned the safety of releasing genetically modified moths into the wild because it could pass the altered gene to other species.

Cornell, on its website for the project, said that scenario won’t happen. “The released GE diamondback moths will only mate with their own species, producing offspring which carry the self-limiting gene.”

In 2015, Oxitec and Cornell tested the concept of GM moths in cages within a greenhouse. The tests showed that the Oxitec moths caused the diamondback moth population to crash.

In July of 2017, after more than a year of review, the U.S. Department of Agriculture granted Cornell permission to test the moths in a field setting.

Shelton and his team selected an eight-acre cabbage field near Geneva, New York.

“As of mid-October the field studies for the year have been completed,” the Cornell website stated. “We will analyze the data during the fall and winter and plan to submit a manuscript to a peer-reviewed journal soon after in 2018.”

Oxitec hopes the field study supports the technology because it may be safer than insecticides.

“The approach ... is specific to the diamondback moth so does not affect beneficial insects,” the Oxitec website noted. “Additionally, the insects die out so the released insects and their genes do not persist in the environment.”

Diamondback moth larvae are a major pest for canola growers in Canada.

Most infestations occur when southerly winds carry the moths into the Prairies. The severity of the infestation depends on the population size in the spring and how early the moths arrive.

The Western Producer contacted Oxitec to see if the technology could be used on canola crops. It didn’t respond by press time.

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SOURCING PARTS for older farm machinery can be a hair-pulling experience. Farmers often find parts are no longer available or the price is unreasonably high. But there may soon be another option for replacement parts.

A 3D printing centre called Create Cafe has opened in Saskatoon, where anyone can walk in, talk to a designer, and order a part and coffee all at the same time.

Dustin Maki, chief executive officer of Create Cafe, said the centre is modelled after the style of an internet cafe.

"3D printing is slightly expensive and inaccessible currently, so having a cafe space where you can educate people on the applications of it and provide them access to printers, like we do in the front of our cafe, lets them try it out before spending $1,000 or $5,000 on their own," Maki said.

Beyond the educational and barista side of the business, Maki said their 3D printing service has worked with multiple industries, including agriculture, medical, aviation, and manufacturing.

There are companies trying to reduce the cost of metal 3D printers, but they still cost around $100,000. So far, Create Cafe prints only with resin-based material.

Maki said there are more than 100 different resins available but the primary material they use is a polylactic acid (PLA) plastic.

"It’s called polylactic plastic. It’s actually made from cornstarch, which is interesting because it’s sustainable. We can keep using that plastic and we can keep growing corn," Maki said.

Acrylonitrile-Butadiene-Styrene (ABS) plastic is also commonly printed, as is rubber.

“We have a selection of rubbers in a few different parameters, so that’s good because you can do custom gaskets and anything with bushings in the middle where you need a little impact resistance. It’s extremely strong and very tear resistant," Maki said.

Replacement parts that need to be impact resistant are often printed in nylon.

"Nylon does absorb moisture, so normally what we do is we’ll actually put the moisture in it right away and then it won’t take on additional moisture after that. It is one of the strongest materials that we’ve found," he said.

When a replacement part is needed, it’s best if the customer brings the old part into the cafe. This makes it easier for designers to recreate it in the software.

"Replacement parts are really nice to work with especially if we have one of the pieces. Even if it’s broken it can be glued together so that we can take measurements from," Maki said.

Three designers help draft a customer’s replacement part in CAD software, that’s often the most expensive part of the procedure.

“One we have that model we put it in the slicer and we can determine how much it will cost to print off,” Maki said.

The turn-around time for replacement parts is between two to five days, but once a part is designed its parameters remain in Create Cafe’s files and subsequent pieces can be produced more quickly.

"After the design is done, the cost stays static, so you will know how much pieces will cost," Maki said.

The design team at Create Cafe can also help improve parts by eliminating weak points in the original design.

The biggest job Create Cafe has done to date was a batch of hopper extensions for a seeder because canola seed wasn’t feeding uniformly with the original system.

"We were contacted by KMK Sales to create an extension that would basically make that five-pound hopper a 25-lb. hopper. And that increase in weight somehow fixed the issue with it seeding more than it needed to, and then it would only seed one at a time," Maki said.

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Sometimes an idea is just too delicious to ignore. That’s how thousands, probably millions of people around the world have reacted to the notion of turning bee brood into human food. Yup, bee brood. That’s the larvae of bees that live inside the thousands of hexagonal chambers that collectively make up a beehive’s nursery. They’re white, maggot-like things. Yummy.

For clarification, people in countries like Canada aren’t necessarily eating a lot of bee brood, at least not yet. What’s caught a lot of interest in the last couple years in the developed world is the idea of eating bee brood, rather than people actually doing it. However, bee brood has long been eaten in developing nations and among indigenous peoples. The world’s poor have proven canny at discovering sources of available protein and other nutrients in their local environments. But among the privileged classes, bug-munching has gone distinctly out of fashion. It’s hard to find a restaurant that offers insect delicacies.

However, a restaurant in Copenhagen, Denmark, has pioneered much bee-based cuisine, including appetizers and brood beer. That has grown out of the work of a Danish scientist who has been laying out the opportunities and issues around the potential of using bee babies as food. Annette Bruun Jensen is a noted international bee researcher. Along with a team of researchers, she released a report in October 2016 that caught fire around the world. It not only discussed with considerable detail the technical challenges of brood extraction, handling, storage and preparation, but ventured into the realm of the culinary with example recipes, such as:

- Thai bee larvae and weaver ant eggs, with sour fermented bamboo shoots
- fresh pea and bee larvae soup
- honey bee larvae granola
- bee larvae ceviche

Apparantly the possibilities are endless when you give a chef a bowl of larvae. According to Bruun Jensen’s 2016 study, bee larvae can taste like “raw nuts,” “avocado,” “vegetal,” and “meaty,” depending on the taster and brood treatment. While the study attracted a lot of interest because of the unusual and exotic nature of the topic, it wasn’t prompted by frivolous concerns. Harvesting bee brood could have serious practical value for beekeepers and society.

For beekeepers, much bee brood is literally thrown away every year as a way of controlling the spread of the varroa mite. Yet the brood are proven to have high nutritional value, and the human race is expected to have a growing demand for protein and other high-value nutrition in coming decades.

The combination of the beekeeper’s need to dispose of brood and humans’ need for food has taken the idea beyond momentary online interest. It is still being talked about more than a year after being published. It’s actually not a new idea, and certainly not unheard of in Canada. In the May 1960 edition of Bee World, two Canadian researchers discussed the idea in the article Bee Brood as Food. B. Hocking and F. Matsumara examined references from the 1950s to humans eating bee brood, and noted the same desire to reduce biological waste and produce food that Bruun Jensen’s team acknowledged.

“At the time of killing, colonies may contain half (a pound) to five lbs. of mature capped brood,” Hocking and Matsumara write. “The world balance, or imbalance, of human food and human population suggested that its utilization should be investigated.” They mention that Japanese canned bee brood was available in Canada.

The researchers suggest that harvesting bee brood could produce a foodstuff worth more than $4 million in 1960 dollars, which was almost as much as the value of the honey crop. Very little bee brood harvesting has occurred in Canada but the idea is back in the public eye and Bruun Jensen’s paper provides all the basics for farmers or cooks interested in exploring this bold new culinary frontier.
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20. She played Lola on Regis (seasons 1–3).
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22. She played Belle Potts, who was the smallest of the group on American Horror Story: Freak Show.
25. English actor Vlahos.
27. Initials of the actor who played Smokey Stenzi in The Sopranos.
28. She starred in The King's Speech (2010).
29. She played Smokey Stenzi in The Sopranos.
30. The one-time creator of the famous violin used by Yo-Yo Ma.
31. The actor who played Nick Szalinski in Honey, I Shrunk the Kid (1989).
32. The actor who played Smokey Stenzi in The Sopranos.
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$115,000

ST. PAUL, AB
780-645-4422

2919 hrs, Loader, Grapple, Joystick, was $125,000

2003 CLAAS 590R

$220,000

SASKATOON, SK
1-844-806-2300

1450 Hrs, Includes P514 Pickup, 1,000 threshing! 2 to Choose from

2008 CASE MAGNUM 275

$130,000

FORT MACLEOD, AB
403-800-7075

FWA, 275 hp, 3,600 hrs, rear duals, GPS system, Auto Steer, 0% Financing for 4 Years

2005 CLAAS 590R

$159,999

CANADA WEST HARVEST CENTRE 1-844-806-2300

1450 Hrs, Includes P514 Pickup, 1,000 threshing! 2 to Choose from

2011 VERSATILE 190

$125,000

ST. PAUL, AB
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2919 hrs, Loader, Grapple, Joystick, was $125,000

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### New 2017 Vehicles

<table>
<thead>
<tr>
<th>Model</th>
<th>Stk. #</th>
<th>Engine Details</th>
<th>Exterior Color</th>
<th>Interior Color</th>
<th>MSRP</th>
<th>Sale Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017 F150 4x4 Supercrew XLT</td>
<td>T17840</td>
<td>3.5L Ti-VCT FFV, 6 Speed Automatic</td>
<td>Ruby Red</td>
<td>Black Leather Interior</td>
<td>$83,324</td>
<td>$72,995</td>
</tr>
<tr>
<td>2017 Explorer 4x4 Limited</td>
<td>T17733</td>
<td>3.5L V6 Ti-VCT Engine, 6 Speed SelectShift Trans, White Platinum, Ebony Black Clth.</td>
<td>$59,139</td>
<td>$44,631</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017 Escape 4 Door SE 4x4</td>
<td>T17733</td>
<td>3.5L V6 Ti-VCT Engine, 6 Speed SelectShift Trans</td>
<td>Magnetic, Ebony Black Clth.</td>
<td>$43,589</td>
<td>$40,473</td>
<td></td>
</tr>
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<td>2017 Explorer 4x4 Limited</td>
<td>T17733</td>
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<td>2017 F350 4x4 Crew cab Lariat</td>
<td>T17840</td>
<td>6.7L Powerstroke V8 Diesel, 6 Speed Automatic, Ruby Red, Black Leather Interior.</td>
<td>$83,324</td>
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*Offer includes freight, air tax and fees, GST extra.*

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**COMBINES**

- **2017 Case IH 9240** 36’ Tracks, Ext Wear Rotor, Folding Auger, Lux Cab, Leather, AccuGuide, HID Lights Stk: 026350 (ME) ................................................ $75,000
- **2016 Case IH 9240** 620 Duals, Lux Cab, Lat Tilt w/Rocktrap, AccuGuide, 50’ Folding Unload, Magnacut Chopper, HID Lights Stk: 022940 (SC) ............................... $499,000
- **2016 Case IH 8240** 520 Duals, Lat Tilt, Rocktrap, Ext Wear Rotor, Standard Chopper, Deluxe Cab, Leather Seat, Pro 700, AccuGuide Ready Stk: 022117 (SC) ............. $405,000
- **2014 Case IH 8230** 900 Singles, Lat Tilt, Deluxe Cab, GPS, Folding Auger, Pivot Spud, Hyd Fold Hopper Cover, 865 Engine & 640 Rotor Hrs, Stk: 025289 (SC) ........... $335,000
- **2013 Case IH 9230** 620 Duals, Lux Cab, Lat Tilt w/Rocktrap, Hyd Grain Tank, Magnacut Chopper, HID Lights Stk: 021990 (ES) ................................................ $350,000
- **2012 Case IH 9120** 620 Duals, HID Lights, Magnacut Fine Chopper, AccuGuide, Pro600 Monitor, 24'Auger Stk: 023445 (PA) .............................................. $275,000
- **2012 Case IH 7230** 520 Duals, Lat Tilt, Ext Wear Rotor, Hy Folding Cover, Std Chopper, HID Lights, AccuGuide, Air Compressor Stk: 021503 (PA) ................................ $289,000
- **2009 Case IH 7120** 520 Duals, Lateral Tilt, AccuGuide, Power Mirrors, Std Cut Chopper, 3016 Header / W SwathMaster Pickup Stk: 205692B (LL) ......................... $189,000
- **2006 Case IH 8010** 14’ CIH 2016 Pickup, 520 Duals, Rocktrap, Pro 600 Monitor, St. Rotor, Mauer Topper, Fine Cut Chopper, Long Auger Stk: 021412 (ME) ....................... $155,500
- **2006 Gleaner R65 Pickup Header, 900 Singles, Single Spreader, 500 Hrs on Reman Engine Stk:026973 (ME) .................................................. $92,500
- **2012 Challenger 540C** 620 Duals, Power Fold Hopper, MAV Chopper, Small Grain Rotor, AutoSteer, Leather, PH5 PU Header Stk: 026658 (SA) ............... $245,000
- **2012 MF 9560** 520 Duals, MAV Chopper, Power Ford Hopper, AutoSteer, Leather, MF 4200 PU Header Stk: 026657 (SA) ..................................... $270,000

**SPRAYERS**

- **2016 Case IH 4440** 120’, AIM Pro, Active Susp, Pro 700, AccuGuide, AccuBoom, AutoBoom, Front Fill, Wide Fenders, Treelborg 710s Stk: 022565 (SA) .............................. $495,000
- **2014 Case IH 4430** 120’, Lux Cab, Active Susp, HID lights, AutoBoom, AccuBoom, Viper Pro Monitor, AIM Pro, 380’s & 620’s, Raven Smartrax Steering Stk: 023711 (PA) ................. $380,000
- **2013 Case IH 4430 300’**, Deluxe Cab, AIM, Pro 700, 372 Receiver, 2 Sets Of Tires, HID Lights, AutoBoom, AccuBoom Stk:024788 (SC) ........................................... $305,000
- **2011 Case IH H4420 120’, Dix Cab, 380’s & 650s, HIldight,AirComp,ViperPro,Smartrax,AutoSteer, AutoBoom, AccuBoom, Crop Dividers, Fan Reverser Stk: 021959 (ME) ........................................... $213,000
- **2009 Case IH 4420 100’, AIM, 1200 Gallon, Norac Boom Height Control, Sectional Control, AutoPilot, 380’s & 520’s, Ag Leader Monitor Stk: 020576 (ES) ................ $199,500
- **2013 Case IH 3330** 100 Fl, 380 & 650 Tires, Active Sup, Front Fill, AIM Command, Deluxe HID Lighting, AutoBoom, AutoBoom Stk: 022510 (SA) ........................................ $249,900
- **2000 Case IH SPX2130 78’, AutoSteer, 2 Sets of Tires, 660 Gallons Stk: 024745 (SA) ................................................................. $69,900
- **2014 Case IH 4530** Floatar 70’, Lux Cab, Power Mirrors, Deluxe HID Lights, Fenders, Double 6” Auger 50 CF, Viper 4 Monitor, 1550 Hours Stk: 024242 (SC) .......................... $320,000
- **2011 Case IH 3230** 100’, Dix Cab, Active Susp, HID Lights, Pro 600, AccuGuide, Fenders, AccuBoom, AutoBoom Stk: 026123A (LL) ............................................. $229,000
- **2010 John Deere 4830** 100’, 1000 Gallon Tank, AutoSteer, Swath Pro, AutoBoom, 2 Sets Of Tires, Crop Dividers Stk: 021520 (SA) ........................................ $215,000
- **2014 New Holland SP240F 120’, 120 Gal SS Tank, Intelliview IV Monitor, 3 Remotes, AccuBoom, 2 Sets of Tires Stk: 024111 (LL) ................................................ $299,000
- **2009 Apache AS1010 100’, 1000 Gal, Raven Control & GPS, 5 Way Nozzle Bodies, 1800 Hrs Stk: 026632 (SC) ........................................ $190,000
- **1998 RoGator 854 100’, 800 Gal SS Tank, Ez-Guide AutoSteer, Rate Controller, Rinse Tank Stk: 023420 (LL) ............................................................... $49,000

**TRACTORS**

- **2014 Case IH Steiger 620** Quadtrac Luxury Cab, PTO, Twin Flow Hyd, 36’ Tracks, 6 Remotes, Pro 700, AccuGuide, HID Lights Stk: 025032 (ME) .............................................. $489,000
- **2015 Case IH Steiger 540** 800 Duals, AccuGuide, 6 Remotes, PTO, HID Lights, 2 Hyd Pumps, Weight Pkg, Stk: 016410A (LA) ................................................ $429,000
- **2016 Case IH Steiger 580** Quadtrac Lux Cab, LED Lights, Pro 700, AccuGuide, 2 Hyd Pumps, 6 Remotes, PTO, 36’ Tracks, Tow Cable Stk: 022922 (SC) .................. $565,000
- **2014 Case IH Steiger 550** Quadtrac Luxury Cab, Dual Hyd Pumps, PTO, HID Lights, Tow Cable, HID Lights, 6 Remotes, Viper Pro, Raven AutoSteer Stk: 023776 (PA) ....... $481,000
- **2016 Case IH Steiger 500** 520 Duals, Deluxe Cab, HID Lights, AccuGuide, Pro 700, 4 Remotes, Hi-Cap Hyd, 342 hours Stk: 020322 (SC) ................................. $380,000
- **2016 Case IH Steiger 420** 520 Duals, Deluxe Cab, HID Lights, Pro 700, AccuGuide, 4 Remotes, High Capacity Hyd, PTO Stk: 023173 (SC) ........................................ $379,000
- **2009 Case IH Steiger 485** Quadtrac Dix Cab, Hi Cap Hyd, PTO, 30’ Tracks, Cab Suspension, AccuGuide Stk: 023118 (SA) ............................................... $255,000
- **2012 John Deere 9510RT 36’ Tracks, Leather Seat, 4 Remotes, SF2 GPS, GreenStar Display, High Capacity Hyd 58 GPM, 2070 hours Stk: 024350 (SC) .................. $350,000
- **2013 New Holland T9.615 36’ High Idler, Lux Cab, HID Lights, GPS AutoGuidance, Twin Pump Hyd, Radar, PTO, 2700 hours Stk: 025507 (SC) ....................... $410,000

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2018 International 4400 SBA 6x4 Tandem Axle Grain Truck, Cummins L9 engine (350) HP, Allison (Auto) transmission (6 speed), Air brakes, 2196km, 14000 lbs front axle capacity, 40000 lbs rear axle capacity, 4-Way rear lockup, A/C. Brandon, MB

$161,800

Stock #9978-18

2018 International 4400 SBA 6x4 Tandem Axle Grain Truck, Cummins L9 engine (350) HP, Allison (Auto) transmission (6 speed), Air brakes, 15km, 14600 lbs front axle capacity, 40000 lbs rear axle capacity, 4-Way rear lockup, A/C. Brandon, MB

$161,800

Stock #3340-18

2018 International 4400 SBA 6x4 Tandem Axle Grain Truck, Cummins L9 engine (350) HP, Allison (Auto) transmission (6 speed), Air brakes, 2202km, 14000 lbs front axle capacity, 40000 lbs rear axle capacity, 4-Way rear lockup, A/C, Not exactly as shown. Regina, SK

$161,890

Stock #9986-18

2009 International ProStar Premium Tandem Axle Grain Truck, Cat C15 engine (155/155) HP, Eaton Fuller Ultra Shift transmission (13 speed), Air brakes, 890000km, 12000 lbs front axle capacity, 40000 lbs rear axle capacity, 3-Way rear lockup, A/C, Automated Tranny, great all purpose usage! Regina, SK

$75,900

Stock #5366-09A

2001 International 9200 Tandem Axle Grain Truck, Cat C12 engine (380/430) HP, Eaton Fuller Auto Shift transmission (10 speed), Air brakes, 743436km, 12000 lbs front axle capacity, 40000 lbs rear axle capacity, Diff Lock rear lockup, A/C, Brand new Grain Box, Hoist and PTO. Brandon, MB

$69,900

Stock #7616-01A

2017 Timpte Tandem Grain Hopper Grain, 2 hopper, Air suspension, Tandem axle, Aluminum rims, 24 king pin, Side Rollers Black, Hoppers, 4x4 Hopper Black, Interior Access steps, Width: 8’6, Length: 48’. Saskatoon, SK

$89,900

Stock K9832-15

2013 International ProStar +125 Tandem Axle Grain Truck, Cat C15 engine (500) HP, Eaton Fuller Ultra Shift transmission (18 speed), Air brakes, 775204km, 12350 lbs front axle capacity, 46000 lbs rear axle capacity, 4-Way rear lockup, A/C, Calgary, AB

$89,900

Stock #99878-18

2017 Timpte Tridem Grain Hopper Grain, 2 hopper, Air suspension, Tandem axle, Aluminum rims, 28 king pin, 4x4 Hopper Black, Hoppers, 4x4 Hopper Black, Interior Access steps, Width: 10’, Length: 48’. Regina, SK

$27,500

Stock K97040150I


$27,500

Stock K97040150I


$161,800

Stock #13440-18

2007 International 4400 SBA 6x4 Tandem Axle Grain Truck, Cat C12 engine (350/400) HP Eaton Fuller Auto Shift transmission (10 speed), 744444km, 12800 lbs front axle capacity, 40000 lbs rear axle capacity, Diff Lock rear lockup, A/C, Brand new Grain Box, Side and PTO. Brandon, MB

$161,800

Stock #9978-18

2013 International ProStar +125 Tandem Axle Grain Truck, Cat C15 engine (500) HP, Eaton Fuller Ultra Shift transmission (18 speed), Air brakes, 775204km, 12350 lbs front axle capacity, 46000 lbs rear axle capacity, 4-Way rear lockup, A/C, Calgary, AB

$89,900

Stock #: V4312-15

2013 International ProStar +125 Tandem Axle Grain Truck, Cat C15 engine (500) HP, Eaton Fuller Ultra Shift transmission (18 speed), Air brakes, 775204km, 12350 lbs front axle capacity, 46000 lbs rear axle capacity, 4-Way rear lockup, A/C, Calgary, AB

$89,900

Stock #: V4312-15

2017 Timpte Tandem Grain Hopper Grain, 2 hopper, Air suspension, Tandem axle, Aluminum rims, 28 king pin, Side Rollers Black, Hoppers, 4x4 Hopper Black, Interior Access steps, Width: 8’6, Length: 48’. Saskatoon, SK

$89,900

Stock # B15862B

2013 Timpte Tandem Grain Hopper Grain, 2 hopper, Air suspension, Tandem axle, Aluminum rims, 24 king pin, Side Rollers Black, Hoppers, 4x4 Hopper Black, Interior Access steps, Width: 96’, Length: 40’. Saskatoon, SK

$89,900

Stock # V4332-15

$89,900

Stock # V4332-15

2001 International 9200 Tandem Axle Grain Truck, Cat C15 engine (155/155) HP, Eaton Fuller Ultra Shift transmission (13 speed), Air brakes, 890000km, 12000 lbs front axle capacity, 40000 lbs rear axle capacity, 3-Way rear lockup, A/C, Automated Tranny, great all purpose usage! Regina, SK

$75,900

Stock #5366-09A

2009 International ProStar Premium Tandem Axle Grain Truck, Cat C15 engine (155/155) HP, Eaton Fuller Ultra Shift transmission (13 speed), Air brakes, 890000km, 12000 lbs front axle capacity, 40000 lbs rear axle capacity, 3-Way rear lockup, A/C, Automated Tranny, great all purpose usage! Regina, SK

$75,900

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WANTED MF 36 & 360 Discers
All sizes, any condition, also parts.
1231-117-113. Bismarck, ND.

FREE TO PICK UP.
Call or text 306-495-8800, SE Sask.

VERSATILE
4310
1974 TRACTOR SERIES 12, 5600 hrs.
4x4, original hrs, runs well, full cab, good tires.
1231-117-113. Bismarck, ND.

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Call or text 306-495-8800, SE Sask.

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2008 JCB 541-70 Agri Diesel telehandler, 10,000 hrs., original, excellent condition, 889, 234, 386, 48-520. Beaverlodge, AB (Tel: 780-272-2283).

FREE TO GOOD WORKING ORDER.
Call or text 306-495-8800, SE Sask.

VERSATILE
4310
1974 TRACTOR SERIES 12, 5600 hrs.
4x4, original hrs, runs well, full cab, good tires.
1231-117-113. Bismarck, ND.

FREE TO GOOD WORKING ORDER.
Call or text 306-495-8800, SE Sask.

WANTED 2006 CAT 523D or CASE 1212S 4x4
5000 hrs, runs well.
1231-117-113. Bismarck, ND.

FREE TO GOOD WORKING ORDER.
Call or text 306-495-8800, SE Sask.

WANTED 2006 CAT 523D or CASE 1212S 4x4
5000 hrs, runs well.
1231-117-113. Bismarck, ND.

FREE TO GOOD WORKING ORDER.
Call or text 306-495-8800, SE Sask.

WANTED MF 36 & 360 Discers
All sizes, any condition, also parts.
1231-117-113. Bismarck, ND.

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VERSATILE
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1974 TRACTOR SERIES 12, 5600 hrs.
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FREE TO PICK UP.
Call or text 306-495-8800, SE Sask.
Cattle Variety

60 YOUNG RED & Fat cross breed cows, 80 cow/calf pairs and 30 one-year olds for February calving. $2500. Box 5001, c/o The Western Producer, 306-796-4503.

HORSE AUCTION


CATTLE VARIETIES

RWF heifers. 250 Black & Red Angus 2nd calvers. Swift Keddie’s, 1-888-932-4447, Delisle, SK.

RWF Angus low BW bulls. RWF heifers. 250 Black & Red Angus 2nd calvers.

Swift Keddie’s, 1-888-932-4447, Delisle, SK.

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SALERS

5185


SINKMILLER

2005


WELSH BLACK

5235


CATTLE VARIETIES

60 YOUNG RED & Fat cross breed cows, 80 cow/calf pairs and 30 one-year olds for February calving. $2500. Box 5001, c/o The Western Producer, 306-796-4503.

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SALERS

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2005

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The little plane that did

BY MICHAEL RAINIE
SASKATOON NEWSROOM

A farmer and a Toronto entrepreneur have taken their dream from door knocking to delivery in 2 1/2 years.

Norm Lamothe and David MacMillan came together to lift agricultural aerial drones to the level of large-scale service provider.

“When you have a family farm with limited acres you need another plan to ensure you have an income. I have done a few things in aviation. Precision agriculture makes a lot of sense as a farmer, so this business made sense too,” said Lamothe.

MacMillan has been involved in several public companies that were startups and I like Lamothe’s idea of providing farmers with aerial images and data from their fields on a timely basis, “even when there is cloud cover.”

MacMillan said the idea of being involved in “sustainable agriculture is also very appealing from a business perspective. ”

"Providing farmers with tools to be able to grow more and profit more from it, that is a good place for a business to be in,” he said.

The pair created a company called Deveron to provide Canadian farmers with a service that quickly delivered aerial reconnaissance data from farmers’ fields during the growing season.

Lamothe said Deveron provides its customers with bare soil analysis, for topography mapping that gives producers tools to plan tillage, ditching and other tasks.

They also carry out in-season normalized difference vegetation index mapping that can be used to highlight growth rates in the fields that need attention.

“We also look for high-yielding zones that can help farmers make choices about their areas that aren’t doing as well,” said Lamothe.

The company has put together regional teams able to send out drones at the farmers’ demand.

“Most farmers have enough to do. They prefer to get that work done by someone else and that would be us,” he said.

“We can deliver whether or not the sky is cloud and at higher frequency, so we compare favorably to satellites,” he said.

They began the business in Ontario before adding Western Canada. They operate in most provinces, from New Brunswick to Alberta, and work with crops that range from corn, soybeans and potatoes to grains and oilseeds.

But a recent deal with Monsanto’s Climate Corp. has put their business plan on fast track, and as a result, they now operate in the U.S. Midwest.

Climate Corp’s Fieldview software system provides producers with in-depth information about their crops and fields, and Deveron’s high-definition imaging can feed that system.

“That gives us access to the 120 million acres that are serving now. That is one-third of the North American market. A real stepup for a start-up,” he said.

“That’s a lot of doors we don’t have to make cold calls to.”

Deveron was already starting to work with some companies, but now that it is working with one very large client, as well as individual farmers, it can roll out plans for additional sensors and technology ahead of schedule, he said.

“Now, we are working hard on automation, to get turn-around on large scales as fast as possible for farmers,” he said.

Deveron, a public company listed on the Canadian Securities Exchange, also relies on good advice. It acquired help in that regard starting last summer with the addition of Art Froehlich, formerly of Alberta Wheat Pool and Horochet Canada, and now on the boards of Richardson International and marketing company AdFarm.

“He knows western agriculture really well, and brings a great perspective for us. And Ian Grant, he has retired (as president from DuPont Pioneer) and has that large scale agricultural industry perspective and knows everybody, like Art,” he said.

David Massotti, formerly of Spar Aerospace and Rogers, and Dave Sippell, formerly with Agricore, Syngenta and Pioneer HiBred, are also advisers to the young company.

Climate Corp’s platform allows producers to store and analyze their data, as well as create prescription maps. The Deveron imaging complements Climate Corp’s satellite views already in place.

MacMillan said he and Lamothe are taking a longer-term view of growth for the business.

“We have seen startups get that hockey stick growth, raise lots of money and expand like crazy and then run out of steam and money, not able to deliver. We are planning to grow steadily with a plan for the long haul. We want to be in this business,” he said.

“We are encouraging producers to try it. No need to put all your eggs in one basket. Like farm inputs, they don’t want to do something new on all their acres right away. And that works for us too. We can grow our business for the right reasons, farmers can make more money with more information,” he said.

Continued on next page
with those areas. Specific locations can be searched for by using township and range denotations, or through latitude and longitude.

Users can click on a specific location and information about it will pop up in a box on the bottom right of the interface screen.

“Surface expression, slope descriptions, stoniness, texture, air capability and the salinity, so some of the things that tend to be most interesting to the typical producer,” Bedard-Haughn said.

Registered users can upload new information to the site.

“If you’re a soil nerd and you just can’t wait to share it with everybody, you can actually upload it along with the spatial information of it, and that will show up as a point on the map. If there’s more than one point you are interested in the soil in the area it will show up,” she said.

Users can upload photos, or even geolocate studies that were performed in a specific area.

SKSIS also aims to refine existing soil data with the use of digital soil mapping (DSM) techniques.

“So the digital soil mapping techniques really allow us to refine soil type and property maps, better predict the landscape scale variability for management planning or for predictive modelling, and refining it is less labour intensive than going out and redoing the soil surveys,” Bedard-Haughn said.

The soil survey information is now on a scale of 1 to 100,000 resolution (one centimetre on the map equals one kilometre on the ground), which is too coarse for most agriculture applications.

Through DSM techniques, the SKSIS will hopefully have a one to 1,000 resolution, or better, and will be able to identify in-field variability.

A high-quality digital elevation model is necessary when conducting digital soil mapping.

“In some places, we have LiDAR (light detecting and ranging) flights that have been flown… that allows us to get a really high resolution digital elevation model. In a lot of areas in Saskatchewan we don’t yet have that information, but we can get it actually relatively easily now with drone technology,” Bedard-Haughn said.

Last year, drones with LiDAR imagery were flown over three sites and statistical approaches were then used to select representative sample points on the field. Then soil sampling was carried out at those points.

This mapping procedure produced a more refined soil map for the area that broke the field down into soil-type zones.

Hydrological modelling was used to further refine the data.

“I have another student that is looking at wetland soil mapping approaches. And so we combined his approaches that used hydrological modelling to look at how water is distributed across the landscape, to figure out where the wetlands would be on there, and then combined the two approaches to get the maximally accurate map or representation of that landscape,” Bedard-Haughn said.

She said growers can use these soil maps with information such as yield maps to help manage inputs.

“This refined data is designed to visualize the within-field variability. You overlay that with the yield, play around with it and you get a lot more powerful information for your decision making,” she said.

Revisions to the SKSIS website are still being done with feedback from users.

The next step is to create a more refined soil map for the province based on information from the digital elevation models derived from shuttle radar.

Semi-automated protocols are also being developed to help users upload information they’ve collected on their fields.

“If you have flown a drone flight and you have point soil information for a piece of land, you can upload that, and with a little bit of interaction, develop one of those refined digital soil maps for a piece of land on your own as well,” Bedard Haughn said.

If funding permits, future plans call for incorporation of an application program interface to make it easier for other programs to interact with it.

She said allowing the program to incorporate multiple types of information will make it a more collaborative space.

“Some folks have concerns regarding privacy, information about their land being publicly available….

“Certainly in the realm of precision agriculture, everybody has their own approach, and so there can be concerns of people knowing what’s going on in other people’s fields. That’s going to be a challenge,” she said.

Much of the information the SKSIS uses is already publicly available, just harder to access.

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Blue River’s technology is designed to grow John Deere’s approach to plant-selective systems. Machinery will manage individual plants, rather than acres and fields.  

By Sean Pratt

Chicago, Ill. — One of the pioneers of the big data movement is ready to take the next step.

“We want to go from field-level data to plant-level data,” said Keith Soltwedel, marketing manager with John Deere Intelligent Solutions Group. “I know we might all laugh today, but I think that’s coming, where we’re going to know every 36,000 corn plants in an acre of ground and how we treat each one of those plants differently in order to maximize yield.”

John Deere announced in September it was acquiring Blue River Technology for US$305 million. The 60-person firm from Sunnyvale, California, is an industry leader in artificial intelligence. “We are using computer vision, robotics and machine learning to help smart machines detect, identify and make management decisions about every single plant in the field,” Jorge Heraud, Blue River co-founder, said in the September news release announcing the acquisition.

Soltwedel said big data started with yield-monitoring combines and evolved into a variety of applications for seed, chemicals and fertilizers.

“On big data. Farmers are gathering reams of information, but they aren’t doing anything constructive with it,” Soltwedel said.

Soltwedel said another criticism was that companies were initially trying to do it all on their own, like John Deere with its Apex software.

“What Deere learned from our dealers and from our customers is that this industry is too big to try to do it yourself and do it alone,” he told the recent 2017 DTN Ag Summit in Chicago.

So Deere launched the John Deere Operations Center, where farmers can manage all their equipment, production and farm operations data on a single website. It is working with 75 technology companies.

“We believe that we are the most open platform in agriculture,” said Soltwedel.

He said the idea of collaborating is foreign to the agriculture sector, which tends to be “tight-lipped” and reluctant to share information all the way back to the individual farm level.

Adam Little, sales manager with Granular, which is using Silicon Valley software to transform farming, said producers have a role to play in ensuring the companies they work with are open.

“You should be demanding that your information technology providers work with each other and share data. Don’t accept anything else,” he said.

“What we keep hearing is that growers don’t want to use 10 different pieces of software. They’re really looking for a more consolidated operating system.”

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SY Rowyn and SY479 VB are proprietary wheat seeds developed by Syngenta and distributed by Alliance Seed under exclusive license.

CDC Precision was bred at Crop Development Center, University of Saskatchewan.
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The digital revolution is coming, just not everybody knows it yet.

BY TERRY FRIES | FREELANCE WRITER

If someone doesn’t understand something, it’s difficult to tell them they need it. It’s happened before, however, and Denise Hockaday of Climate Corporation hopes the lessons learned from that experience will help address some of the issues facing the new digital technologies coming to market today.

“Someone made this comment to me that sums it up nicely. Before autosteer, a farmer said ‘why do I need autosteer?’ I can drive,’ ” Hockaday said. Today, however, the same farmer says they can’t operate if their autosteer isn’t working, she added.

For Hockaday, Climate business lead for Canada, said once farmers start to understand how new digital technology can help them in real-world ways, they will begin to parse its value.

Digital technology is on the cusp of triggering the biggest evolution to agriculture of at least the past three decades. Data gathered and properly analyzed can produce precise field maps to improve seeding and fertilizer applications, collect weather data, guide equipment maintenance and repair, and find ways to help farmers manage with fewer labour resources.

Yet according to a recent survey conducted by Glacier FarmMedia, few farmers see digital technology investment as a greater priority than other farm investments.

Hockaday said market research at Climate Corporation, a division of Monsanto, which offers a range of digital tools designed to bring field data collection, agronomic modelling and weather data into one location, backs up the findings of the FarmMedia survey.

She said she’s seen the story play out before. In the survey, farmers repeatedly cited cost as one of two main barriers limiting their adoption of new digital technologies. Farmers’ confidence in their understanding of the technology and questions surrounding their ability to get support were also commonly cited obstacles.

Hockaday said digital technologies are no different than anything else that exists outside of what she calls the “spaces” of what most farmers do every day. The more novel or unique it is, the more likely it is to find resistance.

“For example, if there is a hybrid that gives you three more bushels to the acre or something like that, then you can clearly articulate the value,” she said.

But farmers find it more difficult to see the return on investment with digital technologies because they haven’t come into contact with it in the past.

If farmers aren’t seeing practical results, they are going to struggle to come up with a business case for it, she said.

Most farmers are already well on their way to putting these new technologies to use. They are collecting reams of usable data via the onboard computers on their farm equipment or from other sensors and monitors. Yet only about 50 per cent of the data is currently used.

For Hockaday, convincing more farmers to put that information to work is about organizing the data into formats farmers can visualize and put to use on their farms.

“A couple key things that have been a struggle for data is a place to put it all in one spot so then you can actively do some analysis and the second piece is to have the tools to do the analysis,” she said.

That means bringing together data from various sources, even technologies that may not have been compatible in the past and putting the information in one central location where it can be analyzed and used to develop recommendations.

“It’s like any new technology use or … anything. You have to put it into the context of their own farm,” she said. In the survey, farmers showed that they recognized the benefits of digital technology, but they still didn’t see those benefits as valuable enough to motivate them to rush out and buy them.

“So, you have to start from ground zero and help people understand what it is and what it can do for them before it can be real in their minds and they can start to figure out what it would look like on their farms.”

That kind of outreach could be exactly what farmers are looking for.

Farmers in the survey said they were not ready to buy into new digital technologies right now, but the majority said they see themselves as being ready in one to two years, especially for data technology systems and sensors.

In addition to those two technology types, two others were included in the survey, autonomous vehicles and telematics, but Hockaday doesn’t view any of them as being completely independent.

She acknowledged autonomous vehicles are further away from farmer acceptance than other technologies, but she said the key to any of them is what happens afterward.

“You can put a sensor on a tractor in a field but if you can’t record why, and see what happened, or the effects of a particular practice, it may not be of much value.

“To me, it starts with being able to bring your data into one spot and that’s why I think the data piece is so important because then you can start to understand that data or visualize it.”

She said once that happens, farmers start to see how that field sensor is relevant to them.

Hockaday said what’s been missing in terms of taking this new technology out to the real world is a comprehensive and understandable way to bring the information together in ways farmers can use it.

“If it’s more what you do with it afterwards that needs some work.”

She said ClimateCorp’s FieldView brings the fragmented aspects of digital technologies into one platform. She said the goal was to provide a place where varied technologies that may not normally be compatible, are brought under one roof.

“For example, one has got a John Deere seeder or drill and they’ve got a Case combine. Well, up to this point, you couldn’t bring that information together and look at it in the same context because the monitors in the equipment speak different languages,” she said.

Being able to bring the languages into one spot enables farmers to look at the information in the context of the environment, application data, what was planted, when it was planted and all of the other decision-making processes that go into growing a crop, she said.

It empowers farmers to try new things because it gives them the ability to measure the outcomes, she added.

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— DENISE HOCKADAY | CLIMATE CORPORATION

DECEMBER 28, 2017 | WWW.PRODUCER.COM | THE WESTERN PRODUCER
Earlier this year, Glacier FarmMedia and Climate Corp. co-commissioned an online survey to find out what drives farmers to engage with new innovations. Respondents were asked a series of questions about four types of technology: specialized sensors, autonomous vehicles, telematics, and data aggregation.

The results of the survey were analyzed by the editorial team. The survey looked at farmer perceptions of emerging technologies: data collection and use, specialized sensors, autonomous vehicles and telematics, such as remote system diagnosis, and connecting machines to equipment dealers.

The number two reason, at 14 percent, was that it’s too complicated. On the positive side, respondents said autonomous vehicles would save time and decrease operating costs. The number two reason, at 14 percent, was that it’s too complicated. On the positive side, respondents said autonomous vehicles would save time and decrease operating costs.

"There’s no freaking way those things (will) ever be on my property, replacing friends, neighbours, and family working together," one farmer said.

Another respondent said driverless vehicles would extinguish the human element of rural life. “By removing the farmer and his need for employees, you remove the basics of life as we know it,” another respondent said.

Adam Gurr, who farms near Rapid City, Man., understands the concept seems like a good fit for farming because producers spend many lonely hours inside tractor cabs, sometimes through the night and into the wee hours of the morning. But there’s one problem. Or maybe two problems.

Many farmers aren’t ready for driverless tractors and others don’t want the technology at all. A Glacier FarmMedia survey of 432 farmers across the Prairies, conducted earlier this year, found that a large percentage of respondents are not ready for autonomous vehicles.

About 75 percent of farmers said they won’t be ready for autonomous vehicles for at least three to five more years. Few said the technology was a high priority for them. These farmers got a close look at one such machine, the DOT autonomous field platform, at the 2017 Ag in Motion farm show.

"Just four percent cite it as a high priority for investment and 70 percent rank it as a low priority," said a summary of the survey, designed to measure farmer readiness for innovation.

The survey looked at farmer perceptions of emerging technologies: data collection and use, specialized sensors, autonomous vehicles, connected machines to equipment dealers, and autonomous farm vehicles capable of going back and forth across crop land for things like cultivation, seeding and spraying.

The concept seems like a good fit for farming because producers spend many lonely hours inside tractor cabs, sometimes through the night and into the wee hours of the morning. But there’s one problem. Or maybe two problems.

Many farmers aren’t ready for autonomous vehicles. A few respondents also included personal comments, explaining why they aren’t interested in driverless tractors.

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As big data comes to the farm, are policies keeping up?

BY WILLIAM DEKAY
SASKATOON NEXROOM

As innovative agricultural technologies speed forward, researchers are exploring gaps in existing policies or laying the groundwork for new guidelines that will affect farmers, stakeholders and the public for years to come.

“We’re on a path and farming is increasingly going to look different. It will be all about getting more efficient and more things will become automated and there will be more data driving better decisions,” said Graeme Jobe from the University of Saskatchewan.

Jobe and Jo-Anne Relf-Eckstein are part of the 11 of S team headed by principal investigator Peter Phillips focused on identifying the opportunities and barriers for digital technology and agriculture for Western Canada from a policy perspective.

The group is exploring what is working well, what needs to change and what’s not exist in agriculture policy.

It’s part of a larger national undertaking called the Creating Digital Opportunities Project, which is a five-year project made up of researchers from universities across Canada that started in 2015.

Teams of researchers are looking into what prepared Canada’s industries are to adapting to the future while assessing opportunities, risks and barriers.

The evaluation will help determine what policy changes are necessary.

“Our group’s goal within the project is to identify the most significant digital transformations that are happening in agriculture and to produce a number of papers, potentially policy briefs, that tell the story of those changes,” said Jobe.

Over the past two years, Jobe and Relf-Eckstein attended numerous trade shows, field days and producer information events across Western Canada that featured the newest technologies.

They interviewed about 25 individuals, asking what they saw as lacking and positive aspects for digital technology in agriculture.

“We asked them about the micro: What is it that you do? What does your company do? What’s your role? If you’re someone who’s trying to help farmers adopt this technology, why are some guys not going to adopt it? We asked them for their comments on the macro: What do you think the future of digital technology is in agriculture and where do you see this going?” said Jobe.

Added Relf-Eckstein, “a common theme was that digital ag-tech opportunities are happening fast and in a big way. Across all 25 individuals, we’re seeing a new entrepreneurial space being created for agriculture leveraging digital technologies from other sectors, mostly automotive and defense.”

Smaller western Canadian companies reported they saw difficulties in securing venture capital as the biggest limitation.

“The lack of venture capital affects the ability for them to grow and become relevant. The innovation per se is already there,” said Relf-Eckstein.

“So, we’re seeing two paths. You either have to leverage Canada to secure venture capital or be bought out.”

Jobe said those smaller companies have a lot of growth potential and the Canadian economy and Canadian agriculture would benefit from their successes.

One gap that is becoming a growing issue surrounds ownership of data.

“That’s a policy question that I anticipate will become more and more hotly contested as more people start to realize what’s already been done with their data,” Jobe said.

Farmers are agreeing to use technologies like sensors, drones and satellite data that is taken from their farming operation and then packaged into a software product, which is then sold back to them to improve their individual efficiency.

“It’s a big deal and it’s going to continue to grow and make farming more and more efficient and really change things, but I think we have to think in the back of our minds about what else can be done with all that data there and what do these companies want to do with it, and what implications does it have for the farmer,” he said.

“If you know a lot about someone’s farming operation, could you then low-ball them when you’re buying grain from them? I wonder if someday we can sell this data?”

He said no evidence has emerged that this kind of things happening, but it’s an example of things that future agriculture policy needs to anticipate and prepare for.

Companies like Google, Amazon and Facebook can now target individual consumers based on their internet searches, a practice that is expected to increase throughout all areas of retail.

Glacier FarmMedia’s Innovation Survey explored farmer perceptions of data, sensors, autonomous vehicles and telematics.

It determined that farmers see potential benefits in these four digital technologies, but are in no rush to adopt them because the barriers currently outweigh potential benefits.

Budget constraints are the main impediment to adoption, as well as lack of understanding and product support after purchase.

The study reported that in the short term most farmers believe they will not get the return on investment necessary to make the technology worthwhile.

However, 10 percent of farmers are fully using data technology now, 20 percent are actively testing and 30 percent said they will be ready in two years.

Jobe and Relf-Eckstein said questions of ownership over the information gathered by these new technologies become important because storing vast quantities of information can have implications for many things.

“Does the farmer enter into the contract that they sign when they use the equipment? Do they say in that contract this company can do whatever they want with the data collected off my farm? Does government have to step in and legislate some kind of protection for farmers that would give them greater protection over that data?”

Jobe said.

An example that cited the limitations of a farmer’s ownership of data involved a court case in the United States where collected data from a crop sprayer was subpoenaed and resulted in a conviction.

While in transport, a nozzle leaked a chemical into a ditch on public land. Regulators had no proof but were successful in petitioning for the sprayer’s data, which recorded tank volumes and when the nozzle was on or off.

Based on the available data, Joke said the court came down with a guilty verdict.

“So that’s another big public policy question. If you’re collecting that data, should it be available? Should it be petitionable in court if there’s some kind of accusation or suspicion of wrongdoing?”

There is currently no policy in Canada in response to ag-specific situations like this, he said.

“In sure there’s some privacy legislation that might apply to this, but I’m not sure how.”

Then there’s the terms in the contracts that are signed by farmers and those who would probably come under some consumer protection legislation, but I don’t think that has any bearing on our concern based on the situations I’ve described,” he said.

Before agriculture policies can be shaped, Jobe and Relf-Eckstein

CONTINUED ON NEXT PAGE
Quicker, cheaper biofuel production in the works

By Karen Briere

Researchers at the University of British Columbia, Columbia, Oregon, have developed a biofuel production method they say is quicker, cheaper and safer than traditional methods. It involves pre-treating agricultural crop waste with carbon dioxide at high temperatures and pressure in water before it is fermented.

Cigdem Eskicioglu, an associate professor of engineering, said this process known as hydrothermal pretreatment can produce biofuel in almost all the biomass feedstocks. “Methane is a biofuel commonly used in electricity generation and is produced by fermenting organic material,” she said. “The process can traditionally take anywhere from weeks to months to complete.”

But she, with colleagues in Europe and Australia, used the pre-treatment to speed that up. The idea is to break down larger molecules into smaller ones that can be fermented much more quickly. They compared traditional processes with the new method using wheat straw, rice straw, corn husks, biomass sludge and Douglas fir bark.

The result was faster hydrolysis rates of 20 to 30 percent during anaerobic digestion for the pre-treated straw, sorghum and corn husks. The treated Douglas fir bark produced methane 172 percent faster.

Eskicioglu said the potential to harness energy more efficiently opens a world of possibilities. “Our new fermentation process would be relatively easy to implement on site and because the bioreactors can be much smaller, the costs can be kept low,” she said in a news release.

The process requires equipment and technology already available on an industrial scale, she said, so retrofitting existing bioreactors or building new, smaller ones, can be easily done. She also said the new method is much safer because it doesn’t use or generate toxic chemicals.

Her findings were published in the September edition of Water Research.

“Results indicated that hydrothermal pretreatment is able to accelerate the rate of biodegradation without generating high levels of inhibitory compounds while showing no discernable effect on ultimate biodegradation,” she said in the study abstract.

Using organic waste from municipalities, industries and agriculture to produce biofuel is a new concept but production hasn’t caught on as well as early proponents had hoped. Eskicioglu, who grew up in Turkey, completed her environmental engineering doctorate at the University of Ottawa in 2006. Sheheads UBC Okanagan’s bioreactor technology group.

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Big doubts about big data

Everyone assumed farmers were immersed in farming their data layers, but they were wrong.

BY RON LYSENG
WINNIPEG BUREAU

Big Data offers layers upon layers and tonnes upon tonnes of valuable information that can cut input costs and boost yields. So why aren’t farmers making better use of it?

Daryle Lavcock started collecting GPS-referenced yield data 20 years ago, mainly because experts and informed sources said it would someday be valuable.

Today, it’s all in the trash file. Not that the data was faulty. It was just useless. The two crop consultants he has worked with over the years both told him they don’t factor in yield data in making prescription maps.

“All those yield maps. That was a lot of work for nothing. We started doing yield maps way back as soon as that technology was available. But now, the agronomists we hire don’t even look at yield maps. The agronomist does the soil testing, infrared maps, satellite images and they make up our variable rate prescription maps. We haven’t got time for all that,” Lavcock, who farms 5,000 acres with his son at Russell, Man., says.

Lavcock adds that his agronomist conducted drone trials on the farm this year to gather more base-line infrared data that will be used in future prescription maps.

Larry Spratt farms 6,000 acres near Melilot, Sask., an area with a half dozen firms offering agricultural consulting services. He collects yield data and as-applied data, but has not yet made the step into variable rate.

“I’ve sat down with all six different companies we have in this area and I’ve done trials on my own farm with most of them. So far, I haven’t seen that I’d get the rate of return I need from variable rate,” explains Spratt.

“This past year was the very best crop I’ve ever had. But for the past 10 years up until 2017, we’ve been drenched out. When I sat down with the agronomists and ran the numbers, it didn’t matter whether I put down 10 pounds of nitrogen or 170 lb., my yield was the same. So why would I do variable rate?”

Spratt says he knows of producers who pay $4 per acre for variable rate prescription maps, but once their crop is in the bin, they don’t bother to sit down to analyze whether it was worth the cost. They take it on blind faith that the system is working.

“We deal with Richardson Pioneer and also an independent dealer. I don’t pay them to walk my fields. I just buy fertilizer and chemical from them. They scout my fields at no charge because scouting is one of the services they provide as part of the package.

“If I hired someone to scout my fields, if I paid an agronomist for that, they’re going to cover their butts by telling me to spray for a wide range of things.

“For example, a lot of guys spray their canola for sclerotinia because that’s what the consultant says. But it still hasn’t been proven to my satisfaction that it’s worthwhile. If you’re paying a guy to scout your canola, chances are he’ll err on the side of caution and tell you to spray.

“I have an ag degree. I like to study my plants. I like to scout my fields. But I always like their second opinion.”

Kevin Dell farms 4,900 acres near Wynyard, Sask. He doesn’t do variable rate. They have not collected yield data because their combines don’t have the necessary equipment, nor have they accumulated other layers of data. Kevin says there’s a good reason for that.

“We have fairly new equipment, but none of it is capable of doing variable rate. It’s just not quite new enough,” says Kevin, explaining they would need a new drill, sprayer and combines. Total cost could exceed $2 million.

Dell says he’s delved into the realm of big data and variable rate, and he thinks it can be viable. He expects the farm will be ready in the future, just not the near future. In the past couple years, they’ve started working with a consultant on crop management issues.

“When it comes to variable rate, I think I’m more knowledgeable than my father, but I don’t think variable rate is fully proven yet. We have a few neighbours around here who’ve tried variable rate, but they didn’t see a benefit so they quit. They already had newer equipment, so that cost wasn’t a big factor.”

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WHAT HAS BECOME known to many as “big data” has promised to transform farming by optimizing crop inputs and yield. Yet a recent survey by Glacier FarmMedia shows farmers are slow with the uptake.

The survey of 428 prairie farmers conducted this fall indicates that half the field data collected is not downloaded or expected to be used in future planning. Even farmers with clear access to their data collection still expressed considerable confusion over how to put that information to use, or how to apply a specific technology to help their specific farm.

Only six percent of farmers rated data technology as a high investment priority compared to other uses of time and capital. For all the attention given big data in recent years, there was a clear lack of enthusiasm for investing in the technology. Most farmers say they recognize the benefits of farming the data, but do not see a strong enough return on investment to justify the cost. Budget constraints were cited as the main barrier.

As well, a large percentage of farmers view data technology as too complicated. Nearly half the respondents chose as barriers to adoption factors such as "too complicated" or "I don't know how to use the data" or "I understand equipment but not data" or "I can't get help when I need it." Surprisingly, farmers younger than 45 are more likely than older farmers to say that the major barriers are knowledge or support issues. Compared to the overall survey group, more farmers in the higher income group are further along in testing the technologies or have fully adopted digital technologies. Although they are less likely to cite financial constraints, they are similar to the overall group in their lack of comfort with understanding digital technologies.

According to the survey, 10 percent of respondents are now using data technology, 20 percent say they are testing data technology and 30 percent say they will be ready in two years. The remaining 40 percent of farmers are not committed. The report summary states that simply promoting the benefits of big data in managing their farm is not enough to cause them to buy in.

WHY DON'T FARMERS USE DATA?

In a recent survey about digital technology on the farm, only six percent of farmers surveyed rated data technology as a high investment priority compared to other needs.

**Top reasons cited for not using data:**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Age 45+</th>
<th>Age 45+</th>
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</thead>
<tbody>
<tr>
<td>Budget constraints</td>
<td>42%</td>
<td>34%</td>
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<tr>
<td>Lack of time</td>
<td>37%</td>
<td>33%</td>
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<tr>
<td>Too complicated</td>
<td>36%</td>
<td>29%</td>
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<tr>
<td>Don't know how to use the data / sensors</td>
<td>29%</td>
<td>25%</td>
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<tr>
<td>Data / sensors / processes are not automated</td>
<td>23%</td>
<td>23%</td>
</tr>
<tr>
<td>I understand equipment but not data / sensors</td>
<td>21%</td>
<td>20%</td>
</tr>
<tr>
<td>I can't get help when I need it</td>
<td>21%</td>
<td>18%</td>
</tr>
<tr>
<td>Other barriers</td>
<td>22%</td>
<td>16%</td>
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What do farmers say are the main benefits to using data captured from field equipment?

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<thead>
<tr>
<th>Benefit</th>
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<th>Percentage</th>
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<td>Increase yield</td>
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<tr>
<td>Save time</td>
<td>34%</td>
<td>34%</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>11%</td>
<td>11%</td>
</tr>
</tbody>
</table>

Source: 2017 Digital Farm Survey

FARMERS READINESS FOR DATA TECHNOLOGY

A recent survey on digital farm technology asked farmers when they will be ready to adopt data technology on their farms. Here are their responses:

- I will not be ready for 3-5 years: 34%
- I will be ready in 1-2 years: 30%
- I am actively testing the use of data now: 20%
- I have fully adopted the use of data on my farm now: 10%
- Other (please specify): 7%

2018 FEATURE EVENT

DRONES IN AGRICULTURE: PRESENT AND FUTURE

Presented by Global Ag Risk Solutions

Wednesday, January 10
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Pre-registration required.

$50 +GST per person
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Visit cropproductiononline.com to register.
Connecting the DOTs

Autonomous platform leaves the tractor behind

BY MICHAEL RAINE
SASKATCHEWAN HORIZON

DOT IS WHAT HAPPENS when farming processes are examined carefully. Does seeding require bigger machines? Does spraying mean going faster and wider? Does anyone need to pilot a field roller? Or any other field machine, except maybe the combine, for now?

The new machine design, the DOT, retires the tractor and giant airseeder and drill from the field and substitutes a much smaller U-shaped, operator-less, powered platform and air drill. The latter can be swapped for a sprayer, land roller, grain cart or any of about 100 other implements and industrial tools that have already been identified for autonomous automation.

After a debut to thousands of farmers at last summer’s Ag In Motion farm show, DOT, or at least its technology, has been making the rounds of industry events in search of feedback.

“We are reaching out to farmers to get their thoughts. We know this is a big change, but farmers see it and get what it could mean,” said Norbert Beaujot, the founder of SeedMaster and the creator of DOT.

For the past three winters, one of the fathers of reduced tillage equipment has been taking in the sun in Mexico and considering the next step-change in agriculture autonomous work.

“Stepping back from the day-to-day has given me the opportunity to consider the subject of farm machinery size, the constant trading cycle and everything that goes with it,” said Beaujot.

The seeding equipment inventor and manufacturer built his Saskatchewan operation into a global business that continues to grow after 25 years. Despite marketing one of the world’s largest seed drills, Beaujot said “bigger isn’t the answer in the long run.”

“I asked myself why we need the tractor in the first place. It is just a part of bigger,” he said.

It’s a big, U-shaped tool carrier that wraps around the implements it operates. There’s no need for giant tires, ballast and hundreds of horsepower just to move the power unit or cab and operator station.

“We purposely didn’t put a seat on it. If it was there, somebody would want to sit on it. That’s the wrong direction,” said Beaujot.

How it works

The DOT platform is designed to carry and power the implements, following a predetermined way-path in the field. For the past three winters, one of the fathers of reduced tillage equipment has been taking in the sun in Mexico and considering the next step-change in agriculture autonomous work.

“Not every farmer wants a SeedMaster (seeding unit). They might want somebody else’s technology, and that is great, too,” he said.

 Implements attach to the DOT with a set of latches, and the unit picks up the tool and powers it.

Change in the industry and overall technology originally spurred Beaujot to start working on a “different path.”

Meyer said business realities were also creeping into the thinking at SeedMaster.

“Rapid devaluation of farm equipment has been a growing issue for both manufacturers and farmers, and that was dragging down our business. So it also made good business sense to be involved in a solution,” he said.

“In August of 2016 CaseIH came out with their cableless, autonomous tractor and we knew that it would grease the wheels a little. Before that, ATS, who did the (autonomous system) for CaseIH, declined to work with us, so we knew someone was working on a solution and it was time to get on this project,” said Meyer.

“No driver. The connection behind the tractor is a problem. Get away from the drawbar and hitch and you take out some of that unpredictability when it comes to precision placement (in the field),” he said.

“We found some key inefficiencies (in what is done now); need smaller more nimble units, lower power per acre, lower investment, higher degrees of functionality. And that is what was targeted.”

Next spring, when the first six units will be on farms for testing, producers will be following their predetermined paths, and sets of eight cameras will be watching out and recording if the machines run off their established trails.

“At a maximum of five m.p.h. in the seeder and eight in the sprayer, we don’t believe machines need operators,” Meyer told farmers attending Canola Week meetings in Saskatoon earlier this month.

Before a single rank toolbar could be designed, which is needed for the relatively narrow DOT to operate at legal road widths, Beaujot had to solve another issue. Seeding tools on the relatively narrow spacings needed for the small grains and oilseeds grown on the Prairies, 12 to 15 inches at most, need to be set on toolbars in multiple ranks for residue clearance.

“I have been working on that since the start of Seed Hawk,” he said of more than 25 years of trying to deal with the issue.

“And we have it,” he said about a driven, flexible pin-disc that he developed to operate between the shanks.

“It allows us to run narrow (rows) without plugging."

The narrow width allows DOT to turn end-ways for transport. The 30-foot unit rotates and measures just 12 feet wide when operating on the road.

CONTINUED ON NEXT PAGE
Beaujot has long been concerned with the size of machinery in transport, so this met one of the safety and road damage objectives. The 30-foot width was based on average seeding windows and combine capacities.

SeedMaster’s field residue blockage removal tool runs between a single rank of precision air drill shanks. Its flexibility to rise and fall with the shanks, but rely on the cooperative power of the whole section, makes it unique.

By the time the machines reach the production phase, a Tier 5 emissions compliant 200 horsepower diesel engine will provide the juice for all operations. It’s currently a 164 h.p. Individual wheel motors and high efficiency hydraulics allow for some creative field maneuvers that a tractor and towed implement could not achieve. As well, per acre fuel costs are very low with average savings of about 30 percent.

At about 8,000 pounds, the DOT powered platform weighs about as much as some large pickup trucks. The seeder or other implement adds the additional weight needed for field traction.

The Seeder or other implement adds the additional weight needed for field traction. “There is a lot of waste in running that massive tractor, with that big glass cab and air conditioning around in the field. And soil compaction,” said Meyer.

While safety might be something that comes to mind, “there will be 25,000 U.S. cars running on roads in 2018, 100,000 by 2020,” he said about the technology that DOT uses for navigation and fail-safes. “Sensor technology has become so inexpensive and effective because of cars, this is only really now possible.”

The scalable system allows farmers from 1,500 to 3,000 acres to run one unit, and then producers can add machines for each subsequent jump in operational size, “which pairs well with combine economics.”

The company believes the resale will be better than with the very largest equipment that now dominates small grains and oilseed farms because the machines can be used by a wider selection of producers. They also feel that as producers’ average age rises, it opens up the window for older farmers to remain active, cutting the “cab-time.”

The company hopes to see machines available for sale by 2019. “This is prairie farmer’s solution to autonomous machinery. They can ditch the hitch,” said Beaujot.

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Researchers showcase ‘the future of farming’ using autonomous vehicles to plant, treat and harvest one hectare of barley

THE MISSION: to plant, treat and harvest one hectare of barley using only autonomous farm equipment.

Mission accomplished. The feat occurred this year in a field at Harper Adams University in the United Kingdom, and university researcher Jonathan Gill, one of the self-professed geeks behind the project, considers it a rubicon in the future of farming.

“We wanted to break down the perceptions of what can actually be done with agricultural technology,” Gill told those at the Farming Smarter conference in Lethbridge earlier this month. “Everybody thinks it’s really, really difficult, that it’s well off into the future and (we) just wanted to really show that the capabilities are there now.”

Gill and his team equipped a tractor and an older model combine with modern technology allowing them to operate the equipment autonomously. The tractor and its system cost about $60,000 and pulled a drill calibrated in a nearby plot and then used on the hands-free hectare, which is 2.5 acres.

The combine, 25 years old with a two-metre header, used laser scanners to track the crop later in the season. One drone was equipped with grabbers to pull some plants and carry them off the field so the team could determine ripeness.

From start to finish, autonomous equipment was used for pre-seed herbicide application, planting, rolling, fertilizing, applying herbicides and fungicides and a pre-harvest desiccant and finally, combining.

“If we do nine applications with our tractor, we got quite confident with our system,” said Gill, who fondly recalled eating fish and chips while watching the farm equipment work.

“We wanted to make sure that all agricultural machinery was able to be adjusted into our methodology,” Gill said autonomous technology has been in the hands of major farm equipment manufacturers for a while, but they’ve instead concentrated on the push for larger, faster equipment and implements.

The Hands Free Hectare project garnered international attention, which was also a goal for Gill and his team. Social media was liberally used to show the project as it progressed.

“I wanted to make sure that the world saw that a crop and agriculture was exciting. This entire industry is kind of backwards in the understanding of how technology can actually be used to actually make our lives a little bit better,” he said.

A second season and a crop of winter wheat is now planned, “to prove it wasn’t a fluke” but also to explore ways to improve yield through better crop sensing and agronomics.

Why attempt a hands-free hectare in the first place?

Gill said autonomous equipment on a wider scale could address farming problems such as limited time windows, cost of machinery, limited labour and soil compaction caused by large machines.

He also said that lack of resolution in current precision farming methods make it difficult to make best use of the information because of large machine size. Robots could move variable rate applications to the individual plant level.

Details on the project can be found at handsfreehectare.com.

barb.glen@producer.com
Researcher understands farmer doubts about hands-free farming

BY BARB GLEN
LETHBRIDGE BUREAU

FARMING BY ROBOT? Remote control? Laser-sensing technology? Drones? Canadian farmers don’t believe they will make major use of autonomous farming methods for at least another five years, according to a survey undertaken by Glacier FarmMedia.

However futuristic it may sound, hands-free farming methods exist and have successfully been used in the Hands Free Hectare project at Harper Adams University in England (www.handsfreehectare.com). Jonathan Gill, a lead researcher on the project, talked about the accomplishment Dec. 5 at the Farming Smarter conference in Lethbridge. He wasn’t surprised to hear about survey results that showed farmer ambivalence.

“I can understand that, mainly because the amount of investment in technology for certain machinery has to pay back whatever it is, over a set period of time, so generally agricultural machinery is worked on a three-to-five year basis. "Maybe that’s the reason why people are saying, ‘well you know, not yet but when it’s actually available for me … I’ll be there using it in my next round of upgrading my equipment.’ ”

Gill and his team proved that older equipment can be automated for hands-free capability. They used a low horsepower tractor and a 25-year-old combine to farm a single hectare.

Instead of one large machine, be it a tractor or combine, several automated smaller machines could do the same job in the same amount of time and if one broke down, work could still continue, said Gill.

As well, smaller machines are lighter causing less compaction and making it possible to work fields earlier in spring and later in fall. "The exciting thing is, a machine doesn’t have to be monitored, in a sense, all the time because it can run for a longer period of time. It can have no breaks, it can run throughout the dark and it can continue to do work," Gill said in an interview.

"Smaller machines are easier to maintain and look after and repair. An awful lot cheaper as well," Gill said major farm equipment manufacturers have the technology to produce autonomous equipment but haven’t had the impetus to produce and market it.

"Why would they actually put their neck out when they can keep on selling larger and larger machinery that can still keep on making them profits and do the job that generally the market believes they need," Gill asked.

"However, this cycle needs to be broken down because it’s not actually doing good for our agricultural practices. It’s not helping us look after our soils. We’re not putting more back in, enabling us to actually get good, rounded approaches to things."

Agriculture can benefit from current and concentrated research on autonomous passenger vehicles and trucks. That work can solve issues around safety and collision avoidance, as well as other traffic factors.

“All you’ve got to do is just take that technology, throw it onto a tractor and it will be safe enough to work in an area that doesn’t generally have people.”

Such farm equipment may help address the labour shortage, said Gill, but he also thinks it could bring people back to rural areas for the highly skilled jobs that require knowledge of robots, sensors and drones.

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Telematics takes data from the field but farmers have been slow to make the trip

BY BRIAN MACLEOD

W h a t  i s  t h e  t r o u b l e  w i t h  t e l e m a t i c s ?

When it comes to telematics, that special set of data that helps monitor and perform the operation of big equipment, acceptance by farmers appears to be becoming fits and starts, with the emphasis on the younger generation.

The challenge, several dealers say, is to provide training and follow-up to farmers who are now buying equipment with the big guns of data collection onboard.

“I don’t know how many times I’ve walked into a farm office and I’ve seen a farmer or a farm manager pull out a Ziplock bag with all of his USB sticks, and he’s been collecting data for a dozen years, and it’s all sitting in a Ziplock bag and he’s done nothing with it,” said Steve Dyck, president and general manager of Western Tractor, which has locations in southern Alberta and in Saskatchewan.

“Even for that next generation, us, as a dealership, we’ve got to create easy buttons for them.”

That easy button comes in the way of training, easier access to data, and follow-up help, issues that a Glacier FarmMedia survey shows are concerns for farmers who are wandering into the fledgling field of telematics data.

Telematics gathers information from on-board sensors about equipment location, operations, diagnostics, and maintenance.

Users can connect their machines to their offices and mobile devices or equipment dealers or manufacturers, which can then study the data and advise farmers.

The GFM survey suggests that farmers are aware of the potential for telematics data use. Some 42 percent of farmers surveyed said it would save time, while 39 percent said it would result in decreased costs.

But few farmers have yet taken the deep dive. Just 11 percent say they are testing telematics now and only five percent say they have fully adopted its use. More than a quarter of farmers say the industry will not be ready to make telematics data useful to them for one to two years and 29 percent say the industry won’t be ready for another three to five years.

Only about a third of farmers believe the industry is ready now. Regardless, 56 percent of farmers feel they’re not going to adopt telematic data use for three to five years, or even longer.

This is despite the widespread availability of the technology on newer machines.

The biggest barrier to acceptance of telematics is budget constraint, say 43 percent of survey respondents. Many believe they’ll have to buy new machines with the onboard equipment, though some dealers say after-market upgrades are possible.

More than one in five farmers say they do not know how to use the technology, almost the same number say they don’t understand telematics, and 17 percent say they can’t get help when they need it.

On that last point, some dealers agree it has been an issue, though there is now a focus in that area.

“They’re not alone in that sometimes,” said Grant Kromrey, branch manager of Tingley’s Harvest Centre in Lloydminster, Alta. “(The) last couple of years in the dealership side, even with ourselves, we’ve struggled with some of the telematics.”

But changes to technology, especially the ability to view data in smart phone apps or tablets, is helping, said Kromrey.

“One thing we’ve really seen change is the advances in smartphones and apps. We’ve really seen their increase. (They’re) a lot more user friendly, making it more intuitive to work your way through menus … simplifying the operations.”

That ease of use is vital to the growth of telematics, he said.

Randy Gates, manager of the precision technology department for the Mazergroup, which operates 13 locations in Manitoba and one in eastern Saskatchewan, understands some farmers’ reluctance to embrace telematics. He says manufacturers have to help.

“I don’t think the manufacturer (has) done a good enough job providing us with information and the understanding of it.”

Dealers must play a role in helping producers, he said.

Gates compared the use of telematics to people getting their first smartphone and only using the basics.

“If you actually sat down and showed the guy the value, is there going to be huge savings? Yeah, there could be. Is there going to be huge time savings? In my mind there definitely will be. How to get it across is what the manufacturers and the dealers need to work on.”

Most dealers interviewed agreed that acceptance of telematics is likely going to be a generational issue. Of the 15-year crowd, they’re the ones that eat that technology up,” said Jeff Schlachter, a co-owner of Wheatbelt Sales in Wadena, Sask. “The older guys still want the plain and simple.”

That plays out in how he sees sales.

“Some companies make different models for how advanced you want to get. (The) new Kubota, for instance, there’s a standard (model) and there’s a premium. The premium has more of the touch screens … in the cab and the standard just has a plain-Jane power-screen.”

But equipment buyers are “probably still two-thirds standard and a third premium,” he said.

Dyck agrees.

“In southern Alberta we’ve got some pretty large farming operations. It’s very common to see 10,000-acre-plus farms here, 20,000 acres, plus.” So while some farmers are not the guys sitting in the cabs anymore.

“It’s their hired help. It’s their children (who) are doing it now and we’re finding the next generation is embracing that, because quite frankly, they are far more technically literate.”

In some areas, telematics has yet to take off.

“I’ve had nobody asking me for it,” said Mathew Marshall, sales manager at Raymore New Holland in Saskatchewan. Farm size could be an issue, he said.

“We don’t have huge fleet farmers here that own 15 combines. For telematics, as of right now, some new equipment definitely is coming with it, you can activate it, but nobody’s really asking for that.”

Dyck believes the industry is reaching a milestone. Dealers have a better handle on the data, they’re more comfortable collecting and explaining the equipment, and apps and smartphones are making it much more accessible.

He thinks the three-to five-year time frame for heavier adaptation of telematics will be completed.

“I actually believe that you’re going to see that five year timeframe for farmers, it’s going to take five years to get to the point where it’s become a staple. The biggest thing for (the dealers’) side is that we are going to need to show the benefits to the end user much more quicker and get them involved. I think that’s going to move it along quicker.”

Dyck agrees.

“We’ve been heavily invested in this for a number of years now,” he said. “We believe this is the future of farming and we have focused primarily with our next generation farmers, especially in trying to turn telematics and data into meaningful decision-making tools.”

“For farmers, it’s a complete mindset shift for them, but I also say … it’s a complete mindset shift for the dealers too. It’s a cultural shift that needs to happen within the dealerships themselves.”

Gates says farmers are at the cusp of a major move into telematics.

“Getting that … maybe not in this coming year, maybe the following year, I’d love to see (the GFM) survey out again, and I bet you these numbers will have changed quite a bit.”

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Sensor technology holds appeal, but each generation assesses its value differently

BY ROBIN BOOKER

C ANADIAN FARMERS are dithering a bit as it comes to using specialized sensors, according to a Glacier FarmMedia survey.

In an online survey filled out by 428 farmers from late August to mid-October, only seven percent of respondents said they have fully adopted the use of specialized sensors, and only 28 percent are actively testing them.

In the survey, farmers said they are agreeable to greater use of sensors and view them as labour-saving, time-saving and more affordable than some of the other technologies they were asked about.

However, most farmers are not rushing to be early adopters, with 37 percent saying they will be ready to use specialized sensors in three to five years, and 39 percent saying they will be ready in one to two years.

For the survey, specialized sensors were defined as sensors that can measure, monitor, control and gather information on field operations. These include yield monitors, variable rate controllers, directional guidance controllers, electrical conductivity sensors, soil moisture sensors, and leaf wetness sensors and weather sensors.

Tavis Huebner, 26, works a 4,500-acre farm with his father near Spalding, Sask. He considers himself a slow adopter of the latest technology.

"I don't think it's a technology thing, because I'm a pretty good tinkerer," he said. "But when it comes to actual sensors, I have been a little slow to embrace them."

"I do think there's a lot of potential," he added, "but I think it just needs to get a little more affordable and more reliable."

Huebner's farm has wireless irrigation, hand-hold nitrate sensors to test soil, and variable-rate seeding.

"It all worked pretty well last year," he said. "But it can still be a little hit and miss."

"I think the technology is going to keep getting better and better, but it's just going to be more affordable for us farmers to do."

For farmers, the use of specialized sensors will depend on their individual needs.

"Some farmers are not going to need it," he said. "But I think it's going to be more widespread and more useful in the future."

BY ROBIN BOOKER

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Drones are becoming ever more useful in agricultural applications, as is the use of sensors for various purposes.

CHRIS HERRNBCK HUMBOLDT, SASK., FARMER

Those of us who are under 40, most of us have been playing with computers for a long time and we are a lot more technology literate, and I think a lot more willing to try it. When you grow up with it, it's not a foreign concept.

TAVIS HUEBNER SPALDING, SASK., FARMER

DECEMBER 28, 2017

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The discovery that could shake up the beer industry

New molecular markers can help breeders to quickly identify malting barley varieties with high levels of a very useful protein.

JASWINDER SINGH can hardly contain his excitement when talking about TLP8, a useful protein he discovered in barley. "It could revolutionize the brewing industry," said the associate professor at McGill University's plant science department. Maltsters despise beta-glucan, a key sugar found in barley. If it is not properly degraded during the malting and germination process it can lead to highly viscous wort, which creates headaches.

"I can tell you right now, that would be of high interest to people in the malting-brewing community. I would say that is a pretty significant finding."

ANDREW NGUYEN
CANADIAN MALTING BARLEY TECHNICAL CENTRE

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“There will be a problem during filtration. The wort will be difficult to filter,” said Singh.

That is why malt barley breeders always select varieties with low levels of beta-glucan.

Singh and his research team identified 22 genes in barley that were related to the germination process.

One of those genes produces the TLP8 protein, which is expressed differently in malt versus feed varieties. It is found at three times higher levels in malt varieties like AC Metcalfe, Bentley and Morex than in feed varieties such as Cowboy, Coalition and Steptoe.

Singh also noticed that during the germination process the amount of beta-glucan was reduced by 60 percent in malt varieties compared to 20 percent in feed varieties.

He realized it was the TLP8 protein that was helping reduce beta-glucan levels by binding itself to the sugar during germination.

Now that it has been identified, a number of things could be done with the protein to enhance the efficiency of the malting process.

New molecular markers can be developed to assist breeders to quickly identify which varieties have high levels of the TLP8 protein.

Gene editing technology could be used to increase the amount of the protein in malt barley varieties.

Or the protein could be synthesized on a large scale and used as an additive in the malting-brewing process.

Andrew Nguyen, malting and brewing technical specialist with the Canadian Malting Barley Technical Centre, thinks Singh’s discovery is a big deal.

“I can tell you right now, that would be of high interest to people in the malting-brewing community,” he said. “I would say that is a pretty significant finding.”

High beta-glucan levels are a major contributing factor to poor quality malt, resulting in reduced malt extract levels and lower alcohol yields.

“High beta-glucans are usually just all bad,” he said.

Nguyen said genetic modification isn’t common in malt barley varieties, but if something could be done using traditional breeding techniques to identify lines with high levels of the TLP8 protein it would be well received.

Maltsters already use glucanases enzymes to break down beta-glucan during the malting-brewing process but those enzymes are temperature sensitive whereas the TLP8 protein is not.

The next step in the research process is to see if the protein performs the same way in the real world as it did in the lab. Maltsters will be providing Singh and his team with wort samples to see if the protein decreases the amount of viscosity.

“The concept is there. The hypothesis is proved. It is just a matter of doing it,” said Singh.

“I really want to see viscosity changes.”

The second phase of the research project could take up one year and if everything goes as planned the malting industry could soon have a promising new tool that will make the whole process more efficient.

A separate project could be spun off from Singh’s research discovery. Breeders could create varieties with low levels of the TLP8 protein, which could increase the amount of beta-glucan in those varieties. Beta-glucan is a dietary fibre, so the idea would be to produce barley that could be used to enhance the amount of fibre in food products like cereal.

“It can also revolutionize, in the future, the food industry,” said Singh.
FASHION DESIGNERS and biologists are weaving together their talents to create a new sustainable fibre that is biodegradable and wearable. Using synthetic biology, they can engineer organisms for growing consumer products. One process creates a gel-like film made from a byproduct of kombucha tea to make clothing, shoes and handbags.

The recipe is a symbiotic mix of micro-organisms, such as bacteria and yeasts, which spin cellulose in a fermentation process. These tiny threads form layers in the liquid and, over time, produce a mat on the surface.

The process has transformed the way Suzanne Lee looks at clothes and creates them. The fashion designer started the BioCouture research project, which is an idea she presented in her book, Fashioning the Future: Tomorrow’s Wardrobe.

Lee works with scientist David Hepworth in the United Kingdom, who develops materials made from non-hydrocarbon-based feedstock. Instead of taking an agricultural approach for producing fibre from sources such as cotton in a field or wool from sheep, Hepworth is focused on living organisms like bacteria to make fibre.

Their commercial business aims to bring living, bio-based materials to the textile and fashion industry. Lee explained their recipe, as well as the future applications, during a TED talk video presentation.

The fabric farm process starts by brewing tea and then adding sugar, which is poured into a growth bath. After it cools, a living organism and acetic acid is mixed in. An optimum temperature must be maintained, but the process can be taken outside during hot weather.

Several days later, the fermenting goop bubbles away as bacteria feed on sugar nutrients in the liquid.

“So, they’re spinning these tiny nano fibres of pure cellulose and they’re sticking together, forming layers and giving us a sheet on the surface,” she said.

About two weeks later, the static culture is about 2.5 centimetres thick and left alone to grow on its own.

To harvest, it is taken out of the bath, washed and spread on a wooden sheet to air dry.

As it dries, it compresses to something that looks like transparent paper or vegetable leather, which Lee said resembles human skin.

“You can either cut that out and sew it conventionally, or you can use the wet material to form it around a three-dimensional shape. And as it evaporates, it will knit itself together, forming seams,” she said.

However, there are shortcomings.

“If I was to walk outside in the rain...
wearing this dress today, I would immediately start to absorb huge amounts of water. The dress would get really heavy, and eventually the seams would probably fall apart, leaving me feeling rather naked, she said.

Another limitation is that in cold conditions, the cellulose fibre becomes brittle and falls apart.

Mass production is another challenge of working with the fibre because its growth cycle in the lab takes three to four weeks, which could bottleneck manufacturing.

Other researchers have designed prototypes of vests, shoes and handbags using the same kombucha process.

Young-A Lee, author of the book, Sustainable Fibres for Fashion Industry said the new cellulose-based fabric is completely biodegradable in the soil. It can also reduce waste by creating a continuous cycle of reuse and regeneration termed a “cradle to cradle” system.

Ananas Anam, based in the United Kingdom, has adopted biomimetics by taking waste from pineapples.

The organization uses the leaf fibre from pineapples to make a leather alternative to try and offset mass leather production and chemical tanning.

According to the company’s website, founder Carmen Hijosa was inspired by the use of plant fibres in traditional weaving such as Barong Tagalog garments in the Philippines.

Their research showed that the strength, flexibility and fineness of the pineapple leaf fibres stood out as a raw material. The company has developed a non-woven textile that can be commercially produced. Designers are using the textile to craft products such as footwear, clothing, interior furniture and automotive upholstery.

The pineapple industry produces about 13 million tonnes of pineapple leaves as a byproduct each year, which are often discarded to rot or be burned.

Harvesting and selling the fibres from the pineapple leaves provides an additional income for Philippine farmers.

Stuart Smyth from the University of Saskatchewan’s College of Agriculture and Bioresources said this idea has huge potential for the Prairies if researchers could find a way to use existing biomass to create the cellulose.

“Think it could provide an opportunity for some biomass that would essentially not have any market value, to now have market value in the proximity of 200 or 300 kilometres from any plant that was going to set up to try and enter into this market,” said Smyth, who also holds the industry research chair in agri-food innovation at the university.

“That could be as simple as a livestock producer who has a bunch of old bales that are no longer valuable as animal feed and they could load them up and sell them for a little bit instead of spreading them or having them rot on a field.”

Sustainability fibres in clothing are driving popular clothing companies to find ways to transform.

Levi Strauss is spinning recycled plastic bottles into its denim jeans and is working with other companies on an initiative to find sources of more sustainable cotton. However, it’s unlikely that microbial cellulose will replace cotton, leather or other textiles on a mass scale any time soon.

Still, growing clothes and making fibres in a factory are viable alternatives, which would reduce waste caused by disposable clothing, and reduce society’s reliance on natural resources.

“Ultimately, maybe it won’t even be fashion where we see these microbes have their impact. We could, for example, imagine growing a lamp, a chair or maybe even a house,” said Suzanne Lee.

“So, I guess what my question to you is: in the future, what would you choose to grow?”

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Blockchain technology offers food safety, traceability and more

By Barb Glen

Lethbridge Bureau

There’s one thing people tend to agree on when it comes to blockchain: it’s hard to get your head around it. Yet blockchain looks likely to play a huge role in the future of agriculture, potentially in food traceability, and in other ways.

In simplest terms, blockchain consists of digital records that are time-stamped, linked and encrypted so that it can’t be modified, without knowledge and approval from everyone who provided the data. New data is added according to a protocol that can be verified by others in the chain. Thus, the chain is managed by those involved, without need for an independent third party to verify changes. It’s a ledger that everyone on the network can see.

Bitcoin is the most well-known example of the blockchain concept. In agriculture, the most obvious use is in food traceability and the meat production chain in particular.

Aidan Connolly, chief innovation officer with international animal health company Alltech, called blockchain “one of most exciting of potential technologies.”

“I think that has tremendous implications for agriculture. We have not typically, as farmers, we have not liked people knowing exactly where our cattle come from. At the same time, when there’s a disease, we want to be able to trace it back,” said Connolly.

Verifiable records and traceability will preserve and restore consumers’ confidence in the food system, he added, because any instance of food contamination can be traced and swiftly addressed.

“Blockchain is a technology that allows us to do so in a manner that keeps us comfortable that we’re not giving away all of our secrets and therefore perhaps not trading away our margins to the end food retailer, but at the same time making sure that if something does occur … that we can actually find out where that occurred, what it is we need to do to stop it happening again,” said Connolly.

Michael Boehlje, an agricultural economist at Purdue University, said agriculture is running behind some other industries in its use of blockchain. The diamond industry, for example, is using it to trace the source of gems to ensure they have been mined legally by the intended workforce.

“I think that this whole issue of traceability and food safety will be the biggest impact that blockchains have on the agricultural sector,” said Boehlje.

Banks and multinational retailers are also using the technology, added Connolly.

“I think when you see people like Walmart getting behind blockchain and using it in countries like China and being so impressed by its potential that they then start taking it to the United States and elsewhere, I think you can see what the possibilities are. “Traceability is a fundamental part of our future.”

Writing for DecisionNext, a San Francisco-based market forecast company, its sales and marketing director Janette Barnard referred to blockchain as the missing link in the food chain. Her white paper can be found at bit.ly/2BMnuDR.

As for price discovery, Barnard added, “Blockchain could allow the industry to track many different meat characteristics from gate to plate: place of a meat animal’s birth, how it was processed and the path it took to a meat tray in a retail store.

That same pathway lends itself to food safety.

On the traceability file, she said blockchain could allow the industry to track many different meat characteristics from gate to plate: place of a meat animal’s birth, how it was processed and the path it took to a meat tray in a retail store.

That same pathway lends itself to food safety.

As for price discovery, Barnard said in her paper that “if enough participants throughout the supply chain decided that price transparency is critical to the market, then blockchain could serve as an ideal mechanism for capturing accurate prices, storing them, and providing price transparency to appropriate participating parties.”

Blockchain could help reduce food waste by giving more immediate information on the demand for meat products so only the required amount would be delivered.

However, Barnard noted in her conclusion that successful use of the technology depends on collaboration and the willingness of everyone in the chain to participate.

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The interim chief executive officer for Canada’s agri-food supercluster is all about getting industry players together to push it to new heights during the next few years.

Rob Davies will lead the Smart Agri-Food Supercluster for now, as members continue to make their case to the federal government that they should have access to its $950-million innovation fund.

“Through innovation and technologies that are already out there, this is designed to increase Canada’s share of global agriculture exports,” said Davies, who has more than 30 years of experience in the agri-business sector.

“The supercluster is composed of members from big and small businesses, post-secondary institutions, government agencies, agriculture associations and research and advocacy groups.

The supercluster has been listed as one of the nine groups that may get access to the federal government’s innovation fund. The government is expected to announce the winners early next year.

Davies said if his organization is selected, its goal is to create more than 300,000 jobs, generate $30 billion in economic growth and reduce greenhouse gas emissions by 40 mega tonnes.

“It seems like a monumental task, but we see advantages to utilizing new technologies and thought processes to build a platform and bring all players together in a cost-effective way,” he said. “It gets the whole value chain working together.”

While it’s too early to outline specific projects that the supercluster would pursue, Davies provided an example of how all industry players could work together to boost the sector.

He said the agriculture sector could partner with the oil and gas industry to get its hands on better in-ground field sensors to monitor and collect data on soil quality.

The program would give specifics on soil quality, and it could let farmers know how much irrigation they need, how much fertilizer to add, or how much pesticide to spray.

“If we combine that with harvest data, and that provides feedback to producers to help them understand productivity and make better decisions for the next year,” he said.

For example, all industry players could work together to develop tracking systems for agri-food products. Wholesalers would use that information to market the products to consumers.

“The whole value chain working together,” he said. “This all could be viewed as a bit hard to wrap our hands around, but if you think back to 20 years ago, who had auto-steer? Now it’s just part of what we do.”

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Supercluster makes big innovation pitch

Initiative aims to create 300,000 jobs and generate $30 billion in economic growth

BY JEREMY SIMES

THE INTERIM CHIEF executive officer for Canada’s agri-food supercluster is all about getting industry players together to push it to new heights during the next few years.

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“Through innovation and technologies that are already out there, this is designed to increase Canada’s share of global agriculture exports,” said Davies, who has more than 30 years of experience in the agri-business sector.

He’s spent most of his time as the CEO of the Weyburn Inland Terminal in Saskatchewan.

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by Jeremy Simes

The agri-food supercluster may be eligible for some of the federal government’s $950-million innovation fund.

Supercluster makes big innovation pitch

Initiative aims to create 300,000 jobs and generate $30 billion in economic growth
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-Lorne Hamblin, Redview Farms Ltd.

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