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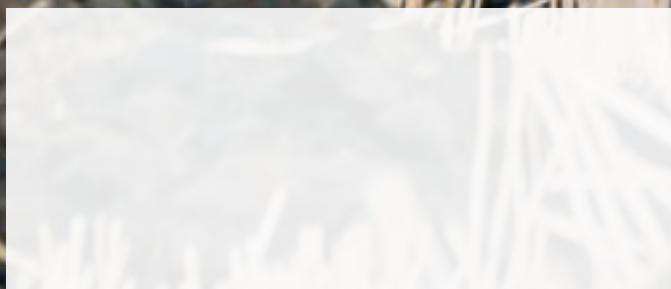
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# INSIDE

## CAN I ASK YOU SOMETHING?

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**H**ow are we doing? If this is the fourth time you are reading a copy of GrowPro, then you have seen them all so far. Starting a new print publication is not an easy task. This one took a lot of consulting with agrologists, examining information needs and what is available in the marketplace and, frankly, a few educated guesses.

It has been a great project from our side of the printing presses. The Glacier FarmMedia reporters, editors, creative staff and columnists have been excited to be a part of a new publication that provides what we hope are useful information and ideas to the industry.

Less about us. We're looking to know more about you and what your thoughts are from our first year of GrowPro.

What do you think of our topics so far and, more importantly, what do you need from us in the future? As we map you Year Two's story plots, what should we be covering? More business management features from an agrologist's perspective? Regional research updates? Features about professionals we know and some we don't? Or, more in-depth pieces such as the law as it relates to you and your role in agriculture? Feel free to bend our Editors' ears at the co-ordinates below, it will help us plot your GrowPros for 2021.

**MIKE RAINÉ, PAG (HON) | EDITOR**

**5 | PANDEMIC EXTENSION**  
COVID-19 caused a lot of change in the field.

**8 | WHITE SPACES**  
Microsoft FarmBeats puts data-driven decision making within reach.

**10 | ONESOIL**  
Belarus firm offers free satellite imagery services to global farmers.



8

COLUMNS

GROUNDBREAKER THE LIVING LAB



**16 | AGRONOMY & THE LAW**  
Negotiating surface rights can be profitable but takes some work.

**28 | THE HEAD OF HIS CLASS**  
One of our first agronomist has spent a career teaching others.

**49 | THE LIVING LAB**  
The drainage dilemma: what's the right choice?

COVER STORY

**18 | DRAINAGE GOES UNDERGROUND**

Tile drainage is becoming more popular in the West as farmers tap into its potential to increase yields.

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ISSN No. 2562-8844  
Publications Mail Agreement No. 40069240

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# EXTENSION DURING (AND AFTER) A PANDEMIC

BY TREENA HEIN  
GROWPRO CONTRIBUTOR

**C**OVID-19 forced anyone planning to get together this year to change plans. The extension activities of researchers and events co-ordinators were no exception.

Just as many consumers switched to online delivery of food and other goods, many of the teams responsible for transferring knowledge from the research plots to farmers' fields transformed their events into the virtual space.

To find out exactly how they were delivered, and also how they've been received, GrowPro checked in with some of the many organizers.

Mario Tenuta, NSERC/WGRF/Fertilizer Canada 4R 'Industrial Research Chair' and professor at the University of Manitoba co-hosted two in-person outdoor extension events this summer, both self-guided field tours. Participants were required to self-screen beforehand for COVID-19 using an online tool, and to confirm impending attendance shortly before arriving. The tour in late July focused on 4R Nutrient Stewardship in corn and the other, in late August, on a canola research trial.

At roughly 15 stations, participants could either read provided materials that they'd printed ahead of time or view the material at the event on an internet-enabled device by scanning QR Codes.

Some stations also had accompanying video clips. Tenuta said there are four to six speakers at a typical field day, but a few organizers were available at both of these events for discussion. "I think the participants enjoyed themselves," he says. "They were able to take their time and ask questions. They could visit the sites on one of several days. Normally tours are taken in at one 'set' time and you hope it's a convenient time, or not raining."

The turnout for both was about half that of a normal field day event (40 to 60 people). That



Knowledge transfer has taken a different form during the pandemic – and it hasn't been all bad.

may be due a variety of factors beyond infection risk – perhaps for example, some didn't feel such an event would be worth attending.

For Tenuta's part however, he considers these modified in-person tours to be more valuable than virtual-only events because participants were actually able to see the plots. However, he adds that the materials for each station could also be accessed online by those who didn't attend. For the July tour, that amounted to about 20 extra downloads.

### Online Only

However, many extension providers in Western Canada have gone the solely virtual route, for example the Canadian Association of Farm Advisors, which started its online program delivery in early April.

Executive Director Liz Robertson believes that overall, the online learning experience has been positive and more inclusive for her members. "I think they have appreciated the opportunity to continue to learn, and those who are more remote to local chapters were able to finally attend/participate," she notes.

"Are members sick of online? To a degree, but it's more accessible for some members and offers flexibility that set meeting times and locations doesn't. I know though, that our members are waiting in anticipation of being able to get together for face-to-face networking."

SaskCanola, with its normal annual canola field day on hiatus, has delivered online learning in a variety of ways and can also confirm good outreach.

For example, agronomy tips ('Top Notch Farming Tips') were shared through both the SaskCanola website and Twitter account. The organization also co-hosted a few related webinars that involved 'Continuing Education Unit' credits. The webinars were well attended, says SaskCanola Grower Relations Manager Ellen Grueter.



Are members sick of online? To a degree, but it's more accessible for some members and offers flexibility that set meeting times and locations doesn't. I know though, that our members are waiting in anticipation of being able to get together for face-to-face networking.

**LIZ ROBERTSON**  
CANADIAN ASSOCIATION  
OF FARM ADVISORS

In addition, "we also hosted a virtual booth for Ag in Motion's digital event that included a video on employing crop rotation as a clubroot mitigation tool, and highlighted SaskCanola's online research database," she reports. "We had a higher number of people visit the booth than we anticipated." SaskCanola is also planning two upcoming virtual conferences, Canola Week in December and CropSphere in January.

#### Attendance Boost

In the mind of SaskCanola's Research Extension Specialist Miki Miheguli, online extension events this year have reached a larger audience not just because of their virtual nature (that is, no travel time or travel costs, and often the opportunity to learn at one's own pace when it's most convenient).

There is also the fact that most online events this year have been free of charge. Indeed, reflecting on her own learning experiences since the pandemic began, Miheguli says "I could have not attended so many events if those events were only in person due to time and budget restrictions."

It's exactly the scalable, convenient and low-cost nature of online learning that has made Stan Blade a big fan.

"It gives us the ability to do things we've haven't done in the past," explains the professor and dean of the Faculty of Agricultural, Life & Environmental Sciences at the University of Alberta. "We recently had a six-session global course on COVID and its impact on food and agriculture, and we had 1,000 people attend from over 50 countries."

And for one of their faculty lectures early in 2021, Blade and his colleagues are bringing in three world leaders in sustainable production (members of CGIAR) and he says "frankly, that's because [with it being a virtual event], we can afford it."

#### Anonymity

Blade adds that another benefit to online learning can be increased interaction. "The usual way at field days is groups for logistical purposes and sometimes the speaker takes up all the time and/or people aren't willing to ask questions," he observes. However, at the virtual events Blade has been part of, more questions came forth. "The chat box seems to make people feel anonymous," he observes, "or it's actually anonymous because you send your question to the moderator."

Jeff Schoenau, professor of soil fertility at the

University of Saskatchewan and the Saskatchewan Ministry of Agriculture Soil Nutrient Management Chair, agrees – but with some caveats.

He held a webinar in July for the Ministry's Crop Diagnostics School and another 'Crop Talk' webinar for the Conservation Learning Centre in March. "They went well, and I think you tend to get more questions from the audience than in-person events," he says, "maybe because you can ask questions quickly and anonymously, but you do miss the interaction. You get more feedback at an in-person event and the discussions after can be very good, but with a webinar, when it's over, it's over."

#### Quality and efficiency

Another benefit of virtual events, in the view of SaskCanola Research Manager Doug Heath, is a higher-quality learning experience. He's observed that "in general, speakers seemed more polished, especially if they are pre-recording their presentations. There is less meandering, most things are direct and to the point, and presentations and Q&A sessions afterwards are wrapped up on time."

Heath adds that "also, because everything had to be planned in advance, this means that there is very efficient use of time and co-ordinated talks when there are multiple speakers in a given session. This decreased the amount of overlap between speakers."

Another factor in increased quality for virtual learning is the perspective that cameras can provide. "The virtual crop/plot tours and equipment demos this year, for example 'Ag In Motion,' were an extremely beneficial addition where anyone could get the best seat in the house to be able to view close-ups of plants and equipment that the speaker was referring to," Heath explains, "as opposed to sitting on a trailer and not necessarily seeing (or sometimes hearing) what the speaker was saying."

However, on the note of quality, Tenuta believes that providers of online-only events do have to make sure the events are truly engaging. Right now with colleagues, he's putting together a short online extension course on soil health that will be offered over the winter, and it will include a mix of online presentations, videos, question sessions and more.

"The important thing about delivering extension online is you need to make it interactive or people are bored and leave," he says. "Either make presentations short or if they're longer,



you have to have interaction."

Heath agrees, and hopes that presenters, having learned from the online events they've delivered this year, will include more video and other ways of demonstrating their points besides just static slides. Indeed, he considers presentations already posted online that have audio and slide animations/embedded videos to be valuable reference material.

#### Looking forward

Although it's been a learning curve for many and stressful to prepare and deliver extension online, there are many who hope that online learning will continue after COVID-19 is (hopefully) a memory – and are excited about its potential. "The pandemic taught us how to become flexible and adapt to the new environment and new tools," Miheguli says. "We have seen benefits of organizing online events and delivering extension messages. So, I suggest that we continue with online events even after the pandemic." Another option for the future, she says, would be offering events through both in-person and online formats, so that people can choose what suits them best.

However, Schoenau is among those who don't believe online events can take the place of those offered in-person. He thinks "it'll be great" to get back to normal.

"You do get tired of looking at the computer screen in so many virtual meetings, and you do the best you can to have visuals to help show the points you are trying to make," Schoenau observes, "but it doesn't replace the real thing." ↗

Treena Hein is a freelance writer based in Ottawa who writes about agriculture, food and technology.

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## PRECISION AGRICULTURE

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Many of these white space bands have never been occupied. This is the key to letting us move data. Using white space is probably our biggest breakthrough.

**RANVEER CHANDRA**  
FARMBEATS

**CONNECTING THE WORLD** | **FarmBeats** is making precision data available to farmers with big and small operations

**BY RON LYSENKO**  
GLACIER FARMMEDIA STAFF

**D**ata-driven precision agriculture extracts more food per acre, and at a lower cost than conventional agriculture. Nobody argues that point anymore.

Nor does anyone argue that data-driven precision agriculture can go a long way toward increasing food production in those parts of the world where mass starvation already occurs.

The challenge is that existing digital platforms that provide this kind of information require an element of connectivity that simply does not exist in many of these regions. And cost is prohibitive. Only the wealthiest farmers can afford the systems, even in some of the more productive regions of the world.

That's where Bill Gates, Microsoft and FarmBeats enter the picture. FarmBeats is a relatively small Microsoft subsidiary started by Ranveer

Chandra in 2015. The goal is to bring usable precision agricultural technology to third world farmers and farmers plagued with connectivity issues.

"We want farmers to use data and data-driven insights when deciding how much water to apply or how much fertilizer or pesticides. But also the timing of these things for maximum efficiency," said Chandra, chief scientist on the project.

"That's no different at all from the way North American farmers employ their agronomists and their precision agriculture systems. The difference is that a farmer in Tanzania might farm only a few acres. But he still will benefit greatly from a precision agriculture system. It will allow him to grow more food."

He said the FarmBeats platform lets a producer install various moisture, temperature and other sensors in his field.

Then, instead of connecting to an expensive platform from an established precision ag provider, he uses the FarmBeat applica-

Ranveer Chandra, Microsoft Research principal researcher, who also heads the FarmBeats lighthouse project in the AI for Earth program, walks a test field at a farm in Carnation, Washington. | MICROSOFT PHOTO

tion on his cell phone to gather and process the information.

If available, the grower uses satellite imagery along with all the layers utilized by established commercial providers. FarmBeat differs from those platforms in the sense that it cuts the cost.

For example, very few Third World farmers can afford a camera-equipped drone. Chandra's pragmatic answer to that challenge is to tape a cell phone to a helium balloon. Since most of these fields will be only a few acres, the balloon solution flies.

"We are also bringing in AI and machine learning on top of what field sensors tell us. With very few sensors, we can begin to build an algorithm that predicts what's happening between our sensors."

"One sensor with NPK can give us a lot of information for more insightful decisions. Our main goal is to make data-driven precision agriculture more affordable for farmers

who cannot afford it today."

Chandra's explanation of the concept and its delivery was captured on video at the 2019 Microsoft Ignite conference where FarmBeats had its public debut.

"Our biggest challenge is how to tie all these elements together. In the areas we target, there is often no electricity or cell towers. So we send and receive WiFi data through the many TV channels that are not being used. It's known as white space. People started seeing this potential 15 years ago.

"Many of these white space bands have never been occupied. In most situations, there is no cost to us. This is the key to letting us move data. Using white space is probably our biggest breakthrough." ↗

Ron Lyseng is a reporter with The Western Producer based in Winnipeg, Man., who writes about agronomy, equipment and technology.

## THE VALUE OF "WHITE SPACE"

FarmBeats has been granted permission to run precision agriculture data through vacant white space channels.

"White space" refers to portions of licensed radio spectrum that licensees do not use all of the time, or in all geographical locations.

According to the U.S. Federal Communications Commission, this unused spectrum between TV stations represents a valuable opportunity for our changing wireless mobile landscape. This block of spectrum is ripe for innovation and experimental use, holding rich potential for expanding broadband capacity and improving access for many users and for developing technologies.

That is what Microsoft FarmBeats requires to move its technology into parts of the world where precision agriculture can boost food production.

The WirelessWhitespace website says, "Regulators around the world are moving towards allowing unlicensed access to these frequencies, subject to the proviso that licensed transmissions are not adversely affected. By allowing access to these white space frequencies, more effective and efficient use of the radio spectrum is envisaged.

Much of the excitement surrounding white space stems from the discontinuation of analogue TV signals in several countries and the spectrum this will free up. Some of this spectrum may be licensed for other uses in the normal way. In the UK, for example, the 'old' TV channels 61-69 (798-862MHz) have been assigned for LTE mobile use. But a good deal of the TV band channels 21-60 (470-790MHz) will be designated 'interleaved' spectrum, meaning that unlicensed users may interleave their transmissions in the white space gaps. Radiosignalsatthesetv frequencies make them suitable for travelling long distances, over hills and around or through buildings. ↗

# ONE AIR, ONESOIL

**O**ne atmosphere blankets the Earth. We all breathe that same air. We all walk on the same band of soil. We all grow food on the same band of soil. We have a lot in common, all of us who live on planet Earth. That's why **OneSoil** is an appropriate name for a new satellite-imaging organization that provides free images to farmers around the world.

OneSoil was co-founded in Belarus six years ago by Sasha Yakoviev. During an online interview from his office in Minsk, Yakoviev said their OneSoil service was initially envisioned as a precision agricultural service to farmers in developing countries. However, they now provide free images to anyone, including farmers on the Canadian Prairies.

Yakoviev isn't expecting to compete with Trimble or Microsoft's new FarmBeats. He is clear about the role of money in his operation.

"We understand that to do something that impacts the world is impossible without money. We see money only as an essential resource to change the world for the better," Yakoviev said.

That sounds like doctrine from a diehard socialist. We asked Yakoviev if the previous communist/socialist environment of Belarus impacts the corporate culture of OneSoil?

"You asked a fascinating question. I wouldn't say the communist past of our country affects our vision at all. Communism doesn't work. Instead, our motivation is a sincere human desire to change something in the industry with our own hands and make a significant contribution to its development."

"We want more people, including the younger generation, to be involved in agriculture. We want being a farmer to be cool. We want new technologies to penetrate the industry, helping it to be more efficient. Our ambition is to have

BY RON LYSENG  
GLACIER FARMMEDIA STAFF



We want being a farmer to be cool. We want new technologies to penetrate the industry, helping it to be more efficient. Our ambition is to have every farmer on Earth to be using OneSoil.

SASHA YAKOVIEV  
ONESOIL FOUNDER

every farmer on Earth to be using OneSoil."

## Dial up any farm in the world

OneSoil has access to all current satellite information. Any farm in the world can be dialed up in a matter of minutes. They do this using free public data from the European Space Agency, with high-quality five-metre resolution. With this data, the team builds advanced image processing technologies. Initial image processing takes three or four days, but once the images are processed, they're available to anyone in a matter of seconds.

"The platform and application are free to any farmer anywhere. You register on our platform and start using in seconds. We believe modern technology must be available to every farmer on Earth. Our vision is to eliminate barriers in the way of widespread adoption of technology. A main barrier is the high cost of technology solutions. We break this barrier by providing solutions to farmers for free."

"Our revenue source at this moment is large institutions and large corporations for whom we provide images and analytics for a fee. In 2015 and 2016, three of us worked without a salary. Our first investment came in 2017. Now we have 30 professional specialists including agronomy people."

"To demonstrate our capabilities we created



an interactive map with data on 60-million fields in the (United States) and Europe. We already know more about fields than any company or state. Statistics from machine learning algorithms are often more accurate than those collected manually."

## Accurate statistics

OneSoil technology provides accurate statistics about fields and crops. Buyers and financial analysts will be able to predict yields and trends. Insurance companies will better assess risks. Corporations will find new customers.

Yakoviev says OneSoil differentiates from other platforms by making simple intuitive instruments. A farmer can simply click on his fields. OneSoil has already established all the borders of the fields in many countries. The satellite imagery is available within one second.

With data from the Copernicus Sentinel 1 radar satellite, the team finds the sowing date. Then they determine the stages of plant development using multispectral images. This helps a farmer choose the best time for application of fertilizers and pesticides.

Platform users add information about their fields,

allowing OneSoil to constantly improve their algorithms. The more data there is, the more accurate are their recommendations. And the farmer's job becomes faster and more efficient.

"Precision farming is not rocket science. Any farmer anywhere can start with his smart phone or android without spending extra money. Just get into OneSoil and then you start monitoring your fields. Our advantage is communication with the user with very simple and friendly language."

"If you already have layers of data on field maps, you can click on the OneSoil map and the borders will match up. You can see all your layers, you can see zones as applied maps and follow development of your crop day after day. Follow crop development or detect disease or weeds or other problems like drainage."

"We can analyze four years of information on your fields. And we draw the maps that you can use for fertilizer to apply different rates in different parts of the field. You don't need to pay for agricultural consulting to build these maps. All our maps are compatible with other systems. You can easily flow our map to your seeder or combine or other machinery."

Yakoviev says the team includes agrologists who direct the data analytical procedures.

It's not all satellite images and algorithms. OneSoil agronomists bring their knowledge to the field to ensure the system is functioning to serve their farmer clients. | ONESOIL PHOTO

Precision farming is not rocket science. Any farmer anywhere can start with his smart phone or android without spending extra money. We can analyze four years of information on your fields. And we draw the maps that you can use for fertilizer to apply different rates in different parts of the field. You don't need to pay for agricultural consulting to build these maps. All our maps are compatible with other systems. You can easily flow our map to your seeder or combine or other machinery."

Yakoviev says the team includes agrologists who direct the data analytical procedures.



OneSoil founders envision this free system will help farmers in Third World countries gradually move into precision farming. The main difference between OneSoil and established precision ag systems is that OneSoil is free. | ONESOIL IMAGE

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► One example of the free service the team provides is the Corn Kernel Calculator. Email a photo of a corn kernel to OneSoil and within seconds it will relay to you the number of kernels on that cob.

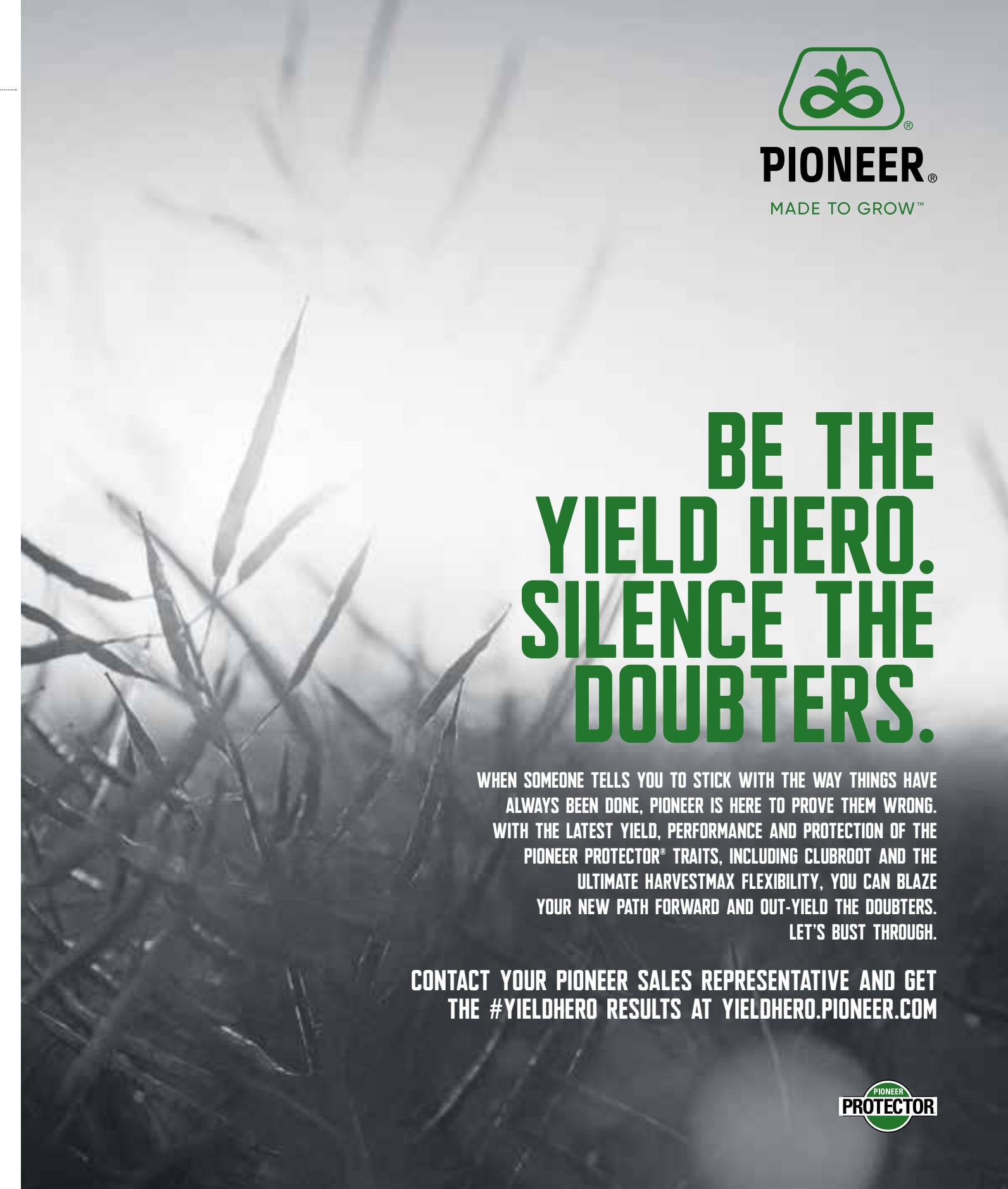
"We never share a farmer's data with third party. We are private company and we don't sell information to anyone."

"We are grateful to the European Union for the free and open satellite data it makes available through the Copernicus program and its fleet of Sentinel spacecraft."

Our last question to Sasha Yakoviev was how the business was surviving in the midst of protests in Belarus.

"Thank you for your worries," he said. "Guys from our team physically are fine but all our country is impacted. We live with a hope for change that was born." ►

Ron Lyseng is a reporter with The Western Producer based in Winnipeg, Man., who writes about agronomy, equipment and technology.



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## NEWLY DISCOVERED GENE CONFFERS FHB RESISTANCE

**THE DISCOVERY** | Scientists have discovered a gene in a wild relative of wheat that neutralizes the toxins making fusarium head blight such a troublesome pest for the cereals industry.

**THE RESEARCH** | The collaborative research involving researchers with Shandong Agricultural University in Shandong, China and USDA Agricultural Research Service (ARS) zeroed in on a gene in Thinopyrum wheatgrass, a wild relative of wheat that has been previously used to develop varieties of wheat with beneficial traits, such as rust resistance and drought tolerance.

They cloned the gene and introduced it into seven wheat cultivars with different genetic profiles to study its effects on plants grown under field conditions.



The results showed that the gene not only conferred resistance to fusarium (scab) in the new plants, it also had no negative effects on yield or other significant traits.

The study sheds new light on the molecular mechanisms that can make wheat, as well as barley and oats, resistant to the pathogen that causes FHB. New varieties of wheat with better FHB resistance using Fhb7 are expected to be available in a few years, the researchers say.

The researchers found that the gene effectively reduces FHB by detoxifying the mycotoxins secreted by the pathogen. The gene also confers resistance to crown rot, a wheat disease caused by a related pathogen.

Fusarium graminearum, and results in significant losses in the United States, China, Canada, Europe, and many other countries. ↗

New varieties of wheat with better FHB resistance using Fhb7 are expected to be available in a few years. | FILE PHOTO

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## SURFACE LEASES

**WHAT YOU SHOULD KNOW** | Landowners should understand their obligations for abandonment, reclamation and restoration when negotiating surface leases.



BY G. BRETT LEDINGHAM

G. Brett Ledingham is Team Lead, Energy and Mining Group, with McDougall Gauley LLP Defence Group in Regina.

Owners of surface parcels throughout the Prairies may be approached from time to time by an oil and gas, potash, or other natural resource, like geothermal, helium, lithium, wind power, and solar power, or mining company seeking to acquire surface access to the minerals that lie within, upon, or under such property.

In most instances the company will have already acquired the right to work the mineral resource and it now requires surface access to move forward with its project. The company will usually not be interested in purchasing the surface but rather will seek a surface lease from the landowner.

The surface lease will permit the company to use a portion, usually about five acres, of the land for the facility or development that is required.

In the vast majority of cases the company and the landowner will voluntarily reach an agreement on a surface lease.

Even though the oil and gas industry has developed a relatively standard form of surface lease, this form is not set in stone. A standard form of surface lease does not exist in the potash or other natural resource or mining industries.

Many of these companies will modify the oil and gas surface lease or develop their own form. Most companies use the form as a starting point and are prepared to negotiate many of the provisions contained therein.

Amongst other matters the landowner should (i) give careful consideration to the current use of the land as well as the future



anticipated use, (ii) obtain information about the operations proposed by the company, and (iii) consider how the operations proposed by the company will impact such use of the land.

These considerations will, in part, guide the amount of compensation to be paid under the surface lease but may also necessitate amendments to the so-called "standard form."

Historically, the courts held that the owner of the surface lands cannot deny access to a party that has the right to work the minerals underlying such lands.

Each of the three Prairie provinces have codified this case law in its surface rights legislation. In the event that the company and the landowner are unable to reach an agreement the company may apply for a right of entry under the surface rights legislation.

A right of entry will permit the company to access, acquire, and use the surface notwithstanding the landowner's objection.

The surface rights legislation in each province also provides for payment of compensation for the acquisition of surface rights,

off-lease damage claims (limited to \$1,000 in Saskatchewan), surface lease rental reviews, reclamation of abandoned sites, and the recovery for non-payment of surface lease rental payments (only in Alberta).

It is important to remember when negotiating a surface lease that the surface rights legislation in Manitoba only applies to oil and gas operations; in Saskatchewan it only applies to oil and gas and potash operations whereas it applies to all minerals in Alberta.

Another issue that is becoming increasingly important given the environmental, economic, and financial pressures on the oil and gas industry, in particular, is the significant increase in the number of inactive wells in each of the Prairie provinces, but especially in Alberta and Saskatchewan.

Although the legislation varies a bit from province to province, a company has a legislative responsibility to "abandon" a well if such well has been inactive for a certain period of time.

In Saskatchewan, a company is to abandon a well that has been inactive for more than 12 months,

unless other arrangements are made.

Abandonment with respect to a well is the permanent plugging or sealing of the well to prevent it from releasing toxic gases or other substances. Abandonment does not, however, result in the clean-up, remediation, re-contouring, reclamation, or rehabilitation of the surface.

Perhaps the more significant issue is, unless a spill or leak has contaminated the land and remediation is required, the legislation in Saskatchewan and Alberta does not provide a timeline within which a well site is to be restored or reclaimed following abandonment.

Restoration or reclamation refers to the process of cleaning up and contouring a well site, including the application of topsoil that may be required, to return the site as near as possible to its original condition. In Manitoba "restoration" is to be completed by the operator as soon as ground and weather conditions permit after abandonment.

A company may continue to pay the surface lease rentals with respect to abandoned well sites so the landowner may continue to receive compensation as it did when the well was active, but many companies, especially those facing financial difficulties, will cease making surface lease payments and ultimately these well sites may fall into the orphan well fund.

There is an impetus for a company to restore and reclaim these sites, since it will remove the liability from its balance sheet, it will improve its licensee liability rating that may result in a refund or reduction in the security deposit it is required to lodge with the respective provincial regulator and the federal government through the COVID-19 Economic Re-

sponse Plan announced a \$1.7 billion fund for the closure and reclamation of orphan and inactive wells in Saskatchewan, Alberta, and British Columbia.

A landowner in Alberta or Saskatchewan with an abandoned or long-time inactive well site on its land would be well-advised to contact the operator of such well while the federal funding is still available as it may bring the site to the attention of the company and the site may be eligible for such funding.

The process for abandoning and restoring a well site does not end once the site has been re-contoured and returned to a condition as near as possible to its original condition.

The final step is the rehabilitation of the site and the acknowledgement of the landowner.

It is not uncommon for impacts to be felt many, many years after reclamation has been completed. The provincial regulator in each province has developed procedures and guidelines for measuring the impact of the activity on the site versus the surrounding land.

In Saskatchewan, for example a detailed site assessment is conducted which includes, among other matters, a vegetation assessment.

With respect to grasslands and cultivated lands, if the vegetation on the reclaimed site is equal to or greater than 80 per cent of the control vegetation then the site does not require any further rehabilitation.

A surface lease can be very rewarding from a financial perspective, but a landowner would be well-advised to discuss and understand the obligations of the company not only when the well is active but also when the life cycle of the well is at an end before granting such a lease. ■

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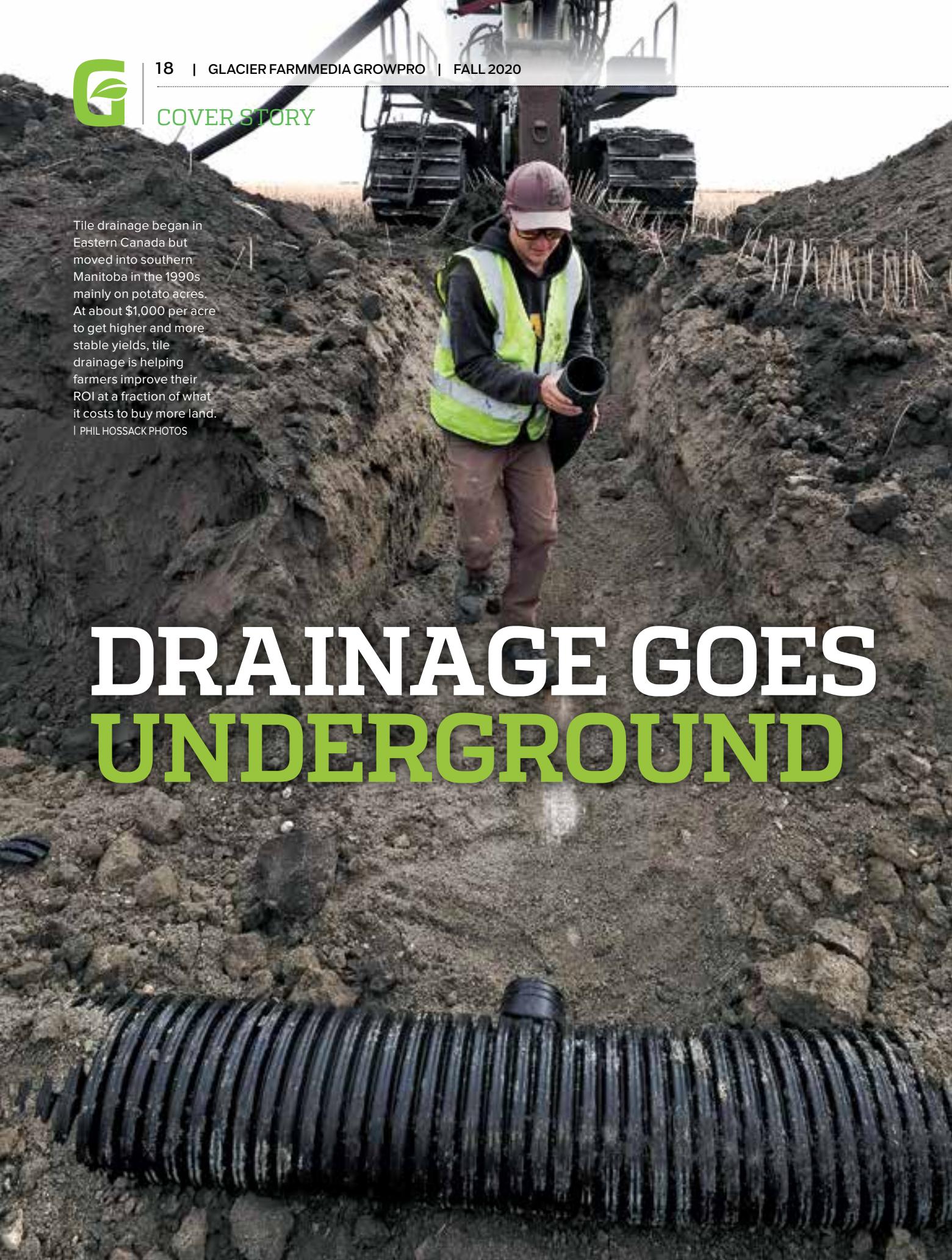
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Tile drainage began in Eastern Canada but moved into southern Manitoba in the 1990s mainly on potato acres. At about \$1,000 per acre to get higher and more stable yields, tile drainage is helping farmers improve their ROI at a fraction of what it costs to buy more land.

| PHIL HOSSACK PHOTOS

# DRAINAGE GOES UNDERGROUND



**A**grologists are well suited to identify potential areas in their clients' fields where tile drainage can have a big impact on profitability. After all, they visit the same places multiple times a year, and in some cases for many years, so they become familiar with trouble spots.

Knowing what makes a field a good candidate for a tile investment that will provide a clear return can be key to helping farm clients avoid making costly mistakes or getting swept up in the controversies surrounding all forms of drainage.

## First steps

Thomas Scherer of North Dakota State University conducts research on tile drainage and delivers presentations for organizations interested in the production practice.

He said the first step is to determine whether an elevated water table is at the root of a field's water woes.

"Just because you got stuck in some parts of the field doesn't mean that it's a high water table," Scherer says. "Visit with whoever works with the field to determine if it's a continual problem."

He's seen significant tiling investments wasted in fields that were tiled during a wet cycle but which drained little or no water once installation was complete because a high water table wasn't the issue.

Finding out the scale of a high water table problem across a field is important to help determine whether a pattern or targeted style of project is best suited to address the water issue.

"Pattern tiling is fairly common on relatively level fields because the problem is persistent right across the field. When you get into areas

BY ROBIN BOOKER  
GLACIER FARMMEDIA STAFF



Just because you got stuck in some parts of the field doesn't mean that it's a high water table. Visit with whoever works with the field to determine if it's a continual problem.

THOMAS SCHERER  
ND STATE UNIVERSITY

where there is a little more slope, they use targeted drainage where you identify the areas where you have water interfering with field and harvest operations," Scherer said.

## Soil profiles

Bruce Shewfelt of PBS Water Engineering has worked with tile drainage in Manitoba since the 1990s. He said a good first step is to look at the soil survey maps.

"Look at if it's rated poorly or imperfectly drained as opposed to well or rapidly drained. Look at the actual soils themselves, look at the soil profile to see if there are signs of the soil being saturated for extended periods of time," Shewfelt said.

A simple way to understand the water flow of your soil is to use a slotted piezometer, which is a slotted pipe that's installed three or four feet deep so that the water table can be periodically measured, possibly with an automated data logger.

"You can see what your water table is doing. It comes up in the spring, goes down in the fall, and you can see what points in time it might be impacting your crop," Shewfelt said.

"Other indicators such as crop yield and salinity might be associated with extended periods of higher water tables. You put all those things together and kind of come up with a zoning of your field."



Installation crews are in full swing from each autumn, from the time the harvest is off the field to freeze up. I PHIL HOSSACK PHOTO

#### Soil test

Agrologists know their way around yield and EM maps and they usually manage the soil testing program, so it's within their scope of work to tweak the sampling to help pull out zones in a field where tile will improve profitability.

Developing zones where a high water table is likely affecting field productivity for the farming customer will provide them with a good understanding of what their field needs before conversations with tile drainage contractors begin.

Scherer said the soil type on the surface isn't always what's below the surface where tile is installed, so a high resolution look at the soil profile in the specific areas being considered is often needed, including if and where the field has sand or clay layers and exactly where the elevated levels of salinity are.

For instance, if there is a heavy clay layer down where the tile pipe is installed, the tile will need to be installed closer together than if there is a sand layer at that depth.

#### Salinity

He said there are two main reasons why growers in North Dakota and the Red River Valley had tile installed. The first is excess water prevented field operations and the second reason is excess precipitation over the last 20 years raised the water table and brought dissolved salts to the surface.

"They've always been there but when you go through dry periods they just get pushed down. When you get the wet periods and the water table rises to the surface and previously farmable land becomes very difficult," Scherer said.

He said there are plenty of areas in Saskatchewan, southern Manitoba and northern parts of

South Dakota where pieces of shale were deposited by glaciers.

The shale is the remnants of an old inland sea so they are full of salts, and when water comes into contact with them some of these salts go into solution, Scherer said.

Just focusing on surface drainage won't solve salinity issues, because the minerals are down below. Scherer said to prevent the salts from rising to the surface it is necessary to remove them through subsurface drainage before they have a chance to surface. Another way is to plant a crop with deep roots, such as prairie grasses that use all the water in the top six to eight feet and prevent the water table from rising up to the surface.

Shewfelt said there are situations where elevated salt levels are associated with deeper upward movement of the minerals, and these scenarios are much trickier to tackle with tile.

In many instances it is possible to turn some salinity problems around with tile drainage, but in order for this to occur, there needs to be an adequate amount of water flowing through the tile.

Tiles can collect salts that are coming up towards the surface in the groundwater and precipitation will dissolve salts near the surface and wash them away through the tile.

#### EM mapping

Shewfelt was involved with work near Winkler, Man., from about 1995 to 2010 where the team conducted EM38 mapping of a potato producer's field with tile drainage.

"We did the EM mapping, that was a measure of salinity in the field over time, and initially there was something in the order of 20 per cent of the field that was slightly to weakly saline. By the end of that 15-year period it was down to about five per cent," Shewfelt said.

When it comes to understanding sodicity versus salinity in fields, the University of North Dakota has studied the feasibility of reclaiming sodic soils, including with tile drainage, and it found tile drainage by itself typically is not the solution for sodic soils and that soil amendments are usually required as well.

Another important step in the preliminary investigation into the suitability of tile drainage to manage a drainage problem is to make sure there is a place for the water to flow.

"You have to look at where the natural drainage is. Where does the water go that runs off that field currently? There are a lot of places in southern Manitoba and Saskatchewan where they don't have an outlet for the water," Scherer said.

"Not only know where it's going, but it has to keep moving. The water that comes off, you don't want it. Some of the biggest problems in tile drainage is people tile and then they dump into neighbours' and it ponds up."

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Filtered tile is necessary in some areas to prevent drainage tubes from becoming clogged with sediments. | GORD UNGER PHOTO



In areas where there is currently no outlet for tile water to flow, Scherer said lift pumps are now economically viable.

"You can buy pre-set up installations from both ADS and Prinsco to lift water if it's difficult to get it out. The big cost is putting them in, the pumping cost is not that great," Scherer said.

"The actual electrical lifting cost in this area is about \$6 an acre, and that was during some wet years."

Shewfelt said growers should be aware that when they put tile in the ground they change the hydrogeology of the field, with typically less surface runoff and more water flow through their soils.

"As the water flows through the soil you can pick up nutrients, mainly nitrogen, as opposed to surface runoff that contains phosphorus. You would also, in the case where you have saline soils, you could be picking up salt load," he said.

From a salt perspective it's a managed issue because you're trying to remove salts from the root zone, but you're not typically removing salts from deeper down.

"So it's a matter of understanding how much salt may be discharging out of your tiles and where it's going to end up. Typically that will dissipate over time," Shewfelt said.

"But that initial flush of salt, you want to make sure that it's getting diluted into the water system downstream."

The minerals dissolved in tile water will stay with the water as long as it keeps moving, whereas they will be deposited where the water stops and evaporation occurs.

A lot of the best management practices coming out of the upper Midwest states target nitrogen or nitrates in the tile water, because there are mil-



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THOMAS SCHERER  
ND STATE UNIVERSITY

lions of tiled acres in these states and they have a nitrate issue in their surface water from tile drainage, among other things, Shewfelt said.

"So they're specifically targeting practices to reduce that, and that would be saturated buffers, wetlands, controlled drainage and bioreactors."

Saturated buffers divert tile water into shallow laterals that raise the water table within the buffer, where perennial vegetation uses some of the water and thus slows water outflow from the tile.

However, Shewfelt said he is not aware of any laws in Canada that regulate the water quality of initial flow of tile water.

Shewfelt helped develop fact sheets on beneficial management practices for agricultural tile drainage in Manitoba for the Prairie Agricultural Machinery Institute (PAMI), including a section on nutrient management.

He said growers should be aware of how tile can potentially affect their fertilization program, especially when it comes to nitrogen inputs.

"If your water table is high and your tiles are running and if you apply fertilizer and it rains, then you're going to wash some of that out. The more timely you can put your fertilizer on relative to crop use the more efficient it is," Shewfelt said.

He said losses of applied crop nutrients through tile is a much bigger issue in the upper Midwest states because their tiles are running up to 11 months of the year, while in Canada, soil freezes over the winter which stops nutrient losses in through the tile.

Tile drainage factsheets can be found at: [bit.ly/360mH0u](http://bit.ly/360mH0u).

Robin Booker is a reporter with the Western Producer based in Saskatoon, Sask. Contact him at [robin.booker@producer.com](mailto:robin.booker@producer.com).

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## AMERICAN EXPERIENCE SHOWS TILE DRAINAGE PAYS WITH YIELD BONUSES

BY ROBIN BOOKER  
GLACIER FARMMEDIA STAFF

**T**wo studies published this summer show significant return on investment of tile drainage in American cropping conditions.

Eileen Kladivko of Purdue University published an update on a 35-year study on a 15-acre plot of poorly drained silt loam soil in Indiana where tile drainage was installed.

When the study began in the early 1980s most of the state's farmland already had tile drainage because of the high amount of precipitation the state receives, aside from fields with high silt content because this tended to plug traditional clay tiles.

"Farmers in that part of the state were asking Purdue when modern plastic perforated drain pipe came out in the 1970s to see if it would work on soils that were poorly structured with low organic matter," Kladivko said.

She said the study's key takeaways show that installation of tile drainage is a good long-term investment, it improves timeliness of fieldwork by one to 15 days, corn yields improved and it helps enable other conservation practices to work better such as cover crops and no-till.

The study used a five, 10, and 20-metre spacing of installed tile compared to a control.

"Crop yields (corn) increased, not every year but on average over the 35 years we had a significant yield increase. I think it was around 24 bushels on average," Kladivko said.

The study did not find a significant increase in soybean yields from the drainage treatment.

She said part of the yield increase came from the tile draining areas in the field where water used to pool and drown out the crop after high precipitation events.

Being able to get on the field and plant earlier on drained treatments also likely provided a yield ben-

efit because the undrained control plots were delayed between one to 15 days for tillage and planting compared to the narrowest drain spacing.

Kladivko said tile drainage helps both cover crops and no-till conservation practices.

"Once you drain the soil then the cover crops grow better, your no-till works better, so you kind of need to deal with drainage issues first before you can be real successful with some of those other conservation practices," Kladivko said.

Shawn Conley is a soybean specialist at the University of Wisconsin and participated in a separate multi-state tile drainage study that was also published this summer.

The study had two main approaches.

"We went out and found colleagues of mine across the north-central region that had replicated field experiments and drainage was the main factor. We had stuff from North Dakota, Minnesota, Iowa and Missouri. Some of this had been published but a lot of that data hadn't been published yet," Conley said.

For the second approach, researchers used funding from North Central Soybean Research Program to survey growers for information on about 8,000 farm fields across the north-central region to find out their agronomic practices, yield numbers and whether they reported tile drainage or surface drainage.

"What we found was across the entire region, average (soybean) yields with subsurface artificial drainage was eight per cent higher in the experimental field and four per cent higher (2.3 bushels per acre) in the farmer's fields," Conley said.

He said the yield response on the farmer-reported data likely came about because they were able to get into the field and plant about a week earlier where tile drainage was installed.

"They could plant seven days earlier. Depending on where you are in the Midwest, we can see up to half a bushel per acre per day yield increase by earlier planting," Conley said. ↗

 Crop yields (corn) increased, not every year but on average over the 35 years we had a significant yield increase. I think it was around 24 bushels on average.

EILEEN KLADEVKO  
PURDUE UNIVERSITY

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## UAVs HELP WHEAT BREEDERS

**THE RESEARCH** | Authors of a recent Crop Science article leveraged unmanned aerial vehicles (UAVs) to record the normalized difference vegetation index (NDVI), a measure of plant health, at the seed increase stage of the International Maize and Wheat Improvement Center's (CIMMYT) wheat breeding program.

**WHAT'S HAPPENING** | NDVI measurements were heritable and moderately correlated with grain yield, and results showed that selection based on NDVI would have outperformed visual selection.

Breeding programs for crops with limited per-plant seed yield require one or more generations of seed increase to generate sufficient quantities for sowing



GETTY IMAGE

replicated yield trials.

The ability to accurately discard low potential lines at these early stages may reduce spending on costly yield testing.

Breeders typically rely on visual selection at these stages because extensive measurement of plant traits is difficult due to the large number of lines under evaluation. However, recent advances in remote sensing have made high-throughput data collection increasingly feasible.

Harnessing UAV-collected traits to inform selection at the early stages may improve resource-use efficiency in breeding programs and/or increase rates of genetic gain.

As remote sensing technologies become increasingly automated and scalable, breeders will have access to comprehensive suites of traits with which to develop integrative selection strategies.

Source: American Society of Agronomy



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## GROUNDBREAKERS



# THE HEAD OF HIS CLASS

**GROUNDBREAKER** | Don Flaten is one of Canada's first agronomists — and he's been training them ever since.

BY ALLAN DAWSON  
GLACIER FARMMEDIA STAFF

**W**hen Don Flaten looks back over his career, one of the standout memories was a doubt-ridden walk across the parking lot at the University of Manitoba in 1995 as he transitioned from administrative duties to teaching.

"I didn't cross that parking lot with a lot of confidence that day. I really wondered if it would be a good move," recalls Flaten who worried whether he'd be able to refocus his career on teaching, research and extension after years in the faculty's administration.

"But I have never regretted it."

"I would say overall in my career the greatest fulfillment comes from teaching because of the suc-

cess I've seen in the students that I have had the privilege to teach," Flaten said during a recent conversation about his long career.

Flaten's love of sharing knowledge in the classroom and field is appreciated by his students; his 2020 graduating students bestowed on him the 'Second Year Teacher of the Year Award' last June.

Over the years Flaten has won more than a dozen teaching and public education awards.

Now 65, he retires Dec. 31 after 33 years as a member of the Department of Soil Science in the Faculty of Agricultural and Food Sciences, leaving a long legacy of important research and outreach related to agronomic and environmental management of commercial fertilizer, livestock manures, and soil, water and nutrient management for reducing nutrient loss.

Flaten has written, or co-authored, 80 peer-re-

viewed papers, plus many more to help farmers get the most from their fertilizer and manure in an environmentally friendly way.

Fellow extension agronomist Marla Riekman shares an image with Flaten at one of the few field days held in Manitoba this past summer. | GERALYN WICHERS PHOTO

viewed papers, plus many more to help farmers get the most from their fertilizer and manure in an environmentally friendly way.

But those accomplishments aren't what define the success of his career — at least not in his eyes.

"Last winter, one of the finest moments I had was visiting a young graduate and his father... to see how he was evaluating a decision about a land purchase," Flaten said.

"When I left the yard and I saw he and his father walking together... and saw how happy both of them were to be working together on their family farm, that to me was just wonderful. So whatever path the students have selected, it's wonderful to see them succeed. If teaching can help that happen, that's super rewarding."

## All for the students

Flaten has taught hundreds of agriculture students and supervised 22 graduate students since 1987, many of which followed his pioneering lead into the field of agronomy.

"Don is one of these people who is all for the students. He knows his students and he remembers his students," says his long-time research collaborator and friend Cynthia Grant.

"He works so hard so that students get as much as possible from their educational experience. He is very good at seeing where the kids are having problems and helping the brilliant ones to achieve their brilliance and helping the ones struggling a little bit to meet their potential and to grow."

John Heard, Manitoba Agriculture and Resource Development's soil fertility specialist, who along with Grant and Flaten are known as the "three amigos," shares Grant's deep respect for Flaten.

In a letter recommending Flaten for an award, Heard wrote that Flaten's students say his courses are among the hardest, but also where they learn the most.

## A first for agronomy

Flaten, who graduated from the University of Saskatchewan in 1978, was among the first crop of agronomy majors trained at a prairie university. Until then, agriculture students chose between soil or plant science.

Creating the agronomy program was recognition of how soil and plant science, along with economics, are critical to improving crop production, he said.



## LESSONS LEARNED OVER A LONG CAREER

- » The learning never stops when studying the interactions between soil, plants, water, nutrients, pests, and economic management.
- » Some of your best teachers will be the students and farmers you serve.
- » Balance principles with practices and technique with technology; Never lose sight of agronomic fundamentals.
- » Mistakes are a great learning opportunity.
- » Agronomy is a team sport; Build and maintain your network.
- » Embrace mentorship from others and invest in mentorship for others.
- » Agronomy is a journey, not a destination. Enjoy the ride.

Flaten, who grew up on a farm near Weyburn, is known by his friends to have a 'goofy' sense of humour. He's self-deprecating, usually smiling and insatiably curious.

"He is such a compulsive learner," Grant said. "He is not a guy who is going to sit around and become stale-dated."

Flaten's career-long interest in delving into the mysteries of soil fertility doesn't mean he's found it easy.

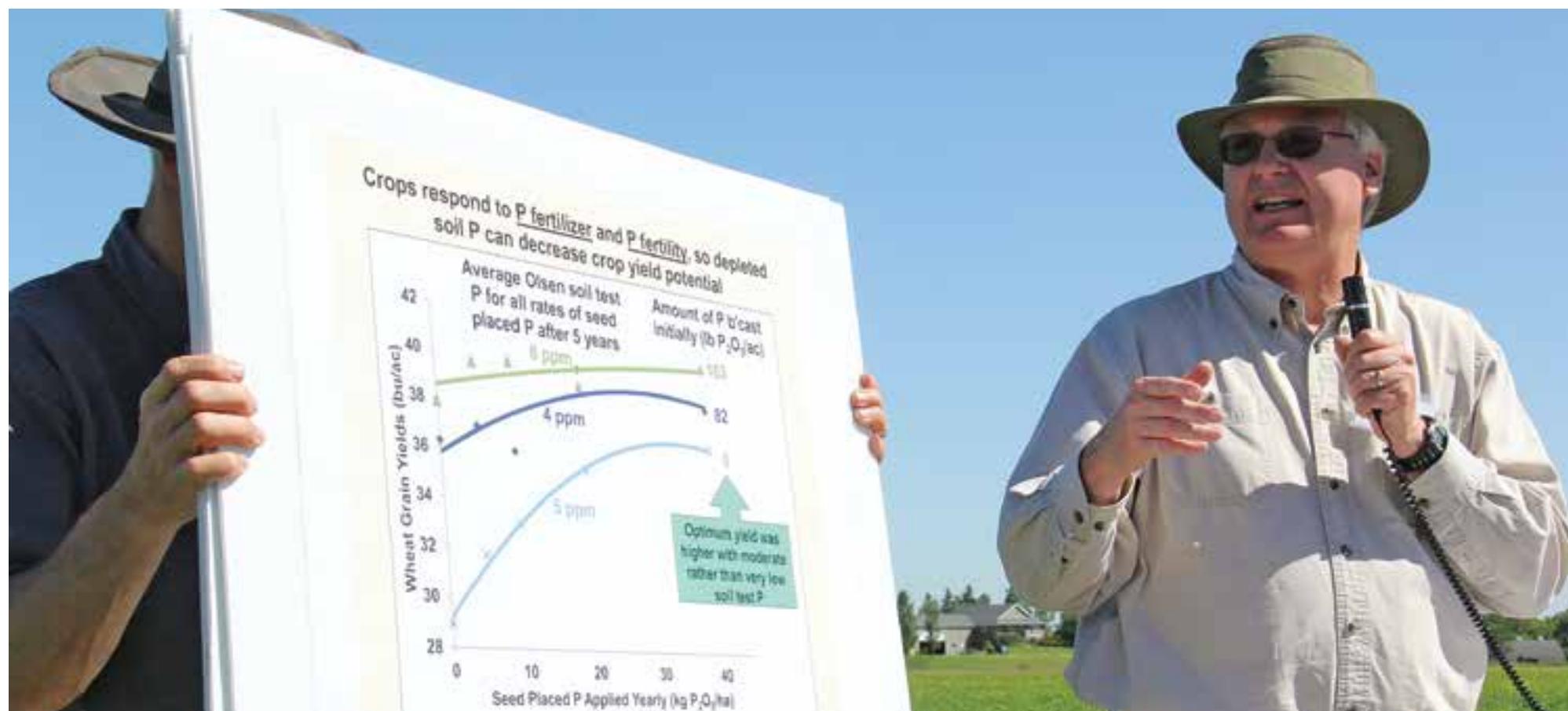
"(It) should be noted that my poorest grade in university was in soil fertility," Flaten said laughing. "It is something that has challenged me and I really needed to learn more about. To this day I feel I should learn more. One of the fortunate things about my career is that I have always had more to learn about soil fertility."

Flaten's first job after graduation was as a district agriculturist with Alberta Agriculture from 1978 to 1980.

"While I was working... in southern Alberta I noticed there were some really challenging decisions farmers and agronomists had to make about fertilizer and manure management," he said. "So I developed an interest and a plan to do a graduate program."

Flaten says he picked the University of Manitoba because of its great staff, including renowned soil scientist Geza Racz, who supervised Flaten. What began as a Masters degree looking into the interactions between banded fertilizers became a PhD.

He was appointed as the Director of the University of Manitoba's School of Agriculture



"You need to consider the local conditions you're working in whether it's agronomic or environmental concerns that you are dealing with," Flaten says. "You have to be very, very careful about imported science."

I ALLAN DAWSON  
PHOTO

from 1987 to 1990 and then its associate dean until he turned to teaching in 1995.

Teaching, research and outreach have been rewarding, but required collaboration.

"I would really like to highlight that as the one of most important things in my career — the delightful collaborations across the industry," Flaten stressed. "We're fortunate to have a very collaborative, collegial agricultural community in Manitoba... and I have learned as least as much from my students, farmers and agronomists and the ag community as I might have been able to share with them."

#### Collaborations and controversy

Those collaborations paid off immeasurably when the research involved controversial issues such as nutrient loading in Manitoba's waterways.

Flaten was one of the researchers behind a multi-disciplinary effort to better understand how phosphorus was getting into waterways and became the face of "phosphorus tea."

Some dubbed them "heretics" after their findings challenged conventional wisdom that considered zero-tillage the answer to controlling nutrient runoff. But the science was solid.

It was widely believed, based on U.S. research, that phosphorus entered waterways attached to

soil particles. So it stood to reason that controlling soil erosion was synonymous with preserving water quality.

However, that research was conducted in regions that aren't covered with snow for several months of the year.

Twenty years of research on the South Tobacco Creek Watershed of southern Manitoba showed phosphorus loading was higher from zero-till or forage riparian zones than from fields under conventional tillage.

Plant residues subject to freezing and thawing break down during snowmelt releasing dissolved phosphorus that became to be known as "phosphorus tea."

"It once again shows you need to consider the local conditions you're working in whether it's agronomic or environmental concerns that you are dealing with," he said. "You have to be very, very careful about imported science."

Flaten also inadvertently became a controversial figure in the heated and highly politicized debate surrounding hog industry expansion in rural Manitoba. Many blamed hog barns for the rising levels of nutrient contamination in Lake Winnipeg.

"Remember the largest confined feeding operation in Manitoba is the City of Winnipeg," Flaten said

then as he says now. "And we're the only major city in the Lake Winnipeg watershed that doesn't have phosphorus removal in our sewage treatment system — so that's another challenge."

Flaten has also repeatedly underscored the need for phosphorus stewardship because it is a finite resource necessary for food production.

"I think most people are talking about no severe shortages for several more decades. Beyond that I think it's anybody's guess. Regardless, it's a very, very important resource that supports our entire food system. So long-term phosphorus stewardship is a very important issue."

He may be retiring, but Flaten hopes to continue some affiliation with the university.

"But I want to make sure I have the flexibility to have more time, not only for myself, but my family," Flaten said. "Retirement is an important step towards doing some other things."

Such as?

"Nothing specific, but I am looking forward to having weekends off."

Allan Dawson is a reporter with the Manitoba Co-operator based in Winnipeg, Manitoba. Contact him at allan@fbcpublishing.com.



## THE CARROT AND THE CACTUS

**THE RESEARCH** | Researchers from Pennsylvania State University are looking at different root structures to determine what grows a better bean.

**WHAT'S HAPPENING** | "Grain legumes are critical for global food security, but achieve low yields in most areas," says Jonathan P. Lynch, a professor at Pennsylvania State University. "This is especially true in areas of the developing world that experience drought, heat, and low soil fertility."

Breeding is a way to improve how crops perform in different environments. But looking at the roots for beneficial characteristics for breeding is rarely part of the equation.

"Optimizing how plants get resources from the soil in stressful environments is important for increasing food production, but specific breeding objectives are ill-defined," Lynch says. "We sought to test hypotheses about the link between root system architecture and life strategy in order to generate breeding targets."

Examining the root systems of beans and other legumes allowed them to see trade-offs and to determine what kind of root characteristics would perform better in certain environments.

Roots explore both the topsoil and subsoil. Nutrients like phosphorus and potassium are more present in the topsoil, while water and nitrogen are usually deeper in the soil. Many crops focus on one or the other of these soil layers, which results in a trade-off.

The researchers say that breeding programs could use trait-based selection on root characteristics they are interested in. They could then use various techniques to get well-adapted plants with stronger primary roots or longer root hairs, for example. "Root architecture is an important component of crop adaptation to environments where water and nutrients are lacking," Lynch says. "We suggest that root phenotypes capable of balancing topsoil and subsoil exploration would be useful."

This typical soybean root system was grown at the Apache Root Biology Research Station in Wilcox, Arizona. | JAMES BURRIDGE PHOTO



Root architecture is an important component of crop adaptation to environments where water and nutrients are lacking.

**JONATHAN LYNCH**  
PENNSYLVANIA  
STATE UNIVERSITY

Source: Crop Science Society of America.

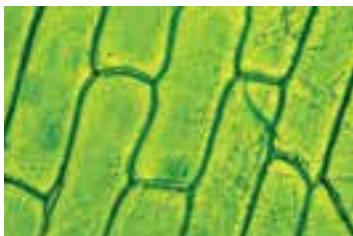
## HOW PLANTS SHUT THE DOOR ON INFECTION

**THE RESEARCH** | International team including University of Maryland researchers discovers key immune system protein in plants.

**WHAT'S HAPPENING** | Plants have a unique ability to safeguard themselves against pathogens by closing their pores, but until recently, no one knew how they did it.

Scientists have known that a flood of calcium into the cells surrounding the pores triggers them to close, but how the calcium entered the cells was unclear.

A new study by an international team including University of Maryland scientists reveals that a protein called OSCA1.3 forms a channel that leaks calcium into the cells surrounding a plant's pores, and they determined that a known immune system protein triggers the process.



mune system protein triggers the process.

The findings are a major step toward understanding the defense mechanisms plants use to resist infection, which could eventually lead to healthier, more resistant and more productive crops.

"This is a major advance, because a substantial part of the world's food generated by agriculture is lost to pathogens, and we now know the molecular mechanism behind one of the first and most relevant signals for plant immune response to pathogens — the calcium burst after infection," said José Feijó, a professor of cell biology and molecular genetics at UMD and co-author of the study. "Finding the mechanism associated with this calcium channel allows further research into its regulation, which will improve our understanding of the way in which the channel activity modulates and, eventually, boosts the immune reaction of plants to pathogens." ↗

Source: The research paper was published on August 26, 2020 in the journal *Nature*

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### Monitoring Clubroot in Saskatchewan



This year, we're ensuring that growers have the tools they need to detect clubroot on their farm through the 2020 fall clubroot soil testing program, offered by SaskCanola and the Saskatchewan Ministry of Agriculture. As part of this program, a grower can request a soil sampling bag, collect soil from their field and submit it for testing (\$100 cost covered by SaskCanola).

Agronomists who would like to have a bundle of soil testing bags on-hand for clients should contact SaskCanola at (306) 975-0262



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# ADVANCING WOMEN GOES VIRTUAL

**WHILE COVID-19** has taken away the ability to meet in person at the Advancing Women in Agriculture Conferences (AWC) in 2020, organizers of the well-known gathering will hold a virtual conference on November 24 & 25, 2020 with new ways for women in agriculture to connect.

"Our past conference attendees have told us there is power in gathering - to share experiences and learn from each other," says Iris Meck, Director of Conferences for Glacier FarmMedia, and organizer of AWC.

"COVID-19 has created so much uncertainty and changed so many in-person plans this year that it made us more determined to find a way to reach out to our community of women in ag – university and college students, farmers, ranchers, entrepreneurs in the ag and food sector, representatives of grower associations and corporate agribusiness."

The new AWC 2020 Virtual Conference will take place online for a cost of \$250 per person. Attendees will be able to view the conference sessions from wherever it works for them – whether on their mobile



devices or a computer. Online sessions feature a wide variety of speakers on mental health, managing stress, running a farm business, advocacy, developing communication skills and more.

**Conference attendees will be able to post questions or comments on each presentation's live chat feature, visit virtual booths for the sponsors from leading Canadian agriculture companies and associations, book meetings with sponsor representatives and get special conference offers from sponsors.**

"We'll have the same superb quality of speakers and information that women in ag have come to expect from our conferences," says Meck. "With our new virtual conference format, women in agriculture will also have a way to connect with one another on the platform, and, if they want, take future conversations offline in a way that suits them."

Meck says that AWC virtual speaker sessions and sponsor information will be available until December 31, 2020 for those registered attendees who wish to view the sessions and chat discussions but may be unable to attend during the designated conference days.

Meck notes that a virtual format also allows women in ag beyond Canada to register and connect with other women at the conference, something that she has been asked about in the past.

"Connecting with others passionate about agriculture across geographical boundaries has always been an important part of our conferences," says Meck.

**"In today's world, where so many women in ag are facing uncertainty and constant change, we wanted to provide a platform for women in ag to connect with their community, find encouragement through guest speakers and build the skills they need to run their businesses and thrive in life."**

Registration is now open for the Advancing Women in Agriculture virtual conference, with more information on the speaker program at [www.advancingwomenconference.ca](http://www.advancingwomenconference.ca).

# THE BENEFITS THE CONFERENCE BRINGS TO WOMEN IN AGRICULTURE

**WOMEN HAVE BEEN** a crucial part of farming operations and agricultural organizations across the country for decades. Women in agriculture have a powerful story to tell. One of leadership, taking risks, embracing opportunities, building stewardship and increasing resilience – from the combine and barn to the boardroom.

In 2014, the first Advancing Women Conference (AWC) brought together a group of Canadian women leaders in agriculture to discuss the opportunities and challenges that women face in the industry and the skills and tools needed to hone their leadership skills. This inaugural conference attracted some 400 women from six provinces and five US states representing over 130 organizations.

"It became apparent through this group of women leaders that there was a strong need for women in every sector of agriculture and food to hear and learn from the experiences of successful women," says Iris Meck, founder of the conference and



Director of Conferences for Glacier FarmMedia. "With this as our guiding principle, we have never looked back, and, to date, AWC has hosted over 5,500 women at 11 conferences."



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## VIRTUAL PLATFORM FORGES SPECIAL CONNECTIONS

**OVER THE LAST** six years, Advancing Women Conference attendees have represented every sector of the industry from primary production (farmers and ranchers), ag retailers and dealers, corporate agribusiness, business owners and entrepreneurs in the ag and food industry, representatives of grower associations and farm-focused ag associations, and government and academia. Each conference, between 25 and 40 students studying agriculture at Canadian universities and colleges also attend.

These young future leaders learn from the presentations that there are tremendous career options in agriculture, but attending the conference also gives them an opportunity to meet women in the industry who can provide guidance and mentorship. Many students also find prospective employers at the conference.

As one student conference attendee in Ontario put it, "Attending the conference opened up my eyes about how much women can impact the agriculture industry."

At the 2020 virtual online Advancing

Women in Agriculture Conference on November 24 & 25, connections will still be possible. Conference attendees will be able to participate in online sessions by asking questions of speakers and connect and chat with other delegates.

One of the great features of our conference platform is the ability for attendees to build their own database of other women passionate about agriculture, then download those connections for future networking.

Virtual booths at the conferences will showcase AWC Virtual 2020 sponsors and give attendees a chance to book meetings and chat with company representatives through text or video.

All speaker video presentations will stay on the virtual platform after the conference so registered attendees can log in and view the content until midnight on Dec. 31.

Any conversations that occurred in the chat during the presentation are also saved in the platform so attendees can see what the virtual discussion was like, even after the presentation ends.

While many agriculture-related companies choose to be a sponsor of the Advancing Women in Agriculture Conference, and demonstrate they recognize the important contribution women in all sectors of agriculture make to the industry, several organizations also see it as a way to train and energize their staff.

**"At Cargill, we are committed to creating an inclusive workplace that fosters growth and development for all our employees," says Jeff Vassart, President, Cargill Limited.**

**"The Advancing Women Conference reflects this and is a great way to accelerate the development of women at Cargill and in Canadian agriculture. Our employees return from the conference energized, motivated and excited about what they learned and the networking they were able to do. It is exciting to see women in agriculture gathering in such an engaging way and Cargill is proud to be a sponsor of this event."**

## THE FOUR PILLARS OF INFORMATION

**THE ADVANCING WOMEN** in Agriculture Conference speaker lineup frequently includes women who are company owners, executives, authors and many others who hold leadership positions in the industry. The conference aims to cover a wide variety of topics to provide women with inspiration in several areas of interest.

The quality of conference speakers is a key attraction for AWC delegates. While the lineup of speakers for each conference is unique, conference director Iris Meck says that she builds each conference agenda to address learning in four key areas.

### 1. FINANCIAL MANAGEMENT & INDEPENDENCE

Producers and executives share economic and management tools to help others navigate through financial challenges, minimize risk, manage succession plans and work toward a strong, stable and sustainable supply chain.

### 2. COMMUNICATION

Many speakers tell their stories, share ways they advocate in the industry, and talk about

the importance of coaching and mentorship. A popular topic is looking at strategies to help consumers understand the story of agriculture.

### 3. CAREER BUILDING & SETTING GOALS

The conference presents ways to participate on a board or committee and shape the future of agriculture, negotiating with others including ways to get your point across, how to be a team leader, self-awareness and self-management, motivating others and gaining a better understanding of who you are.

### 4. HEALTH & WELL BEING AND BALANCE-OF-LIFE SKILLS

How many balls are you juggling? How much time are you taking for yourself?

The demands of our daily working and personal lives can create stress. We discuss how to understand the impact of stress and recognize what happens when we are emotionally triggered, plus ways to recognize stress in others and what kind of next steps can be taken. In addition to mental health, many speakers address tips and tools that help enhance physical health.

## JOIN OUR COMMUNITY

Connections are so key to who we are. The Advancing Women in Agriculture Conferences make it possible to step outside a sometimes geographically isolating environment and reach out to others who understand the unique challenges and opportunities for women in agriculture.

Invest in yourself, and get inspired by joining us at the upcoming AWC Virtual Conference on November 24 & 25, 2020.

More information can be found at [www.advancingwomenconference.ca/2020virtual/](http://www.advancingwomenconference.ca/2020virtual/).

See you there!



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Sonya shares three key elements that allowed her to succeed.

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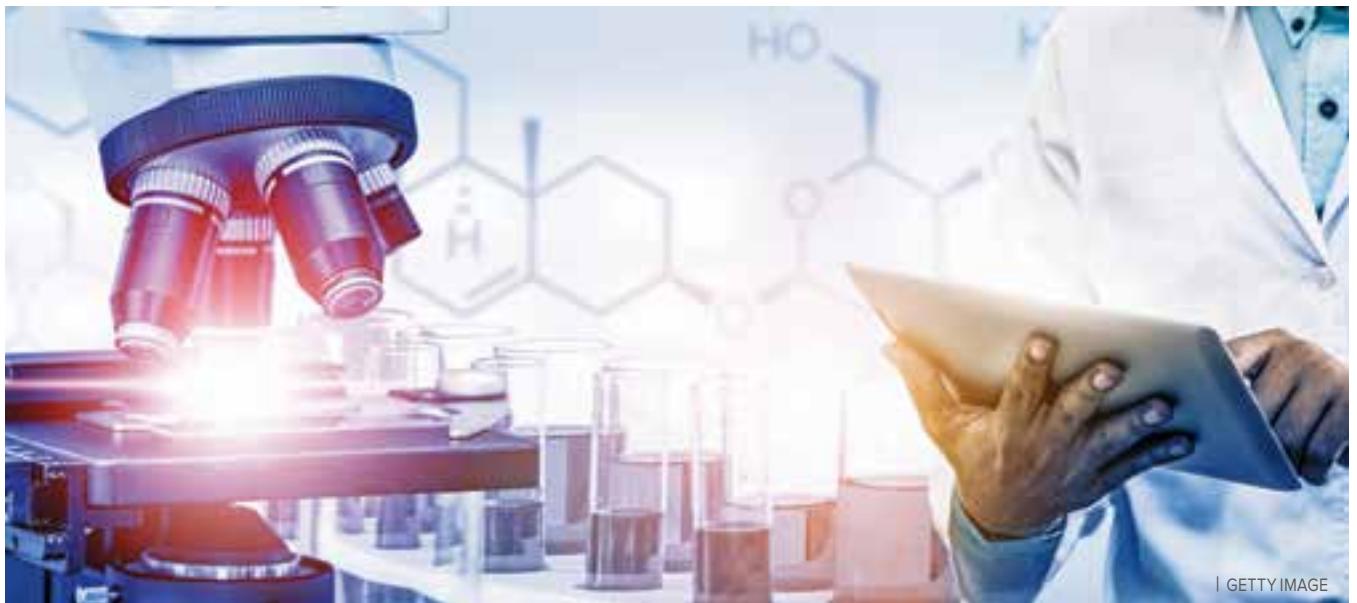



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| GETTY IMAGE

#### FOUR OVERARCHING RESEARCH GOALS:

- » Harness plants for planetary resilience;
- » Advance technology for diversity-driven sustainable plant production systems;
- » Develop 21st-century applications of plant science to improve nutrition, health, and well-being;
- » Launch the "Transparent Plant", an interactive tool to discern mechanisms and solve urgent and vexing problems.

#### HUMAN RESOURCE GOALS:

- » Reimagine the workplace to nurture adaptive and diverse scientists;
- » Build capacity and interest to engage with plant science.

## PLANT SCIENCE RESEARCH: A VISION FOR THE NEXT DECADE

**THE RESEARCH** | The U.S.-based Plant Science Research Network (PSRN) has released a new vision statement it hopes will guide global plant research over the next decade.

**WHAT'S HAPPENING** | The report, *Plant Science Decadal Vision 2020-2030: Reimagining the Potential of Plants for a Healthy and Sustainable Future*, outlines bold, innovative solutions to guide investments and research in plant science over the next 10 years.

The PSRN is calling on its community to unite around the Decadal Vision's priorities and to inspire their government representatives and fellow community members.

"The Decadal Vision is a community-wide vision that is a powerful tool for communication and advocacy," said David Stern, president of the Boyce Thompson Institute and corresponding author. "After all, the public should be the ultimate beneficiary of the vision."

The key message is that without sustained investment from multiple sources, including government, industry and philanthropy, the research to generate innovative solutions is at risk, the proponents say.

The Decadal Vision grew out of Plant Summit 2019, a conference held February 10-13, 2019, at Biosphere 2 in Arizona.

"50 diverse participants — including scientists, industry representatives, educators and advocates — discussed the future of research, training

and infrastructure," says Stern, who is also an adjunct professor of plant biology in Cornell University's College of Agriculture and Life Sciences.

"From that meeting, the writing team developed the Decadal Vision as a rallying cry for all plant scientists to unite around a common vision, inspire new collaborations to pursue interdisciplinary research goals, and implement new paradigms for professional development that will catalyze a more diverse, inclusive, and equitable future."

The Decadal Vision recognizes the intersection of human and scientific elements and demands integrated implementation of strategies to advance research, people and technology. The vision is presented through eight specific and interdisciplinary goals, each with an accompanying action plan.

#### Agriculture and food

When it comes to agriculture, "Increasing food production may not be the solution," explains co-author Ole Wendorff, professor of soil science at the University of Kentucky.

"Food needs to be produced more sustainably, and plant science plays an important role in this for the future. Farmers that I have worked with are very willing to take this bold step as long as they can produce a safe farm income."

"What I like about the Decadal Vision is that equity and justice were part of the vision right from the beginning, and not just tacked on at the

end," says co-author Madelaine Bartlett, an associate professor of biology at the University of Massachusetts Amherst. "Everyone should have the same opportunities that I have had, but that is simply not the case right now. It is hard work, but it can be done and it must be done."

Bartlett adds that collaborations among people from many scientific disciplines is the new normal, and the PSRN has strengthened connections between scientific societies.

"My research is in the intersection of genetics, bioinformatics, developmental biology and evolutionary biology, so I belong to four different research societies," she says. "I hope this report will help knock down those barriers and stimulate more research that integrates multiple disciplines."

Co-author Eric Lyons, associate professor in the School of Plant Sciences at the University of Arizona, says such new technologies are necessary because plant research is a diverse set of sciences that span from molecules to the entire planet.

"Addressing the most pressing questions of plant research requires an unprecedented level of co-ordination, collaboration, and training across many disciplines of science," says Lyons. "This Decadal Vision is essential to bring a common voice to the needs of these diverse researchers and the central role that data science plays in facilitating integrating information to make new discoveries to improve the human condition through plants and agriculture."

#### Funding diversity

While the Decadal Vision makes a case for new funding, obtaining that support will require plant scientists to engage the public and advocate for needed resources.

Indeed, federal funding agencies, private philanthropies, corporations and entrepreneurs, are all necessary for plant science to have a maximum impact on enhancing human health, improving environmental quality, boosting the economy, and benefitting global equity and justice.

"Plant science gets such a small piece of the funding pie. If there are going to be solutions to surviving climate change, then plants are going to be a critical part of those solutions," says Bartlett.

Wendorff believes that funding agencies can foster plant science discoveries to address pressing global issues by calling for proposals in forward-thinking, interdisciplinary research with speculative outcomes. "This would help harness scientific creativity in a similar way that venture capital is used to invest in long-term growth potential opportunities," he says. ↗

Source: Boyce Thompson Institute Release

## NEONICS RAISE NEW CONCERN

**THE RESEARCH** | Researchers from North Carolina State University and Pennsylvania State University say there is now evidence that shows neonicotinoid impacts are more widespread than previously thought.

**WHAT'S HAPPENING** | In an opinion in the journal *Proceedings of the National Academy of Sciences*, the authors say neonics should be discontinued as a seed treatment because of the potential impacts on non-target species.

They say the research has focused on transmissions of the insecticide from a plant to a particular pest to the predator of that pest. However, "it has ignored the hundreds of other herbivores that are also on that plant, and also transmission of that material to their predators. That's where the food web concerns come in that we're interested in," said Steven Frank, a professor in North Carolina State's Department of Entomology and Plant Pathology.

A study led by researchers from the Valencia Institute of Agricultural Research showed that neonicotinoids can be transmitted in a sugary liquid called "honeydew" that is excreted by certain insects like aphids, mealybugs and whiteflies. Other bugs consume honeydew, including hoverflies or parasitoid wasps and also ingest the toxin.

"We've known that neonicotinoids can be transmitted through nectar and pollen and can harm pollinators that way — directly from the plants," Frank said. "We've known that if herbivores feed on the plants and predators eat those herbivores, that they could be harmed because the neonicotinoids accumulate in the herbivores' bodies."

"This was a new revelation that it could be transmitted through the herbivore to the environment as a carbohydrate that a lot of animals feed on."

"This adds one more example of how the material can move in a three-part food chain from the plant to an herbivore to a predator," Frank said. "Our concern is that if it can do that, it seems evident that it could spread much wider throughout the entire food web because insect populations are so diverse and abundant on plants."

Frank said if ingested by organisms that are not killed directly, those organisms could pass the toxin on to insects, birds, amphibians or others.

Neonicotinoids have become the most widely used insecticides in the world since their introduction in the 1990s. In 2014, these products represented 25 per cent of the global pesticide market. ↗



This adds one more example of how the material can move in a three-part food chain from the plant to a herbivore to a predator. Our concern is that if it can do that, it seems evident that it could spread much wider throughout the entire food web because insect populations are so diverse and abundant on plants.

**STEVEN FRANK**

NORTH CAROLINA STATE UNIVERSITY



Source: *Proceedings of the National Academy of Sciences*.  
The authors were Frank and J.F. Tooker of the Pennsylvania State University Department of Entomology.

## RESEARCH BRIEFS

The traditional system can put a heavy workload on the peers chosen to review scientific proposals. | GETTY IMAGE

## PUTTING MORE SCIENCE INTO SCIENTIFIC REVIEWS

**THE RESEARCH** | Machine learning matches topics with best experts on the subject.

**WHAT'S HAPPENING** | A team of scientists led by Michigan State University astronomer Wolfgang Kerzendorf has tested a new system that distributes the workload of reviewing project proposals among the proposers, known as the "distributed peer review" approach. Kerzendorf says the proposed method is as effective, if not more so, than the traditional peer-review method.

The team enhanced it with two other novel features: Using machine learning to match reviewers with proposals and the inclusion of a feedback mechanism.

This process consists of three different features. First, when scientists submit a proposal for evaluation, they're asked to review several of their competitors' papers, a way of lessening the number of papers one is asked to review.

"If you lower the number of reviews that every person has to do, they may spend a little more time with each one of the proposals," Kerzendorf said in an MSU release.

Second, by using machine learning, funding agencies can match the reviewer with proposals of fields in which they are experts. This process can take human bias out of the equation, resulting in a more accurate review. Kerzendorf said.

"We essentially look at the papers that potential readers have written and then give these people proposals they are probably good at judging. Instead of a reviewer self-reporting their expertise, the computer does the work."

Third, the team introduced a feedback system in which the person who submitted the proposal can judge if the feedback they received was helpful.

To do the experiment, Kerzendorf and his team considered 172 submitted proposals that requested use of the telescopes on the European Southern Observatory in Germany. All were reviewed by the traditional and new processes. The results were statistically indistinguishable. ↗



## 'SUPERFOOD' WHEATGRASS BUILDS BETTER SOIL

**THE RESEARCH** | A food-grade variety of perennial wheatgrass is poised to take its place in the line-up of soil-building crop options available to farmers.

**WHAT'S HAPPENING** | MN-Clearwater was recently released by the University of Minnesota after a collaboration with the Kansas-based Land Institute crossed seven wheatgrass parents with desired qualities.

These qualities include high grain yield and seed size. "Because wheatgrass is a perennial, it's known to be a soil builder," said James Anderson, a professor at the University of Minnesota. "It provides soil cover throughout the year."

Wheatgrass is packed with beneficial nutrients, which makes the crop a popular superfood. However, historically, wheatgrass has been used as a crop in animal feed. Now, this eco-friendly and cost-effective crop can be commonly grown as human food, too.

"The Land Institute has been breeding intermediate wheatgrass since 2002," Anderson said. "Developed using germplasm provided by The Land Institute in 2011, this variety of wheatgrass is the first to be available for public use."

In addition to providing soil coverage, wheatgrass also has deep, dense roots that capture nutrients before it gets into groundwater. This helps to protect groundwater-based water systems.

Other benefits of this new wheatgrass variety compared to other crops like corn and soybeans, are less soil loss from the field, fewer chemicals and fertilizers entering the groundwater system, and improved carbon storage.

There are also economic advantages for the farmer growing wheatgrass. As a perennial crop, wheatgrass uses less fertilizer and machinery than annual crops.

"Wheatgrass can lower the growth of certain weed species," explains Anderson. Natural weed control also reduces potential costs for herbicides.

For farmers, the big advantage is that they only must plant once every three years and will have multiple harvests off of the one crop.

"But the farmer isn't the only one who benefits," explains Anderson. "As the first food-grade wheatgrass, food processors and consumers can see a benefit, too."

End-users are always searching for new items. MN-Clearwater wheatgrass provides new flavours and nutritional properties that can be added to food products.

The harvested wheatgrass goes well with wheat-based products. It can be used as a replacement for wheat, but it is best used with it. By using both wheat and wheatgrass as ingredients, the product can maintain its baking and functional properties while offering new flavors.

The first registered food product using the MN-Clearwater wheatgrass was a beer from Patagonia Provisions, and other products include several locally brewed beers and a limited-edition cereal from Cascadian Farm. ↗

Source: Journal of Plant Registrations

## BIOLOGICAL CONTROL AGENTS CAN PROTECT SOYBEANS FROM DISEASE

**THE RESEARCH** | One of the most destructive diseases of soybean, SDS is especially severe in the Midwest and Northcentral regions of the U.S. where high soil humidity and cold weather help the disease grow.

**WHAT'S HAPPENING** | Current management practices, which include using fungicide seed treatments and tolerant soybean varieties, add production costs, reduce profits, and can ultimately be ineffective.

Recently, Mirian Pimentel, a PhD student, and a group of plant pathologists at Southern Illinois University, observed that several biological control agents (BCA), or beneficial fungi, were able to substantially reduce the growth of the causal pathogen agent of SDS. In some cases, these agents even overgrew the pathogen, parasitized it, and displayed evidence of "feeding" on it.

They found that isolates from the genera Trichoderma showed the highest inhibition of SDS-pathogen growth and even reduced root rot. Additionally, these agents interacted with soybean plants to colonize their roots and activate plant defense-related genes, which help the soybeans fend off attacks from pathogens.

"Our results highlight the potential of Trichoderma isolates native to soybean production fields in inhibiting pathogen growth and reducing SDS severity, providing additional tools for biological control in soybean production," said Dr. Ahmad Fakhouri, a plant pathologist at Southern Illinois University.

"The integrated use of biological control with other management practices can be valuable for sustainable and cost-effective protection of soybean from yield losses." ↗

Source: American Phytopathological Society



# FARM FORUM EVENT MOVES ONLINE

**THE FARM FORUM EVENT**, a future-focused agriculture production conference, is going virtual on Nov. 9 & 10, 2020.

The virtual conference will bring progressive farmers, agronomists, innovators, researchers and strategists from across Canada together to learn about the latest in politics, trade, climate, technology, ag trends, innovations and research in crop management, nutrient management, soil and water management and pest management – key factors in your bottom line and profitability.

"With so many Canadian agriculture events and meetings this year being put off, we wanted to make sure that the industry still has access to the latest information and experts who can share innovative approaches to the challenges that farmers face today," says Iris Meck, Conference Director, the Farm Forum Event.

Farm operations are a vital service, and with production continuing in spite of the pandemic, the Farm Forum Event organizers from Glacier FarmMedia are building a new virtual conference platform that will



allow farmers and agronomists to connect with each other, the presenters and stakeholders in the industry.

For just \$250 per person, attendees registered for the Farm Forum Event virtual conference will get two full days of over

30 presentations.

Attendees can watch and comment on sessions, visit virtual exhibitor booths from sponsoring companies and connect with their staff, plus book meetings and connect with other attendees

at the conference and attend small-group roundtables.

"In such an uncertain year, we are committed to keeping our agriculture community in touch with experts in agricultural production to give them timely information for their farm operation," says Meck. "We've created a speaker program that has a wide range and diversity of speakers and topics that attendees won't be able to find anywhere else."

Meck says that by November, a good part of harvest in Canada will be complete, and producers, consultants and agronomists often spend the time after harvest catching up on the information they need to take them into a successful subsequent crop year.

The 2020 Farm Forum Event virtual conference is the perfect place to take in information on how science and innovation connect with farm

operations, the latest on trends and technologies that will help agronomists and producers alike, and other topics that are on the minds of producers such as soil health, AgTech, regenerative agriculture and markets, trade and weather.

**Forward-thinking leaders are driven by their strong vision and business mission. While driving a business to grow, there is a certain amount of risk, but by being informed and making bold decisions and calculated risks, successful leaders can achieve more.**

Let the Farm Forum Event virtual conference help you move your business forward. Join us Nov. 9 and 10 for this production conference.

More information and online registration is available at [farmforumevent.com](http://farmforumevent.com).

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Two icons: a monitor displaying a farm map and a smartphone with a grid overlay, with a hand pointing at the screen.

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A smartphone screen displaying the AGvisorPRO app. It features a man in a blue jacket standing next to a large blue question mark icon. The text "The only question AGvisorPRO can't help you answer..." is visible.

Two images side-by-side: a combine harvester operating at dusk and a close-up of yellow rapeseed plants.

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## EARN CCA EDUCATION CREDITS

**THE PRAIRIE CERTIFIED** Crop Adviser Board has approved agronomy-focused sessions at the virtual Farm Forum Event so attending these sessions gives Certified Crop Advisers (CCA) their continuing education units (CEU).

With a focus on agriculture production, the conference features critical information from the industry's top thought leaders, innovators, researchers and strategists. To date, 25 online sessions at the Farm Forum Event on November 9 and 10, 2020 will qualify for a total of 13.5 CEU credits.

A wide range of sessions on soil health, AgTech, precision agriculture, crop nutrient research, biologicals, grazing strategies and cropping management will be presented at the Farm Forum Event virtual conference. Attendees will hear about the most common questions that have surfaced in 2020 to do with soil fertility issues on the farm, nutrient stewardship, the impacts of wind erosion and more.

The Farm Forum Event website lists all the speakers – here are some highlights:

- Michael Gomes, Topcon Agriculture, on smart implements and data

- Mark Belmonte, University of Manitoba, on biotech's role in integrative pest management
- Bruce Burnett, MarketsFarm, on major events in 2020 and a look towards 2021
- Alastair Handley, Radicle, speaking on carbon markets and supply chains
- Ryan Boyd, South Glanton Farms, on grazing ruminants
- Jarrett Chambers, Concentric Ag and ATP Nutrition, on biologicals for your farm

"This year, many in-person meetings and learning opportunities that crop advisers counted on for their credits have been postponed or cancelled," says Kevin Yaworsky, who is on the planning committee for Farm Forum Event. "It's become more challenging for agronomists to get the credits they need to keep their certification up to date but attending the Farm Forum Event means agronomists can take in this single event over two days and qualify for a number of CEUs."

Yaworsky notes that agronomists are an important part of decision-making teams on many Canadian farms. As such, it's vital that they stay up-to-date on the lat-

est news, trends, research and technology. With the interactive format of this virtual ag production conference, agronomists can connect with each other, the farmers who are attending and the presenters, to gain insights into the research and findings that have come about this year.

Another great feature of the virtual conference that Yaworsky thinks will be valuable for agronomists and farmers is the flexibility of being able to connect with others at the conference through text, video or audio chat, and when the conference is over, download all those contacts for future networking and follow up.

"The Farm Forum Event has always been a very popular learning event for Canadian agronomists, and this continues to be a way they can meet their learning requirements," explains Yaworsky. "Work on the farm hasn't stopped this year, so we wanted to find a way to help agronomists and farmers stay informed and profitable.

The 2020 Farm Forum Event virtual conference takes place Nov. 9 & 10. More information, the agenda and online registration is available at [farmforumevent.com](http://farmforumevent.com).

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## MAKING VIRTUAL CONNECTIONS IN CHALLENGING TIMES

**EVENTS HAVE ALWAYS** been an important part of bringing the agriculture community together. With the uncertainty of the past 6 months, and with so many in-person events not happening in 2020, access to information and connecting with others can seem more challenging.

At the 2020 virtual online Farm Forum Event conference on November 9 & 10, the conference organizers are making sure that information is easy to access through an online platform that can be accessed on your computer, tablet or smart phone, and with several ways to connect with other attendees at the conference.



### CONFERENCE ATTENDEES WILL BE ABLE TO:

- participate in the sessions by asking questions of speakers
- connect and chat with other delegates
- build a database and download connections made during the conference for future networking
- visit virtual booths at the conferences hosted by sponsors
- book meetings with sponsor company representatives through text or video.

All Farm Forum Event speaker video presentations will stay on the virtual platform after the conference until midnight on December 31, 2020 so registered attendees can log in and view the content even after the conference wraps up. It's just our way to bring knowledge to you, the way you want, and when you want.

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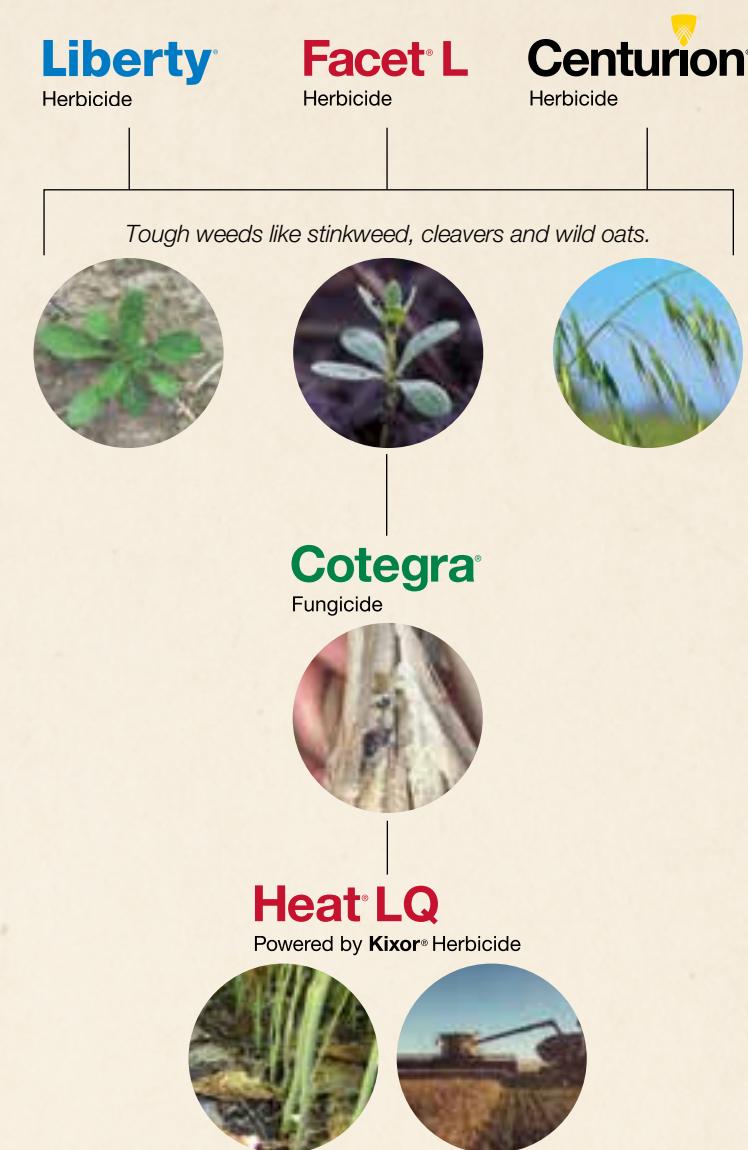
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WHEN YOU NEED TO BE SURE

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**50** TO DRAIN OR NOT  
TO DRAIN?  
Maneuvering  
around wet areas poses  
logistical problems and lost  
revenues. Is drainage the  
solution?

**54** GROUND LEVEL:  
Precision tools  
allow us to group  
areas of the field with  
similar response  
characteristics.



Do try this on the farm and tell us how it went. Many of the projects highlighted in this section can be applied to on-farm research initiatives.

Large-scale surface water consolidation turns "potholes" into reliable farmland. At the Discovery Farm near Langham, Sask., work is underway to better understand nutrient loss reduction with surface drainage. | KYLE BURGESS PHOTO



## To drain or not to drain?



BY BLAKE WEISETH, MSC, PAg  
APPLIED RESEARCH LEAD, GLACIER FARMMEDIA DISCOVERY FARM

**WE CAN ALL APPRECIATE** that with the exception of a handful of areas across Western Canada, most agricultural land is characterized by topography of upper- mid- and lower-slope positions, such that water will run off certain areas and collect in other areas of the field for varying lengths of time during the growing season.

In addition to logistical challenges that arise from maneuvering around these wet spots, economic implications persist from lost revenue of unseeded acres or marginal productivity of those areas that are seeded due to agronomic issues such as salinity, compaction, anaerobic conditions in the root zone, and others.

For this reason, it is not surprising that so many producers have addressed some of these problem areas of their field through drainage. The challenge in an agricultural setting is that as soon as water is drained from one area, it will inevitably collect in another area of the field, or be sent further downstream, carrying with it nutrients in both dissolved and particulate form.

Vivid images that have been previously displayed in popular media illustrate the impact that nutrient-enriched run-off waters can have on promoting algal blooms in surface water bodies, and the resulting devastating effects that can have on water quality and esthetic appeal (think Lake Winnipeg or Gulf of Mexico). While the agricultural sector cannot be solely held responsible, run-off waters from agricultural fields certainly do have an impact. And while the proportion of this total nutrient enrichment that may be attributed to agricultural run-off is debatable, public policy has already placed stringent regulations

on nutrient application rates in other jurisdictions. The same drivers behind these policy decisions may influence and limit future drainage policy, and Western Canadian agronomists should be mindful of this.

The total nutrient load that enters a surface water body is influenced by two major factors, including the volume of water entering the body and the nutrient concentration within that water.

A research project being initiated this fall at the Glacier FarmMedia Discovery Farm near Langham, Saskatchewan will investigate how both of these variables may be manipulated within an agricultural setting and will assess their effectiveness at optimizing productivity on drained agricultural soils, while limiting off-site nutrient losses in run-off water. The scientific team on this project consists of me, as principal investigator, along with Jeff Schoenau and Jane Elliott as collaborating scientists from the University of Saskatchewan.

The first component of the project is to conduct a surface drainage project over approximately 40 acres, which will consolidate several "pothole" depressional areas that are prone to periodic flooding into a larger collection area or adequate outlet.

The draining of the smaller potholes will certainly result in an impact on the total volume of run-off water entering the adequate outlet.

The second component of the project will look to address an important research question. That is, can the use of targeted agricultural management practices on drained wetland soils result in improved nutrient use efficiency and consequently reduced nutrient load in run-off waters compared to a status quo situation?

(continued on next page)

The challenge in an agricultural setting is that as soon as water is drained from one area, it will inevitably collect in another area of the field, or be sent further downstream, carrying with it nutrients in both dissolved and particulate form.



# the living lab

Do try this on the farm and tell us how it went. Many of the projects highlighted in this section can be applied to on-farm research initiatives.

## Sound management practices

While many management practices can be used to promote improved nutrient use efficiency, three categories of management practices will be evaluated for their effectiveness in this project. These include fertility management, residue management, and novel cropping practices.

The idea behind the fertility management category is that a variable-rate fertility prescription will be developed and applied at seeding in the treatment area.

A reduced fertilizer rate prescription should be able to be applied to the drained soils without a resulting yield penalty due to anticipated greater nutrient mineralization rates from the drained soils.

The residue management treatment will result in shallow incorporation of crop residues into the soil. This incorporation will reduce contact and interaction of the snowmelt run-off water and surface crop residue, which will consequently reduce the amount of soluble reactive phosphorus from the crop residue being lost in the run-off water.

The novel cropping practices treatment will consist of a polycropping species mix including legumes. This treatment will look at whether the species mix will, through reduced fertilizer input and increased nutrient uptake and removal, reduce soluble soil nutrient contents and subsequent run-off losses. A control treatment of standard farming practices (e.g. monoculture with a blanket fertilizer application rate) will be included for comparison purposes.

With the potential downstream impacts from agricultural drainage, a certain amount of regulatory oversight is understandable and warranted. However, for the reasons noted at the opening of this article, it would be impractical to prohibit all agricultural drainage.

For this reason, important potential policy questions arise from this project. For example, can the potential negative impacts from increased runoff load into a collection area from a drainage project be off-set from the use of targeted agricultural management practices?

If so, can the appropriate regulatory bodies have increased confidence to approve more drainage projects if agreements are made that



Blake Weiseth, left, principal investigator at Discovery Farm, says policy decisions may influence and limit future drainage, and Western Canadian agronomists should be mindful of this. | KYLE BURGESS PHOTO

the drained lands must be managed in a certain manner? What happens if the approved management practice is unable to be executed on a drained land for various reasons (logistical or otherwise)? While this project will not result in definitive answers for the above policy questions, it will provide regional data that may inform policy and will hopefully inspire future projects for further validation.

For updates on this project, you can follow Discovery Farm on Twitter at @DiscoveryFarmSK or on our website at [www.discoveryfarm.ca](http://www.discoveryfarm.ca). Funding for this project has been gratefully received by the Saskatchewan Water Security Agency, the Saskatchewan Soil Conservation Association, and the Saskatchewan Stock Growers Association.



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Do try this on the farm and tell us how it went. Many of the projects highlighted in this section can be applied to on-farm research initiatives.

## GROUND LEVEL

# Precision ag doesn't need to be hard



BY WES ANDERSON

Wes Anderson is the Senior Fertility Specialist with CropPro Consulting based out of Beaumont, Alta., specializing in enhancing soil fertility program using SWAT MAP variable rate technology.

Two years ago, I hardly knew where to start when it came to using precision ag tools to their full potential.

I had some experience using satellite NDVI (normalized difference vegetation index) to variable rate nitrogen and growth regulators in cotton and rice when I worked in Australia, as well as monitoring regional crop conditions in Western Canada.

But using only satellite imagery never quite made sense to me for soil applied nutrients applied at seeding. I certainly recognized there is always soil and water variability affecting the crop, but didn't find an effective way to map it all so it could be managed. For years, I thought that considering how long VR technology has been available, you'd think there'd be some better solutions.

Precision agriculture solutions shouldn't be hard to employ by a typical agronomist.

I have now worked for two years for CropPro Consulting and Crop-mimetic Technology as a fertility specialist, and while I don't want to say any of this is simple – it doesn't need to be difficult.

I was fortunate to join a team of experienced professionals that had spent years learning and developing tools to map, measure, and manage soil variability – the primary result being a soil, water, and topography map (a SWAT map).

The goal of a SWAT map is to combine all the stable soil and

## DRILL PRESCRIPTION

Data from the Discovery Farm wheat field (lb./ac):

| Zone     | Acres | Yield goal (bu./acre) | MAP           |         |              |         | KS blend | Total applied (lbs.) |                               |                  |
|----------|-------|-----------------------|---------------|---------|--------------|---------|----------|----------------------|-------------------------------|------------------|
|          |       |                       | Wheat Layer 1 | Layer 2 | Urea Layer 3 | Layer 4 |          | N                    | P <sub>2</sub> O <sub>5</sub> | K <sub>2</sub> O |
| 1        | 2.4   | 50                    | 140           | 55      | 150          | 80      | 85       | 29                   | 18                            | 12               |
| 2        | 9.5   | 55                    | 135           | 55      | 150          | 80      | 85       | 29                   | 18                            | 12               |
| 3        | 14.1  | 60                    | 132           | 60      | 160          | 75      | 90       | 31                   | 17                            | 11               |
| 4        | 17.1  | 65                    | 132           | 60      | 170          | 70      | 94       | 31                   | 16                            | 10               |
| 5        | 26.1  | 70                    | 132           | 65      | 170          | 65      | 94       | 34                   | 15                            | 10               |
| 6        | 20.5  | 75                    | 132           | 65      | 165          | 60      | 91       | 34                   | 14                            | 9                |
| 7        | 18.1  | 80                    | 135           | 60      | 165          | 55      | 89       | 31                   | 13                            | 8                |
| 8        | 22.1  | 75                    | 140           | 60      | 165          | 50      | 89       | 31                   | 11                            | 7                |
| 9        | 6.1   | 50                    | 150           | 45      | 140          | 40      | 74       | 23                   | 9                             | 6                |
| 10       | 1.9   | 30                    | 165           | 30      | 80           | 30      | 44       | 16                   | 7                             | 4                |
| AVERAGE: | 68.4  | 135.3                 | 60.2          | 162.5   | 61.9         | 89      | 31       | 14                   | 9                             |                  |

topography attributes that considers soil texture, salts (using electrical conductivity or EC), topography, elevation, and water flow and accumulation into one map. It's the foundation for understanding field variability. The SWAT map can then be used to direct zone soil sampling and produce variable rate fertilizer, seed, and even herbicide prescriptions.

The way I think about this technology is this: if your whole field was saline would you continue to annual crop it? Or seed it to salt-tolerant forages? If the whole field had very high soil phosphorus levels from historical manure applications, would you apply higher or lower rates of annual phosphate fertilizer? If the whole field often lodged would you apply more nitrogen or less? If the whole field always struggled to achieve target plant population, would you adjust your seeding rate? Using precision ag tools allow us to do just that – group areas of the field with similar response characteristics together so they can be managed as a "zone."

One example of how we use this was demonstrated at the Discovery Farm near Langham, Sask. in 2020.

The field was SWAT-mapped, ground-truthed, soil tested, and a variable rate fertilizer and seed prescription was applied using a Vaderstad Seed Hawk airdrill and iCon control system. This entire process for a new field can occur in as little as seven days.

One of the opportunities at the Discovery Farm is managing salinity, which is a well-known strength of soil EC mapping. This farm has some very high sand content in parts of the field, which also tends to be picked up well by EC, so in the field shown below, EC has a strong influence on overall variability and SWAT map.

The general strategy on the wheat field at the farm was to reduce fertilizer rates in poorly responsive saline zones 9 and 10, and apply higher seeding rates on knolls and saline areas to achieve desired plant population. There was also additional nitrogen top-dressed mid-season as variable rate UAN, which was planned from the start. The top-dress application was based on soil moisture probes providing up-to-date water driven yield potential.

There proved to be strong value in the variable rate seed at this site, as the mortality rates were very typical of what we see in this kind of landscape.

Actual wheat mortality rates were 19 percent in Zone 1 (generally sandier, drier knolls), decreasing to only 10 percent in Zone 5 (nice mid-slopes and flatter areas), and then increased in saline zones to as high as 36 percent in Zone 10. The reason for increasing plant population in saline areas is to provide weed competition and use water through transpiration, rather than evaporation.

While this is only a snippet of what was demonstrated at the Discovery farm, it's the core of what we are able to do with SWAT maps. It's a process that is proven and can be replicated over millions of acres. There are certainly several steps to complete the process, requiring qualified individuals at each step, but it doesn't need to be hard. In its simplest form it is just agronomy applied at a higher resolution.



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