WGRF

Advancing Agriculture through Research

RESEARCH REVIEW

celebrating 40 years

ADVANCING AGRICULTURE THROUGH RESEARCH

RESEARCH CONDUCTED ON

25 CROPS

MORE THAN

$200M

INVESTED IN RESEARCH SINCE 1981

171

CURRENT RESEARCH PROJECTS & ACTIVITIES

INVESTMENT AT MORE THAN

20

DIFFERENT RESEARCH INSTITUTIONS

550 +

PROJECTS LISTED AT WGRF.CA

130 +

FARMERS HAVE SERVED ON THE WGRF BOARD

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COVER PHOTO CREDIT: CHRISTINA WEESE

CHAIR AND EXECUTIVE DIRECTOR'S MESSAGE

DR. KEITH DEGENHARDT
Chair, WGRF

GARTH PATTERSON
Executive Director, WGRF

As we celebrate 40 years of the Western Grains Research Foundation (WGRF), it's an ideal time to reflect on our accomplishments and plan ahead for future success.

Since 1981, WGRF has invested more than $200 million on behalf of farmers in more than 550 crop research projects. We've achieved these milestones by being steadfast in our mission of producers directing investment in crop research to benefit western Canadian field crop farmers.

Working together for the common good

More than 130 farmers from across Western Canada have worked together on the WGRF Board over the past four decades. By guiding research funding decisions, they've been instrumental in advancing agriculture for the betterment of all Prairie farms. Today, the WGRF Board is made up of 18 farmers from the four western provinces. Their collective voices ensure that funding is awarded to research that is most needed by their fellow farmers.

Our relationships with research institutions across Canada is another critical element of our 40-year success. The cover story of this magazine features one of WGRF's new Research Chairs. Supporting the Universities of Alberta, Manitoba and Saskatchewan with the establishment of Research Chair positions will provide tremendous insights when it comes to agronomic research.

Transferring that knowledge to farmers is something that these researchers are committed to and that our WGRF staff is skilled at making happen.

Commitment, collaboration and vision

Directing investments in field crop research on behalf of farmers is a responsibility that the WGRF Board and staff take very seriously. We are committed to supporting research that will deliver a positive on-farm impact.

Increasingly, we also work with other funding organizations to identify collaborative opportunities. It's through these partnerships that farmers and researchers truly win.

This annual *Research Review* highlights examples of how WGRF has strategically invested farmer dollars over the past year. Be sure to read the 40th anniversary article – it's a great reminder of where we've been and just how far we've come.

We look forward to funding more research and continuing to deliver on the vision of profitable and sustainable western Canadian grain farmers.

Dr. Keith Degenhardt PhD
Board Chair, WGRF

Garth Patterson M.Sc., PAg
Executive Director, WGRF

Vision & Mission

Vision: Profitable and sustainable western Canadian grain farmers.

Mission: Producers directing investments into crop research to benefit western Canadian grain farmers.

WGRF MEMBER ORGANIZATIONS

- Agricultural Producers Association of Saskatchewan
- Alberta Barley
- Alberta Federation of Agriculture
- Alberta Wheat Commission
- BC Grain Producers Association
- Canadian Canola Growers Association
- Canadian Seed Growers' Association
- Keystone Agricultural Producers
- Manitoba Crop Alliance
- National Farmers Union
- Prairie Oat Growers Association
- Saskatchewan Barley Development Commission
- Saskatchewan Flax Development Commission
- Saskatchewan Wheat Development Commission
- Western Barley Growers Association
- Western Canadian Wheat Growers Association
- Western Pulse Growers
- Western Winter Cereal Producers

CELEBRATING 40 YEARS

Advancing agriculture through research since 1981

It's 1981 – NASA launches the first space shuttle mission, the word 'internet' is used for the first time and the Western Grains Research Foundation (WGRF) is born.

2021 marks the 40th anniversary of the ground-breaking organization that has grown up to be the largest producer funder of variety development and field crop research in Canada. Formed by 12 farm groups who had a vision for a robust agricultural research funding organization directed *by* and *for* western Canadian grain farmers, WGRF has always stayed true to its roots.

"WGRF is committed to the original intent of the founders of the organization, that we would be a western Canadian, multi-crop organization comprised of a diverse membership and working with the sole purpose of funding research to benefit western Canadian crop producers," says Garth Patterson, WGRF Executive Director. "That vision and mission have really held up over time. And there's a lot of value and opportunity for WGRF to continue that into the future."

Farmer funded, farmer directed

Dr. Keith Degenhardt, current WGRF Chair, applauds the founding members for getting farmers involved from the outset.

"We are the ones who are actually on the land experiencing the different challenges. So we have a really good feel for where the funding should go in research," says Degenhardt who operates a mixed cattle and seed farm at Hughenden, Alberta. "It's important for research to be farmer funded and farmer directed because it gives you ownership and responsibility to make the best investment in research to help farms across the Prairies move forward."

WESTERN GRAINS RESEARCH FOUNDATION 1981-2021

1981
WGRF is born

1983
Endowment (Research) Fund

1984
Research policy established

1994
Administration of wheat & barley check-offs

1996
First WGRF varieties released

2002
WGRF varieties are acreage leaders

2008
Rail Revenue Entitlement

2010
First graduate scholarships awarded

2011
WGRF wheat dominates

2012
ROI study: $1 wheat check-off = $20 producer value

> **WGRF is committed to the original intent of the founders of the organization back in 1981, that we would be a western Canadian multi-crop organization comprised of a diverse membership and working with the sole purpose of funding research to benefit western Canadian crop producers.** ~Garth Patterson, WGRF Executive Director

Major milestones

Degenhardt, who has served in many volunteer capacities with WGRF for more than two decades, has witnessed several of these advancements through the years.

First, he points to the organization's variety development success. Between 1994 and 2014, WGRF supported the breeding of more than 200 wheat and barley varieties. Many were recognized as acreage leaders, offering not only higher yields but improved end-use properties, and better disease and insect resistance.

"We have always looked at funding the most impactful research, whether that be long-term upstream or both short-term and immediate," says Patterson. "It's really about the impact and the science."

Degenhardt also references WGRF's agronomic research as having a strong impact. "As we've moved away from varietal development in the past few years, we've focused on identifying gaps in agronomic research," he says.

In 2019, the launch of the Integrated Crop Agronomy Cluster (ICAC) represented a multi-crop approach to providing farmers with solutions as they tackle widespread agronomic challenges.

There are too many individual milestones to count, but collectively, the 40-year anniversary can be summed up as four decades of evolution and success.

"The fact that WGRF is still going strong after 40 years means that Prairie producers have shown the willingness to invest in research on a long-term basis," says Degenhardt.

Looking to the future

He looks forward to witnessing the mark WGRF will make in the years to come. "What I see as exciting is how can research contribute to making life easier for the farmer? There's going to be some significant changes in agriculture over the next five to 10 years, we need to continue to fund research that will help farmers stay in the game and get a good return."

celebrating 40 years

2015
Largest producer funder of crop research

2016
Largest industry investment into research at AAFC

2017
- New direction to multi-crop research
- Check-off transfer
- Field Heroes launch

2019
- Capacity-building initiative
- Integrated Crop Agronomy Cluster launch
- Midge Tolerant Wheat anniversary

2020
First WGRF research chairs established

2021
40 years of farmer-directed, farmer-funded research

> I'm planning on taking the time to talk to farmers to understand what they feel might be the most pressing issues and the solutions that might have the greatest impact.

IN PURSUIT OF ANSWERS

New Research Chair to focus on integrated agronomy

If you're a farmer on the Prairies, Maryse Bourgault is looking forward to talking with you.

Bourgault is the new WGRF-funded Integrated Agronomy Research Chair at the University of Saskatchewan. The key word here is "integrated," because the challenges farmers face and the biological systems that make up crop production are both myriad and complex, and finding answers will take a team of integrated professionals – a team Bourgault is eager to establish.

"I'm excited to be setting up a research program that will be highly collaborative, and there are a lot of questions that would surely benefit from having several different specialists looking into it together," she says. "But I'm planning on taking the time to talk to farmers to understand what they feel might be the most pressing issues and the solutions that might have the greatest impact."

Around the world and back again

Bourgault grew up in Victoriaville, Quebec where dairy is king. So how did she wind up working in the field crop sector? "My background is in environmental sciences," she explains. "And I got drawn into the sustainable agriculture domain because as much as we want to protect our environment, we still need to produce food and vice versa, no matter where you are in the world."

Her PhD in Plant Science (McGill) focused on drought tolerance in common and mung beans, and it was that pesky mung bean that set her on an international path.

"Mung bean is a light-sensitive crop, so growing it in the winter here, it starts flowering too early," she says. One after the other, greenhouse experiments were ruined and frustration set in. Then, on a trip to Australia where the seasons are reversed, Bourgault made some connections, someone gave her some greenhouse space to finish her PhD work (which she did), then she decided to stay.

After eight years working in various capacities in Australia's agricultural sector, Bourgault applied for a position at the Northern Agricultural Research Centre (Havre site), Montana State University. "The job was just really interesting," she says of the decision to return to North America, adding that the facility has livestock and crops at the same site, and a huge outreach component to surrounding communities.

At Havre, Bourgault continued her research work in cropping systems and drought tolerance. "As a crop physiologist, I'm always interested in drought tolerance," she says. "I'm interested in deep rootedness and whether or not that's associated with yield." Indeed, crunching the data on work started last year, Bourgault thinks that selecting for root traits may be possible, but it's still far too early to be certain.

Building a research community

Bourgault is excited about her return to Canada, setting up an applied research program at the U of S and using her global experience and contacts to design research projects that will help farmers. "I've always worked in semi-arid areas, and we need to talk to each other a lot more," she says. "I would like Canadian farmers to know that I want to talk to them about what they think is needed from interdisciplinary research.

"For example, in Montana we looked at crop rotation, at developing and integrating winter broadleaf crops – winter peas, winter lentil, winter canola – into cropping systems, and at placing phosphorus at depth (~30 cm deep) in no-till systems for 'drought-proofing' and this might, or might not, be of interest to farmers," she says.

"Other things we could look at is integrating livestock and cropping enterprises. My interest has always been in trying to find ways to make the most of the rainfall we have."

In pursuit of answers, Bourgault will work with people from across research disciplines – from weed, disease, insect and soil scientists to agricultural economists and engineers – for a truly broad, integrated approach to problem solving.

"I'm hoping that we will be able to contribute to industry knowledge by taking a step back and looking at the various components of the production system to see how we can understand how different practices might work together or against each other," she says. "Then, we might be able to propose the best ways to utilize the synergies that arise and minimize the negatives."

> I really want to get out there and talk with farmers, get some baseline data. I want to do this work with them – a solution that works in the lab or greenhouse might not work in the field, so I want to know what they experience.

FINDING SOLUTIONS WITH FARMERS

New Chair champions integrated cropping systems

Linda Gormin wants to work at the source, tapping into the experiences and knowledge of farmers to find practical solutions for the challenges they face. As the WGRF Chair in Cropping Systems at the University of Alberta, she's in a great position to make a difference.

"The long-term sustainability of cropping systems is very important to me," says Gorim, who assumed the WGRF Chair in January 2020. "Farmers know a lot and I want to work on what matters to them." That idea hands-on, collaborative work is one of the things that brought her to Canada in the first place.

Abiotic stresses in cropping systems

Gorim, a self-described farm girl who grew up in Cameroon, West Africa, travelled to Stuttgart, Germany on a Fiat Panis Foundation scholarship for her master's degree in agricultural sciences. She stayed on at the University of Hohenheim to do her PhD.

Her work in Germany looked at how cropping systems could be designed to help alleviate pest and environmental challenges and improve overall productivity – including protecting land and water resources – particularly in tropical regions.

In the summer of 2015, Gorim took a post-doctoral fellowship at the University of Saskatchewan to work with well-known pulse breeder, Bert Vandenberg. "One of the reasons I moved from Germany was Bert," she says, recounting how it was made clear to her that knowledge transfer was going to be part of the job. "I really wanted to work in a place where information winds up with farmers and not just in scientific journals."

At the University of Saskatchewan, Gorim began to focus on drought research. She worked with wild lentil material collected from drought-prone areas around the world, phenotyping roots and plants to identify traits that could be incorporated into the breeding program.

When the post-doc was finished, she took a professional research associate position and continued her work. "I'm a drought scientist," says Gorim, adding there are two prongs to her research. "The first is the basic research looking at the water relationship because there's no guarantee the same amount of rain will fall every year." She's looking at strategies, techniques and crop choices farmers can use to make the most of the moisture they do have.

The second prong is looking at vapour pressure deficit. "It involves testing the air for water and looking at how plants respond to this water," she says. Gorim is interested in how the interaction between ambient moisture and plant stomata (the pores on plant surfaces) is being affected by climate change, and how this impacts the incidence of pest damage and the carbon cycle.

It's probably not something most prairie farmers think about on a day-to-day basis, but it's hugely important. Stomata take up CO_2 from the atmosphere and they also control plant moisture loss through evaporation.

> **"I really wanted to work in a place where information winds up with farmers and not just in scientific journals."**

So Gorim's question is: are hotter summers limiting these functions and, if so, is that making crops more vulnerable to pests? "Are there wheat varieties that are coping with this heat already?" she asks. "What is happening with stomata in the heat? Is there a pest that wants to eat this plant and is it easier for them to do so in these conditions?"

Building for the future of agriculture

The WGRF Chair in Cropping Systems was established to close a gap in agronomy research by taking a systems approach to examine the layers of interaction between plants, soils, environmental conditions and crop management practices over the long term.

Gorim is raring to go in her new role at the University of Alberta. "I really want to get out there and talk with farmers, get some baseline data. I want to do this work with them – a solution that works in the lab or greenhouse might not work in the field, so I want to know what they experience."

She's passionate about the power of integrated cropping systems to address new agricultural challenges farmers face today, and she's determined to find answers for them. If the last couple of harvests have shown us anything, this work is needed now more than ever.

PANDEMIC PROBLEM SOLVING

Research programs get creative during COVID times

The research must go on. When the COVID-19 pandemic threatened to bring crop research programs to halt in spring 2019, researchers did what they do best and problem solved ways to continue their important work.


Martin Scanlon

"Initially, there was some panic when the pandemic was declared and the university limited what activities could carry on," says Martin Scanlon, Professor and Dean, Faculty of Agricultural & Food Sciences, University of Manitoba. "The prospect of losing an entire growing season of crop research was troublesome. Fortunately, it didn't come to that. With subsequent authorizations given for field work, we managed to make progress on research objectives while minimizing risk to staff, students and everyone involved."

Creative modifications

Rob Duncan, who leads University of Manitoba's canola and rapeseed breeding program, explains that with proper safety protocols in place, his team was able to get back into the field in time for planting. The seed prep work that happens in advance of the season, however, required some creative modifications.

"It's quite a bit of work to prepare seed for planting, and maintaining identity is absolutely critical. Normally, we can lay seed out in a proper facility.

"Even under COVID-19 restrictions, so much of the research that was planned, was possible and successful."
~Rob Duncan


Angela Bedard-Haughn

Photo Credit: Christina Weese

This year, staff worked remotely, sorting seed in their sheds, garages and even their living rooms. Getting all of that organized was a challenge, but our amazing staff and students made it happen," he says. "Even under COVID-19 restrictions, so much of the research that was planned, was possible and successful."

At the University of Saskatchewan, Angela Bedard-Haughn is also grateful for her staff's ingenuity. The Dean and Professor in the College of Agriculture and Bioresources was impressed by how faculty modified workflows to accommodate the safety of work crews. "The situation forced everyone to look carefully at how they're doing their work and how it could be done differently, or in some cases, even more efficiently," she says.

Prioritizing research

Bedard-Haughn says the pandemic also forced the school's research programs to examine priorities.

"The top priority went to any of our field research programs where there would be a real impact or loss of momentum by missing a single year," says Bedard-Haughn. She cites long-term crop rotation studies funded by Western Grains Research Foundation as an example. "We prioritized studies where year-over-year information is so crucial. We didn't want to lose any legacy effects associated with those rotational studies."

Catalyst for innovation


Charles Geddes

Charles Geddes's research program in Weed Ecology and Cropping Systems at the Lethbridge Research and Development Centre also forged ahead with some modifications. The research scientist with Agriculture and Agri-Food Canada, says COVID-19 also inspired some new thinking for the future.

"I believe the pandemic is forcing researchers outside of their comfort zone. That can lead to some unique innovations," he says.

Normally, his research on herbicide-resistance weeds is very hands on. "One of the things we're looking at is developing a plant phenotyping system for the greenhouse. This would involve a network of cameras taking images of our herbicide-resistant weed screening. In that way, we can collect imaging data and take all of our measurements remotely." Obviously, some tasks would need to be completed in person, but all of the data collection could be done remotely. "If this plan works out, we'll be able to collect a greater amount of data and probably have greater accuracy as well," he says.

Silver linings aside, COVID-19 did cause a reduction in the volume of research completed in 2020 and some projects have delayed start dates. These researchers are upbeat about the work that was able to continue. They managed to find new ways to get the job done so that their important findings can get into the hands of farmers and make a difference in their fields sooner rather than later.

ACCELERATING CAPACITY

Infrastructure and equipment speeds research

Effective and efficient research requires the right tools. For some crop research programs in Western Canada that may mean building a new facility, upgrading an existing structure or acquiring equipment to increase research capacity.

"We realized a number of years ago that in order to answer questions from farmers about crop production challenges, that it's more than just funding research projects. There needs to be the capacity to carry the research out," says Garth Patterson, WGRF Executive Director. "That's really what our capacity initiative has been about. It's identifying the gap, either in human resources or infrastructure resources, and then funding a solution."

In 2019, WGRF initiated Phase 2 of its capacity-building initiative, a competitive, proposal-based process to expand the tools (infrastructure and tangible assets) necessary to accelerate crop research for the benefit of field crop farmers in Western Canada. (Phase 1 expanded research capacity through human resources, supporting the establishment of Research Chairs at Universities of Alberta, Manitoba, and Saskatchewan.)

For Phase 2, the WGRF Board approved $24 million in funding, an increase of $4 million from its original budget.

"There were so many great applications that we stretched it and were able to bring some more funds to the table," says Pat Flaten, WGRF Research Program Manager. She reports that were 33 applications were submitted, ranging from proposals for new buildings and building enhancements to combines and drones.

Photo Credit: Wintersteiger Quantum Plot Combine

Farmers direct dollars

The WGRF all-farmer Board decides which proposals go ahead. As with research project funding, a Research Committee that includes both external members and Board members is instrumental. "In reviewing the applications, the committee went through an extensive process of ranking a matrix of important considerations. The Board then made independent decisions based on those recommendations," says Flaten.

In total, 24 applications were successful. "Some applicants have already acquired their equipment or are in the process of putting a building up," she says. (See sidebar for details.) "We look forward to announcing all of the funding in the coming months."

New agronomy centre in Northern Alberta

A project by Mackenzie County in Northern Alberta in partnership with Mackenzie Applied Research Association (MARA) was one of the first out of the gate. With $300,000 from WGRF (and an additional $200,000 from another funder), they are constructing an agronomy centre/repair shop. "The previously used research sample processing facilities and workshop were antiquated and very expensive to operate," says Greg Newman, MARA Board Chair. "The new facility will allow staff to process samples and build and repair specialized equipment to better serve the farming community in our isolated region."

Research capacity will expand in other areas as more shovels go in the ground and equipment is purchased.

As the ability to carry out research speeds up, western Canadian grain farmers will benefit from receiving answers to crop production questions at an accelerated pace.

> **"The new facility will allow staff to process samples and build and repair specialized equipment to better serve the farming community in our isolated region."**

INFRASTRUCTURE PROJECTS
THAT ARE COMPLETE OR UNDERWAY

Parkland Regional College and East Central Research Farm – Yorkton, SK

New equipment will help fill in the gaps in their research and extension program, including cameras to assist with knowledge transfer activities, field day bleachers, sample harvest equipment and a truck.

Saskatchewan Conservation Learning Centre – Prince Albert, SK

A new combine will increase efficiency and expand capacity for small plot research.

Mackenzie County and Mackenzie Applied Research Association – Fort Vermillion, AB

A new building to accommodate an agronomy centre and repair/workshop will expand the research program.

Chinook Applied Research Association – Oyen, AB

A variety of equipment will add efficiency, including a small plot combine, truck and tractor, and GPS unit.

Indian Head Agricultural Research Foundation (IHARF) – Indian Head, SK

Equipment and building needs for small plot and on-farm field-scale research will allow IHARF to continue to expand its research program. Assets include weighing systems, sample processing equipment, computer equipment, tractor, plot combine, drone and dryer shed.

Visit **WGRF.ca** for more project details.

SPORE SPOTTING

Detecting stripe rust before it strikes

Stripe rust is wily and tough. For the longest time, Canadian farmers could depend on cold winters and a fairly hot, dry summer climate to keep it at bay. But stripe rust is also highly adaptable and around 2000, scientists noticed a change.

"Pathogens always evolve," says André Laroche, Research Scientist with Agriculture and Agri-Food Canada (AAFC) in Lethbridge. "In 2000, new isolates of the stripe rust pathogen developed the capacity to infect in drier, warmer conditions and were able to infect susceptible wheat all over the Prairies – the pathogen is very efficient at mutating and causing infection. Prior to 2000, there was no need to develop resistant cultivars for this pathogen outside the irrigated region of southern Alberta."

Ah, how times have changed.

Resistance to stripe rust in Canadian wheat cultivars is fairly low and while work to develop resistant varieties is ongoing, stripe rust's ability to quickly adapt to and overcome single-gene resistance makes this a long and complicated process. Robustly resistant cultivars, in other words, could take a while to get here. In the meantime, farmers are looking for other solutions now, and Laroche thinks he may have one.

Finding a path forward

"We wanted to find a way that's simpler, faster and sensitive enough to detect stripe rust spores," he says.

> **"We wanted to find a way that's simpler, faster and sensitive enough to detect stripe rust spores."**

The idea being that if farmers had a way of knowing if disease spores were present in sufficient quantities to cause infection, they could act quicker to protect crops and prevent yield loss before visible symptoms of stripe rust set in, and act only when necessary to preserve fungicide tools.

With funding from the Western Grains Research Foundation and the Saskatchewan Wheat Development Commission, Laroche and his team may have found a path forward.

A sensitive and reliable test

Assays are complex things to develop. In essence, they are analytical tools designed to measure the quantity or quality of a specific target using a specific reagent known to react only to that target and nothing else. So researchers needed a specific biological target – in this case stripe rust spores – and a specific biological reagent that accurately detects that target – in this case an antibody that had already been developed through previous research.

That's a massive oversimplification, but Laroche and his team were starting from a point of strength – they already had primary and secondary antibodies. Stripe rust spores, specifically their DNA, was another matter.

Laroche explains that the goal was to develop a rapid assay that would detect the presence and quantity of stripe rust ureniniospores using DNA-based technology. Ureniniospores are one of up to five spore stages in

the rust life cycle and the forerunners of infection – if they are present, then visible symptoms of disease will inevitably follow within two to three weeks.

The trouble is, to get at that DNA, the ureniniospores need to be cracked open, but their thick cell walls make that very difficult and it's even more challenging when they are not abundant. So the team developed two different, yet complementary, approaches that would lead them to a solution.

"In the direct assay, we linked the DNA to the primary antibody that recognized the stripe rust spores, and used that to multiply the signal," says Laroche. "We also used an indirect way where we used a secondary antibody linked to the DNA reporter sequence to react with the first antibody to enable an indirect multiplication in the system."

So, that sounds complicated (and it is), but what it boils down to is that researchers found a way to detect the target stripe rust without having to crack open the ureniniospores. And they did it by, as Laroche puts it, "interrogating the surface of the spore," which allowed them to build an assay that detected interactions with proteins and other molecules found on the surface of ureniniospore cell walls. They ended up with an assay that clearly and reliably "lights up," or signals, when stripe rust ureniniospores are present.

So far so good, but the mere presence of stripe rust ureniniospores is only part of the equation. "How many ureniniospores need to be present for infection to occur?" says Laroche. "It was a question we had for some time. There is no literature on that, so when we started, we didn't know how many we needed to cause infection."

As it turns out, as little as 1,000 to 100,000 ureniniospores floating around are enough to cause stripe rust infection. Those are small numbers when it comes to fungi where spores are often counted in the millions. So Laroche needed to make sure the assay being developed could detect very low levels of ureniniospores. "My biggest worry was whether it was going to be sensitive enough," he says. The antibody tests showed that the assay could detect between 20 and 40 ureniniospores from different stripe rust isolates, proving the test was highly sensitive and therefore highly reliable.

Protecting wheat yields

The main goal with all of this work is to protect wheat yield and also the fungicide tools farmers still have when it comes to stripe rust management. If you've heard it once, you've heard it a thousand times that infection occurs before visible symptoms develop, which is why preventive fungicide application has become common practice. But that has its downside.

"Everybody knows that spraying 'in case' is not a mid-term or long-term solution because the pathogen could develop resistance to the active ingredients," says Laroche. "There are only two fungicide classes useful now against stripe rust, and the day you lose that ultimate tool, you're in deep trouble. People are aware of it, there is a level of concern. They need to protect their future."

The rapid detection system Laroche and his team have developed can help farmers do that by letting them know if their wheat crop is in actual danger of being infected with stripe rust or not. Deploying it is the next hurdle.

"The assay is a little bit tricky," says Laroche. "You need specialized equipment to read it. One way it could work is if farmers have a device to collect spores that they can send to a service lab for testing, and the lab could say we found them and how many, or say if it's clean."

Another idea is a larger program of aerobiological surveillance. "We could have an organization with detectors spread out across the land," says Laroche. "There could be a reading of air samples once a week, and we could send an automated message to growers." Those messages could let farmers know if they're in a hotspot, for instance, or let them know there are not enough stripe rust spores to cause a problem in their area.

Right now, Laroche and the team at AAFC Lethbridge are working with farmers to figure out what approach will work best.

OPTICAL SPOT SPRAYING

Field trials to validate key aspects of real-time technology

There's nothing quite like starting a field research project just as the COVID-19 pandemic hit Canada. But that turned out to be the launch pad for a three-year field project to evaluate the functionality and economic benefits of optical spot spraying (OSS) in Western Canada.

"We considered putting the project on hold, but were able to slightly modify our plans for year one," says Dr. Joy Agnew, Associate Vice President, Applied Research at Olds College Centre for Innovation in Olds, AB. "We were able to do some initial work using OSS technology with indoor controlled testing and limited outdoor field testing."

Agnew is overseeing the project at Olds College, working with project lead Ike Edeogu and a group of research technicians and students. Olds College received funding from WGRF, Sask Wheat and Alberta Innovates to test the WEEDit optical spot spraying technology, eventually under real field conditions, over multiple years. Conducting replicated field trials, they'll evaluate how well the system controls weeds, the impact on yield, as well as other functional aspects of using the precision technology.

"The benefits of reducing herbicide use with OSS are well understood, and this technology is already commercialized and used on a handful of larger farms in Alberta and Saskatchewan," says Agnew. "We are interested in providing in-field, replicated, real world insights on the benefits of the technology for farmers in Western Canada."

Early insights on weed size and travel speed

Although the research team couldn't get full-scale field trials started in 2020, they were able to conduct a few initial tests that will be helpful going forward.

OSS works in real time with sensors on the sprayer that scan the ground ahead of the boom, identify green spots and deliver targeted herbicide to spray individual green areas. One of the first tests the Olds team conducted was evaluating the size of weeds that can be effectively controlled with the system. The developer of the WEEDit system that Olds is using indicates weeds as small as one square centimetre can be accurately detected, targeted and sprayed.

"Our preliminary results – improvising with indoor trials on concrete – indicated that the one square centimetre weeds were not reliably detected, even at the most sensitive setting," says Agnew. "However, other environmental factors such as lighting and reflectance of the concrete surface may have played a role. Additional testing will be completed to better validate the size of weed that can be reliably detected in field conditions."

Initial field work in 2020 also examined if speed impacts the overall performance of the OSS system. They compared the OSS on the same pre-seed area with the same weed pressure at two different speeds – 5 km/h

WEEDit research team (l to r): Ike Edeogu, Evan Jenkins, Daniel Stefner

and 10 km/h. "Our very preliminary results indicate a significantly smaller amount of chemical was used at higher speeds. We expected velocity to have an effect and now we know we have to validate the positive and negative impact on the functionality of the system." That work will continue in-field in years two and three to evaluate any potential significance this early finding could have on overall weed control.

Field trials keyed up for 2021

The main part of the project will get underway next spring – multi-year, replicated strip trials comparing weed control using OSS technology and conventional full-coverage spraying. All field trials will be conducted at Olds College under commercial-style field conditions. "OSS offers the biggest opportunity for pre-seed weed control and that's where we are focussed," says Agnew. "We'll evaluate the performance of OSS on cereal and canola stubble."

The researchers will follow the two stubble treatments throughout the season, doing weed counts and surveys at key points and measuring yield as accurately as they can. OSS and conventional spraying will be compared in a pre-seed application. All plots will then receive the same in-season treatment as needed. And a post harvest survey of weed pressure will look for any different weed pressures in fields where weeds were controlled using OSS or treated conventionally.

> **"OSS is ideal for farmers who predominantly use a pre-seed burndown and are comfortable around technology."**

Finding the fit for OSS

Agnew says OSS is ideal on broad-acre farms with growers who predominantly use a pre-seed burndown and are comfortable around technology. That's why the project will also assess the usability of the technology, and support provided by the manufacturer.

When it comes to return on OSS investment, it's currently estimated at three to five years based on reduced chemical use. "Maybe we'll find a two- to three-year payback is possible with improved yields and improved efficiency of field logistics," says Agnew.

The return on investment with OSS has improved significantly since earlier systems introduced several years ago didn't pencil out economically.

In the longer term, Agnew knows spot application of herbicides will help build further public and consumer trust in the sustainability of the agriculture industry.

NEXT GENERATION RESEARCHERS

WGRF strengthens investment in young scientists

For nearly a decade, WGRF supported graduate students across Western Canada with funding to work on their Master's or PhD in agricultural sciences at the University of Manitoba, University of Saskatchewan, and University of Alberta. WGRF provided $100,000 every year, rotating between the three universities, supporting recipients for up to a three-year period.

The success of the scholarship – and the continued need for new agricultural scientists – prompted WGRF to recently commit additional funding. "WGRF has made it a priority to increase agricultural research capacity in Western Canada, and over the next five years is committing $100,000 to each university every year towards graduate student scholarships," says Garth Patterson, WGRF Executive Director. "Rather than rotating the funding, each university will now receive $100,000 per year."

$100,000
per university
per year

This increased investment comes at time when continued support is vital to train the next generation of scientists who will serve western Canadian agriculture. Two past recipients clearly show how WGRF funding for student scholarships is delivering on its goal. Sean Asselin and Jagroop Gill Kahlon, both received a significant and critical boost to their graduate studies with the scholarship, changing the course of their professional careers as agricultural researchers.

Sean Asselin,
Agriculture and Agri-Food Canada

In 2011, Sean Asselin was three-quarters of the way through his Master's program at the University of Manitoba. "I was interested in doing a PhD but hadn't made a decision," he says. That's about the time one of his co-advisors suggested he apply for, what was then, a new scholarship opportunity.

Asselin applied and was the inaugural recipient of the WGRF graduate scholarship in 2012.

The scholarship was a really big deal for him. "I was 24, and the scholarship helped me much more than just academically," he says. "It meant I could be more independent – move out on my own and ultimately complete my PhD."

"The WGRF scholarship helped me develop the skill set I needed to establish myself as a plant breeder in Canada." ~ Sean Asselin, PhD

Asselin's doctoral thesis – on the breeding potential of perennial sunflower species native to Western Canada – gave him an excellent training ground for his current role as a native forage breeder with Agriculture and Agri-Food Canada in Swift Current, Saskatchewan. "I run the native plant germplasm enhancement program with the bulk of my work on native plant species for forages and landscape reclamation."

"The WGRF funding provided financial freedom that opened new opportunities for how to conduct my research," he says. "I was able to apply for partially matching funds from Manitoba Agriculture, and expand the degree of genetic mapping for my research. A lot of projects in graduate school have a very defined focus, but I was able to design a lot of mine and develop skills that I wouldn't have otherwise."

Asselin encourages graduate students to take the time to apply for the scholarship. "It was an easy process. Don't hesitate – go for it and see what happens," he says.

Jagroop Gill Kahlon,

Alberta Pulse Growers Commission

Jagroop Gill Kahlon was in the first year of her PhD program at the University of Alberta when she received financial assistance that would change the course of her professional career. She was researching genetically modified traits for disease resistance in peas.

"University is a pretty tight research bubble and I had only thought about traditional research roles for my degree – doing post doctoral work and maybe a professor one day," says Gill Kahlon. "The scholarship was a very eye-opening experience because I realized there were other types of research work out there."

When Gill Kahlon received the 2013 WGRF graduate scholarship, her research career options began to open up. "WGRF was a very unique funding opportunity, and I didn't know there were organizations working on behalf of farmers to do research," she says, who is now a Research Officer with Alberta Pulse Growers Commission.

Gill Kahlon found it very motivating to be funded by a grower organization. "The scholarship funding made me work harder and it was important to be working on issues that matter to farmers in Western Canada."

One of her roles at Alberta Pulse Growers is to advise the Board on the merits of research proposals submitted for funding. "I used to be on the other side of funding and now I am helping support industry funded research," she says. "I never second guess my decision to work in the pulse industry."

For graduate students considering the scholarship, Gill Kahlon reminds them "don't get caught in your research bubble and miss these types of unique opportunities."

"The scholarship made me work harder and it was important to be working on issues that matter to farmers in Western Canada."

~ Jagroop Gill Kahlon, PhD

INTRODUCING PRAIRIEPEST.CA

New streamlined site tracks insect pests

The new Prairiepest.ca site is live, loaded and ready for the 2021 season.

Over the past year, the Prairie Pest Monitoring Network (PPMN) transitioned its popular blog to a new, full website to continue to share timely information for scouting and managing insect pests.

For 24 years, PPMN has delivered a coordinated, science-based service to monitor insect pests across the Canadian Prairies. PPMN provides valuable information predicting insect pest risk and how to assess insect populations. This helps growers and agrologists time in-field scouting activities to make informed decisions about pest management.

The new website provides timely, regional updates, and offers a new way to communicate and engage the agri-industry. "We strive to include information applicable to the Canadian Prairies and the website design helps users navigate to find relevant information," says Jennifer Otani, Pest Management Scientist with Agriculture and Agri-Food Canada.

"We're really happy blog subscribers are moving to the new PrairiePest.ca," says Otani. "One of the main reasons for the new format was to improve the network's capacity and ongoing requirements for technology transfer to support Canadian growers across the Prairies."

Behind the scenes, the task of moving information stored on the blog over to the new website was a big one. "An immense amount of data needed to move from the blog to build the new website," says Otani. "We're thrilled WGRF supported the process – it made the transition possible in a manageable time period so there was little interruption."

Easy-to-find features

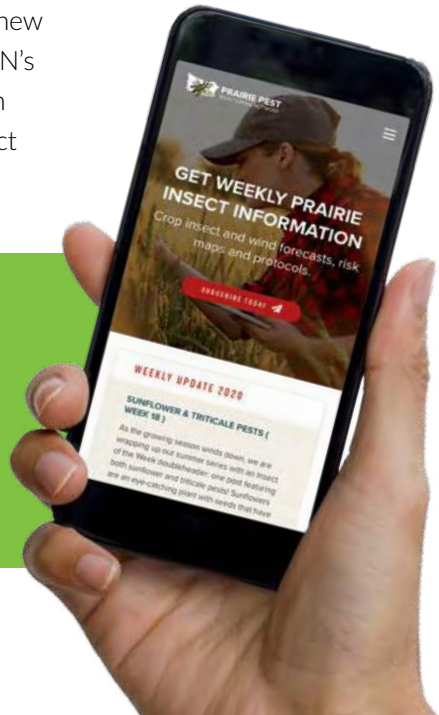
Many PrairiePest.ca features will be familiar to blog followers. Key sections still include: annual insect risk maps; weekly updates; insect of the week; and insect monitoring protocols for key economic pests. Users can also access insect scouting charts, scouting tips and links to two integral field guides.

"We try to make reliable, science-based information available on the website," says Otani. "It's important to provide practical, applicable information to help growers deal with what's in their field, how to scout for key pests and how to implement integrated pest management strategies."

During the growing season, the website is updated weekly to predict pests that growers may be seeing in their field and alert them to when and how to be scouting.

"We're communicating emerging insect pest risk and equipping agrologists with resources for in-field scouting. Ultimately, the resources give researchers a sense of what's going on across the Prairies."

Everyone involved in field crop production will want to bookmark the new PrairiePest.ca and put PPMN's valuable resources to use in support of sustainable insect pest management.



PPMN SUPPORTERS:

Manitoba Agriculture and Resource Development, Saskatchewan Agriculture, Alberta Agriculture and Forestry, Saskatchewan Crop Insurance Corporation, Manitoba Canola Growers Association, Saskatchewan Canola Development Commission, Saskatchewan Pulse Growers, Manitoba Pulse and Soybean Growers, Saskatchewan Wheat Development Commission, Alberta Wheat Commission, Manitoba Crop Alliance, Prairie Oat Growers Association, Western Grains Research Foundation, Government of Canada, Agriculture and Agri-Food Canada (Canadian Agricultural Partnership) and Integrated Crop Agronomy Cluster

FIND YOUR FIELD HEROES

PESTS & PREDATORS PODCAST

Popular podcast promotes beneficial insects

How do you make technical information about beneficial insects more engaging?

For the Field Heroes campaign, the answer appeared as a new podcast series featuring entomologists from across the Prairies. Who better to bring the science and the story of the role of these ingenious insects in crop production than on-the-ground researchers?

Field Heroes is a WGRF initiative that's trying to get farmers and crop advisors to think differently about insect populations in field crops. All bugs aren't bad bugs. The campaign wants farmers to think about the input decisions they are making by understanding more about insect pests and predators. A Q&A style podcast became a great new format for delivering the beneficial insect story.

The new Pests and Predators podcasts launched during the 2020 growing season to provide a relatable, conversational platform for entomologists to share scientific insights. The podcasts were produced to coincide with when farmers would be walking the field and making spraying decisions.

"These podcasts are an important way to pass on the knowledge that scientists discover, to the people who can make use of that knowledge," says Dr. Tyler Wist, Research Scientist of Field Crop Entomology with Agriculture and Agri-Food Canada. Wist is featured in the Plentiful Parasitoids episode. "I doubt that most growers would read my scientific manuscript on how many aphids the beneficial parasitic wasp can kill, or how long it takes the aphids to die. But I can share that message in a few succinct sentences through the podcast."

Six podcasts were produced for the 2020 summer scouting seasons covering the Field Heroes campaign, the Prairie Pest Monitoring Network, and specific episodes on wasps, grasshoppers and parasitoids. (Check out all episodes by scanning the QR code on this page.)

"The Field Heroes campaign has reached a lot of growers, and raised people's interest in beneficial insects in agriculture," says Dr. Meghan Vankosky, Research Scientist of Field Crop Entomology with Agriculture and Agri-Food Canada. Vankosky appears in the Do you know your field heroes? episode of Pests and Predators. "The research I do with AAFC is largely for the public good, and the podcasts mean I am able to tell a wide audience about the work I am doing and how it could help them. It's a great opportunity to build momentum and get more information out on the role of beneficial insects," says Vankosky.

The Q&A style of the Pests and Predators podcasts created an engaging and easy-to-follow format for breaking down scientific information into bite size pieces. The ultimate goal in each episode is to encourage farmers to learn more about individual beneficial insect species and population counts so they will consider this info when faced with an input decision about pest control.

"The podcasts are helping growers and agronomists be more aware of the beneficial insects in their field, and maybe make the decision to let these insects do their work controlling pest insects – saving money and time on inputs," says Wist.

Based on the popularity of the 2020 podcasts, plans are underway for another season of Pests & Predators that would air in early summer 2021.

WGRF

Advancing Agriculture through Research

We've got a new look but you'll still find the same great information on our website.